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Gender Balance in the R&I Field to Improve the Role of Women in the Energy Transition

Final Report and Annexes

Research and Innovation

Gender Balance in the R&I Field to Improve the Role of Women in the Energy Transition – Final Report and Annexes

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Gender Balance in the R&I Field to Improve the Role of Women in the Energy Transition

Final Report and Annexes

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Abstract

Addressing gender balance in the European energy sector is crucial for the success of the energy transition, a key component of the European Green Deal. This report, based on comprehensive research including surveys, data analysis, and expert collaborations, assesses gender balance in the sector and identifies strategies for inclusivity. The findings indicate women make up only 25% of the workforce in EU energy companies, marginally higher in senior roles. Contrary to expectations, women's representation in renewable energy is not higher than in traditional sectors. Women's involvement in research and innovation stands at 22%, with significant variations across EU states. Despite generally satisfactory working conditions, gender pay gaps and discrimination are still in evidence. The report projects the necessity of adding 200,000 women to the EU27 energy sector by 2050 to attain minimal gender balance. Influential factors include societal norms, governance policies, educational structures, and corporate cultures. Emphasizing the need to promote STEM careers for women, the report recommends creating gender-sensitive environments and challenging stereotypes. Concluding, it urges the European Commission to embed gender equality in its energy transition strategy, enhance funding programmes for gender balance, and employ precise indicators for monitoring progress.

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1 Introduction

1.1 Purpose and structure of the document

This document presents the main findings of a Study on Gender Balance in the R&I Field to Improve the Role of Women in the Energy Transition (CINEA/2021/OP/0012) on behalf of the European Commission. Its purpose is to provide valuable insights for a diverse audience. Our goal is to make this information accessible and coherent, shedding light on current trends, historical developments, future projections, and practical solutions.

Our main focus is to create a strong framework to address gender disparities in the energy sector, particularly in research and innovation (R&I), as well as in the renewable and hydrogen sectors. The following sections will cover a review of our work and key findings; a discussion of pathways for policymakers and stakeholders aiming to achieve gender balance in R&I during the energy transition; conclusions and recommendations tailored to different stakeholder groups, including policymakers, educational institutions, energy companies, and civil society.

Our target audience includes policymakers, academic institutions, industry leaders, associations, civil society organizations, HR professionals, European Commission entities, and the general public. We have worked closely with the European Commission and CINEA to carefully structure and develop this report.

1.2 Research questions

The main research questions that guided the study have been the following:

What is the current status in gender equality in (i) the renewables, hydrogen and batteries sectors, and (ii) the energy sector at large:

- … with respect to overall gender balance, seniority, career trajectories and working conditions (e.g., employment relationships, pay, access to social security)?

- How can developments in gender equality in the energy sector be monitored, e.g., using statistical indicators, in a way which effectively supports targeted policymaking?

What are the differences between the current status in gender equality between (i) the renewables, hydrogen and batteries sectors, (ii) conventional energy sectors, and (iii) other sectors of the economy?

- Can differences between sectors be explained fully by STEM-related barriers to gender equality, or are there factors which are specific to the renewables or energy sectors?

- What is the effect of young women's growing interest in climate change and the energy transition on career decisions, including the option of choosing a career in renewables, hydrogen and batteries?

How will the level of gender balance and gender equality in the energy sector develop in the years until 2050:

- ... under certain assumptions concerning the overall development trajectory of the energy sector, the EU economy and the skills pipelines?

- What are the main factors which will explain the development of gender imbalances in the energy sector until 2050?

- What influence, for instance, will changes within the skills pipeline exert on the development of such gender imbalances?

What are the main impacts of (existing and future) gender imbalances in the energy sector , specifically its effect on the capability of the EU to manage the energy transition in socially and economically sustainable ways?

Which options are available for policymakers and other stakeholders to improve gender equality in the energy sector?

- How successful have past interventions, including at the level of individual companies/ organisations employing energy professionals, been in addressing gender imbalances?

- Which interventions are most suitable and effective (depending on implementation context) at the level of (i) education systems, (ii) companies and other organisations employing energy professionals, (iii) government regulation (iv) the wider societal level?

- What are the factors determining the degree to which successful practices can be emulated in different implementation contexts?

1.3 Scope of the study and key working definitions

1.3.1 Definition of gender

Gender describes the characteristics of women and men that are socially constructed, while **sex** refers to their biologically determined characteristics[1]. The two terms are used according to this definition throughout the present document. Mindful that gender is not confined to a binary, in our primary research respondents were given the opportunity to define their gender beyond the binary of male or female. It is, however, important to point out that given that most secondary data that is available is binary, the terms "men" and "women" are used to present sex-disaggregated data unless indicated otherwise. This is in line with the approach used in most quantitative analysis on the subject such as in the She Figures reports[2], which disaggregate data by sex.

More recently, conceptualisations of gender integrate the wider notion of social equity, which captures the intersectional nature of gender (e.g., ethnicity, social status, age, geography). Whenever possible, the present study takes into the account, wherever possible, of **intersecting factors**, such as age, education, family composition and parenthood, country of birth, disability, when collecting data – as it is suggested by the European Institute for

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1 https://www.euro.who.int/en/health-topics/health-determinants/gender/gender-definitions

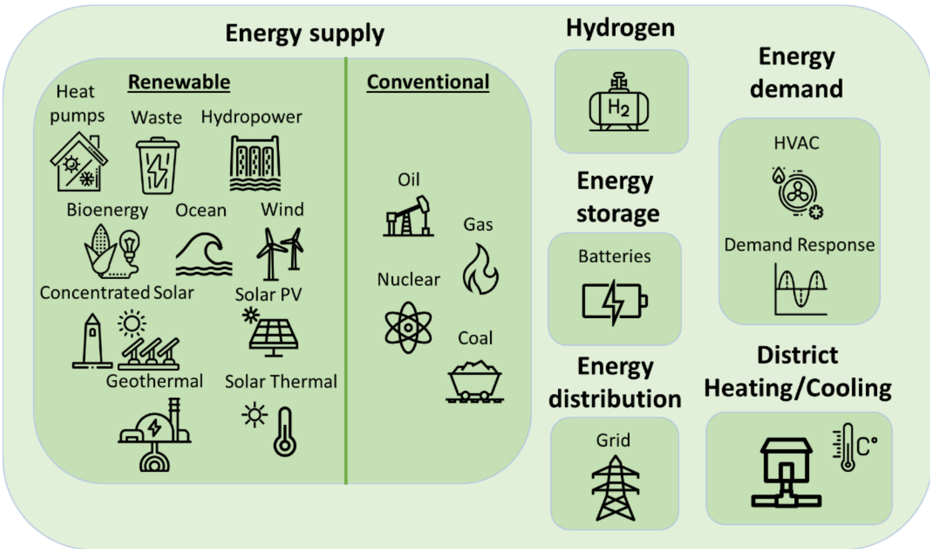
2 European Commission (2021) 'She Figures 2021: Gender in Research and Innovation: Statistics and Indicators', Luxembourg: Publications Office of the European Union, available online: Link.

Gender Equality (EIGE)[3]. Another intersecting factor which has recently attracted attention is geography, i.e., the regional settings within the wider framework of a country and the EU. The data show that there are significant differences, for instance, between more and less developed regions regarding disadvantages affecting women.[4] There is, however, limited data to do an intersectionality analysis of the energy sector, particularly at a European level.

1.3.2 Sectoral scope and definition of research and innovation (R&I)

The sectoral scope of the study encompasses all sub-sectors of the **renewable energy sector**, the sub-sectors of the **conventional energy sector** for comparison, and the **hydrogen, energy storage (batteries) and energy distribution sectors**, which cannot be assigned to only one of these. The scope of this study, illustrated below, was adapted based on the Employment in the Energy Sector report of the Joint Research Centre[5].

Exhibit 1: Sectoral scope of the study



Source: The authors

The renewable energy sector is divided into sub-sectors of solar photovoltaic, solar heating and cooling, concentrated solar energy, wind energy, hydropower, bioenergy (biomass, biogas and liquid biofuels), ocean energies (wave, tidal and ocean thermal), geothermal energy (power generation and heating and cooling), heat pumps, and waste energy (municipal and industrial waste). Given that hydrogen production can occur through various methods, including the use of conventional or renewable resources, it is analysed as a separate sector wherever data availability allows. The conventional energy sector will also

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3 https://eige.europa.eu/publications/gender-mainstreaming-gender-statistics-and-indicators. For defining intersectionality, we follow EIGE, which sees it is an “analytical tool for studying, understanding and responding to the ways in which sex and gender intersect with other personal characteristics/identities, and how these intersections contribute to unique experiences of discrimination” (https://eige.europa.eu/thesaurus/terms/1263).

4 Norlen, H., Papadimitriou, E. and Dijkstra, L. (2019) 'The regional gender equality monitor', JRC Technical reports, Luxembourg: Publications Office of the European Union, available online: Link.

5 Czako, V. (2020) 'Employment in the Energy Sector Status Report 2020', JRC Science for Policy Report, Luxembourg: Publications Office of the European Union, available online: Link.

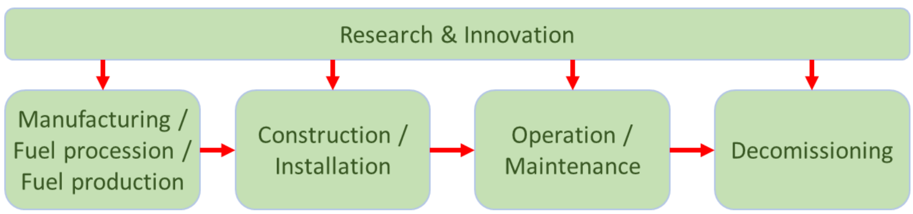
be included for comparison, and consists of nuclear, gas, coal and oil. The distribution includes those that operate the power grids, such as TSOs and DSOs. Energy storage is addressed by including the battery sector.

Note that, for reasons of data availability, the present study needs to make use of classifications which do not map exactly on the sectoral scope as defined above. For example, the sampling frame for the company survey consisted of the SIC codes listed in Annex XII (page 315).

For reasons of data availability, our definition of the study's sectoral scope could not be applied consistently in all collection of primary and secondary data. For example, sector-disaggregated data from labour force surveys is not available for all subsectors listed above. In the present report we highlight any limitations arising from such cases when presenting the data in the study's outputs. Additional information can be found in Annex VI (from page113).

Within each of these sub-sectors, the study covers the entire value chain comprising of manufacturing/ production/processing, construction/ installation, operation & maintenance, and decommissioning, as in the JRC energy sector analysis. The study specifically addressed the R&I part that may address and contribute to all the steps of the value chain, as illustrated in Exhibit 2.

Exhibit 2: Basic value chain of energy technologies



Source: JRC[6]

Our understanding of the term research & innovation (R&I) follows the internationally recognised definitions contained in the **Frascati Manual** published by the OECD[7] and the **Oslo Manual** published by the OECD and Eurostat[8]. The Frascati Manual distinguishes between three **types of research and development** (R&D):

- "Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.

[6] Adapted from: Czako, V. (2020) 'Employment in the Energy Sector Status Report 2020', JRC Science for Policy Report, Luxembourg: Publications Office of the European Union, available online: Link.

[7] OECD (2015) 'Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities', OECD Publishing, Paris, available online: Link.

[8] OECD/Eurostat (2018) 'Oslo Manual 2018: Guidelines for Collecting, Reporting and Using Data on Innovation', 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris/Eurostat, Luxembourg, available online: Link.

- Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective.

- Experimental development is systematic work, drawing on existing knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes."

In addition to these different types of research, our definition of R&I comprises the four **types of innovation** described in the The Oslo Manual:

- "A **product innovation** is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics."

- "A **process innovation** is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software."

- "A **marketing innovation** is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing."

- "An **organisational innovation** is the implementation of a new organisational method in the fi rm's business practices, workplace organisation or external relations."

1.3.3 Fields of education and training

Our analysis of education and training for positions in the energy sector focuses on three broad fields, as illustrated below, defined in accordance with the International Standard Classification of Education, or ISCED: [05] Natural Sciences, Mathematics, and Statistics; [06] Information and Communication Technologies (ICTs); and [07] Engineering, Manufacturing and Construction. These fields make up the focal point of the analysis as they provide students and graduates with the knowledge and skills required for subsequent employment in the energy sector or a position as a researcher in an energy-related field. Importantly, these three fields cover the disciplines related to STEM education and training, which are critical to meeting workforce needs in the energy sector[9].

[9] UN Women (2020) 'Women in Science, Technology, Engineering, and Mathematics (STEM) in the Latin America and the Caribbean Region', Montevideo: UN Women, available online: Link.

Exhibit 3: Relevant ISCED fields of education and training

Broad field	Narrow field
05 Natural Sciences, Mathematics and Statistics	051 Biological and Related Sciences
	052 Environment
	053 Physical Sciences
	054 Mathematics and Statistics
06 Information and Communication Technologies (ICTs)	061 Information and Communication Technologies (ICTs)
07 Engineering, Manufacturing, and Construction	071 Engineering and Engineering Trades
	072 Manufacturing and Processing
	073 Architecture and Construction

Source: UNESCO Institute for Statistics[10]

In particular, we concentrate on five sub-fields within the three broader classifications to sufficiently narrow down education and training of relevance. For this purpose, we rely on the UNI-Set Universities Survey Report by the European University Association. It found that programmes related to the energy sector are highly concentrated in [071] Engineering and Engineering Trades given that it encompasses subjects like Electricity and Energy. The following four highly featured sub-fields are: [053] Physical Sciences, [052] Environment, [054] Mathematics and Statistics, and [061] Information and Communication Technologies (ICTs)[11].

1.3.4 Geographical scope

The quantitative analysis to be carried out covers **all SET Plan countries,** i.e., EU27 member states plus Norway, Iceland, Switzerland, and Turkey, as well as **four additional Mission Innovation**[12] **countries**: Australia, Canada, the U.K. and the USA.

When referring, throughout the document, to the 35 countries covered by the present study, we mean these 27+4+4 countries.

1.3.5 Collection of primary statistical data in the context of the study

The boxes below give an overview of the three interview surveys that were conducted in the context of the study. More information can be found in Annex I starting on page 113.

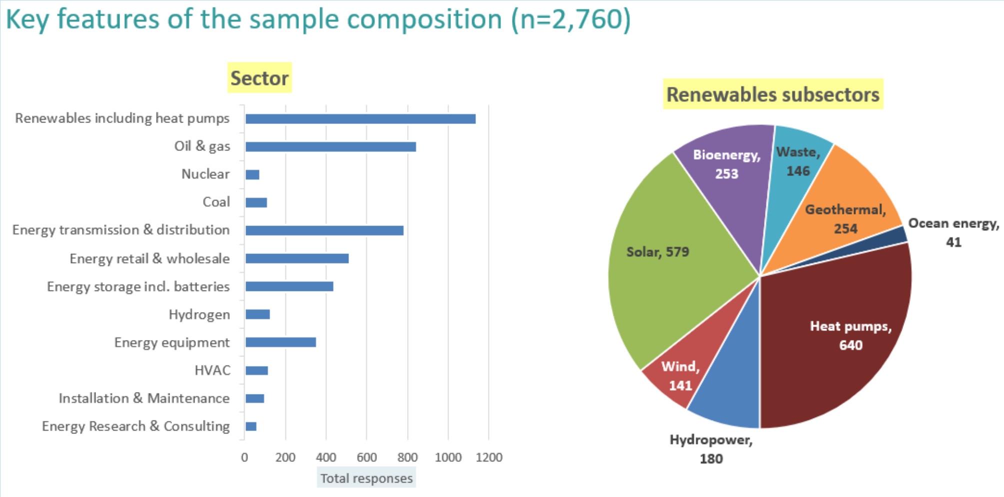
10 UNESCO Institute for Statistics (2014) 'ISCED Fields of Education and Training 2013', Montreal: UIS, available online: Link.

11 European University Association (2017) 'Energy Research and Education at European Universities: The UNI-SET Universities Survey Report', Brussels: EUA, available online: Link.

12 http://mission-innovation.net/about-mi/overview/

Exhibit 4: Methodological notes about survey of energy sector companies

Survey of energy sector companies



The survey was conducted in early summer 2023 using computer-aided telephone interviews (CATI) by a specialised survey research company (GDCC). The sampling frame consisted of companies with >10 employees in the energy sector in the 35 countries covered by our study[13].

The target interviewee was the HR manager or a member of management with responsibility for HR matters. The questionnaire covered the following topics: Current gender ratios by key occupational groups; Implementation of measures to boost gender balance; Perceived effectiveness of such measures; Perceptions about barriers to achieve gender balance; and difficulty in filling open positions.

Country	n	Country	n	Country	n
Austria	89	Hungary	79	Slovenia	50
Belgium	79	Ireland	69	Spain	100
Bulgaria	90	Italy	100	Sweden	89
Croatia	50	Latvia	68	Norway	107
Cyprus	29	Lithuania	70	Iceland	30
Czech Republic	80	Luxembourg	30	Switzerland	128
Denmark	64	Malta	13	Turkey	127
Estonia	77	Netherlands	91	Australia	99
Finland	70	Poland	88	Canada	97
France	90	Portugal	90	UK	99
Germany	100	Romania	86	USA	96
Greece	77	Slovakia	59	**TOTAL**	**2,760**

Readers should note that survey results are **not weighted by company size**, i.e., they are not adjusted for the size of each company in terms of its number of employees. In other words, small

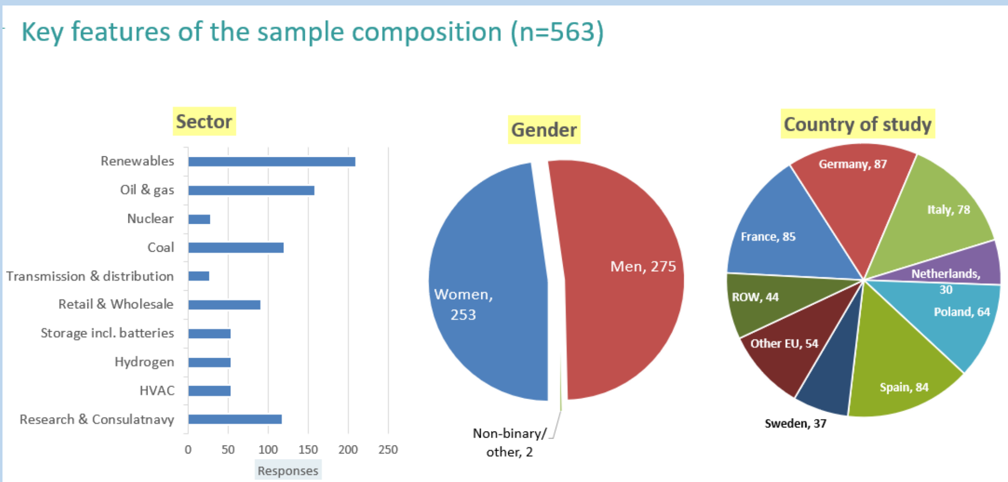
13 In some smaller countries, companies with 5-9 employees were included as well because of exhaustion of the sampling frame for larger companies. The data on companies with less than 10 employees were included exclusively in the multivariate analysis.

companies and large companies are treated as equals in our calculations. In other words, small companies and large companies are treated as equals in our calculations. This means the results might not give a fully accurate picture of the entire energy sector workforce. For example, if a large company with 500 employees introduces a new policy, it affects more people than if a small company with 10 employees does the same. But in our results, both companies would be counted equally. EU averages are also not weighted by country size.

Due to the limited number of companies in the address database, the sample does not always allow for analysis at individual country level. Therefore, the following **country groupings** are used to in the following to present geographical differences: Anglophone Europe (Ireland & U.K.), Baltic (Estonia, Latvia, Lithuania), Central-Eastern Europe (Bulgaria, Croatia, Czechia, Hungary, Poland, Romania, Slovakia, Slovenia), Continental Europe (Austria, Belgium, France, Germany, Luxembourg, Netherlands, Switzerland), Northern Europe (Denmark, Finland, Iceland, Norway, Sweden), Southern Europe (Cyprus, Greece, Italy, Malta, Portugal, Spain, Turkey), and Non-Europe (Australia, Canada, United States).

Exhibit 5: Methodological notes about survey about of energy sector employees

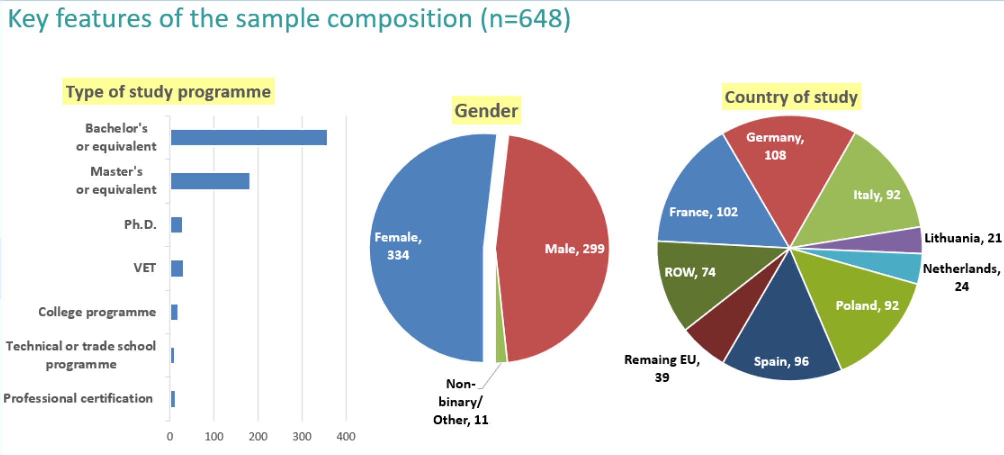
Survey of energy sector employees



A survey targeting employees of the energy sector was conducted in summer 2023. The questionnaires were implemented on the web, namely on EUSurvey and Netigate. The survey made use of a structured questionnaire with a range of closed questions and the option to add open text responses where appropriate. The survey was distributed with the help of the broad network of organisations and experts in the studied countries. In addition, an industry panel provided by Netigate was used to reach the target number of responses. The survey was aimed an any person in the target population of people working in the energy industry, irrespective of gender. The survey took 15 to 20 minutes to answer. All answers were anonymous, and the respondents were not asked any identifiable information, such as e-mail address, to avoid bias. The questionnaire was available in the primary national language of each EU27 country and special attention was paid to formulate the questions in a non-biased, clear and gender-neutral manner, avoiding jargon or ambiguity. No weighting was applied to the dataset.

Exhibit 6: Methodological notes about survey of students in tertiary education

Survey of students in tertiary education

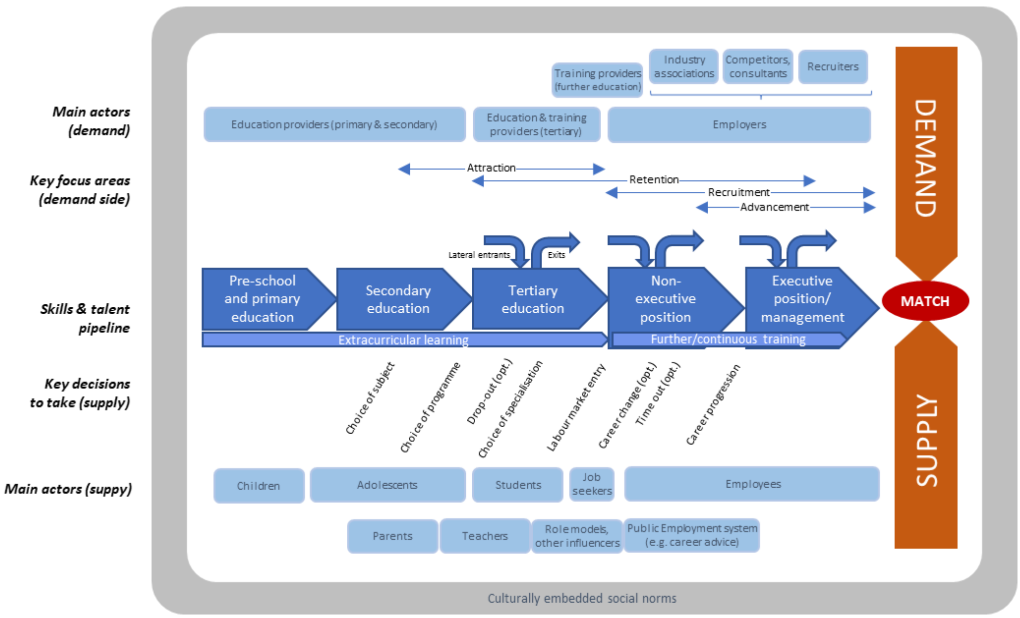


A survey targeting students in tertiary education was conducted in summer 2023. The questionnaires were implemented on the web, namely on EUSurvey and Netigate. The survey made use of a structured questionnaire with a range of closed questions and the option to add open text responses where appropriate. The survey was distributed with the help of the broad network of organisations and experts in the studied countries. In addition, a student panel provided by Netigate was used to reach the target number of responses. The survey was aimed an any person in the target population, irrespective of gender and field of education and training. The survey took 5 to 10 minutes to answer. All answers were anonymous, and the respondents were not asked any identifiable information, such as e-mail address, to avoid bias. The questionnaire was available in English as well as French, German, Italian, Polish and Spanish. No weighting was applied to the dataset.

2 Conceptual background

Several conceptual models and proposals for a theoretical foundation have been developed for the purpose of guiding research on gender inequalities with respect to participation in education & training, the labour market and top-level decision-making[14]. The overall goal of such models is to contribute to understanding the causes of gender inequalities and how these interrelate with each other to produce the outcomes we currently observe, and which are reflected in indicators on gender imbalances in the field of R&I related to the energy transition. Since the focus of the present study is on skills and the labour market, the heart of our framework consists of the **skills & talent pipeline** (see Exhibit 7 below). Such pipeline models are of special relevance for the analysis of the causes of gaps in the representation of women and minority groups in certain parts of the workforce [15]. The pipeline approach was originally developed in the sales and marketing sphere; talent pipelines are used in the recruitment context to conceptualise pools of potential candidates that employers can access and engage with for ensuring a steady supply of workers to fill open positions within an organisation. Organisations typically have multiple talent communities that revolve around certain roles or themes as part of their talent acquisition strategy. From the viewpoint of labour markets at large, the pipeline approach can be used to guide medium and long-term strategies for addressing current or emerging skill shortages and gaps affecting a given sector.

Exhibit 7: Conceptual model for the analysis of the gender balance in the energy sector workforce



Source: empirica

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14 For example, see: genSET (2010) ‘Recommendations for Action on the Gender Dimension in Science’, Project report, London: Portia, available online: Link.

15 For example, see: Stewart, C. (2016) ‘How diverse is your pipeline? Developing the talent pipeline for women and black and ethnic minority employees’, Industrial and Commercial Training, 48(2): 61–66, available online: Link.

In the context of the need for more women to enter the labour force in the energy sector and take over more senior positions within organisations, the skills & talent pipeline comprises primary, secondary and tertiary education & training (including extracurricular skills development, such as in coding schools) as well as the phases after entering the labour market (including further education). Major determinants of the demand for and supply of skills related to the energy transition include the willingness and practices of employers to recruit women for positions in the industry and the interest of girls and women to opt for a career in energy, respectively. These, in turn, are heavily influenced on the supply side, by gendered norms and perceptions, e.g., among young women, their parents and social environment about the merits, suitability and appropriateness of careers in the domain. A major influence is exerted also, of course, by stakeholders in the career guidance system.

It should be noted that the pipeline metaphor has been criticised based on various arguments:

- The pipeline metaphor risks being too simplistic and limiting, and does not account for the wide variety of possible career pathways, e.g., in STEM fields[16];
- The pipeline metaphor assumes that the only way to increase diversity in certain fields (such as energy related STEM programmes) is to increase the number of students who enter the pipeline, rather than addressing the systemic barriers that prevent underrepresented groups from succeeding in these fields[17];
- Moreover, the pipeline metaphor tends to ignore students who do not fit the narrow profile of, e.g., a "STEM student", and can discourage them from pursuing such careers[18];
- The pipeline metaphor can lead to a focus on short-term solutions, such as increasing the number of students who enter STEM fields, rather than addressing long-term systemic issues, such as the lack of diversity in STEM leadership positions[19].

We take account of these arguments by putting the spotlight on the need for proactive strategies on the part of all main stakeholders in the education & training system and the labour market not so much on “channelling young people into the pipeline”, but especially on proactive pursuits for **attraction**, **recruitment**, **retention,** and **advancement** of women within the energy sector skills ecosystem.

In the following sections, we discuss empirical evidence, in particular, from the primary research undertaken by the study research team, on gender balance regarding R&I on the energy transition.

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16 Hill, W. L. (2019) ‘The Myth of the STEM Pipeline’, online article, IHE Inside Higher End, 01/10/2019, available online: Link.

17 Cannady, M.A., Greenwald, E. & Harris, K.N. (2014) ‘Problematizing the STEM Pipeline Metaphor: Is the STEM Pipeline Metaphor Serving Our Students and the STEM Workforce?’, Sci. Ed., 98: 443-460, available online: Link.

18 Hill, W. L. (2019) ‘The Myth of the STEM Pipeline’, online article, IHE Inside Higher End, 01/10/2019, available online: Link.

19 Cannady, M.A., Greenwald, E. & Harris, K.N. (2014) ‘Problematizing the STEM Pipeline Metaphor: Is the STEM Pipeline Metaphor Serving Our Students and the STEM Workforce?’, Sci. Ed., 98: 443-460, available online: Link.

3 Gender balance in R&I on the energy transition

The analysis of the role of women in the energy transition, Clancy suggest comparing between three *roles of women as change agents* in the context of the shift[20]:

- As **energy professionals**: The key issue here is the underrepresentation of women compared to men working in the energy sector;

- As **energy decision makers**: The key issue here is the underrepresentation of women in energy policy making and decision-making bodies at all levels in the European Union and its Members States;

- As **energy consumers**: The key issue here are gender differences in patterns of energy consumption and demand.

The role of women as energy consumers is beyond the scope of the present study. Our research has focused instead entirely on the role of women as energy professionals and energy decision makers in institutional settings.

While the role of women as energy consumers is beyond the scope of the present study, the first two roles have been at the centre of our research. Before looking closer into women operating in the energy sector as professionals, in the following we first discuss women as decision-makers on matters related to the energy transition.

3.1 Women as decision makers on the energy transition

3.1.1 Background: Attitudes to the energy transition

How decisions about the energy transition are made, who and why and how is included in that process, can have a strong influence on the outcomes of the decisions, e.g., how wealth and prosperity (or, for that matter, cuts in both, which will be required to help meet, e.g., Green Agenda targets) are distributed and shared across a population. If women are underrepresented at all levels and in all areas of energy-related decision making they are excluded from energy transition decision-making processes, this may reinforce existing inequalities[21], and, critically, the "greening" of energy systems may not make them any fairer, inclusive, or just without recognition of and specific interventions to address gender concerns[22].

Apart from general questions of justice between the sexes, the quality of decision making on the energy transition can also be expected to be influenced by gender imbalances *if attitudes and their translation into effective behaviours in energy transition related matters can be shown to differ between both genders*.

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20 Clancy, J. & Feenstra, M. (2019) 'Women, Gender Equality and the Energy Transition in the EU', Study for FEMM Committee, European Parliament, available online: Link.

21 Sovacool, B. K. (2021) 'Who are the victims of low-carbon transitions? Towards a political ecology of climate change mitigation', Energy Research & Social Science, 73, available online: Link.

22 Johnson, O. W. et al. (2020) 'Intersectionality and energy transitions: A review of gender, social equity and low-carbon energy', Energy Research & Social Science, 70, available online: Link.

There is, indeed, a consensus emerging that women and men are **impacted differently** by environmental hazards, such as climate change, and that gender influences the perception of environmental risks and the necessary actions to address them, which has led to claims of a "**gender gap in environmentalism**"[23]. Previous research in Europe found that women are more likely than men to say climate change is a very serious problem and to have taken personal action to fight climate change[24]. Women are less likely than men to support fossil fuels and are more likely to consider them an environmental risk than an economic opportunity[25]. Men are more knowledgeable of energy sustainability and have better cause-effect logic, while women are more concerned regarding its importance and make better holistic associations in energy sustainable decision-making[26]. Climate change scepticism is higher among men than among women[27]. Women are more supportive of renewable energy than men[28]. Women are more inclined than men to buy more energy efficient appliances, use energy more efficiently and buy environmentally friendlier products even if they cost more[29]. Women in general were found to be more open to energy behaviour change and express willingness to buy green energy despite higher costs[30].

At an organisational level, companies with a higher share of women on their board of directors were found to be more likely to proactively invest in renewable energy and to reduce carbon emissions[31,32]. Similarly, countries with higher rates of female parliamentary representation were found to be more likely to cut greenhouse gas emissions and designate protected land areas[33]. In the European Parliament, female MEPs were found to be more likely than their male colleagues to advance environmental protection[34].

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23 Economou, A. & Halkos, G. (2020) 'The Gender Environmentalism Gap in Germany and the Netherlands', Social Science Quarterly, 101: 1038-1055, available online: Link.

24 https://ec.europa.eu/clima/system/files/2021-07/report_2021_en.pdf

25 Davis, C., & Fisk, J. (2014) 'Energy abundance or environmental worries? Analyzing public support for fracking in the United States', Review of Policy Research, 31(1): 1-16, available online: Link.

26 Imbulana Arachchi, J. and Shunsuke, M. (2021) 'Preferences for energy sustainability: Different effects of gender on knowledge and importance', Renewable and Sustainable Energy Reviews, 141: 110767, available online: Link.

27 Whitmarsh, L. (2008) 'Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response', Journal of Risk Research, 11(3): 351-374, available online: Link.

28 Clancy, J. S. (2001) 'Gender and Energy-Women's Concerns in Energy: Background and State of the Art. Gender Impact Assessment of the Energy Sub-Programme of the Fifth Framework of the European Communities', Brussels: European Commission, Directorate General of Research.

29 Carlsson-Kanyama, A., Pipping Ekström, M. and Shanahan, H. (2003) 'Food and life cycle energy inputs: consequences of diet and ways to increase efficiency', Ecological Economics, 44: 293-307, available online: Link.

30 European Institute for Gender Equality (2012) 'Review of the implementation in the EU of area K of the Beijing Platform for Action: Women and the Environment. Gender and Climate Change', Luxembourg: Publications Office of the European Union, available online: Link.

31 Atif, M., Hossain, M., Alam, M.S., and Goergen, M. (2021) 'Does board gender diversity affect renewable energy consumption?', Journal of Corporate Finance, 66: 101665, available online: Link.

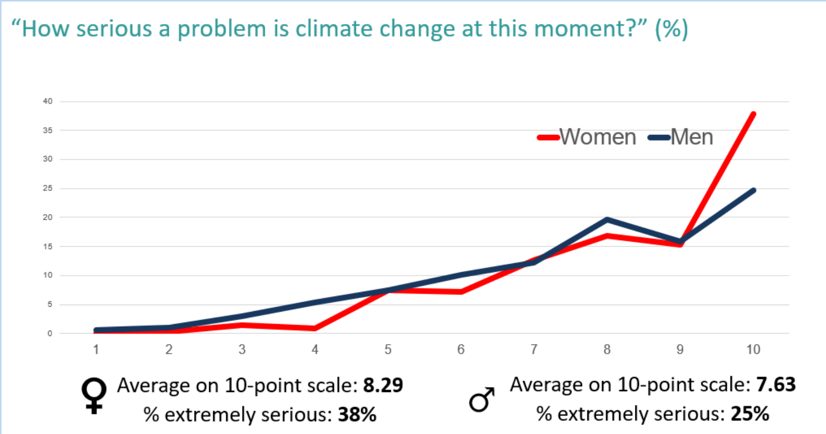
32 Center for Responsible Business (2012) 'Women Create a Sustainable Future', Haas School of Business, University of California Berkeley, Berkeley (CA), available online: Link.

33 United Nations Development Programme (UNDP) (2011) 'Human Development Report 2011: Sustainability and Equity: A Better Future for All', New York: UNDP, available online: Link.

34 Ramstetter, L.; Habersack, F. (2020) 'Do women make a difference? Analysing environmental attitudes and actions of Members of the European Parliament', Environmental Politics, 29(6): 1063-1084, available online: Link.

Exhibit 8: Survey findings on gender differences in opinions about climate change

Findings from survey of tertiary students



All students; n = 644; Scale: 1 = "Not at all a serious problem"; 10 = "An extremely serious problem"

Data from our own survey of students in tertiary education confirms that women tend to be more concerned about climate change than men, see chart above. 38% of female students consider the climate change an extremely serious problem, compared to merely 25% of male students.

The causal mechanisms that lead to gendered differences in environmental thinking and acting remain contested, but they are thought to be a combination of a variety of factors, such as the socialisation of women to be more altruistic and risk averse, see chapter 3.5.

Such gendered differences in attitudes and behaviours have several implications for the topic of the present study:

- Considering both gender and generational differences, young women particularly stand out as the group that have the greatest awareness of climate change[35], which could potentially create new opportunities to attract them into STEM in general and careers in energy in particular;
- Opportunities for community engagement as opposed to economic prospects can contribute to the share of women in the renewable energy sector[36], including renewable energy R&I;
- An increasing share of women in decision making positions can be expected to influence energy policies and energy transition related R&I policies, and also to create novel professional opportunities in line with women's priorities and interests.

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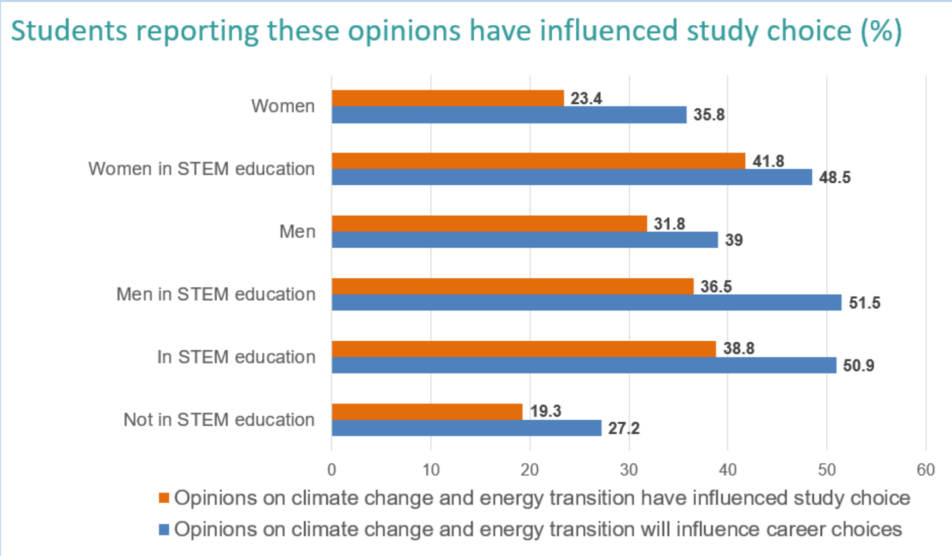
35 Bowman, B. (2019) 'Imagining future worlds alongside young climate activists: a new framework for research', Fennia - International Journal of Geography, 197(2): 295-305, available online: Link.

36 Emmons Allison, J., McCrory, K., and Oxnevad, I. (2019) 'Closing the renewable energy gender gap in the United States and Canada: The role of women's professional networking', Energy Research & Social Science, 55: 35-45, available online: Link.

Exhibit 9: Survey findings on influence of opinions about climate change and the energy transition on own study and career choices

Findings from survey of tertiary students



All students; n = 620-647; Sum of responses "yes, a little" and "yes, a lot" in %

Data from our own survey of students in tertiary education suggests that at the moment, female students are less likely to report that their opinions about the climate change and the energy transition have influenced their choice of field (see chart above). 23% report that this was the case, against 32% of male students. Among STEM students, however, a larger share of women than men report an influence of such opinions upon their study choice (42% against 37%).

3.1.2 Gender balance in policymaking

Women are underrepresented among policy makers in positions taking decisions related to the energy transition, but there is evidence of significant improvements over recent years. According to a 2014 study analysing 72 countries around the world, women represented only 6% of ministerial positions responsible for national energy policies and programmes[37].

Looking at Europe and more recent data, the status looks better but not yet gender balanced. The ASSET study conducted surveys in 2021 of EU Member States' energy-related ministries, regulation bodies and gas and electricity transmission system operators (TSOs).[38] Its main findings include:

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[37] Pearl-Martinez, R. (2014) 'Women at the Forefront of the Clean Energy Future', White Paper, Initiative Gender Equality for Climate Change Opportunities (GECCO), Washington D.C.: IUCN-USAID, available online: Link.

[38] ASSET (2021): 'Collection of gender-disaggregated data on the employment and participation of women and men in the energy sector', project report, Brussels: European Commission, Directorate-General for Energy, available online: Link.

- For **energy-related national ministries**, the proportion of women at the two highest job positions (Ministers and Junior Ministers) was merely about a quarter on average, while at Directorates level gender balance is nearly achieved;

- In the case of **regulators**, the female share is close to 50%, with a slight decrease for the board and the senior management positions;

- In the case of **TSOs**, the share of women among board members is 19% on average, 17% in senior management and 23% of the total workforce.[39]

A publication of EIGE from October 2023[40] indicates some more recent improvements:

- The share of women among **senior ministers responsible for energy** in the EU-27 in November 2022 was 43%, compared to 32% for the total of all senior ministers.

- The share of women among members of European Parliament committees dealing with energy in May 2023 was 41%;

- The share of women among **members of parliamentary committees dealing with energy** in those 19 EU countries that feature a parliamentary committee or senior minister with this specific responsibility in September 2022 was 29%, compared to 36% for all committees. The share of women among **chairs of parliamentary committees** dealing with energy in the same countries was merely 8%.

- Overall, the report finds a good representation of women in senior level decision-making on energy compared to some other areas of the European Green Deal, namely agriculture, transport, and finance and regional development.

There is some evidence, then, of significant improvements in gender balance at the senior policymaking level dealing with the energy transition.

Some experts warn, however, that striving for more gender balance at the level of representation, but not also reflected in the wider workforce, can be misguided because "there is some suggestion that women who do manage to enter into male-dominated spheres tend to act according to the institutionalised 'masculine' norms that characterise them. [...] Therefore, there is a danger that prioritisation of participation could fail to integrate women's interests while other potential pathways are neglected."[41]

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39 The study also sought to explore intersectional issues such as the share of women (by level of seniority) who belong to minority groups (according to existence of a disability, ethnic origin, non-EU citizenship, caring responsibilities), but since none of the findings are reported but challenges mentioned, it appears that the data could not be analysed meaningfully (possibly because of low response rates/missing data and lack of data for drawing comparisons).

40 European Institute for Gender Equality (EIGE)(2023) 'Gender balance in the European Green Deal', Luxembourg: Publications Office of the European Union, available online: Link.

41 Mort, H. (2019) 'A Review of Energy and Gender Research in the Global North', project report, Gender Equality in Engineering through Communication and Commitment (GEECCO), available online: Link.

3.1.3 Gender balance among senior management in the energy sector

For discussion of available evidence on the share of women among senior managers in the energy sector, see chapter 3.4.7.

3.2 Matching skills to green energy jobs: The energy transition's impact on skills demands

Any paradigmatic shift affecting large parts of the economy, such as the energy transition (itself part of an expected and politically desired general shift to ecologically more sustainable lifestyles and economies), must be expected to exert a large influence on the types of labour and skills required on the labour market. Matching skills to green energy jobs and ensuring that skills supply will evolve in line with projected changes in skills demand presents a major challenge for Europe, as well as its competitors in the global market. For obvious reasons, then, the issue of gender balance in the workforce of a fast-changing sector such as the renewables industries is related to the evolution of skills needs.

According to a recent study by the ILO on methods of identification of skills needs in the context of the transition to the low carbon economy[42], such research takes place at four main levels: macroeconomic; sectoral; occupational and skills; and training and education.[43] The same study distinguishes four areas of skill needs:

- **Changing need for existing occupations**: For some areas of skill, people in a well-defined existing occupation are required, often with specialized knowledge relevant to implementing the transition.

- **Changing occupations**: For some areas, people who fit quite well into one or more existing occupational classifications are needed, but who require a skill set that differs significantly from that of people doing more traditional work in those occupations.

- **Newly emerging occupations**: For some area of skill, people with new skills in types of roles that amount to new occupations are needed, e.g., energy efficiency.

- **New skill needs across occupations**: In some areas of skill, the requirement is to supplement existing skills within existing occupations. Examples might include economics

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[42] ILO (2011) 'Comparative Analysis of Methods of Identification of Skill Needs on the Labour Market in Transition to the Low Carbon Economy', Geneva: International Labour Organization, available online: Link.

[43] Approaches to quantitative analysis within these levels vary significantly, but approaches taken to linking them are fairly standard:
• Input-output Matrices (or similar SAM and supply-use matrices) are used to link macro analysis to sector analysis.
• Sector-Occupation matrices are used to link sector analysis to occupational analysis.
• Calculations based on changes in numbers employed plus replacement demand are used to link occupations to demand; substantial qualitative analysis are required to make this comparable with data on manpower supply.

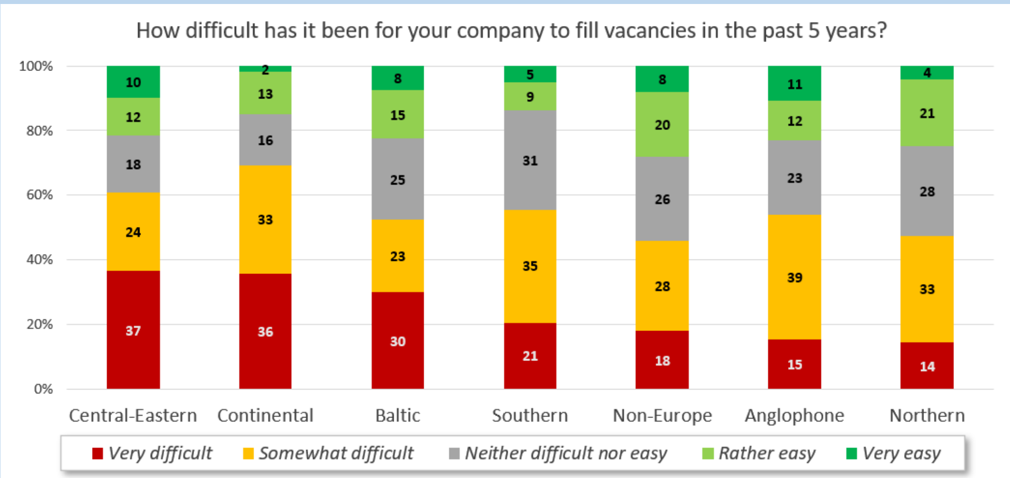
It is possible for research projects to focus just on sector level or just at macro level, but most span and link both levels. There is no single correct approach to macroeconomic analysis. Assumptions about developments in technology, labour productivity and industry structure should also be taken into account in sector level models. Occupational modelling should take account of likely future changes in occupational structure. See ILO (2011).

of sustainable transport for road engineers, carbon management for operations managers, or balancing heating systems for plumbers and heating engineers.[44]

Several studies have used approaches of this type to model the employment impact of the energy transition. Findings from this emerging body of research clearly indicate that a **big amount of workforce re-shuffling in the context of the energy transition** can be expected. A report by the International Energy Agency in 2019 suggests that the number of jobs in the energy sector could increase to 29 million worldwide by 2050[45]. This growth accounts for the human capital required within the energy sector to successfully implement and transition to clean energy. The discussion in many European countries displays a tension between, on the one hand, the need for qualified personnel to technically enable the green transition and, on the other hand, qualified workforce in carbon-based industries likely to lose their jobs.[46] Consulting firm McKinsey estimates[47] that "reaching net-zero emissions could require retraining up to 18 million workers, especially to fill jobs that currently do not exist (almost 3.4 million by 2050) and those lost during the transition (2.1 million by 2050). [While] some of the new jobs would require skills similar to those that disappear (for instance, oil and gas engineers could transition into the CCS industry)", others will require totally new or redesigned education and training programmes.

Exhibit 10: Survey findings on companies' difficulties in filling vacancies

Findings from survey of energy sector companies



All companies with >9 staff and with vacancies over last 5 years; n = 736 (missings excluded)

Many companies in the energy sector suffer from challenges in sourcing talent. 25% of the entire sample (EU27: 30%) faced severe difficulties in filling vacancies over the past 5 years, and 57%

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44 ILO (2011) 'Comparative Analysis of Methods of Identification of Skill Needs on the Labour Market in Transition to the Low Carbon Economy', Geneva: International Labour Organization, available online: Link.

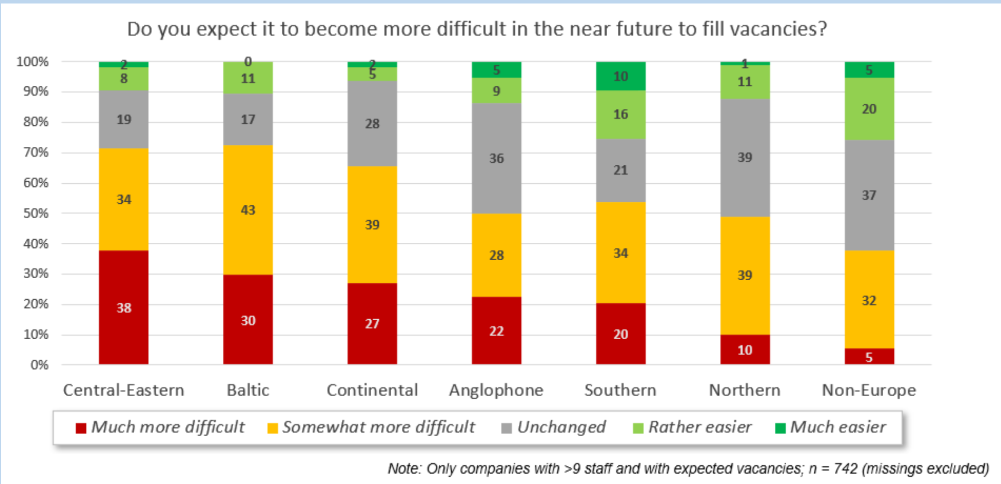
45 IEA (2021) 'Net Zero by 2050 - A Roadmap for the Global Energy Sector', Paris: International Energy Agency, available online: Link.

46 Korte, W.B. and Vogt, W. (2020) 'Energieberufe im Wandel – Ergebnisbericht SINTEG', available online: Link.

47 McKinsey (2020) 'Net-Zero: Europe Decarbonization pathways and socioeconomic implications', available online: Link.

(EU27: 59%) faced at least some difficulties. Companies facing severe difficulties are particularly widespread in Central-Eastern and Continental Europe, much less so in Northern and Anglophone Europe.

The picture is even more serious when looking at expectations for the next 2-3 years (see chart below). Many companies in the energy sector expect increasing challenges in. 22% of the entire sample (EU27: 26%) expect much stronger difficulties in sourcing talent in the near future, and 58% (EU27: 63%) expect at least some aggravation of the skill shortage. This highlights the extent to which shortages on the labour market put pressure on energy sector companies just at a time when the energy transition forces companies to adapt to a fast-changing business environment.



Note: Only companies with >9 staff and with expected vacancies; n = 742 (missings excluded)

For renewables subsectors, available projections also indicate a fast-growing demand for skilled labour. McKinsey forecasts that the **battery** industry, across the entire value chain, “could contribute to up to 18 million jobs in 2030 by securing existing positions and creating new ones”, a considerable increase over earlier projections[48]. The EU Solar Jobs Report projects that the EU **solar PV** industry will create about one million jobs by 2025 and 1.2 million jobs by 2027[49]. According to WindEurope, the European **wind** industry will need to fill at least 150,000 new positions, from today's 300,000 jobs to more than 450,000, in just 8 years[50]. Already in 2019, an industry consortium of gas transport companies estimated that the **green hydrogen** economy could create as many as 5.4 million upstream jobs in the EU by 2050, of which about one-third of new jobs would be associated only with fuel cells[51]. EHPA, an association representing the **heat pump** industry, estimates that “the number of employees needed to supply the [expected] 2030 sales to the market will amount to between

48 Fleischmann, J. et al. (2023) ‘Battery 2030: Resilient, sustainable, and circular’, online article, available online: Link.

49 SolarPower Europe (2023) ‘EU Solar Jobs Report 2023: Bridging the solar skills gap through quality and quantity’, available online: Link.

50 WindEurope (2022) ‘What is the wind industry doing on skills and education to deliver a fair transition?’, online article, available online: Link.

51 Navigant Netherlands (2019) ‘Gas for Climate: Job creation by scaling up renewable gas in Europe’, online article, available online: Link.

450 and 500,000 FTE (full-time equivalent), compared to around 117,000 today. While some of these will be re-trained boiler installers, others will be new to the industry"[52].

Overall, the green transition is expected to create mainly medium-skilled jobs.[53][54] The Green General Skill index developed by Vona et al.[55] identifies for **skills groups especially relevant for the green transition**: engineering and technical skills, science skills, operation management skills and monitoring skills[56]. The nature of skills required varies across the energy value chain and according to the extent to which renewables are integrated. However, new and changing occupations and skillsets do not necessarily lead to a new workforce structure. Starting at the operator level, skillsets in energy generation contexts are likely to involve a lot of physical work, largely dominated by male workforce. Operators and installers in wind and solar share a skillset with, e.g., coal workers that involves work in hazardous environments and physical strength[57][58]. However, other middle-skilled energy professions are becoming increasingly data-related – such as remote power plant maintenance.[59] They will increasingly include digital skills and therefore become more independent of physical attributes. In this regard, the share of women in these new job profiles also depends on the success in up-/reskilling the existing (mainly male) fossil energy workers – not only on the permanent challenge of attracting women to STEM (see section 3.5.2).

3.3 Producing the skills for professional roles in the energy transition

The conceptual model depicted in Exhibit 7 on page 24 shows the main components of the skills pipeline for jobs in the energy sector. It distinguishes between:

- **Pre-school and primary education**, stages which have been identified by research into STEM-related decisions of young people as being of major importance for later career choices[60]. Consequently, early exposure with STEM related topics is now included in many strategies for attracting more women to STEM.

- **Secondary education**, a stage during which young people prepare or take choices for tertiary education or VET, and sometimes develop a strong interest already for certain

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52 European Heat Pump Association (2023) 'Heat Pumps in Europe: Key Facts & Figures', Brussels: EHPA, available online: Link.

53 ILO (2019) 'Skills for a Greener Future: A Global View', Geneva: International Labour Organization, available online: Link.

54 JRC (2020) 'Employment in the Energy Sector', JRC Science for Policy Report, Luxembourg: Publications Office of the European Union, available online: Link.

55 Vona, F., Marin, G., Consoli, D., Popp, D.C. (2015) 'Green Skills', CESifo Working Paper Series No. 5323, available online: Link.

56 Arthur, C. (2022) 'What are green skills?', Online post, available online: Link.

57 JRC (2018) 'EU Coal Regions: Opportunities and Challenges Ahead', JRC Science for Policy Report, Luxembourg: Publications Office of the European Union, available online: Link.

58 https://res-skill.eu/

59 JRC (2020) 'Employment in the Energy Sector', JRC Science for Policy Report, Luxembourg: Publications Office of the European Union, available online: Link.

60 Van Tuijl, C. & Van Der Molen, J. H. W. (2016) 'Study choice and career development in STEM fields: An overview and integration of the research', International Journal of Technology and Design Education, 26(2): 159–183, available online: Link.

career trajectories. Teachers and families have been identified as playing an often-critical role in influencing career choices during the secondary education stage.[61]

- **Tertiary education and Vocational education and training (VET)**: While there are study programmes preparing students for narrowly defined job positions in the energy sector, a much broader range of fields (typically in STEM) qualify for jobs in the industry. Since many female students graduate in a STEM field but afterwards decide to work in a non-STEM position, more needs to be learned about their experience while in tertiary education and how positive change can be made to happen.

- **Extracurricular learning**, including out-of-school time (OST) programmes such as summer camps and enrichment programmes focusing on energy- and STEM-related activities, is made us of to influence students' attitudes towards subjects they might not be confronted with otherwise[62]. In the area of digital skills, in particular, many grassroots programmes have been initiated to equip girls and young women with programming skills in a playful manner.

- **Further / continuous education** (including on-the-job training): The green and digital transitions currently affecting all parts of the economy imply a strong need for continuous professional development (CPD) and lifelong learning. Employees can be equipped with new skills through on-the-job and inhouse training, or by means of programmes provided by a third-party training provider. A further option is self-initiated learning using e-learning systems.

Data on the participation of women in education & training across all fields of education has been compiled by SheFigures[63]:

- In 2018, women represented 48.1% of all doctoral graduates at European level: Women accounted for between 40% and 60% of doctoral graduates in majority of the EU-27 Member States. Women continue, however, to be strongly underrepresented in certain fields of STEM of relevance to careers in the energy sector, namely in ICT (20.8%) and Engineering & Engineering Trades (27.0%), while women represented more than half of doctoral graduates in the fields of Biological & Related Sciences, and Environment in 2018 (59.7% and 56%, respectively).

- In 2019, the share of tertiary educated population is gender-balanced in the EU (53.7%), but women are less represented among employed scientists and engineers (41.3%).

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61 Jungert, T., Levine, S., and Koestner, R. (2020) 'Examining how parent and teacher enthusiasm influences motivation and achievement in STEM', The Journal of Educational Research, 113(4): 275-282, available online: Link.

62 Stringer, K., Mace, K., Clark, T., and Donahue, T. (2019) 'STEM focused extracurricular programs: who's in them and do they change STEM identity and motivation?', Research in Science & Technological Education, 38: 1-16, available online: Link.

63 European Commission (2021) 'She Figures 2021: Gender in Research and Innovation: Statistics and Indicators', Luxembourg: Publications Office of the European Union, available online: Link.

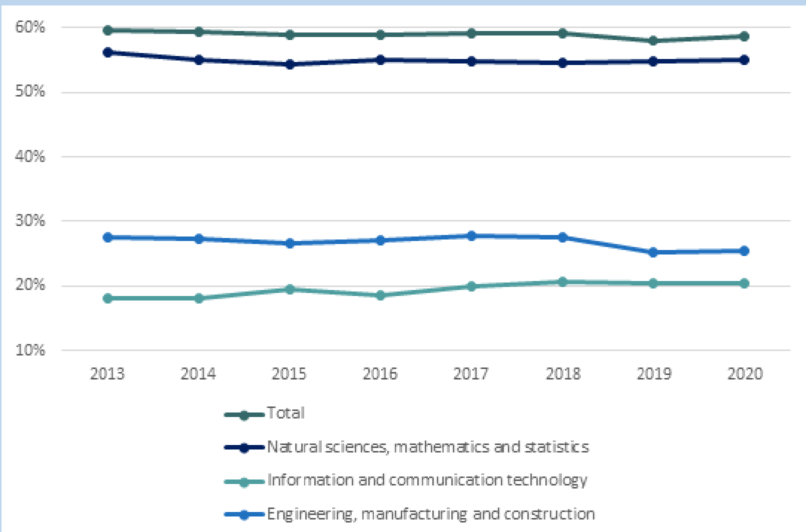
Exhibit 11: Findings from analysis of secondary data on women's share in fields of education and training preparing for a position in the energy sector

Findings from our analysis of Eurostat data

The SheFigures findings are confirmed by our data analysis of more recent secondary data from Eurostat and the OECD. The data shows that women are under-represented among graduates in STEM-related fields of study[64]. While women are well represented among all post-secondary non-tertiary and tertiary education graduates, they are under-represented when focussing on STEM-related fields and, in particular, in ICT and Engineering, Manufacturing & Construction. An examination of women's presence in 2020 compared with 2015 makes apparent that little to no progress is visible in improving women's representation in these study fields. Nevertheless, there is significant heterogeneity across countries and in narrow fields of study that should be kept in mind when generalizing these results. For example, the Czech Republic, Estonia, and the Scandinavian countries regularly stand out with high proportions of women, although this does not apply to every subject at every level.

An investigation of subject choices by gender highlights that most STEM-related fields were less popular among female graduates in post-secondary non-tertiary and tertiary education than among male graduates. The least popular among women was ICT while the largest discrepancy between women's and men's choices existed in Engineering, Manufacturing & Construction, which was pursued to a much higher degree by men. When analysing the propensity to graduate as well as the propensity to transition, it becomes apparent that women were at least equally as likely as men to graduate from STEM-related bachelor's and master's programmes as well as to continue from bachelor's to master's level studies. However, women were less likely to graduate from doctoral studies and to continue their education at the doctoral level. In general, the main statements exist in both the broad and narrow fields of study

Share of women (%) in the EU27 among bachelor's graduates by broad field of study

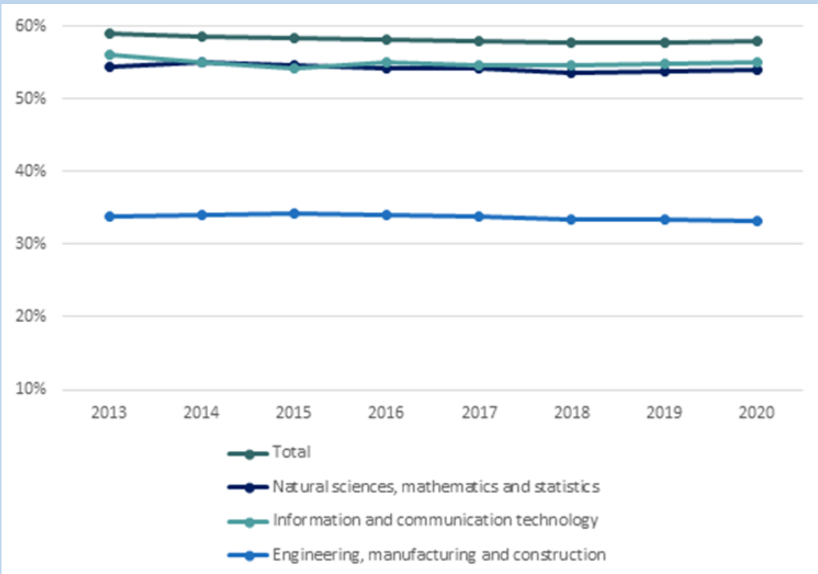


Notes: Definition differs: 2018 (for all fields); Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

64 See section 6 for the tabular report on retrospective mapping of energy-related education & training.

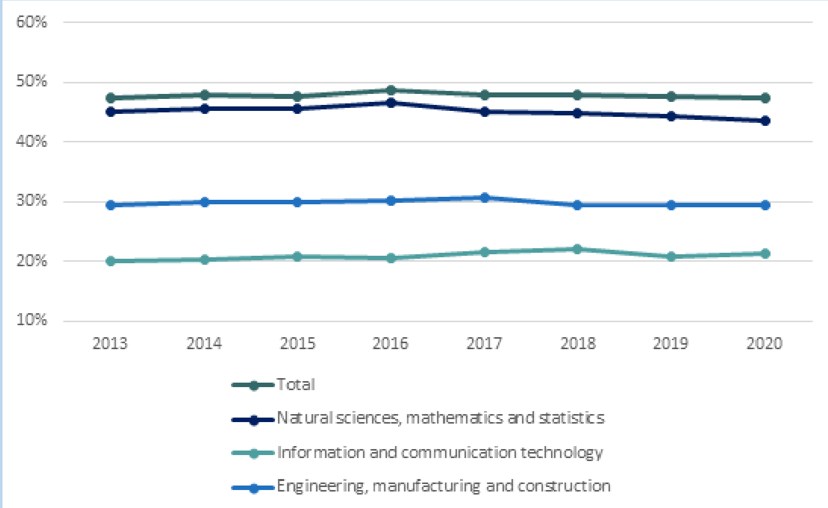
The charts above and below show the development of the share of women among bachelor's, master's, and doctoral graduates in the relevant fields of study for the years 2013 to 2020 for the EU27. The EU average of the respective female shares is relatively stable over time. It is noticeable that the share of women is higher among Master's graduates than among Bachelor's graduates for the broad fields in which they are typically under-represented, i.e., ICT and Engineering, Manufacturing and Construction. This difference is particularly large for ICT programmes where women account for only a fifth of bachelor graduate's but more than half of master's graduates. However, the proportion of women then drops again for doctoral degrees in all relevant fields of study as well as in total. For natural sciences the female share drops to around 45% at the doctoral level but remains the top area of study for women among the relevant fields. For ICT, the share of women drops to about 30% at the doctoral level and in engineering it drops to around 20%. A similar picture emerges for post-secondary non-tertiary education. There, women represented about 49% of graduates in science studies, 21% in ICT and 17% in engineering studies in 2020.

Share of women (%) in the EU27 among master's graduates by broad field of study



Notes: Definition differs: 2018 (for all fields); Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

The share of women (%) in the EU27 countries among doctoral graduates by broad field of study



Notes: Definition differs: 2015 (for Natural Sciences, Mathematics & Statistics; Information and Communication Technologies; Engineering, Manufacturing & Construction), 2016, 2018 (for all fields); Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02), SheFigures (Proportion (%) of women among graduates), and OECD (Graduates by field)

National education and training systems are developing **curricula and study programmes** to help meet such skill needs. Many of the most relevant changes in skills and jobs profiles happen in university education. As of now, renewable energy engineering is rarely treated at graduate level. Specialised master programmes usually build up on a previous Bachelor's in Mechanical or Electrical Engineering.[65] Existing European projects on re- and upskilling provide valuable insights either on very specific sub-sectors of renewable energies or focus on energy-efficient construction. None of them seem to address gender issues specifically.

The 2017 UNI-SET survey by the European University Association (EUA) to gather information about energy research and education at Europe's universities (master's and doctorate level in all areas of knowledge related to energy)[66] found a gender ratio of 30% of students being women. For individual countries, more detailed statistics for single engineering subsectors are available. In Germany, for example, the share of female first year students in 2019 was 34.2% across all STEM areas, but it was merely 26.2% in Engineering and only 17.5% in Electrical Engineering and IT, which is of most immediate relevance for the energy domain. The only subfields reaching almost gender equality are Chemistry (49.8% women) and Mathematics (48.7%).[67]

There seems to be evidence that the share of women in **environmental engineering** is higher, but since the area is relatively new, solid data is still lacking[68]. Some individual

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65 See for example https://www.innoenergy.com/for-students-learners/master-school/master-s-in-renewable-energy/ and https://www.kth.se/en/studies/master/sustainable-energy-engineering and https://www.osa.uni-freiburg.de/rem/degree-program/short-profile/

66 European University Association (2017) 'Energy Research and Education at European Universities: The UNI-SET Universities Survey Report', Brussels: EUA, available online: Link.

67 https://www.komm-mach-mint.de/service/mint-datentool

68 See, for example: https://www.ingenieur.de/karriere/berufsprofile/umweltingenieur/

universities report shares of female students in environmental engineering much above the rate for other engineering programmes[69].

The high need for re-and upskilling towards renewable skills profiles suggests that there needs to be a level of personal **lifelong learning** engagement from workers, since not all needing to transition will likely be accommodated by large-scale upskilling programmes. Thus, the regions with pre-existing high participation in lifelong learning might have an advantage in the workforce green transition.[70] Among the SET countries, these are above all the Nordic countries and Switzerland (2020 rates 20.0 – 28.6%), while the lowest performers are located in Eastern Europe (1.0%-5.5%). For most SET-plan countries, participation rates in lifelong learning are higher for women than for men (exceptions: CY, CZ, DE, EL, RO).[71] The tabular report in Chapter 6 presents up-to-data data on participation rates by gender in non-formal education, which has considerable overlap with life-long learning. A similar picture emerges with the Nordic countries and Switzerland having the highest rates overall, and with women being generally more greatly represented (7.4% compared with 6.2% for men for the EU27 as a whole).

All these described skill profile changes *could* mean an entry door to enhance the share of women in the workforce – but for this to happen other changes are needed, more upstream in the educational pipeline. In the ILO's energy sustainability scenario[72] both most jobs destroyed and created will be occupied by men – if policy is not to intervene by facilitating women's access to relevant training. And this relevant training is likely to have a **strong focus on STEM**.[73]

A consistent finding of research into participation of women in STEM, including energy sector related programmes, is what is referred to as the **leaky pipeline**, as reflected in a **scissor-shaped curve** representing the percentage of women and men according to academic career stages. The 2021 She Figures Report found – across all fields of academic research – that "in 2018, women represented more than 40% of academic staff. However, there were considerable differences by grade. While women represented nearly half of grade C and D staff (46.6% of grade C staff and 47.1% of grade D staff) and more than 40% of grade B staff (40.3%), they only occupied around a quarter of grade A staff positions (26.2%) – equivalent to full professorship". In the engineering and technology domain, which comprises most researchers in the energy domain, the share of women occupying A staff positions is even smaller (17.9%). Since the higher education gender talent pipeline was first mapped in 2000[74], it has retained the scissors figure shape showing more women than men entering higher education and performing well until doctoral studies, but men overtaking women in

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69 See, for example: Angelakis, C. (2016) 'Against the grain: female students dominate environmental engineering', online article, The Tufts Daily, November 16th, available online: Link.

70 ILO (2019) 'Skills for a Greener Future: A Global View', Geneva: International Labour Organization, available online: Link.

71 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Adult_learning_statistics#Participation_rate_of_adults_in_learning_in_the_last_12_months

72 See: ILO (2019) 'Skills for a Greener Future: A Global View'. The creation of jobs for women will be bigger (but still not equal) in the "circular economy" scenario, which entails more spill-over effects to other sectors.

73 IRENA (2020) 'Measuring the Socio-economics of Transition: Focus on Jobs', available online: Link.

74 European Commission (2000) 'Science policies in the European Union—promoting excellence through mainstreaming gender equality', Report from the ETAN Expert Working Group on Women and Science, available online: Link.

progressing to careers beyond post-doctoral level. The latest figures show that 74% of top-level professorial positions in the EU are occupied by men (it was close to 90% in 2000[75]).

At both the European and country levels, women **doctoral graduates** are consistently under-represented in the mathematically intensive STEM fields, but the STEM talent pipeline shows a different pattern of gender imbalance than the one for all fields, with more men than women choosing these subjects at the start of their higher education experience, but, nevertheless, more men than women achieving top positions compared to how many are in the pipeline. The charts in Exhibit 11 (see p. 36) provide some insights into this talent pipeline. A significant leak occurs at the point of entry into higher education since women are hugely underrepresented in relevant fields at the bachelor level. A further leak then occurs going from the master's level, where women experience an uptick in representation, to doctoral studies, where female shares drop back down. Therefore, from a skills perspective, increasing the share of women in top positions in the energy sector may be best supported by aiming to increase women's enrolment in relevant studies at the bachelor level, as well as by trying to retain the extra inflows at the master's level.

75 European Commission (2021) 'She Figures 2021: Gender in Research and Innovation: Statistics and Indicators', Luxembourg: Publications Office of the European Union, available online: Link.

3.4 Women as professionals in the energy sector

What is the share of women in the energy sector workforce? For answering this question, we below distinguish between the entire energy sector workforce and the workforce involved in energy sector related R&I.

3.4.1 Total workforce

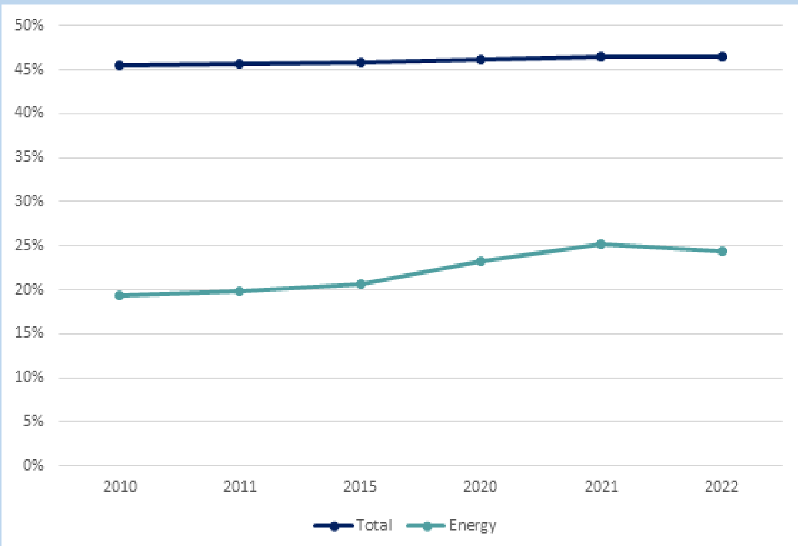
Existing data is based on different collection approaches and therefore difficult to compare. Considering these limitations, the sources reveal a similar message on women's energy workforce participation. Below we first present the findings of our analysis of Eurostat LFS data, before looking at different sources of data that provide a more fine-grained picture but are based on less extensive sets of data.

Exhibit 12: Findings from analysis of LFS data on women's share in the energy sector labour force

Findings from our analysis of Eurostat data

Analysis of secondary data for the EU shows that women are underrepresented in the energy sector compared to the overall economy, although the female share of employees in the energy sector is increasing (see first chart below). Between 2010 and 2022, the share of women in the energy sector increased from around 20% to around 25%.

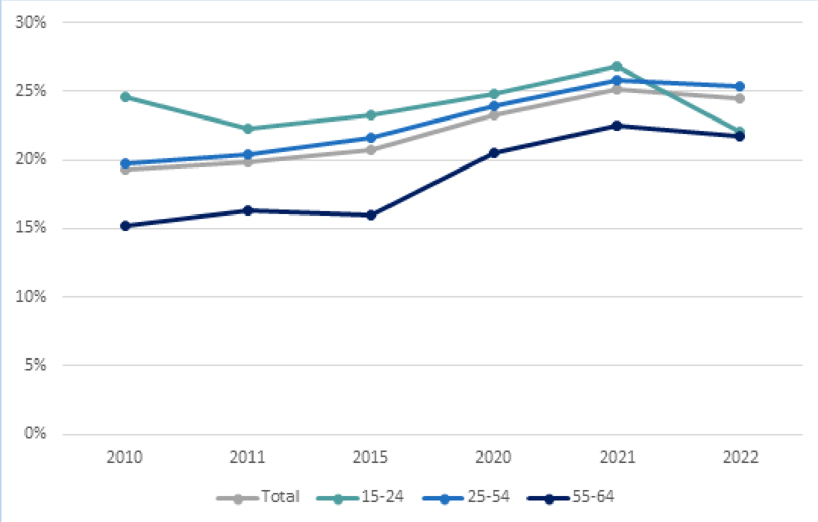
Share (%) of women among employed persons: Total labour force and energy sector, EU27



Data source: Eurostat – Labour Force Survey

The chart below shows that the share of women in the 25-54 age group and in the 55-64 age group has increased since 2010. This contrasts with a decline in the proportion of women in the under-25 age group, which was the age group with the highest female share up until 2021. In general, it can be said that the share of women in each age group has levelled off in the most recent year available in the data (2022) but had previously grown from between 15% and 25% in 2010 to between 21% and 26% in 2021.

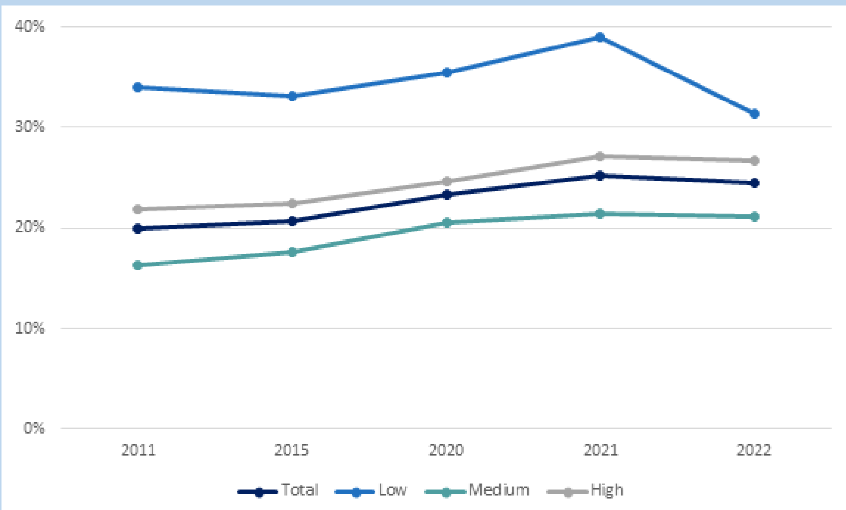
Share (%) of women among employed persons by age group, EU27 energy sector



Data source: Eurostat – Labour Force Survey

The chart below shows that women are more strongly represented in low-skilled occupations relative to high-skilled occupations within the energy sector. Nevertheless, the share of women in low-skilled occupations has decreased slightly from 34.0% in 2011 to 31.4% in 2022. The shares in the high-skilled group and in the medium-skilled group have developed similarly to the overall share, which has shown an upward trend over the period examined. Female shares in the high-skilled group are slightly above average whereas shares in the medium-skilled group are slightly below average.

Share (%) of women among employed persons by occupational skill level, EU27 energy sector



Data source: Eurostat – Labour Force Survey

The tabular report in chapter 6 also provides information on contract types. In 2021, women represented 68.1% of the part-time contracts in the EU27 energy sector. Consistent with this, women were more likely than men to be on part-time contracts (15.2% vs 2.4% in 2021). Nevertheless, women's part-time share was still lower in the energy sector than it was in the economy as a whole (18.2%). Women's part-time share remained almost stable between 2015 and 2021, whereas men's part-time share rose slightly from 1.4% to 2.4% over this period. The higher share of part-time work is also associated with lower working hours for women compared to men. In 2021, women in the EU27 energy sector worked on average around 36.3 hours while men worked around 39 hours. Compared to 2015, working hours for men and women have slightly decreased by around 0.5 and 0.2 hours, respectively. Women work longer hours on average in the energy sector than in the economy, where the average in Europe is around 33.3 hours. Another clear difference between the energy sector and the economy can be seen in the duration of contracts. Compared to the economy as a whole (50.9%), women in the energy sector made up a smaller proportion of all fixed-term contracts in 2021, at 34.2%. The likelihood of being on a fixed-term contract in the energy sector is nevertheless higher for women, at around 10%, than it is for men, at around 6-7%. Furthermore, women in the energy sector are less likely to be self-employed (1.5%) than men in the energy sector (2.0%) and women in the economy (9.3%) based on data from 2021. In general, it should be noted that statements on the energy sector labour market at the country level are not always reliable. Reliability decreases with the size of the country. Nevertheless, statements at the European level and on general trends remain robust.

Available data suggests that these average workforce characteristics are roughly mirrored on national level. In Spain 28.5% of surveyed energy workforce were female, as were only 22.5% of senior management in 2018.[76] In Germany 19% of supervisory board members of surveyed companies and energy policy bodies were female. Women in leading positions in marketing departments made up 56.7%, and 41.4% in HR, but only 7.4% of leaders in technology and manufacturing.[77] In Mission Innovation country Chile, 51% of the administrative staff in the surveyed companies were female in 2019 vs. 25% of directors.[78] In Australia 28.6% of electricity supply workforce was female in 2021, with 4.0% female CEOs and 17.9% female key management personnel.[79] In the UK, 24% of board seats and 14% of executive director positions were occupied by women in 2021.[80] In Canada, 30% of board seats and 29% of roles in executive teams in the energy sector were held by women in 2020. It is also crucial to notice that Canadian energy company representatives consider previous roles in operations and engineering/science as most helpful for leadership roles – while most STEM roles in earlier career stages are held by men.[81] Iceland is an honourable exception, with 58% of female chairs of the board in the surveyed companies – even more than heads of department (29%).[82] One explanation for the good performance of Iceland is

[76] Adecco Institute (2020) 'Estudio de empleabilidad y recursos humanos en el sector energetico', available online: Link.

[77] PricewaterhouseCoopers (2022) 'Frauen in der Energiewirtschaft: Warum die Branche mehr "Frauen-Power" braucht', available online: Link.

[78] MTalent (2021) 'Diagnóstico de la intervención de sesgos inconscientes en la empleabilidad, procesos de selección, procesos de formación y posterior desarrollo de carera de la mujer en empresas del sector eléctrico', available online: Link.

[79] Workplace Gender Equality Agency Data Explorer (2021) 'WGEA Data Explorer', available online: Link.

[80] POWERful WOMEN/ Pricewaterhouse Coopers (2021) 'POWERful Women's Annual State of the Nation', online article, available online: Link.

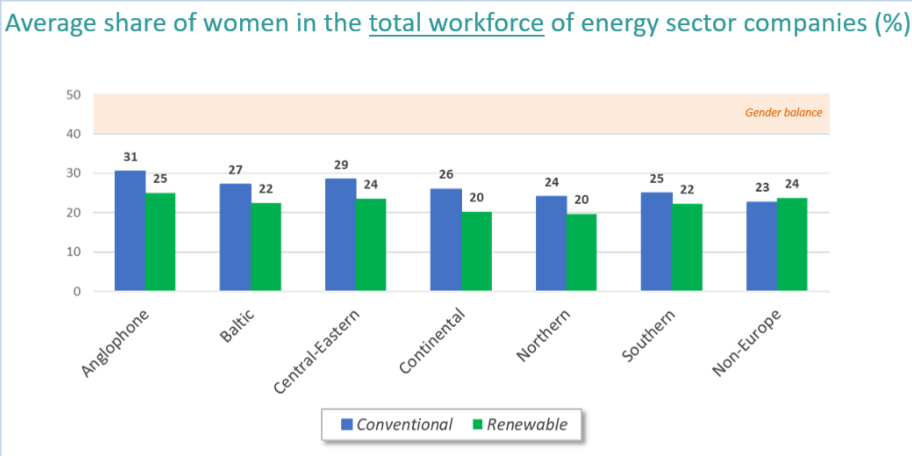
[81] Electricity Human Resources Canada (2020) 'Leadershift: Pathways to Gender Equity', report, available online: Link.

[82] Women in Energy Iceland / Ernst and Young (2021) 'Úttekt á stöðu kvenna í íslenska orkugeiranum', available online: Link.

a gender quota law introduced in 2010 stating that listed companies and public enterprises should have at least 40% of each gender.[83]

Exhibit 13: Survey findings on average share of women in energy sector companies' total workforce

Findings from survey of energy sector employees



Note: Only companies with >9 staff; n = 2,470 (missings excluded)

The average share of women in the workforce of energy sector companies across the entire sample is 24.3%, and 25.0% for the EU27. This confirms previous analyses according to which energy is one of the most gender imbalanced sectors of the EU economy. According to our data, companies operating in the renewables subsector have a slightly lower share of women among their staff than companies operating (exclusively) in the conventional energy subsector in all regions apart Non-Europe, which comprises Australia, Canada and the USA.

3.4.2 Workforce in Renewable Energy, Batteries and Hydrogen

Concerning the renewables sector, an often-quoted benchmark in this field is the 2019 study from the International Renewable Energy Agency (IRENA), "Renewable Energy: A Gender Perspective" [84], which analysed on 1,500 questionnaires from across 144 countries. The authors conclude that the proportion of women in the renewable energy sector is significantly higher (32% on average) than in the traditional energy sector, exemplified by the gas & oil industry (22%). Having a closer look at the workforce structure, the study points out that women's share in technical positions (28%) is significantly lower than in administrative jobs (45%). The statistics presented are not disaggregated by country or region.

83 Nordic Energy Research (2021) 'Gender Equality in the Nordic Energy Sector', available online: Link.

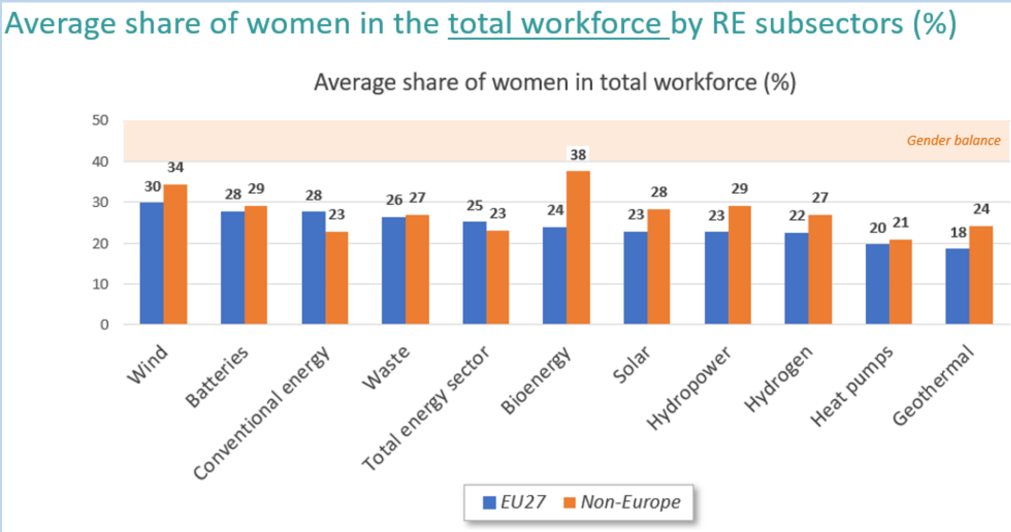
84 IRENA (2019) 'Renewable Energy: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

In two newer surveys focusing on the wind energy (2019)[85] and the solar PV industries (2022)[86], IRENA found figures for women's share in the workforce of 21% and 40%, respectively. Disaggregation of key statistics by region is provided, according to which the share of women in wind energy and solar PV in the country group "Europe and North America" is 26% and 27%, respectively.

In addition, a recent report by Equal by 30[87] shows the diminishing participation of women on the way to seniority: women make up 39% of positions at the entry-level, they represent just 26% of all executives and C-Suite leaders. In terms of skills background, 28% of STEM positions are occupied by women.

Exhibit 14: Survey findings on average share of women in renewable sector companies' total workforce

Findings from survey of energy sector employees



Note: Only companies with >9 staff; n = 2,470 (missings excluded)

Our survey data suggest that only the wind industry has a (slightly) higher share of women in the entire workforce compared to the conventional energy sector, while all other subsectors have the same or a lower figure. The industries in which women make up the smallest share of the workforce are heat pumps, a sector which accounts for a large percentage of the recent increase in renewables employment in the EU27[88], as well as the geothermal subsector. Our figures for

85 IRENA (2020) 'Wind Energy: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

86 IRENA (2022) 'Solar PV: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

87 EQUALby30 / DIVERSIO (2021) 'Advancing Diversity & Inclusion in the Energy Sector', available online: Link.

88 Data from the EurObserv'ER online database (https://www.eurobserv-er.org/online-database/) suggests that EU employment in the heat pump sector, including upstream activitis, has jumped from 220,000 in 2018 to 375,000 in 2021. Industry source EHPA suggests that the total number of employees directly employed in the European heat pump industry was 116,679 in 2022, "with approximately 37% of these working in heat pump manufacturing", see European Heat Pump Association (EHPA)(2023) 'Heat Pumps in Europe: Key Facts & Figures', Link.

the share of women in the wind and solar energy sectors are somewhat above to very similar, respectively, to the estimates produced by IRENA based on its surveys in 2019 and 2022.

The renewable energy sector has also seen an increase in women employment over the past decade. IRENA estimates that the number of worldwide jobs directly or indirectly related to the renewable energy sector passed 11.5 million in 2019, doubling its initial assessment of 5.7 million jobs in 2012[89]. There appears to have been little change, however, in the concentrated of women in lower-wage roles and occupations[90].

3.4.3 Forecast of the development of gender balance in the energy sector to 2050

Several recent studies have tried to forecast changes in employment in the renewables sectors, as well as shifts in total employment resulting from the energy transition. These were utilised as input and reference for our own forecasting exercise:

- A long-term forecast by consulting firm McKinsey, looking towards the year net-zero emissions will have to be reached according to EU policy, found that that 3.4 million new jobs will be created by 2050, while 2.1 million will be lost.[91]

- Analysis of consulting firm BCG found that climate mitigation and adaptation strategies as designed today could delay the attainment of gender equity by 15 to 20 years[92].

- Research by IRENA found that total employment in renewables will reach 42 million globally by 2050, four times their current level. “Energy efficiency measures would create 21 million and system flexibility 15 million additional jobs”[93]

Our own analysis is based on the employment projections published by **Cedefop**. The agency is responsible for producing EU Skills Forecasts for the next 10-15 years, i.e., projections of the skills required on the EU labour market according to country, economic sector, occupational group, education level, etc. – an important input to EU policymaking. In this context, Cedefop also forecasts employment in the EU27 per sector; the latest version includes projections until the year 2035. The forecasts take into account, as much as possible, current challenges facing Europe such as the green transition, geopolitical tensions, post-COVID changes, and demographic developments. A breakdown by sex or gender is available only for the total workforce, not for individual sectors.

Total energy sector employment has decreased slightly over the last 10-15 years. According to Cedefop’s latest projection (see Exhibit 15), the energy sector workforce will continue its downward curve slightly in the years until 2035.

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89 IRENA (2020) 'Measuring the socio-economics of transition: Focus on jobs', Abu Dhabi: International Renewable Energy Agency, available online: Link.

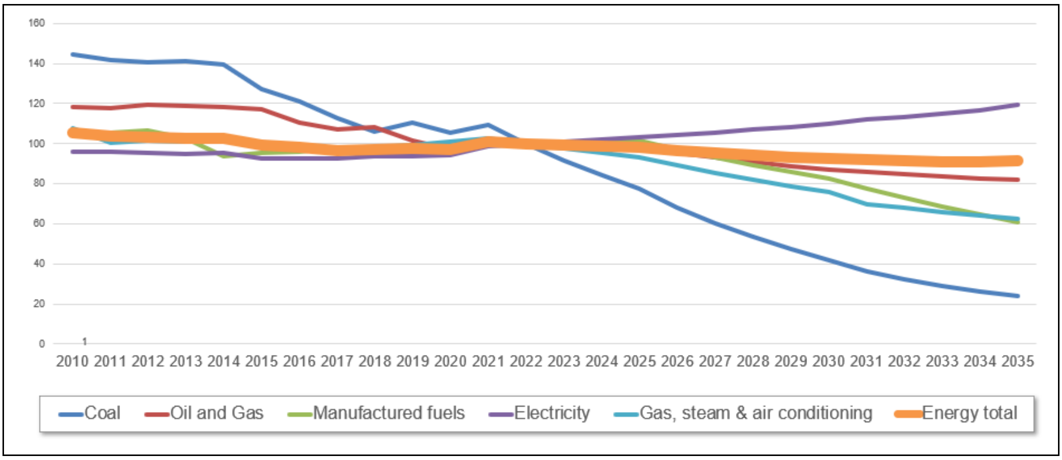
90 IEA (2022) 'Gender and Energy Data Explorer', Paris: International Energy Agency, available online: Link.

91 McKinsey (2020) 'How the European Union could achieve net-zero emissions at net-zero cost', available online: Link.

92 Sqalli, Z. et al. (2021) 'Why Climate Action Needs a Gender Focus', online article, Boston Consulting Group, 29 October, available online: Link (emphasis added).

93 IRENA (2019) 'Global energy transformation: A roadmap to 2050 (2019 edition)', available online: Link.

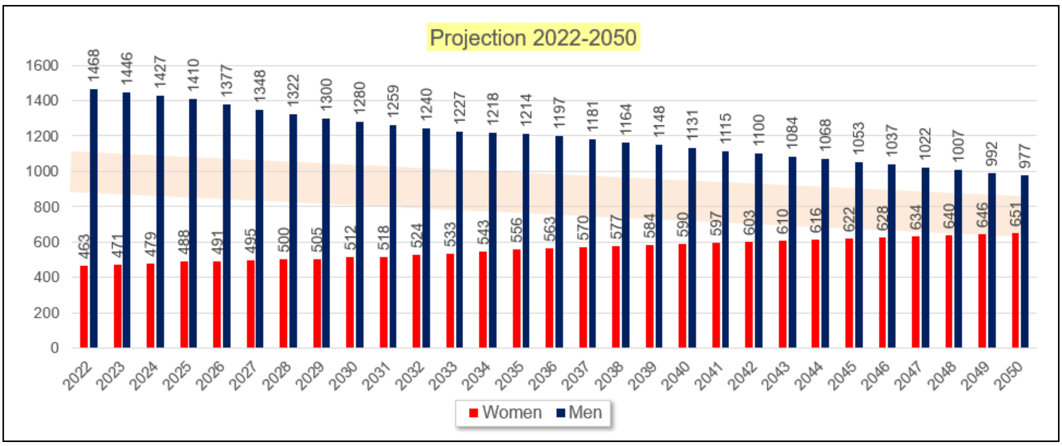
Exhibit 15: Cedefop employment projection for energy subsectors, 2010-2035



Data source: Cedefop (2023)

Under the assumption that women's share in the energy sector workforce will continue to show modest growth, as it has done in the years since 2010 (see Exhibit 12), we can now estimate the number of jobs which need to be taken by women in order to arrive at gender balance, which according to the definition used by EIGE amounts to a minimum share of 40% women[94] in the total sector workforce (Exhibit 16).

Exhibit 16: Forecast of total employment in energy sector until 2050, by sex (in 1000's)



Data source: Own calculations based on Cedefop and Eurostat (LFS) data

Accordingly, to achieve minimum gender balance (40%) by 2050, the total number of women employed in the sector must grow significantly each year, so that nearly 200,000 additional job positions are filled by women by 2050.

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94 EIGE (2022) 'Statistical brief: gender balance in business and finance 2021', Gender Statistics Database series, available online: Link.

3.4.4 The R&I workforce in the energy sector

Little quantitative data have so far been available on the R&I workforce in the energy sector and its current gender balance situation. The R&I workforce is generally distributed over academic research institutions such as higher education institutions (HEIs), other research organisations both in the public and private sectors, and positions in the industry.

The 2021 edition of She Figures[95] provides data and analysis for approximately 88 indicators developed over a twenty-year period to monitor the state of gender equality in R&I across Europe, in the academic talent pipeline, and STEM-related employment. While the published data is not disaggregated to a level which allows to focus exclusively on R&I in the energy field, the main findings appear of high relevance to the present study as well:

- In 2018, women represented around one-third (32.8%) of the total population of researchers at European level. In comparison, women researchers take up a somewhat higher share in the higher education (42.3%) and government sectors (43.9%), but lower in the business enterprise sector (20.9%).

- In 2019, the proportion of women researchers working part-time in the higher education sector was higher than that of men researchers by 3.9 percentage points (11.1% for women and 7.2% for men).

- At European level in 2019, just over 3 in 10 board members were women (31.1%) and under one-quarter of board leaders (24.5%) were women.

- Men accounted for a greater share of research team members than women between 2015-2019 at both European and country level.

- Between 2015- 2019, women were more likely to be under-represented among active authors who led research.

In our own survey research (see Exhibit 17), we looked at the share of women in the R&I workforce of companies in the energy sector. For the survey we operationalised the R&I workforce, following the Oslo manual definition, as consisting of "employees engaged in general research, in development of new products and services, or in innovation of new processes".

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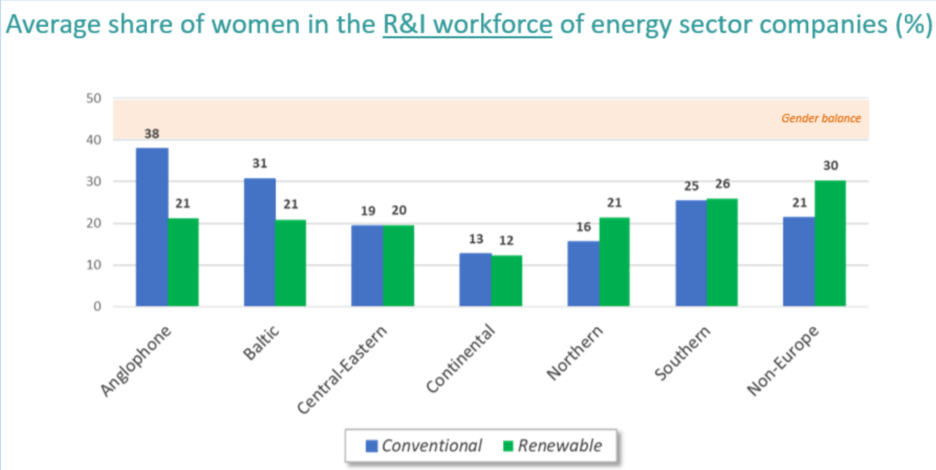
95 European Commission (2021) 'She Figures 2021: Gender in Research and Innovation: Statistics and Indicators', Luxembourg: Publications Office of the European Union, available online: Link.

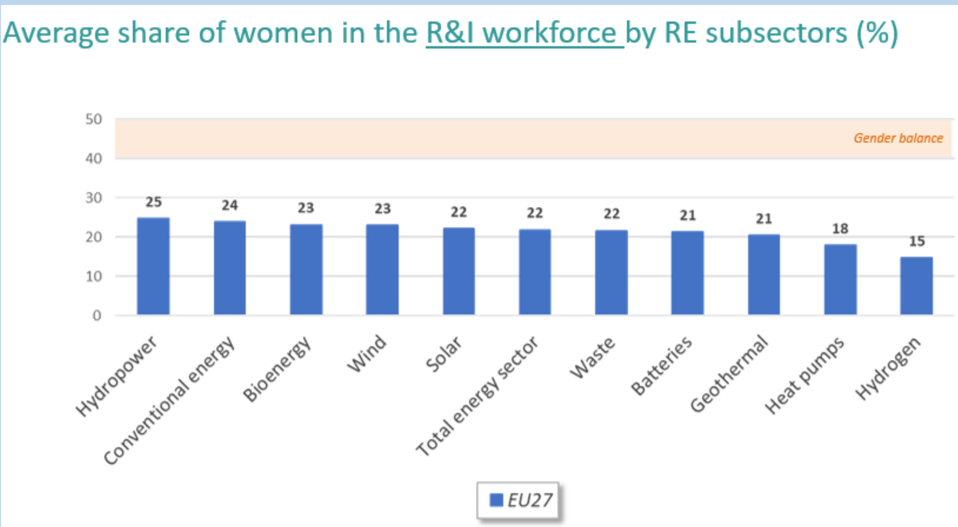
Exhibit 17: Survey findings on average share of women in energy sector companies' R&I workforce

Findings from survey of energy sector employees



Note: Only companies with >9 staff and with R&I activities; n = 1,122 (missings excluded)

In the average R&I workforce in the EU, 22% are women. This means that the average energy sector company (with 10 or more employees) works with R&I teams in which only one in five employees is a woman. There are notable differences between country groups: The share of women in R&I workforces is lowest in the countries of Continental Europe (12.4%) and highest in the Anglophone Europe (30.0%), Baltic (26.3%) and Southern Europe (25.5%) groups. Among companies in the renewables sector, the sample from Non-Europe performs best.



Note: Only EU27 companies with >9 staff and with R&I activities; n = 1,079 (missings excluded)

Among the subsectors of the renewable energy sector, most have a lower share of women in R&I than in the conventional energy sector. Hydrogen and heat-pumps, two sectors of particular importance for the energy transition, have the lowest share of women in R&I.

3.4.5 Intersectional aspects

Intersectionality refers to personal characteristics/identities that could be social or political, such as gender, age, ability, ethnicity, migratory status and sexual orientation, acknowledging that women are not a homogenous group. For example, it was[96] found that black women are perceived more negatively as leaders than black men and white women and asymmetrically penalised for mistakes. The inclusion of an intersectional approach not only aims to truly capture the issues of the heterogenous group of women, which may have varying values, needs and backgrounds, but also to allow for the development of the right palette of policies and interventions that can be used to address gender balance issues in the energy sector workforce. A study by McKinsey[97], examining proprietary data sets for 366 public companies across a range of industries in Canada, Latin America, the United Kingdom, and the United States, found that companies in the top quartile for racial and ethnic diversity and companies in the top quartile for gender diversity are 35% and 15% more likely respectively, to have financial returns above their respective national industry medians. In addition, having the variety of experiences, perspectives, and skills that the diverse groups of women bring to the energy transition would make it more far-reaching and fairer, leaving no one behind.

3.4.6 Attraction and retention

A broad range of research studies is available for the reasons why women are less likely to work in STEM fields, after controlling for participation in education and training qualifying for STEM positions[98]. The findings are equally applicable to STEM positions within the energy industry. **Attraction** of women with adequate degrees to a career in the energy sector is, therefore, a major challenge. Most energy sector employers are fully aware of the issue, as surveys of companies and employees working in the sector are showing[99]. The renewables sector is especially affected: "those working in clean energy have the most in-demand skills, with almost eight in 10 being offered at least one new job in the past year", as the GETI 2023 survey found[100]. There is some hope that the green transition underway in the energy sector will help draw young women to the sector due to the widespread interest in ecological sustainability and the climate change among young female cohorts (see chapter 3.1) and the increasing interest of women students in "green" study programmes such as environmental engineering.

A related issue of particular concern is the higher share of women than men employees who leave the sector, either by leaving the labour force or by changing to another sector, after having spent some time in the energy industry[101]. **Retention**, therefore, is a key issue for

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96 Livingston, R.W., Rosette, A.S., & Washington, E.F. (2012) 'Can an agentic black woman get ahead? The impact of race and interpersonal dominance on perceptions of female leaders', Psychological Science, 23(4): 354-358.

97 McKinsey&Company (2015) 'Why diversity matters', available online: Link.

98 For example, see: Kahn, S. and Ginther, D.K. (2015) 'Are recent cohorts of women with engineering bachelors less likely to stay in engineering?', Frontiers in Psychology, 6: 1–15.
Sassler, S. et al. (2017) 'The missing women in STEM? Assessing gender differentials in the factors associated with transition to first jobs', Social Science Research, 63: 192–208

99 Brunel and Oilandgasjobsearch.com (2022) 'Energy Outlook 2021/22 Report', available online: Link.

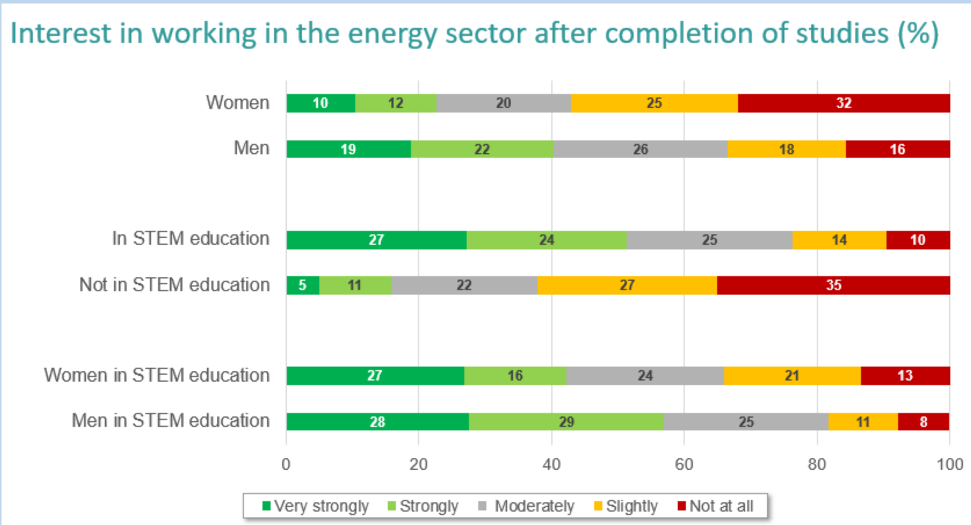
100 For instance, see: Airswift (2023) 'GETI 2023 - The Global Energy Talent Index Report', available online: Link.

101 Conrad, M., Abdallah, A. and Ross, L. (2021) 'Why Is Retaining Women in STEM Careers So Challenging? A Closer Look at Women's Insights and Experiences In STEM Fields', Paper presented at ASEE 2021 Annual Conference.

discussions of the gender balance in the energy sector. Recent analysis by International Energy Agency in co-operation with the OECD shows that that women are more likely than men to leave the labour market at all ages in both the energy sector and non-energy sector, though the gender gap is more visible and consistent for energy[102].

Exhibit 18: Survey findings on average share of students interested in a career in the energy sector

Findings from survey of students in tertiary education



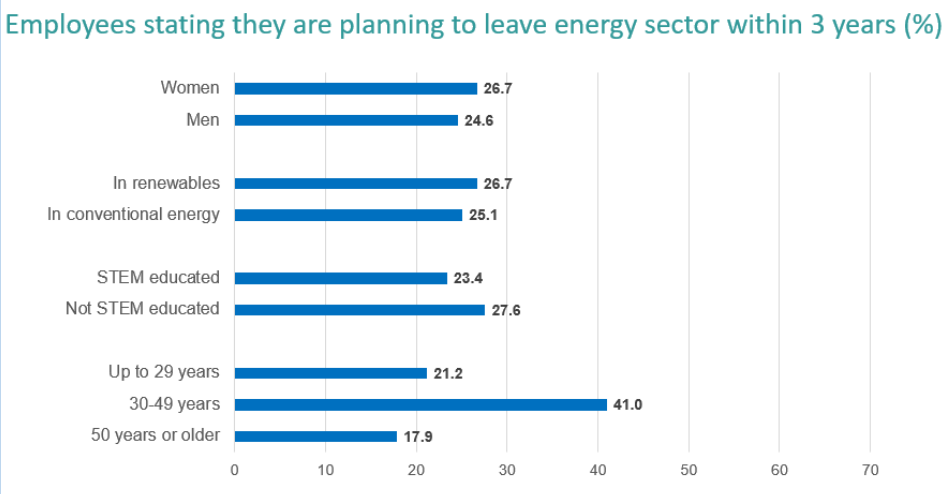
Note: All students; All students; n = 620-647 (missings excluded)

There is sizeable interest in working in the energy sector : 43% of female and 67% of male students would considering a career in energy. Among STEM students, 66% of female and 82% of male students do so, with 42% and 57% expressing strong interest. Even among students neither in STEM nor in “business, administration & law”, interest is significant. The survey also found that one in two female and two in three male students state that their skills, preferences, and values align well with a career in energy.

[102] IEA (2022) 'Understanding gender gaps in wages, employment, and career trajectories in the energy sector', available online: Link.

Exhibit 19: Survey findings on intention to change jobs and to leave the energy sector

Findings from survey of energy sector employees



Note: All employees; n = 529-539 (missings excluded); Sum of percentages for responses 4, 5, 6 on 6-point response scale

One in four employees plans to leave the energy sector soon. Among energy sector workers aged 30-49, 41% plan to do so at least to some extent.

3.4.7 Advancement and leadership

The picture is very clear as far as **gender equity in senior management** in the energy sector is concerned. In corporations in general, women are largely underrepresented in boards of directors and senior executives. Among the SET countries, Poland is the only one featuring among its biggest 30 listed companies an energy corporation with gender equality on its board of directors: for instance, 50% women at Energa[103]. In Germany, major energy actors RWE, Siemens Energy and EON have at least one woman on their board, but do not reach 40%[104]. Women are even less present in senior management positions in smaller companies of the sector.

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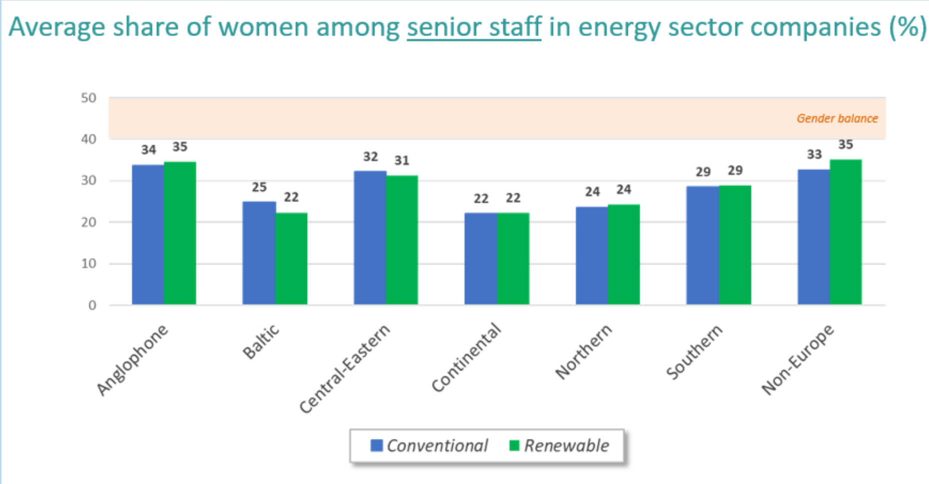
[103] Grupa Energa 'Władze', available online: [Link].

[104] AllBright Foundation (2021) 'Aufbruch oder Alibi? Viele Börsenvorstände erstmals mit einer Frau', available online: [Link].

Exhibit 20: Survey findings on the average share of women in executive positions in energy sector companies

Findings from survey of companies in the energy sector



Note: Only companies with >9 staff; n = 2,190 (missings excluded)

The average share of women among senior staff (i.e., employees holding any kind of executive position) in energy sector companies across the entire sample is 27.7%, and 28.0% for the EU27. In most country groups, and particularly in the renewables subsector, the figure is higher than for the entire workforce, which is possibly due to the numerical importance of male-dominated, manual labour in the sector. The countries in the Continental Europe group appear to lag behind, especially if compared to the Anglophone and Non-Europe clusters.

Looking specifically at energy, the IEA Gender and Energy Data Explorer provides data on boardroom and senior management composition of energy companies, based on analysis of data from Refinifiv, a supplier of data on corporations, to investigate differences between energy firms versus firms in other industries as well as between energy sub-sectors with respect to **gender diversity in boardroom and senior management positions**[105]**.** Due to nature of the data source, the findings are likely to represent the situation mainly in publicly listed and larger firms. At the global level, the analysis found that “women make up just under 14% of senior managers. […] This compares with 15.5% of the 30,000 non-energy firms in the sample. […] Among the energy business lines, women in senior roles are better represented in the utilities sector at 17.1%. [….] Somewhat surprisingly, renewable energy firms are well below the composite average at just 10.8%, and only slightly higher than the coal sector, which has the lowest representation at 10.6%. […]”[106]. Exhibit 21 below shows the findings for those EU member states for which statistically robust figures are available. There are sizeable differences between countries, with shares of women in senior management much above the EU average in France, Austria and Denmark, and also Portugal, Finland, Belgium and Italy. At the other end of the ranking order, Ireland, Spain

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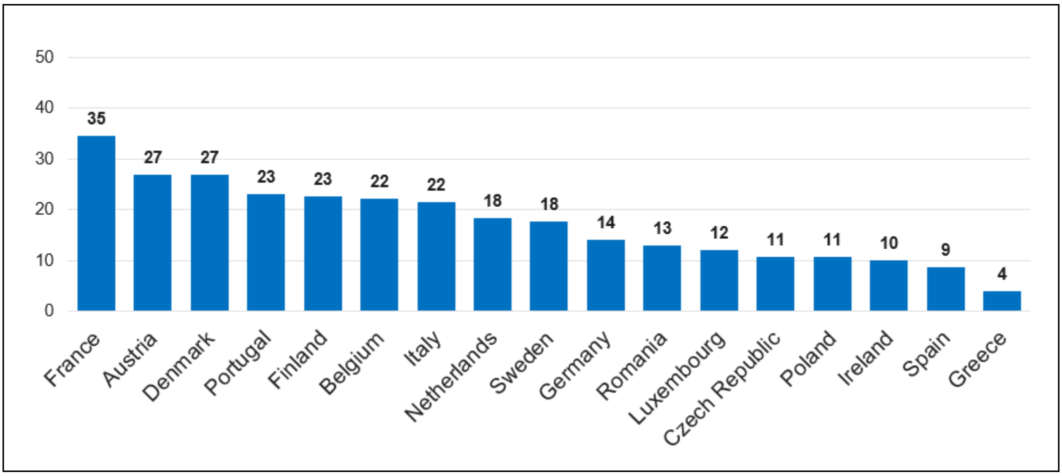
105 IEA (2023) 'Gender and Energy Data Explorer', Paris: International Energy Agency, available online: Link.

106 Pilgrim, G., Nicholson, D.-J., Johnstone, N. (2021) 'Women in senior management roles at energy firms remains stubbornly low, but efforts to improve gender diversity are moving apace', online article, 20 May, available online: Link.

and, in particular, Greece still need a long way to go before coming close to gender balance in senior management.

Exhibit 21: Share of women among senior managers in the energy sector, 2022



Data source: IEA Gender and Energy Data Explorer, 2023

Further advancement within energy sector companies poses special challenges to women. The analysis of the IEA concludes that “a further glass ceiling exists beyond the glass ceiling to enter senior management in general, and that this problem is particularly acute in energy and energy utilities firms” [as] “female representation is relatively lower in more senior management positions relative to less senior management positions. Within the energy sector this is particularly evident for the top posts (e.g., chair of the board, CEO, president), at less than 5%”[107].

Other data sources confirm this finding: The EY Index for Women in Energy (2019) found 17% of board members among the top 200 global energy sector companies. However, only 6% of executive board members were women, versus 21% non-executive counterparts. In senior management, 15% were women in 2019[108]. A study carried out by BCG in 2018[109] and again in 2022[110] using data mainly from Hungary, Slovakia, Czech Republic, Poland, Serbia, Croatia, Slovenia, Romania, Bulgaria and Ukraine found that, while women account for on average 28% (2018: 26%) of the total workforce in the energy sector in Eastern Europe, their representation at higher levels in the organisation is much smaller: Only 14% (2018: 17%) of board members are female. Based on their findings, the authors conclude that:

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107 Pilgrim, G., Nicholson, D.-J., Johnstone, N. (2021) 'Women in senior management roles at energy firms remains stubbornly low, but efforts to improve gender diversity are moving apace', online article, 20 May, available online: Link.

108 Ernst & Young (2021) 'Women in power and utilities', available online: Link.

109 Beck, Z. and Pánczél, A. (2021) 'Women in Energy: Gender Diversity in the CEE-SEE Energy Sector', Budapest: Boston Consulting Group, available online: Link.

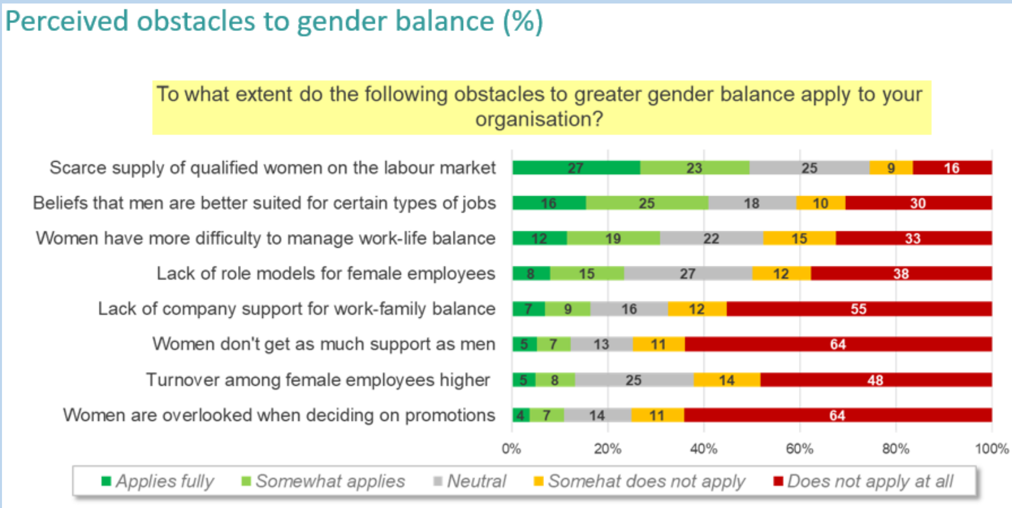
110 Beck, Z. and Pánczél, A. (2023) 'Women in Energy 2.0: Gender Diversity in the CEE-SEE Energy Sector', Budapest: Boston Consulting Group, available online: Link.

- “The [energy] industry fails to attract highly qualified female talent already at the entry-level stage;
- Later it struggles to retain female employees in mid-career,
- Finally, it fails to offer viable options to senior female employees looking for promotion opportunities”[111].

The analysis also found that “there is a much higher representation of women leadership positions at large energy related multinational enterprises”, quite likely because of corporate policies focused on gender balance, diversity and inclusion.

Exhibit 22: Survey findings on companies’ perceptions about barriers to gender balance

Findings from survey of companies in the energy sector



Note: Only companies with >9 staff; n = 2,142 – 2,185 (missings excluded)

Among perceived obstacles to gender balance, the factor mentioned by the largest share of companies is a „scarce supply of qualified women on the labour market” (50%; EU27: 49% agreeing fully or somewhat), followed by “beliefs that men are better suited for certain types of jobs than women” (41%; EU27: 44%). 31% (EU27: 29%) perceive “female employees having more difficulty to manage work-life balance” as an obstacle, while only half as many (16% EU27: 14%) see “lack of company support for work-family balance” as a problem. The responses suggest that HR managers in energy sector company tend to consider the challenge a supply-side issue rather than a problem caused by the company’s organisational culture and practices.

[111] Beck, Z. and Pánczél, A. (2021) 'Women in Energy: Gender Diversity in the CEE-SEE Energy Sector', Budapest: Boston Consulting Group, available online: Link.

3.4.8 Working conditions

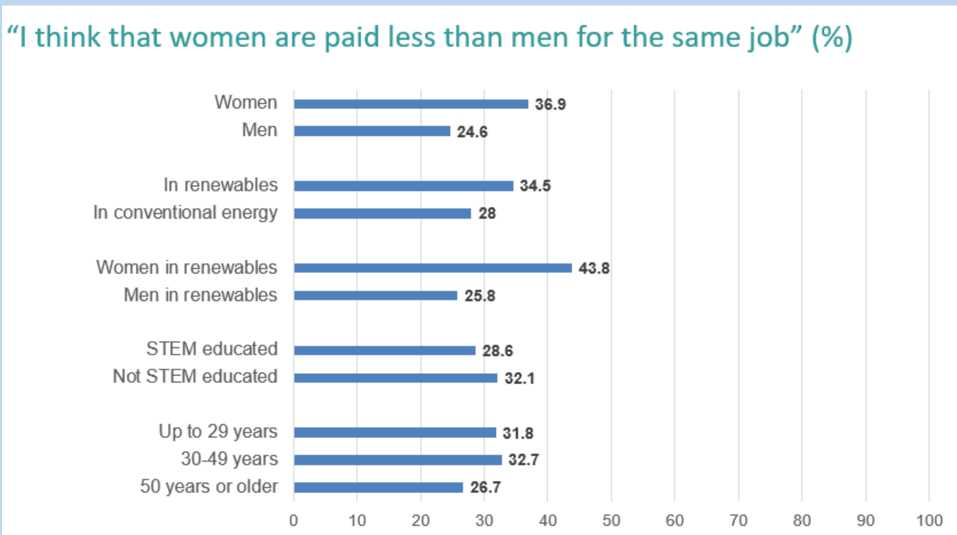
The labour market displays significant gender imbalances in terms of working conditions. We understand the term, following the European Foundation for the Improvement and Living and Working Conditions' model used within the context of the **European Survey of Working Conditions** (ESWC)[112], as consisting of compensation quality, employment security and key features of the work environment, including work intensity, working-time quality, physical health risks, skills and discretion and social environment.

Compensation quality

Gender **pay gaps** are being criticised not only for reasons of justice. Experience and/or expectation of pay gaps can also affect the willingness of women to enter, maintain, or re-enter a career in an industry dominated by men, as suggested, e.g., by evidence from the Gender Pay Gap Employee Poll in UK suggests[113]. The latest IRENA survey of people working in renewables found that 51% of female respondents think men are paid more than women in their sector (solar PV), while only 15% of male respondents perceive such a pay gap.[114]

Exhibit 23: Survey findings on perceived pay gap

Findings from survey of energy sector employees



Note: All employees; Sum of percentages for responses 5 and 6 on 6-point response scale; n = 518-539 (missings excluded)

Our own survey confirms the finding from IRENA, although differences in women's and men's perceptions about the existence of a gender pay gap are not as pronounced. 37% of women notice a gender pay gap in their company, but only 25% of men; among women in the renewables

[112] Eurofound (2023) 'Job Quality', available online: Link.

[113] BMG Research (2018) 'Gender Pay Gap Employee Poll', available online: Link.

[114] IRENA (2022) 'Solar PV: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

sector, the share is 44%. Notwithstanding, satisfaction with the pay received is widespread: More than one in two employees (both women and men) are satisfied with their pay[115].

Recent analysis by International Energy Agency in co-operation with the OECD shows that gender wage gaps are greater in the energy sector than in the non-energy sector and that women are more likely than men to leave the labour market at all ages in both the energy sector and non-energy sector, though the gender gap is more visible and consistent for energy.[116]

According to analysis by the OECD[117], much of the gender wage gap is explained by differences in pay between men and women with similar skills *within firms*, but it is interesting that the *between-firm* component is markedly greater in the energy sector than in non-energy sectors due to an apparent concentration of women in low-wage energy firms. The OECD research found that about three-quarters of the wage gap between the similarly skilled women and men reflects pay differences within firms, mainly due to differences in tasks and responsibilities but also, albeit to a lesser extent, due to differences in pay for work of equal value. This seems to reflect the impact of bargaining processes and other forms of discrimination on wages of men and women, for which there is evidence from other sectors[118].

According to the Eurofound framework, the compensation quality domain also comprises the entitlement to benefits such as **maternal and paternal leave** - a factor which is frequently mentioned as of significant importance in surveys of women working in the energy industry[119].

Employment security

Women are generally over-represented in **non-standard employment** due to their much higher share of part-time work, much of which (in many EU Member States) is involuntary[120]. Types of precarious work as defined by the European Institute for Gender Equality (EIGE), are also more common for women than for women in the EU[121].

Female researchers, across all economic sectors and fields of education and training, are more likely to work part-time and in precarious contracts, as the statistics published in the She Figures Report show[122]. In the higher education sector, the part-time share was higher

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115 Sum of percentages for responses 4 and 5 on 5-point response scale

116 IEA (2022) 'Understanding gender gaps in wages, employment, and career trajectories in the energy sector', available online: Link.

117 OECD (2021) 'The role of firms in wage inequality: Policy lessons from a large-scale cross-country study', Paris: OECD, available online: Link.

118 For example, see: Biasi, B. & Sarsons, H. (2022) 'Flexible Wages, Bargaining, and the Gender Gap', The Quarterly Journal of Economics, 137(1): 215–266, available online: Link.

119 For example, see: IRENA (2022) 'Solar PV: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

120 Cabrita, J., Vanderleyden, J., Biletta, I., and Gerstenberger, B. (2020) 'Gender inequality at work', EuroFound, European Working Conditions Survey 2015 series, Luxembourg: Publications Office of the European Union, available online: Link.

121 EIGE (2017) 'Gender, skills and precarious work in the EU', Research note, Vilnius: European Institute for Gender Equality, available online: Link.

122 European Commission (2021) 'She Figures 2021: Gender in Research and Innovation: Statistics and Indicators', Luxembourg: Publications Office of the European Union, available online: Link.

than that of men researchers by 3.9 percentage points in 2019. 9.0% of women researchers and 7.7% of men researchers in the higher education sector worked within precarious employment relationships.

Job demands

The Eurofound framework subsumes the issues of working-time quality, work intensity and physical health risks under the "job demands" domain.

Concerning **working-time quality**, which includes the availability and take-up of **flexible work arrangements** such as part time (also for senior positions) and flexitime, the energy sector has traditionally been heavily dominated by standard arrangements, namely full-time work. Data from IRENA on the renewables industries confirm that full-time employment is indeed still the norm in the energy sector[123]. Australian data suggests a full-time employment level in electricity supply at 93.8% compared to 53.8% across all industries[124]. Considering the gender gap in part-time employment, it becomes evident that the very definition of managerial positions as full-time jobs entails a structural disadvantage for women – especially in countries without a solid childcare system. It does not surprise, then, that a greater need for working time flexibility on the part of women employees is frequently mentioned as a barrier to careers in the energy industry[125], and that women voice the wish for greater work flexibility in interview surveys[126].

Another way to provide employees with greater flexibility in the combination of work and other obligations is **remote work**, typically **from home** or another location preferred for reasons related to work-life balance (e.g., due to lower commuting distances). Remote work arrangements usually allow for a certain number of days per week to be spent outside of the main worksite (hybrid remote work). During the COVID-19 pandemic, many employees in the energy sector have made first experience with remote working and liked it. At the latest since then, employers have found that many job applicants and current employees demand a remote working option as a precondition for accepting or remaining in a job, respectively.

The flexibility enabled by remote work and other flexible arrangements can easily disbenefit women employees, especially at times of additional burden as during the recent pandemic. The report of the EC expert group on the **impact of the COVID-19 pandemic** on gender equality in R&I sector, published in 2023[127], presents evidence that the group of researchers most affected by the pandemic response were early career researchers, particularly women, who had additional care responsibilities and/or worked in resource-intensive fields. The study found that, while remote, home-based working provided most researchers with the flexibility to continue their work during the pandemic, early-career and less well-connected staff faced challenges due to a lack of informal social interaction and limited opportunities to establish new collaborative relationships through face-to-face contact. In a situation where care

123 IRENA (2019) 'Renewable Energy: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

124 Workplace Gender Equality Agency Data Explorer (2021) 'WGEA Data Explorer', available online: Link.

125 Von Lonski, U. et al. (2021) 'Untapped Reserves 2.0: Driving Gender Balance in Oil and Gas', BCG & World Petroleum Council, available online: Link.

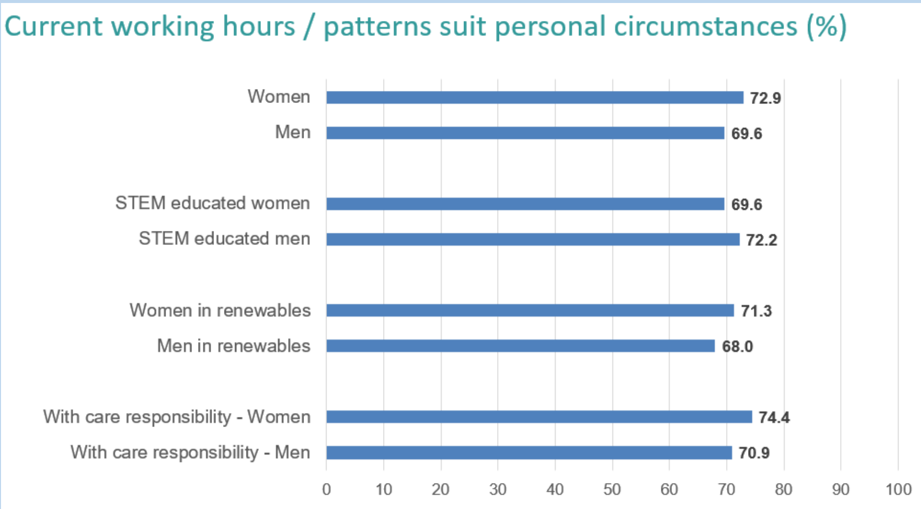
126 "When asked what their current company could do to be more welcoming and encouraging to women, respondents cited 'more flexible working' [...] as [one of] their top criteria (at 43 percent)", from: NES Global Talent and Energy Jobline (2018) 'Women in Energy Global Study 2018', available online: Link.

127 European Commission, Directorate-General for Research and Innovation (ed.) (2023) 'COVID-19 Impact on Gender Equality in Research & Innovation. Independent Expert Report', Luxembourg: Publications Office of the European Union, available online: Link.

responsibilities at home are still unevenly distributed between men and women, female researchers were significantly more susceptible to the negative effects of blending work and personal life when working from home. The situation was further exacerbated by the temporary closure of facilities such as schools and kindergartens. The combined impact of these factors resulted in a substantial decrease in productivity, as evidenced by reduced journal submissions and publications within this group. The report presents compelling evidence for what it calls the 'productivity penalty', which is likely to have long-lasting effects on the career prospects and leadership roles of female researchers, extending well beyond the end of the pandemic. In corporate R&I, similar effects have been reported, e.g., by the Women Tech Council[128].

Exhibit 24: Survey findings on perceptions about work-family balance

Findings from survey of energy sector employees



Note: All employees; Sum of percentages for responses 4 and 5 on 5-point response scale; n = 535 (missings excluded)

Our own survey does not provide any evidence that women employees in the energy sector face more challenges in work-family balance than male employees. 73% of female respondents report that their current working hours and patterns suit their personal preferences, slightly more than the figure for men. Women with care responsibilities are even more likely to voice satisfaction in this regard.

Moreover, two in three women (66%) say that their line manager actively promotes flexible working hours/patterns, against 60% among men. Employees in the renewables sector and in larger companies are significantly more likely to report that their line manager promotes flexible working hours and patterns.

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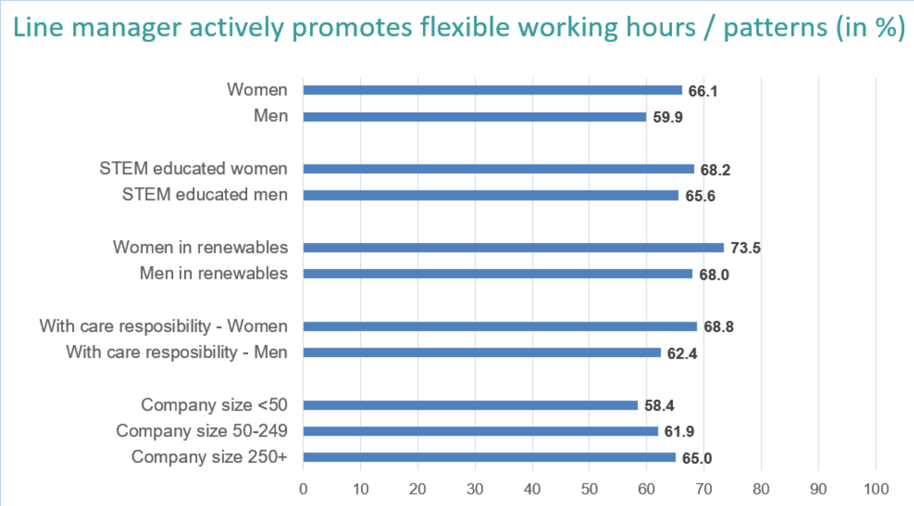
[128] Women Tech Council (2021) 'The Pandemic's Impact on Women in Tech', report, available online: Link.



Note: All employees; n = 537 (missings excluded); Sum of percentages for responses 4 and 5 on 5-point response scale

When we discussed these findings with members of the study's Advisory and Observer Board, experts voiced the opinion that the positive findings about women's perceptions on their working conditions, in particular concerning work-family balance, need to be seen against the background of the recent COVID-19 pandemic. As availability of remote working options spread across large sections of the economy, employees benefitted from an expansion of options to balance work and family responsibilities. There are clear indications, however, that a post-pandemic backlash against remote work has already set in[129], which may affect gendered satisfaction with perceptions about work-family balance.

Our own analysis of LFS data according to the reasons for part-time employment in the energy and construction sector (combined), moreover, shows that certain reasons for part-time work are much more common for women than for men. Among workers who chose part-time work because of care responsibilities, 86.1% are women; among those who do for "other personal/family reasons", the figure is 60.4% (data from 2021).[130]

Concerning **work intensity**, energy research involves a broad range of methods and working practices, often including intense lab or field work. This factor might be disproportionally disadvantageous for women. Female scientists with small children are more likely to manage the biggest share of childcare than men[131]. While desk research is more compatible with remote working from home, experimental research often involves presence in the lab in up to 14 hours workdays, including on weekends. In science in general, PhD projects are highly specific to single researchers. Not only can periods of absence due to maternity leaves can make it hard to catch up on new research developments, but they also put the scientist's own project on hold. In this regard, they differ from less individualistic professions. Careers in

129 Carbonaro, G. (2023) 'Remote work: Is it time for workers to go back to the office?', online article, Euronews, 25/07/2023, available online: Link.

130 For more Information see chapter 8.

131 Morgan, A.C. et al. (2021) 'The unequal impact of parenthood in academia', Science Advances, 7(9), available online: Link.

science depend on producing an independent and substantial body of research early – which is difficult to build with intense family duties[132]. It is reasonable to assume that this hinders many experimental female scientists' careers at a moment when their male counterparts can fully focus on work. On another note, a 2014 survey of 600 field scientists found that 26% of women had experienced sexual harassment in the field[133]. These factors certainly contribute to a status quo in which, compared to their scientific potential, women are underrepresented in science and research.

The impact of perceived job demands on the attractiveness of jobs in the eyes of female candidates is the subject of a recently published research in Germany[134]. The researchers found that women are significantly less likely to apply for jobs in high-wage companies than men, which they argue can explain a large share of the adjusted gender pay gap. The underlying reason for this observation, the researchers found, lies in the fact that the female share among applicants is the lower, the more frequently working hours are changed, and overtime and job-related (physical) mobility are requested. Job flexibility requirements therefore play a key role. These findings indicate that the main underlying reason for gender pay gaps in Germany is the unequal distribution of private care work between men and women, which results in women being less able to meet certain job flexibility requirements than men, in combination with employer's continued insistence on ways of working that make reconciliation of work and family responsibilities difficult.

Concerning the **physical demands** associated with the job, across sectors women score somewhat more favourably than men on the physical environment index, which measures the absence of physical hazards, in the EWCS study[135]. Some STEM jobs in the energy industry are known to be associated with high physical demands, which might lead to perceptions that they are less suited for women. As the example of the new quota for firefighters in the Spanish region of Catalonia shows[136], however, traditional assumptions about the fitness of women for jobs demanding physical strength and endurance are in need of re-examination also within the energy industry.

Job resources

With regards to **access to training**, a fundamental element in the continuous improvement and updating of workers' skills, the Eurofound analysis quoted above found significant variation across EU member states and between occupational groups. While the share of male and female workers with access to training is roughly the same for most occupations (e.g., science professionally, science associate professionals), it is more than twice as high for plant and machine operators, a key occupational group in the energy sector[137].

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132 Morgan, A.C. et al. (2021) 'The unequal impact of parenthood in academia', Science Advances, 7(9), available online: Link.

133 Simmonds, A. (2014) 'Women scientists sexually harassed while doing fieldwork, online article, Nature, available online: Link.

134 Lochner, B. and Merkl, C. (2023) 'Wie Männer und Frauen sich bei der Jobsuche unterscheiden: Bewerbungsverhalten kann die Hälfte der bereinigten Verdienstlücke erklären', IAB-Kurzbericht, 8/2023, Nürnberg: Institut für Arbeitsmarkt- und Berufsforschung, available online: Link.

135 Cabrita, J. et al. (2020), see footnote 120, pp.19-20.

136 According to the regulation, since mid-2022 40% of open positions for Catalan firefighters are being reserved for women, for which physical tests have been modified, see https://en.ara.cat/society/40-of-future-catalan-police-and-firefighters-will-be-women_1_4238164.html

137 Cabrita, J. et al. (2020), see footnote 120, p. 57

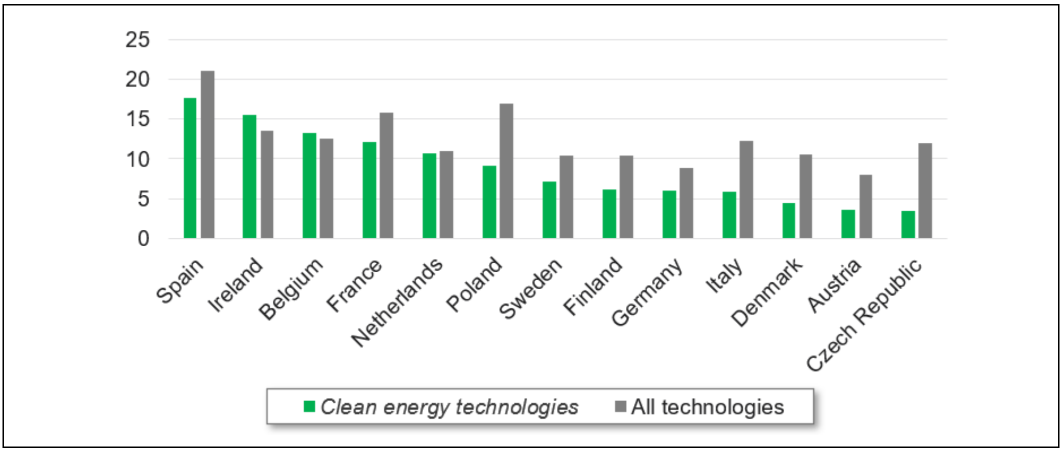
The **quality of managers** is rated significantly higher for female managers in all types of occupations, and by both male and female employees in the EWCS.[138]

3.4.9 Innovation, entrepreneurship and R&I funding

One area in which women are significantly under-represented is **innovation and entrepreneurship activities in technology-oriented fields**, as the latest edition of She Figures reports: In the period 2015-2018, women were holding just one **inventorship** for every 10 inventorships held by men[139].

An analysis of European Patent Office's World Patent Statistical Database carried out by the IEA[140] found that the global **share of women among inventors in patent classes** closely associated to the energy sector[141] (8%-10%) is not only still very low, but also significantly below their share across all technologies (16%) with the exception of climate change mitigation technologies (16%). The figure has been increasing steadily, but slowly, since 1978, the start of the time series. The figures in Exhibit 25 represent the status in the year 2020 for those EU member states for which reliable data are available, differentiating between patents in clean energy technologies and in all technology fields taken together. The share of female inventors in clean energy technologies ranges between 4% and 18%, and is lower than for all technologies, for which they range between 8% and 21%. Spain, Ireland, Belgium and France have above average female participation in patent applications, whereas Denmark, Austria and the Czech Republic perform below par. Among the non-EU countries covered in the present report, Australia (25%) and Turkey (17%) have comparatively high levels of female participation in clean energy technology patents, while Norway and Switzerland (6% each) are at the lower end of the ranking table.[142]

Exhibit 25: Share of female inventors (inventor country of residence) listed in patent applications (2020)



Data source: IEA Gender and Energy Data Explorer, 2023

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138 Cabrita, J. et al. (2020), see footnote 120, p. 46

139 European Commission (2021) 'She Figures 2021: Gender in Research and Innovation: Statistics and Indicators', Luxembourg: Publications Office of the European Union, available online: Link.

140 IEA (2020) 'Gender diversity in energy: what we know and what we don't know', Paris: International Energy Agency, available online: Link.

141 Combustion apparatus, engines & pumps, power, climate change mitigation technologies.

142 IEA (2023) 'Gender and Energy Data Explorer', available online: Link.

The picture concerning entrepreneurship looks similarly bleak: 90.1% of **funding raised by European startups** in 2021 was raised by male founder teams; mixed founder teams raised 8.8% of funding; Female founder teams raised just 1.1%[143]. Start-ups founded or cofounded by women also garner significantly less in investments than those where all founders are men. 85% of start-up funding went to all-male founding teams in 2020 in Europe.[144] Of all the capital invested into the Nordic countries, presumably the forerunners in gender balance among EU Member States, investors allocated 92% of capital to all-male teams, 7.3% for mixed teams and merely 0.7% for all-female teams[145]. These findings are worrying not least because of evidence that start-ups founded or cofounded by generate more revenue[146].

Based on its extensive analysis of the area, The European Investment Bank (EIB) lists as the main explanations for the **persistent low share of women among recipients of risk capital**:

- "Women are underrepresented in investment decisions on the part of venture capital investors - Female investors are 3 times more likely to fund women CEOs, but make up only 10% of VC partners;
- Sector bias distorts investment in female led companies: EU investors prefer to fund women led companies in stereotypically female industries;
- Public funding to female led companies doesn't bridge valley of death: EU government agencies fund the largest number of women-led companies, but often focus only on seed and Series A rounds;
- Female led companies access external financing less often: Women face a higher loss aversion bar when seeking capital and more often resort to bootstrapping, family sources, or costlier loans that hinder long term growth"[147]

On a positive note, analysis by EIB the found that "since approximately 2006, the rate of funding for women-led and women-founded companies has gradually improved. Moreover, the number of women involved as lead partners in venture funding has increased, albeit marginally"[148].

Very little data appears to be available for venture investment, entrepreneurial activity and R&I funding limited to the energy sector. The IEA publishes an indicator on the "percentage of females in the sample of founders of companies less than ten years old and for whom gender is known" (based on data from business data provider Crunchbase) as a poxy for

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143 Atomico (2022) 'The State of European Tech 2022: The Path Ahead', London: Atomico, available online: Link.

144 ScaleUp (2022) 'Do you believe the next generation of tech giants will be European', report, available online: Link.

145 Unconventional Ventures (2021) 'The Startup Funding Report: The Untapped Potential in the Nordic Ecosystem and beyond', online report, available online: Link.

146 BCG (2018) 'Why Women-Owned Startups Are a Better Bet', available online: Link.

147 Nikolova, D. (2022) 'Funding women entrepreneurs: state of play', presentation at European Innovation Gender and Diversity Index Workshop, May 5th, Brussels.

148 Fackelmann, S. and De Concini, A. (2020) 'Funding women entrepreneurs: How to empower growth', Luxembourg: European Investment Bank.

start-up activity. It found that "only about 11% of energy sector founders are female compared with 20% across all sectors, except for consumer goods"[149].

3.5 Causes

The literature points to several reasons for the low employment rate of women in the energy sector such as the pipeline problem, most prominently among which the disproportionately low number of women with STEM degrees, which reduces the pool of potential female applicants for typical positions in the renewables, batteries and hydrogen sectors.

Other factors frequently mentioned include employment practices in hiring, promotion and compensation that discriminate against women, such as in the case of high pay gaps between men and women with similar skills. These can also have significant negative impacts on the career trajectories of female employees in the sector, thus keeping them from reaching higher shares among senior positions.

Moreover, working conditions in the sector can deter and/or discriminate against women. Flexible working practices also appear to remain underdeveloped in comparison to other sectors.

3.5.1 Cultural and social norms

Any assessment of the causes for the underrepresentation of girls and women in STEM must take account of the role of **culturally embedded social norms** which influence gendered behaviour such as career choices of young people as well as individuals already in the labour market. The constraining effect of predominant masculine norms of the energy sector on its ability to achieve gender balance is a much-discussed topic[150].

Much of this effect appears to be due to the high importance of the **engineering profession** for the public image of the energy sector. "The cultural landscape of engineering has been noted to be masculine in various ways, reflected for example in different valuations of ‘hard’ and ‘soft’ skills, or the strong linkage of engineering identity and male norms", as Naukkarinnen & Bairoh[151] point out: "This contradictory situation can be challenging especially for female engineers, who need to match these expectations with their personal identities". It can also lead to stereotypical assumptions about women's capability and fitness for positions in the industry which explain why recruitment and promotion practices have been found to discriminate against women. **Perceptions of gendered ability** appear to be particularly salient, therefore, for STEM professions.

A useful theoretical concept for assessing the interrelation between gender identify and professional identification with a certain sector is the **Social Identity Theory**. According to the theory, women in STEM have to deal with two identities - a female gender identity and a male-dominated professional identity. How they manage these two conflicting identities is expected to determine their self esteem and performance in a male-dominated field like the

149 IEA (2020) 'Gender diversity in energy: what we know and what we don’t know', Paris: International Energy Agency, available online: Link.

150 Mort, H. (2019) 'A Review of Energy and Gender Research in the Global North', GEECCO project report, available online: Link.

151 Naukkarinen, J. and Bairoh, S. (2022) 'Gender differences in professional identities and development of engineering skills among early career engineers in Finland', European Journal of Engineering Education, 47(1): 85-101, p. 85.

energy industry[152]. The theory postulates that women operating in such industries need to develop what has been termed "gender-professional identity integration", an "identity construct that is critical for women to transition and position themselves for success in a male-dominated sector like STEM. The G-PII construct refers to one's self-definition and is driven by one's self-esteem and ability to manage the gender stereotype threat. G-PII is also defined by one's effort in integrating one's gender identity with the professional role"[153].

How such identity challenges play out in real life is reflected in study on the **lived experiences** of women in energy and other STEM fields. Several studies based on interviews with STEM professionals or students have identified a range of similar societal prejudices, based on assumptions that women employees possess stereotypical personality traits and patterns of behaviour.[154]

With regard to gender stereotypes and prejudices which negatively affect women's perceptions of working in STEM, several have been identified that arguably exert a strong influence on the lived experiences of women operating in the energy sector. One such is the so-called **family penalty**, i.e., the belief that "being family-oriented is not associated with professional success". When women "wish to do both, climb the career ladder and raise their children, [they] often experience their family responsibilities as a barrier to advancement"[155]. Related to this, women are often considered **less flexible** when the job requires adjustments, e.g., a relocation, due to their greater engagement in care work[156]. They are also expected to walk what researcher Joan C. Williams calls "**a tightrope between being seen as too feminine to be competent, and too masculine to be likable**"[157] - since women in STEM professions need to behave in masculine ways in order to be seen as capable of meeting their job's requirements.

In order to cope with these challenges, women working in STEM professions are making use of several adjustment strategies, including:

- **Resilience**, e.g., displaying "thick skin, constancy, authority, self-confidence, cheeky behavior [sic], persistence, assertiveness, self assurance, speak out";

- **Assimilation / familiarisation**, e.g., "highlighting self-reported masculinity in behavior [sic], in appearance and in leisure activities, negating feelings and emotions, male peer group, hide femininity, forceful discussion";

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152 Kim, A., Sinatra, G., and Seyranian, V. (2018) 'Developing a STEM Identity Among Young Women: A Social Identity Perspective', Review of Educational Research, 88(4): 003465431877995, available online: Link.

153 EurekAlter! (2021) 'Stemming the leaky pipeline of females in STEM', news release, Singapore Management University, June 2nd, available online: Link.

154 For instance, see: Conrad, M.O., Abdallah, A.R., Ross, L. (2021) 'Why is retaining women in STEM careers so challenging? A closer look at women’s insights and experiences in STEM fields', Paper presented at ASEE 2021 Annual Conference, available online: Link.

155 Schwerter, J. & Ilg, L. (2021) 'Gender differences in the labour market entry of STEM graduates', European Journal of Higher Education, available online: Link.

156 von Lonski, U. et al. (2021) 'Untapped Reserves 2.0: Driving Gender Balance in Oil and Gas', BCG & World Petroleum Council, available online: Link.

157 Williams, J.C. (2016) 'The 5 Biases Pushing Women Out of STEM', Harvard Business Review, March 24th, available online: Link.

- **High performance and engagement**, e.g., demonstrating "high effort, efficacy, ambitiousness, proof potential, persuasiveness, hard work";

- **Avoidance**, using tactics such as "invisibility, gender neutral appearance, ignorance of offending actions, immobility in the workplace, ignore discriminatory patter, avoid workplaces such as the construction site, turn a deaf ear, paying selective attention".[158]

Prieto-Rodriguez et al. found that resilience and determination proved vital for women who persisted in typical STEM professions, concluding that "these women have ‘survived’ their work environments despite structural barriers, only due to their determination, resilience and fervent interest"[159].

3.5.2 Gendered preferences for careers in STEM

A UNESCO study from 2017 attempted to integrate all relevant factors influencing girls' and women's participation, achievement and progression in the STEM field into an **ecological framework** (see Exhibit 26). It points to the critical role of family and peers as well as the school environment, both of course influenced by the wider societal context, for a learner's career related decisions. In addition, personal traits such as language and spatial skills, self-perception, self-efficacy and interest / motivation regarding STEM are core included in the framework.

There is indeed clear evidence that career choices towards STEM – and the associated gender differences – start early in life. The 2018 OECD PISA study surveyed the percentage of maths and science top performing nineth graders who expect to be science and engineering professionals at age 30. On OECD average, 11.5 percentage points less girls than boys expressed this aspiration. In all countries but one (MD) less girls than boys had this career dream. Seven SET Plan countries (BG, EE, FI, HR, PL, RO, SK) at least had a gender gap of less than 5%, while the country with by far the biggest differences was also a SET member (PT – 32.8 p.p.)[160].

These teenage attitudes towards STEM professions translate themselves to higher education. While women represent 44% - 55% of Bachelor’s and Master’s level of study globally[161], the situation in STEM is much less balanced. In EU 28, 14.3 per 1,000 individuals were female STEM graduates versus 26.3 /1,000 males[162]. Looking at the percentage of female Doctoral graduates, She Figures 2021 reports 29.4% share of women in Engineering, Manufacturing and Construction at European level[163].

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158 Makarova, E., Aeschlimann, B., and Herzog, W. (2016) 'Why is the pipeline leaking? Experiences of young women in STEM vocational education and training and their adjustment strategies', Empirical Res Voc Ed Train, 8(2), available online: Link.

159 Prieto-Rodriguez, E., Sincock, K., Berretta, R. et al. (2022) 'A study of factors affecting women’s lived experiences in STEM', Humanit Soc Sci Commun, 9: 121, available online: Link.

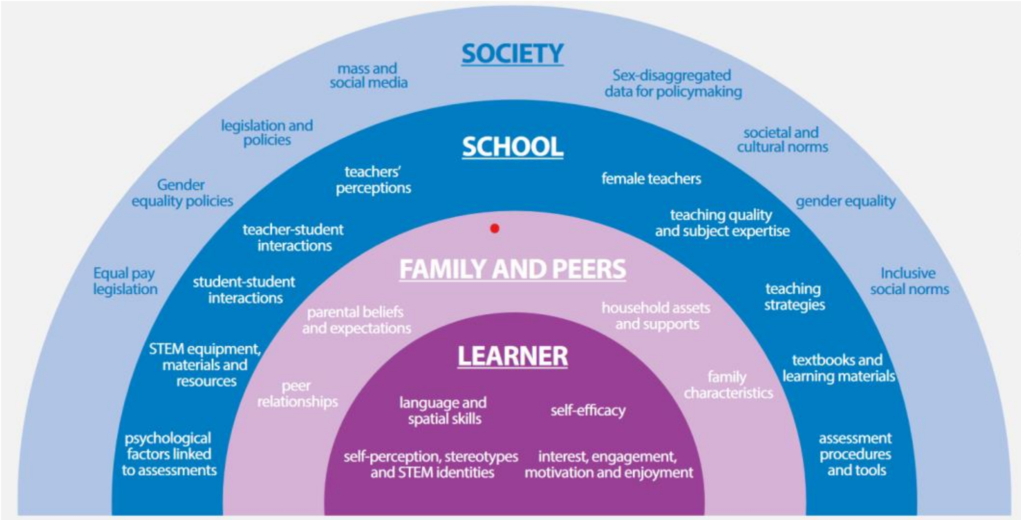
160 OECD (2018) 'PISA 2018 Results Where all Students Can Succeed. Volume II'.

161 World Economic Forum, 'STEM has a gender problem. We must address it in the COVID-19 recovery', available online: Link.

162 European Commission (2020) 'Women in Digital Scoreboard 2020', available online: Link.

163 European Commission (2021) 'She Figures 2021: Gender in Research and Innovation: Statistics and Indicators', Luxembourg: Publications Office of the European Union, available online: Link.

Exhibit 26: Ecological framework of factors influencing girls' and women's participation, achievement and progression in STEM studies



Source: UNESCO164

The sex/gender disparities in representation and career progression in STEM have been intensely researched during the last decades to help identify the underlying structural, biological and sociocultural – including (workplace) discrimination – causes. In social science sex differences in academic careers have typically been attributed to structural and societal issues. An often reported finding on cognitive differences in STEM performance is that on average, men score significantly higher than women on tests of spatial ability and mathematical reasoning, whilst women score significantly higher on verbal tasks. There is an ongoing debate as to whether these differences are indicative of inherent cognitive abilities or are the result of learned experiences.

Stewart-Williams & Halsey[165] discuss to what extent sex differences in academic achievement is likely to be attributed to sociology, biology or, rather, to a complex interaction between the two. Referring to an extensive body of literature, they identify several recurring elements, including:

- **Career-relevant preferences**, e.g., interest in people versus things/objects/machines, which by far shows the largest female/male difference and is thus likely to influence occupational preference – e.g., humanistic or societal work in women. However, it is essential to note that these preferences may be significantly shaped by societal factors and early childhood stimulation and for this reason can evolve considerably over time.

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164 UNESCO (United Nations Educational, Scientific and Cultural Organization) (2017) 'Cracking the code: girls' and women's education in science, technology, engineering and mathematics (STEM)', Paris: UNESCO, available online: Link.

165 Example studies:
Stewart-Williams, S., & Halsey, L. G. (2021) 'Men, women and STEM: Why the differences and what should be done?', European Journal of Personality, 35(1): 3–39, available online: Link.,
Wang, MT., Degol, J.L. (2017) 'Gender Gap in Science, Technology, Engineering, and Mathematics (STEM): Current Knowledge, Implications for Practice, Policy, and Future Directions', Educ Psychol Rev, 29: 119–140, available online: Link.

- **Life priorities**: Women and men show big differences in the degree to which they value work-life balance versus career success and income. These patterns have been remarkably resistant to change through decades. Such differences in life priorities are rooted in the different roles that societies around the world have assigned to men and women, prioritizing women's reproductive rather than productive roles, and were significantly amplified by cultural, social, and economic factors. Over time, these roles became deeply ingrained in societal norms and expectations.[166]

- **Cognitive abilities**: There are insignificant sex differences in general average (mean) cognitive abilities, even in fields of mathematics.[167]

- **Differences in relative cognitive strength** have been reported in literature as significant between women and men for most verbal and visuospatial skills.

- **Gender-related stereotypes and biases** exert a significant influence. For example, higher ratings were given to assumed male applicants in blinded evaluations. In contrast, the same research found no gender bias for open outstanding applications[168].

From the above we conclude that while it might be misguided to strive for a 50/50 sex ratio in every area, stakeholders must nevertheless try their best to remove any barriers for women who qualify for and are interested in work in, for instance, renewable energy. A large number of studies show that women still perceive substantial barriers and discrimination, much of which may be unconscious, at STEM workplaces[169] including in the energy sector It is to this subject that we turn in the following section.

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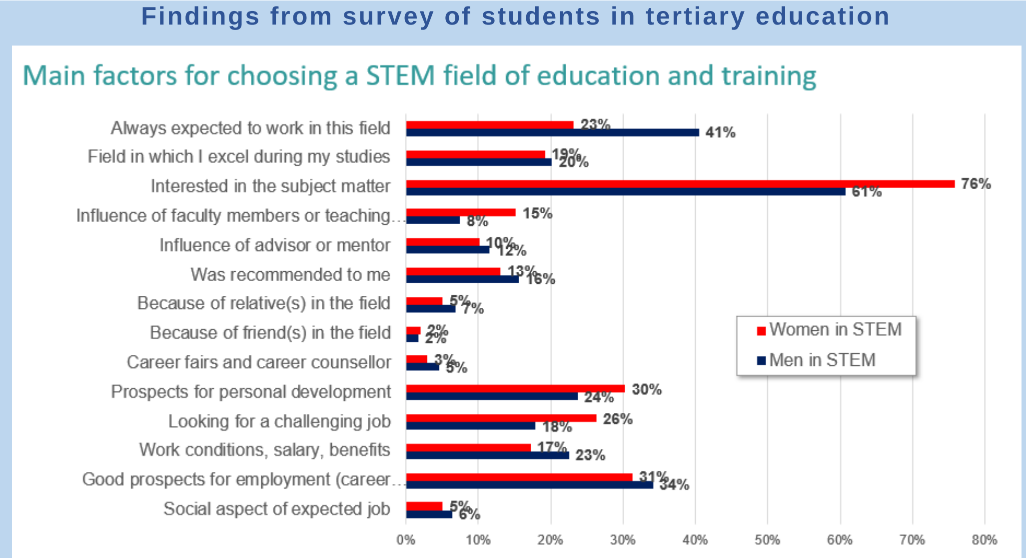
166 Berger, P. L. and Luckmann, T. (1966) 'The Social Construction of Reality: A Treatise in the Sociology of Knowledge', Garden City, NY: Anchor Books.

167 For example, see: Ghasemi, E. and Burley, H. (2019) 'Gender, affect, and math: a cross-national meta-analysis of Trends in International Mathematics and Science Study 2015 outcomes', Large-scale Assessments in Education, 7:10, available online: Link.

168 Bertogg, A. et al. (2020) 'Gender Discrimination in the Hiring of Skilled Professionals in Two Male-Dominated Occupational Fields: A Factorial Survey Experiment with Real-World Vacancies and Recruiters in Four European Countries', Köln Z Soziol, 72(Suppl 1): 261–289, available online: Link.

169 Danbold, F. and Huo, Y. J. (2017) 'Men's Defense of their Prototypicality Undermines the Success of Women in STEM Initiatives', Journal of Experimental Social Psychology, 72: 57–66.

Exhibit 27: Survey findings about reasons for choosing study field



Note: All students; n = 648 (missings excluded)

Female STEM students are more likely to have decided for STEM because of interest in the subject matter, the wish for a challenging job, and influence of faculty members or teaching assistants. They are much less likely to have chosen STEM because they “always expected to work in this field”.

3.5.3 Barriers as perceived by women working or training in the field

Extensive evidence from research studies is available about the general and practical barriers women employed in the energy sector face, as perceived mainly by themselves.

The 2021 IRENA survey of people working in the Solar PV sector[170] found that 66% of female respondents agreed that there are gender-related barriers in the sector, against only 40% of male respondents. When asking for the actual barriers perceived, the surveys by IRENA distinguish between:

- Barriers to entry,
- Barriers to retaining women working in renewables, and
- Barriers to advancement.

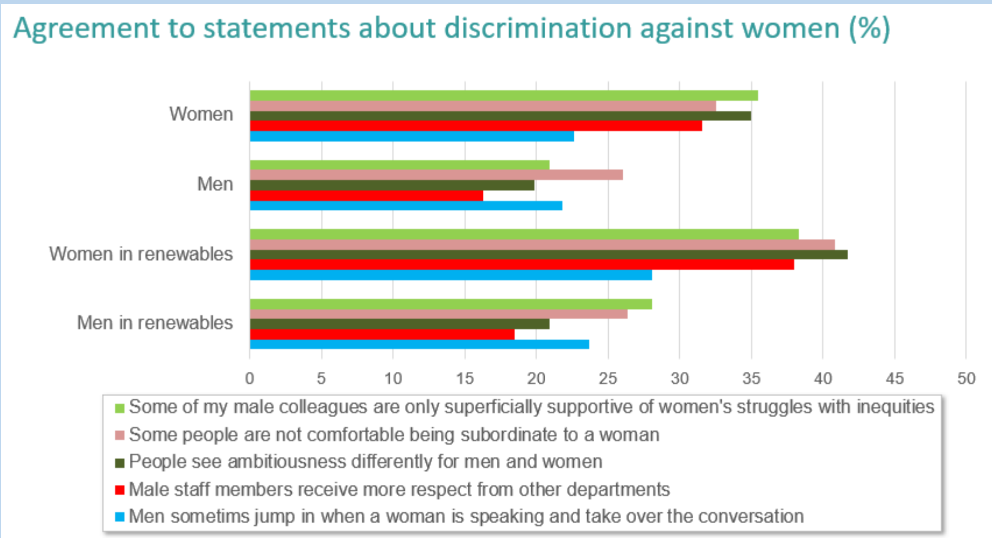
170 IRENA (2022) 'Solar PV: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

Among **barriers to entry**, IRENA's surveys all found that social and cultural factors are mentioned by the largest majority, namely **perception of gender roles** and **social and cultural norms**. A **lack of gender targets** and common **hiring practices** were confirmed by a large share of respondents, as well. The survey of workers in the Solar PV sector also found **limited mobility** on the part of female employees being mentioned frequently - possibly because of the survey being conducted during the height of the Covid-19 pandemic. A lack of adequate skills (STEM or non-STEM) or insufficient knowledge of the opportunities offered by a career in the renewables industry were confirmed as barriers to entry by a minority of respondents only.

There is indeed robust evidence from research studies that common **recruitment practices** discriminate against candidates purely based on their sex[171]. Experiments with gender-blind hiring policies have clearly shown that such practices can help overcome some of the negative impact of unconscious bias on hiring outcomes[172].

Exhibit 28: Survey findings on perceptions about discrimination against female employees

Findings from survey of energy sector employees



Note: All employees; n = 492-513 (missings excluded); sum of percentages for responses 5 and 6 on 6-point scale

One in three women finds that male staff receive more respect from outsiders, that people see female ambitiousness as off-putting, and that some male colleagues are only superficially supportive of gender equality; less than 20% of men hold the same views.

171 Johnson, S.K., Hekman, D.R., and Chan, E.T. (2016) 'If There's Only One Woman in Your Candidate Pool, There's Statistically No Chance She'll Be Hired', Harvard Business Review, April 26, available online: Link.

172 Rinne, U. (2018) 'Anonymous job applications and hiring discrimination', IZA World of Labor, 48(2), available online: Link.

Analysis of the survey results also suggests that women in renewable energy are significantly more likely to experience discrimination than those in other parts of the sector, while women with care responsibility are less likely to report of discrimination.

Among **barriers to retention**, IRENA's surveys identified "**fairness and transparency in internal policies and processes** [...] as the most relevant concern, closely followed by several of the other barriers, including **lack of maternity** and **paternity leave**"[173]. Other barriers to retention frequently mentioned includes **lack of supportive workplace policies** (e.g., availability of **flex-time**, option to **work from home**, **job sharing** and **part-time working)** as well as missing supportive services (**on-site childcare**).

Among **barriers to advancement**, IRENA survey's found a majority of respondents agreeing about the role of **social and cultural norms**, followed by **limited mobility** and lack of **childcare facilities**. This points to the difficulty for women to take up leadership positions within the energy sector if traditional work cultures are not adequately adapted to the needs of women employees. With respect to mobility, for example, the report's authors state that "many studies have reported how women are often penalised when mobility is a requirement, ignoring that they may have different patterns, needs and behaviours. [...] Because women carry out three-quarters of unpaid domestic care work globally, they must consider commuting schedules and travel connection options when applying for a job or accepting a promotion"[174].

Research recently conducted by the Nuclear Energy Agency[175], which surveyed over 8,000 women working in the nuclear energy sector across the world in 2021, reported that the key barriers perceived by women in the sector are a lack of developing a sectoral strategy, workplace sexual harassment, a lack of female role models, and absence of measures to help with work-life balance, particularly concerning pregnancy and family related-duties. The study authors expect these barriers to have a negative impact on gender wage gaps and career trajectories.

Although many companies in the energy industry have introduced measures to support women employees, these are not always taken up by the target group to the degree expected, which indicates that there are **barriers to making use of options** for improving, for example, work-life balance. The 2021 survey conducted in the oil and gas sector by BCG found that only half of women employees have taken up diversity and inclusion measures, with reasons given for lack of interest including "that they felt unsupported unless their supervisor was also from a diverse group"[176]. Other explanations include **lack of fit**, i.e., that some existing measures are designed in a way which does not make them sufficiently supportive in practice, which brings up the issue of effectiveness.

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173 IRENA (2022) 'Solar PV: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

174 IRENA (2022) 'Solar PV: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, p.32, available online: Link.

175 Nuclear Energy Agency (2022) 'NEA task group working on improving gender balance in the nuclear sector', online article, 17 February, available online: Link.

176 von Lonski, U. et al. (2021) 'Untapped Reserves 2.0: Driving Gender Balance in Oil and Gas', BCG & World Petroleum Council, available online: Link.

3.6 Impacts

Why should the EU care if employment in jobs related to the energy transition, or more generally in STEM research and industries, are predominantly held by men? What are the impacts if the current situation is upheld at the expense of a stronger participation of women in the field? The rationale for policy and stakeholder interventions in the area can be summarised under three headings: justice; performance; and skills, gaps and mismatches.

3.6.1 Justice

Fair and equal participation in decisions, as policymakers, professionals or consumers, in the energy transition is looked at as a matter of social justice, a "theme that has gained increasing importance with the recognition that energy transitions are accompanied by huge underlying social upheavals".[177] In relation to inclusion of women in processes concerning the energy transition, inclusion needs to be understood in terms of both process (how decisions are made and who is included in that process and how and why, i.e., **procedural justice**) and outcomes (how wealth and prosperity are distributed and shared across a population and why, i.e., **distributional justice**)[178]. The latter is understood also to include questions related to the quality of employment, e.g., any gender-based differences in working conditions in the energy sector.

3.6.2 Performance

Research has shown that the gender balance in the workforce of an organisation has an effect on its performance in terms of typical KPIs such as overall financial returns and productivity, but also access to scarce talent, capacity for innovation, lower risks in corporate initiatives, and enhanced reputation[179]. There is now **substantial evidence that companies with more women at the senior executive level perform better** than those with lower representation across a whole range of KPIs[180], meaning that the under-representation of women in senior management positions in energy negatively impact the performance of the sector, and hence the energy transition. A better overall organisational performance has been linked to an increase in the number of qualified women in an organisation's leadership[181]. Recent studies have also shown the negative effect with below par share of women in an organisation (the tipping point is typically found around 30%) frequently has in general, with cultures of "**toxic masculinity**" endangering the capability of firms to successfully manage change in times of uncertainty[182].

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177 Mort, H. (2019) 'A Review of Energy and Gender Research in the Global North', GEECCO project report, p. 3.

178 Clancy, J. and Roehr, U. (2003) 'Gender and energy: is there a Northern perspective?', Energy for Sustainable Development, 7(3): 44-49.

179 Electricity Human Resources Canada (2020) 'Leadershift: Pathways to Gender Equity', available online: Link.

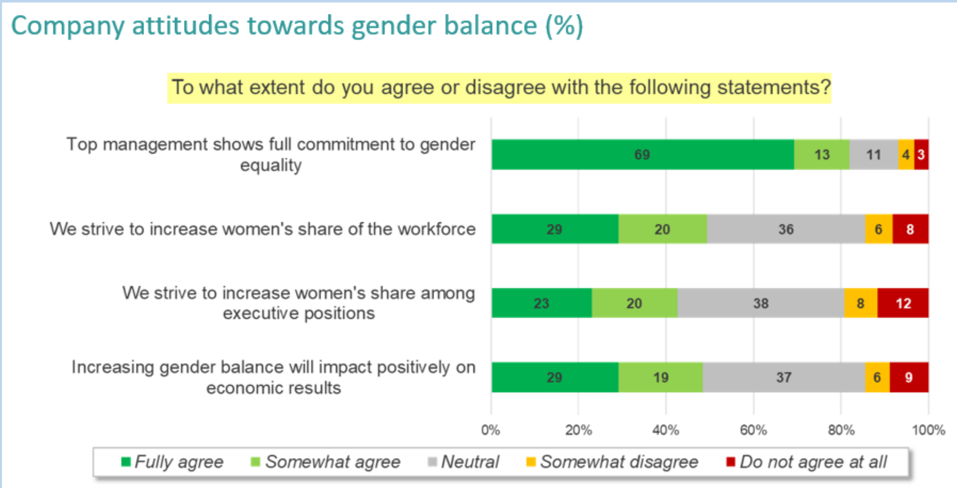
180 Dixon-Fyle, S., Hunt, V., Dolan, K., Prince, S. (2020) 'Diversity wins: How inclusion matters', London: McKinsey, available online: Link.

181 Noland, M., Moran, T. and Kotschwar, B. (2016) 'Is gender diversity profitable? Evidence from a global survey', Peterson Institute for International Economics, Working Paper 16-3. See also the comprehensive review of evidence in: Momani, B.; Stirk, J. (2017) 'Diversity dividend: Canada's global advantage', Centre for International Governance Innovation & The Pierre Elliott Trudeau Foundation.

182 Scott, L. (2020) 'The Double X Economy: The Epic Potential of Empowering Women', New York: Farrar, Straus and Giroux.

Exhibit 29: Survey findings on company's opinions about the issue of gender balance

Findings from survey of companies in the energy sector



Note: Only companies with >9 staff; n = 2,419 – 2,468 (missings excluded)

HR managers in the large majority of energy sector companies report that their top management shows full commitment to gender equality (EU27: 81%). Only half (EU27: 44%), however, are also committed to increasing the women share in their entire workforce and 43% (EU27: 38%) to increasing the share of female managers.

Although a lot of research evidence suggests that gender balance has a positive benefit on organisational performance, this is not yet universally acknowledged by business managers. 49% of our sample (EU27: 43%), however, do agree that increasing gender balance will have a positive effect on economic results, against 15% (EU27: 16%) who disagree.

Moreover, a favourable gender ration is increasingly needed for **compliance** with legal, regulatory and reporting requirements. It is to be expected, for example, that practices of **gender-responsive procurement**[183] will become increasingly widespread, with potential negative implications for bidding companies lagging behind in gender balance in senior management. Finally, a lack of women in technological fields has been shown to translate into biased outputs of R&I, potentially leading to **loss of opportunities for innovation** in key fields, which would negatively competitiveness particularly in innovation-driven sectors such as the renewables, batteries and hydrogen industries.[184]

With respect to the **energy transition as a societal level project**, the question whether more gender equality in research, industry or policy leads to fundamentally different outcomes still needs to be studied more closely. A body of research has found gendered differences in views and behaviours related to environmental issues and climate change (see chapter 3.1). Some research is also available suggesting that because of these differences,

183 EIGE 'Gender-Responsive Public Procurement', available online: Link.

184 Díaz-García, C., González-Moreno, A., Sáez-Martínez, F.J. (2013) 'Gender diversity within R&D teams: Its impact on radicalness of innovation', Innovation: Management, Policy & Practice, 15 (2): 149, available online: Link.

increased involvement of women in decision-making on topics related to energy efficiency leads to better outcomes (i.e., more in line with the targets of the Green Agenda) since women tend to be more environment-conscious and show greater awareness of risks and social issues. Carlsson-Kanyama and Röhr (2010)[185] suggest that greater involvement of women might shape, and even improve decision-making in the context of the 'energy transition' due to their greater perception of risk, and on average, greater concern for the environment. Offenberger & Nentwich (2010)[186] found that female scientists are more likely to include social issues into their R&I work than men, who often tend to focus exclusively on technological aspects. Mort (2019)[187] warns, however, that if masculine norms remain prevalent in the energy sector in spite of the growing diversity in the workforce, the positive impact of more women in senior positions might be constrained.

At the national level, an important correlation can be observed between the status of gender equality and that country's innovation system, namely countries with the best performing innovation systems in the EU Innovation Union Scoreboard are also the countries with the best gender equality scores in the EIGE Gender Equality Index.[188] Such correlation must, of course, not be construed as evidence of a causal relationship.

3.6.3 Skill shortages

As outlined in section 3.2, **skill shortages** are a major concern for Europe's ability to master the energy transition. A skill shortage describes a situation in the economy when the demand for a particular type of skill exceeds the supply of available people with that skill[189]. Attracting more women into STEM education and subsequent employment could help to address current and expected labour supply and skill shortages in STEM occupations by broadening the pool of applicants and recruits and thereby extend the talent pool available for filling positions in renewables, hydrogen and batteries.

The European Jobs Monitor 2021 reports that women's employment will have to grow at a rate at least three times faster than that of men up to the end of the decade to meet the gender and employment targets set out in the European Pillar of Social Rights Action Plan[190]. The Monitor also reports that the rise in women's employment has led to low-paying jobs, which were formerly dominated by men, becoming dominated by women. However, women have also benefited more than men from employment growth in well-paid jobs.[191]

According to the analysis of the European Centre for the Development of Vocational Training (CEDEFOP), among the top five skill shortage occupations across the EU are ICT

[185] Carlsson-Kanyama, A., & Juliá, I. R. and Röhr, U. (2010) 'Unequal representation of women and men in energy company boards and management groups: are there implications for mitigation?', Energy Policy, 38, 4737-4740.

[186] Offenberger, U., & Nentwich, J. (2010) 'Intertwined practices of gender and technology: the case of sustainable home heating', Project report, No. 11, available online: Link.

[187] Mort, H. (2019) 'A review of energy and gender research in the global North', Gender Equality in Engineering through Communication and Commitment (GEECCO), Project Deliverable.

[188] Gender Action (2020) 'Gender equality and RI performance go hand in hand', available online: Link.

[189] CEDEFOP (2010) 'Skill mismatch in Europe: Europe's challenge is not just to improve skill levels, but to match people with the right skills to the right jobs', Briefing Note, available online: Link.

[190] European Commission 'The European Pillar of Social Rights Action Plan', available online: Link.

[191] Eurofound and European Commission Joint Research Centre (2021) 'European Jobs Monitor 2021: Gender gaps and the employment structure', European Jobs Monitor series, Publications Office of the European Union, Luxembourg, available online: Link.

professionals and STEM professionals. Demand for ICT professionals is rising because almost every economic sector needs their skills. Similarly, STEM professionals are needed in many other fields. However, the supply of ICT and STEM graduates from upper-secondary and higher education are insufficient to meet demand, a situation which CEDEFOP projects will continue in the near to medium future.[192]

3.6.4 Skill gaps

In addition to skill shortages, other types of skill challenges need to be considered as well. A **skill gap** is a situation in which "the level of skills of the person employed is less than that required to perform the job adequately or the type of skill does not match the requirements of the job".[193] In the context of the present study, skill gaps can arise from a low representation of women, e.g. in product development and marketing, because of the need to properly consider the preferences and needs of female customers in issues concerning the energy transition.

Skill gaps are also of relevance when it comes to **soft skills** typically not captured by skills profiles. Research by Eurostat indicates that a growing number of employers are seeking staff with the necessary capacities to manage complex information, think autonomously, be creative, use resources in a smart and efficient manner, as well as communicate effectively.[194] A diverse workforce with a good gender balance has been shown to increase the likelihood that such skills are present in operational teams.[195]

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192 CEDEFOP (2016) ' Skill shortages in Europe: Which occupations are in demand – and why', available online: Link.

193 CEDEFOP (2010) 'Skill mismatch in Europe: Europe's challenge is not just to improve skill levels, but to match people with the right skills to the right jobs', Briefing Note, available online: Link.

194 Eurostat (2022) 'Tertiary education statistics', online article, retrieved 2023-02-07, available online: Link.

195 Sakpal, M. (2019) 'Diversity and Inclusion Build High-Performance Teams', online article, Gartner, available online: Link.

4 Towards improved gender balance in the energy sector

4.1 Overview of recent policy interventions

What can be done about the issues surrounding gender balance and equality in the energy sector? In many countries around the globe, policy and stakeholders have developed a response to the challenge, for which a great variety of approaches has been applied. Interventions can be developed and executed at different levels, from the level of organisations and sub-units thereof that establish procedures and rules for gender equality up to level of government, which has introduced legislation and other types of regulation for promoting gender balance. Government is also playing a strong role in multi-stakeholder initiatives bringing together policymakers, representatives of the education system as well as employers.

4.1.1 EU policy strategies and legislation

With respect to the scope of the present study, three domains for policies are to be distinguished: Policies on gender equality as a vertical challenge across all policy fields; policies targeting gender equality within the R&I and STEM domain; and policies looking specifically into the role of gender in the energy sector.

Gender equality

Gender equality is a core value of the European Union and gender mainstreaming is the mechanism favoured by EU policy makers for realising this goal. One of the European Union's founding values, gender equality dates back to the Treaty of Rome (1957). Throughout the last decades, the EU has driven forward gender mainstreaming in policies, as well as equal treatment in legislation and concrete measures for the advancement of women.

The **Strategy for Equality between Women and Men**, renewed twice per decade, is the strategic instrument to this end. The current edition of the strategy is "A Union of Equality: Gender Equality Strategy 2020-2025" and represents one of a series of EU initiatives and strategies concerning equality, diversity and inclusion[196]. It strives for a Europe with gender equality that respects diversity, thrives in a gender-equal economy and practices intersectional gender mainstreaming in policies, among others. Also taken up in the tender specifications text, the intersectional approach is addressed for the first time in the strategy, taking account of the unique discrimination experiences this creates.

The 2019 **Directive on Work-life Balance for Parents and Carers**[197] highlights that work-life balance policies should contribute to achieving gender equality by supporting the participation of women in the labour market and equal sharing of household and care chores between partners, as well as the closing of gender pay gaps. It acknowledges the fact that people with caring responsibilities tend to be female more often than male, meaning a lesser

[196] European Commission (2020) 'Questions and Answers: Gender Equality Strategy 2020-2025', available online: Link.

[197] European Union (2019) 'Directive (EU) 2019/1158 of the European Parliament and of the Council of 20 June 2019 on work-life balance for parents and carers and repealing Council Directive 2010/18/EU', Official Journal of the European Union, available online: Link.

participation of women in paid employment. The Directive lays down minimum requirements for parental and carer's leave, as well as flexible working arrangements. With the pandemic workforce shifts, these provisions have become of more importance still. Yet, specifically in energy R&I and employment, some of these models might be more difficult to apply.

In the 2021 **Report on Gender Equality in the EU**[198] analyses the adverse impacts of the Covid-19 pandemic which fall disproportionately on women. Beyond evidence about an increase of violence by male partners, negative impacts also include reduced participation in the labour market. The report reiterates the need for more gendered data in crucial areas, mentioning explicitly the energy sector.

In 2017, the European Commission presented a **Gender Pay Gap Action Plan**[199] to address the persistent pay gap between men and women. In March 2021, the European Commission published a proposal for binding pay transparency measures. The initiative aims at tackling the persisting inadequate enforcement of the fundamental right to equal pay and ensuring that this right is upheld across the EU, by establishing pay transparency standards to empower workers to claim their right to equal pay. In 2019, the European Parliament adopted a new directive (EU) 2019/1158 on work-life balance for parents and carers.[200] The principle of equal pay for work of equal value is embodied in the EU Recast Directive on equal opportunities and equal treatment (2006/54/EC).

Due to the sheer summative volume of procurement contracts between public authorities, such as government departments or local authorities, and commercial suppliers of work, goods or services, rules and procedures for **gender-sensitive public procurement** have been identified as a major potential level for policy interventions[201]. According to data from the European Commission "every year, over 250,000 public authorities in the EU spend around 14% of GDP (around €2 trillion per year)"[202]. As a precondition for the use of procurement for social ends, however, the use of gender clauses as selection or award criteria must be permitted in the applicable EU and national regulation such as the 2014 EU procurement directives and applicable principles set out in the Treaty on the Functioning of the European Union (TFEU) or the financial rules applicable to the general budget of the Union. The EC's **Public Procurement Strategy** was laid out in the 2017 communication "**Making public procurement work in and for Europe**"[203]. Under its strategic policy priority "Ensuring wider uptake of innovative, green and social procurement", guidance to help public buyers integrate social considerations into public procurement have been developed[204]. Such considerations include "equality of opportunity and treatment for all women and men" and "gender equality and non-discrimination in access to employment". **UN Women**, the United Nations entity working for gender equality and the empowerment of women, issued a

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198 European Commission, Directorate-General for Justice and Consumers (2021) 'Report on gender equality in the EU', Luxembourg: Publications Office, available online: Link.

199 European Commission 'EU Action Against Pay Discrimination', available online: Link.

200 European Union (2019) 'Directive (EU) 2019/1158 of the European Parliament and of the Council of 20 June 2019 on work-life balance for parents and carers and repealing Council Directive 2010/18/EU', Official Journal of the European Union, available online: Link.

201 OECD (2021) 'Promoting gender equality through public procurement: Challenges and good practices', OECD Public Governance Policy Papers, No. 09, Paris: OECD Publishing, available online: Link.

202 European Commission 'Public Procurement', Single Market - Economy, available online: Link.

203 European Commission (2017) ' Communication from the Commission to the Institutions: Making Public Procurement work in and for Europe', available online: Link.

204 European Commission (2021) 'Buying Social - a guide to taking account of social considerations in public procurement (2nd edition)', Commission notice, C(2021) 3573 final, available online: Link.

Gender-Responsive Procurement Guidance Note in 2020. The European Institute for Gender Equality (EIGE) published a report[205] and practical toolkit[206] on the topic in 2021.

With regard to the issue of **intersectionality**, several EU strategies, policies and guidelines incorporate aspects of it, such as the Gender Equality Strategy 2020-2025 mentioned above, but also the **LGBTIQ Equality Strategy 2020-2025**[207], and the **EU Platform of Diversity Charters**[208], among others.

Research & Innovation

In R&I, the key implementation mechanism to advance gender equality are the European Research Area (ERA) and Horizon Europe.

The **European Research Area (ERA)**, which strives to achieve a single market for research innovation and technology across the EU, has since 2012 prioritised gender equality and gender mainstreaming. In a Communication issued that year, the European Commission set three objectives to be achieved by working with member states and fostering institutional change: “Gender equality in careers at all levels”; “Gender balance in decision making”; and “Integration of the gender dimension into the content of research and innovation”. The **ERA Policy Agenda** adopted in 2021[209] sets out 20 concrete Actions for the period 2022-2024 to contribute to the priority areas defined in the **Pact for Research and Innovation**, which defines common principles for research and innovation in Europe, including values like freedom of scientific research, equal opportunities for all, free circulation of researchers and knowledge, inclusiveness, and societal responsibility. Gender equality is mainly covered by **Action 5 (“Promote gender equality and foster inclusiveness”)**, also subject of the so-called **Ljubljana declaration on Gender Equality in Research and Innovation**, endorsed by 37 parties including the European Commission and all member states at the Competitiveness Council meeting on 26 November, 2021. Action 5 embraces inclusiveness and diversity objectives in R&I, also to reflect the intersections between gender and other social categories, such as ethnicity, disability, religion, age, and sexual orientation to ensure equal opportunity for students, researchers, and staff from diverse backgrounds in European R&I systems.[210]

Gender mainstreaming is also covered in other Actions, namely Action 3 (“Advance towards the reform the assessment system for research, researchers and institutions to improve their quality, performance and impact”) , Action 4 (“Promote attractive research careers, talent circulation and mobility”), Action 9 (“Promote a positive environment and level playing field for international cooperation based on reciprocity”), Action 13 (“Empower higher education

205 EIGE (2021) 'Gender-responsive public procurement', Luxembourg: Publications Office of the European Union.

206 EIGE (2021) ' Gender-responsive Public Procurement', available online: Link.

207 European Commission, Commissioner Dalli (2020) 'Union of Equality: LGBTQI Equality Strategy 2020-2025', available online: Link.

208 European Commission (2020) 'The EU Platform of Diversity Charters turns 10!', available online: Link.

209 Council of the European Union (2021) ' Council Recommendation on a Pact for Research and Innovation in Europe', available online: Link.

210 European Commission, Directorate-General for Research and Innovation (2022) 'Approaches to inclusive gender equality in research and innovation (R&I)', Luxembourg: Publications Office of the European Union, available online: Link.

institutions to develop in line with the ERA, and in synergy with the European Education Area") and Action 19 ("Establish an efficient and effective ERA monitoring mechanism").[211]

The **Horizon Europe Programme** has strengthened to support gender equality in R&I through both integrating a gender dimension in R&I content but also through encouraging gender balance and setting new eligibility condition, such as requiring public bodies, research organisations and higher education establishments to have **a Gender Equality Plan (GEP)**[212]. This condition fully reflects the gender equality objectives set out in the ERA Policy Agenda 2022-2024.

SET Plan & the European Green Deal

In December 2019 the European Commission introduced the vision of the **European Green Deal**. All 27 EU Member States committed to turning the EU into the first climate neutral continent by 2050. To get there, they pledged to reduce emissions by at least 55% by 2030, compared to 1990 levels. One of the benefits claimed is that this will create new opportunities for innovation and investment and jobs. The way to achieve the transition is set out in the **European Strategic Energy Technology Plan (SET Plan)** and in the **Just Transition Mechanism (JTM).** JTM calls for a "fair way, leaving no one behind" actions. JTM incorporates the financial tool **Just Transition Fund (JTF)** to support to EU territories facing serious socio-economic challenges arising from the transition to climate-neutral economies. The relevant Regulation[213] includes the statement: "To address the specific situation and role of women in the transition to the climate-neutral economy, gender equality should be promoted. Women's labour market participation and entrepreneurship, as well as equal pay, play an important role in ensuring equal opportunities."

This statement must be seen in the context of the EU commitment to mainstreaming gender into the **Multiannual Financial Framework** (MFF)[214], which calls for the design of a methodology to measure gender expenditure. Budgets are a powerful economic tool to transform societies and economies and enhance equality, hence it is important that gender should be considered in the budget for the Just Transition Mechanism.[215] Of the 48 programmes assessed so far by **DG Budget** for their contribution to gender equality only five include gender equality as a principal objective, six identified gender equality as a significant objective, 29 have a likely but unclear impact on gender equality, and eight were sees as having no significant impact on gender equality. The **European Green Deal** (EGD) and its associated measures are amongst the 29 programmes with unclear impact on gender equality

[211] European Union (2020) 'Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions A new era for Research and Innovation', Official Journal of the European Union, available online: Link.

[212] European Commission 'Horizon 2020 - Promoting Gender Equality in Research and Innovation', available online: Link.

[213] European Union (2021) 'Regulation (EU) 2021/1056 of the European Parliament and of the council of 24 June 2021 establishing the Just Transition Fund', Official Journal of the European Union, available online: Link.

[214] European Parliament (2023) 'Multiannual Financial Framework', available online: Link.

[215] European Union (2021) 'Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2021 establishing the Just Transition Fund', Official Journal of the European Union, available online: Link.

There are several policies, interventions and initiatives to increase the influence of women on the energy transition. These include the EC's **Green Employment Initiative**[216], which works for a gender equality perspective in the definition, implementation and monitoring of green job creation policies at all levels.

Critics argue that the European Green Deal's just transition principle has mostly taken a narrow focus, e. g. by seeking to open-up pathways into a clean energy future for – mostly male – workers in the old fossil fuel sectors.[217] It includes the goal of "*Supplying clean, affordable and secure energy*", which parallels the UN Sustainable Development Agenda's 2030 goal **SDG7** to *"ensure access to affordable, reliable, sustainable, and modern energy for all".* Both are gender blind in that they have no gender indicators or targets, even though "access" and "affordable" are concepts that hide a multitude of power and gender inequality relations[218] [219].

Responding to the EU's commitment to 'greening' the environment and economy, which will require appropriately skilled workforce, the EC's Joint Research Centre (JRC) already in 2014 published a **Roadmap on Education and Training for SET-Plan** for the key low-carbon energy technology sectors with recommendations proposed through consultation of 130 experts.[220] The roadmap makes only one brief reference to gender. However, the associated report on the Assessment of the Working Groups includes several references to gender concerns such as underrepresentation of women in the key 'green energy' technological fields, barriers to career advancement, and limited information on career pathways. The JRC Roadmap proposes numerous structural improvements in education and training including: 1) filling the knowledge and competence gaps; 2) fostering involvement of business and research; 3) access, and uptake by the labour market, and 4) planning and enabling skills development, uptake, and recognition. The expert consultation included a mapping of around 40 Master-level courses on sustainable energy already developed in Europe. The consulted experts have also pointed to the Marie Sklodowska Curie Actions (MSCA) of Innovative Training Networks, as a mechanism designed for high-level research and innovation training that can cross academic and industry energy transition agendas. During Horizon 2020, MSCA achieved gender balance among funded researchers.[221]

EU policymaking is aware of the energy transition's impacts on skills. In June 2022, the Council of the European Union adopted a **Recommendation on learning for the green transition and sustainable development**. It and the accompanying Staff Working

216 European Parliament (2015) 'Report on the Green Employment Initiative: Tapping into the job creation potential of the green economy', available online: Link.

217 Heffernan, R., Heidegger, P., Köhler, G., Stock, A., Wiese, K. (2022) 'A Feminist European Green Deal - Towards an Ecological and Gender Just Transition', Bonn: Friedrich-Ebert-Stiftung, available online: Link.

218 UN Women (2018) 'Turning promises into action: Gender equality in the 2030 Agenda for Sustainable Development', New York: UN Women, available online: Link.

219 European Environmental Bureau (EEB) and WECF International (2021) 'Why the European Green Deal needs ecofeminism - Moving from gender-blind to gender-transformative environmental policies', available online: Link.

220 European Commission (2014) 'Education & Training Roadmap', report, available online: Link.

221 EURAXESS (2019) 'Gender equality policies and gender distribution in MSCA and ERC', available online: Link.

Document[222] make reference to gender only, however, with respect to education and training for environmental sustainability having to be open and accessible to all learners.

4.1.2 National policy initiatives

Governments across the EU27 have started to respond to the challenge of how to make the energy transition just and fair, which includes ensuring that the energy industry makes significant progress towards gender balance, including in management positions and in R&I.

For each country, an overview of relevant policy initiatives is included in the Country Briefs published separately along with the present report.

4.2 Overview of stakeholder interventions

4.2.1 A typology of stakeholder interventions for boosting gender balance in the energy sector

Since there are excellent guides available for this purpose, such as GWNET's 2019 comprehensive review of "Strategies to Foster Women's Talent for Transformational Change"[223], we refrain from describing in more detail individual measures energy sector employers can take to support gender equality. We do, however, discuss briefly in the following the typology of interventions developed for the purpose of research in the present study. It is based on previous attempts to classify interventions for improving gender balance and equality, e.g., in the energy sector.

By target group

Interventions can be distinguished by their main (direct, i.e., primary) target group as follows:

- **Learners**
  - Pupils/ students (pre-school, primary / secondary education)
  - Students in tertiary education
  - Students in vocational education & training
  - Students in further education & (re)training
- **Workers/ professionals**
  - Women (and employed in energy sector
  - Women employed in other sectors
  - Intersectional target group(s) - This includes women from groups that tend to be disadvantaged for other reasons as well, such as members of ethnic groups

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[222] European Commission (2022) 'Council Recommendation on learning for environmental sustainability', Staff Working Document, SWD/2022/3 final.

[223] Boyd, A., Nobelius, A.-M., Stands, S. (2019) 'Women for Sustainable Energy: Strategies to Foster Women's Talent for Transformational Change', Vienna: Global Women's Network for the Energy Transition (GWNET), available online: Link.

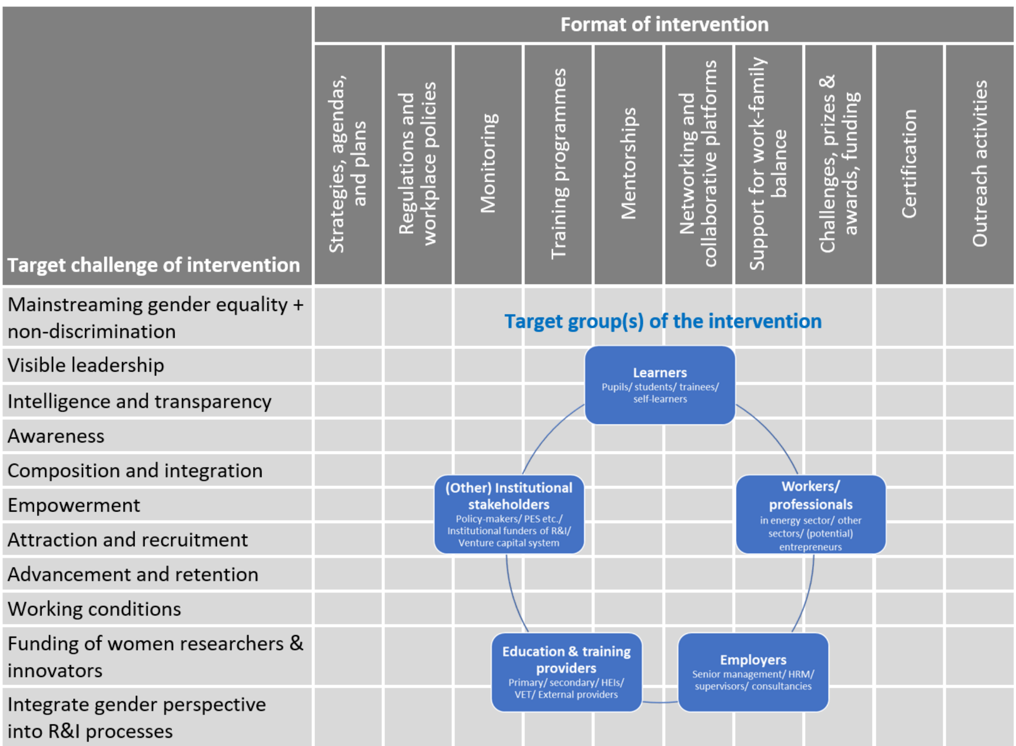
- Women managers / leaders
- (Potential) Entrepreneurs

- **Employers**
  - Recruiters/ HR management
  - Senior management
  - Supervisors / Team managers
  - Management consultancies and other intermediaries

- **Providers of education and training**
  - Primary and secondary education providers
  - Higher education institutes (HEIs)
  - Providers of vocational education and training (VET)
  - External providers of continuous training

- **(Other) Institutional stakeholders**
  - Policymakers
  - Public employment systems, placement services, career advice
  - Institutional funders of R&I
  - Start-up funders incl. venture capital investors

Exhibit 30: Typology of company interventions for boosting gender balance



Source: The consortium

By target challenge

- **Mainstreaming gender equality and non-discrimination**: The goal here is to establish gender equality as a key principle horizontally across all activities of an organisation.

- **Visible leadership**: A commitment of top management to the topic of gender equality is frequently mentioned as a precondition for successful interventions. Such commitment can be demonstrated, for instance, by external communication of gender goals and related pledges (at public events, via interviews and press releases), frequent internal communication on gender KPIs and progress achieved, participation in external rankings, public commitment by the CEO, and leadership compensation linked to gender balance related goals.

- **Intelligence and transparency**: Knowledge of the status concerning gender equality within organisations, even large ones in Europe, is often extremely limited. Only few companies have systems for monitoring gendered aspects of recruiting, promotion and management practices in place. Evaluations, possibly by external experts and in the context of a certification process, and benchmarking exercises are other examples of possible approaches.

- **Awareness**: One possible purpose here is to raise awareness about existing gender equality challenges (e.g., widespread bias within an organisation) and about how these can be addressed. An entirely different example concerns programmes for raising awareness among girls and young women of the opportunities offered by a career in STEM and the energy sector.

- **Composition and integration**: A typical example are quotas and targets for the share or number of women in certain positions, e.g., senior management, or other decision-making entities (e.g. research projects).

- **Empowerment**: Greater visibility of the contribution of women in their sphere of operation has been shown to have an empowering effect on other women employees. For this purpose, **role models** play an important part in influencing attitudes among women, men as well as children towards gender balance and gender stereotype[224]. Empowerment also comprises activities to enable women to seek peer support from fellow employees.

- **Attraction and recruitment**: Making more girls and women opt for careers in the energy sector poses significant challenges. For this reason, many approaches have been developed and tried out to exert an influence during times of decision-making on career choices of this target group. Interventions can be holistic, e.g., longer-term strategies to change gendered attitudes in society about careers in STEM, or closely targeted, such as cooperation between energy sector companies and HEIs in their vicinity for the purpose of marketing campaigns, promotion of internships to female students, etc.

- **Advancement and retention**: The evidence from the energy sector shows that women are less likely than men to progress in their career, and that many leave their job in STEM rather than advance within the sector. Actions targeting advancement and retention are

[224] De Gioannis, E., Luca Pasin, G. & Squazzoni, F. (2023) 'Empowering women in STEM: a scoping review of interventions with role models', International Journal of Science Education, Part B, available online: Link.

needed. Providing good access to further education and training is another important issue.

- **Working conditions**: Conditions that are sensitive to the specific needs and preferences of women are typically harder to find in sectors heavily dominated by men, such as in STEM. Such working conditions must be supportive of employees who have private care obligations, e.g., for children or elderly household members. This also comprises career pathways that do take full account of employees, including in senior management, wishing to take family leave but return afterwards to a position in line with their preferred work-family arrangement. Examples include job-sharing programmes.

- **Funding of women researchers & innovators**: This may take the form of gender-sensitive budgeting or earmarking a certain share of the available funding for teams led by women or with a significant share of women.

- **Integrate a gender perspective into research and innovation processes**: Referring here to the consideration of sex and gender as subjects of research (rather than in research inputs, i.e., human resources), this target challenge arises from substantial evidence that the results of R&I have traditionally been prioritising the preferences and needs of men over those of women[225]. The goal is to overcome gender bias in R&I knowledge making[226].

By format of intervention

- **Strategies, agendas and plans**, comprising national and sectoral policies strategies as well as, at organisational level, gender equality plans (GEPs). Such interventions are typically holistic in the sense that they sketch out a whole range of individual actions, which are not necessarily being specified much in detail yet, for the purpose of mainstreaming certain practices related to gender equality. Strategies, agendas and plans also often come with concrete (numerical) targets to be achieved within a defined period of time (see below).

- **Regulations and workplace policies**:

  - Mandatory quotas or targets for inclusion of women in decision-making bodies/ processes;
  - Mandatory quotas or targets for inclusion of women in R&I (both as professionals and as research subject), including funding decisions;
  - Revision of recruitment and promotion policies and procedures, such as ensuring women’s representation on interview panels or gender-blind hiring practices;
  - Revision of internal policies as codified in internal regulations, works agreements, guidelines, etc. Examples include entitlement to paid or unpaid leave/leave of absence (maternal and paternal leave) beyond what is required by national employment legislation; flexitime; remote work; etc.
  - Sexual harassment and anti-discrimination policies, possibly including Ombudsperson/ grievance systems;

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225 Criado Perez, C. (2021) 'Invisible Women: Data Bias in a World Designed for Men', New York City: Abrams Press.

226 Schiebinger, L. (ed.) (2008) 'Gendered innovations in science and engineering', Stanford: Stanford University Press.

- Revision of teaching curricula and texts used in education and training;
- Revision of internal policies concerning procurement, e.g., by adapting gender-responsive procurement practices[227].

- **Monitoring**, i.e., analysis of gender balance and related issues via continuous monitoring and/or one-off assessments, either by in-house staff or third-party experts. Examples include questions on gender equality as an explicit part of employee engagement surveys;

- **Training programmes**: This comprises both revision of existing curricula, study programmes and texts used in education and training as well as the design and implementation of new ones. Examples include:

  - Training for all employees in understanding and addressing unconscious bias;
  - Training of line managers (e.g., supervisors) in gender-sensitive management practices;
  - Incorporation of the gender dimension in training curricula and texts across all fields of education and training;
  - Training measures targeting women operating in men-dominated work settings;
  - Extracurricular training, often targeting children and young people and with a focus on STEM in general rather than dealing with energy transition topics.

- **Mentorships**: Women-to-women counselling and peer support via mentorship programmes is a very prominent examples of small-scale interventions that can create more favourable conditions for women to prosper in men-dominated working cultures. This format is widely applied in campaigns for supporting women in STEM jobs.

- **Networking and collaborative platforms**: Usually in combination with counselling schemes, formats for enabling effective networking between women within and beyond the boundaries of individual organisations are also very popular. Examples include women's employee resource groups (ERGs).

- **Services and practices to support work-family balance**: Successful practices from across the world show that additional support structures/practices to help women employees coordinate work with care and family life are also called for, e.g., onsite childcare facilities, supports for dual career couples such as spouse relocation schemes, etc. For energy sector jobs that include extensive field work, arrangements may be needed to ensure that established practices do not discriminate against women[228].

- **Challenges, prizes and awards, and funding** reserved for female researchers or innovators or under conditions which safeguard a desired level of women beneficiaries.

- **Certification**: This means participation in third-party programmes for benchmarking gender practices in organisations, which typically leads to qualifying companies to be allowed to display a label, e.g., in recruitment activities.

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227 Weempower (2020) 'WEPs Guidance Note: Gender-responsive procurement', UN Women, available online: Link.

228 von Lonski, U. et al. (2021) 'Untapped Reserves 2.0: Driving Gender Balance in Oil and Gas', BCG & World Petroleum Council, available online: Link.

- **Outreach activities**, understood as activities to reach populations that might not otherwise have been reached through standard approaches. Examples include:

  - For the target groups of young persons who are to be attracted to STEM education and careers, a wide range of formats have been tried out including festivals, hackathons, makerspaces, and many others which provide early opportunities for girls to try out STEM related activities[229];
  - Some employers also establish collaboration with providers of education and training to allow students to make hands-on experience in the energy sector (e.g., in the form of traineeships);
  - Targeted recruitment marketing for women.

4.2.2 Examples of stakeholder interventions and Good Practice

Industry initiatives

Research conducted by the IEA looked into **participation of companies in gender diversity initiatives** by sector and found it to be very low (4%) for the energy sector compared to other sectors such as communications and financials (21% both).[230] Other available evidence suggests, however, that more and more companies - starting with the larger ones - are setting up dedicated diversity and inclusion teams. In the oil & gas sector, the share among 50 large companies increased from 39% in 2017 to 67% in 2020[231], a clear indication of a perceived need for action. There are indeed many examples of initiatives launched by stakeholders in the industry, some of which are targeted at STEM careers in general, while other focus specifically on jobs in the energy sector.

Individual industry players have shown increasing interest in designing and adopting measures directly intended to attract and retain women in the energy-related sector (e.g., **Atkins**, **Ferrovial**, **Assystem**, **ENI**, **Thales**)[232], including providing re-training and up-skilling opportunities into technical roles. Portuguese electric utilities company **EDP**'s campaign #rebelsforchange promotes testimonials from women in energy and provides resources on how to support girls in STEM.[233]

Several companies operating in the fusion energy ecosystem related to the **ITER project**[234] have recognised the importance of outreach activities to schools and widening the talent pool by providing internal retraining for women with STEM background. Industry has also been responding to skills need by introducing own measures to allow women to move from non-technical areas to technical job roles and to accelerate opportunities for promotion. For instance, Assystem have an 18-months training programme of training on technical roles,

229 OECD (2018) 'PISA 2018 Results Where all Students Can Succeed. Volume II', available online: Link.

230 IEA (2020) 'Gender diversity in energy: what we know and what we don't know', available online: Link.

231 von Lonski, U. et al. (2021) 'Untapped Reserves 2.0: Driving Gender Balance in Oil and Gas', BCG & World Petroleum Council, available online: Link.

232 Some of these examples were presented at the 2022 Big Science Business Forum, Granada, Spain, "The Woman in Science Event", 4-10-2022, available online: Link.

233 https://www.edp.com/en/careers/rebelsforchange

234 https://www.iter.org

such a commissioning and project management support[235] and Atkins offer career development programme to prepare women employees for promotion[236].

Other approaches include **awards and prices** to raise awareness about female talent. Launched by French solar and wind park providers Greensolver and GreenUnivers, the **Prix Des Femmes des Énergies Renouvelables** honours women in the categories politics, business, services, start-up/ SME and organisations.[237] The **EU Sustainable Energy Awards**, honouring Europeans contributing to the continent's green transition, has a category for women in the field.[238] **Fem'Energia** is a prize awarded each year by Women in Nuclear France together with industry and research partners. It aims at raising awareness of women in nuclear, mainly in energy, and give insights into the related professions. It includes the categories secondary school and university students and professionals.[239] The annual Perspektywy Women[240] in Tech Summit in **Poland** and the Women Award in Technology and Science (WATS)[241] in **Belgium** are other award schemes.

In some countries the use of **industry targets or quotas** is widespread; there is evidence that in France, mandatory gender quotas have resulted in the share of women in the boardroom to increase from 9% in 2009 to 37.6% in 2015[242]. Icelandic energy provider Reykjavik Energy reduced its pay gap from 8.4% to 0.3% within nine years after announcing a target to abolish the pay gap. It did so, for example, by showing in real time the effects of each pay decision on the gender gap[243].

Exhibit 31: Selected examples of Good Practice in industry initiatives

Good Practice in industry initiatives

The **#DIEzukunft Initiative**, launched in 2021 by **Salzburg AG**, which serves as the multi-utility company for both the city of Salzburg (Austria) and the surrounding state, aims to increase equal opportunities within the company as well as the advancement of women and girls in STEM fields. It promotes a cultural change through an open corporate culture and an attractive working environment. Key elements include promoting gender balance, offering part-time management options ("topsharing"), providing vacation programs for STEM-focused employees, and offering mentoring programs. The initiative also focuses on creating a family-friendly work environment with flexible home office options and childcare support. Salzburg AG actively encourages women in science and technology through targeted recruitment and employer branding measures. They also organize one-week robo.camps exclusively for girls to spark interest in technology. Another important aspect of the initiative is an internal network that promotes trust, genuine exchange, support, and community among female managers. Large parts of these objectives have already been implemented. The main achievements so far include an increase in the representation of

[235] https://www.assystem.com/en/career/boost-your-career-path/

[236] https://www.bsbf2020.org/WBS_Poster_session

[237] www.greenunivers.com/2020/02/le-palmares-2020-des-femmes-des-energies-renouvelables-224685/

[238] www.eusew.eu/awards2021-winners-finalists

[239] www.win-france.org/accueil/femenergia/

[240] https://womenintechsummit.pl/

[241] https://researchportal.vub.be/nl/prizes/second-prize-wats-women-award-in-technology-amp-science

[242] Lee, L -E., Marshall, R., Rallis, D. and Moscardi, M. (2015) 'Women on Boards: Global Trends in Gender Diversity on Corporate Boards', blog post, available online: Link.

[243] USAID (2018) 'Practical Guide to Women in Energy Regulation', Washington, DC: USAID.

women in leadership positions, the establishment of diverse teams, the promotion of an inclusive corporate culture, the active recruitment of male mentors, and a modern parental leave system.[244]

The **"Promoting Diversity" (ProDi) project at Siemens Energy AG**, a large energy multinational headquartered in Munich (Germany), aims to increase diversity in the workforce and improve the representation of women, especially in technical roles and managerial positions. The project became part of the Chief Diversity Office when it was established in 2008, focusing on worldwide diversity goals and the best selection of candidates regardless of gender, background, or skin colour. Siemens promotes diversity through the inclusion of different perspectives, backgrounds, skills, and qualities, fostering an inclusive and heterogeneous workforce. The company's commitment to diversity has resulted in the appointment of female board members and an increased proportion of women on the supervisory board, signifying progress in gender representation and empowerment within the organization.[245]

Canadian-British multinational **Atkins**, a leading provider of engineering, procurement, and construction services to various industries across Europe, including mining, environment and water, infrastructure, and clean energy, has several initiatives and programmes to promote und support women in STEM as well as a wide range of diversity networks that organise events and facilitate discussions. The network ParentNEt for example aims to assist the transitions that employees face from a work role to life as a parent and adjusting back to balancing work as a working parent. Atkins also signed the Women in Nuclear Charter (WiN) in 2021, supporting an industry target of 40% women in the nuclear sector by 2030. Atkins is member of WISE (Women into Science and Engineering), a platform for enabling and promoting the participation, contribution and success of women in the UK STEM workforce. To provide a fair and inclusive recruitment process, Atkins uses a gender bias decoder, provides ED&I training to interviewers. Additionally, Atkins launched their 'Net Zero Superheroes' school competition in 2020/2021 with the aim to spread awareness amongst school pupils across the UK and to inspire them to pursue careers in STEM. Atkins successfully worked with 43 different schools.

Ferrovial, a Spanish multinational that operates in the infrastructure sector, including energy infrastructure, aims to increase the percentage of women in the company on all levels of the organisation with the help of a carefully designed Gender Diversity Strategy. As well as collaborations with key institutions such as the Spanish Ministry of Equality, with whom the company has participated in various projects to promote gender equality, Ferrovial established synergies with different international partners, foundations and NGOs to promote STEM vocations in girls and women through our corporate volunteering. Finally, Ferrovial fosters STEM jobs trough various initiatives and especially invests in the support of female STEM students.

Schneider Electric, a French multinational that specialises in digital automation and energy management, has launched a **Pay Equity Framework** to ensure that the company delivers on its commitment to rewarding employees fairly for the skills they possess and their work performance regardless of gender. The framework identifies gender pay gaps within comparable groups of employees and ensures consistency, fairness, and transparency in pay. The framework was implemented in 2014 with pilots in 12 countries and has since been expanded to over 100 countries, reaching 99.6% of the company's total workforce by the end of 2020. The framework uses a unified global-local methodology to address pay gaps, ensuring consistency while also adapting to local market conditions. Schneider Electric aims to attain and maintain a pay gap of <1% for all employees and to achieve a 50:40:30 gender balance (i.e., women should represent

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244 http://presse.salzburg-ag.at/news-diezukunft-fuer-mehr-chancengleichheit?id=136797&menueid=17306&l=deutsch

245 www.siemens.com/de/de/unternehmen/konzern/geschichte/specials/frauen-bei-siemens.html

50% of all new hires, 40% of all frontline managers, and 30% of senior leadership) by 2025.[246] Schneider Electric is partner of "Where Women Work", a networking platform that was set up to showcase the work and achievements of women and shine a spotlight on leading organisations supporting women.[247]

The "**50:50 Sustainable Projects**" initiative by **ACCIONA,** a Spanish multinational mainly active in development and management of infrastructure and renewable energy, aims to promote female participation and leadership in projects and production centres worldwide, particularly in the energy sector. It focuses on reskilling and upskilling women, identifying and promoting internal female talent, enhancing employability of women in critical sectors of the economy, and challenging gender stereotypes. Notable achievements include establishing equal participation in a network code team and promoting female inclusion in key positions in wind energy production. By creating opportunities and encouraging female participation, the initiative has already contributed significantly to a more diverse and inclusive workforce in the renewable energy sector.[248]

Initiatives from education system stakeholders

The member institutes of **CESAER**, a European association bringing together more than 60 science and technology universities from 26 EU countries, in 2019 adopted a declaration to increase gender balance at all levels to 30% and adopt policies and actions for gender equality, diversity and inclusion, backed up by Equality, Diversity and Inclusion best practice guide and new EDI indicators[249]. Since then, CESAER has been active in advocating for more interdisciplinarity in study programmes as a means to ensure that sufficient numbers of students, especially women, are equipped with the skills required for the energy transition[250].

The **European University Association (EUA)** conducted a survey of HEIs in 2019 about member HEIs' experience concerning institutional approaches to implementing strategies for equity, diversity and inclusion[251]. 159 HEIs responded. The survey identified several success factors and challenges. The most important success factor appears to be support from the organisation's top management, for example from the rector or vice rector, which is seen as a must to allowing bottom-up initiatives to become policies that lead to cultural and structural changes – which confirms well-known findings from research into change management in large organisations in general. The study also found that third-party initiatives and external drivers play an important role in practice for translating well-meaning intentions into firm strategies for equity, diversity and inclusion. Examples includes awards and competitions through which good practices are acknowledged and promoted to stakeholders in the HEI ecosystem. "When asked explicitly about the top three success factors for their institutional strategies and activities, the majority of respondents (76%) indicated that commitment and

246 www.ifc.org/content/dam/ifc/doc/2023-delta/ifc145-e2e-case-studies-schneider-digital.pdf

247 https://blog.se.com/life-at-schneider-electric/2019/02/01/female-talents-enjoy-growth-working-at-schneider-electric/

248 https://procoazrbolsast1.blob.core.windows.net/media/15opitrj/acciona_ener_sust_report_2021_en.pdf

249 https://www.cesaer.org/news/universities-of-science-and-technology-commit-to-accelerate-equality-diversity-and-inclusion-362/

250 Dotti, N.F. et al. (2023) 'Interdisciplinarity for the Net-Zero Transition: the Perspectives of Universities and Research Organisations', CESAER, available online: Link.

251 Claeys-Kulik, A. L., Jørgensen, T. E. & Stöber, H. (2019) 'Diversity, Equity and Inclusion in European Higher Education Institutions: Results from the INVITED project', available online: Link.

support of the institutional leadership was the most important followed by direct involvement of target groups (48% of respondents) and involvement of the entire university community (43%). When asked about the barriers to promote EDI strategies, the top two barriers identified were the lack of funding and other resources and the lack of the awareness about the issue within the university community."[252]

An EUA expert group report, "**Greening in higher education institutions**", was published in 2019[253]. It examines how to create dedicated curricula and Master and PhD level training. The EUA analysis focused on 24 energy topics (e.g., energy system control, technology integration, urban planning, energy communities, future professional behaviour, etc.) and four categories of know-how: technology, social, policy and economic. The report strongly advocates development of interdisciplinary university programmes that work across engineering, social sciences, sciences, and the humanities. Such an approach could well open up opportunities for career mobility for women from fields where they are well represented, e.g., social sciences, to job roles in technological fields. The EUA recommendations make, however, no explicit reference to the well-evidenced gender issues in STEM education pipeline and in STEM related employment.

The interdisciplinary approach to overcoming the gender gap in STEM fields, including the energy sector, involves integrating other disciplines that may traditionally attract more women and leveraging these to spark interest in STEM. Building blocks for more achieving greater interdisciplinarity include:

- **Curriculum Integration**: By weaving in subjects like social sciences, arts, and humanities with STEM courses, curriculums can become more appealing to a broader range of students. These interdisciplinary curriculums showcase the relevance of STEM in varied contexts, emphasizing the impact on society, culture, and the environment, which may resonate more with some women and girls.

- **Problem-Based Learning**: Interdisciplinary education often uses real-world problems as a teaching mechanism. This approach can demonstrate the societal relevance of STEM, which has been found to particularly appeal to women who often value careers that they perceive as contributing to societal good.

- **Role Models and Mentoring**: Incorporating professionals from interdisciplinary backgrounds in mentoring roles can provide students with relatable role models who demonstrate the diversity of STEM careers. Seeing successful women in these roles can help to counteract stereotypes and encourage more women to pursue and remain in STEM fields.

- **Educational Pathways**: Creating educational pathways that are flexible and interdisciplinary can help students who might not have initially been interested in STEM to discover these fields later on. For example, a student studying environmental law might become interested in environmental engineering through exposure to the interconnectedness of these fields.

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252 Claeys-Kulik, A. L., Jørgensen, T. E. & Stöber, H. (2019) 'Diversity, Equity and Inclusion in European Higher Education Institutions: Results from the INVITED project', available online: Link.

253 EUA Expert Group (2019) 'Greening in higher education institutions', available online: Link.

- **Outreach and Engagement**: Interdisciplinary programs can facilitate partnerships with schools, communities, and businesses to provide early exposure to STEM in a context that is integrated with other areas of study and societal needs. This can include community projects, internships, or collaborations that highlight the intersection of STEM with public health, environmental policy, or education.

- **Gender-Inclusive Pedagogy**: Instructional strategies that are inclusive and take into account different learning styles and interests can be more effective. Interdisciplinary approaches often focus on collaborative and inclusive learning environments, which can be more inviting to women.

- **Communication and Soft Skills**: Integrating communication, leadership, and other soft skills into STEM education recognises the importance of these skills in professional settings. Women have historically excelled in these areas, and their integration into STEM could make these fields more attractive.

By using interdisciplinary approaches, the field of STEM is gradually becoming less siloed and more reflective of the interconnected world where technology intersects with every aspect of life. This can help break down barriers and misconceptions about STEM being isolated from other areas of interest and societal impact, potentially attracting a more diverse group of students, including women. The box below highlights some interdisciplinary study programmes that have been explicitly designed with the intention to attract students who would not normally consider a career in engineering to energy transition related fields of study.

Exhibit 32: Selected examples of Good Practice in education system initiatives (I)

Good Practice in interdisciplinary study programmes

At EU level, the **European Institute of Innovation and Technology (EIT)** offers the EIT InnoEnergy master's programme in Environomical Pathways for Sustainable Energy Systems.[254] In this programme, "students learn to address societal challenges with technical solutions in fields like renewable energy, solar systems, biomass processing, offshore energy and more". The programme involves seven European universities.[255] In year 2 the choice is between KTH, UPC, Politecnico di Torino (Italy), Eindhoven University of Technology (Netherlands), Instituto Superior Técnico (Portugal), Aalto University (Finland) or University of Science and Technology (Poland).) The programme welcomes 50-60 students per year. In 2022, around 30% of participants were female. Women's participation has increased to 20 out of 53 in 2021. The plan is to keep their share increasing.

In Austria, the **University of Applied Sciences** Burgenland has rolled out several innovative study programmes**,** such as the BSc in Energy and Environmental Management. The course combines energy engineering and energy management with ecology and environmental engineering, business economics and law.[256] Another example is the Master in Sustainable Energy Systems: its curriculum connects the topics of business, environmental economics,

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254 https://www.innoenergy.com/for-students/master-s-school/master-s-in-sustainable-energy-systems/

255 Students choose two universities for their studies: In year 1, Royal Institute of Technology in Stockholm (KTH, Sweden) or Universitat Politècnica de Catalunya – Barcelona Tech (UPC, Spain)

256 https://www.fh-burgenland.at/studieren/bachelor-studiengaenge/bakk-energie-und-umweltmanagement/

politics and law with management and personal development. Furthermore, an in-depth study of eight alternative forms of energy is provided within the program.[257]

In France, the **CIFE European Institute**'s Master in Global Energy Transition and Governance has a strong multidisciplinary approach. The programme analyses the links between the different levels of energy governance, from an international to a local level, offering problem-focused learning with theory and practice.[258]

In Germany, the **University of Stuttgart's** BSc in renewable energies has a strong interdisciplinary focus. Energy technology is one of the University's interdisciplinary focal points. Students can attend courses in mechanical, electrical, and civil engineering and computer science as well as in the supplementary areas of environmental sociology or business administration.[259] The **Berlin University of Applied Sciences'** BSc in Information Technology and Economics - women's program not only focuses on applicability, practice orientation and interdisciplinarity, but is also available exclusively to women. In this way, barriers to studying in a male-dominated domain are sought to be overcome.[260]

In Hungary, the **Bucharest University of Economic Studies** offers an **Energy MBA,** a study program designed as a balanced mix of technical and soft skills. The intention was to create a "true transformational journey for actual and future managers and leaders in the energy business". This MBA aims to equip students with a holistic understanding of the energy landscape, combining business acumen with specialized industry knowledge to drive sustainable and impactful decisions.[261]

In Ireland, the **University College Dublin**'s MSc in renewable energy and environmental finance aims at graduates from Business, Economics, Engineering, Mathematics, Environmental Science and Physics. It offers an understanding of the fiscal side of renewable and sustainable energies, as well as management and innovation.[262] The same HEI has also rolled out the MSc in Sustainable energy and green technologies which combines renewable energy exploitation, efficiency in energy generation and utilisation, mitigation of environmental impacts, business innovation and job creation opportunities, plant biotechnology and entrepreneurship.[263]

In Spain, the **University of Cadiz'** MSc in renewable energies and energy efficiency does not only teach STEM subjects (assessment of resources, knowledge about technologies) but also relevant legislation, energy control and management tools.[264]

In the UK, the **University of Manchester**'s MSc in Renewable Energy Systems and Clean Technology provides the foundations of solar, wind and marine energy technologies and the knowledge required to understand the efficient distribution of renewables, their integration into

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257 https://www.fh-burgenland.at/studieren/master-studiengaenge/ma-nachhaltige-energiesysteme/

258 https://www.cife.eu/en/3/description_257-1

259 https://www.uni-stuttgart.de/studium/bachelor/erneuerbare-energien-b.sc./

260 https://fiw.htw-berlin.de

261 https://energy.fabiz.ase.ro/#1599210691997-bd5cd67e-5098

262 https://www.mastersportal.com/studies/270480/renewable-energy-and-environmental-finance.html

263 https://hub.ucd.ie/usis/!W_HU_MENU.P_PUBLISH?p_tag=PROG&MAJR=X413

264 https://oficinadeposgrado.uca.es/wp-content/uploads/2023/02/WEB-Energias-Renovables-y-eficiencia-sep17-E.pdf?u

zero-carbon infrastructure, and to determine the economic and climate issues affecting the choice of renewables.

There have also been initiatives that seek to overcome **work-life-balance related barriers** to gender balance in the higher education sector. To address disadvantages that women researchers may face due to maternal leave and childcare responsibilities, the Federal Ministry of Education, Science and Research in **Austria** promotes more gender-sensitive career models and selection procedures in public universities[265], whereas in **Spain**, a legislative change in 2019 that aims to promote science and research included provisions to ensure that recruitment of researchers does not discriminate against candidates who have taken career breaks[266]. To address the use of precarious contracts in R&I, which disproportionally disadvantages women researchers, the Research Council of **Norway** addressed precarious contracts in its policy to promote gender balance in research[267]. There is renewed commitment to increase mobility in the ERA and several countries, such as **Switzerland**, **Finland** and **Germany** provide additional stipends to caregivers who conduct research abroad, which can be expected to primarily benefit women.

Exhibit 33: Selected examples of Good Practice in education system initiatives (II)

Good Practice in initiatives of the education & training system

The French association **Elles bougent** ("They [women] move") aims at attracting more young women to STEM studies and careers. Its backbone is a network of 6,860 "godmothers" – female engineers, technicians and scientists sharing their experiences, serving as role models and mentors. With 22%, "godmothers" from the energy sector make up the biggest share of the group. The association also includes 1,160 male ambassadors in similar positions, as well as 236 partner companies. It conducts regular sector meetings, career fairs, challenges and a yearly international "Girls on the Move" week. The last energy sector meeting in 2019 attracted 2,000 participants. Headquartered in France, the association also has branches in Belgium and Spain.[268]

Not a usual research scholarship, **Christiane-Nüsslein-Volhard Foundation** and **Ursula-Von-Euch Foundation** both provide practical support to female PhD and Post Doc candidates in STEM and selected other fields of study. They each provide a monthly 400€ grant earmarked explicitly for support in domestic duties: cleaning service, babysitting for evening or weekend events, domestic appliances like dishwashers etc. The aim is to ease the household workload and allow mothers to focus on their career in science and on quality time with their children. Nobel Prize Laureate and biochemist Christiane-Nüsslein-Volhard founded the homonymous scholarship, focused on researchers in experimental Science or Medicine at German universities. Energy topics researched by recent participants include solar cells and smart buildings, as well as material science. The Women in Science Foundation L'Oréal and UNESCO Conference Germany founds three of the scholarships per year. Ursula-Von-Euch Foundation supports candidates in STEM, Medicine and Peace Research at Münster University (DE).[269]

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265 Gender Action (2020) 'Disruptive measures for gender equality in R&I', policy brief, available online: Link.

266 European Commission and OECD (2021) 'STIP Compass: International Database on Science, Technology and Innovation Policy (STIP)', available online: Link.

267 Research Council of Norway (2019) 'Policy for gender balance and gender perspectives in research and innovation', available online: Link.

268 https://www.ellesbougent.com/

269 http://ursula-von-euch-stiftung.de/

In the German state of Lower Saxony, **Technikum**[270] ("techship") is a 6-months programme where young women leaving secondary school can take a deep dive into STEM professions and study. A 4-day paid company internship is combined with one day per week at a partnering (technical) university. Six among the participating companies are in the energy sector, including GE Renewable Energy and a renewable electricity utility. During the programme, each participant develops her own research project within the company; a network of former programme graduates provides hands-on guidance. Completing 10 years of existence in 2022, the scheme has a rate of 90% of participants choosing technical university studies or VET training.[271]

The **Technical University of Munich** offers a wide range of measures to attract girls in secondary school and female students to STEM subject areas and to provide them with support. This includes "mentorING", a program directed at female engineers and scientists in three stages of life critical for their career paths: Female first-year students receive guidance for everyday university and student life, female students benefit from support in their transition to working life, and young female professionals receive assistance in tackling their new work requirements. TUM is a long-time member of "Femtec", a networking program targeting female STEM students in industry and science and supporting them in their personal career development. The "TUM Entdeckerinnen – MINT Erlebnis an der Uni" initiative (TUM female discoverers – STEM experience at the university) gives girls aged 10 and above the opportunity to solve practical science/technology problems in small groups and meet female scientists involved in STEM subjects.[272]

Women's Initiatives

Women's initiatives play a crucial role in promoting gender balance and gender equality in the energy sector by addressing several key areas:

- **Advocacy and awareness**: These initiatives often work to raise awareness about the importance of gender diversity within the energy sector. They advocate for equal opportunities and challenge the stereotypes that might discourage women from pursuing careers in this field.

- **Networking and community building**: By creating networks, these initiatives provide a platform for women to connect, share experiences, and support one another. Such communities can be particularly empowering in male-dominated fields like energy.

- **Professional development**: Women's initiatives frequently offer training programs, workshops, seminars and mentorship schemes designed to develop professional skills. They help women prepare for leadership roles and progress in their careers within the energy sector. Examples of established mentorship schemes of this kind include the ones from Associación Española de Mujeres en Energia[273], Women in Energy Iceland[274] , Mujeres

270 https://www.niedersachsen-technikum.de/

271 https://www.niedersachsen-technikum.de/fileadmin/Nitec/Rund_ums_Technikum/Downloads/Fast_Facts_Niedersachsen-Technikum.pdf

272 https://mediatum.ub.tum.de/doc/1639267/1639267.pdf

273 https://aemener.es/mentoring/

274 https://konuriorkumalum.is/

en Energia Renovable México[275], the German Society for Sustainable Energy Carriers, Mobility and Carbon Cycles,[276] and Women in Energy (focussed on Central and Eastern Europe)[277]..

- **Research and education**: These initiatives often conduct and disseminate research on gender equality in the energy sector. They highlight the contributions of women and the benefits of a gender-diverse workforce, thereby influencing policy and educational strategies.

- **Policy influence**: By lobbying and engaging with policymakers, women's initiatives can influence legislation and company policies that promote gender balance. They often play a pivotal role in the creation of policies that support work-life balance, equal pay, and anti-discrimination in the workplace.

- **Visibility and representation**: Women's initiatives strive to increase the visibility of female role models in the energy sector. Showcasing successful women can inspire others and demonstrate that women are integral to the industry.

- **Recruitment and retention**: These initiatives work with organizations to improve recruitment processes and workplace cultures to attract and retain more women. They often help implement strategies that make the sector more appealing and accommodating to a diverse workforce.

Overall, women's initiatives are instrumental in driving progress towards a more inclusive and equitable energy sector, ensuring that gender diversity is recognised not only as a social and ethical imperative but also as a critical factor for innovation and growth in the field. The box below presents our selection of Good Practice in women's initiatives.

Exhibit 34: Selected examples of women's initiatives in the energy sector

Good Practice in women's initiatives in the energy sector

Global Women's Network for the Energy Transition (GWNET)[278] is an international non-profit organization with a global mission to empower women in sustainable energy. It seeks to achieve this goal by establishing a network that includes women from diverse backgrounds, career levels, and sectors, both public and private, around the world. GWNET is at the forefront of developing multiple regional and global mentoring programs for women. Their primary objective is to promote the role of women as catalysts of change in society and to encourage the adoption of best practices within the sustainable energy industry. As of 2023, GWNET is running at least four distinct mentorship programs[279] across various energy sectors in Asia, Sub-Saharan Africa, the Middle East and North Africa, as well as Latin America and the Caribbean regions tailored to the needs and circumstances of women of these regions.

Women in Wind together with **Global Women's Network for the Energy Transition** has a Global Leadership Programme for women from 19 countries, mainly from the global south. It aims

275 https://mermx.org/mentoria/
276 https://dgmk.de/themen/she-drives-energy-network-of-women-in-energy-technology/
277 https://www.womeninenergy.eu/mentoring/
278 https://www.globalwomennet.org/
279 https://www.globalwomennet.org/about-gwnet/mentorship/

to support women in emerging wind energy markets through monthly meetings, a learning programme, a study excursion, and networking events.[280]

UK-based POWERful Women's mentoring scheme **POWERful Connections** strategically focuses on mentees who already have a certain level of seniority (> 10 years professional experience) and aspire to executive and board positions. Mentors are C-suite energy professionals. Since the programme's start, 65 matches were made.[281]

Women of Renewable Industries and Sustainable Energy (WRISE) is a US nonprofit working across the renewable energy economy. It seeks to provide expertise and hands-on advice to renewable energy companies and organizations that are interested in taking the next steps in boosting diversity and inclusion. WRISE aims to inspire companies and organizations to undertake self-reflection and internal practices that open them up to recruiting and retaining more women. To achieve that they work to build understanding around intersectionality of identities and how experiences may differ under the broad umbrella of women in the workplace. WRISE highlights stories of individual women, as well as best practices from research on diversity and inclusion and case studies of companies that are finding successful models to create change at an institutional level so that other companies and organizations have concrete tools to get started.[282] The WRISE mentorship programme offers both 1-on-1 and group mentoring for its members. While the former is a more classical format, the latter is a peer group approach where members follow a specific curriculum while they act as mentors and mentees simultaneously.[283]

The **Women of Color Collective in Sustainability (WOC/CS)** is an initiative that seeks to amplify the voices and experiences of women of colour. The initiative hosts online and in-person events and runs newsletters to showcase the stories and achievements of women of colour, as well as to provide a platform for peer support, collaboration, and empowerment. The aim is to show the industry and the next generation the opportunities available to women of colour working in the field, and to highlight the key role women of colour can play in the development of a more sustainable economy.[284]

The **"Women in Power"** network is a professional community in the Swiss energy industry that aims to increase gender diversity and innovation. It connects female specialists and managers, offering networking, training, coaching, and mentorship opportunities. The network also collaborates with partner organizations to promote diversity and enhance employer attractiveness. Its objective is to increase the number of women in the energy industry and improve the overall workplace environment through empowerment and inclusivity.[285]

The Lights on Women project[286] began in 2017 as an impromptu editorial effort at the Florence School of Regulation (FSR) with the goal of showcasing women's careers in the energy sector, promoting gender equality, and assessing FSR's activities through a gender lens. Over time, the project evolved into a well-structured initiative that influenced FSR's work in training, events, and knowledge production. Recently, the Lights on Women initiative launched the LUCE Award[287] to

280 https://gwec.net/women-in-wind/about-the-program/
281 https://wrisenergy.org/programs/mentoring/
282 https://wrisenergy.org/programs/corporate-diversity/
283 https://wrisenergy.org/programs/mentoring/
284 https://www.woccs.co/about
285 https://www.womeninpower.ch
286 https://lightsonwomen.eu/
287 https://lightsonwomen.eu/luce-award-legacy-women/

recognize women's contributions to the Green Transition. During the awards ceremony on May 16, 2023, women in the energy, climate, and sustainability sectors under two categories, Emerging Talent, and Legacy Woman, were celebrated. By acknowledging women's careers and projects related to energy transition, climate emergency, energy access, energy poverty, sustainable development goals, and renewables, the initiative aims to highlight their role in global sustainability efforts.

Women in Green Hydrogen initiated the **WiGH Mentoring Program** in mid-2021 to support and empower young professionals in the green hydrogen sector in the early stages of their careers. Green hydrogen experts from around the world help to enhance the professional skills and abilities of new leaders in the sector. The mentees can build new knowledge on green hydrogen strategies, initiatives, and content. As well as strengthen confidence and develop new skills to promote further development. The program should strengthen connections and build networks in the field of green hydrogen, in order to connect on benefits and concerns that are of more relevance to women (e.g., how to proceed in a male-dominated sector, working hours, family planning, etc.).[288]

75inQ is a Dutch NGO that aims to accelerate the energy transition by focusing on gender equality and thus making a positive impact from the boardrooms to the living rooms. 75inQ focuses on labour participation and policymaking. In their vision by 2030 stakeholders of clean and affordable energy systems are reflecting the diversity and offering equal opportunities for all. Their goals are bound to the Sustainable Development Goals (SDGs) "5 – Achieving gender equality and empowering women and girls" and "7 – Ensure access to affordable, reliable, sustainable and modern energy for all". The organisation is active in consultancy to renewable companies keen to contribute to gender equality, services for professionals intending to switch to a career in renewables, and scientific research. 75inQ also runs a network for experienced female professionals, currently actively shaping the energy transition.[289]

National and supranational policy initiatives

National governments have applied several policy approaches to boost gender balance and equality in the energy sector, including **legislative measures** (implementing laws and regulations that mandate gender equality in hiring, promotions, and pay within the energy sector), **incentives for gender diversity** (offering tax breaks, grants, or other incentives to companies in the energy sector that achieve certain benchmarks in gender balance and equality), **education and training initiatives** (see above)**, awareness campaigns** (running public awareness campaigns to challenge stereotypes about gender roles in the energy sector and to highlight the contributions of women in this field, **support for work-life balance** (enacting policies that support work-life balance, such as parental leave and flexible working arrangements, to make the energy sector more attractive and accessible to women), **data collection and monitoring** (Collecting and analysing gender-disaggregated data within the energy sector to identify areas for improvement and track progress over time), **public-private partnerships** (collaborating with private sector companies in the energy industry to develop and implement gender equality strategies), **gender equality targets and quotas** (setting specific targets or quotas for female representation in various roles within the energy sector)

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288 https://women-in-green-hydrogen.net/mentoring-program/

289 https://75inq.com/mission/

and interventions in **funding for R&I** (allocating funding specifically for research and innovation projects led by women or focusing on gender issues in the energy sector).

At supranational level, there are policy initiatives to achieve progress towards gender equality in the energy sector through collaboration between governments, industry and other major stakeholders.

Exhibit 35: Selected examples of supranational policy initiatives in the energy sector

Good Practice in national and supranational policy initiatives in the energy sector

The **Equality in Energy Transitions** is a governmental network with currently 13 member countries. The Initiative aims to accelerate gender equality and diversity in clean energy transitions and close the gender gap by 2030. The Equality Initiative Transitions is a Technology Collaboration Programme (TCP), jointly under the International Energy Agency (IEA) and the Clean Energy Ministerial (CEM). Equality in Energy Transitions works on the improvement of gender-disaggregated data in the energy sector in member countries and beyond. Activities include an Awards program and an Ambassadors program to honour women in leadership roles and showcase role models in the clean energy sector. Furthermore, networking opportunities and information exchange is organized through regional and international events with the aim to raise awareness and illustrate good practice examples of policies and activities.

A key initiative is **Equal by 30**, a campaign bringing together public and private sector organizations around a public commitment to work towards equal pay, equal leadership and equal opportunities for women in the clean energy sector by 2030. The number of signatories has reached 180 worldwide spanning the energy sector, including renewables, energy efficiency, nuclear energy, and oil and gas, and including 15 national governments [290]

The **Empowering People Initiative (EPI)**[291] is one of the cross-cutting initiatives of the Clean Energy Ministerial. Its goal is to advocate for inclusive policies that enable a just transition, encompassing gender equality, skills/capacity building and training, working conditions, and corporate governance. By providing a platform for governments and interested stakeholders, EPI aims to exchange and develop innovative approaches that reflect the voice of women, youth, and other underrepresented groups, resulting in an equitable transition. EPI is currently organizing a Solutions Summit that focuses on preparing the clean energy workforce for an inclusive green economy. Staff involved in policy making and programs at the education, employment/labour, industry, economic development, and social affairs and well-being of all countries/ministries are invited to join the Summit. The overall objective is to equip participants with tools and resources that promote and facilitate coordinated efforts, overcome fragmented approaches to workforce development, and accelerate comprehensive workforce and green economy policies and programs. The first session of the Summit took place on March 30, 2023, and it was attended by government staff from over 40 countries.

FEMtech Career is a program promoted by the **Austrian Research Promotion Agency (FFG)** that supports organisations in their efforts to employ, promote, and retain more women in scientific and technical professions. The program provides funding for projects that last between 6-24 months and with a funding rate of 50-70% (up to 50,000 euros). These projects aim to create favourable and fair conditions for all employees, such as work-life balance and paternity leave.

290 https://www.equalby30.org/

291 https://www.cleanenergyministerial.org/initiatives-campaigns/empowering-people-initiative

The funding covers a range of activities, including gender competence training, personnel management improvements, work-life balance initiatives, career development for female employees, gender-sensitive communication strategies, and developing a gender equality plan. The program's main achievement is that it has been instrumental in implementing activities related to equal opportunities and gender competence in organisations that require financial support for carrying out activities of this kind.[292]

4.2.3 Evidence on the effectiveness of stakeholder interventions

Some evidence is available about the effectiveness of stakeholder interventions on gender balance in STEM-related education and training as well as in the energy sector workforce.

From her extensive research, Lagesen[293] follows that the degree of professionalism of interventions taken by employers makes a significant difference. This refers to the effort invested in designing and implementing individual company measures, the number and range of measures taken, and their integration guided by a comprehensive strategy for improving gender equality in the organisation. Schmidt & Garvesen[294] argue that, as social change is complex and it is often unclear which adjustments need to be made to promote sustainable change, the mere number of different interventions does matter a lot. It is unlikely that single interventions can trigger a sizeable impact; instead, a comprehensive package of measures is required for self-sustaining improvements in the role of women in the energy sector.

Further support for this proposition comes from research undertaken by Silander et al. in universities in Sweden, Finland, and Norway[295]. The research explored the effect of institutional gender equality measures on the share of women in top academic positions in STEM departments of HEIs. They found that "STEM-oriented universities which saw the biggest growth of women in grade A positions between 2000 and 2018 used or had used, on average, a variety of measures to promote gender equality. In contrast, the universities with small changes used fewer measures."

The same study also found the strongest increase in the proportion of women in grade A positions in STEM-oriented HEIs that have been "more active in using **preferential treatment measures** and targeted measures". Affirmative action policies (such as earmarking, i.e., the practice of reserving or setting aside certain positions exclusively for women) appear to show clear positive effects, but they are highly controversial and subject to stricter European legislation over the past decades. Earmarking, for example, was abolished in many Swedish and Norwegian universities based on a ruling by the European

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292 https://www.ffg.at/femtech-karriere

293 Lagesen, V.A., Pettersen, I. and Berg, L. (2022) 'Inclusion of women to ICT engineering – lessons learned', European Journal of Engineering Education, 47., available online: Link.

294 Schmidt, E.K., and Graversen, E.K. (2020) 'Developing a conceptual evaluation framework for gender equality interventions in research and innovation', Evaluation and Program Planning, 79., available online: Link.

295 Silander, C., Drange, I., Pietilä, M., & Reisel, L. (2022) 'Promoting Gender Equality in STEM-oriented Universities: Institutional Policy Measures in Sweden, Finland and Norway', in: Griffin, G. (ed.) 'Gender Inequalities in Tech-driven Research and Innovation', Bristol, UK: Bristol University Press, pp. 93-108., available online: Link.

Court of Justice in 2002 and 2003 that such practices might be discriminatory towards men[296].

The discussion around preferential treatment and positive action is directly linked to the debate about the pros and cons of **quotas**, e.g., for the share of women in decision-making bodies. The debate in many European countries (most pronounced in the UK) has centred around whether positive action effectively addresses systemic imbalances or whether it sometimes implies positive discrimination, which many see as unfair. Critics argue that any form of preferential treatment can lead to resentment, lower morale, and questions about the legitimacy of the appointment. Proponents argue that such measures are essential to correct long-standing imbalances and that without them, progress would be much slower[297]. Given the complexities and the potential for legal challenges, some employers are wary of implementing policies that might be construed as illegal positive discrimination[298]. They fear potential backlash or legal repercussions. This concern has led some organizations to be overly cautious, potentially avoiding positive action measures that are legally permissible and might be beneficial.

Exhibit 36: Survey findings on take-up of measures for improving the role of women in companies and their perceived effectiveness

Findings from survey of energy sector companies

Note: Only companies with >9 staff; n = 2,402 – 2,469 (missings excluded)

Three in four companies in the energy sector (EU27: 72%) make use of flexible work arrangements (beyond what is required by law) as a means to support the role of women in the

[296] Silander, C., Drange, I., Pietilä, M., & Reisel, L. (2022) 'Promoting Gender Equality in STEM-oriented Universities: Institutional Policy Measures in Sweden, Finland and Norway', in: Griffin, G. (ed.) 'Gender Inequalities in Tech-driven Research and Innovation', Bristol, UK: Bristol University Press, pp. 93-108., available online: Link.

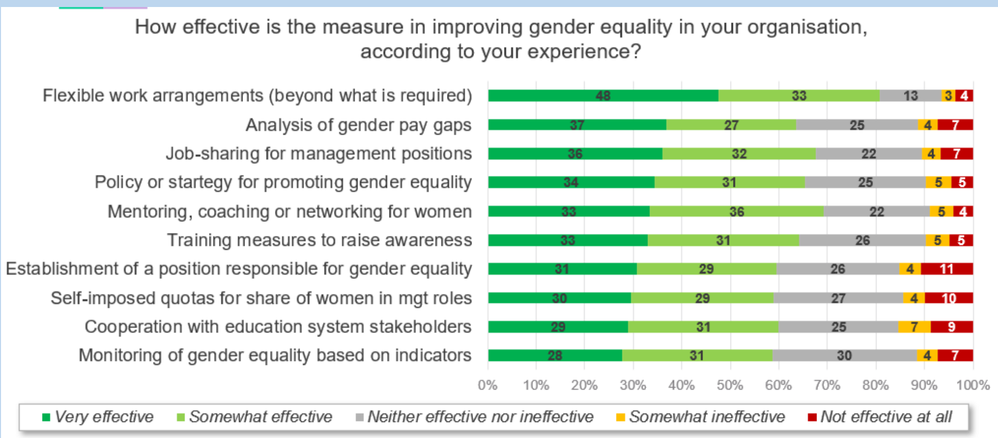
[297] Axelsdóttir, L., Þ. and Rafnsdóttir, G.L. (2023) 'Justice and utility: Approval of gender quotas to increase gender balance in top-level managements—lessons from Iceland', Gender, Work & Organization, 30(4): 1218–1235., available online: Link.

[298] For a discussion of the debate about the legal implications of companies' diversity, equality and inclusion initiatives in the USA, a forerunner country in their widescale adoption, see: The Economist (2023) 'Why DEI Won't Die', 7 October, available online: Link.

organisation. While the use of other, more specific instruments to boost gender balance is less frequent, take-up figures are generally high, especially among larger companies. For example, 42% (EU27: 40%) reportedly allow job-sharing in management positions, about one in three companies (37%; EU27: 32%) conducts an analysis of gender pay gaps, and the same proportion (37%; EU27: 31%) have implemented mentoring, coaching or networking for women. Quotas for the share of women in decision-making bodies and establishment of a position responsible for gender quality are relatively little used (26%; EU27: 21%).

Flexible work arrangements (beyond what is required by law) are rated as very effective by the largest share of companies that have implemented them (81%), but all are considered effective by a majority of the HR managers interviewed for the survey.

Regression analysis determined that companies that report an increase in the share of women in the total workforce are indeed significantly more likely to offer flexible working conditions, and job-sharing for managers. However, only job-sharing for management positions, also known as "topsharing" in some countries and offered by 42% of companies surveyed, had a statistically significant effect on increasing the proportion of women among managers as well as R&I staff. Companies in the country clusters Southern Europe, Baltic and Non-Europe use this measure more often than average. Not all other measures that are frequently used or considered effective by HR managers were found to contribute to a higher proportion of women or help women to develop in a company and be promoted to management ranks. Further measures positively related to the overall proportion of women among employees are the implementation of gender equality plans (implemented by 42%) and gender equality trainings (implemented by 37%). Measures such as the analysis of gender pay gaps (37%), and mentoring, coaching, or networking for women (37%), already implemented by more than one in three energy sector companies, were not found to be correlated with improvements in gender balance. The same applies to cooperation with education system stakeholders (applied by 34% of the companies), monitoring of gender equality based on indicators (33%), self-imposed quotas for the share of women in management roles (26%) and the establishment of a position responsible for gender equality (26%).



Note: Only companies with >9 staff and that have implemented the measure; n = 622 – 1,787 (missings excluded)

Further analysis of the data also showed that companies implementing a greater number of measures were more successful in improving gender balance in recent years. Recently set up companies, moreover, display significantly better gender balance compared to longer established ones.

Another factor that can play a critical role for spreading effective gender equality practices in an industry, profession, region or country is **networking**. Striebing et al.[299] suggest that employers that successfully promote gender balance are often well networked, i.e., actively seek exchange of good practice and mutual learning in collaboration with other organisations.

Collaboration between companies and local/regional providers of education and training is frequently mentioned as a necessity in times of growing skills shortages affecting, in particular, STEM-related job positions[300]. Such collaboration can be effective for boosting a company's or sector's ability to source the female talent needed to achieve gender balance. In our survey of energy industry companies, the most commonly reported barrier to achieving gender balance was the limited availability of qualified female candidates in the labour market. Against this background, companies that directly hire from study programmes offered by regional and national universities can have a decisive advantage. However, it is important to avoid one-sided cooperation with the same educational institution without a concept of women's advancement, as it may also contribute to the formation of a homogenously male workforce[301].

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[299] Striebing, C., Müller, J., Schraudner, M. (2022) 'Promoting Diversity and Combatting Discrimination in Research Organizations: A Practitioner's Guide', available online: Link.

[300] Lagesen, V.A., Pettersen, I. and Berg, L. (2022) 'Inclusion of women to ICT engineering – lessons learned', European Journal of Engineering Education, 47., available online: Link.

[301] Vroonhof, P. et al. (2017) 'Business cooperating with vocational education and training providers for quality skills and attractive futures', Brussels: European Commission, Directorate-General for Employment, Social Affairs and Inclusion, available online: Link.

5 Discussion and recommendations

5.1 Key findings from the participative foresight exercise

The evidence presented in this report has shown that the goal of achieving gender balance at all functional levels of the energy sector by 2050 will not happen without strong efforts by the key stakeholders in the field. Despite an increase in women's education and workforce participation, the specific nature of energy-related roles, gender stereotypes, and the limited impact of corporate gender equality measures contribute to this challenge. To ensure progress, the key stakeholders of the energy sector, educational institutions, and policymakers need to join forces and act strategically. Policy interventions, industry initiatives, and comprehensive innovation in education systems are essential to counter these trends and work towards achieving true gender balance in the energy industry, a key ingredient of a just and fair energy transition.

Achieving gender balance in the energy sector by 2050 demands a nuanced understanding of complex interplays involving national, situational, and organisational factors. National contexts, including governance, societal expectations, and education structures, significantly impact gender dynamics. Policies promoting inclusive childcare, dismantling gender stereotypes, and fostering STEM education are imperative. Situational factors such as company size, regional disparities, and industry-specific demands pose challenges. Organizations can focus on professionalisation, fostering networks, demonstrating commitment through policies, nurturing inclusive corporate cultures, and ensuring career permeability. Policymakers can support these efforts with targeted policies, novel approaches in education & training, and stringent monitoring to create a truly equitable energy sector.

The foresight exercise conducted in the context of our study (see box) showed that progress-as-usual will not result in satisfactory results, for the following reasons:

- A central finding of our study is that the shift from fossil to green, renewable energy sources and related infrastructures will not automatically lead to stronger inclusion of women in the energy industry workforce. Contrary to what has frequently been claimed, our research does find **no indications that the share of women is higher in renewables than in the conventional energy sector in Europe**. Functional aspects are decisive for the share of women in the different areas of the energy transition. Notably, the proportion of women is comparatively low in hydrogen energy, which is very research-intensive, and in heat pumps, which is heavily dependent on manual labour. Heat pumps, in particular, are a central element of the energy transition policy in many European countries.

- Recent research has provided evidence for the existence of a so-called ‘gender equality paradox’, which suggests that with increasing prosperity and higher levels of equality in a country, gender stereotypes regarding aptitude for STEM studies become more pronounced[302]. Thus, a progressive shift in values towards higher representation of

[302] Breda, T., Jouini, E., Napp, C., & Thebault, G. (2020) 'Gender stereotypes can explain the gender-equality paradox', Proceedings of the National Academy of Sciences, 117(49): 31063-31069., available online: Link.

women in STEM subjects within the EU may not be realised. The opposite might be the case, with increased prosperity leading to lower participation of women in STEM fields.

- Over the past decade, the higher labour force participation of women in STEM occupations has been largely due to an increase in their share among academic degree holders[303]. Already today, the share of women among graduates with tertiary education in the EU-27 has reached a plateau at 57%[304]; this figure stood at 58% in 2013. It is expected that the catch-up effect for women in labour force participation based on academic education will stagnate. Moreover, within the group of women with tertiary degrees, there is no discernible shift towards more STEM degrees.[305]

- A substantial expansion of care provision for children and elderly, as well as an increase in the equitable sharing of care responsibilities between men and women seems unlikely. The former would require massive, concerted investment in the care system across Europe and a considerable increase of the workforce at a time when the care sector is already suffering sizeable skill shortages; the latter would only be feasible if a significant shift in societal values regarding gender roles will take place. The recent backlash against gender mainstreaming in some EU member states[306] suggests that such an assumption appears unrealistic.

- Another important finding of the study is that companies have limited strategic control over the proportion of women in their workforce. Using the data we gathered from a global survey of nearly 2,700 HR managers, we calculated what best predicts the proportion of women in the workforce in the energy industry. We compared the explanatory power of the sector as an indicator of the specific requirements in the energy industry (e.g., strong focus on STEM research, sales activities, or manual labour), country, government involvement, and the type and number of gender equality measures implemented. The result: sectoral characteristics have the greatest explanatory power for the share of women in the workforce. The effect of gender equality measures in a company appears to contribute only marginally to explaining the low share of women. However, case studies of companies that have successfully managed to increase women's share in the workforce and in management positions demonstrate that well-implemented measures can have a significant effect.

In summary, the arguments presented lead us to the point of not assuming a continued linear growth of women's share in the energy industry. A stagnation at a slightly higher level than today seems more plausible. The share of women participating in the labour force and of women with tertiary education might continue to increase. However, in many member states, the number of female graduates from tertiary education seems to have stabilised, showing no significant increase. If the probable growth of the proportion of women's participation in

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303 Striebing, C., et al. (2020) 'Women Underrepresentation in R&I: A Sector Program Assessment of the Contribution of Gender Equality Policies in Research and Innovation', Evaluation and program planning, 79, 101749., available online: Link.

304 Own calculations for years 2013 and 2021, based on the Eurostat dataset "Graduates by educational level, programme orientation, gender and field of education". online data code: educ_uoe_grad02.

305 See Eurostat dataset "Graduates in tertiary education, in science, math., computing, engineering, manufacturing, construction, by sex – per 1000 of population aged 20-29". (online data code: educ_uoe_grad04).

306 For example, see: EIGE (2022) 'The EU's evolving legal and policy approaches to Gender Equality', Luxembourg: Publications Office of the European Union, available online: Link.

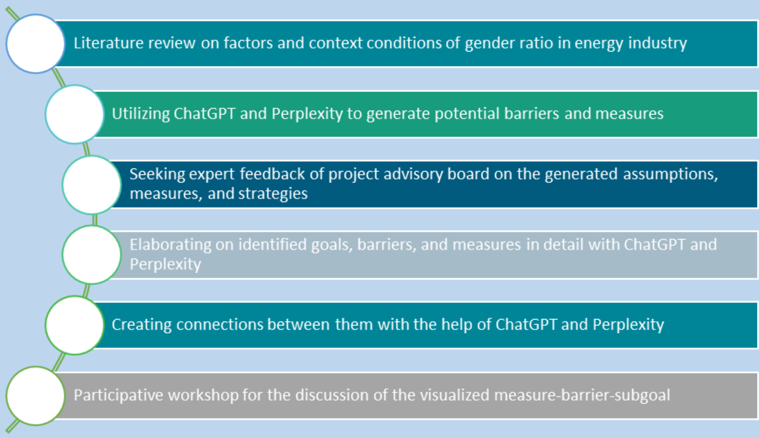
the labour market and in tertiary education slows down or reverses, we see no reason why the share of women in the energy industry should not decline further.

Gender balance in the energy sector of 2050 will therefore by no means be a self-fulfilling prophecy but rather require increased joint efforts by the energy industry, education sector, and policy.

Exhibit 37: Methodology for foresight exercise conducted in the context of the study

Participative foresight analysis

Part of the project's scope was to develop a vision on how to achieve the goal of gender parity in the European energy industry by 2050. To develop a strategic vision, we sought to: identify influential factors for the gender ratio in the energy sector; comprehensively identify measures for the fields of business, policy, and higher education that can plausibly contribute to increasing the proportion of women in companies in the energy sector; and bundle the measures into strategies to derive an intersectoral strategy roadmap. To achieve these work objectives, a five-stage process was followed, see figure below.



Source: Own visualization (Fraunhofer CeRRI)

Key factors affecting women's representation in the energy industry were identified through a literature review, setting sub-goals for Business, Policy, and Higher Education sectors towards 2050 gender parity. The review's summary was processed through ChatGPT to develop measures for increasing women's participation and form an intersectoral strategy. This output, reviewed by an Advisory and Observer Board, was refined and re-analysed using ChatGPT and Perplexity to identify and address potential barriers and measures. The final results, integrating feedback and ensuring the removal of duplicates, were visually represented, creating a clear network of measure-barrier-subgoal connections.

At final participatory event of the project (Brussels, 12 October 2023), key representatives of all relevant stakeholders groups and the members of the AOB were involved in discussing and evaluating the visualisations of the measure-barrier-subgoal links. This was done in small groups to assess their potential impact and determine whether the selected measures can be implemented in the short or long term. The workshop material was evaluated and used to formulate strategy packages. The presentation of the results for Business, Policy, and Higher Education differs from each other, as they depend strongly on the situational course, as well as the expertise and experience of the respective groups involved in the discussions.

5.2 Stakeholder recommendations

As a result of the study conducted on the likelihood, framework conditions, and strategic steering options towards parity in 2050 in the energy sector, we identified a series of recommendations for action and illustrated them with examples of good practice. The recommendations for action link central goals with measures that have shown clear benefits of the interventions taken to be effective and can thus form the basis for an intersectoral strategy roadmap of business, policy, and higher education shaping energy transition efforts.

Overcoming structural barriers: To ensure the professional development of women in the energy sector, evidence suggests that companies will benefit from implementing a well-designed **equal opportunity policy**, for which they must devote sufficient resources in terms of HR personnel, training and other resources for change management. **Mentoring programmes** can be highly effective, especially if they are integrated into reward systems. Successful programmes establish strong mentor-mentee relationships, offering career guidance and support. However, there is a need for “strong and visible long-term executive sponsorship and funding […] for mentoring to thrive and become part of an organizational culture”[307]. Developing **HRM innovations** to create opportunities for upskilling, recognising transferrable skills from degrees not directly related, and facilitating re-entry into the workforce through skill development programmes can greatly contribute to increasing gender diversity.

Networking: Networking and visibility can be powerful tools for increasing the representation of women in the workforce. An example are **cross-company or HRM-specific networks** that facilitate mutual learning and the exchange of experiences among professionals, often combined with a shared commitment to meet defined targets, such as in the case of **Equal by 30**, an international campaign bringing together governments, public and private sector organizations around a public commitment to accelerate gender equality and diversity in clean energy transitions and close the gender gap by 2030. Networking is also essential for boosting a company’s or sector’s ability to source the female talent needed to achieve gender balance. In our survey of energy industry companies, the most commonly reported barrier to achieving gender balance was the limited availability of qualified female candidates in the labour market. Against this background, companies that directly hire from study programmes offered by regional and national universities can have a decisive advantage.

Commitment: Efforts to advance women within an organisation become evident in **strategic plans** and **specific policies** addressing harassment and gendered violence. The allocation of **resources** for recruiting women, the regular **monitoring** of equality figures, and the imposition of **sanctions** for non-compliance with gender targets also contribute to gender diversity (Lagesen et al., 2022). Additionally, a clear commitment from political and organisational **leaders** positively influences the promotion of gender equality. For all the excellent work that employee resource groups centred around women’s interests are doing, cases of organisations that have successfully achieved a marked increase in gender balance almost without exception benefitted from top-down implementation, i.e., strong, visible commitment by top management to gender equality as a transversal goal across all activities of the organisation.

Promoting an inclusive corporate culture: Fostering an inclusive corporate culture that celebrates diversity can be achieved by ensuring that organisational processes and practices

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[307] Dickinson, K., Jankot, T., & Gracon, H. (2009) 'Sun Mentoring: 1996-2009', p. 64, available online: Link.

are transparent, that is, relevant information about decision-making is easily accessible to all employees when requested, and the organisation's corporate mission and operations recognize public interests and needs, e.g., societal responsibility and sustainability. Transparency in how corporate decisions are being made, backed by public interest, enhances the visibility of the organisational diversity efforts, challenging gender stereotypes and promoting more considerate and accepting of difference attitudes in society.

Facilitating work-life balance: Introducing flexible work models that give employees a high degree of freedom to manage their work and private responsibilities enables an inclusive work environment and supports the needs of working parents. Provision of flexible work arrangements such as generous parental leave tailored to individual needs and remote working allows women to balance professional and family responsibilities effectively and encourages people with substantial care responsibility not just to carry out their job, but, importantly, to pursue a career. Furthermore, up-skilling and re-entry schemes should be more widely adopted to prevent younger women (and men) being forced to follow a career path that does not offer potential for professional growth and may result in opting for more gender-stereotyped job roles.

Non-linear career pathways: Expectations of a professional career leading from school STEM profile, via STEM further studies into STEM jobs, should be challenged. A higher **permeability of careers** is needed to help address existing and future skill shortages: Companies that diversify their recruitment to include a wider range of academic disciplines can tap into a larger pool of female professionals, especially given the lower representation of women in STEM fields compared to areas like the humanities. In addition, the permeability of professional development opportunities within organisations is important. The negative effects of rigidly separated career paths in areas such as research and development, production, sales, and administration can hinder women's advancement. By creating more flexible and interconnected career paths, organisations can facilitate the upward mobility and growth of female professionals, enhancing gender diversity within the workforce.

Fostering interest in STEM careers: As our analysis of Eurostat data showed, higher education institutions (HEIs) in the large majority of EU countries are not nearly producing the number of female, STEM trained graduates needed to enable the energy sector to achieve gender balance in R&I positions. HEIs and employers in the energy industry should collaborate on **career awareness initiatives** to raise awareness of female students during their studies in the type of job roles that can be available to them. Being exposed to professionals working in the energy sector can act as catalyst for fresh interest in STEM and energy careers and help challenge prevailing social stereotypes. These interactions can encourage a more diverse group of students to explore and pursue careers in male-dominated STEM fields. More **interdisciplinary study programmes** are needed to produce more female graduates in STEM-related fields because they integrate diverse perspectives and subjects, making STEM more accessible and appealing to women who might otherwise choose non-STEM disciplines.

Creating gender-sensitive study environments in Europe's education systems: HEIs and providers of vocational education and training (VET) should integrate gender-sensitive curricula into STEM education. These curricula require validation to help make male-dominated fields more accessible to girls and women exploring careers in energy. A 'gender-inclusive' curriculum is one that has been consciously designed to recognise and acknowledge the evidence that males and females are likely to bring different cultural experiences to their learning experience. In an applied area such as engineering, this would include students' experiences of the applications of engineering in daily life, which may vary according to gender, ethnicity, culture, and class.

Increasing the attractiveness of HEI and VET technical degree programmes can be achieved by making the social effects and relevance of energy-related technical degree programmes more visible as part of the curriculum and encourage critical reflection on the directions that a career in the energy sector could take by designing course content in a more interdisciplinary way. By creating an inclusive and interdisciplinary learning framework, HEIs and VET providers can help attract women to pursue STEM-related careers, ensuring a diverse talent pool in the energy sector. Research suggests that "for an equitable sustainable education in the areas of energy and sustainable society, science and technology knowledge should be acquired in conjunction with humanities and arts, through a multidisciplinary approach that infuses technical training with social sciences, arts, ethics, and business" [308].

Challenging gender stereotypes: Media and societal actors should conduct future-oriented awareness campaigns challenging outdated gender role stereotypes. These campaigns can play a pivotal role in influencing public perception of gender roles. By challenging existing norms, these initiatives can help shape societal environment where gender equality is not only accepted but actively embraced as a good and right thing to do. This, in turn, motivates girls and women to consider and pursue STEM and energy-related careers. Researchers found that, when implemented correctly, entertainment-education outreach was an extremely effective and cost-efficient method of changing individual attitudes, behaviours, and beliefs[309]. This phenomenon creates an opportunity for media and society to make a positive difference in the overall composition of top talent in the energy industry.

5.3 Recommendations to the European Commission and other EU level stakeholders

There are number of ways and instruments already available to the European Commission and other EU level policy stakeholders that can help accelerate progress towards gender balance in energy transition R&I, as explained below.

5.3.1 Putting gender equality at the heart of the energy transition

The **EU Gender Equality Strategy** reports provide detailed assessments of the status quo on gender equality in Europe using many indicators[310]. *We recommend that future reports add context to these evaluations and use energy transition as core example of progress made in mainstreaming gender equality into EU policies and programmes, using appropriate indicators (see below). This can be done in collaboration with EIGE*.

The **European Sustainable Energy Week (ESEW)** events have been so far heavily focused on technological innovation and have paid little attention to the need for social innovations to achieve fair and just energy transition outcomes and provided hardly any opportunities to raise awareness of gender issues in energy transition, or to mainstream gender into policies on energy transition. Gender-related topics have been treated so far as a side issue,

308 Skowronek, M. et al. (2022) 'Inclusive STEAM education in diverse disciplines of sustainable energy and AI', Energy and AI, 7: 100124, p. 1., available online: Link.

309 Singhal, A. and Rogers, E. (2012) 'Entertainment-education: A communication strategy for social change', London: Routledge, available online: Link.

310 European Commission (2023) '2023 Report on Gender Equality in the EU', Luxembourg: Publications Office of the European Union, available online: Link.

restricted in the last two events to single sessions[311]. *We suggest that the recommendations made in this report are adopted as core topics for discussion in future events*.

The European Commission's **Equality Platform for the Energy Sector[312]** could become an important gender mainstreaming initiative at EU level but as any network it needs constant effort to remain active, become well-known and well used, which appears to be limited at present. *We suggest that the Platform is strategically oriented as an essential tool for sharing information and practices to improve gender balance focused on the recommendations made in this report for Policy, Business and HE*.

5.3.2 Funding

The **Multiannual Financial Framework 2021-2027**, the EU spending instrument of the that sets the maximum amount the EU can spend for each year from 2021 to 2027, has not yet lived up to the EU's commitment to gender mainstreaming in the EU budget, as the European Court of Auditors report found[313]. The auditors proposed recommendations for improving the Commission's framework for supporting gender mainstreaming, and to increase the consideration given to gender equality in the EU's budgeting. *We suggest that the recommendations made in this report provide a solid ground for monitoring and demonstrating the efforts towards gender equality in the EU funded energy-related programmes, including those on the European Green Deal.*

Horizon Europe represents a globally unique effort in R&I that includes an explicit expectation to improve gender balance among researchers and innovators. *We suggest that participation, representation, and impact of women in energy projects is monitored closely using the elements highlighted in this project, not just as proportion of PI or co-authors but also in relation to the influence on policy and transfer of knowledge into impact.*

The **Erasmus+** programme is a unique and hugely successful mobility programme for students. However, the STEM disciplines are characterized by a male prevalence in mobility participation, whilst the opposite has been observed for the non-STEM sectors[314]. *We suggest that universities participating in the Erasmus programme take note of the recommendations made for HE in this report to help them enlarge the international experience and increase women's skills in STEM fields related to energy.*

Marie Curie Sklodowska Actions provide exceptional opportunity for doctoral training that combines academic and industrial experience. Overall, MCSA has been very successful in promoting gender balance among beneficiaries, but this is not the case for technology related training programmes with a focus on the energy transition, such as E4F and FLOAWER[315]. *We suggest that fresh consideration is given how MSCA can attract proposals offering interdisciplinary training relevant to energy transition, guided, perhaps, by the EUA*

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311 https://ec.europa.eu/newsroom/ener/items/755104/en

312 https://energy.ec.europa.eu/topics/energy-strategy/equality-platform-energy-sector_en

313 European Court of Auditors (2021) 'Gender mainstreaming in the EU budget: time to turn words into action', ECA special report 10, available online: Link.

314 Benedictis, L.D., Leoni, S. (2020) 'Gender bias in the Erasmus network of universities', Appl Netw Sci, 5: 64, available online: Link.

315 E4F = Energy For Future, https://europeanenergyforfuture.com; FLOAWER = FLOAting Wind Energy netwoRk, https://www.floawer-h2020.eu/

recommendations on the content of the curricula, and attract the businesses attending the ESEW events to participate in MSCA projects as training partners

Several **COST** actions have targeted energy transition technical issues and the efforts to connect the energy research landscape but with only minor attention paid to discussing gender balance issues. *We suggest that the recommendation made in the EUA report "Energy Transition and the Future of EnergyResearch, Innovation and Education"* [316] *are strongly promoted by COST to the relevant projects as part of the agency's expected contribution to achieving the EU's commitment to gender mainstreaming.*

In 2021, **EIT InnoEnergy**[317] adopted a policy and a 3-year Gender Mainstreaming Plan[318]. Based on the assessment of the EIT InnoEnergy and relevant benchmarks in the energy sector**,** the Plan recognised that energy sector overall in Europe and worldwide has been highly male-dominated, and that "EIT InnoEnergy is well-positioned to reach its goals for the participation of women at all levels". *We suggest that the recommendations made in this document may be of direct interest and help in making continued progress in this mission*.

ERA-LEARN on Clean Energy is a multilateral and strategic partnership of national and regional research, development, and innovation (RDI) programmes in European member states and associated countries aiming to boost and accelerate the energy transition and to support the implementation of the European Strategic Energy Technology Plan (SET Plan)[319]. *We suggest that ERA-LEARN provides opportunities to positively respond to gender mainstreaming expectations stated in the 2021-2027 MFF and as a programme is an excellent target for raising awareness and promoting action on the gender balance recommendations offered in this report.*

5.3.3 Monitoring using indicators

The **European Statistical System**, the partnership between the statistical offices of EU member states and Eurostat, *should step up efforts to collect gender-disaggregated data on topics related to the energy transition*. A broad conversation is ongoing on the importance of gender-specific data to better inform policymaking and address gender inequalities. In view of the key role of the energy transition for one of Europe's key policy milestones, the European Green Deal, the existing indicator framework should be systematically reviewed as to incorporate more measurement of energy related issues, including employment in renewable energy sectors. Currently, data based on the well-established statistical classification of economic activities (NACE) does not allow identification of employment in

316 European University Association (2017) 'Energy Transition and the Future of Energy Research, Innovation and Education: An Action Agenda for European Universities', Brussels: EUA, available online: Link.

317 The European Institute of Innovation and Technology (EIT), an EU body, was set up to foster innovation in Europe by forming dynamic, cross-border partnerships called Knowledge and Innovation Communities (KIC), which unite businesses, education institutions, and research organizations. EIT InnoEnergy is the KIC focused on accelerating Europe's energy transition.

318 EIT InnoEnergy (2023) 'Gender Mainstreaming Policy', Eindhoven: European Institute of Innovation and Technology, available online: Link.

319 https://www.era-learn.eu/network-information/networks/clean-energy-transition

renewables. Such data are essential for formulating EU policies and making informed decisions, including on the gender dimension of developments in the energy sector.[320]

The **Skills Forecasts** produced by EU agency **Cedefop** play an important role in informing EU policymaking[321]. They act as an early warning mechanism to help alleviate potential labour market imbalances and support different labour market actors in making informed decisions. Currently, the Skills Forecasts provide gender-disaggregated data only for the entire workforce, but not for individual sectors. *We propose that the Skills Forecasts should include gender-disaggregated data for (selected) individual sectors as well, based on available industry data on the workforce composition in specific sectors.* This would enable the Skills Forecasts to become a key resource for the detection of gender imbalances and their mitigation.

5.3.4 The role of higher education institutions (HEIs)

The **consultation on what universities can do for energy transition** carried out by the **European University Association (EUA)**, the largest association of HEIs in Europe, representing more than 800 universities and national rectors' conferences in 48 European countries, has recommended adoption of interdisciplinary approaches to master and doctoral training that included social, political, technological, and environmental components[322]. The consultation has not included discussions how improve gender balance in STEM training, even though this issue has been well documented in She Figures, *and we suggest that the recommendations made in our report for the higher education sector are adopted by universities that contributed to the EUA's vision of R&I training for energy transition.*

In 2017 the **EUA** has carried out the **survey of energy education in universities** as part of the Uni-SET project[323]. Only two minor references were made to gender balance, and *we suggest that such surveys with specific attention to gender balance are conducted on regular basis in the future and are used to supplement She Figures by providing important gender context to the national statistics on STEM.*

CESAER, the association of leading engineering universities in Europe with 53 members from 26 countries, has been very active in creating doctoral training conditions that are supportive and inclusive but as an engineering-focused associations of research universities it could also be influential in promoting gender balance in fields related to energy transition. For this purpose, the recommendations of the ERA Steering Group Human Resources and Mobility (ERA SGHRM) report on "Using the Principles for Innovative Doctoral Training as a Tool for Guiding Reforms of Doctoral Education in Europe"[324] could act as a guide. *We suggest that the recommendations made in this report could help advance women into*

[320] See Clancy, J. & Feenstra, M. (2019) 'Women, Gender Equality and the Energy Transition in the EU', Study for FEMM Committee, European Parliament, available online: Link.

[321] https://www.cedefop.europa.eu/en/tools/skills-forecast

[322] European University Association (2017) 'Energy Transition and the Future of Energy Research, Innovation and Education: An Action Agenda for European Universities', Brussels: EUA, available online: Link.

[323] European University Association (2017) 'Energy Research and Education at European Universities: The UNI-SET Universities Survey Report', Brussels: EUA, available online: Link.

[324] ERA Steering Group Human Resources and Mobility (2011) 'Using the Principles for Innovative Doctoral Training as a Tool for Guiding Reforms of Doctoral Education in Europe', available online: Link.

research and innovation in industry and develop gender- and socially responsible doctoral training programmes for energy transition R&I.

6 Annex I: Research methodology

6.1 Primary data collection

6.1.1 CATI survey of companies in the energy sector

An interview survey was conducted targeted at HR managers of organisations in the energy sector, i.e., including but not limited to companies in renewables and hydrogen. Subjects included in the survey were the following:

- Current gender ratios by key occupational groups and governance roles, e.g., executive positions;
- Recent as well as expected difficulties in filling vacancies, and the perceived impact of improving gender balances on company performance;
- Perceptions about barriers to achieve gender balance;
- Existence of any strategic plans, concrete measures, company policies and KPIs addressing gender balance;
- The perceived effectiveness of such measures for improving the role of women in the organisation;
- Organisation characteristics (sector, size, age, ownership structure, workforce composition).

The methodological approach chosen to the survey was to draw a **probability sample**, which ensured that results are fully **statistically representative** for all organisations in the energy sector, except for companies with less than 10 employees as these are likely to be concentrated in installation & maintenance and therefore of less relevance to R&I related to the energy transition. This way the study avoided the sampling bias which is characteristic for surveys using convenience or snowball samples. It also provides the basis for repeating the survey to produce time series data on progress in achieving gender balance in the energy sector – something which cannot be done in a methodologically sound way by using non-probability samples.

The survey was conducted in the form of a **CATI survey of HR managers** in organisations in all 35 countries across all sectors of the economy, for which a probability sample of the establishment population was applied. In organisations that do not have an HR manager, a member of management with responsibility for HR matters was interviewed. The target number of complete responses to be collected was n=2,000 across the EU27, n=400 across the remaining SET Plan countries and n=400 across the four Mission Innovation countries Australia, Canada, the UK and the US.

Preparation, execution and data processing for the surveys consisted of the following steps:

- Instrument development will be organised in close collaboration between content experts (academic researchers) and survey experts, guided by the research framework and research questions finalised at an early stage of the project;

- Cognitive pre-testing of the master questionnaire (English language) was carried out to ensure a high validity of the instrument;

- Field work was carried out by GDCC in close collaboration with the remaining members of the core research team.

Drawing of the sample

A random sample was drawn from commercial sources (mainly Dun and Bradstreet and/or Orbis), using the relevant criteria such as sector and employee size. Once the sample with company data (company name, sector, employee size) was drawn, it was where possible enriched with the names of potential respondents (HR decision makers), to allow the interviewers a good "first entry" into the relevant company. The sampling frame used for the study looked as follows:

Exhibit 38: Sampling frame used for the CATI survey of energy sector companies

Country	Size (primary SIC code only)
Austria	1,840
Belgium	1,270
Bulgaria	1,160
Croatia	740
Cyprus	120
Czech Republic	4,580
Denmark	1,250
Estonia	390
Finland	1,690
France	5,710
Germany	21,480
Greece	850
Hungary	1,290
Ireland	830
Italy	5,660
Latvia	510
Lithuania	570
Luxembourg	210
Malta	110
Netherlands	2,650
Poland	3,320
Portugal	1,690
Romania	2,470
Slovakia	580
Slovenia	410
Spain	5,590
Sweden	2,370
TOTAL EU27	***69,320***
Norway	3,500
Iceland	70
Switzerland	2,550
Turkey	6,370
Australia	23,770
Canada	10,510

Country	Size (primary SIC code only)
UK	15,640
USA	105,480
TOTAL	***237,190***

Questionnaire design

The questionnaire was developed jointly be the core research team under leadership of empirica. It was designed carefully to extract as much relevant information with a minimum of questions, therefore keeping average interview durations within an acceptable limit. For this purpose, interview routing using conditional questions was applied. Questionnaire design also took account of the level of knowledge on organisational issues that can be expected from the head of HR or a person in an equivalent position; questions which could be expected to require interviews to look up data from their files were excluded. The wording of question items (e.g., obstacles to gender balance, measures implemented) was based on our analysis of the literature, including surveys conducted previously by others such as IRENA, BCG, NES Fircroft and others.

All of the questions were close ended, designed to collect quantitative data. For the questions on workforce composition (e.g., number of female staff engaged in R&I), respondents could choose whether to give a total number or an estimated share of the total (in this case: workforce engaged in R&I). The master questionnaire is available from the authors.

Questionnaire programming- and translating

The word version of the finalised questionnaire, produced by the study team, was programmed, and subsequently internally checked on skips/routings and consistency. After completion of the internal checks a version of the tested questionnaire were sent to the other members of the core research team for review and approval.

Translation of the questionnaire in the relevant languages was done by a professional agency, deploying certified/accredited translators. In a second step, the translated instruments were checked by native speakers with knowledge of the subject area (gender / energy) from the network of National Correspondents, and subsequently finalised.

Screening relevant companies/respondents

Given the fact that businesses eligible for this survey must operate in the energy sector and be of a certain minimum size, the first part of the screener (verification) questionnaire was to find out if the business is indeed part of the target group, i.e. that the entry in the address database was correct. When the business was confirmed to be eligible for the survey the next statement was to ask for the person we wished to interview; the person responsible for HR. This could for example be the owner for smaller businesses, or a function such as HR manager/director for the larger ones.

Interviewer briefing and instruction

The interviewers and team leaders selected for the project were briefed by the project manager of GDCC, accompanied by the dedicated supervisor assigned to this project. After the briefing, the briefing instructions were prepared for the Interviewers, the so called “interviewer notes”, and captured in pdf format in the questionnaire. The interviewer was able to view and review those notes whenever he/she wanted.

Ensuring high response rates

GDCC, over time, has implemented several processes and procedures to reduce non-response bias, especially amongst B2B target groups. For this project, it was of evident importance that, given the challenges of the sample, to convince all eligible companies to participate in the study. The following (non-limitative) measures were executed in order to ensure a high response rate:

- Allocation of interviewers with business-to-business experience;
- The number of call attempts were set to 15 attempts per working phone number: this yielded additional response in the sectors/countries where the population is small, and the available sample needed to be utilised as fully as possible;
- Call-back appointments were not terminated after 15 attempts: GDCC experience has proven that, once a potential respondent has given permission to schedule a call to do the interview, often more attempts are needed to complete the interview;
- The call attempts of a working phone number were programmed in such a sequence that the attempts of each individual number will be spread over the weekdays and different times during a particular day;
- A confidentiality statement was clearly communicated in the introduction phase of the survey. This will have helped to convince a certain part of the audience to participate in the survey;
- The client of the study was revealed during the introduction phase, including a clear explanation for what purpose the outcome of the survey will be used for (i.e., policy making);
- The rigorous training and QC regime within GDCC, implemented in a uniform way for all interviewers/languages involved, helped ensure a high response rate.

Besides the points mentioned above, other means were executed to improve the response rates. An introduction/recommendation letter signed by CINEA was prepared and provided to businesses by email in pdf format when on the phone with the gatekeeper, and optionally when speaking to the eligible respondent. The ability to send this letter directly after capturing the email address of the person on the phone, so-called “warm hand-off”, helped keep respondents on the phone while sending the letter, in the meanwhile trying to switch the conversation into an instant interview.

The sample

The original data set contained 2,802 cases. 42 of these were excluded from further analysis due to missing data on key variables. The remaining 2,760 cases are distributed among countries as follows:

Exhibit 39: Valid responses to CATI survey of energy sector companies

Country	Responses
Austria	89
Belgium	79
Bulgaria	90
Croatia	50

Country	Responses
Cyprus	29
Czech Republic	80
Denmark	64
Estonia	77
Finland	70
France	90
Germany	100
Greece	77
Hungary	79
Ireland	69
Italy	100
Latvia	68
Lithuania	70
Luxembourg	30
Malta	13
Netherlands	91
Poland	88
Portugal	90
Romania	86
Slovakia	59
Slovenia	50
Spain	100
Sweden	89
TOTAL EU27	***1,977***
Norway	107
Iceland	30
Switzerland	128
Turkey	127
Australia	99
Canada	97
UK	99
USA	96
TOTAL	***2,760***

More details about the composition of the sample are provided in the first chapter of the Tabular Report on survey of energy sector companies (chapter 9).

Data analysis - No weighting was applied for any of the statistics developed on the basis of the survey data. In most cases, however, companies with only 5-9 employees were excluded from the analysis, as they are not equally distributed across countries and our main focus is on larger organisations.

6.1.2 Online surveys

Survey methodology

Procedures and options for setting up and running the surveys were as follows:

Questionnaire design - The survey instrument was designed jointly by the core research team. Several well-established scales were used to allow advanced statistical analysis of the findings and to allow comparisons of the findings with surveys conducted by other research teams and with different focus:

- For questions about the **retention related intentions**, scale developed and validated by Kyndt et al.[325] was used. Out of 11 items proposed by the authors, the six ones with the highest factor load were selected. To account for the specific focus of the present study, an additional item ("I'm planning to leave the energy sector within a period of 3 years") was added.

- For measuring **organisational career growth**, i.e., the degree to which employees experience career growth within their current organisation, the **organisational career growth scale** developed and validated by a team of researchers led by Derek Weg[326] was applied, again shortened to the eight items with the highest factor load.

- For measuring **organisational climate**, the Organisational Culture Profile (OCP) created originally by O'Reilly, Chatman & Caldwell[327] and further developed and validated by Sarros et al.[328] was used. It consists of 28 items across seven factors: Competitiveness, Social Responsibility, Supportiveness, Innovation, Emphasis on Rewards, Performance Orientation, and Stability.

- For capturing **work-related quality of life**, the WRQoL scale initially developed as part of a number of large staff surveys for the UK National Health Service and subsequently established as a sort-of standard for the field[329] was used. The scale consists of 23 items, to which a 24th was added ("I am satisfied with the payment I receive") as this issue was felt missing from the original.

- The **quality of collaboration at work** including **subtle gender bias**, the Perceived Subtle Gender Bias Index as validated by Tran et al.[330] was applied. From the 21 items in the original scale, the 14 with highest factor load were selected for our purposes. Some items were slightly reworded to make them suitable for working contexts outside of academia.

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325 Kyndt; E. et al. (2009) 'Employee Retention: Organisational and Personal Perspectives', Vocations and Learning, 2(3), 195–215, available online: Link.

326 Weng, Q. (2018) 'Manual of the Organizational Career Growth Scale', available online: Link.

327 O'Reilly, C. A., Chatman, J., Caldwell, D. F. (1991) 'People and organizational culture: A profile comparisons approach to assessing person-organization fit', Academy of Management Journal, 34(3): 487–516, available online: Link.

328 Sarros, J. C., Gray, J., Densten, I. L., Cooper, B. (2005) 'The Organizational Culture Profile Revisited and Revised: An Australian Perspective', Australian Journal of Management, 30(1): 159–182, available online: Link.

329 See, for instance: Easton S. & van Laar, Darren (2018) 'Reconciling Organizational Stress, Cultural Differences and Quality of Working Life', Indian Journal of Career and Livelihood Planning, 7(1): 27-38, available online: Link.

330 Tran, N. et al. (2019).'Perceived Subtle Gender Bias Index: Development and Validation for Use in Academia', Psychology of Women Quarterly, 43(4): 509–525, available online: Link.

- For the topic **discrimination**, questions from the European Social Survey[331] were used (ESS questions C18, C19, C20).

- For capturing **negative experiences** related to work, the "Negative Acts" items from the instrument developed by the COPSOQ international network were used[332]. COPSOQ, originally developed by a group of researchers lead by Kristensen and Borg at the Danish National Research Centre for the Working Environment, is one of the most established sources for this type of questionnaire items, which have been validated by research teams around the world.

- For the survey of **drivers and barriers to careers in the field of energy**, questions from the SAGA survey were used[333]. SAGA (STEM and Gender Advancement) was a global UNESCO project that offers governments, policymakers and other stakeholders across the world a variety of tools to help address the current global gender gap in STEM.

In case of all multi-item questions, items were shuffled/rotated randomly to control for potential order effects.

Most of the remaining questions were also close ended, designed to collect quantitative data, with open text responses foreseen in some cases to capture responses not properly covered by closed response options.

Questionnaire programming - The questionnaires were implemented on the web, using special software for programming online surveys, namely EUSurvey and Netigate. Our surveys made use of a structured questionnaire with a range of closed questions and the option to add open text responses where appropriate.

Piloting **-** Before sending out invitations to the respective survey target population, questionnaires were piloted with 5-10 persons from among the target group. Based on the findings from the pilot interviews, selected parts of the instruments were redesigned.

Promotion and follow-up **–** For ensuring success of the survey, measures were taken to effectively reach the target populations, namely individuals of both genders working in the energy sector. The survey ran as an open online survey for 10 weeks on **EUSurvey**, where anybody who had access to the link was able to complete it. Continuous advertising and follow-up were used, e.g., via posts on LinkedIn, to promote the survey and boost participation. Members of the Advisory and Observer Board, the network of National Correspondents, and key organisations directly contacted via LinkedIn or email, were used.

Panel of individuals working in the energy sector **–** In addition to the open survey on EUSurvey, the study team used a panel sample provided by **Netigate**, a specialised survey operator.

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331 https://www.europeansocialsurvey.org/methodology/ess-methodology/source-questionnaire/source-questionnaire-development

332 COPSOQ (2021) 'COPSOQ III. Guidelines and Questionnaire', COPSOQ international network, available online: Link.

333 UNESCO (2018) 'The SAGA Survey of Drivers and Barriers to Careers in Science and Engineering', available online: Link.

Data analysis - No weighting was applied.

Survey of persons working in the energy sector

An online survey targeting employees of the energy sector was be sent out to collect data on the share of women at a sub-sector level and investigate intersecting issues, perceptions of barriers to gender equality and policies to achieve gender balance in the energy sector. The survey was distributed with the help of the broad network of organisations and experts in the studied countries.

The survey was aimed an any person in the target population, irrespective of gender, and included the following sections:

- Socio-demographic background variables(e.g., gender, age, children);
- Sector of employment (e.g., renewables subsector) and experience, employment status (e.g., part-time/full-time) and history;
- Working conditions and perceived job quality;
- Perceptions of over-qualification and skills mismatch, and access to training;
- Employment preferences;
- Nationality/country of origin, country of employment, characteristics re diversity (e.g., disability, LGBTQI, immigrant background etc.);
- Personal experience and perception of gender barriers in working life (e.g., fair pay, promotion opportunities);
- Personal experience and perception about career advancement (e.g., career progression, personal experiences of discrimination);
- Participation in organisational decision-making in topics related to the energy transition.

The survey took 15 to 20 minutes to answer. All answers were anonymous, and the respondents were not asked any identifiable information, such as e-mail address, to avoid bias. The survey was available in the primary national language of each EU27 country and special attention was paid to formulate the questions in a non-biased, clear and gender-neutral manner, avoiding jargon or ambiguity. Once the survey was closed, data cleansing, identifying, and addressing incomplete, duplicate and erroneous answers were carried out prior to data analysis.

The original data set contained 1,257 cases. 694 of these were excluded from further analysis due to not working in the energy sector, failure in plausibility check or because of missing data on key variables. The remaining 563 cases are distributed among countries as follows:

Exhibit 40: Total valid responses per country and gender

Country	Women	Men	Non-binary/ other	n.a.	Total
Austria	11	1	0	0	12
Denmark	6	4	0	1	11
France	36	40	1	8	85
Germany	43	40	1	3	87
Italy	38	34	0	6	78
Netherlands	16	14	0	0	30
Poland	14	45	0	5	64
Spain	41	37	0	6	84
Sweden	10	27	0	0	37
Remaining EU27	15	14	0	2	31
TOTAL EU27	***230***	***256***	***2***	***31***	***519***
Non-EU	22	16	0	2	40
Country missing	1	3	0	0	4
TOTAL	***253***	***275***	***2***	***33***	***563***

All respondents; n = 563

More details about the composition of the sample are provided in the first chapter of the Tabular Report on the survey of energy sector employees (section 10).

Survey of students in tertiary education

The original data set contained 723 cases. 75 of these were excluded from further analysis because of missing data on key variables or failure in plausibility check. The remaining 648 cases are distributed among countries as follows:

Exhibit 41: Total valid responses per country of study and gender

	Women	Men	Non-binary/ other	n.a.	Total
France	49	51	1	1	102
Germany	56	50	1	1	108
Italy	65	26	1	0	92
Lithuania	4	17	0	0	21
Netherlands	7	17	0	0	24
Poland	59	32	1	0	92
Spain	45	49	2	0	96
Remaining EU27	24	13	1	1	39
TOTAL EU27	***309***	***255***	***7***	***3***	***574***
Non-EU	25	44	4	1	74
TOTAL	***334***	***299***	***11***	***4***	***648***

All respondents; n = 648

More details about the composition of the sample are provided in the first chapter of the Tabular Report on the survey of students in tertiary education (section 11).

6.1.3 Pilot survey of research funding bodies in the energy domain

Research funding organisations play a key role in bringing in a gender dimension to research and increase the share of women in renewable energy R & I. A gender dimension in research involves shifting from the normative notions of gender to influence research, including the research questions, the method, the data collection, among other aspects, not necessarily related to having both women and men in a project. The gender equality aspect is having gender balance in, for example, research teams and applications, review committees, although it goes beyond just the share of women and men in a project, but also involves the terms and conditions of employment, wage-gaps, among other aspects. This can be further deepened by integrating an intersectional approach both to the research itself but also to those that are involved in the research process.[334]

A pilot survey was sent out to energy research funding organisations from the 31 SET-Plan countries + UK, including questions on the following topics:

- Gender balance in their organisation and among research application review committees;
- Consideration or application of a gender dimension in the funded research;
- Gender competence among the reviewers;
- Gender balance among project leaders who have been granted funding;
- Success rate for women and men in research funding applications;
- Initiatives or methods to influence gender balance in organisations that received funding.

The questionnaire instrument was sent out per email and designed to be answered in 5-10 minutes, excluding the time to research the necessary data for its completion.

6.1.4 Definition of macro-regions

Whenever it was not possible to analyse available data at the level of individual countries (e.g., if the size of the sample for a given country does not allow statistically reliable analysis or it was not available from Eurostat due to small number of cases per cell), we made use of country groupings, i.e. macro-regions. For this purpose, we applied a common-sense country grouping as used, for instance, by the European Foundation for their “Gender equality at work” report[335]:

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[334] Håkansson, S. & Sand, J. (2021) 'The Gender Dimension in Research and Innovation: Results from a global survey on research funding organisations', University of Gothenburg, available online: Link.

[335] Cabrita, J. et al. (2020), see footnote 120

Exhibit 42: Macro regions as used by Eurofound

Country group	Countries
Anglophone	Ireland, United Kingdom
Baltic	Estonia, Latvia, Lithuania
Central-eastern	Bulgaria, Croatia, Czechia, Hungary, Poland, Romania, Slovakia, Slovenia
Continental	Austria, Belgium, France, Germany, Luxembourg, Netherlands
Northern	Denmark, Finland, Sweden
Southern	Cyprus, Greece, Italy, Malta, Portugal, Spain

Source: European Foundation for the Improvement of Living and Working Conditions, 2020

Switzerland was grouped in the Continental Europe cluster. Iceland and Norway were grouped in the Northern Europe cluster. The other non-SET-Plan countries (USA, Canada, Australia) were included in a comparison group "Non-Europe".

6.2 Analysis of secondary data

6.2.1 Employment data

Gender-disaggregated data from the European Labour Force Survey (EU LFS) and Structural Business Statistics (SBS) is available from Eurostat for NACE (Rev.2) at the two- and three-digit level. Using EU LFS data ensures harmonization and cross-country comparability. Empirica, the coordinator of the present study, has a special arrangement with Eurostat that grants access to fine-grained data not publicly available. Due to the small size of the energy labour force and the industry in the smaller member states, for many sectors at three-digit level no gender-aggregated data are disclosed by Eurostat[336]. Therefore, data on the two-digit level was aggregated to construct a unified energy sector according to the Eurostat definition found in the table below.

The EU LFS data does not provide gender-disaggregated statistics on **employment parameters such as job quality, employment relationship, career development, access to training, etc.** for the energy sector. Additionally, the EU LFS data does not allow analysis of intersectional issues, i.e., gender-disaggregated data on ethnic origin, country of birth, educational attainment, number of children, age of youngest child, household composition etc. within subsectors of the economy.

The ILOSTAT labour market database is another source of secondary data of high relevance for the present study used to cover the Mission Innovation Countries (Australia, Canada and United States) and supplement missing values. Most ILOSTAT data – with a few exceptions – is available only at the ISIC (Rev.4) one-digit level, which is identical to the NACE (Rev.2) one-digit level. Accordingly, it mostly served to supplement data on total employment.

336 ASSET (2021) 'Collection of gender-disaggregated data on the employment and participation of women and men in the energy sector', project report, Brussels: European Commission, Directorate-General for Energy, available online: Link.

Sector Coverage (Energy sector):

NACE 2-Digit	Description
B05	Mining of coal and lignite
B06	Extraction of crude petroleum and natural gas
C19	Manufacture of coke and refined petroleum products
D35	Electricity, gas, steam and air conditioning supply

Due to the small number of employed persons in the energy sector, particularly in smaller economies and countries, employment data was often missing, particularly for women who are mostly underrepresented in the sector. This issue was most prevalent in data broken down by age group and ISCO-08 occupational group. To counteract this, ISCO-08 occupational groups were aggregated to form three overarching occupational skill levels according to the definition employed by the International Energy Agency[337]. Additionally, if values for the number of male employed persons as well as total employed persons in a specific category were available, they were used to calculate the number of female employed persons, which was often missing[338]. The same methodology was employed to impute the number of employed persons in low skilled jobs and in the youngest age group etc., if all other values were known.

6.2.2 Data on education & training

The collection of data on education and training provides the basis for the "retrospective mapping" of energy-related skills under Task 2. To allow for a meaningful benchmarking analysis, data on education and training must satisfy three essential criteria. Firstly, the data to be collected should be harmonized across EU Member States to guarantee their comparability across countries. Secondly, to allow for the analysis of trends over time, the data should be retrospectively available and comparable for the last 10 years. Thirdly, since the focus of this study is on "energy-related" skills and education, the data should be disaggregated by fields of study to identify students and graduates in fields of education that provide them with the knowledge and skills required for a subsequent employment in the energy sector or for a position as a researcher in an energy-related field.

For EU Member States as well as the SET Plan countries (Norway, Iceland, Turkey and Switzerland), we used data provided by Eurostat, which fulfil all three criteria. In addition, data from the OECD was used to also cover the Mission Innovation countries as far as possible. Here it was crucial to ensure that the data collected from OECD are comparable to the Eurostat data. For example, the fact that both sources use the International Standard Classification of Education (ISCED) established by UNESCO is important to compare statistics by educational level across countries.

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337 IEA (2022) 'Understanding Gender Gaps in Wages, Employment and Career Trajectories in the Energy Sector', report, available online: Link.

338 According to the methodology used in ASSET (2021).

The analysis covered the period from 2010 to 2020, for each of the following tertiary and non-tertiary education levels:

- Post-secondary non-tertiary education – vocational [ISCED ED45]
- Bachelor's or equivalent level [ISCED ED6]
- Master's or equivalent level [ISCED ED7]
- Doctoral or equivalent level [ISCED ED8]

All indicators were **disaggregated by sex** as well as **by field of education**. The disaggregation by field of education is crucial to identify the skills and education programmes that are energy related. In particular, the analysis focused on three broad fields of education which provide relevant skills for the energy sector:

- Natural Sciences, Mathematics and Statistics [ISCED Code: 05]
- Information and Communication Technologies [ISCED Code: 06]
- Engineering, manufacturing and construction [ISCED Code: 07]

Additionally, we explored recent developments for narrow subfields, e.g., [F052] Environment, [F053] Physical sciences, [F054] Mathematics and statistics. Finally, a special focus lay on the subfield of [F071] Engineering and Engineering trades, given that it encompasses the field [F0713] Electricity and energy which is of high relevance to the energy sector. The data collection across educational fields was also informed by existing studies on energy-related education and research programmes. For example, in a study in the context of the UNI-SET project, the European University Association sought to identify and classify research topics and degree programmes that prominently include energy related topics across the EU. Out of 570 master's programmes on which data was collected, the study found that 61.5% were assigned to ISCED 0713 "Electricity and Energy", but quite many were assigned to Physical Sciences (ISCED 53) and Environment (ISCED 52) as well – 35% and 29%, respectively.[339]

6.2.3 Good practice identification and analysis

For the identification and analysis of candidates for good practice, a set of selection criteria was applied (see Exhibit 43). A major objective of the exercise was to scrutinise any self-promotion which initiatives and organisations when publishing about their own efforts, in order to gain insight into actual success factors, facilitators that may explain the success (or lack thereof) achieved, as well as barriers and ways to overcome these.

The **first step** in this task was to identify candidates for good practices, for which the study team made use of:

[339] European University Association (2017) 'Energy Research and Education at European Universities: The UNI-SET Universities Survey Report', Brussels: EUA, available online: Link.

- Existing knowledge on the part of study team members and national correspondents on candidate cases from previous work undertaken in the area;

- Established personal contacts by study team members to educational institutions, businesses, governmental bodies, industry associations and NGOs, and European as well as national projects;

- The results of our own literature analysis;

- Research undertaken by National Correspondents on the basis of instructions and guidelines provided by the study team, quality-checked and validated in an iterative process.

Data on more than 300 candidates was collected through this initial screening process.

The **second step** consisted of the analysis of these candidates using a range of selection criteria (Exhibit 43), based on which a selection of 30 good practice cases was carried out.

Exhibit 43: Criteria for identification of good practices

Evaluation criterion	Evaluation question	Associated questions
Relevance	To what extent is the measure relevant in terms of boosting gender equality in the energy domain?	• Are the objectives explicitly and precisely specified? • Does the initiative originate in the local / municipal / regional level (rather than national)? • Does the initiative have a size and scope which makes it relevant as a national / international practice to be emulated elsewhere?
Transparency	To what extent is it possible to have access to information about the measure?	• To what extent is it possible to get information about the implementation of the measure? • Has the impact of the measure been evaluated (internally / independently)? • If so, is it possible to access information about outcomes?
Effectiveness & efficiency	How effective and efficient is the measure in addressing barriers to gender equality in practice?	• How have target groups been properly defined (indicators)? • Have the needs of target groups been identified using robust methods? (e.g., is there sufficient data about gender balance and any gender-specific challenges or inequalities?) • How successful is the measure in terms of reaching the target groups (e.g., enrolment numbers) and in avoiding deadweight effects? • How efficient was the organisation and management of the measure in reaching its objectives? Performance indicators: cost/outcome ratio.
Impacts	What were the effects of the measure on the target groups involved?	• Has the implementation of the measure led to tangible benefits to the participants, in terms of effects on gender inequalities as perceived by the target group or reflected in KPIs? • Does the measure target intersectional issues, i.e., groups of women who are particularly underrepresented or affected by inequalities? • Have perceptions about the risk of energy poverty improved?
Sustainability	To what extent are the achieved benefits from the	• Does the governance model take account of the sustainability of the measure over the short/medium/long term (e.g., regarding source of financing; sponsoring;

Evaluation criterion	Evaluation question	Associated questions
	measure sustainable?	creditworthiness; inability of residents to provide necessary supplementary funding)? • What are the major influencing factors on sustainability (internal/external)? Is there a strategy for how to respond to contingencies? • Are behavioural changes, if relevant, likely to be sustained after the end of the observation/ project /initiative?
Transferability	How likely is it that the measure can be transferred / replicated in another city/region?	• (To what extent) Is the success of the measure dependent on local conditions that are rare/ unique/ difficult to emulate? • Has replicability been taken into account when designing the measure?
Inclusive/ participatory design	To what extent are the targeted group involved in the development processes?	• Were the targeted group invited to participate in the development, planning, implementation, and monitoring of the measures? • Are you engaged in/collaborate with civil groups, communities, and NGOs active in supporting and raising awareness about the targeted group?
Structured procedures	To what extent the measure changes structures and processes	• Does the measure focus on equal participation opportunities for all genders? • Does the measure change structures and processes (e.g., recruiting, talent management, meeting culture, mixed leadership concept)?

Two additional selection criteria, applied to the whole set of cases, were **geographical coverage** and **thematic coverage**. We sought to select cases from each of the macro regions listed in section 6.1.4. Moreover, practices from all main types were included in the final set of good practices.

6.3 Foresight analysis and forecasting

6.3.1 Quantitative forecasting

Employment in the energy sector as per the narrow definition in the table below has been on decline. As our analysis of Eurostat data (see section 6.2.1) found, in 2022 there were 1.847 million workers in the industry in EU27, down from over 2 million in 2010.

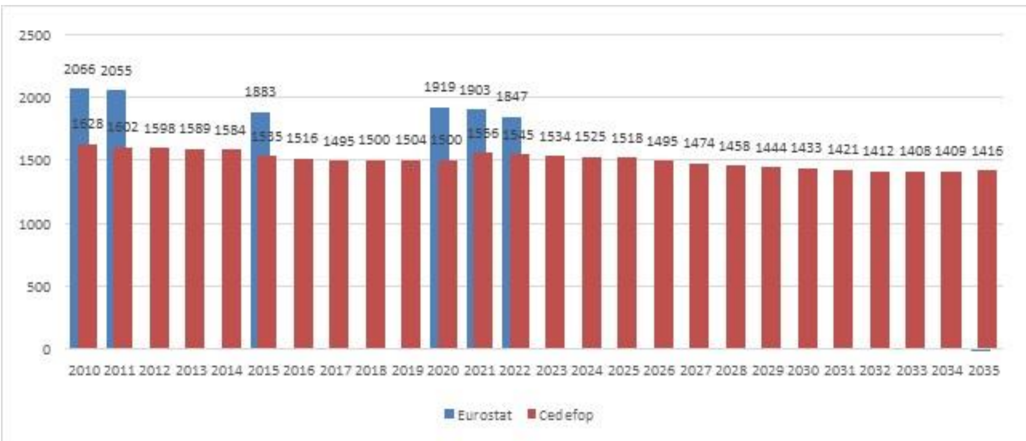
Exhibit 44: Definition of energy sector per NACE rev. 2 used for projection

Industry	NACE rev. 2
Coal	05
Oil and Gas	06
Manufactured fuels	19
Electricity	35.1
Gas, steam & air conditioning	35.2-25.3

For our forecast until the year 2050, we are using as a base the projections published by EU agency **Cedefop.** Under the name of Skills Forecasts, Cedefop produces forecasts for EU27 employment per sector until the year 2035[340]. The methodology they use for this involves a consortium led by Cambridge Econometrics and including Economix, the Research Centre for Education and the Labour Market at Maastricht University, the Institute for Employment Research at the University of Warwick, and the Vienna Institute for International Economic Studies. The consortium uses a **global macroeconomic model called E3ME** to produce sectoral employment and labour supply forecasts. They also lead individual country expert consultations and implement feedback, quality check the data, and produce country fiches and reports. The forecasts take into account, as much as possible, current challenges facing Europe such as the green transition, geopolitical tensions, post-COVID changes, and demographic developments. The Skills Forecast is visualized as an interactive tool that enables policymakers and industry stakeholders to understand the impact of these challenges on future jobs and skills. The forecasts are updated regularly, and the latest round of the forecast covers the period up to 2035. The forecasts provide insights into national employment trends by sector, occupational group, and education level, as well as developments in the working-age population by age and gender. The forecasts also provide information on the expected growth or decline of employment in different sectors and occupations, which can help policymakers and industry stakeholders make informed decisions about workforce planning and development.

Cedefop, using a different definition of energy sector jobs than Eurostat, also sees a decline in employment in the energy sector, from 1.628 million in 2010 to 1.545 million in 2022 (see Exhibit 45). Cedefop projects employment in the energy sector to decline further to 1.416 million in 2035.

Exhibit 45: Eurostat employment data and Cedefop employment forecast for the energy sector



Data source: Eurostat and Cedefop, 2023

Data (or projections) on the distribution of employment by gender is not available from Cedefop. Eurostat sees the share of women increasing from 19% in 2010 to 24% in 2022.

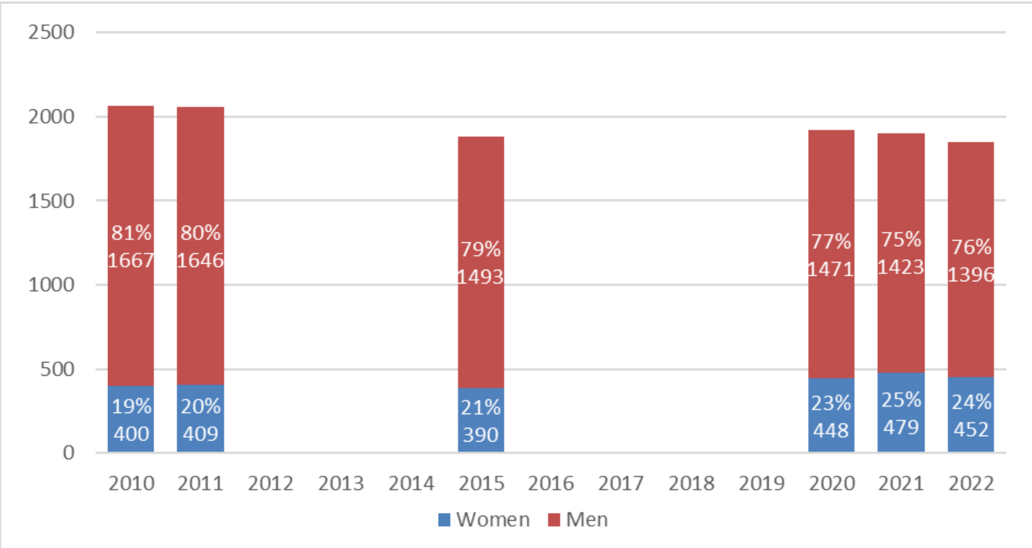
Given the limitations in data availability, some assumptions need to be made. Given the inherent uncertainties of forecasting over such a huge time span as 2023 -2050, assumptions

340 https://www.cedefop.europa.eu/en/tools/skills-forecast

suffice to be rather rough and do not need to pretend accuracy in terms of digits of percentages. Therefore, based on the observation that Eurostat data is on average about 25% higher than Cedefop data, we apply a multiplier of 1.25 to the Cedefop projections in order to adjust our estimations to the Eurostat definition. The average growth rate (CAGR) of employment in the energy sector has been -0.56% per year. We simply assume the same growth rate for 2035-2050, which leads to a decrease in employment (Eurostat definition) to 1.629 million in 2050[341].

Under the assumption that women's share in the energy sector workforce will continue to grow, as it has done in the years since 2010, we can now estimate the number of jobs which need to be taken by women in order to arrive at gender balance, which according to the definition used by EIGE[342] amounts to a minimum share of 40% women in the total sector workforce (Exhibit 47).

Exhibit 46: Eurostat employment data by sex for the energy sector, selected years 2010-2022



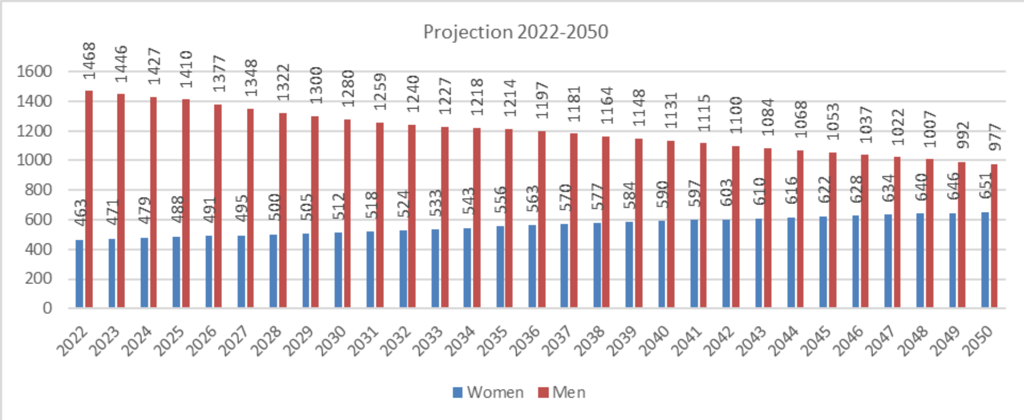
Data source: Eurostat, 2023

Accordingly, to achieve minimum gender balance (40%) by 2050, the total number of women employed in the sector must grow significantly each year to about 650,000 in 2050, i.e., nearly 200,000 additional job positions need to be filled by women by that time.

341 Note that in this projection, the employment in 2022 is computed as 1.770 million in 2022, which is 1.25 times the Cedefop value for 2022, instead of the Eurostat value of 1.847 million. The values diverge from the Eurostat figures because of calibration of the timeline to Cedefop based on averages.

342 EIGE (2022) 'Statistical brief: gender balance in business and finance 2021', Gender Statistics Database series, available online: Link.

Exhibit 47: Projection 2022-2050 of employment by sex in the energy sector - heading towards a 40% female share



Source: Own calculations based on Eurostat and Cedefop data, 2023

Note that Cedefop's projections rely on differential evolutions of the energy sub-sectors, as demonstrated in Exhibit 15 on page 47. Notably, coal, manufactured fuels as well as gas, steam and air conditioning, are expected to shrink significantly, while especially electricity is expected to expand strongly in terms of employment.

The sub-sectoral development is assumed to be related to the expected gender shift, but we refrain from attempting any sub-sector breakdown of gender analysis for the time being.

6.3.2 Participative foresight analysis

Part of the scope of the project was to develop a vision on how to achieve the goal of gender parity in the European energy industry by 2050. To develop a strategic vision, it is necessary to:

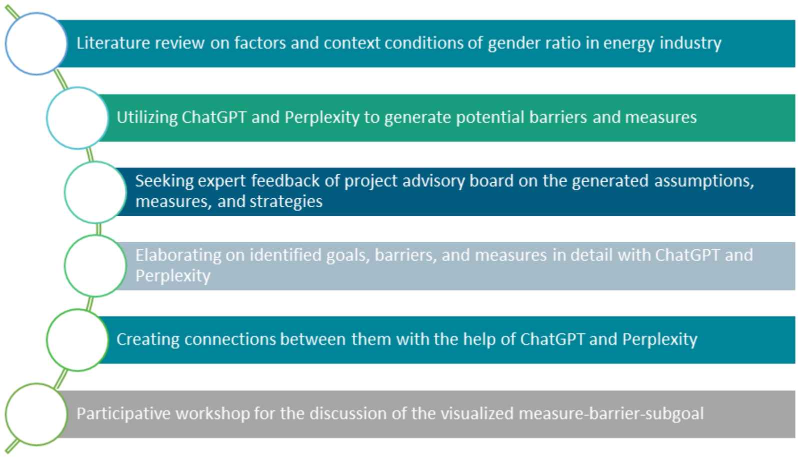
- identify influential factors for the gender ratio in the energy sector,
- comprehensively identify measures for the fields of business, policy and higher education that can plausibly contribute to increasing the proportion of women in companies in the energy sector, and
- bundle the measures into strategies in order to derive an intersectoral strategy roadmap.

To achieve these work objectives, a five-stage process was followed, which is shown in Exhibit 48 below.

First, the key factors and contextual conditions influencing the proportion of women in the energy industry were presented as part of a literature review. Based on the literature review, sub-goals were formulated for the three sectors of business, policy, and higher education on the path to parity in 2050 (e.g., "Increase the number of women among employees, especially in R&I positions").

The compact summary of the literature review results was entered into ChatGPT, a large language model-based chatbot, with appropriate commands ("prompts"). The aim was to generate a list of appropriate measures for the Business, Policy, and Higher Education sectors to contribute to an increase in the proportion of women in the energy industry and to condense these measures into an intersectoral strategy.

Exhibit 48: Hybrid Strategy-Foresight-Methodology



Source: Striebing et al. (2023)

The input and output of ChatGPT was presented as a comprehensive text document to the Advisory Board of the study to assess the plausibility of the document, identify blind spots, and enhance the quality of the analysis through further comments and feedback. The feedback from the Advisory Board was integrated into the overall document by the research team.

The revised text document was again entered as input with corresponding commands ("prompts") into ChatGPT and also into Perplexity, another language model-based chatbot, for triangulation. The goal was now to comprehensively generate potential barriers for each of the sectoral subgoals, as well as measures to overcome the barriers. The generated barriers and measures were ordered manually, and duplicates were deleted. Using ChatGPT and Perplexity, plausible measure-barrier-subgoal connections were also identified and reviewed by the research team. The resulting network was graphically visualized.

In the final event of the study, the visualisations of the measure-barrier-subgoal links were discussed in small groups and evaluated regarding their impact potential and whether they are rather measures to be implemented in the short term or in the long term. The workshop material was evaluated and used to formulate strategy packages.

6.4 Review of the state-of-the-art in research and practice

6.4.1 Literature review

Going beyond incorporating the findings from relevant previous and ongoing EU funded projects listed above, the consortium conducted a thorough literature analysis on gender balance in energy (transition), aiming above all at those published after 2017.

For the purpose of the present study, a study of outstanding relevance is "Women, Gender Equality and the Energy Transition in the EU"[343], authored by consortium member and chair of the Advisory and Observer Board Prof. Joy Clancy, together with Marielle Feenstra. The report contextualises the role of women in energy professions and transition, including the STEM talent pipeline. Another non-quantitative piece of great value is the GEECCO project's literature review on research in energy and gender[344]. These and other relevant literature have been reviewed for contextualisation of the quantitative data. The review team has been advised in this task by Prof. Clancy, Chair of our Advisory and Observer Board (AOB).

Literature wase searched in several sources, including:

- Results from national and EU-funded research projects;
- Cross-country and national level data sources on women in energy;
- Publications on websites by stakeholder organisations representing women in energy, engineering and STEM stakeholder organisations;
- Publications on websites of renewable energy stakeholder organisations;
- Publications of national Energy Ministries and statistical bureaus of SET Plan and Mission Innovation countries;
- Search in scientific publication data bases like Elsevier, SAGE etc.;
- Search for publications promoted on LinkedIn and Twitter.

Search terms focused on "women" / "gender" in "energy" (and subsectors), "renewable energy" (and subsectors, was well as associated terms like "electricity". Resources on women/ girls in STEM education were considered for the mapping of energy-related skills. We considered literature on women in engineering to the extent as it touches upon women in (renewable) energies, as well as for comparison of labour force participation between different engineering sectors. Likewise, literature on women in non-renewable energies was considered for contextualisation and comparison.

The task was not limited to literature published in English language, but also covered sources available in any of the following languages: Bulgarian, Croatian, Czech, Danish, Dutch, French, Greek, German, Hungarian, Icelandic, Italian, Norwegian, Polish, Portuguese, Romanian, Slovak, Spanish, Swedish, Turkish.

We recognise that the linguistic challenge also includes the contrasting vocabularies deployed in the fields related to the energy transition, gender equality and R&I. A common vocabulary was developed in the early stagey of the project, building on prominent literature, available glossaries and official definitions (as quoted in the present document) to ensure

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[343] Clancy, J. & Feenstra, M. (2019) 'Women, Gender Equality and the Energy Transition in the EU', Study for FEMM Committee, European Parliament, available online: Link.

[344] Mort, H. (2019) 'A Review of Energy and Gender Research in the Global North'. GEECCO project deliverable, available online: Link.

that we use a vocabulary that as far as possible reflects the agreed standards across the SET Plan countries and beyond.

7 Annex II: Tabular report on retrospective mapping of energy-related education & training

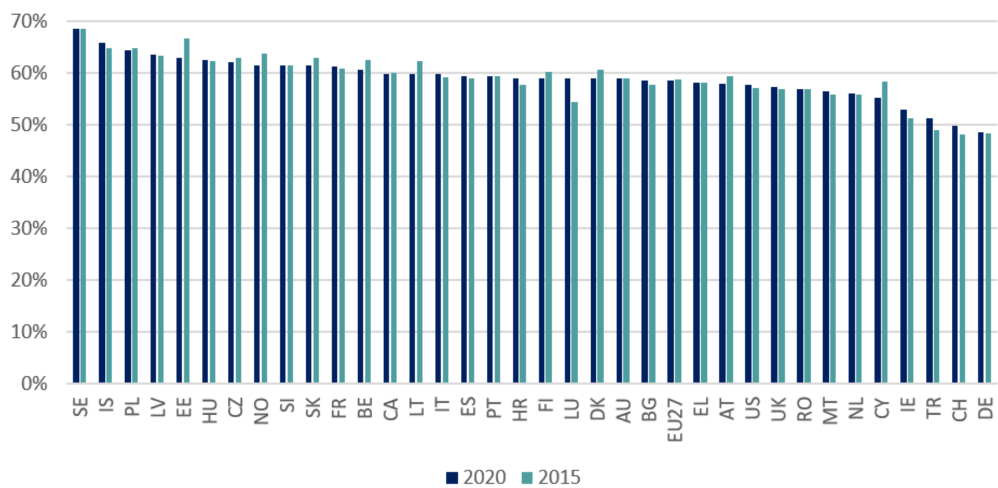
7.1 Women's representation among tertiary graduates

This section examines the representation of women among graduates with bachelor's, master's, and doctoral degrees as well as the progress made in improving women's presence in tertiary education in recent years.

7.1.1 Bachelor's graduates

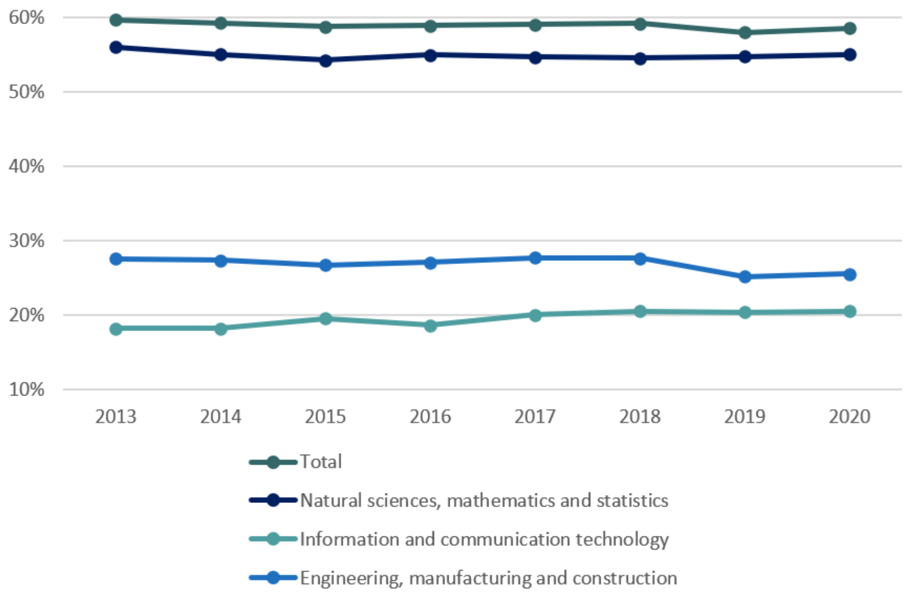
Exhibit 49 displays the share of women among all bachelor's graduates when no differentiation is made by field of study, in 2015 and 2020. In 2020, nearly all countries (except for Switzerland and Germany) had shares of women of at least 50%. The ratio in the EU27 countries was 58.4%. The highest shares in the full sample were observed in Sweden (68.5%) and Iceland (65.8%), where women were strongly overrepresented. While the lowest shares were observed in Switzerland (49.7%) and Germany (48.6%), both were still close to parity. Since 2015, women's representation at European level has remained virtually unchanged and at a high level (the difference is less than 1 percentage point (p.p.) (see also Exhibit 50). However, there were more significant changes at the country level. Luxembourg experienced the biggest improvement in terms of women's representation between 2015 and 2020, its share of female graduates increased by 4.5 p.p. Estonia and Cyprus experienced the largest declines in the shares of female bachelor's graduates, witnessing decreases of 3.8 and 3.1 p.p., respectively. Nevertheless, women still accounted for more than 50% of graduates in both countries.

Exhibit 49: Share (%) of women among bachelor's graduates, 2015 and 2020



Notes: Definition differs: BE, DE (2015), IE, HU (2020); Provisional: IT (2020)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Exhibit 50: The share of women (%) in the EU27 countries among bachelor's graduates by broad field of study



Notes: Definition differs: 2018 (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

While female presence is high, often even higher than 50%, among bachelor's graduates when no differentiation is made by field of study, significant differences persist when considering the three broad fields of education that importantly relate to the knowledge and skills required for subsequent employment in the energy sector or in an energy-related field. The table in Exhibit 51 shows the share of women among bachelor's graduates by broad field of study, in 2015 and 2020. At European level, the share of female bachelor's graduates in 2020 in the field of Natural Sciences, Mathematics & Statistics was at 55% close to the overall share of female bachelor's graduates. However, the proportion of women was substantially lower in the fields of ICT (20.6%) and Engineering, Manufacturing & Construction (25.6%). Women in the field of ICT were highly underrepresented in 18 countries (AT, BE, CH, CZ, DK, ES, FR, HU, IT, LT, LU, MT, NL, NO, PT, SI, SK, UK) where the shares of female bachelor's graduates were less than 20%. Switzerland had the lowest share of female ICT graduates (10.6%). Sweden, in turn, had the highest proportion of female ICT graduates (39.2%). While the situation was slightly more balanced among bachelor's graduates in the broad field of Engineering, Manufacturing & Construction, four countries (CH, CY, DE, IE) still had shares of women lower than 20%. Switzerland also had the lowest proportion of female graduates (15.4%) in this field while Poland had the highest (38.7%).

Little or even no progress is noticeable in improving women's representation in ICT and Engineering, Manufacturing & Construction since 2015 at European level. The shares of female ICT bachelor's graduates in the EU27 countries changed by less than 1 p.p. while they worsened by slightly more than 1 p.p. in the field of Engineering, Manufacturing & Construction (see also Exhibit 56). Nevertheless, some countries have made improvements (more than 1 p.p. change), especially the non-European English-speaking countries (AU, CA, US) which progressed significantly in women's representation in ICT and Engineering, Manufacturing & Construction. Six countries (CA, HR, IS, LU, NL, US) were able to achieve progress in all three fields. Among these countries, Luxembourg stood out as it achieved increases of 10 p.p. and above in the share of women among bachelor's graduates in Natural

Sciences, Mathematics & Statistics (16.7 p.p.) and ICT (15.7 p.p.) – the latter had zero female graduates in 2015 - between 2015 and 2020. In the field of Engineering, Manufacturing & Construction, Iceland achieved the largest increase in the proportion of women, at 7.6 p.p.

Exhibit 51: Share (%) of women among bachelor's graduates by broad field of study, 2015 and 2020

Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	2015	2020	2015	2020	2015	2020
AU	51.14	50.61	17.60	21.90	21.71	26.49
AT	50.96	49.92	15.79	19.41	26.48	27.63
BE	41.10	38.32	7.78	12.56	17.65	22.35
BG	66.26	68.15	38.87	31.90	25.93	26.03
CA	55.55	58.24	19.11	20.67	21.56	25.87
CH	43.40	45.50	9.65	10.57	12.58	15.40
CY	79.08	74.86	38.78	25.19	31.09	19.19
CZ	62.35	62.37	14.88	15.86	31.38	32.57
DE	43.84	48.27	18.15	20.78	17.71	17.82
DK	51.45	55.44	12.35	15.79	27.30	24.13
EE	66.14	69.37	27.02	32.06	31.06	30.90
EL	52.74	54.77	42.00	32.98	29.48	34.89
ES	54.20	52.70	15.81	13.64	26.57	27.84
EU27	**54.28**	**55.02**	**19.59**	**20.55**	**26.74**	**25.58**
FI	59.57	58.02	16.11	21.94	20.11	21.26
FR	49.83	53.34	14.26	17.29	29.24	25.99
HR	62.31	65.16	18.83	23.21	28.57	33.79
HU	55.66	53.91	23.68	16.52	25.83	23.80
IE	51.62	50.58	23.59	25.50	12.93	17.26
IS	50.39	52.63	23.42	25.78	28.94	36.49
IT	59.32	58.09	21.01	16.53	31.40	28.65
LT	58.47	61.13	9.73	16.07	25.22	24.55
LU	36.84	53.57	0.00	15.56	16.28	20.00
LV	59.82	61.43	20.05	23.78	27.64	27.48
MT	45.36	49.14	19.81	13.10	19.69	26.94
NL	43.65	47.90	8.84	12.14	18.66	22.84
NO	63.54	51.28	15.11	18.39	24.95	25.91
PL	70.91	70.40	20.80	22.41	39.31	38.73
PT	60.66	59.62	17.10	17.85	30.10	28.62
RO	64.37	65.81	30.36	30.53	33.73	33.11
SE	60.74	59.38	32.51	39.22	32.87	35.36
SI	62.87	62.11	16.53	14.06	24.23	24.87
SK	63.89	67.00	13.85	16.55	27.28	24.57
TR	58.91	59.71	34.88	29.67	32.59	31.92
UK	53.31	45.72	17.32	16.53	19.85	22.57
US	53.03	57.78	19.34	22.40	20.55	24.89

Notes: Definition differs: BE, DE (2015, for all fields), IE, HU (2020, for all fields); Provisional: IT (2020, for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

To further assess the gender balance in education and training that is of importance for the energy sector, the table in Exhibit 52 reports the variation in women's representation among bachelor's graduates in selected narrow fields of education that are of particular relevance for the purpose of this study. While the share of women at European level in 2020 was between 43.1% and 52.3% among bachelor's graduates in the fields of Environment, Physical Sciences, and Mathematics & Statistics, it was particularly low in Engineering & Engineering Trades (19.5%). This subfield encompasses, among others, the detailed field Electricity and Energy. Women were severely underrepresented in 19 countries (AU, AT, BE, CH, CY, CZ, DE, DK, EE, FI, HU, IE, LT, LU, LV, NL, SI, SK, UK) where the proportions of female graduates in Engineering & Engineering Trades were lower than 20%. Switzerland had the lowest share with only 9.7%. Romania fared best by reaching a share of 28.5%.

Exhibit 52: Share (%) of women among bachelor's graduates by narrow field of study, 2015 and 2020

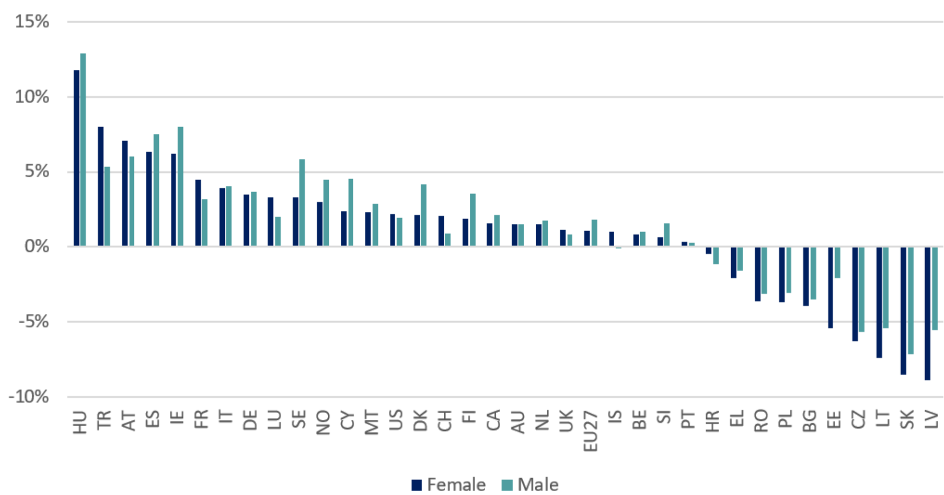
Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	2015	2020	2015	2020	2015	2020	2015	2020
AU	53.01	55.71	37.87	41.64	37.24	30.85	15.77	18.82
AT	51.55	52.33	31.94	31.99	38.87	36.93	13.72	16.29
BE	26.67	48.61	28.34	28.28	45.69	33.94	9.66	13.71
BG	65.48	59.70	62.74	61.48	63.64	53.92	22.45	21.40
CA	:	61.61	:	41.88	:	46.44	:	21.84
CH	48.44	52.58	33.94	39.78	28.64	23.70	7.20	9.70
CY	68.75	58.33	82.61	53.66	78.26	86.00	19.88	10.33
CZ	71.81	63.86	50.17	44.47	51.45	50.34	19.26	19.64
DE			34.41	38.62	38.05	38.04	11.39	10.29
DK		63.16	40.98	40.90	30.72	32.98	15.00	17.26
EE	70.87	68.92	52.50	61.86	79.41	64.29	16.91	16.76
EL	56.30	58.33	49.39	55.33	51.50	50.07	19.22	25.74
ES	50.55	50.51	43.83	43.79	45.74	42.80	22.33	24.88
EU27	**57.42**	**52.29**	**45.23**	**46.75**	**48.13**	**43.13**	**19.33**	**19.53**
FI	69.43	76.58	49.78	45.14	43.16	43.55	18.58	19.01
FR	42.46	26.71	44.82	48.97	36.12	36.49	20.42	21.21
HR	68.00	63.24	53.76	61.31	66.03	60.20	17.46	24.31
HU	59.38	57.46	44.02	43.39	59.84	47.87	20.13	17.80
IE	36.30	41.70	46.30	46.12	31.03	28.13	9.96	12.72
IS	100.00	100.00	41.67	61.76	16.67	33.33	18.00	23.08
IT	53.66	54.96	46.79	44.98	52.77	46.44	22.08	24.81
LT	75.00	60.00	42.96	48.43	64.37	58.82	17.46	17.30
LU			0.00	66.67	44.44	41.67	9.09	18.52
LV	65.22	66.67	48.85	51.35	69.35	65.85	18.38	15.98
MT	35.00	0.00	40.74	46.34	38.89	42.11	18.64	21.92
NL	33.33	45.37	22.05	27.35	33.42	34.87	9.15	13.11
NO			51.56	39.52	32.26	29.20	23.21	21.99
PL	68.70	68.65	67.09	69.68	68.96	60.78	27.05	26.71
PT	46.30	48.44	43.89	47.04	63.57	50.36	24.25	23.23
RO	63.44	53.36	58.58	61.97	70.45	63.06	28.45	28.54
SE	72.48	76.90	53.40	51.76	42.21	30.00	26.62	28.15
SI	84.00	66.67	48.35	44.33	61.72	50.00	13.18	16.19
SK	54.84	60.66	56.07	55.86	60.00	61.43	12.23	11.04
TR		21.43	48.72	45.28	64.67	65.06	24.79	21.83
UK		51.33	40.61	44.14	41.04	37.87	13.04	16.96
US	51.77	56.81	38.44	42.55	42.97	42.02	17.90	21.71

Notes: Definition differs: BE, DE (2015, for all fields), IE, HU (2020, for all fields); Provisional: IT (2020, for all fields)
Other: " " indicates that the denominator is zero; ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

At European level, the share of female bachelor's graduates in the field of Engineering & Engineering Trades hardly changed since 2015 (the difference between 2015 and 2020 was less than 1 p.p.). At country level, however, progress is visible some countries. Luxembourg was able to improve women's presence the most by increasing their proportion by 9.4 p.p.. Croatia comes in second place as female representation increased by 6.8 p.p. In the narrow field of Mathematics & Statistics, the share of female graduates in the EU27 countries decreased by 5 p.p. compared to 2015. This mirrors the development in all but 10 countries (CY, DE, FI, FR, IS, MT, NL, SK, TR, US). Of the few countries that achieved higher shares of female graduates in this field, Iceland saw the highest increase (16.7 p.p.). Finally, the progress in the Netherlands is noteworthy, as the share of women increased in all four narrow fields.

Exhibit 53 reports the compound annual growth rate (CAGR) of female and male bachelor's graduates between 2010 and 2020 without any differentiation by field of study. At the European level, the numbers of female and male graduates developed relatively similarly. The number of female graduates grew at an annual average rate of 1.1% while the number of male graduates grew by 1.8%. The numbers of male and female bachelor's graduates in non-European countries (AU, CA, US) developed similarly. The number of male bachelor's graduates grew at a faster rate than the number of women in eight countries in the sample (CY, DK, ES, FI, HU, IE, NO, SE) while it either developed relatively equally, grew at a slower pace than the number of women or contracted for both genders (BG, CZ, EE, EL, LV, LT, PL, RO, SK) in the rest of the sample. The highest growth rates among both men and women at the bachelor's level were observable in Hungary, where on average male graduates grew by 12.9% and female graduates by 11.8% per year. In Latvia, the number of female bachelor's graduates declined the most at an average annual rate of 8.9%. However, this cannot be interpreted as a movement backwards in terms of gender balance as Latvia's share of female bachelor's graduates remained at a high level of 63.5% in 2020 (see Exhibit 49). The largest difference between the CAGR of women and men can also be found in Latvia (3.4 p.p.), where the shares of graduates of both genders declined, followed by Turkey (2.6 p.p.), where the shares of both genders, especially women, grew.

Exhibit 53: Compound annual growth rate (CAGR, %) of bachelor's graduates by sex, 2010-2020



Notes: Exceptions to the reference period: UK: 2012-2020; HR, CZ, EU27, DE, EL, IS, IE, IT, LU, MT, RO, CH: 2013-2020***;*** Definition differs: IE & HU (2020); Provisional: IT (2020)

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Exhibit 54: Compound annual growth rate (CAGR, %) of bachelor's graduates, by sex and broad field of study, 2010-2020

Country	F05: Natural sciences, mathematics and statistics		F06: Information and communication technologies		F07: Engineering, manufacturing and construction	
	Female	Male	Female	Male	Female	Male
AU	4.07	4.91	8.15	5.60	0.87	0.66
AT	4.32	5.52	3.03	0.63	8.24	5.50
BE	3.13	3.49	11.53	4.82	4.21	1.43
BG	-5.67	-6.18	1.35	5.43	-7.05	-4.35
CA	3.89	3.10	13.68	10.84	1.92	2.57
CH	4.28	3.17	12.43	4.88	7.09	1.68
CY	7.60	3.24	-4.45	1.43	-2.38	3.72
CZ	-5.46	-6.54	-2.12	-4.18	-3.93	-5.28
DE	-1.51	-1.88	8.24	3.88	3.86	3.97
DK	6.43	5.76	5.78	8.35	2.98	5.85
EE	-6.11	-5.85	3.83	1.28	-2.10	-3.47
EL	2.52	2.01	-8.99	-6.88	-1.78	-4.11
ES	48.17	49.21	-1.87	1.44	0.42	0.47
EU27	**2.66**	**3.25**	**5.77**	**3.55**	**-1.08**	**0.40**
FI	4.58	6.21	3.61	1.59	1.12	2.24
FR	3.49	1.82	5.31	2.31	0.64	2.10
HR	7.38	5.87	4.47	-2.66	6.88	2.81
HU	8.25	11.44	11.30	14.81	8.81	10.77
IE	14.76	13.86	27.67	19.39	10.04	8.06
IS	-5.63	-4.03	19.16	11.09	1.77	-0.54
IT	3.03	3.36	9.20	6.86	-0.95	1.68
LT	-1.51	-3.25	-1.44	-1.43	-6.89	-5.82
LU	7.57	11.68	12.87	8.84	6.94	-3.48
LV	-8.63	-6.52	2.03	-2.02	-4.23	-3.53
MT	-9.20	-4.08	0.49	0.66	7.75	3.47
NL	8.39	5.75	13.60	4.11	5.81	1.10
NO	3.03	7.24	15.16	9.93	1.72	1.87
PL	-4.44	-5.26	1.50	-1.58	1.25	-0.90
PT	3.61	4.65	-0.41	2.51	-1.22	-0.24
RO	-0.47	-0.13	22.76	22.38	-7.84	-6.67
SE	6.92	12.22	19.05	12.27	6.13	4.21
SI	14.50	14.92	11.01	10.65	2.09	2.03
SK	-7.67	-10.15	0.76	-4.55	-10.35	-7.50
TR	-1.06	-5.85	9.03	5.60	14.56	11.73
UK	1.77	1.81	2.51	3.14	2.71	0.82
US	5.46	3.47	10.49	8.34	7.64	4.32

Notes: Exceptions to the reference period: UK: 2012-2020; HR, CZ, EU27, DE, EL, IS, IE, IT, LU, MT, RO, CH: 2013-2020; Definition differs: IE & HU (2020, for all fields); Provisional: IT (2020, for all fields); Includes data from another category: CA (2010, for Engineering, Manufacturing & Construction), TR (2010, for all fields except Information & Communication Technologies)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

The table in Exhibit 54 differentiates between the three different broad fields of study that relate to STEM education. In the EU27 countries, the CAGRs of both female and male graduates in the fields of Natural Sciences, Mathematics & Statistics and in ICT were higher than the CAGRs when no differentiation is made by field of study. The growth rates were lower only in Engineering, Manufacturing & Construction. It is noticeable that ICT was not only the field with the highest growth rates of bachelor's graduates but also the only field where the number of female graduates increased faster than their male counterparts (5.8%

for women and 3.6% for men). This contrasts with the situation in Engineering, Manufacturing & Construction, where the CAGR of women was not only lower than the one of men but also negative (-1.1% for women and 0.4% for men). Thus, the number of female bachelor's graduates decreased over the considered time horizon while the number of male graduates increased. Nevertheless, many countries exhibited equal or higher positive growth rates of female graduates in Engineering, Manufacturing & Construction. Among them, Luxembourg stood out by displaying the largest difference (10.4 p.p.) between women and men. The number of female graduates grew by 6.9% while the number of male graduates decreased by 3.5% mirroring the improvements made in increasing the share of women in this field visible in Exhibit 51.

The table in Exhibit 55 shows further disaggregation into the four narrow fields of study. While the number of female bachelor's graduates at European level grew in the fields of Physical Sciences (5.9%) and Engineering & Engineering Trades (3.1%), it decreased in Environment (-5.7%) and Mathematics & Statistics (-1.1%). At the same time, the number of male graduates developed relatively equally in Physical Sciences and Engineering & Engineering Trades while it decreased at a slower pace in Environment and even increased in Mathematics & Statistics. Despite the decrease, women with degrees in Environment-related studies remained slightly overrepresented in 2020 while they were slightly underrepresented in Mathematics & Statistics (see Exhibit 59).

Exhibit 55: Compound annual growth rate (CAGR, %) of bachelor's graduates, by sex and narrow field of study, 2010-2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	-5.85	-7.87	-16.21	-13.24	2.17	6.73	3.26	1.11
AT	4.20	5.98	7.00	9.01	5.32	5.50	7.53	5.65
BE	2.63	-8.40	2.70	4.28	-2.21	2.89	10.30	9.66
BG	-11.05	-6.78	-6.61	-6.24	-8.38	-6.80	-8.97	-4.87
CA	1.62	1.73	-1.90	-0.07	5.83	4.23	4.83	2.55
CH	3.59	0.22	3.79	3.14	1.17	5.35	8.76	0.95
CY	-13.93	13.99	-4.54	0.54	4.38	-6.70	0.41	3.97
CZ	-13.97	-9.21	-13.70	-11.43	-18.70	-12.61	0.96	-5.28
DE	0.00	0.00	-1.47	-2.46	-3.75	-0.90	3.24	5.16
DK	-7.65	-11.67	-1.59	-2.24	6.62	9.98	6.62	12.29
EE	-12.23	-9.59	1.48	-3.00	-6.16	5.24	-4.33	-2.96
EL	6.52	7.57	2.79	-0.74	-0.98	0.54	0.16	-4.27
ES	19.45	19.95	85.92	58.70	17.50	25.86	5.77	5.01
EU27	**-5.69**	**-1.70**	**5.87**	**5.81**	**-1.06**	**3.29**	**3.12**	**3.47**
FI	10.44	11.83	1.81	5.60	7.09	6.41	0.31	1.67
FR	-8.74	-1.46	6.46	1.91	1.83	3.76	1.83	1.28
HR	20.39	25.59	12.21	7.07	-5.66	-2.28	13.19	5.87
HU	12.94	18.54	7.84	11.19	1.25	8.40	7.40	10.88
IE	-0.14	2.48	18.96	16.55	29.96	16.95	22.66	16.88
IS	-12.76	-100.00	-1.89	-12.46	10.41	15.04	-0.36	0.56
IT	1.74	1.77	9.39	5.22	0.09	4.41	24.87	21.60
LT	-9.34	-3.97	-2.97	-3.60	-5.86	-5.79	-5.24	-4.46
LU	-100.00	-100.00	0.00	0.00	3.24	4.92	25.85	-1.24
LV	-9.24	-10.13	-12.83	-10.57	-0.36	8.84	-5.46	-1.79
MT	-100.00	4.20	-4.38	-5.63	-3.14	1.37	-0.44	-0.49
NL	15.26	6.99	6.30	4.09	7.35	5.90	9.87	2.74
NO	-100.00	-100.00	3.45	6.97	3.24	2.42	0.36	1.88
PL	-13.46	-15.67	-1.40	-3.22	-6.15	-4.21	0.68	0.05
PT	0.33	3.68	3.01	2.30	3.75	8.46	3.00	2.38
RO	3.52	12.57	-5.15	-4.88	1.84	5.87	-3.95	-4.50
SE	7.42	8.37	9.23	10.04	11.16	19.20	7.19	4.59
SI	-0.75	-2.75	56.12	26.87	-0.31	1.34	17.31	3.20
SK	-10.72	-14.35	-8.38	-8.96	-12.26	-14.21	-14.50	-7.21
TR	-62.09	40.85	-4.84	-6.34	0.53	-6.12	22.47	13.50
UK			1.50	0.86	0.83	3.66	4.63	1.03
US	8.26	5.26	4.74	3.87	5.10	5.66	9.17	5.20

Notes: Exceptions to the reference period: **Environment:** SI: 2012-2020; CY, CZ, DE, EL, IS, IT, MT, RO, ES: 2013-2020; IE, TR: 2014-2020 (women), 2013-2020 (men); AU, HR, EU27, CH: 2015-2020; DK, LU: 2016-2020; NO: 2017-2020 (women), 2019-2020 (men); CA: 2019-2020; **Physical Sciences:** UK: 2012-2020; HR, CZ, EU27, DE, EL, IS; IE, IT, MT, RO, CH: 2013-2020; LU: 2014-2020 (women), 2013-2020 (men); **Mathematics & Statistics, Engineering & Engineering Trades:** UK: 2012-2020; HR, CZ, EU27, DE, EL, IS, IE, IT, LU, MT, RO, CH: 2013-2020;

Definition differs: IE & HU (2020, for all fields); Provisional: IT (2020, for all fields); Includes data from another category: CA & TR (2010, for Physical Sciences, Engineering & Engineering Trades)

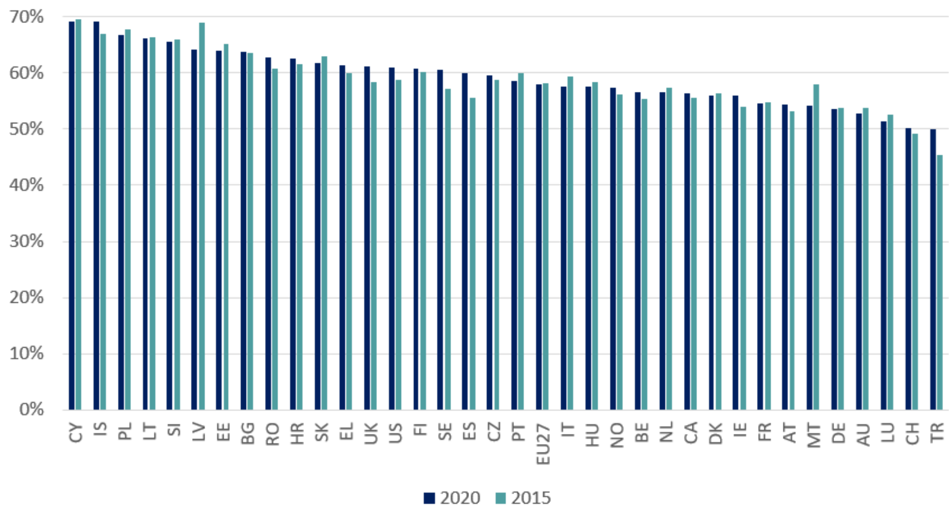
Other: " " indicates one single point of reference; a CAGR of -100% indicates that the absolute value in 2020 was zero

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

7.1.2 Master's graduates

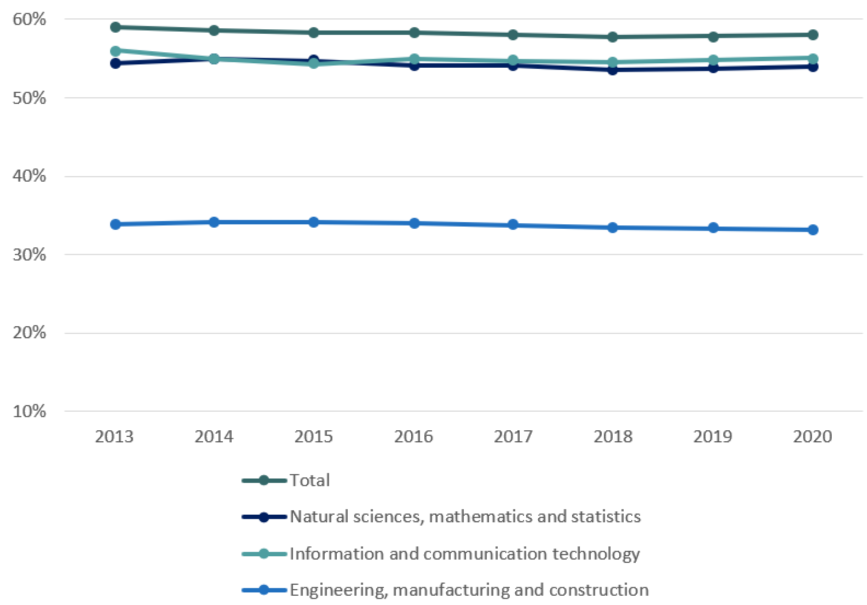
Exhibit 56 displays the proportion of women among all master's graduates regardless of their field of study, in 2015 and 2020. In the EU27 countries, the share of female graduates in 2020 was 58% and therefore very similar to the bachelor's level. The proportion of women among master's graduates was already at a high level in 2015 and changed little over the five-year period (less than 1 p.p.) (see Exhibit 57). Cyprus (69.1%) and Iceland (69.1%) had the highest shares of female master's graduates while Switzerland (50.2%) and Turkey (49.9%) had the lowest. Thus, even in the country where women's presence was the lowest across all countries, the proportion of women was effectively balanced. Noteworthy in this context is the progress made by Turkey as its proportion of women increased by 4.6 p.p. in comparison to 2015. Latvia experienced an equally strong decline of its proportion of female graduates while still maintaining its position as one of countries with the highest shares of female graduates.

Exhibit 56: Share (%) of women among master's graduates, 2015 and 2020



Notes: Definition differs: IE, HU (2020); Provisional: IT (2020)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Exhibit 57: The share of women (%) in the EU27 countries among master's graduates by broad field of study



Notes: Definition differs: 2018 (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

The table in Exhibit 58 displays women's share among master graduates across the three broad fields of education, in 2015 and 2020. At European level, the proportion of women among master's graduates in 2020 was balanced in both Natural Sciences, Mathematics & Statistics (54%) and ICT (55.0%). This contrasts with the situation at the bachelor's level, where the share of female students in the field of ICT was significantly below parity. Women were underrepresented among master's graduates in the field of Engineering, Manufacturing & Construction, in which they only made up 33.2%. Furthermore, women's share in this field only changed marginally (less than 1 p.p.) between 2015 and 2020.

Mirroring anew the situation at bachelor's level, Switzerland had the lowest female presence in Engineering, Manufacturing & Construction (24.8%) although it somewhat improved (by 2.1 p.p.) relative to 2015. The largest improvement was observed in Luxembourg where the share of women in the field of Engineering, Manufacturing & Construction grew by 12.9 p.p.. Luxembourg was also the country that saw the most progress in the other two fields, with improvements of 16.7 p.p. in ICT and 8 p.p. in Natural Sciences, Mathematics & Statistics. The largest step backwards in the field of Engineering, Manufacturing & Construction occurred in France, where women's presence deteriorated by 4.1 p.p.. The largest decline overall was in ICT in the United Kingdom, where the share of women deteriorated from 53.3% to 31.5%. A similar decline can be observed in Canada, where women's share in ICT contracted by 13.7 p.p..

Exhibit 58: Share (%) of women among master's graduates by broad field of study, 2015 and 2020

Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	2015	2020	2015	2020	2015	2020
AU	49.79	52.81	22.89	33.90	29.18	29.86
AT	47.79	48.87	50.96	49.92	27.13	28.23
BE	47.37	45.95	41.10	38.32	26.88	26.22
BG	71.62	68.41	66.26	68.15	33.61	33.25
CA	49.97	52.05	44.95	31.26	27.85	29.42
CH	44.58	42.70	43.40	45.50	22.66	24.79
CY	83.33	60.81	79.08	74.86	47.11	45.41
CZ	60.31	64.02	62.35	62.37	33.01	34.84
DE	50.96	51.65	43.84	48.27	25.23	26.39
DK	48.27	53.37	51.45	55.44	36.23	37.40
EE	65.22	62.02	66.14	69.37	34.42	36.98
EL	48.54	46.97	52.74	54.77	47.22	43.31
ES	54.09	47.36	54.20	52.70	37.33	38.08
EU27	**54.69**	**53.96**	**54.28**	**55.02**	**34.16**	**33.21**
FI	56.94	55.45	59.57	58.02	26.26	25.96
FR	45.78	51.04	49.83	53.34	34.20	30.12
HR	64.52	66.13	62.31	65.16	31.60	36.79
HU	50.20	51.18	55.66	53.91	30.34	33.77
IE	47.60	47.17	51.62	50.58	33.99	36.17
IS	64.15	56.79	50.39	52.63	34.41	42.47
IT	62.03	58.62	59.32	58.09	36.79	34.60
LT	57.29	64.27	58.47	61.13	30.17	32.82
LU	51.52	59.52	36.84	53.57	26.67	39.53
LV	62.50	63.58	59.82	61.43	34.46	33.27
MT	62.50	63.46	45.36	49.14	30.59	42.86
NL	43.79	45.26	43.65	47.90	28.97	32.27
NO	51.92	50.70	63.54	51.28	34.01	37.62
PL	74.79	72.21	70.91	70.40	43.51	44.06
PT	62.73	60.50	60.66	59.62	37.20	36.41
RO	67.74	74.18	64.37	65.81	41.03	43.24
SE	53.40	53.08	60.74	59.38	32.18	35.84
SI	63.38	62.89	62.87	62.11	30.41	36.57
SK	65.08	67.19	63.89	67.00	29.03	27.72
TR	57.66	58.30	58.91	59.71	34.58	40.10
UK	59.27	49.85	53.31	31.48	30.70	35.37
US	49.07	52.60	30.77	33.73	28.37	30.36

Notes: Definition differs: IE, HU (2020, for all fields); Provisional: IT (2020, for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

The picture that emerged when considering the broad STEM-related fields of education is confirmed when examining the four narrow fields. At European level, female master's graduates accounted for relatively high proportions of graduates in Environment, Physical Sciences and Mathematics & Statistics, ranging between 44.2% and 57.3%. However, as in the broad Engineering field, women's representation was quite low (26.2%) in the field of Engineering & Engineering Trades. The share of female master's graduates was below 20% in only four countries (AT, BE, CH, SK), a much smaller number than at the bachelor's level.

The lowest proportion was observed in Slovakia (14.8%) while the highest share was present in Iceland (41.7%). Moreover, the comparison to 2015 illustrates that the share of female master's graduates in the field of Engineering & Engineering Trades in the EU27 countries did not improve since then (difference less than 1 p.p.).

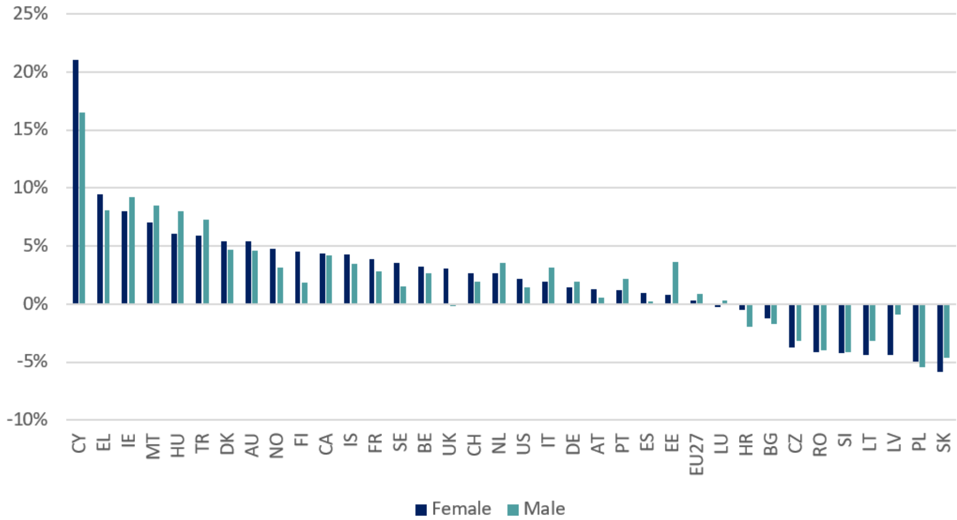
Exhibit 59: Share (%) of women among master's graduates by narrow field of study, 2015 and 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	2015	2020	2015	2020	2015	2020	2015	2020
AU	57.32	58.42	35.79	43.62	39.33	41.09	20.17	20.37
AT	46.63	62.15	31.30	30.86	30.50	35.19	17.31	19.04
BE	54.46	59.41	37.50	34.32	42.09	35.37	18.18	15.39
BG	70.59	64.56	64.96	63.21	47.62	72.22	24.03	21.51
CA	:	60.16	:	40.69	:	40.06	:	24.78
CH	57.46	49.30	39.62	38.37	29.84	28.13	12.97	17.41
CY	80.00	33.33	90.91	18.18	77.27	75.00	34.09	38.74
CZ	64.46	67.59	48.98	48.67	50.63	49.73	20.38	23.61
DE			38.97	39.91	54.42	55.08	20.23	23.17
DK		62.50	44.48	40.91	38.05	38.68	28.38	32.30
EE	62.82	79.49	58.89	52.00	56.00	47.62	25.94	28.22
EL	50.00	52.38	54.23	47.08	46.17	43.07	36.19	32.45
ES	50.24	54.76	45.49	40.90	42.41	31.00	27.20	27.53
EU27	**57.46**	**57.32**	**45.12**	**44.22**	**50.37**	**45.63**	**25.67**	**26.19**
FI	66.67	64.47	51.33	42.06	44.17	47.64	22.36	22.70
FR	47.42	37.12	40.73	44.91	29.18	28.16	24.29	22.97
HR	77.78	73.13	56.03	57.22	70.14	69.77	22.88	26.62
HU	51.72	60.95	35.57	38.68	46.97	42.20	20.85	24.66
IE	48.11	51.07	45.88	41.74	40.31	34.15	32.66	31.21
IS	73.91	71.43	50.00	43.75	0.00	12.50	18.75	41.67
IT	53.06	52.63	40.72	43.27	54.63	47.16	26.14	25.98
LT	76.67	88.89	45.45	51.85	58.54	57.75	22.30	26.10
LU			36.36	50.00	60.00	44.44	26.67	35.71
LV	65.79	47.73	51.16	65.00	57.89	71.43	22.66	20.80
MT		100.00	53.33	50.00	66.67	60.00	28.38	33.33
NL	52.55	56.83	21.75	23.13	34.78	30.56	17.53	22.05
NO	58.06	65.88	40.05	37.84	34.65	25.64	29.15	32.76
PL	72.10	67.92	71.70	69.29	71.69	64.94	33.36	32.92
PT	65.33	66.92	46.47	45.42	54.47	51.10	30.76	29.36
RO	62.86	61.98	64.10	69.72	70.33	77.63	35.06	38.35
SE	65.36	65.94	43.90	41.53	34.78	26.11	27.43	31.92
SI	54.55	73.33	57.73	51.33	62.50	58.33	12.93	24.22
SK	72.01	62.18	55.95	58.07	46.72	59.84	17.14	14.76
TR	51.06	62.07	52.23	47.36	53.04	57.55	27.51	30.92
UK		55.58	47.54	47.61	39.44	47.17	20.44	25.54
US	55.46	59.83	37.37	39.15	40.57	42.19	24.61	27.05

Notes: Definition differs: IE, HU (2020, for all fields); Provisional: IT (2020, for all fields)
Other: " " indicates that the denominator is zero; ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Exhibit 60 shows the CAGRs of female and male master's graduates between 2010 and 2020 across all fields of study. Similar to the bachelor's level, the number of female and male master's graduates at European level grew at an annual rate of 0.34% and 0.88%, respectively. While the gender gap was of similar size in Australia, Canada and the US (less than 1 p.p.), the growth rates for both women and men were higher than at the EU level. Female master's graduates grew at a faster rate than their male counterparts (more than 1 p.p.) in only eight countries (CY, EL, FI, FR, HR, NO, SE, UK) with Cyprus having the largest difference in growth rates. Additionally, Cyprus had the highest increase in both female (21%) as well as male (16.5%) master's graduates. Slovakia experienced the largest decrease in female representation as the number of female master's graduates declined at an annual average rate of 5.9% albeit remaining at a high level of 61.9% in 2020 (see Exhibit 56).

Exhibit 60: Compound annual growth rate (CAGR, %) of master's graduates, by sex, 2010-2020



Notes: Exceptions to the reference period: UK: 2012-2020; HR, CZ, EU27, DE, EL, IS, IE, IT, LU, MT, RO, CH: 2013-2020***;*** Definition differs: IE & HU (2020); Provisional: IT (2020)

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

The table in Exhibit 61 shows the compound annual growth rates between 2010 and 2020 of master's graduates in the three STEM fields. At European level, the trends visible at this level of education were very comparable to the developments at the bachelor's level. The number of women grew in Natural Sciences, Mathematics & Statistics (1.4%) and ICT (8.5%) while it hardly changed in Engineering, Manufacturing & Construction (declined by less than 1%). By comparison, non-European English-speaking countries (AU, CA, US) experienced significant growth for both genders in all broad fields. In the EU, women only grew more than men in the field of ICT (5 p.p) and the gap was even more pronounced than at the bachelor's level. In the field of Engineering, Manufacturing & Construction, in which the share of women was generally quite low, Ireland displayed the highest CAGR of women (22.3%) as well as the largest gap between the CAGR of women and men, in women's favour (10 p.p.).

Exhibit 61: Compound annual growth rate (CAGR, %) of master's graduates, by sex and broad field of study, 2010-2020

Country	F05: Natural sciences, mathematics and statistics		F06: Information and communication technologies		F07: Engineering, manufacturing and construction	
	Female	Male	Female	Male	Female	Male
AU	9.52	5.78	16.91	10.18	6.18	6.99
AT	1.64	2.46	1.19	-0.13	4.58	2.57
BE	3.32	1.70	3.97	-2.07	3.23	2.58
BG	-5.28	-4.09	6.35	5.31	-3.46	-3.39
CA	2.12	1.79	20.74	9.09	11.58	8.05
CH	4.30	3.59	4.76	1.76	7.27	3.50
CY	6.94	8.35	7.51	25.47	22.19	13.56
CZ	-3.72	-6.21	1.41	-4.11	0.44	-2.86
DE	-0.58	-0.50	11.76	3.51	5.48	3.92
DK	8.75	6.91	15.64	4.89	6.78	8.06
EE	-3.90	-0.25	14.05	9.29	-1.07	1.37
EL	8.06	10.57	4.59	4.53	-2.85	-1.40
ES	-8.34	-3.58	-1.70	-3.90	-1.03	-1.73
EU27	**1.39**	**1.63**	**8.52**	**3.53**	**-0.42**	**0.00**
FI	2.95	6.23	6.00	-1.65	-2.19	-2.50
FR	4.91	2.49	4.49	4.01	1.26	1.75
HR	5.12	-6.19	-6.75	17.36	2.73	0.05
HU	-0.97	0.54	7.80	-1.38	3.95	4.15
IE	25.93	16.40	21.07	19.16	22.25	12.27
IS	7.91	6.18	21.90	16.18	2.54	-1.89
IT	6.27	6.07	8.90	8.01	0.31	1.81
LT	3.53	0.90	-1.05	-4.75	-4.76	-3.04
LU	-3.89	-6.40	2.64	1.63	2.81	4.58
LV	-5.48	-1.97	-0.75	-0.71	-2.64	-1.36
MT	9.05	-4.38	3.24	3.78	-4.93	-8.67
NL	7.96	5.69	16.87	8.52	9.67	4.97
NO	2.97	5.56	13.06	8.24	6.57	3.68
PL	-7.31	-8.42	-1.24	-5.72	-1.68	-5.21
PT	1.88	2.81	8.78	6.93	1.85	1.21
RO	-0.37	-7.21	3.20	-0.76	-4.32	-6.20
SE	-0.37	1.22	7.92	-1.08	5.37	1.70
SI	1.12	1.87	9.90	-3.34	-2.15	-3.82
SK	-4.58	-6.35	0.45	-1.99	-6.89	-4.91
TR	3.36	2.52	6.39	-1.05	9.12	6.53
UK	3.30	1.51	5.92	-0.78	3.27	-1.80
US	7.10	5.48	13.26	10.18	4.15	1.82

Notes: Exceptions to the reference period: UK: 2012-2020; HR, CZ, EU27, DE, EL, IS, IE, IT, LU, MT, RO, CH: 2013-2020 (for all fields); RO: 2015-2020 (for Information & Communication Technologies); Definition differs: IE & HU (2020, for all fields); Provisional: IT (2020, for all fields); Includes data from another category: CA (2010, for Engineering, Manufacturing & Construction), TR (2010, for all fields except Information & Communication Technologies)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

The table in Exhibit 62 presents the CAGR of master's graduates by narrow field of study displaying a somewhat similar picture compared to bachelor's graduates. At European level, the number of female graduates increased over time in Physical Sciences (2.9%) and Engineering & Engineering Trades (2.2%) while it decreased in Environment (-8.1%) and Mathematics & Statistics (-3.3%). Similar to the bachelor's level, there was no field in which the share of female graduates grew at a faster rate than male graduates. Growth rates were comparable in Environment, Physical Sciences and Engineering & Engineering Trades (differences are less than 1 p.p.) while the number of female graduates decreased at a faster rate (3.2 p.p.) than the number of male graduates in Mathematics & Statistics. However, the differences between the CAGRs of women and men were less pronounced at the master's level in all fields except for Physical Sciences. As observed in the broad field of Engineering, Manufacturing and Construction, Ireland also stood out in the corresponding narrow field in terms of increasing the number of women (35.4%) significantly more than the number of men (16.7%). The result was a relatively high share of women in this field in 2020 (see Exhibit 59).

Exhibit 62: Compound annual growth rate (CAGR, %) of master's graduates, by sex and narrow field of study, 2010-2020

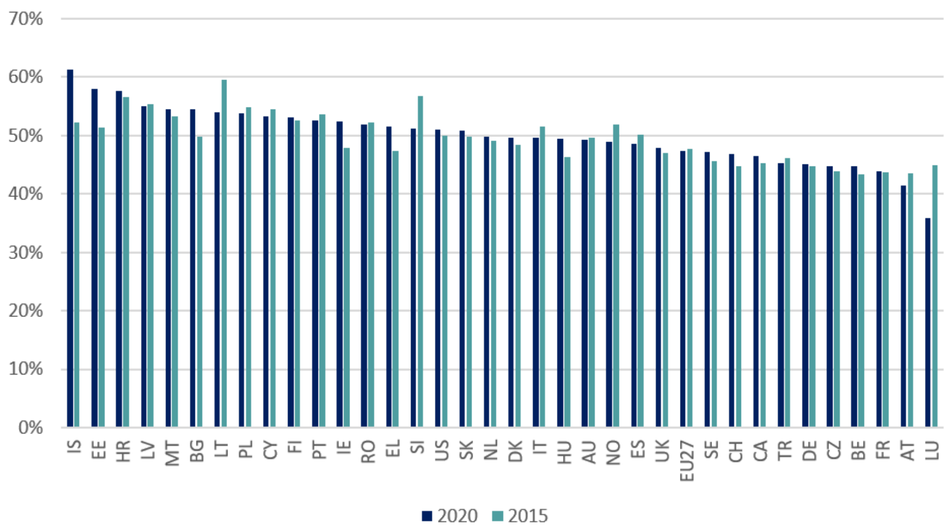
Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	1.10	0.19	-3.09	-5.70	7.90	8.66	8.36	6.39
AT	7.89	6.21	1.76	4.23	-1.15	-0.99	6.07	2.53
BE	16.46	11.14	-1.95	-2.44	0.00	3.54	24.64	17.93
BG	-7.05	-5.63	-5.29	-2.23	-3.97	-7.99	-5.75	-3.76
CA	4.17	4.93	1.09	1.36	6.38	5.29	14.73	8.12
CH	5.96	13.16	2.13	0.71	3.28	4.49	7.74	2.24
CY	-17.97	-4.03	-11.77	8.45	-2.84	-12.94	30.51	12.47
CZ	-9.52	-7.41	-9.40	-10.03	-4.97	-3.02	3.08	-4.19
DE	0.00	0.00	-1.23	-1.51	-2.00	-0.69	6.49	3.30
DK	-7.23	-8.34	6.98	4.81	5.70	5.05	7.34	9.49
EE	-5.91	-6.70	0.80	1.84	-5.71	13.87	-0.71	1.88
EL	48.96	46.14	2.66	7.63	-2.84	-3.64	-1.60	1.10
ES	-10.26	-8.22	-8.40	-3.65	-10.90	-2.76	-3.66	-2.50
EU27	**-8.12**	**-8.01**	**2.92**	**3.56**	**-3.25**	**-0.07**	**2.20**	**2.36**
FI	7.26	7.18	0.89	4.96	2.99	6.70	0.15	-1.97
FR	-17.60	-13.52	3.00	0.46	0.72	2.76	3.28	1.86
HR	0.00	5.15	3.96	24.62	-3.41	-12.74	29.84	16.02
HU	35.33	19.62	-4.66	-1.63	0.22	2.14	3.65	4.72
IE	25.70	5.96	35.57	12.72	8.54	15.80	35.42	16.73
IS	13.99	1.06	-3.53	3.66	-15.91	32.05	7.57	-1.29
IT	59.02	51.12	5.39	3.57	0.16	4.74	12.38	7.05
LT	-11.45	-12.94	3.42	1.46	-1.96	-0.33	-4.12	-2.21
LU	-100.00	-100.00	4.56	30.77	-5.63	-2.57	4.56	-3.93
LV	-5.76	4.37	-5.41	-5.76	-3.31	2.92	-4.16	0.20
MT	-20.54	-100.00	4.20	-9.43	16.99	10.41	-10.12	-13.58
NL	7.60	5.14	8.53	5.44	4.19	5.03	9.96	6.97
NO	8.84	6.13	7.44	5.41	-4.88	0.17	8.10	4.17
PL	-15.82	-16.08	-5.27	-7.09	-10.55	-9.68	-2.70	-4.91
PT	5.73	0.47	-1.24	1.95	3.33	3.52	4.70	3.40
RO	-19.15	-16.03	-4.22	-8.96	-15.59	-25.25	-8.15	-9.23
SE	3.53	1.01	-0.53	4.68	-2.60	0.48	5.70	1.82
SI	7.87	1.68	5.18	2.03	0.00	0.00	6.81	-5.10
SK	2.64	0.00	-2.42	-3.35	-7.72	-9.97	-10.58	-5.34
TR	-16.85	-16.39	-1.33	1.03	1.16	-0.11	13.51	7.71
UK			-2.58	-4.22	10.56	6.23	0.08	-6.33
US	6.06	3.39	2.96	3.23	8.42	7.47	5.37	2.19

Notes: Exceptions to the reference period: **Environment:** SI: 2012-2020; CY, CZ, DE, IS, IT, IE, MT, LU, RO, TR: 2013-2020; AU, HR, EU27, CH, EL: 2015-2020; DK: 2016-2020; CA: 2019-2020; **Physical Sciences:** UK: 2012-2020; HR, CZ, EU27, DE, EL, IS, IE, IT, MT, CH: 2013-2020; LU: 2015-2020 (women), 2014-2020 (men); RO: 2015-2020; **Mathematics & Statistics:** UK: 2012-2020; HR, CZ, EU27, DE, EL, IE, IT, LU, MT, RO, CH: 2013-2020; IS: 2016-2020 (women), 2013-2020 (men); **Engineering & Engineering Trades**: UK: 2012-2020; HR, CZ, EU27, DE, EL, IE, IT, MT, RO, CH: 2013-2020; LU: 2015-2020; Definition differs: IE & HU (2020, for all fields); Provisional: IT (2020, for all fields); Includes data from another category: CA, TR (2010, for Physical Sciences, Engineering & Engineering Trades)
Other: " " indicates one single point of reference; a CAGR of -100% indicates that the absolute value in 2020 was zero
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

7.1.3 Doctoral graduates

Exhibit 63 displays the share of women among all doctoral graduates, in 2015 and 2020. In 2020, the share of women reached or surpassed 50% in approximately half of the countries (BG, CY, EE, EL, FI, HR, IE, IS, LT, LV, MT, PL, PT, RO, SI, SK, US), a much smaller number than at the bachelor's and master's levels. This is also reflected in the EU27 share which was significantly lower than at previous education levels but still relatively close to parity (47.4%). In Iceland, women were even overrepresented as they accounted for 61.3% of all doctoral graduates. Luxembourg (35.9%) and Austria (41.4%), in turn, had the lowest shares of women.

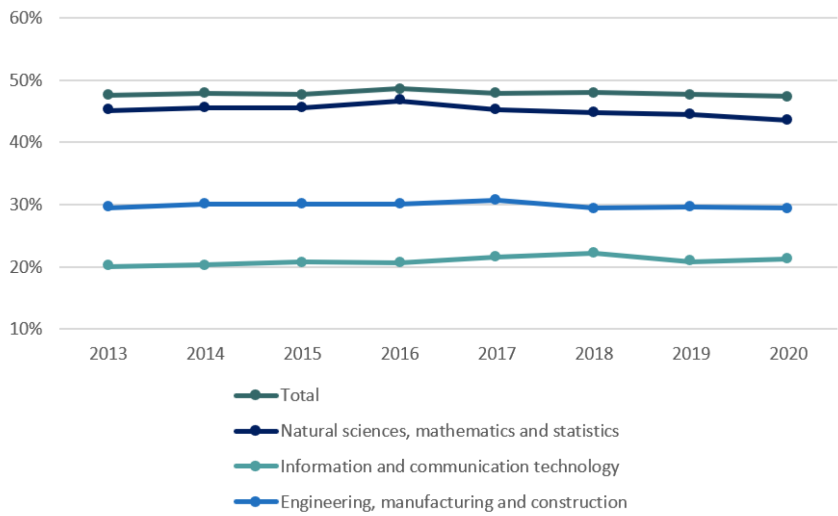
Exhibit 63: Share (%) of women among doctoral graduates, 2015 and 2020



Notes: Definition differs: IE (2020); Provisional: IT (2020)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02), SheFigures (Proportion (%) of women among graduates), and OECD (Graduates by field)

Since 2015, the share of women among doctoral graduates in the EU27 countries changed only marginally (less than 1 p.p.) (see Exhibit 64). However, the situation at the country level differed significantly as multiple countries witnessed significant changes in women's representation. Luxembourg and Austria - the two countries with the lowest shares of female doctoral graduates in 2020 - witnessed a decrease in the proportion of women compared to 2015 (9 p.p. and 2.2 p.p. respectively). Lithuania and Slovenia also experienced large declines (5.6 and 5.5 p.p., respectively) but women still accounted for over 50% of graduates in both countries. The largest improvements were observed in Iceland (9.1 p.p.) and Estonia (6.5 p.p.) - the two countries with the highest shares of women in 2020.

Exhibit 64: The share of women (%) in the EU27 countries among doctoral graduates by broad field of study



Notes: Definition differs: 2015 (for Natural Sciences, Mathematics & Statistics; Information and Communication Technologies; Engineering, Manufacturing & Construction), 2016, 2018 (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02), SheFigures (Proportion (%) of women among graduates), and OECD (Graduates by field)

Across the three broad fields of study, female doctoral graduates were especially underrepresented in ICT and Engineering, Manufacturing & Construction in 2020. At European level, women made up 43.5% of all doctoral graduates in Natural Sciences, Mathematics & Statistics but they only represented 21.2% in ICT and 29.4% in Engineering, Manufacturing & Construction. 13 countries (AT, BE, CH, CY, CZ, DE, ES, HU, IT, MT, PL, PT, SI) had female shares of less than 20% in the field of ICT. Romania fared best with 47.6% of doctoral graduates in the aforementioned field being women. Interestingly, Poland had one of the lowest shares of women in ICT (9.7%) but the highest proportion of women in Engineering, Manufacturing & Construction (45.4%).

The development of the EU27 shares suggests that no progress has been made since 2015 in considerably increasing the share of women in any of the three fields considered (see also Exhibit 64). The development followed a similar trend in non-European English-speaking countries (AU, CA, US) where women's representation among doctoral graduates experienced little to no changes. Nevertheless, women's representation increased (more than 1 p.p.) in the field of ICT in 14 countries (AT, BE, CZ, DE, EL, FI, HR, LU, LV, NO, RO, SE, SK, UK) and in the field of Engineering, Manufacturing & Construction in 19 countries (BE, BG, CA, CH, DK, EE, EL, HR, HU, IE, IS, MT, NO, PL, PT, SE, SI, SK, US).

Exhibit 65: Share (%) of women among doctoral graduates by broad field of study, 2015 and 2020

Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	2015	2020	2015	2020	2015	2020
AU	47.89	47.44	26.91	27.14	27.25	27.47
AT	36.43	38.13	16.81	19.59	25.91	24.68
BE	38.56	39.77	0.00	11.11	23.81	25.68
BG	57.07	64.06	38.89	35.00	30.98	35.85
CA	42.09	42.19	22.79	23.00	21.55	23.72
CH	41.73	44.98	15.57	13.59	28.25	30.11
CY	57.14	51.61	50.00	14.29	27.78	21.43
CZ	44.75	49.68	10.53	16.33	28.55	29.49
DE	41.36	40.70	13.78	16.67	19.45	20.44
DK	41.06	39.37			29.92	31.84
EE	46.88	59.09	31.25	23.53	36.84	40.00
EL	47.53	49.79	22.41	40.32	34.20	37.73
ES	51.89	49.76	24.10	15.29	37.62	31.70
EU27	**45.60**	**43.52**	**20.77**	**21.22**	**30.05**	**29.39**
FI	48.45	45.29	21.71	23.77	33.42	31.19
FR	41.47	39.12	25.51	25.56	33.47	27.54
HR	64.46	61.29	18.18	23.81	35.17	39.58
HU	45.00	45.07	18.18	17.24	30.16	31.82
IE	44.72	45.89	27.91	23.44	28.28	36.06
IS	44.00	51.85	0.00		14.29	20.00
IT	52.90	49.75	20.48	19.72	38.24	35.24
LT	51.09	53.26	62.50	28.57	37.65	25.81
LU	50.00	42.11	7.14	20.00	14.29	9.09
LV	48.15	55.56	33.33	42.86	40.74	37.04
MT	66.67	40.00		0.00	16.67	30.77
NL	:	35.28	:	26.19	:	28.73
NO	44.73	36.52	17.39	25.00	22.40	24.86
PL	52.47	56.32	17.07	9.68	41.32	45.39
PT	65.55	50.00	23.86	12.77	33.60	43.01
RO	53.82	50.93	33.01	47.62	39.07	38.32
SE	39.97	38.28	25.14	26.96	28.56	35.09
SI	58.93	46.59	20.45	0.00	36.17	37.21
SK	62.89	60.68	10.71	32.26	27.55	32.14
TR	53.17	54.62	50.00	34.15	36.30	35.66
UK	47.14	42.59	20.23	26.77	26.51	27.07
US	43.42	43.87	22.57	22.83	23.65	25.45

Notes: Definition differs: EU27 (2015), IE (2020, for all fields); Provisional: IT (2020, for all fields)
Other: " " indicates that the denominator is zero; ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02), SheFigures (Proportion (%) of women among graduates), and OECD (Graduates by field)

When considering within-variation in the broad field of Natural Sciences, Mathematics & Statistics at European level in 2020, it is observable that the proportion of women was gender-balanced in the narrow field of Environment (56.9%) but below parity in Physical Sciences (36.8%) as well as in Mathematics & Statistics (28.4%). Furthermore, the field of Engineering & Engineering Trades was even more unequal in terms of women's representation (27%) than the overall broad field of Engineering, Manufacturing & Construction. This observation falls in line with the situation at the master's level, at which women were also significantly underrepresented in Engineering & Engineering Trades. Noteworthy in this context is Estonia, where the proportion of female doctoral students was at least 40% in all four fields, although the total number of doctoral students was relatively low.

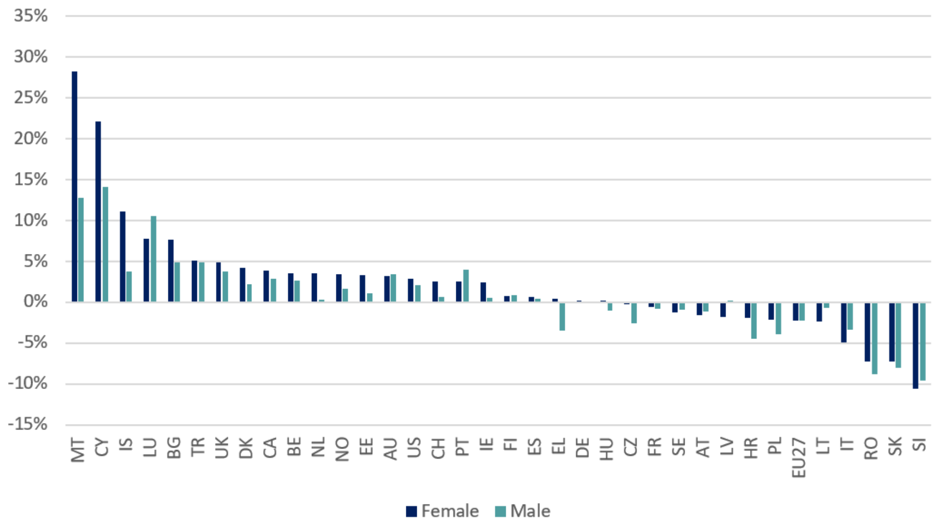
Exhibit 66: Share (%) of women among doctoral graduate s by narrow field of study, 2015 and 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	2015	2020	2015	2020	2015	2020	2015	2020
AU	46.88	53.10	40.04	42.55	39.82	28.97	26.09	25.84
AT	40.00	44.44	31.58	28.18	24.68	34.67	25.07	24.26
BE	50.00	50.00	30.04	27.88	25.00	33.10	20.35	23.80
BG		70.00	55.32	61.02	21.43	57.14	23.49	27.27
CA	:	58.33	:	32.38	:	29.27	:	22.65
CH	46.43	57.14	31.16	34.29	26.15	22.99	23.84	25.42
CY		37.50	60.00	75.00	100.00	12.50	25.00	23.81
CZ	55.17	56.10	35.88	39.87	33.33	45.16	21.45	26.54
DE			30.80	31.46	25.31	24.48	18.01	20.10
DK							29.92	31.84
EE	50.00	62.50	25.93	54.55	50.00	40.00	40.00	47.62
EL	40.00	50.00	44.53	46.21	22.22	28.13	28.74	28.19
ES		57.63	50.64	40.77	36.16	25.41		28.26
EU27	**:**	**56.90**	**:**	**36.08**	**:**	**28.44**	**:**	**27.03**
FI	75.86	64.71	44.17	34.07	11.90	15.15	31.17	24.69
FR			35.32	35.82	27.57	26.25	29.97	25.05
HR	100.00	100.00	61.90	55.56	40.00	40.00	27.91	27.94
HU	50.00	59.26	32.73	38.46	42.86	20.00	20.27	26.67
IE	57.69	57.69	37.20	37.27	25.00	35.29	21.53	33.12
IS	66.67	100.00	25.00	30.77	60.00	33.33	20.00	0.00
IT	:	54.55	:	41.28	:	31.65	:	26.53
LT	45.45	100.00	44.90	41.67	20.00	0.00	35.82	9.38
LU			36.36	0.00	0.00	40.00		
LV	50.00	57.14	34.62	50.00	100.00	100.00	36.36	20.00
MT			100.00	0.00		100.00	20.00	25.00
NL	:	:	:	:	:	:	:	:
NO	100.00	100.00	45.28	43.18	26.67	21.43	20.20	20.81
PL	61.54	40.00	46.68	54.02	26.58	29.17	35.35	32.04
PT	62.50	47.06	68.84	38.69	47.06	39.39	29.74	37.80
RO	70.00	66.67	56.76	49.53	36.36	45.00	37.05	38.58
SE	61.04	54.05	34.82	33.33	26.80	25.71	27.93	35.14
SI	58.82	50.00	41.67	34.69	63.64	50.00	31.63	23.91
SK	58.54	52.38	52.17	46.58	50.00	73.33	24.06	22.90
TR	50.00	72.73	47.49	46.99	49.78	53.33	27.57	25.62
UK		48.09	35.57	37.34	28.67	29.67	21.96	23.70
US	47.81	53.40	34.32	34.82	27.95	29.01	21.98	23.84

Notes: Definition differs: IT (2015), EU27 & IE (2020) for all fields; Provisional: IT (2020, for all fields)
Other: " " indicates that the denominator is zero; ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02), SheFigures (Proportion (%) of women among graduates), and OECD (Graduates by field)

Exhibit 67 reports the CAGR of female and male doctoral graduates between 2010 and 2020 when no differentiation is made by field of study. At European level, both the number of female and male doctoral graduates declined at an annual average rate of 2.2%. In contrast, the number of graduates of both genders increased in all English-speaking non-EU countries (AU, CA, UK, US). In line with the trend at European level, the number of female and male doctoral students decreased by more than 1 p.p. in seven countries (AT, HR, IT, PL, RO, SK, SI). The largest drop for both women and men was observed in Slovenia, where on average the number of female doctoral graduates declined by 10.6% and male doctoral graduates by 9.6% per year. On average, Malta experienced the highest growth rate of female graduates with 28.2% per year. Combined with much more moderate growth of male graduates, Malta had a share of female doctoral graduates higher than 50% in 2020 (see Exhibit 63). While male graduates grew the fastest in Cyprus with an annual growth rate of 14.1%, Luxembourg was the country with the largest discrepancy in favour of men (10.6% for men and 7.8% for women).

Exhibit 67: Compound annual growth rate (CAGR, %) of doctoral graduates, by sex, 2010-2020



Notes: Exceptions to the reference period: IT, LU: 2011-2020, EU27: 2013-2020; Provisional: IT (2020)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_grad5) and OECD (Graduates by field)

The same downward trend in the number of doctoral graduates was observable in the three STEM fields (see Exhibit 68). Irrespective of gender or field, the number of doctoral graduates at European level decreased over time. However, there were disparities in the degree of decline between men and women. The largest drop for women was observed in Natural Sciences, Mathematics and Statistics, in which the number of female doctoral graduates decreased by an average of 2.95% per year while male graduates declined by 2.0%. Nevertheless, this field was still the closest to gender parity in 2020 of all three disciplines, with women accounting for 43.5% of all graduates (see Exhibit 65). In ICT, male graduates declined at a faster rate than female graduates, with rates of -2.3% and -1.3%, respectively. Finally, the share of both male and female graduates in Engineering, Manufacturing & Construction declined on average by 1.8%. Interestingly, all English-speaking non-EU countries (AU, CA, UK, US) displayed different trends as they experienced an increase in the number of female and male doctoral graduates across all three STEM-related fields. Moreover, another notable development can be observed in Czechia, Estonia and Greece, where women had a higher (more than 1 p.p.) CAGR than men in all three fields.

Exhibit 68: Compound annual growth rate (CAGR, %) of doctoral graduates, by sex and broad field of study, 2010-2020

Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male
AU	4.45	4.02	6.23	5.36	6.46	5.58
AT	-2.27	-0.49	2.39	-5.05	0.94	2.65
BE	10.60	8.66	0.00	-7.26	2.78	6.25
BG	5.28	2.77	5.76	15.79	-1.89	-2.76
CA	2.55	1.84	0.91	3.48	4.70	3.12
CH	7.09	2.20	3.42	-0.44	1.57	0.90
CY	14.87	22.32	0.00	1.84	8.01	22.05
CZ	-1.14	-3.36	-3.13	-4.36	0.00	-3.00
DE	-1.47	-1.08	2.11	-0.10	5.67	2.16
DK	2.38	1.11	0.00	0.00	5.41	3.46
EE	3.75	-0.71	7.18	2.66	2.92	0.00
EL	0.00	-3.20	-1.13	-9.90	0.60	-4.31
ES	0.70	1.44	-16.51	-0.92	-0.91	0.31
EU27	**-2.95**	**-2.03**	**-1.29**	**-2.29**	**-1.84**	**-1.81**
FI	0.53	1.39	2.35	-0.32	-0.73	-0.10
FR	-3.20	-2.54	0.45	-0.82	-0.15	1.12
HR	-3.28	0.00	5.24	0.00	-1.46	-4.40
HU	-4.49	-4.88	3.63	0.87	-2.21	-0.80
IE	0.19	1.54	0.69	-1.50	4.14	-1.00
IS	6.52	3.82	-100.00	-100.00	-6.70	0.00
IT	-2.44	-0.89	-4.41	1.69	-2.35	-1.36
LT	0.42	4.38	-10.40	0.00	-6.40	-0.83
LU	-2.75	5.81	12.98	14.67	8.01	16.65
LV	2.26	-3.13	4.14	7.18	0.00	0.00
MT	10.41	16.99	0.00	8.01	16.65	24.57
NL	2.68	4.12	1.56	-12.95	-0.19	-3.45
NO	0.55	-1.36	-12.27	-11.84	36.22	41.96
PL	-4.80	-6.40	-26.52	18.72	-6.65	-12.64
PT	-0.83	1.99	-1.53	7.44	1.08	2.92
RO	-16.55	-13.94	-10.07	-20.44	-8.80	-12.15
SE	-2.97	-1.53	-2.27	-0.69	2.61	0.35
SI	-9.40	-4.57	-100.00	-9.11	-4.74	-10.68
SK	-5.71	-8.41	2.26	-8.84	-8.50	-8.97
TR	3.98	2.22	-4.84	-6.16	6.45	8.16
UK	5.32	4.69	7.18	1.79	5.97	3.41
US	1.52	1.35	4.93	4.20	4.59	3.45

Notes: Exceptions to the reference period: **Natural Sciences, Mathematics & Statistics:** IT: 2011-2020; LU: 2012-2020; HR, EU27, DE, IS, MT, NL, RO, CH: 2013-2020; PL: 2014-2020; **Information & Communication Technologies:** IT, LU: 2011-2020; MT: 2011-2020 (men), 2013-2020 (women); EU27, NO: 2013-2020;; PL: 2014-2020 (men), 2015-2020 (women), RO: 2015-2020; NL. 2017-2020; **Engineering, Manufacturing & Construction:** CY, MT (women only), IT, LU: 2011-2020; EU27: 2013-2020; PL: 2014-2020; Provisional: IT (2020, for all fields); Not significant: DK (2010, for Information & Communication Technologies); Includes data from another category: IE & TR (2010, for Natural Sciences, Mathematics & Statistics), TR, CA, CZ, IE (2010, for Engineering, Manufacturing & Construction)

Other: A CAGR of -100% indicates that the absolute value in 2020 was zero

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_grad5) and OECD (Graduates by field)

Exhibit 69: Compound annual growth rate (CAGR, %) of doctoral graduates, by sex and narrow field of study, 2010-2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.00	-4.86	3.84	1.17	5.59	1.58	8.48	4.49
AT	-7.79	0.00	1.21	-0.19	0.39	3.42	0.96	3.32
BE	-26.94	-25.01	-5.85	-4.10	15.63	19.50	-5.59	-1.49
BG	5.27	0.00	6.60	2.48	-2.21	-2.84	-5.76	-3.01
CA	0.00	0.00	3.06	2.79	4.14	4.23	5.13	3.05
CH	9.00	0.00	3.79	1.63	9.60	4.53	-2.51	-0.88
CY	31.61	25.85	11.61	7.18	0.00	21.48	19.58	23.11
CZ	3.56	10.41	-3.81	-6.85	-1.33	-9.28	4.52	-5.43
DE	0.00	0.00	2.52	1.98	0.44	1.00	0.70	-5.21
DK	0.00	0.00	0.00	0.00	-100.00	-100.00	5.41	3.46
EE	3.24	4.14	0.87	-4.59	-7.41	4.14	5.24	-2.38
EL	-12.94	0.00	0.00	-3.02	-1.99	-5.38	-4.98	-6.74
ES	5.28	5.48	3.81	3.26	-9.70	-2.73	-1.30	2.68
EU27	**12.79**	**18.27**	**-6.39**	**-3.86**	**-10.62**	**-4.67**	**3.65**	**5.23**
FI	6.86	2.54	1.41	1.07	-6.70	-0.35	-3.24	-0.43
FR	0.00	0.00	0.29	-1.38	1.96	2.79	-2.56	-2.66
HR	0.00	-100.00	-2.59	-2.84	-8.76	-9.34	-2.31	-2.93
HU	0.93	-3.39	-4.59	-3.88	-12.18	-9.05	-0.60	0.71
IE	13.99	15.55	-3.41	-1.71	0.00	0.00	8.04	2.26
IS	16.99	-100.00	0.00	2.54	0.00	7.18	-100.00	0.00
IT	25.00	31.58	-2.61	-0.52	-1.63	2.59	11.42	8.65
LT	-2.84	-100.00	-0.49	5.12	-100.00	-10.40	-17.68	-2.67
LU	0.00	0.00	-100.00	1.95	9.05	4.61	-100.00	-100.00
LV	14.87	11.61	-4.98	-8.12	-18.05	-100.00	7.18	3.82
MT	0.00	-100.00	-100.00	11.61	0.00	-100.00	12.98	24.57
NL	:	:	:	:	:	:	:	:
NO	14.87	-100.00	-2.07	-7.76	-9.43	1.37	53.61	69.91
PL	-30.12	-16.74	-5.24	-6.05	-13.75	-19.40	-12.36	-13.86
PT	1.34	24.57	-1.23	1.99	-7.71	2.26	-2.43	1.32
RO	-38.98	-41.27	-12.78	-7.56	-22.62	-23.95	-12.83	-16.17
SE	-7.79	-7.97	-2.72	-1.30	-3.97	-2.93	4.70	0.56
SI	-21.59	-20.07	-4.52	0.65	-4.98	-4.98	0.00	-11.88
SK	10.65	2.26	-4.87	-7.82	-9.24	-16.05	-11.60	-9.98
TR	-14.52	-21.95	-2.34	-1.77	3.89	3.58	12.64	10.60
UK			3.81	3.36	6.18	4.32	3.95	0.35
US	4.28	3.45	2.79	1.84	2.06	2.51	4.29	3.40

Notes: Exceptions to the reference period: **Environment:** LU, SI: 2012-2020; BE, CZ, EE, DE, HU, IE, RO, TR: 2013-2020; EL: 2013-2020 (men), 2015-2020 (women); IS: 2013-2020 (women), 2015-2020 (men); CY: 2013-2020 (men), 2016-2020 (women); MT: 2013-2020 (women), 2016-2020 (men); AU,, PL, CH: 2015-2020; HR: 2015-2020 (women), 2016-2020 (men); BG, EU27: 2017-2020; NO: 2015-2020 (women), 2018-2020 (men); CA, IT: 2019-2020; **Physical Sciences:** IT, MT (women only): 2011-2020; LU: 2011-2020 (women), 2012-2020 (men); NO: 2013-2020; PL: 2014-2020; RO: 2015-2020; EU27: 2017-2020; **Mathematics & Statistics:** IT, LV, EE (women only): 2011-2020; LU: 2011-2020 (men), 2012-2020 (women); NO: 2013-2020; IS: 2014-2020 (women); PL: 2014-2020; MT: 2016-2020; EU27: 2017-2020; **Engineering & Engineering Trades**: CY & MT (women only), IT, BE, LU: 2011-2020; NO: 2011-2020 (men), 2012-2020 (women); PL: 2014-2020; EU27: 2017-2020; Definition differs: PL (2014, for all fields except Mathematics & Statistics), EU27 (2017 & 2020) & IE (2020) for all fields; Provisional: IT (2020, for all fields); Not significant: DK (2010, for Physical Sciences); Includes data from another category: CA, CZ, EL, IE, TR (2010), IT (2011) for Physical Sciences, Engineering & Engineering Trades; UK (2010), EE (2010), NO (2011 & 2012) for Engineering & Engineering Trades
Other: " " indicates one single point of reference; ":" indicates that data are not available; a CAGR of -100% indicates that the absolute value in 2020 was zero
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_grad5) and OECD (Graduates by field)

The table in Exhibit 69 displays the CAGRs for female and male doctoral graduates by narrow field of study. At European level, the number of female and male doctoral graduates declined in Physical Sciences (-6.4% and -3.9% respectively) and Mathematics & Statistics (-10.6% and -4.7% respectively) while the number of graduates grew in Environment (12.8% for women and 18.3% for men) and Engineering & Engineering Trades (3.7% for women and 5.2% for men). What all four fields had in common, however, was that the number of women decreased more strongly or increased more slowly than the number of men. This was particularly pronounced in Mathematics & Statistics, which displayed a 6 p.p. difference between women's and men's negative growth rates. Moreover, the gender gap in all four fields was larger than at the master's level. In the field of Environment, which tends to be relatively popular among women at all levels of tertiary education, 15 countries (BG, CH, CY, CZ, EE, ES, FI, IE, IS, IT, LV, NO, PT, SK, US) experienced an increase in the number of female doctoral graduates. In nearly half of these countries (BG, CH, CY, FI, IS, LV, NO, SK), the growth rates were higher (more than 1 p.p.) for women than men. In Mathematics & Statistics, in which the number of women declined more rapidly than the number of men, some countries (AU, CH, CZ, EL, LU, LV, MT, PL, RO, SK, UK) still displayed the opposite trend. Most noticeably, two countries (AU, LV) had higher CAGRs for female than male doctoral graduates in all four fields of study.

In summary, this chapter demonstrates that women were generally well-represented among bachelor's graduates. However, their proportion was significantly below parity in the fields of ICT and Engineering, Manufacturing & Construction. The most notable improvement in terms of women's participation was visible in ICT; it was the only field in which the number of female bachelor's graduates in the EU27 countries grew faster than the number of male graduates. Contrary to the observations made at the bachelor's level, women accounted for at least 50% of graduates at the master's level in all fields except Engineering, Manufacturing & Construction. While the latter did not display any progress in terms of women's representation since 2010, female graduates in ICT grew significantly and at a faster rate than their male counterparts between 2010 and 2020. Contrary to these trends, Luxembourg exhibited exemplary improvement in women's shares among STEM graduates at the bachelor's and master's levels. Thus, a further examination of Luxembourg's progress may thus be beneficial for facilitating the road towards gender equality in STEM education.

At the doctoral level, women accounted for approximately half of all graduates in the EU27 countries but not in any of the STEM fields, in which women were consistently underrepresented. This was accompanied by a decline in both the number of male and female doctoral graduates in all fields, albeit at different rates for women and men in each field.

7.2 Distribution of tertiary graduates across fields of study

Different choices of field of study can lead to diverging educational pathways. Therefore, the following indicators display the distribution of women and men across the different STEM fields. Moreover, a comparison over time helps to identify whether women's self-selection into STEM subjects has changed.

7.2.1 Bachelor's graduates

Exhibit 70 shows the distribution of male and female bachelor's graduates across the three broad fields of study in 2020. At European level, the fields of ICT and Engineering, Manufacturing & Construction were less popular among women than men while Natural Sciences, Mathematics & Statistics was nearly equally sought after by women and men (difference of less than 1 p.p.). In general, all three fields seemed to be rather unpopular among women given that the combined share of female bachelor's graduates amounted to only 12.7% of all female bachelor's graduates. In contrast, male STEM bachelor's graduates accounted for 38.6%, which points to a stark gender difference in the tendency towards selecting a field of study in STEM. Engineering, Manufacturing & Construction was the most popular STEM field among both female (6%) and male bachelor's graduates (24.9%). The least popular field of study among female bachelor's graduates was ICT, with little over 1% of European female bachelor's graduates selecting this field, while the least sought-after subject among men was Natural Sciences, Mathematics & Statistics (6.1%). Although Engineering, Manufacturing & Construction was the most popular choice among bachelor's graduates regardless of their gender, it also exhibited the largest discrepancy between women and men in terms of subject choice (18.8 p.p.).

At country level, the fields of ICT and Engineering, Manufacturing & Construction were less popular among female than male bachelor's graduates in all countries except in Turkey where the difference between the distribution of women and men in ICT was less than 1 p.p.. Moreover, female ICT graduates did not exceed 5% of all female bachelor's graduates in any of the observed countries, with Romania having the highest share of women graduating from this field (4.5%). In the field of Natural Sciences, Mathematics & Statistics, six countries (BG, CY, EE, HR, RO, SK) contrarily reported that this field was more sought-after among women than men. Moreover, this field was close to being equally popular among both female and male bachelor's graduates in several countries (CA, CH, CZ, DE, DK, FI, IE, IT, LT, LU, LV, PL, PT, SI, TR, US) (difference between women and men of less than 1 p.p.). Interestingly, Natural Sciences, Mathematics & Statistics was a much more popular subject choice in English-speaking countries (CA, UK, US) than in the EU27 countries, as the former were the only countries where both male and female shares were around 10% or higher.

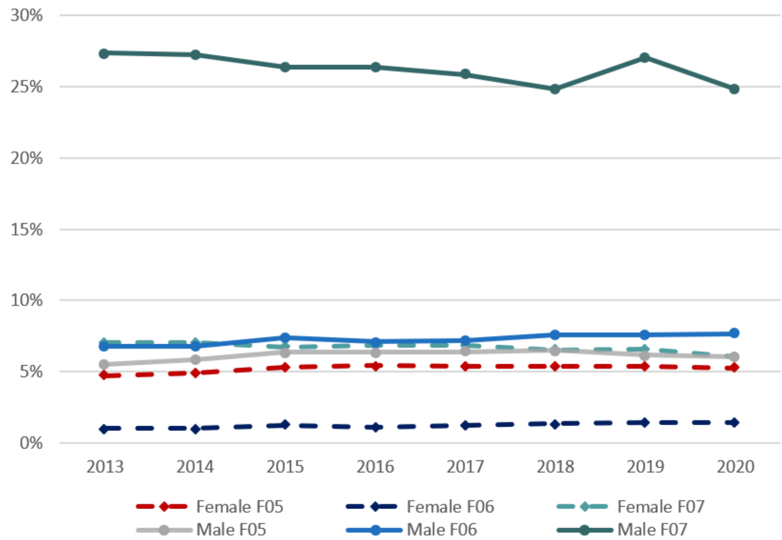
Exhibit 70: Distribution (%) of bachelor's graduates across broad fields of study, by sex, 2020

Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male
AU	6.23	8.71	2.00	10.22	3.20	12.71
AT	7.28	10.08	1.64	9.43	6.58	23.80
BE	1.67	4.14	0.64	6.82	3.81	20.35
BG	3.69	2.44	3.06	9.23	5.95	23.93
CA	11.59	12.40	1.57	9.00	3.89	16.63
CH	3.84	4.55	0.74	6.18	5.10	27.74
CY	7.30	3.02	1.84	6.73	3.68	19.09
CZ	5.38	5.33	1.45	12.63	7.00	23.81
DE	4.50	4.57	2.16	7.80	9.55	41.68
DK	4.15	4.79	1.07	8.21	4.67	21.08
EE	5.89	4.42	4.00	14.42	5.56	21.12
EL	7.93	9.13	1.69	4.80	10.43	27.14
ES	5.87	7.71	0.62	5.78	4.98	18.89
EU27	**5.27**	**6.08**	**1.41**	**7.68**	**6.05**	**24.85**
FI	3.72	3.87	2.75	14.09	5.88	31.35
FR	8.78	12.11	1.05	7.90	3.08	13.84
HR	5.71	4.40	2.03	9.68	11.72	33.09
HU	2.33	3.34	0.94	7.95	4.05	21.68
IE	8.69	9.56	3.70	12.19	3.72	20.11
IS	2.66	4.60	3.08	17.06	5.52	18.49
IT	6.53	6.98	0.40	3.00	5.73	21.15
LT	3.37	3.20	1.32	10.25	7.99	36.63
LU	3.86	4.80	1.80	14.02	2.06	11.81
LV	2.99	3.27	2.04	11.38	5.92	27.17
MT	3.93	5.27	2.07	17.77	4.07	14.29
NL	4.46	6.16	0.77	7.04	3.43	14.75
NO	2.36	3.59	1.47	10.47	2.81	12.89
PL	3.05	2.32	1.46	9.18	6.91	19.81
PT	6.00	5.94	0.53	3.56	8.12	29.60
RO	5.79	3.96	4.48	13.42	10.56	28.06
SE	2.93	4.35	2.92	9.82	5.25	20.87
SI	7.65	7.44	1.05	10.19	6.33	30.49
SK	5.06	3.96	1.54	12.37	4.79	23.37
TR	2.73	1.93	0.60	1.51	8.97	20.10
UK	9.58	15.33	1.31	8.88	3.46	16.00
US	10.65	10.64	1.96	9.30	3.40	14.01

Notes: Definition differs: IE, HU (for all fields); Provisional: IT (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

At European level, no progress was visible in increasing the popularity of STEM subjects among women since 2015 (see Exhibit 71). The share of women that graduated with a bachelor's degree in any of the three STEM fields remained virtually unchanged when comparing 2020 to 2015 (the difference is less than 1 p.p.). Moreover, the differences between women and men in terms of subject choice did not diminish over time in any of the three fields. However, a cross-country comparison illustrates that Canada made progress in attracting a higher percentage of women in all three fields of study (see tables in Exhibit 70 & Exhibit 72). Generally, the largest increase was observable in Croatia with 4.2 p.p. more women selecting Engineering, Manufacturing & Construction compared to 2015. This change was accompanied by similar growth in the share of male graduates in this field (7.2 p.p.).

Exhibit 71: The distribution (%) of bachelor's graduates across broad fields of study in the EU27 countries, by sex



Notes: Definition differs: 2018 (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02)

Exhibit 72: Distribution (%) of bachelor's graduates across broad fields of education, by sex, 2015

Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male
AU	6.85	9.39	0.91	6.12	2.53	13.12
AT	7.22	10.13	1.15	8.90	6.15	24.88
BE	1.82	4.35	0.17	3.45	2.63	20.45
BG	4.11	2.87	2.40	5.19	6.38	24.99
CA	8.58	10.29	0.53	3.39	2.72	14.85
CH	3.68	4.46	0.54	4.73	4.41	28.48
CY	5.82	2.15	2.74	6.06	7.99	24.76
CZ	4.65	4.75	1.05	10.13	7.00	25.92
DE	5.89	7.07	1.86	7.88	9.45	41.18
DK	3.17	4.59	0.65	7.07	4.08	16.66
EE	5.53	5.68	2.13	11.54	5.69	25.33
EL	6.99	8.69	1.86	3.57	9.82	32.56
ES	4.98	6.04	0.78	5.98	6.99	27.74
EU27	**5.31**	**6.38**	**1.26**	**7.40**	**6.75**	**26.38**
FI	3.24	3.33	1.75	13.77	5.98	35.97
FR	7.58	11.87	0.81	7.61	3.62	13.61
HR	4.39	3.64	1.50	8.85	7.55	25.88
HU	3.65	4.80	0.90	4.81	6.71	31.83
IE	8.86	8.75	3.23	11.04	2.73	19.38
IS	3.45	6.26	1.96	11.84	4.78	21.62
IT	7.18	7.12	1.49	8.09	5.77	18.22
LT	3.22	3.78	0.30	4.56	7.58	37.19
LU	2.06	4.21	0.00	7.37	2.06	12.63
LV	3.60	4.19	1.35	9.31	6.04	27.40
MT	11.01	16.76	3.64	18.62	2.17	11.17
NL	3.15	5.17	0.36	4.73	2.64	14.62
NO	3.26	3.29	0.80	7.93	3.29	17.46
PL	3.84	2.91	1.13	7.96	9.00	25.68
PT	5.71	5.39	0.35	2.46	9.33	31.56
RO	6.71	4.91	3.37	10.23	10.52	27.35
SE	3.02	4.26	1.74	7.89	5.23	23.39
SI	6.16	5.78	0.96	7.68	6.11	30.38
SK	5.68	5.45	0.84	8.84	5.41	24.49
TR	6.58	4.40	0.18	0.32	7.73	15.34
UK	15.31	17.71	1.20	7.57	2.94	15.71
US	8.90	10.49	1.16	6.43	2.33	12.00

Notes: Definition differs: BE, DE (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

A review of the four narrow fields of study affirms the trends observed across the broad fields at European level in 2020. As displayed in Exhibit 73, all narrow fields of study, except for Engineering & Engineering Trades, were equally popular among women and men. While being the most popular among both female and male bachelor's graduates, Engineering & Engineering Trades exhibited the largest discrepancy between the shares of female and male graduates (13.3 p.p.). This discrepancy did not decrease between 2015 and 2020 (see

Exhibit 74). The largest difference at country level can be observed in Lithuania (23.5 p.p.) and the smallest in France (5.3 p.p.), where participation rates of both women and men were the lowest in this field.

Exhibit 73: Distribution (%) of bachelor's graduates across narrow fields of study, by sex, 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.53	0.60	0.22	0.44	0.27	0.86	1.12	6.94
AT	0.87	1.09	1.62	4.75	0.49	1.16	1.71	12.14
BE	0.08	0.13	0.68	2.64	0.12	0.37	1.06	10.28
BG	0.55	0.52	1.14	1.01	0.38	0.46	4.02	20.87
CA	1.32	1.23	1.37	2.84	1.32	2.28	2.26	12.07
CH	0.69	0.62	1.34	2.01	0.22	0.69	1.98	18.26
CY	0.39	0.34	1.23	1.30	2.40	0.48	1.39	14.90
CZ	0.23	0.21	0.96	1.97	0.31	0.51	2.12	14.23
DE	0.00	0.00	1.62	2.43	0.63	0.96	2.64	21.74
DK	0.09	0.08	0.58	1.21	0.35	1.02	1.81	12.44
EE	1.52	1.17	2.18	2.28	0.54	0.51	1.82	15.38
EL	0.21	0.20	3.16	3.55	2.47	3.43	4.82	19.38
ES	0.55	0.79	1.68	3.16	0.56	1.10	3.68	16.26
EU27_2020	**0.33**	**0.43**	**1.59**	**2.55**	**0.65**	**1.22**	**2.76**	**16.05**
FI	0.73	0.32	1.02	1.79	0.54	1.01	3.45	21.18
FR	0.17	0.75	2.52	4.14	1.14	3.13	1.10	6.42
HR	0.40	0.33	2.50	2.27	1.12	1.06	6.00	26.92
HU	0.57	0.70	0.86	1.88	0.18	0.32	2.27	17.54
IE	0.47	0.74	2.39	3.15	0.57	1.65	1.68	13.01
IS	0.27	0.00	1.12	1.33	0.42	1.63	2.07	13.28
IT	0.47	0.57	1.78	3.23	0.71	1.21	3.80	17.07
LT	0.06	0.06	1.05	1.67	0.68	0.71	3.84	27.37
LU	0.00	0.00	0.51	0.37	1.29	2.58	1.29	8.12
LV	0.51	0.44	0.88	1.45	0.63	0.57	2.25	20.59
MT	0.00	0.36	1.31	1.96	0.55	0.98	2.21	10.18
NL	0.41	0.62	0.55	1.87	0.32	0.76	1.17	9.90
NO	0.00	0.00	0.60	1.47	0.15	0.58	1.55	8.78
PL	0.28	0.23	1.28	1.01	0.49	0.57	2.69	13.40
PT	0.10	0.15	1.14	1.88	0.66	0.96	5.13	24.79
RO	0.62	0.71	2.45	1.98	0.98	0.75	6.62	21.82
SE	0.85	0.55	0.62	1.25	0.27	1.39	2.59	14.34
SI	0.31	0.25	1.67	3.33	0.62	0.99	2.96	24.44
SK	0.35	0.36	1.34	1.69	0.40	0.40	1.34	17.11
TR	0.00	0.00	0.77	0.97	1.09	0.62	3.38	12.72
UK	0.23	0.30	3.06	5.21	1.42	3.13	1.30	8.59
US	0.92	0.95	1.26	2.33	0.97	1.83	2.11	10.39

Notes: Definition differs: IE, HU (for all fields); Provisional: IT (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Exhibit 74: Distribution (%) of bachelor's graduates across narrow fields of education, by sex, 2015

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.77	0.98	0.30	0.70	0.16	0.38	1.01	7.73
AT	0.47	0.65	1.44	4.46	0.55	1.25	1.33	12.17
BE	0.03	0.12	0.52	2.21	0.12	0.24	0.74	11.60
BG	1.11	0.81	1.35	1.10	0.50	0.39	4.67	22.11
CA	:	:	:	:	:	:	:	:
CH	0.62	0.61	1.15	2.08	0.23	0.53	1.62	19.42
CY	1.06	0.67	1.83	0.54	1.73	0.67	3.22	18.17
CZ	0.42	0.28	1.38	2.32	0.60	0.96	2.12	15.03
DE	0.00	0.00	2.22	3.97	0.89	1.35	2.61	19.01
DK	0.00	0.00	0.65	1.44	0.18	0.63	0.68	5.88
EE	1.98	1.63	1.38	2.51	0.59	0.31	2.02	19.91
EL	0.21	0.23	2.45	3.48	2.69	3.52	4.09	23.80
ES	0.54	0.76	1.23	2.26	0.40	0.67	4.13	20.62
EU27_2020	**0.48**	**0.50**	**1.57**	**2.71**	**0.75**	**1.16**	**2.63**	**15.68**
FI	0.49	0.33	1.00	1.52	0.45	0.90	3.72	24.72
FR	0.41	0.86	1.79	3.43	0.95	2.61	1.32	7.98
HR	0.16	0.10	1.82	2.15	1.58	1.11	2.76	17.92
HU	0.34	0.38	1.47	3.09	0.52	0.57	4.07	26.67
IE	0.44	0.82	2.41	2.94	0.41	0.95	1.35	12.90
IS	0.05	0.00	1.33	3.42	0.16	1.47	1.91	16.05
IT	0.54	0.68	2.05	3.38	0.89	1.15	2.13	10.85
LT	0.08	0.05	0.84	1.85	1.10	1.01	3.42	26.79
LU	0.00	0.00	0.00	1.40	1.18	1.75	0.59	7.02
LV	0.55	0.51	1.18	2.14	0.79	0.61	2.64	20.33
MT	2.43	5.70	2.86	5.26	1.21	2.41	1.91	10.51
NL	0.18	0.46	0.37	1.66	0.23	0.57	0.71	8.91
NO	0.00	0.00	0.85	1.41	0.15	0.57	2.22	12.98
PL	0.89	0.75	1.21	1.10	0.81	0.67	3.01	14.98
PT	0.09	0.15	1.10	2.04	0.58	0.49	5.10	23.18
RO	1.08	0.82	3.33	3.12	0.85	0.47	5.85	19.48
SE	0.86	0.72	0.69	1.32	0.34	1.00	2.61	15.73
SI	0.67	0.20	1.40	2.38	1.26	1.24	2.07	21.70
SK	0.68	0.95	2.01	2.68	0.55	0.62	1.32	16.07
TR	0.00	0.00	2.39	2.41	2.62	1.37	3.37	9.80
UK	0.00	0.00	3.03	5.86	1.52	2.88	1.04	9.21
US	0.76	0.94	1.05	2.24	0.87	1.53	1.43	8.74

Notes: Definition differs: BE, DE (for all fields)
Other: ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

7.2.2 Master's graduates

The table in Exhibit 75 illustrates a similar distribution of master's graduates compared to the bachelor's level across the broad fields of study in 2020. At European level, all three STEM fields were less popular among women compared to men. The share of female graduates with master's degrees in STEM fields was, however, slightly higher (16.4%) than at the bachelor's level. Engineering, Manufacturing & Construction was also the most sought-after STEM choice among female as well as male master's graduates. It was slightly more popular (2.3 p.p.) among female master's graduates than among female bachelor's graduates. Furthermore, the gender disparities at European level were mostly smaller for master's graduates compared to bachelor's graduates. The difference between male and female graduates in Natural Sciences, Mathematics & Statistics remained around 1 p.p. while for ICT and Engineering, Manufacturing & Construction graduates it dropped to just below 5 p.p. and 15 p.p., respectively.

Exhibit 75: Distribution (%) of master's graduates across broad fields of study, by sex, 2020

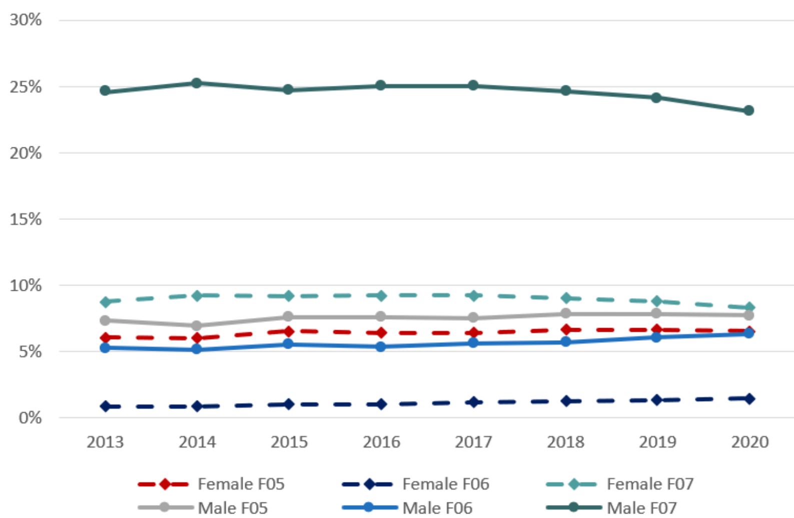
Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male
AU	2.62	2.61	9.18	19.94	6.43	16.83
AT	6.24	7.79	1.26	7.22	7.31	22.18
BE	4.22	6.48	0.37	1.82	6.13	22.50
BG	2.32	1.88	2.39	5.69	5.38	18.96
CA	7.45	8.90	2.20	6.26	7.35	22.84
CH	7.62	10.33	0.55	3.07	6.58	20.15
CY	1.09	1.57	0.80	4.72	2.15	5.80
CZ	5.33	4.43	1.66	9.40	9.89	27.36
DE	10.81	11.64	2.09	8.07	9.42	30.23
DK	7.91	8.83	5.13	10.83	8.06	17.23
EE	5.64	6.12	5.85	15.27	8.87	26.82
EL	8.52	15.32	2.73	7.80	5.46	11.38
ES	3.38	5.64	0.64	3.53	6.58	16.07
EU27	**6.55**	**7.73**	**1.47**	**6.30**	**8.31**	**23.13**
FI	6.14	7.67	3.71	13.99	5.65	25.07
FR	7.95	9.20	1.58	7.58	8.09	22.64
HR	5.46	4.67	1.26	8.82	9.55	27.39
HU	2.01	2.60	0.60	2.72	4.58	12.21
IE	4.47	6.34	6.17	20.33	3.89	8.70
IS	4.47	7.61	0.78	4.35	3.02	9.13
IT	7.81	7.51	0.34	1.78	9.52	24.52
LT	5.05	5.47	0.78	3.86	6.89	27.51
LU	6.07	4.37	1.46	7.20	4.13	6.68
LV	3.67	3.77	1.82	7.79	5.81	20.87
MT	3.68	2.50	1.12	4.61	3.68	5.79
NL	7.80	12.25	1.51	5.44	4.98	13.58
NO	6.29	8.23	1.69	8.17	10.24	22.86
PL	4.10	3.16	0.80	6.82	9.62	24.46
PT	6.91	6.39	0.80	2.75	14.69	36.32
RO	5.97	3.49	2.99	6.78	11.23	24.79
SE	4.05	5.51	1.40	3.11	14.19	39.10
SI	6.51	7.34	0.59	6.47	8.60	28.50
SK	5.78	4.57	0.96	7.31	5.80	24.52
TR	5.10	3.64	0.68	1.16	7.87	11.72
UK	4.28	6.78	1.90	6.53	5.09	14.66
US	4.21	5.92	3.08	9.44	3.13	11.20

Notes: Definition differs: IE, HU (for all fields); Provisional: IT (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

In the field of Natural Sciences, Mathematics & Statistics, most countries (AU, BG, CY, CZ, DE, DK, EE, HR, HU, IT, LT, LU, LV, MT, PL, PT, RO, SI, SK, TR) had higher or comparable shares of women in relation to the shares of men. The field of ICT was only equally popular among men and women in Turkey (the difference is less than 1 p.p.), although it needs to be noted that the pursuit of ICT was generally low in this country. Furthermore, Australia exhibited the highest proportion of women in ICT (9.2%) as well as the largest increase in female students between 2015 and 2020 (6.4 p.p.). Finally, there were no countries where women had higher or comparable proportions of graduates from Engineering, Manufacturing & Construction than men.

Exhibit 76 displays the development of the distribution of master's graduates across the broad fields of study in the EU27 countries over time. It outlines that no progress was observed since 2015 in increasing the popularity of any of the three STEM fields among women (differences less than 1 p.p.). Moreover, the discrepancies in the distributions of male and female graduates did not change noticeably (less than 1 p.p.) over time. Nevertheless, the table in Exhibit 77 shows that the European perspective obscures important country-level improvements. The largest increase in the share of women across all three fields of study was observable in Australian ICT programmes (6.4 p.p) although it was accompanied by an even larger increase in the share of men by 9.1 p.p.. Noteworthy were also developments in Denmark where all three STEM fields became somewhat more popular among women in 2020 compared to 2015 (only Engineering, Manufacturing & Construction became slightly more popular among men). Moreover, Estonia, the country with the largest discrepancy in the field of Engineering, Manufacturing & Construction between women and men in 2015, managed to reduce the disparity in its gender distributions from 25.4 p.p. to 18 p.p.. This was mostly attributed to a decrease in the share of male master's graduates in the respective field as the share of women remained largely unchanged. A decrease in the share of male graduates from Engineering, Manufacturing & Construction is also evident at European level, as can be seen in Exhibit 76.

Exhibit 76: The distribution (%) of master's graduates across broad fields of study in the EU27 countries, by sex



Notes: Definition differs: 2018 (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02)

Exhibit 77: Distribution (%) of master's graduates across broad fields of study, by sex, 2015

Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male
AU	2.86	3.36	2.75	10.81	5.13	14.53
AT	6.35	7.87	1.19	8.04	6.62	20.18
BE	4.53	6.23	0.09	1.25	7.06	23.76
BG	3.66	2.53	1.59	4.29	7.16	24.70
CA	6.29	7.89	2.87	4.41	6.51	21.13
CH	8.07	9.74	0.50	2.49	5.49	18.21
CY	2.57	1.18	1.07	5.00	4.89	12.55
CZ	4.02	3.76	0.67	7.32	8.25	23.80
DE	11.79	13.22	1.27	7.13	8.49	29.31
DK	6.02	8.37	3.68	10.30	6.82	15.58
EE	8.64	8.66	2.30	7.41	9.83	35.22
EL	11.69	18.65	2.51	6.79	7.88	13.25
ES	6.28	6.69	0.59	3.65	10.32	21.75
EU27	**6.56**	**7.60**	**1.03**	**5.52**	**9.19**	**24.75**
FI	6.39	7.29	2.88	12.78	6.44	27.31
FR	5.70	8.16	1.33	6.10	10.65	24.77
HR	5.57	4.93	1.03	7.72	7.20	25.07
HU	3.23	4.47	0.79	2.74	7.95	25.49
IE	4.85	6.28	3.42	12.66	3.68	8.42
IS	3.73	4.22	0.11	1.78	3.51	13.56
IT	7.09	6.35	0.34	3.09	9.32	23.43
LT	4.03	5.90	0.58	3.61	6.00	27.33
LU	4.39	4.60	2.07	7.76	1.03	3.16
LV	4.24	5.66	1.60	9.30	5.97	25.27
MT	4.12	3.42	1.24	3.98	3.57	11.20
NL	6.21	10.71	0.76	3.51	3.67	12.10
NO	6.81	8.07	1.17	5.82	8.17	20.30
PL	5.43	3.83	0.49	5.70	10.01	27.24
PT	6.95	6.17	0.42	1.39	15.25	38.48
RO	6.07	4.47	2.59	6.55	10.75	23.90
SE	4.30	5.03	1.02	3.22	13.09	37.00
SI	5.35	6.01	0.86	5.38	6.54	29.03
SK	5.18	4.72	0.33	4.94	5.84	24.23
TR	7.69	4.68	0.50	1.10	7.30	11.44
UK	8.01	7.73	1.31	5.13	5.03	15.94
US	3.19	4.72	1.94	6.23	3.32	11.95

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

The tables in Exhibit 78 and Exhibit 79 report the distribution of female and male master's graduates across the narrow fields of study, in 2015 and 2020. Within Natural Sciences, Mathematics & Statistics, the gender gap was essentially closed (difference of less than 1 p.p) in the fields of Environment and Mathematics & Statistics. However, both narrow fields were quite unpopular among both women and men. Physical Sciences, which was the most popular subfield of Natural Sciences, Mathematics & Statistics among graduates of both genders, displayed a larger discrepancy between female and male master's graduates. The latter were more likely to select this subject than female graduates (3.1% of men and 1.8% of women).

Exhibit 78: Distribution (%) of master's graduates across narrow fields of study, by sex, 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.77	0.61	0.22	0.32	0.50	0.80	1.95	8.52
AT	1.05	0.76	1.51	4.03	0.38	0.84	2.14	10.84
BE	0.81	0.72	0.79	1.98	0.44	1.05	2.17	15.60
BG	0.39	0.38	0.94	0.96	0.20	0.14	2.13	13.66
CA	1.69	1.45	1.42	2.67	1.06	2.06	4.25	16.73
CH	1.33	1.38	2.93	4.74	0.75	1.93	2.55	12.23
CY	0.07	0.33	0.05	0.49	0.07	0.05	1.04	3.69
CZ	0.40	0.29	1.21	1.90	0.50	0.75	3.02	14.44
DE	0.00	0.00	3.34	5.79	3.00	2.82	2.70	10.30
DK	0.15	0.11	1.60	2.95	0.70	1.41	3.95	10.57
EE	1.35	0.62	2.27	3.72	0.44	0.85	3.54	15.97
EL	0.17	0.25	3.06	5.48	1.13	2.38	2.12	7.03
ES	0.48	0.59	1.10	2.40	0.18	0.59	2.57	10.16
EU27_2020	**0.39**	**0.40**	**1.80**	**3.13**	**0.91**	**1.50**	**3.45**	**13.46**
FI	0.93	0.80	1.55	3.32	1.03	1.76	3.82	20.22
FR	0.14	0.28	2.00	2.95	0.65	2.00	3.18	12.85
HR	0.51	0.31	2.13	2.65	1.24	0.90	4.37	20.10
HU	0.43	0.38	0.64	1.37	0.19	0.36	2.03	8.45
IE	0.77	0.93	0.65	1.15	0.81	1.98	1.83	5.11
IS	3.40	3.04	0.68	1.96	0.10	1.52	1.46	4.57
IT	0.36	0.44	1.67	2.99	0.96	1.46	4.30	16.68
LT	0.17	0.04	1.22	2.20	0.89	1.27	3.87	21.36
LU	0.00	0.00	1.21	1.29	0.97	1.29	1.21	2.31
LV	0.75	1.47	1.39	1.34	0.36	0.26	2.42	16.53
MT	0.11	0.00	0.45	0.53	0.33	0.26	1.00	2.37
NL	1.01	1.00	1.32	5.70	0.39	1.15	1.78	8.17
NO	0.60	0.42	1.81	4.01	0.22	0.84	5.12	14.15
PL	0.39	0.37	1.67	1.48	0.57	0.61	3.94	16.07
PT	0.58	0.41	1.42	2.41	0.60	0.82	8.03	27.36
RO	0.69	0.72	2.32	1.70	0.93	0.45	6.41	17.33
SE	1.25	0.99	0.76	1.65	0.27	1.19	10.29	33.78
SI	0.72	0.50	1.89	3.42	0.68	0.93	2.77	16.55
SK	0.62	0.62	1.73	2.03	0.62	0.67	1.86	17.40
TR	0.09	0.05	1.58	1.75	0.95	0.70	3.42	7.62
UK	0.33	0.42	1.19	2.07	1.05	1.85	1.21	5.56
US	0.41	0.43	0.55	1.34	0.87	1.86	1.96	8.25

Notes: Definition differs: IE, HU (for all fields); Provisional: IT (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Engineering & Engineering Trades was the most popular field among both women and men while simultaneously exhibiting the highest gender gap out of all fields (10 p.p). Similar proportions and gender gaps can be observed in English-speaking non-EU countries (AU, CA, UK, US). This gap remained mostly unchanged since 2015. The EU-wide gender gap mirrors the situation at the individual country level, as there was no country where both genders were equally represented in this field in 2020. The lowest discrepancy was observed in Luxembourg (1.1 p.p.), albeit with very low percentages of both women and men graduating from this field. The biggest difference (23.5 p.p.) between men and women was observed in Sweden. However, Sweden also had the highest share of female Engineering & Engineering Trades graduates (10.3%).

Exhibit 79: Distribution (%) of master's graduates across narrow fields of study, by sex, 2015

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	1.03	0.89	0.33	0.69	0.25	0.46	1.90	8.76
AT	0.74	0.96	1.53	3.81	0.33	0.85	1.81	9.81
BE	0.82	0.85	1.04	2.15	0.54	0.92	3.00	16.71
BG	0.49	0.35	1.55	1.46	0.12	0.22	3.32	18.35
CA	:	:	:	:	:	:	:	:
CH	1.08	0.78	2.95	4.37	0.78	1.78	1.68	10.95
CY	0.69	0.39	0.43	0.10	0.73	0.49	1.93	8.53
CZ	0.30	0.24	1.30	1.93	0.47	0.65	2.22	12.33
DE	0.00	0.00	3.74	6.82	3.29	3.21	2.27	10.44
DK	0.00	0.00	1.29	2.09	0.37	0.79	2.36	7.73
EE	2.17	2.41	2.35	3.08	0.62	0.92	3.37	18.07
EL	0.04	0.06	3.43	4.36	2.52	4.42	2.97	7.89
ES	0.86	1.07	1.72	2.59	0.37	0.63	4.07	13.69
EU27_2020	**0.62**	**0.64**	**1.97**	**3.34**	**1.04**	**1.43**	**3.45**	**13.97**
FI	0.65	0.49	2.33	3.34	0.85	1.62	3.73	19.55
FR	0.68	0.91	1.91	3.36	0.55	1.62	3.70	13.95
HR	0.49	0.22	4.67	5.89	3.48	2.39	5.53	30.02
HU	0.39	0.51	1.05	2.66	0.27	0.42	3.58	18.99
IE	1.08	1.37	0.83	1.15	1.10	1.92	1.88	4.56
IS	1.87	1.33	1.10	2.22	0.00	0.22	0.66	5.78
IT	0.34	0.44	1.17	2.48	0.93	1.13	3.36	13.88
LT	0.41	0.24	1.06	2.50	0.85	1.18	2.98	20.45
LU	0.00	0.00	1.03	2.01	1.55	1.15	1.03	3.16
LV	0.82	0.94	1.44	3.05	0.36	0.58	2.45	18.59
MT	0.00	0.00	2.20	2.66	0.55	0.38	2.88	10.06
NL	0.90	1.09	0.99	4.77	0.38	0.96	0.94	5.97
NO	0.48	0.44	1.95	3.73	0.46	1.12	4.09	12.74
PL	1.04	0.84	1.87	1.54	0.91	0.75	3.78	15.83
PT	0.66	0.52	1.45	2.50	0.45	0.56	7.36	24.75
RO	0.76	0.69	2.92	2.53	1.00	0.65	5.14	14.72
SE	1.22	0.86	0.88	1.50	0.39	0.98	8.58	30.43
SI	0.32	0.52	1.51	2.14	0.81	0.94	1.43	18.64
SK	1.10	0.72	1.56	2.09	0.33	0.64	1.73	14.20
TR	0.10	0.08	3.15	2.38	1.19	0.87	3.47	7.57
UK	0.00	0.00	1.74	2.70	0.62	1.34	1.40	7.62
US	0.36	0.41	0.51	1.23	0.60	1.25	1.99	8.71

Notes: ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

7.2.3 Doctoral graduates

Exhibit 80 shows the distribution of doctoral graduates across the different broad fields of study for women and men in 2020. Female doctoral graduates with degrees in STEM fields made up 34.4% of all female doctoral graduates in the EU27 countries, more than female master's and bachelor's graduates combined. Male graduates in STEM accounted for 53.2% of all male doctoral graduates. At European level, all three fields were a less common choice among women than men. The most popular field among both female and male doctoral graduates was Natural Sciences, Mathematics & Statistics, which is significantly different from the distributions at the bachelor's and master's levels (Engineering, Manufacturing & Construction was the most common field of study). Nevertheless, the largest discrepancy between women and men at the doctoral level was still visible in Engineering, Manufacturing & Construction (11.5 p.p.) although the gap became continuously smaller the higher the level of education. At the same time, the gender gap in Natural Sciences, Mathematics & Statistics increased when compared to bachelor's and master's levels (from less than 1 to 3.9 p.p.).

As observed at the bachelor's and master's levels, the fields of ICT and Engineering, Manufacturing & Construction were consistently less popular among women than men. ICT was at least equally sought-after in three countries (BE, RO, TR) where numbers of doctoral graduates in this field were overall low. Denmark and Iceland achieved perfect parity with zero female and male graduates. In Natural Sciences, Mathematics & Statistics, several countries (BG, CZ, EE, ES, HR, IT, LU, LV, PL, SK, TR) displayed that women were at least equally selecting themselves into this field. The largest gender gap existed in Iceland (14.4 p.p.) although the share of women graduating from Natural Sciences, Mathematics & Statistics in this country was among the highest in the sample.

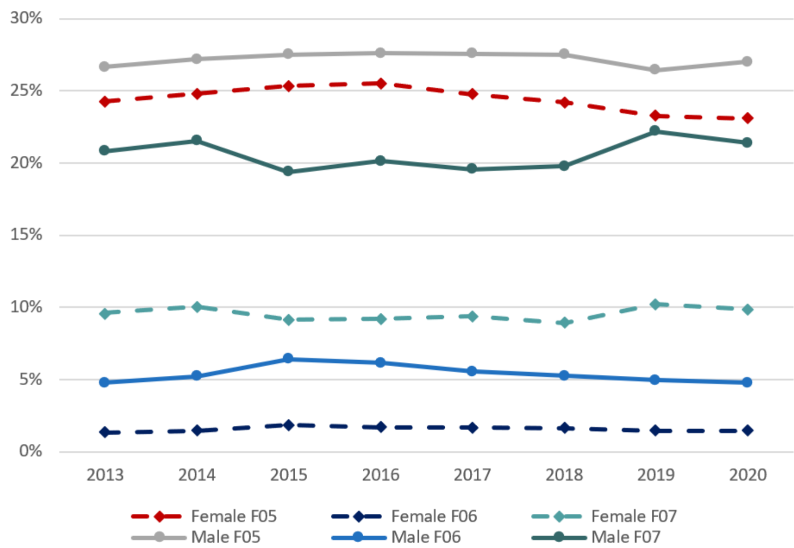
Exhibit 80: Distribution (%) of doctoral graduates across broad fields of study, by sex, 2020

Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male
AU	21.41	23.12	2.47	6.46	10.56	27.18
AT	17.63	20.20	2.11	6.11	14.86	32.03
BE	18.86	23.12	0.08	0.51	13.38	31.35
BG	13.71	9.22	1.17	2.61	6.35	13.63
CA	24.88	29.69	1.88	5.47	10.20	28.55
CH	28.59	30.77	0.68	3.79	9.05	18.47
CY	19.75	21.13	1.23	8.45	7.41	30.99
CZ	27.15	22.34	0.94	3.93	13.58	26.37
DE	26.10	31.24	1.21	4.97	5.84	18.69
DK	13.21	20.11	0.00	0.00	15.87	33.58
EE	30.47	29.03	3.13	13.98	9.38	19.35
EL	14.11	15.10	3.04	4.77	12.53	21.94
ES	25.54	24.38	0.86	4.49	8.95	18.24
EU27	**23.07**	**27.00**	**1.42**	**4.76**	**9.88**	**21.42**
FI	15.25	20.88	2.87	10.44	9.11	22.78
FR	30.35	36.86	3.09	7.02	9.02	18.53
HR	16.10	13.79	1.41	6.13	10.73	22.22
HU	15.89	18.96	1.66	7.78	4.64	9.72
IE	21.83	28.30	2.02	7.26	10.11	19.70
IS	30.43	44.83	0.00	0.00	2.17	13.79
IT	28.34	28.12	0.73	2.94	16.48	29.74
LT	26.34	27.04	1.08	3.14	8.60	28.93
LU	17.02	13.10	12.77	28.57	4.26	23.81
LV	15.15	14.81	4.55	7.41	15.15	31.48
MT	5.56	10.00	0.00	6.67	11.11	30.00
NL	13.07	23.73	0.99	2.77	7.03	17.26
NO	19.79	32.99	0.53	1.53	5.84	16.94
PL	22.39	20.25	0.23	2.49	10.13	14.21
PT	16.98	18.76	0.59	4.45	15.41	22.56
RO	7.64	7.93	1.86	2.21	11.46	19.88
SE	15.86	22.92	2.17	5.26	19.99	33.12
SI	18.55	22.38	0.00	4.76	14.48	25.71
SK	18.88	12.68	1.51	3.29	10.88	23.79
TR	16.86	11.55	0.41	0.65	14.85	22.09
UK	23.78	29.51	2.22	5.58	8.20	20.34
US	19.88	26.58	1.46	5.14	7.79	23.84

Notes: Definition differs: IE (for all fields); Provisional: IT (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

In combination with Exhibit 81, the table in Exhibit 82 allows the identification of changes in the distribution of doctoral graduates over time. At European level, the popularity of ICT and Engineering, Manufacturing & Construction among women only changed marginally (less than 1 p.p.) while Natural Sciences, Mathematics & Statistics became slightly less popular (2.3 p.p.). As the selection of male graduates into Natural Science, Mathematics & Statistics did essentially not change, the gender gap in this field increased somewhat from 2015 to 2020. The same development, a widening gender gap, occurred in the field of Engineering, Manufacturing & Construction due to a relatively higher increase in the popularity of the field among men than among women. On the country level, it stands out that no country was able to increase the popularity of all three STEM fields among women between 2015 and 2020. The largest improvement in terms of women's representation across all fields was visible in Luxembourg's ICT doctoral programmes. The share of female ICT graduates among all female graduates increased by 8.6 p.p., which made it the only country in 2020 where women made up more than 10% of female doctoral graduates in ICT. Combined with a 15.5 p.p. decrease in the share of male ICT graduates, the gender gap in ICT decreased from 39.9 p.p. to 15.8 p.p. over time. The largest decline in women's representation was visible in Malta's doctoral programmes in Natural Sciences, Mathematics & Statistics. In 2015, Malta had the largest negative gender gap as 10.7 p.p. more women than men earned doctoral degrees in Natural Sciences, Mathematics & Statistics. However, this gap had grown by 15.2 p.p. by 2020, mostly due to a 19.4 p.p. decline in the share of female graduates.

Exhibit 81: The distribution (%) of doctoral graduates across broad fields of study in the EU27 countries, by sex



Notes: Definition differs: 2015, 2016 & 2018 (for all fields)
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02)

Exhibit 82: Distribution (%) of doctoral graduates across broad fields of study, by sex, 2015

Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male
AU	21.25	22.78	2.06	5.50	8.85	23.29
AT	16.46	22.17	1.99	7.61	12.68	27.99
BE	25.54	31.15	0.00	0.13	10.30	25.22
BG	15.16	11.34	1.95	3.04	10.99	24.34
CA	25.74	28.94	1.86	5.13	9.82	29.20
CH	28.78	32.63	1.10	4.84	9.55	19.70
CY	19.05	17.14	2.38	2.86	11.90	37.14
CZ	22.71	21.90	0.75	4.96	15.23	29.78
DE	26.86	30.74	1.16	5.88	5.58	18.65
DK	15.46	20.86	0.00	0.00	14.71	32.35
EE	28.04	33.66	4.67	10.89	13.08	23.76
EL	12.44	12.32	1.53	4.74	13.97	24.11
ES	39.07	36.34	3.09	9.75	5.68	9.45
EU27	**25.37**	**27.52**	**1.85**	**6.41**	**9.17**	**19.40**
FI	16.35	19.30	3.14	12.55	12.07	26.69
FR	40.59	44.50	3.32	7.53	10.53	16.26
HR	21.53	15.49	0.40	2.36	10.26	24.67
HU	19.32	20.40	1.79	6.96	6.80	13.60
IE	24.16	27.35	3.51	8.31	8.20	19.03
IS	31.43	43.75	0.00	3.13	2.86	18.75
IT	25.12	23.84	2.51	10.40	11.30	19.44
LT	18.95	26.63	2.02	1.78	12.90	31.36
LU	25.00	20.34	4.17	44.07	2.08	10.17
LV	18.44	24.56	2.13	5.26	15.60	28.07
MT	25.00	14.29	0.00	0.00	6.25	35.71
NL	:	:	:	:	:	:
NO	23.80	31.80	0.55	2.81	3.83	14.35
PL	21.46	23.64	0.67	3.98	11.45	19.78
PT	18.59	11.26	1.67	6.14	13.11	29.85
RO	8.79	8.22	1.63	3.61	17.00	28.90
SE	18.36	23.06	2.65	6.60	16.44	34.39
SI	17.43	15.97	1.58	8.10	11.97	27.78
SK	20.99	12.28	0.63	5.20	11.33	29.55
TR	21.35	16.08	0.13	0.11	14.16	21.27
UK	28.78	28.57	1.66	5.78	7.99	19.60
US	20.62	26.80	1.29	4.40	7.30	23.51

Notes: Definition differs: EU27 (2015, for all fields)

Other: ":" indicates that data are not available

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

The table in Exhibit 83 displays the distribution of doctoral graduates across the narrow fields of study in 2020. In the EU27 countries, all subfields of Natural Sciences, Mathematics & Statistics, with the exception of Environment, were less sought-after by women than men. The latter was as popular among women as among men (the difference is less than 1 p.p.). Moreover, the subfields of Natural Sciences, Mathematics & Statistics had the smallest gender gaps among doctoral graduates, as is the case within the broader field of study. The subfield of Physical Sciences was much more popular among doctoral than among master's and bachelor's graduates while also exhibiting the largest gender gap (5.8 p.p.) among the three subfields. The largest gap overall continued to exist in Engineering & Engineering Trades, as it exhibited a gap of 7.4 p.p.. Moreover, no country (except where the number of both female and male doctoral graduates was zero) displayed equal popularity among women and men in this field, unlike in the subfields of Natural Sciences, Mathematics & Statistics. In the latter, multiple countries (BG, HR, LV, NO, PL, RO, SK, TR) had higher or nearly equal shares of women and men in all three fields.

Exhibit 83: Distribution of doctoral graduates across narrow fields of study, by sex, 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	1.37	1.18	6.33	8.33	0.71	1.69	5.62	15.73
AT	0.44	0.39	6.87	12.37	2.88	3.84	10.98	24.20
BE	0.16	0.13	2.27	4.75	3.68	6.02	6.57	17.04
BG	1.17	0.60	6.02	4.61	0.67	0.60	3.51	11.22
CA	2.28	1.42	7.42	13.49	1.96	4.12	7.67	22.80
CH	4.84	3.19	9.82	16.55	0.97	2.85	5.18	13.36
CY	3.70	7.04	7.41	2.82	1.23	9.86	6.17	22.54
CZ	2.72	1.73	7.20	8.82	1.65	1.63	6.61	14.86
DE	0.00	0.00	11.29	20.21	1.18	3.00	2.12	6.93
DK	0.00	0.00	0.00	0.00	0.00	0.00	15.87	33.58
EE	3.91	3.23	9.38	10.75	1.56	3.23	7.81	11.83
EL	0.12	0.13	8.15	10.06	1.09	2.97	5.11	13.81
ES	2.24	1.56	8.60	11.81	0.68	1.89	5.68	13.62
EU27	**0.71**	**0.48**	**9.64**	**15.40**	**1.38**	**3.13**	**5.12**	**12.47**
FI	3.27	2.02	4.55	9.99	0.50	3.14	5.84	20.20
FR	0.00	0.00	18.72	26.17	2.63	5.76	4.56	10.64
HR	0.28	0.00	8.47	9.20	0.56	1.15	5.37	18.77
HU	2.65	1.78	7.45	11.67	0.50	1.94	2.65	7.13
IE	2.02	1.63	5.53	10.22	0.81	1.63	7.01	15.56
IS	13.04	0.00	8.70	31.03	2.17	6.90	0.00	3.45
IT	0.79	0.64	11.99	16.75	2.31	4.90	8.06	21.91
LT	1.61	0.00	10.75	17.61	0.00	0.63	1.61	18.24
LU	0.00	0.00	0.00	8.33	4.26	3.57	0.00	0.00
LV	6.06	5.56	4.55	5.56	1.52	0.00	6.06	29.63
MT	0.00	0.00	0.00	10.00	2.78	0.00	8.33	30.00
NL	:	:	:	:	:	:	:	:
NO	0.27	0.00	2.52	3.18	0.40	1.40	4.12	15.03
PL	0.30	0.53	12.80	12.70	0.53	1.51	4.42	10.92
PT	0.79	0.98	5.20	9.11	1.28	2.17	7.75	14.10
RO	0.37	0.20	4.94	5.42	0.84	1.10	7.08	12.15
SE	1.40	1.06	7.48	13.40	1.26	3.26	15.37	25.42
SI	0.45	0.48	7.69	15.24	1.36	1.43	4.98	16.67
SK	1.66	1.56	5.14	6.10	1.66	0.63	4.53	15.81
TR	0.23	0.07	5.01	4.66	3.03	2.19	6.32	15.13
UK	0.83	0.82	9.73	15.02	1.80	3.94	3.81	11.30
US	0.67	0.61	5.82	11.38	1.56	3.99	5.58	18.62

Notes: Definition differs: IE (for all fields), EU27 (all fields except F071); Provisional: IT (for all fields)
Other: ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Exhibit 84: Distribution (%) of doctoral graduates across narrow fields of study, by sex, 2015

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	1.40	1.57	5.02	7.41	1.05	1.57	5.04	14.09
AT	0.21	0.24	6.92	11.57	1.99	4.69	9.01	20.79
BE	0.25	0.19	6.51	11.60	0.66	1.51	3.79	11.35
BG	0.00	0.00	7.23	5.81	0.42	1.52	5.42	17.57
CA	:	:	:	:	:	:	:	:
CH	3.76	3.53	9.67	17.35	0.98	2.26	5.04	13.07
CY	0.00	0.00	7.14	5.71	2.38	0.00	9.52	34.29
CZ	1.50	0.95	8.79	12.26	2.06	3.21	6.36	18.18
DE	0.00	0.00	10.85	19.68	1.23	2.94	1.94	7.13
DK	0.00	0.00	0.00	0.00	0.00	0.00	14.71	32.35
EE	1.87	1.98	6.54	19.80	2.80	2.97	9.35	14.85
EL	0.23	0.32	6.69	7.47	0.70	2.21	8.57	19.05
ES	0.00	0.00	19.52	19.08	3.39	6.00	0.00	0.00
EU27_2020	**:**	**:**	**:**	**:**	**:**	**:**	**:**	**:**
FI	2.09	0.74	6.84	9.60	0.48	3.90	9.60	23.52
FR	0.00	0.00	20.14	28.65	2.41	4.91	7.18	13.04
HR	0.20	0.00	10.46	8.40	0.80	1.57	4.83	16.27
HU	2.68	2.32	6.44	11.44	1.61	1.85	2.68	9.12
IE	2.20	1.47	8.93	13.81	0.88	2.41	4.54	15.15
IS	5.71	3.13	5.71	18.75	8.57	6.25	2.86	12.50
IT	:	:	:	:	:	:	:	:
LT	2.02	3.55	8.87	15.98	0.40	2.37	9.68	25.44
LU	0.00	0.00	8.33	11.86	0.00	3.39	0.00	0.00
LV	2.13	2.63	6.38	14.91	2.13	0.00	8.51	18.42
MT	0.00	0.00	12.50	0.00	0.00	0.00	6.25	28.57
NL	:	:	:	:	:	:	:	:
NO	0.14	0.00	3.28	4.29	0.55	1.63	2.74	11.69
PL	1.15	0.88	10.83	15.04	1.01	3.39	6.74	14.98
PT	0.40	0.27	7.55	3.94	1.27	1.65	7.23	19.69
RO	0.67	0.31	5.04	4.19	1.54	2.93	11.48	21.26
SE	2.83	1.51	8.91	13.95	1.57	3.58	11.20	24.17
SI	1.76	1.62	0.88	1.62	1.23	0.93	5.46	15.51
SK	2.52	1.77	6.30	5.72	1.36	1.35	5.35	16.75
TR	0.08	0.07	7.52	7.11	4.76	4.11	6.27	14.08
UK	0.00	0.00	9.19	14.73	1.61	3.54	4.36	13.71
US	0.70	0.76	5.81	11.08	1.46	3.76	5.22	18.47

Notes: ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Overall, STEM-related fields of study were much less popular among female than male bachelor's graduates, with Engineering, Manufacturing & Construction exhibiting the largest gender gap followed by ICT and Natural Sciences, Mathematics & Statistics. Moreover, the distribution of graduates did not undergo any noticeable changes between 2015 and 2020. At the master's level, slightly more women graduated in STEM-related fields and the differences were marginally smaller than at the bachelor's level. However, the gaps were still persistent over time and were largest in Engineering, Manufacturing & Construction. The doctoral level exhibited the highest participation rate of women in STEM fields, with most women (and men) earning degrees in Natural Sciences, Mathematics & Statistics. This constitutes a significant departure from the previous education levels, at which Engineering, Manufacturing & Construction was the top choice among STEM fields for both genders. The differences between women's and men's choices continued to persist at the doctoral level, albeit smaller than at the bachelor's and master's levels. While little improvement was visible on the aggregate in the EU27 countries, there were large differences across countries as some countries achieved notable progress in improving women's participation in STEM education.

7.3 Propensity to graduate

Previous chapters focused only on graduates as the unit of interest. However, to provide a comprehensive picture of gender differences in educational pathways, the following section investigates the progress made across the course of an educational programme. For this purpose, the indicators presented subsequently show the ratios of graduates to entrants separately for women and men for each level of education and field of study. If the number of graduates equals the number of first-year students, the ratio is 1. A ratio smaller (larger) than 1 means that there are fewer (more) graduates than entrants. A disadvantage of this indicator is that values are sensitive to fluctuations in student numbers over time as it compares different cohorts of students to each other. This limitation becomes evident in countries where the ratio of graduates to entrants is larger than 1 indicating that the number of entrants in the reference year is smaller than the number of students graduating.

7.3.1 Bachelor's students

The table in Exhibit 85 compares the number of bachelor's graduates with the number of bachelor's entrants in the same year by sex and by broad field of study. At European level, women displayed higher propensities to graduate from bachelor's-level studies (0.86) in 2020 compared to men (0.72). Of the countries considered, the large majority exhibited a higher propensity of women to graduate than men, with the exceptions of Turkey, Switzerland and Malta. Nevertheless, women's propensities to graduate in each of these three countries were still high with the ratios ranging between 0.79 and 0.92.

A similar picture emerges when considering the three broad fields of study that relate to STEM education. At the European level, female bachelor's entrants were more likely to graduate than male entrants in each of the three broad fields. However, the propensity to graduate from STEM fields in the EU27 countries was lower for both women and men compared to the general propensity to graduate from bachelor's studies. Although most countries had higher graduation propensities for women, some countries (AT, CH, DE, DK, MT, NL) had higher graduation rates for men in all three fields analysed. Women's lower propensities to graduate from STEM fields in Austria, Germany, Denmark and the Netherlands were contrary to the students' overall propensities to complete bachelor's studies in these countries that were generally higher for women.

Looking at the four narrow fields of study displayed in Exhibit 86, the pattern of women having higher ratios of bachelor's graduates to entrants was less pronounced but still visible. At European level, men had higher completion rates in the field of Environment (0.61 for women and 0.71 for men) while the opposite held true for the three other fields. In six countries (BG, ES, LV, PL, SI, SK), women's propensities to graduate were higher or equal in all four fields.

Exhibit 85: Ratio of bachelor's graduates to bachelor's entrants, by sex and broad field of study, 2020

Country	Total		Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.81	0.77	0.70	0.71	0.76	0.67	0.74	0.73
AT	0.76	0.71	0.47	0.57	0.47	0.53	0.64	0.76
BE	0.86	0.70	0.64	0.63	0.61	0.53	0.70	0.67
BG	0.68	0.51	0.54	0.45	0.56	0.44	0.69	0.47
CA	:	:	:	:	:	:	:	:
CH	0.92	0.95	0.57	0.68	0.63	0.77	0.84	0.94
CY	0.56	0.37	0.74	0.62	0.85	0.37	0.46	0.74
CZ	0.67	0.54	0.48	0.44	0.44	0.44	0.70	0.53
DE	0.72	0.71	0.46	0.47	0.51	0.53	0.72	0.77
DK	0.86	0.82	0.76	0.78	0.66	0.88	0.75	0.83
EE	0.98	0.74	0.69	0.49	0.80	0.52	0.93	0.73
EL	0.58	0.50	0.49	0.46	0.58	0.34	0.52	0.53
ES	0.93	0.82	0.77	0.72	0.50	0.54	0.81	0.79
EU27	**0.86**	**0.72**	**0.55**	**0.48**	**0.69**	**0.60**	**0.76**	**0.72**
FI	1.04	0.93	0.86	1.02	0.86	0.81	0.79	0.83
FR	0.62	0.55	0.44	0.32	1.06	0.97	0.59	0.61
HR	0.74	0.59	0.85	0.78	0.50	0.45	0.70	0.60
HU	3.88	2.72	3.02	2.64	1.12	1.06	2.14	2.23
IE	1.00	0.97	0.74	0.88	1.40	0.97	0.84	0.99
IS	0.90	0.75	0.38	0.53	1.21	1.11	0.62	0.66
IT	0.98	0.78	0.48	0.50	0.63	0.50	0.69	0.62
LT	0.93	0.73	0.75	0.56	0.67	0.48	1.48	0.92
LU	0.61	0.50	0.37	0.22	0.30	0.44	0.36	0.44
LV	0.57	0.31	0.40	0.33	0.35	0.22	0.45	0.32
MT	0.91	0.99	0.69	1.16	0.77	0.93	0.82	1.00
NL	0.77	0.71	0.72	0.76	0.49	0.54	0.65	0.66
NO	0.93	0.79	0.54	0.57	0.68	0.70	1.05	0.98
PL	1.26	0.76	0.69	0.43	1.08	0.58	0.89	0.64
PT	0.90	0.78	0.80	0.74	0.64	0.66	1.53	0.99
RO	0.68	0.58	0.70	0.52	0.72	0.68	0.70	0.59
SE	0.76	0.55	0.35	0.27	1.10	0.64	0.77	0.66
SI	0.63	0.50	0.72	0.49	0.34	0.43	0.51	0.54
SK	0.64	0.49	0.57	0.44	0.51	0.40	0.55	0.45
TR	0.79	0.85	0.54	0.42	0.28	0.29	0.91	0.87
UK	0.74	0.69	0.78	0.78	0.56	0.56	0.74	0.73
US	:	:	:	:	:	:	:	:

Notes: Definition differs: IE, HU, BE (all fields), PL (all fields except Total); Estimated: BG (all fields), PL (all fields except Total); Provisional: IT (all fields)
Other: ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_uoe_ent02), OECD (Graduates by field, New entrants by field)

Exhibit 86: Ratio of bachelor's graduates to bachelor's entrants, by sex and narrow field of study, 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.62	0.68	0.76	0.95	0.88	0.78	0.67	0.72
AT	0.87	1.16	0.41	0.58	0.37	0.39	0.52	0.72
BE	3.50	7.40	0.62	0.63	0.46	0.58	0.72	0.78
BG	0.45	0.39	0.51	0.45	0.76	0.60	0.70	0.47
CA	:	:	:	:	:	:	:	:
CH	0.50	0.68	0.59	0.69	0.37	0.63	0.77	0.93
CY	7.00	5.00	0.52	1.19	0.93	0.27	0.44	0.76
CZ	0.11	0.11	0.38	0.42	0.50	0.35	0.63	0.49
DE			0.38	0.45	0.38	0.48	0.65	0.76
DK	0.63	0.78	0.92	0.88	0.63	0.63	0.67	0.81
EE	0.82	1.35	0.66	0.48	0.53	0.28	0.73	0.71
EL	0.16	0.31	0.53	0.47	0.46	0.46	0.58	0.55
ES	0.80	0.77	0.73	0.71	0.55	0.46	0.78	0.77
EU27	**0.61**	**0.71**	**0.56**	**0.50**	**0.54**	**0.51**	**0.74**	**0.71**
FI	0.95	1.63	0.83	1.23	1.24	1.20	0.71	0.76
FR	1.28	1.11	0.50	0.32	0.64	0.58	0.74	0.76
HR	0.72	0.78	1.01	0.90	0.76	0.60	0.73	0.61
HU	7.06	10.45	3.66	2.94	2.61	1.66	2.04	2.16
IE	0.99	1.24	1.22	1.15	0.81	0.95	0.73	1.02
IS	0.45	0.00	0.52	0.39	0.67	1.00	0.58	0.66
IT	0.34	0.39	0.52	0.60	0.50	0.52	0.61	0.58
LT			0.96	0.64	0.56	0.43	1.35	0.91
LU			0.22	0.04	0.24	0.28	0.50	0.50
LV	0.51	0.44	0.36	0.29	0.32	0.24	0.34	0.32
MT			0.73	1.29	0.62	0.50	0.84	1.08
NL	0.64	0.95	0.70	0.71	0.64	0.71	0.67	0.65
NO	0.00	0.00	0.77	0.89	0.40	0.60	0.97	0.95
PL	0.67	0.49	0.74	0.45	0.62	0.36	0.85	0.62
PT	0.47	0.42	0.80	0.70	0.62	0.78	1.31	0.94
RO	0.63	0.64	0.71	0.56	0.67	0.36	0.73	0.62
SE	0.61	0.47	0.22	0.19	0.14	0.24	0.60	0.59
SI	0.29	0.21	0.83	0.59	0.28	0.18	0.58	0.58
SK	0.47	0.38	0.47	0.41	0.47	0.32	0.63	0.47
TR	0.75	0.73	0.37	0.40	0.81	0.48	0.83	0.82
UK	0.52	0.57	0.84	0.87	0.85	0.83	0.82	0.83
US	:	:	:	:	:	:	:	:

Notes: Definition differs: IE, HU, BE (all fields), PL (all fields except Total); Estimated: BG (all fields), PL (all fields except Total); Provisional: IT (all fields)
Other: " " indicates that the denominator is zero; ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_uoe_ent02) and OECD (Graduates by field, New entrants by field)

7.3.2 Master's students

The tables in Exhibit 87 and Exhibit 88 show the propensities to graduate from master's-level studies for women and men in total, in the broad and narrow fields of study. At European level, women had slightly higher graduation likelihoods of 0.91 than men with 0.89 when no differentiation by field of study is made. Nevertheless, the cross-country comparison illustrates that men had higher propensities to graduate than women in 11 countries (AU, AT, CH, CY, FI, FR, IE, IS, LU, NO, PL). This is nearly four times the number of countries at the bachelor's level. Nevertheless, women still had fairly high likelihoods to graduate from master's-level studies in these 11 countries with the lowest ratio of female graduates to entrants observed being 0.59 in Norway. Overall, the country that had the lowest completion propensity for both women (0.53) and men (0.48) was Turkey.

Exhibit 87: Ratio of master's graduates to master's entrants, by sex and broad field of study, 2020

Country	Total		Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.86	0.99	0.73	0.67	1.27	1.23	1.20	1.31
AT	0.88	0.91	0.84	0.87	0.51	0.73	0.86	0.90
BE	0.95	0.91	0.94	0.86	3.10	0.80	0.90	0.80
BG	0.90	0.78	0.82	0.69	0.88	0.64	0.72	0.70
CA	:	:	:	:	:	:	:	:
CH	0.97	1.01	0.81	0.90	0.55	0.69	0.89	0.89
CY	0.64	0.65	0.85	0.91	0.47	0.56	1.02	0.98
CZ	0.92	0.89	0.87	0.84	0.80	0.79	1.07	1.04
DE	0.72	0.71	0.78	0.78	0.48	0.56	0.67	0.72
DK	0.88	0.87	0.76	0.86	0.85	0.76	0.83	0.81
EE	0.94	0.79	1.00	0.89	1.03	0.93	0.91	0.73
EL	0.80	0.79	0.80	0.84	0.65	0.71	0.68	0.66
ES	1.32	1.29	1.14	1.11	1.01	1.04	1.26	1.28
EU27	**0.91**	**0.89**	**0.93**	**0.92**	**0.72**	**0.74**	**0.86**	**0.83**
FI	2.18	2.31	4.04	5.27	2.09	2.18	1.68	1.66
FR	0.90	0.91	1.21	1.16	0.75	0.77	0.87	0.89
HR	0.85	0.78	0.90	0.74	1.13	1.36	0.90	0.79
HU	2.31	2.20	1.42	1.38	1.31	1.31	1.85	1.76
IE	1.08	1.20	1.05	1.11	1.61	1.72	1.09	0.98
IS	0.83	0.84	0.70	0.74	2.00	2.22	0.53	0.40
IT	0.95	0.93	0.84	0.80	0.73	0.67	0.91	0.81
LT	0.90	0.76	0.86	0.85	0.90	0.48	0.77	0.73
LU	0.80	1.05	0.48	0.49	0.24	0.78	0.61	0.38
LV	0.66	0.52	0.66	0.68	0.41	0.37	0.67	0.57
MT	0.71	0.66	1.43	0.90	0.83	0.67	0.75	0.47
NL	0.92	0.91	0.78	0.80	0.76	0.85	0.84	0.80
NO	0.59	0.64	0.67	0.75	0.51	0.60	0.82	0.78
PL	0.82	0.88	0.98	0.99	0.73	0.81	1.02	1.06
PT	0.65	0.60	0.71	0.61	0.44	0.43	0.62	0.60
RO	0.75	0.64	0.82	0.63	0.63	0.45	0.63	0.55
SE	0.82	0.71	0.72	0.94	0.59	0.51	0.76	0.65
SI	0.69	0.60	0.74	0.67	0.39	0.57	0.93	0.66
SK	1.07	0.99	1.20	1.14	1.16	0.87	1.11	0.99
TR	0.53	0.48	0.45	0.34	0.47	0.36	0.38	0.31
UK	0.87	0.83	0.86	0.92	0.63	0.58	0.92	0.81
US	:	:	:	:	:	:	:	:

Notes: Definition differs: IE, HU (all fields), PL (all fields except Total); Estimated: BG (all fields), PL (all fields except Total); Provisional: IT (all fields)

Other: ":" indicates that data are not available

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_uoe_ent02) and OECD (Graduates by field, New entrants by field)

When considering at European level the broad fields of study, women displayed marginally higher ratios of graduates to entrants in Natural Sciences, Mathematics & Statistics (0.93 for women and 0.92 for men) as well as Engineering, Manufacturing & Construction (0.86 for women and 0.83 for men). Men had somewhat higher propensities to graduate than women in ICT (0.74 for men and 0.72 for women) although differences were considerably low. Additionally, only two countries (AT, PL) exhibited higher completion ratios for male than female entrants in all three broad fields.

Exhibit 88: Ratio of master's graduates to master's entrants, by sex and narrow field of study, 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.69	0.71	0.60	0.61	0.85	0.61	1.43	1.50
AT	0.98	0.82	0.72	0.91	0.95	0.80	0.83	0.96
BE	1.74	1.30	0.74	0.75	1.28	1.14	0.80	0.76
BG	1.16	1.04	0.77	0.59	0.74	0.43	0.78	0.77
CA	:	:	:	:	:	:	:	:
CH	0.71	0.92	0.91	0.98	0.81	0.91	0.80	0.82
CY	0.75	1.20	0.50	3.00	0.33	0.08	1.08	1.11
CZ	0.91	0.59	0.72	0.77	1.02	0.91	1.02	1.04
DE			0.72	0.81	0.84	0.72	0.67	0.74
DK	0.80	0.67	0.78	0.88	0.78	0.81	0.76	0.80
EE	0.86	0.80	1.24	0.86	0.71	0.92	1.01	0.88
EL	1.16	1.05	0.70	0.79	1.04	0.88	0.72	0.72
ES	1.09	1.06	1.13	1.20	0.48	0.39	1.23	1.24
EU27	**0.93**	**0.92**	**0.88**	**0.90**	**0.89**	**0.83**	**0.84**	**0.83**
FI	6.05	5.83	3.93	6.08	141.00	17.22	1.47	1.57
FR	0.87	1.08	1.05	1.04	1.00	1.04	0.96	0.94
HR	0.80	0.69	0.86	0.82	1.06	0.56	0.81	0.76
HU	2.40	3.30	1.31	1.45	1.28	1.05	2.71	1.92
IE	0.78	0.75	1.07	1.16	1.22	1.17	0.95	1.00
IS	1.17	0.70	0.39	0.75	0.33	1.40	0.71	0.46
IT	0.72	0.74	0.97	0.85	0.93	0.87	0.74	0.72
LT	0.50	0.11	0.90	1.16	0.71	0.75	0.81	0.79
LU	0.00	0.00	0.45	0.63	2.00	0.50	1.00	0.47
LV	0.62	1.10	0.78	0.47	0.63	0.44	0.52	0.57
MT			1.00	0.27	3.00	2.00	0.69	0.33
NL	0.69	0.69	0.78	0.82	0.72	0.75	0.69	0.72
NO	1.08	1.12	0.80	0.96	0.80	0.85	0.79	0.77
PL	0.97	1.03	0.97	1.02	1.00	0.84	1.02	1.03
PT	0.89	0.54	0.60	0.53	0.49	0.46	0.60	0.61
RO	0.66	0.57	0.80	0.61	1.02	0.86	0.65	0.54
SE	1.04	1.47	0.68	0.90	0.54	0.74	0.76	0.64
SI	0.50	0.42	1.05	0.72	0.64	0.38	0.99	0.58
SK	1.28	1.88	1.30	1.01	1.26	1.20	1.07	1.00
TR	0.37	0.29	0.44	0.34	0.38	0.29	0.37	0.30
UK	0.97	1.13	0.92	0.95	0.86	0.87	0.83	0.79
US	:	:	:	:	:	:	:	:

Notes: Definition differs: IE, HU, PL (all fields); Estimated: BG, PL (all fields); Provisional: IT (all fields)
Other: " " indicates that the denominator is zero; ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_uoe_ent02) and OECD (Graduates by field, New entrants by field)

Among the four narrow fields of study at European level, men had slightly higher graduation propensities in Physical Sciences (0.9 for men and 0.88 for women) while female students had higher ratios than men in the remaining three fields. At country level, however, several countries (AU, BG, EE, FR, HR, IT, LV, MT, PT, RO, SI, SK, TR) displayed higher or equivalent propensities to graduate for women than men in Physical Sciences. When comparing the median graduation propensities in all countries and in each broad and narrow field across the different levels of education, it is noticeable that the graduation propensities at the master's level were higher than at the bachelor's level.

7.3.3 Doctoral students

The tables in Exhibit 89 and Exhibit 90 show the ratios of graduates to entrants for men and women in total and in the broad and narrow fields of study at the doctoral level. The overall EU27 graduation ratios for both women and men were below the rates at the master's and bachelor's levels. Moreover, women's propensities to graduate (0.66) were slightly below that of men (0.68). Nevertheless, there was substantial cross-country heterogeneity. Nearly half of the countries (BG, CY, EE, EL, HR, HU, IS, IT, LT, LV, MT, NL, PL, PT, SK) exhibited higher or at least equal female completion to entrance ratios compared to male ratios. The largest difference was observable in Malta, where women were considerably more likely to graduate than men (2.57 for women and 1.58 for men).

Exhibit 89: Ratio of doctoral graduates to doctoral entrants, by sex and broad field of study, 2020

Country	Total		Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.83	0.96	0.88	1.02	0.73	0.87	0.89	1.13
AT	0.60	0.70	0.75	0.78	0.40	0.48	0.60	0.80
BE	:	:	:	:	:	:	:	:
BG	0.59	0.55	0.86	0.64	0.35	0.32	0.49	0.40
CA	:	:	:	:	:	:	:	:
CH	0.74	0.84	0.83	0.90	0.31	0.51	0.81	0.90
CY	0.53	0.53	1.14	1.00	0.09	0.50	0.67	0.85
CZ	0.44	0.46	0.55	0.58	0.25	0.28	0.38	0.42
DE	0.73	0.78	0.83	0.91	0.54	0.62	0.62	0.69
DK	0.85	0.86	1.27	1.16			0.80	0.76
EE	0.71	0.63	0.93	0.82	0.31	0.42	0.63	0.58
EL	0.49	0.46	0.57	0.53	0.51	0.32	0.40	0.38
ES	0.48	0.52	0.66	0.66	0.34	0.59	0.51	0.52
EU27	**0.66**	**0.68**	**0.77**	**0.82**	**0.51**	**0.58**	**0.58**	**0.65**
FI	0.90	1.03	0.96	1.31	0.97	0.90	1.11	1.12
FR	0.61	0.66	0.71	0.75	0.67	0.64	0.43	0.65
HR	0.49	0.40	0.40	0.32	0.83	1.00	0.60	0.35
HU	0.47	0.46	0.46	0.47	0.48	0.58	0.36	0.36
IE	0.66	0.72	0.67	0.77	0.28	0.51	0.65	0.69
IS	0.66	0.56	1.40	1.44	0.00	0.00	0.25	0.25
IT	0.70	0.64	0.83	0.71	0.44	0.56	0.69	0.64
LT	0.65	0.54	0.68	0.55	0.67	0.50	0.47	0.52
LU	0.96	1.11	0.50	0.69	0.86	1.00	0.33	1.43
LV	0.26	0.23	0.36	0.21	0.20	0.17	0.33	0.29
MT	2.57	1.58						
NL	1.41	1.36	1.62	1.56	2.20	0.98	1.17	1.08
NO	0.66	0.76	0.65	0.80	0.29	0.38	0.62	0.71
PL	0.64	0.55	0.76	0.63	0.21	0.39	0.61	0.39
PT	0.36	0.34	0.47	0.54	0.15	0.36	0.37	0.33
RO	0.38	0.39	0.37	0.45	0.39	0.22	0.22	0.23
SE	0.99	1.18	1.09	1.29	0.63	0.72	1.16	1.48
SI	0.47	0.51	0.72	0.85	0.00	0.43	0.52	0.55
SK	0.79	0.69	0.79	0.70	1.00	0.49	0.94	0.79
TR	0.33	0.40	0.38	0.42	0.19	0.28	0.27	0.34
UK	0.81	0.90	0.86	0.94	0.62	0.71	0.83	0.95
US	:	:	:	:	:	:	:	:

Notes: Definition differs: EU27, IE, DE (all fields), PL (all fields except Total); Break in time series: DE (all fields); Estimated: NL (all fields), PL (all fields except Total); Provisional: IT (all fields)
Other: " " indicates that the denominator is zero; ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_uoe_ent02) and OECD (Graduates by field, New entrants by field)

In the three broad fields related to STEM education, men were more likely to graduate from doctoral-level studies in each field. This reflected the situation in 13 (AU, AT, CH, CZ, DE, ES, IE, LU, NO, SE, SI, TR, UK) of the 30 observed countries. In contrast, five countries (BG, EL, LV, NL, SK) stood out as they displayed higher propensities for women to graduate than men in all three fields.

The four narrow fields of study show that there was heterogeneity within the broad fields of study. While women had equal or higher completion propensities in the field of Environment (0.78 for women and 0.61 for men) and Mathematics & Statistics (0.73 for men and women), men were more likely to graduate than women in Physical Sciences (0.81 for men and 0.72 for women) and Engineering & Engineering Trades (0.64 for men and 0.60 for women).

Exhibit 90: Ratio of doctoral graduates to doctoral entrants, by sex and narrow field of study, 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.76	1.00	1.15	1.12	0.67	0.88	0.97	1.18
AT	0.80	0.56	0.72	0.87	1.08	0.89	0.68	0.82
BE	:	:	:	:	:	:	:	:
BG	1.00	1.00	1.29	0.70	0.67	0.25	0.46	0.42
CA	:	:	:	:	:	:	:	:
CH	0.99	0.88	0.81	0.90	1.11	1.18	0.84	0.99
CY	1.00	1.25	2.00	0.67		1.00	1.00	0.84
CZ	0.77	0.49	0.47	0.50	0.88	0.45	0.39	0.39
DE			0.82	0.91	0.74	0.93	0.65	0.68
DK							0.80	0.76
EE	1.67	1.00	0.86	0.53	2.00	1.00	0.67	0.42
EL	0.25	0.11	0.56	0.65	0.45	0.48	0.32	0.42
ES	0.90	0.60	0.64	0.67	0.49	0.57	0.53	0.52
EU27	**0.78**	**0.61**	**0.72**	**0.81**	**0.73**	**0.73**	**0.60**	**0.64**
FI	1.43	1.13	0.62	1.06	1.67	1.75	0.88	1.18
FR			0.72	0.80	0.58	0.57	0.65	0.78
HR	0.25	0.00	0.41	0.29	0.15	0.43	0.51	0.37
HU	0.47	0.34	0.46	0.48	0.38	0.57	0.53	0.44
IE	0.65	0.61	0.66	0.80	0.32	0.31	0.57	0.68
IS	2.00		2.00	1.50		2.00		0.17
IT		2.78	0.67	0.70	0.79	0.69	0.67	0.63
LT	0.30	0.00	0.87	0.80	0.00	0.17	0.16	0.54
LU			0.00	0.54	2.00	3.00		
LV	0.67	0.75	0.33	0.12	0.50	0.00	0.24	0.39
MT								
NL	:	:	:	:	:	:	:	:
NO	0.40	0.00	1.06	0.78	1.00	0.65	0.45	0.67
PL	0.57	1.20	0.93	0.73	0.64	0.53	0.55	0.47
PT	0.19	0.20	0.41	0.62	0.65	0.40	0.37	0.34
RO	0.27	0.25	0.43	0.50	0.50	0.42	0.21	0.19
SE	0.77	0.89	1.05	1.35	1.13	0.95	1.17	1.35
SI	0.20	0.50	2.83	6.40	0.75	0.38	0.50	0.56
SK	0.55	1.25	0.72	0.62	1.22	0.33	0.81	0.89
TR	0.24	0.19	0.40	0.38	0.55	0.64	0.29	0.36
UK	0.74	0.99	0.90	0.97	0.92	0.82	0.85	1.03
US	:	:	:	:	:	:	:	:

Notes: Definition differs: EU27, IE, NL, DE, PL (all fields); Break in time series: DE (all fields); Provisional: IT, PL (all fields)
Other: " " indicates that the denominator is zero; ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_uoe_ent02) and OECD (Graduates by field, New entrants by field)

In general, women had higher propensities to complete a bachelor's degree than men, which has also proven true for STEM fields of study. Graduation propensities for both genders were highest in Engineering, Manufacturing & Construction, followed by ICT and Natural Sciences, Mathematics & Statistics. At the master's level, graduation propensities were overall higher for both male and female students across all fields of study. However, gender differences were no longer unequivocally in women's favour as graduation likelihoods were mostly equal for both genders. At the doctoral level, both women and men were less likely to complete a degree than at the bachelor's and master's levels. Additionally, men were more likely to earn doctoral degrees than women in all STEM fields.

7.4 Propensity to transition

Differences in the propensity to transition to the subsequent level of education after graduation may lead to divergence in educational and career pathways between women and men. Thus, this section explores students' propensity to transition both across broad and narrow fields of study.

7.4.1 From bachelor's graduates to master's students

The table in Exhibit 91 shows the ratio of master's entrants to bachelor's graduates as a measure of the proportion of students continuing their education at master's level. At European level, the ratios across all fields of study were relatively high for both men and women, with only a slightly higher value for men than for women in 2020 (0.72 for women and 0.75 for men). This indicates that, regardless of gender, more than 70% of graduates from bachelor's programmes in the EU27 countries transitioned to master's programmes after graduation.

When examining the variation at country level, a very heterogeneous picture emerges, with significant differences in both the absolute values of the propensity to transition for women and men and the respective gender gaps. In 17 (AU, AT, BE, CZ, DK, EE, FR, HU, IT, LU, LV, MT, NO, PT, SE, SK, TR) of the 34 observed countries, women were less likely to enter a master's degree programme after obtaining a bachelor's degree. The largest difference between men's and women's propensities to transition was observed in Sweden, albeit with a very high likelihood to pursue a master's degree for bachelor's graduates of both genders (0.9 for women and 1.46 for men). Additionally, a few countries stood out (FI, HU, TR) due to their low proportions of women and men transitioning to master's-level studies (between 0.13 and 0.27 for women and 0.16 and 0.31 for men).

Exhibit 91: Ratio of master's entrants to bachelor's graduates, by sex and broad field of study, 2020

Country	Total		Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.49	0.55	0.24	0.24	1.52	0.86	0.70	0.55
AT	0.94	1.05	0.84	0.84	1.23	0.99	1.07	0.99
BE	0.58	0.72	1.49	1.19	0.10	0.22	0.99	0.90
BG	0.99	0.92	0.68	0.80	0.79	0.69	1.12	0.81
CA	:	:	:	:	:	:	:	:
CH	0.46	0.43	1.09	1.10	0.61	0.32	0.64	0.36
CY	3.61	1.95	0.40	0.73	2.12	1.59	1.32	0.39
CZ	0.84	0.97	0.87	0.85	1.11	0.81	1.02	0.95
DE	0.86	0.73	1.92	1.67	1.27	0.96	0.93	0.52
DK	0.58	0.65	1.26	1.22	2.85	0.99	1.06	0.58
EE	0.73	0.82	0.65	1.02	0.97	0.75	1.20	1.14
EL	0.58	0.51	0.62	0.81	1.15	0.92	0.36	0.26
ES	0.60	0.60	0.40	0.51	0.81	0.45	0.83	0.51
EU27_2020	**0.72**	**0.75**	**0.88**	**0.92**	**0.95**	**0.74**	**1.05**	**0.75**
FI	0.27	0.24	0.24	0.21	0.38	0.25	0.34	0.26
FR	1.08	1.39	0.73	0.83	1.94	1.57	2.92	2.33
HR	1.05	0.98	0.95	1.11	0.49	0.52	0.81	0.80
HU	0.13	0.16	0.18	0.20	0.14	0.09	0.18	0.11
IE	0.57	0.46	0.30	0.33	0.64	0.53	0.59	0.24
IS	0.66	0.56	1.32	1.04	0.07	0.05	0.57	0.58
IT	0.67	0.75	0.92	0.94	0.75	0.62	1.18	1.00
LT	0.50	0.45	0.78	0.69	0.30	0.27	0.50	0.35
LU	1.33	1.37	3.47	2.69	3.57	0.95	3.50	2.16
LV	0.99	1.21	1.22	1.07	1.42	1.18	0.95	0.85
MT	0.86	1.02	0.40	0.36	0.40	0.26	0.75	0.58
NL	0.52	0.52	1.08	1.17	1.25	0.43	0.83	0.54
NO	0.72	0.78	1.67	1.53	0.95	0.65	1.87	1.14
PL	0.61	0.52	0.69	0.62	0.38	0.42	0.68	0.53
PT	0.75	0.84	0.80	0.89	1.67	0.91	1.44	1.03
RO	1.00	0.91	0.93	0.81	0.79	0.65	1.25	0.94
SE	0.90	1.46	1.42	1.40	0.59	0.64	2.61	2.98
SI	0.86	0.82	0.69	0.73	0.85	0.55	0.87	0.71
SK	1.04	1.10	1.06	1.11	0.60	0.75	1.22	1.16
TR	0.27	0.31	0.60	0.84	0.34	0.33	0.33	0.28
UK	0.80	0.72	0.36	0.29	1.61	0.76	1.12	0.68
US	:	:	:	:	:	:	:	:

Notes: Definition differs: IE, HU (for all fields), PL (for all fields except Total); Provisional: IT (for all fields); Estimated: BG (for all fields), PL (for all fields except total)
Other: ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_uoe_ent02) and OECD (Graduates by field, New entrants by field)

A breakdown of the data by broad field of study shows that women had higher propensities to continue to master's-level studies in ICT (0.95 for women and 0.74 for men) and Engineering, Manufacturing & Construction (1.05 for women and 0.75 for men) at European level. These correspond to the two fields in which women were underrepresented at the bachelor's level. The pattern that women had higher probabilities of transitioning to master's-level studies was visible in all but five countries (BE, HR, PL, SE, SK) in the field of ICT and in all but three countries (HR, IS, SE) in Engineering, Manufacturing & Construction. Hungary stood out by displaying the lowest propensity of women and men to transition in Natural Sciences, Mathematics & Statistics (0.18 for women and 0.2 for men) and Engineering, Manufacturing & Construction (0.18 for women and 0.11 for men).

Further disaggregation into the four relevant narrow fields of study in Exhibit 92 demonstrates that in the EU27 countries, women were more likely than men to transition to master's-level studies in all fields, except Physical Sciences. This observation also held true at country level in the field of Engineering & Engineering Trades, although not in Bulgaria, Malta and Slovenia. In Environment and Mathematics & Statistics, there were no consistent trends across countries. In Physical Sciences, women were more likely than men to pursue master's degrees in 15 (AU, AT, BE, CH, CY, CZ, DE, DK, FI, LT, LV, NO, PL, RO, UK) out of the 33 countries observed.

Exhibit 92: Ratio of master's entrants to bachelor's graduates, by sex and narrow field of study, 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.88	0.77	0.70	0.64	0.92	0.82	0.51	0.44
AT	1.02	0.81	1.06	0.89	0.67	0.86	1.24	0.88
BE	3.31	2.86	0.88	0.65	1.54	1.62	1.42	1.31
BG	0.55	0.50	0.96	1.16	0.64	0.49	0.61	0.61
CA	:	:	:	:	:	:	:	:
CH	1.20	1.07	1.07	1.05	1.91	1.35	0.72	0.36
CY	0.57	1.00	0.18	0.16	0.21	1.86	1.60	0.28
CZ	1.51	1.97	1.36	1.06	1.22	1.40	1.08	0.84
DE			1.78	1.50	3.57	2.07	0.96	0.33
DK	1.04	1.29	1.78	1.58	1.29	0.98	1.46	0.61
EE	0.71	0.43	0.58	1.24	0.78	1.20	1.31	0.77
EL	0.34	0.47	0.64	0.79	0.21	0.32	0.28	0.21
ES	0.63	0.54	0.46	0.49	0.52	1.06	0.45	0.39
EU27	**0.83**	**0.68**	**0.84**	**0.91**	**1.02**	**1.00**	**0.98**	**0.68**
FI	0.12	0.23	0.23	0.17	0.01	0.06	0.44	0.33
FR	0.88	0.44	0.73	0.87	0.55	0.78	2.92	2.70
HR	1.42	1.04	0.89	1.10	0.93	1.16	0.81	0.76
HU	0.09	0.06	0.16	0.18	0.25	0.38	0.10	0.09
IE	1.30	0.92	0.16	0.17	0.72	0.56	0.71	0.22
IS	6.00		0.86	0.92	0.38	0.31	0.54	0.35
IT	0.66	0.71	0.62	0.76	0.94	0.97	0.98	0.95
LT	2.67	2.25	0.57	0.39	0.83	0.82	0.56	0.34
LU			5.50	8.00	0.40	1.43	1.00	0.86
LV	1.55	1.91	1.32	1.25	0.59	0.64	1.34	0.89
MT	0.00	0.00	0.21	0.68	0.13	0.09	0.41	0.47
NL	1.74	1.09	1.47	1.76	0.81	0.95	1.05	0.54
NO			1.58	1.43	0.76	0.85	1.77	1.05
PL	0.71	0.70	0.66	0.65	0.58	0.57	0.71	0.53
PT	3.23	2.48	1.02	1.23	0.90	0.95	1.28	0.91
RO	1.26	1.02	0.89	0.82	0.69	0.41	1.11	0.86
SE	1.04	1.27	1.34	1.53	1.38	1.20	3.86	3.81
SI	2.75	2.38	0.64	0.70	1.03	1.22	0.56	0.58
SK	1.57	1.00	1.10	1.29	1.35	1.52	1.44	1.11
TR	32.33	7.00	0.67	0.80	0.33	0.59	0.39	0.30
UK	1.03	0.75	0.30	0.25	0.60	0.41	0.79	0.49
US	:	:	:	:	:	:	:	:

Notes: Definition differs: IE, HU, PL (for all fields); Provisional: IT (for all fields); Estimated: BG, PL (for all fields)
Other: " " indicates that the denominator is zero; ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_uoe_ent02) and OECD (Graduates by field, New entrants by field)

7.4.2 From master's graduates to doctoral students

The tables in Exhibit 93 and Exhibit 94 report the number of doctoral entrants in relation to master's graduates. Generally, the ratios of doctoral entrants to master's graduates were significantly lower than the equivalent ratios at the previous education level, irrespective of gender, country and field of study. Aggregated over all fields, there were eight female and 11 male doctoral entrants for every 100 master's graduates in the EU27 Member States in 2020. Hence, both women and men had very low propensities to transition while women's likelihood to transition was even lower. At country level, the ratios ranged between 0.02 for women and 0.03 for men in Malta and 0.26 for both genders in Turkey. Women's transition ratios were either equal or lower than men's in all countries while Slovenia exhibited the largest gender gap.

A similar picture emerges when considering the three broad fields of study that are of interest in this study. The propensity to transition at European level was lower for women in all three fields compared to men although the difference was very small in ICT and Engineering, Manufacturing & Construction. Moreover, transition ratios were very low for both women and men in all fields except Natural Sciences, Mathematics & Statistics in which ratios were somewhat higher (0.22 for women and 0.32 for men). Nevertheless, Natural Sciences, Mathematics & Statistics had the largest gender gap out of all fields at European level. This appears consistent with the gaps at the country level as women were less likely to pass on to doctoral-level studies in all but five countries (CH, EL, ES, IE, MT). The largest difference in the propensity to transition for women and men in this field can be observed in Latvia. Country-level data paint a more balanced picture in the fields of ICT and Engineering, Manufacturing & Construction with several countries having gender gaps in favour of women. Luxembourg stood out as it displayed the biggest difference in women's propensity to transition compared to men in ICT.

The additional breakdown into the selected narrow fields of study reveals little variation at European level within the broad field of Natural Sciences, Mathematics & Statistics. In all the displayed narrow fields of study that fall within this broad field, women were less likely to pursue doctoral studies than men. The gender gap at European level was most pronounced in the field of Mathematics & Statistics. At country level, only four EU27 Member States (DK, IE, LU, MT) reported equal or higher propensities to transition for women in this field. In Engineering & Engineering Trades, women were slightly more likely to continue with doctoral-level studies (0.12 for women and 0.11 for men). This mirrored the situation in the majority of the countries observed (AU, AT, BG, CH, CZ, EE, EL, FI, FR, IE, LV, PT, SE, SI, SK, UK).

In sum, this chapter illustrates that women had a higher likelihood of pursuing higher degrees in ICT and Engineering, Manufacturing & Construction than men while men were more likely to transition from bachelor's to master's degrees in Natural Sciences, Mathematics & Statistics. Transitioning from master's to doctoral level was generally a rarer occurrence for both male and female graduates as all master's graduates had very low propensities to enter a doctoral programme overall as well as in STEM fields. Women were nearly likely as men to pursue a doctoral degree in ICT and Engineering, Manufacturing & Construction while men had a significantly higher likelihood to continue their studies in Natural Sciences, Mathematics & Statistics.

Exhibit 93: Ratio of doctoral entrants to master's graduates, by sex and broad field of study, 2020

Country	Total		Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.09	0.09	0.69	0.74	0.03	0.03	0.14	0.12
AT	0.10	0.15	0.23	0.34	0.25	0.18	0.20	0.18
BE	:	:	:	:	:	:	:	:
BG	0.08	0.12	0.32	0.52	0.06	0.10	0.11	0.12
CA	:	:	:	:	:	:	:	:
CH	0.21	0.21	0.71	0.60	0.63	0.43	0.26	0.18
CY	0.04	0.07	0.31	0.52	0.33	0.14	0.10	0.24
CZ	0.11	0.19	0.44	0.74	0.11	0.13	0.17	0.20
DE	0.15	0.19	0.31	0.44	0.12	0.15	0.11	0.13
DK	0.08	0.10	0.09	0.18	0.00	0.00	0.17	0.23
EE	0.08	0.11	0.33	0.42	0.10	0.16	0.09	0.09
EL	0.13	0.21	0.19	0.18	0.14	0.18	0.37	0.50
ES	0.10	0.15	0.57	0.51	0.19	0.17	0.13	0.17
EU27_2020	**0.08**	**0.11**	**0.22**	**0.32**	**0.09**	**0.10**	**0.10**	**0.11**
FI	0.08	0.10	0.19	0.21	0.06	0.08	0.11	0.08
FR	0.05	0.07	0.16	0.25	0.09	0.07	0.08	0.06
HR	0.07	0.11	0.27	0.42	0.05	0.03	0.07	0.10
HU	0.05	0.08	0.43	0.54	0.15	0.17	0.07	0.08
IE	0.07	0.08	0.35	0.32	0.06	0.04	0.19	0.18
IS	0.07	0.11	0.22	0.26	0.25	0.35	0.13	0.38
IT	0.05	0.08	0.16	0.27	0.18	0.15	0.09	0.10
LT	0.06	0.13	0.31	0.60	0.08	0.11	0.11	0.14
LU	0.12	0.20	0.64	0.94	1.17	0.86	0.35	0.54
LV	0.09	0.15	0.27	0.66	0.29	0.19	0.18	0.18
MT	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00
NL	0.06	0.08	0.08	0.13	0.02	0.05	0.09	0.12
NO	0.12	0.15	0.39	0.57	0.09	0.06	0.07	0.12
PL	0.02	0.05	0.11	0.26	0.02	0.02	0.03	0.04
PT	0.19	0.25	0.34	0.46	0.33	0.38	0.19	0.16
RO	0.09	0.13	0.12	0.26	0.05	0.08	0.15	0.18
SE	0.07	0.11	0.27	0.41	0.18	0.30	0.09	0.07
SI	0.15	0.26	0.28	0.47	0.44	0.22	0.23	0.21
SK	0.07	0.13	0.23	0.35	0.09	0.08	0.11	0.11
TR	0.26	0.26	0.74	0.78	0.27	0.21	0.60	0.57
UK	0.10	0.15	0.52	0.64	0.15	0.17	0.15	0.20
US	:	:	:	:	:	:	:	:

Notes: Definition differs: HU, IE, DE, EU27 (for all fields), PL (for all fields except Total); Provisional: IT (for all fields); Break in time series: DE (for all fields); Estimated: NL (for all fields), PL (for all fields except Total)
Other: ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_uoe_ent02), OECD (Graduates by field, New entrants by field)

Exhibit 94: Ratio of doctoral entrants to master's graduates, by sex and narrow field of study, 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.18	0.17	1.85	1.99	0.16	0.20	0.22	0.13
AT	0.03	0.09	0.38	0.36	0.42	0.52	0.45	0.28
BE	:	:	:	:	:	:	:	:
BG	0.14	0.11	0.23	0.46	0.23	1.20	0.17	0.13
CA	:	:	:	:	:	:	:	:
CH	0.58	0.47	0.65	0.70	0.18	0.23	0.38	0.20
CY	1.00	0.67	1.50	0.33	0.00	7.00	0.12	0.28
CZ	0.41	1.06	0.59	0.79	0.18	0.41	0.26	0.22
DE			0.44	0.57	0.06	0.17	0.13	0.15
DK	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.38
EE	0.10	0.38	0.27	0.40	0.10	0.27	0.19	0.13
EL	0.18	0.45	0.31	0.28	0.14	0.25	0.49	0.46
ES	0.26	0.34	0.60	0.57	0.38	0.44	0.20	0.20
EU27	**0.11**	**0.15**	**0.36**	**0.46**	**0.10**	**0.22**	**0.12**	**0.11**
FI	0.18	0.23	0.35	0.29	0.02	0.10	0.13	0.09
FR	0.00	0.00	0.39	0.52	0.21	0.23	0.07	0.05
HR	0.08	0.33	0.36	0.55	0.11	0.13	0.09	0.11
HU	0.33	0.48	0.64	0.63	0.17	0.33	0.06	0.07
IE	0.19	0.16	0.61	0.61	0.15	0.14	0.32	0.25
IS	0.09	0.00	0.29	0.67	0.00	0.14	0.00	0.29
IT	0.00	0.03	0.40	0.42	0.12	0.25	0.10	0.11
LT	1.25	7.00	0.41	0.67	0.05	0.20	0.11	0.11
LU			1.00	2.60	0.25	0.20	0.00	0.00
LV	0.29	0.17	0.23	1.19	0.20	1.00	0.25	0.16
MT	0.00		0.00	0.00	0.00	0.00	0.00	0.00
NL	:	:	:	:	:	:	:	:
NO	0.09	0.14	0.11	0.12	0.15	0.29	0.15	0.18
PL	0.02	0.03	0.12	0.30	0.02	0.12	0.03	0.04
PT	0.47	1.02	0.59	0.52	0.22	0.56	0.17	0.13
RO	0.07	0.06	0.16	0.33	0.06	0.30	0.18	0.19
SE	0.11	0.15	0.69	0.77	0.30	0.37	0.09	0.07
SI	0.23	0.25	0.10	0.09	0.19	0.53	0.26	0.23
SK	0.27	0.18	0.23	0.43	0.12	0.24	0.17	0.09
TR	0.94	0.73	0.68	0.72	0.49	0.50	0.54	0.57
UK	0.27	0.27	0.72	1.03	0.15	0.36	0.30	0.27
US	:	:	:	:	:	:	:	:

Notes: Definition differs: HU, IE, DE, PL, EU27 (for all fields); Provisional: IT (for all fields); Break in time series: DE (for all fields); Estimated: PL (for all fields)

Other: " " indicates that the denominator is zero; ":" indicates that data are not available

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02, educ_uoe_ent02) and OECD (Graduates by field, New entrants by field)

7.5 Post-secondary non-tertiary education

Post-secondary non-tertiary education can facilitate entry into the labour market and serve as an alternative route to tertiary education. Post-secondary non-tertiary degrees are often vocationally oriented and offer knowledge, skills, and competencies required for a specific occupation[345]. Although the importance of post-secondary non-tertiary education differs across countries[346], it will most likely gain in importance due to the increasing need to upskill and retrain the workforce in the course of the green transition. Vocational education and training can thus fill skills gaps, reduce recruitment bottlenecks and improve long-term employability[347]. This section thus examines gender gaps in post-secondary non-tertiary graduates. More specifically, women's representation and their choice of fields of study are examined.

The tables in Exhibit 95 and Exhibit 96 display the share of women among post-secondary non-tertiary graduates by broad and narrow field of study, in 2015 and 2020. Women's representation in post-secondary non-tertiary education in 2020 mirrors the observations made in tertiary education in the same year. While women were overrepresented at European level when no differentiation by field of study is made (61.2%) and equally represented in the field of Natural Sciences, Mathematics & Statistics (48.8%), they accounted for only 21.1% of all graduates in ICT and 17.4% in Engineering, Manufacturing & Construction. However, heterogeneity at the country level was more pronounced than in tertiary education. When no differentiation by field of study is made, there were five countries (BG, DK, IS, LU, PT) where women made up less than 40% of post-secondary non-tertiary graduates. In ICT and Engineering, Manufacturing & Construction, values ranged between 60.7% (AT) and 0% (BE, DK) and 61% (FI) and 0% (AT, DK) respectively. Among the countries for which information was available for 2015 and 2020, Finland stood out as it noticeably increased women's presence in each of the three STEM-related broad fields of study.

A closer look at the four different narrow fields of study shows that at European level women were underrepresented in Physical Sciences (26%), Mathematics & Statistics (6.7%) as well as in Engineering & Engineering Trades (14.3%). Women accounted for a relatively high share of all graduates (44%) only in the field of Environment.

345 OECD/Eurostat/UNESCO Institute for Statistics (2015) 'ISCED 2011 Operational Manual: Guidelines for Classifying National Education Programmes and Related Qualifications'; Paris: OECD Publishing.

346 OECD (2022) 'Education at a Glance 2022'; Paris: OECD Publishing.

347 European Centre for the Development of Vocational Training (2022) 'An Ally in the Green Transition'; Thessaloniki: CEDEFOP.

Exhibit 95: Share (%) of women among post-secondary non-tertiary graduates by broad field of study, 2015 and 2020

Country	Total		Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	2015	2020	2015	2020	2015	2020	2015	2020
AU	52.06	53.97	67.48	62.67	17.99	21.91	12.35	11.59
AT	74.25	73.93	43.33	48.42	53.85	60.71	22.43	0.00
BE	51.22	52.46	7.07	7.83	0.00	0.00	4.71	0.26
BG	47.92	29.01					20.41	3.23
CA	:	:	:	:	:	:	:	:
CH	:	:	:	:	:	:	:	:
CY	33.87	:		:		:	11.11	:
CZ	31.00	48.44	:	:	:	:	:	:
DE	60.80	59.57	42.12	53.23	11.86	12.74	13.30	15.80
DK	75.71	31.02	100.00		66.67	0.00		0.00
EE	59.40	69.71	73.17	83.33	27.27	23.08	34.65	33.33
EL	53.88	55.06	81.82	14.71	33.95	16.02	4.69	7.98
ES	58.99	64.34	47.65		26.27	33.72	16.51	42.15
EU27	**:**	**61.17**	**:**	**48.76**	**:**	**21.07**	**:**	**17.36**
FI	55.85	58.85	0.00	42.86	0.00	11.11	47.26	60.95
FR	64.49	67.13	56.08	65.91	20.00	6.67	18.37	54.84
HR	:	:	:	:	:	:	:	:
HU	51.12	52.69	48.95	49.21	6.83	9.82	10.30	9.04
IE	59.21	41.76	:	:	:	15.56	:	0.49
IS	37.90	29.59			64.29	38.89	7.73	5.67
IT	:	42.77	:	36.70	:	19.23	:	33.98
LT	49.65	49.34			21.79	32.32	15.16	9.79
LU	20.30	23.53					5.49	10.53
LV	66.94	70.50			0.00	7.14	21.41	25.13
MT		82.29						33.33
NL	:	:	:	:	:	:	:	:
NO	57.47	71.95	100.00		9.62	12.57	14.68	14.61
PL	75.67	75.31			16.85	27.11	16.05	28.57
PT	37.92	29.96	58.24		8.67	16.25	22.13	11.34
RO	64.07	65.92	16.67		38.25	42.05	21.10	29.66
SE	55.39	65.28			25.65	23.89	22.54	24.35
SI	:	:	:	:	:	:	:	:
SK	48.88	55.26	57.14				9.68	9.61
TR	:	:	:	:	:	:	:	:
UK	:	:	:	:	:	:	:	:
US	58.95	56.66	45.27	51.48	28.03	24.16	6.43	8.29

Notes: Definition differs: PL (2015, all fields), EU27 (2020, all fields except Total), IE, EL (2020, all fields); Break in time series: EL (2020, all fields)
Other: " " indicates that the denominator is zero; ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Exhibit 96: Share (%) of women among post-secondary non-tertiary graduates by narrow field of study, 2015 and 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	2015	2020	2015	2020	2015	2020	2015	2020
AU							2.63	3.64
AT			43.33	50.57			40.00	
BE			7.07	7.83			0.76	0.31
BG							20.41	3.23
CA	:	:	:	:	:	:	:	:
CH	:	:	:	:	:	:	:	:
CY		:				:	3.57	:
CZ	:	:		:	:	:	:	:
DE			19.80	24.14	8.33	6.67	9.86	12.58
DK								0.00
EE	73.17	83.33					8.15	1.12
EL		14.71	82.14				4.46	6.03
ES	47.46		40.00				11.22	43.03
EU27	**:**	**43.99**		**26.04**	**:**	**6.67**	**:**	**14.32**
FI	0.00	42.86					55.65	72.22
FR			90.91	40.00	75.00		9.09	0.00
HR	:	:	:	:			:	:
HU	47.11	49.21			83.33		6.51	5.69
IE	:		:		:		:	0.17
IS							1.80	0.72
IT	:	36.70	:		:		:	34.46
LT							3.19	3.76
LU							5.56	0.00
LV							3.50	1.43
MT								33.33
NL	:	:	:	:	:	:	:	:
NO							22.67	12.61
PL							3.53	18.37
PT	51.35		0.00				16.90	8.31
RO			16.67				15.66	24.28
SE							14.95	13.96
SI	:	:	:	:	:	:	:	:
SK			57.14				4.10	2.96
TR	:	:	:	:	:	:	:	:
UK	:	:	:	:	:	:	:	:
US	30.79	45.42	34.78	47.49	23.84	27.79	6.86	8.43

Notes: Definition differs: EU27, IE, EL (2020, for all fields), PL (2015, for Engineering & Engineering Trades); Break in time series: EL (2020, for all fields), IE (2020, for Engineering & Engineering Trades)

Other: " " indicates that the denominator is zero; ":" indicates that data are not available

Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

The tables in Exhibit 97 and Exhibit 98 report the distribution of female and male post-secondary non-tertiary graduates respectively across the three broad fields and the four narrow fields of study in 2020. At European level, fewer women selected themselves into two of the three broad fields of study (ICT and Engineering, Manufacturing & Construction) as well as into one of the four narrow fields (Engineering & Engineering Trades) compared to men. Among the broad fields of study, the most popular choice among women and men was Engineering, Manufacturing & Construction: 4.3% of all women and 32.5% of all men decided to study and eventually graduated in this field. Nevertheless, this field also displayed the highest discrepancy between women and men (28.2 p.p.). At country level, the largest gender disparity is observed in Ireland (65 p.p.) Moreover, Italy stood out in a negative sense by exhibiting that all three broad fields of study were a less common choice for women than for men.

Exhibit 97: Distribution (%) of post-secondary non-tertiary graduates across broad fields of study, by sex, 2020

Country	Natural sciences, mathematics and statistics (EF05)		Information and communication technologies (EF06)		Engineering, manufacturing and construction (EF07)	
	Female	Male	Female	Male	Female	Male
AU	0.66	0.46	0.74	3.08	2.28	20.38
AT	0.72	2.16	0.53	0.97	0.00	1.55
BE	0.18	2.29	0.00	0.19	0.02	8.16
BG	0.00	0.00	0.00	0.00	0.56	6.85
CA	:	:	:	:	:	:
CH	:	:	:	:	:	:
CY	:	:	:	:	:	:
CZ	:	:	:	:	:	:
DE	0.29	0.38	0.45	4.53	4.98	39.12
DK	0.00	0.00	0.00	0.40	0.00	5.62
EE	1.03	0.48	0.31	2.38	5.57	25.65
EL	0.08	0.54	1.46	9.35	2.10	29.67
ES	0.00	0.00	6.50	23.07	5.46	13.51
EU27	**0.30**	**0.49**	**1.15**	**6.77**	**4.34**	**32.53**
FI	0.07	0.14	0.07	0.84	29.91	27.41
FR	6.35	6.71	0.09	2.50	0.74	1.25
HR	:	:	:	:	:	:
HU	0.83	0.96	1.32	13.46	3.79	42.49
IE	0.00	0.00	1.05	4.09	0.45	65.48
IS	0.00	0.00	4.58	3.02	10.46	73.08
IT	3.45	4.45	7.33	23.02	22.52	32.69
LT	0.00	0.00	3.70	7.54	5.31	47.67
LU	0.00	0.00	0.00	0.00	30.00	78.46
LV	0.00	0.00	0.12	3.67	5.79	41.24
MT	0.00	0.00	0.00	0.00	0.24	2.27
NL	:	:	:	:	:	:
NO	0.00	0.00	0.85	15.25	0.97	14.49
PL	0.00	0.00	1.44	11.85	0.06	0.48
PT	0.00	0.00	10.85	23.90	15.26	51.02
RO	0.00	0.00	2.73	7.27	6.90	31.66
SE	0.00	0.00	1.15	6.90	7.13	41.65
SI	:	:	:	:	:	:
SK	0.00	0.00	0.00	0.00	2.53	29.44
TR	:	:	:	:	:	:
UK	:	:	:	:	:	:
US	0.87	1.07	2.28	9.37	2.91	42.10

Notes: Definition differs: EU27, IE, EL (for all fields); Break in time series: EL (for all fields)
Other: ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

Exhibit 98: Distribution (%) of post-secondary pre-tertiary graduates across narrow fields of study, by sex, 2020

Country	Environment (EF052)		Physical sciences (EF053)		Mathematics and statistics (EF054)		Engineering and engineering trades (EF071)	
	Female	Male	Female	Male	Female	Male	Female	Male
AU	0.00	0.00	0.00	0.00	0.00	0.00	0.06	1.84
AT	0.00	0.00	0.69	1.90	0.00	0.00	0.00	0.00
BE	0.00	0.00	0.18	2.29	0.00	0.00	0.02	6.86
BG	0.00	0.00	0.00	0.00	0.00	0.00	0.56	6.85
CA	:	:	:	:	:	:	:	:
CH	:	:	:	:	:	:	:	:
CY	:	:	:	:	:	:	:	:
CZ	:	:	:	:	:	:	:	:
DE	0.00	0.00	0.01	0.06	0.00	0.02	2.76	28.22
DK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.62
EE	1.03	0.48	0.00	0.00	0.00	0.00	0.10	20.90
EL	0.08	0.54	0.00	0.00	0.00	0.00	1.50	28.67
ES	0.00	0.00	0.00	0.00	0.00	0.00	4.13	9.87
EU27	**0.07**	**0.15**	**0.03**	**0.13**	**0.00**	**0.01**	**2.53**	**23.85**
FI	0.07	0.14	0.00	0.00	0.00	0.00	29.03	15.97
FR	0.00	0.00	0.09	0.27	0.00	0.00	0.00	0.09
HR	:	:	:	:	:	:	:	:
HU	0.83	0.96	0.00	0.00	0.00	0.00	1.84	34.01
IE	0.00	0.00	0.00	0.00	0.00	0.00	0.11	47.11
IS	0.00	0.00	0.00	0.00	0.00	0.00	0.65	37.64
IT	3.45	4.45	0.00	0.00	0.00	0.00	15.79	22.44
LT	0.00	0.00	0.00	0.00	0.00	0.00	1.50	37.47
LU	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47.69
LV	0.00	0.00	0.00	0.00	0.00	0.00	0.12	19.49
MT	0.00	0.00	0.00	0.00	0.00	0.00	0.24	2.27
NL	:	:	:	:	:	:	:	:
NO	0.00	0.00	0.00	0.00	0.00	0.00	0.52	9.25
PL	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.30
PT	0.00	0.00	0.00	0.00	0.00	0.00	9.93	46.86
RO	0.00	0.00	0.00	0.00	0.00	0.00	3.38	20.39
SE	0.00	0.00	0.00	0.00	0.00	0.00	2.38	27.62
SI	:	:	:	:	:	:	:	:
SK	0.00	0.00	0.00	0.00	0.00	0.00	0.53	21.61
TR	:	:	:	:	:	:	:	:
UK	:	:	:	:	:	:	:	:
US	0.10	0.16	0.35	0.51	0.02	0.07	1.57	22.31

Notes: Definition differs: EU27, IE, EL (for all fields); Break in time series: EL (for all fields), IE (for Engineering & Engineering Trades)
Other: ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: educ_uoe_grad02) and OECD (Graduates by field)

In sum, this chapter shows that similar gender differences persisted in post-secondary non-tertiary as in tertiary education while cross-country heterogeneity was more pronounced. Women's representation was relatively low in STEM-related fields of study and participation rates in these fields were lower among women than men. Nevertheless, some countries make interesting cases for further analysis as they display noticeable progress. This applies, for instance, to Finland as it was able to significantly increase the share of women in all three broad fields of study and even had the highest share of female graduates in Engineering, Manufacturing & Construction.

7.6 Non-formal education

Previous sections have solely focused on gender imbalances in formal education, i.e. education that takes place within structured institutions like schools and universities and culminates in a recognised qualification or certification. This section instead focuses on non-formal education which can take place in any institution or organisation that provides purposeful education but does not confer formal qualifications. Non-formal education has two advantages that can be critical to the transition to a low-carbon economy: greater reach and flexibility. Non-formal programmes can reach a wider audience, including those who may have limited access to formal education or who are at a later stage in their careers (lifelong learning). They can also be tailored to the needs and educational goals of specific groups or individuals, e.g. to develop skills relevant to greening the economy or the energy sector in particular. Given the potential relevance of non-formal education and the observed gender gaps in this type of education[348], an examination of gender inequalities in non-formal programmes adds another important facet to the broad overview of gender imbalances in skills and education.

As a breakdown by field of study is not available, Exhibit 99 shows the general importance of non-formal education for women and men separately in the countries under study in 2020. At European level, female participation in non-formal education and training was somewhat higher (7.4%) than male participation (6.2%). This reflects the situation in many countries (AT, DK, EE, ES, FI, FR, IE, IS, LT, LU, LV, MT, PT, SE, SI) where women had higher participation rates (at least 1 p.p.) than men. The largest difference between women and men, in women's favour, can be observed in Sweden (8.5 p.p.).

348 UNESCO (2020) 'Global Education Monitoring Report 2020: Inclusion and education: All means all', Paris: UNESCO.

Exhibit 99: Participation rate (%) in non-formal education and training by sex, 2020

Country	Female	Male
AU	:	:
AT	9.20	7.30
BE	5.10	4.90
BG	0.50	0.40
CA	:	:
CH	22.90	24.10
CY	5.50	4.60
CZ	3.80	4.20
DE	4.50	4.00
DK	17.80	13.30
EE	14.10	9.10
EL	5.20	4.40
ES	9.90	8.50
EU27	**7.40**	**6.20**
FI	20.50	14.60
FR	13.20	11.10
HR	1.40	1.10
HU	4.20	3.30
IE	8.50	5.90
IS	11.10	8.20
IT	4.60	4.50
LT	6.90	4.10
LU	13.70	12.50
LV	5.30	2.70
MT	9.60	8.10
NL	10.20	9.70
NO	10.40	9.70
PL	3.20	2.40
PT	9.00	7.80
RO	0.70	0.80
SE	26.70	18.20
SI	6.90	5.10
SK	1.60	1.80
TR	2.10	1.90
UK	:	:
US	:	:

Notes: Break in time series: DE, IS
Other: ":" indicates that data are not available
Source: Eurostat – Education Statistics (online data code: trng_lfs_09)

8 Annex III: Tabular report on retrospective mapping of energy sector employment

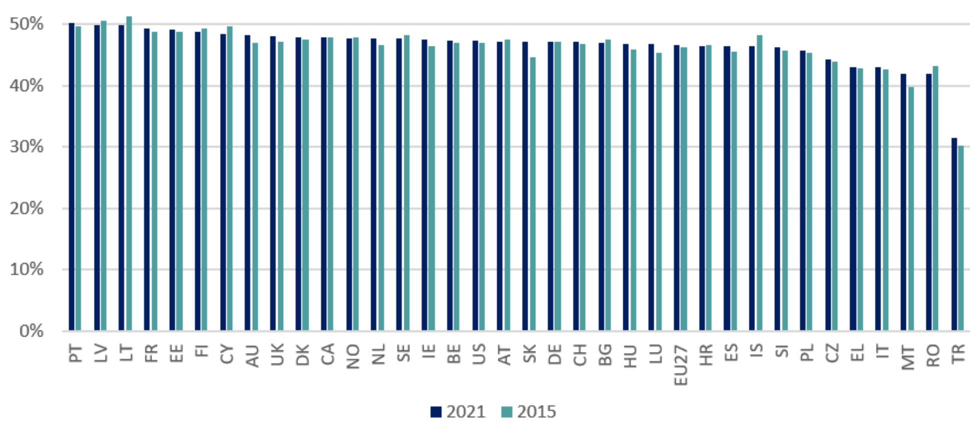
8.1 Aggregate and sector-specific employment of women: demographic and occupational factors

This section investigates the representation of women among employed persons in the energy sector and compares it to the whole economy as well as evaluating the development of these shares in recent years. The first subsection presents an overview at the aggregate level, while the second develops a more detailed analysis by age groups. The third subsection examines the representation of women by occupational skill level.

8.1.1 Aggregate share of women among employed persons

Exhibit 100 and Exhibit 101 compare the shares of women in the total working population and in the energy sector. While the share of women in the total working population was between 45 and 50% in most European countries in 2015 and 2021, the share of women in the energy sector was relatively low, with an EU27 average of only 20.7% in 2015 and 25.2% in 2021. The highest values in 2021 occurred in France (33.7%), Spain (33.3%) and Sweden (31.7%), while the lowest values are in Slovakia (16.2%), Romania (18%) and Latvia (19.2%). Although the average for the EU27 in the energy sector increased between 2015 and 2021, there were also cases where the share of women decreased (CY, DK, EE, HR, LT, LV, NO and SI). In international comparison, the EU27 are ahead of the USA with 23% or Turkey with only 7.6% female workers in the energy sector. Exhibit 101 also displays the share of the energy sector workers among all male and female workers. This shows that in 2021, the energy sector was more important for men in the EU27 average at 1.4% than for women at 0.5%. The values have moved only marginally in favour of women since 2015. In 2021, the energy sector was most important for women in Bulgaria (1.1%) and Slovakia (0,9%), and least important in Cyprus (0.2%) and the Netherlands (0.3%).

Exhibit 100: Share (%) of women among all employed persons, 2015 and 2021



Notes: Break in time series: LU (2015), All countries except AU, CA, TR, UK, US (2021)
Source: Eurostat – Labour Force Survey, ILOSTAT (ID: EMP_2EMP_SEX_ECO_NB_A, EMP_TEMP_SEX_EC2_NB_A)

Exhibit 101: Share (%) of women among employed persons in the energy sector and ratio (%) of employed persons in the energy sector to all employed persons by sex, 2015 and 2021

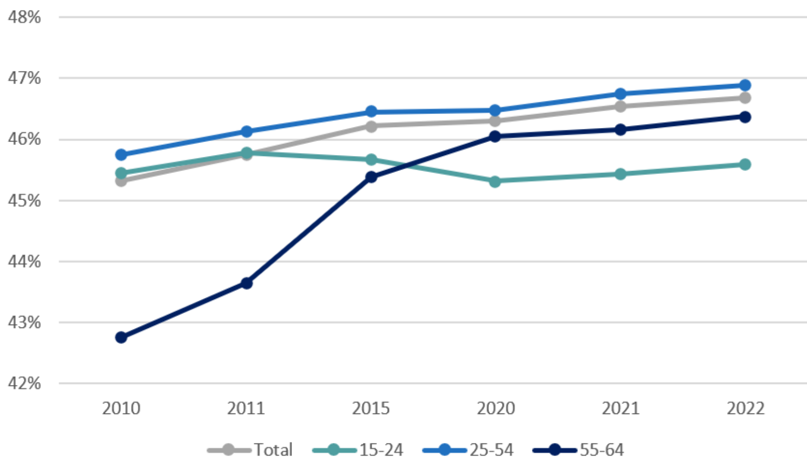
Country	Share		Ratio 2015		Ratio 2021	
	2015	2021	Women	Men	Women	Men
AU	:	:	:	:	:	:
AT	17.19	22.44	0.32	1.37	0.37	1.15
BE	21.06	26.34	0.31	1.03	0.42	1.06
BG	18.58	26.39	0.73	2.89	1.11	2.73
CA	:	:	:	:	:	:
CH	21.52	23.66	0.29	0.93	0.33	0.94
CY	(24.10)	(22.67)	(0.27)	(0.83)	(0.21)	(0.68)
CZ	16.32	23.58	0.61	2.46	0.83	2.13
DE	24.67	26.03	0.54	1.46	0.55	1.40
DK	27.21	24.36	0.39	0.94	0.32	0.92
EE	(24.24)	(20.81)	(0.82)	2.43	(0.55)	2.00
EL	23.25	27.39	0.56	1.39	0.80	1.59
ES	24.38	33.29	0.35	0.90	0.41	0.71
EU27	**20.70**	**25.18**	**0.46**	**1.50**	**0.54**	**1.39**
FI	25.73	25.91	0.36	1.00	0.40	1.09
FR	25.51	33.68	0.38	1.05	0.52	1.00
HR	(24.07)	(21.46)	(0.70)	1.91	(0.64)	2.04
HU	19.84	23.80	0.42	1.45	0.50	1.40
IE	(18.54)	(24.42)	(0.22)	0.84	(0.36)	1.00
IS	(17.05)	(22.68)	(0.26)	1.20	(0.41)	1.20
IT	18.99	26.77	0.30	0.94	0.39	0.81
LT	(25.23)	(21.67)	(0.47)	1.46	(0.43)	1.56
LU	(12.71)	:	0.16	0.91	:	0.67
LV	22.17	(19.22)	0.64	2.30	(0.53)	2.22
MT	:	:	:	:	:	:
NL	23.93	25.25	0.26	0.74	0.29	0.80
NO	26.05	24.03	0.96	2.50	0.91	2.63
PL	15.06	18.71	0.77	3.57	0.89	3.23
PT	29.06	(31.13)	0.31	0.74	(0.32)	0.72
RO	17.24	17.96	0.72	2.64	0.75	2.48
SE	21.49	31.37	0.30	1.02	0.47	0.94
SI	(16.38)	(16.10)	(0.51)	2.19	(0.42)	1.86
SK	14.70	28.06	0.49	2.30	0.94	2.14
TR	6.00	7.62	0.12	0.83	0.15	0.85
UK	22.07	:	0.38	1.18	:	:
US	22.73	22.95	0.51	1.53	0.51	1.53

Notes: Break in time series: LU (2015), All countries except TR, UK, US (2021)
Other: ":" indicates that data are not available; parentheses indicate that data have low reliability
Source: Eurostat – Labour Force Survey, ILOSTAT (ID: EMP_TEMP_SEX_EC2_NB_A)

8.1.2 Employment of women by age group

Exhibit 102 shows the share of women in the total working population by age group. Women are most present in the 25-54 age group. It is striking that the proportion in the 55-64 age group has risen from under 43% to over 46%. Exhibit 103 shows that a similar development can be seen for the EU27, albeit at a lower level. In the oldest age group, the share of women across the EU27 has risen from 16% to 22.5%. Greece, Belgium and France show the strongest increase with more than 20 percentage points (p.p.). This contrasts with Lithuania, Croatia and Latvia with a reduction in the proportion of women in the oldest age group of 4.1, 6.6 and 13.9 p.p. respectively. As a rule, women are more represented in the middle age group although Belgium, Greece, Finland, France and Romania constitute notable exceptions. In general, the share of women in the energy sector has increased in all age groups.

Exhibit 102: Share (%) of women among employed persons by age group, EU27 countries



Notes: Break in time series :2011, 2021
Source: Eurostat – Labour Force Survey

Exhibit 103: Share (%) of women among employed persons by age group: energy sector, 2015 and 2021

Country	15-24		25-54		55-64	
	2015	2021	2015	2021	2015	2021
AU	:	:	:	:	:	:
AT	(21.82)	24.60	(17.92)	(23.64)	(8.67)	(17.36)
BE	(15.39)	(1.56)	23.50	26.72	(7.77)	(29.57)
BG	(7.11)	:	18.30	28.23	(21.82)	(22.07
CA	:	:	:	:	:	:
CH	(8.94)	(19.26)	(23.73)	24.83	(18.74)	(21.79)
CY	:	:	(24.60)	(15.28)	:	:
CZ	(15.41)	(16.34)	17.53	24.59	(11.66)	20.88
DE	30.63	(26.51)	25.57	27.75	18.77	(20.42)
DK	(51.20)	:	(29.15)	(26.93)	(15.45)	(18.32)
EE	(48.24)	:	(25.99)	(21.90)	(18.42)	(21.37)
EL	(26.05)	(24.70)	24.58	24.49	(16.42)	38.56
ES	(31.62)	(49.84)	26.47	33.88	(9.45)	(24.52)
EU27	**23.29**	**(26.87)**	**21.59**	**25.79**	**16.00**	**22.49**
FI	(20.87)	(25.63)	(26.89)	(23.52)	(23.59)	(35.41)
FR	(16.86)	(27.35)	27.83	33.15	(18.38)	39.03
HR	(56.68)	:	(25.79)	(26.85)	(16.11)	(9.56)
HU	(5.69)	(31.19)	22.07	23.63	(13.02)	(22.12)
IE	(40.53)	:	(22.18)	(25.61)	(3.33)	:
IS	:	:	(15.78)	(24.59)	:	:
IT	(28.41)	(23.46)	21.18	28.87	10.77	19.77
LT	:	(17.27)	(27.04)	(23.74)	(22.59)	(18.54)
LU	:	:	(9.86)	:	:	:
LV	:	:	(18.95)	(20.29)	(31.44)	(17.59)
MT	:	:	:	:	:	:
NL	(30.75)	(7.93)	26.39	28.06	(12.61)	(19.83)
NO	(22.28)	(46.10)	29.29	(23.76)	(15.19)	(18.40)
PL	(10.63)	(30.61)	14.81	18.34	(17.33)	(18.29)
PT	:	:	29.42	(28.85)	:	:
RO	(21.19)	:	17.72	17.69	(13.85)	(19.74)
SE	(64.86)	(98.92)	18.56	32.72	(22.03)	(22.48)
SI	(18.57)	(4.72)	(17.47)	(17.45)	(8.73)	(13.07)
SK	(4.51)	(35.42)	15.97	(28.79)	(11.50)	(24.60)
TR	(11.77)	:	5.57	:	:	:
UK	(20.35)	:	24.21	:	(14.22)	:
US	:	:	:	:	:	:

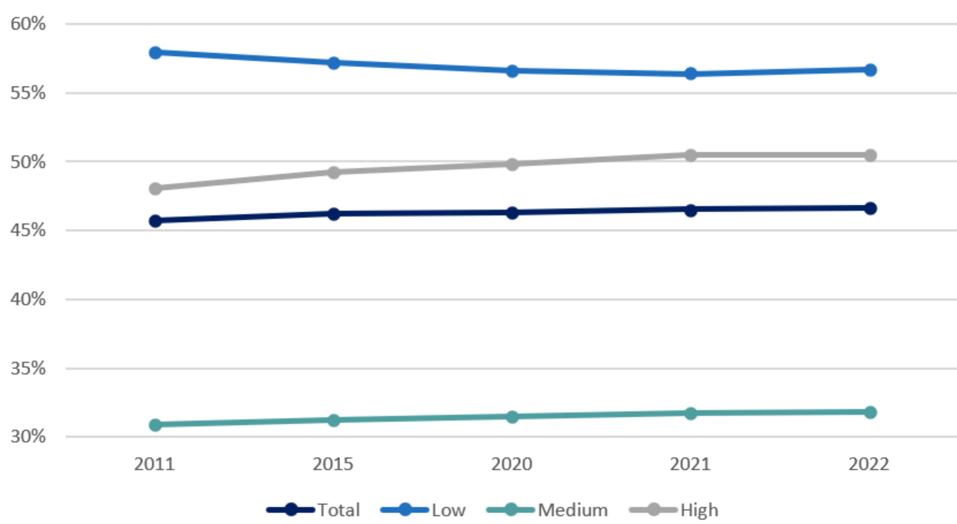
Notes: Break in time series: LU (2015), All countries (2021)
Other: ":" indicates that data are not available; parentheses indicate that data have low reliability
Source: Eurostat – Labour Force Survey

8.1.3 Employment of women by occupational skill level

Exhibit 104 depicts the share of women in different occupational skill groups for the whole economy in EU27 countries. On average in the EU27 countries, the proportion of women is high in occupations with a high occupational skill level (50%), but even more so in the low occupational skill level (55-60%). In the medium skill level, women are only represented with about 30 to 35%. The share of women in the low skill level decreased slightly between 2011 and 2022, while it increased slightly in the high requirement profile. A similar picture emerges in the energy sector, albeit at a lower level. In the EU27 average, women were represented in occupations with a low skill profile at 39%, in the medium skill profile at 21.4% and in the high requirement profile at 27.1% in 2021. Between 2015 and 2021, the proportion of women increased at all levels. There are particularly high proportions of women in the jobs with high skill level in Romania and France, with over 35%.

More meaningful than the proportion of women in the respective skill groups is the distribution of women across groups. Although women make up a relatively high proportion in the lowest group, only 6.9% of women work in this skill group on average in the EU in 2021. In the highest skill group, 55.7% of women work, which is a higher share than for men with 50.4%. At the medium level, 36.7% of women and 45.4% of men are represented. In 2021, most women with high skill levels worked in Sweden and Iceland. In these countries, more than 80% of women in the energy sector are employed in high skill level occupations. The fewest women work in Austria, Bulgaria, Greece and Slovakia. There, within the energy sector, less than 40% of women work in high skill level occupations.

Exhibit 104: Share (%) of women among employed persons by occupational skill level, EU27 countries



Notes: Data are not available: 2010; Break time series: 2011, 2021
Source: Eurostat – Labour Force Survey

Exhibit 105: Share (%) of women among employed persons by occupational skill level: energy sector, 2015 and 2021

Country	Low		Middle		High	
	2015	2021	2015	2021	2015	2021
AU	:	:	:	:	:	:
AT	(37.53)	(68.15)	(18.16)	(27.97)	(14.85)	(14.35)
BE	(27.48)	(56.91)	(30.30)	(31.73)	(15.34)	(20.07)
BG	(28.88)	(29.68)	(11.79)	29.18	(24.08)	(23.00)
CA	:	:	:	:	:	:
CH	:	(15.13)	(21.36)	(29.88)	(19.17)	(20.61)
CY	:	(38.00)	(15.63)	(13.88)	(37.58)	(29.87)
CZ	(46.12)	(50.93)	13.58	20.33	16.68	23.56
DE	34.49	:	28.01	29.46	20.42	23.34
DK	:	:	(31.49)	(26.04)	(23.35)	(22.84)
EE	:	(57.68)	(17.80)	(8.21)	(34.21)	(26.12)
EL	(4.21)	(22.19)	25.23	26.76	(24.97)	30.78
ES	(15.13)	(9.13)	19.39	32.33	28.47	34.80
EU27	**33.09**	**38.95**	**17.59**	**21.40**	**22.41**	**27.13**
FI	(35.67)	(71.71)	(18.37)	(24.63)	(27.72)	(25.18)
FR	(49.39)	:	(14.95)	25.93	26.99	35.57
HR	(60.10)	(29.16)	(27.71)	(18.13)	(21.04)	(22.91)
HU	(53.49)	(52.70)	(16.02)	(14.63)	(20.22)	29.98
IE	(26.92)	:	(18.41)	:	(16.95)	(19.04)
IS	:	:	:	:	(18.87)	(30.28)
IT	(13.10)	(20.60)	25.99	30.27	13.27	24.43
LT	(45.42)	(85.13)	(19.96)	(12.00)	(28.65)	(22.65)
LU	:	:	(7.05)	:	(17.71)	:
LV	(60.64)	(13.76)	(8.41)	(10.43)	(33.81)	(25.97)
MT	:	:	:	:	:	:
NL	(22.74)	(57.14)	37.18	27.63	17.02	23.77
NO	(47.30)	:	20.86	(22.05)	26.70	(24.70)
PL	(35.99)	:	8.65	(10.11)	22.10	26.18
PT	(29.65)	(42.08)	(35.82)	(30.07)	(25.13)	(30.17)
RO	(44.77)	(48.64)	(6.46)	(5.96)	34.38	35.16
SE	:	:	(29.36)	(19.59)	19.88	32.97
SI	:	(13.00)	(16.81)	(12.32)	(16.75)	(18.65)
SK	(22.72)	(26.04)	10.59	(34.36)	18.62	(21.79)
TR	(1.87)	:	8.10	:	6.05	:
UK	(20.41)	:	20.61	:	23.34	:
US	:	:	:	:	:	:

Notes: Break in time series: LU (2015), All countries (2021)
Other: ":" indicates that data are not available; parentheses indicate that data have low reliability
Source: Eurostat – Labour Force Survey

Exhibit 106: Distribution (%) of employed persons across occupational skill levels by sex: energy sector, 2015

Country	Low		Middle		High	
	Women	Men	Women	Men	Women	Men
AU	:	:	:	:	:	:
AT	(8.59)	(2.97)	(46.14)	43.16	(45.27)	53.87
BE	(4.59)	(3.23)	(50.91)	31.24	(44.50)	65.53
BG	(23.06)	(12.95)	(32.10)	54.79	(44.84)	32.25
CA	:	:	:	:	:	:
CH	:	:	(41.17)	41.57	(47.25)	54.65
CY	:	(19.52)	(23.38)	(40.07)	(76.62)	(40.41)
CZ	(13.04)	(2.97)	46.95	58.29	39.70	38.68
DE	6.59	4.10	52.64	44.29	40.43	51.57
DK	:	(4.10)	(36.32)	(29.54)	(54.06)	66.36
EE	:	:	(40.35)	59.59	(59.65)	36.68
EL	(1.63)	(11.23)	65.88	59.18	(32.50)	29.59
ES	(1.72)	(3.12)	33.50	44.78	64.35	52.08
EU27	**7.47**	**3.95**	**38.93**	**47.62**	**53.43**	**48.32**
FI	(6.48)	(4.05)	(18.07)	(27.81)	(75.46)	68.14
FR	(5.19)	(1.82)	(10.10)	19.68	84.71	78.50
HR	(2.50)	(0.53)	(45.59)	(37.71)	(51.91)	(61.77)
HU	(13.57)	(2.92)	(39.35)	51.07	(47.09)	46.01
IE	(16.40)	(10.13)	(31.28)	(31.55)	(52.32)	58.32
IS	:	:	:	:	(82.88)	73.24
IT	(2.98)	4.63	61.60	41.11	35.43	54.26
LT	(8.43)	(3.42)	(38.26)	51.78	(53.30)	(44.80)
LU	:	(2.76)	(23.78)	(45.67)	(76.22)	(51.57)
LV	(18.77)	(3.46)	(20.13)	62.48	(61.10)	34.06
MT	:	:	:	:	:	:
NL	(6.12)	(6.54)	49.15	26.12	43.45	66.63
NO	(7.64)	(3.00)	20.75	27.73	71.61	69.27
PL	(10.12)	(3.19)	32.34	60.54	57.54	35.97
PT	(8.76)	(8.51)	(40.88)	30.01	(50.36)	61.48
RO	(14.30)	(3.68)	(23.75)	71.69	61.95	24.63
SE	(0.49)	:	(28.86)	19.18	70.65	78.30
SI	:	:	(54.83)	53.18	(45.17)	44.00
SK	(5.05)	(2.96)	(36.31)	52.85	58.64	44.19
TR	(7.30)	24.45	61.40	44.51	31.29	31.04
UK	(5.94)	6.57	35.99	39.26	58.06	54.03
US	:	:	:	:	:	:

Notes: Break in time series: LU

Other: ":" indicates that data are not available; parentheses indicate that data have low reliability

Source: Eurostat – Labour Force Survey

Exhibit 107: Distribution (%) of employed persons across occupational skill levels by sex: energy sector, 2021

Country	Low		Middle		High	
	Women	Men	Women	Men	Women	Men
AU	:	:	:	:	:	:
AT	(17.61)	(2.38)	(45.46)	33.86	(36.93)	63.75
BE	(13.42)	(3.64)	(41.12)	31.63	(45.46)	64.74
BG	(8.49)	(7.21)	51.65	44.95	(39.86)	47.85
CA	:	:	:	:	:	:
CH	(3.05)	(5.30)	(45.17)	32.86	(51.78)	61.83
CY	(9.05)	(4.33)	(29.29)	(53.24)	(61.67)	(42.43)
CZ	(12.96)	(3.85)	43.35	52.42	43.69	43.73
DE	:	:	49.10	41.37	46.98	54.30
DK	:	:	(25.59)	(23.40)	(67.00)	72.89
EE	(16.02)	(3.10)	(15.71)	46.16	(68.27)	50.74
EL	(8.36)	11.06	60.76	62.73	30.88	26.20
ES	(0.60)	(2.99)	37.11	38.78	62.29	58.23
EU27	**6.85**	**3.62**	**36.73**	**45.43**	**55.72**	**50.37**
FI	(5.22)	(0.72)	(25.01)	(26.78)	(69.77)	72.50
FR	:	:	21.14	30.67	69.22	63.69
HR	(6.78)	(4.50)	(26.51)	(32.70)	(66.71)	61.32
HU	(10.94)	(3.07)	(29.22)	53.27	59.84	43.66
IE	:	:	:	:	(46.90)	(64.44)
IS	:	:	:	:	(84.00)	56.75
IT	(4.07)	5.74	49.29	41.51	46.64	52.75
LT	(16.81)	(0.81)	(19.00)	(38.55)	(64.19)	60.64
LU	:	:	:	:	:	(58.57)
LV	(5.42)	(8.08)	(20.33)	41.55	(74.25)	50.37
MT	:	:	:	:	:	:
NL	(3.94)	(1.00)	25.44	22.50	70.62	76.50
NO	(3.74)	:	(21.91)	(24.51)	(74.35)	71.70
PL	:	:	(28.30)	57.90	60.03	38.95
PT	(11.29)	(7.02)	(36.25)	(38.09)	(52.47)	54.88
RO	(13.55)	(3.13)	(20.31)	70.17	66.14	26.69
SE	(4.25)	(0.53)	(11.75)	(21.97)	84.00	77.50
SI	(3.05)	(3.91)	(28.18)	(38.51)	(68.77)	57.58
SK	(4.06)	(4.50)	(59.25)	44.14	(36.68)	51.36
TR	:	:	:	:	:	:
UK	:	:	:	:	:	:
US	:	:	:	:	:	:

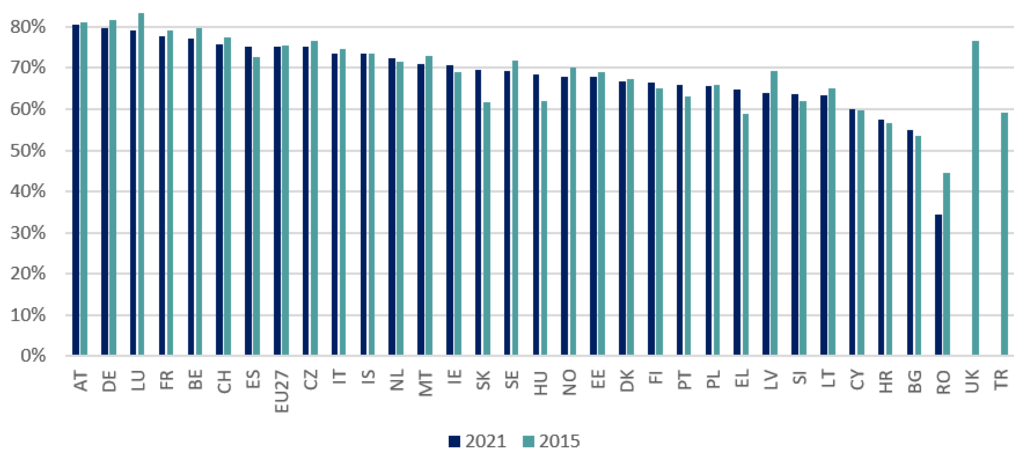
Notes: Break in time series: All countries
Other: ":" indicates that data are not available; parentheses indicate that data have low reliability
Source: Eurostat – Labour Force Survey

8.2 Representation of women among employed persons by contract characteristics

The following section evaluates the employment of women in the overall economy and in the energy sector along contract characteristics. The next three subsections examine women's representation depending on the choice between part- and full-time employment, self-employment and the operation under temporary contracts.

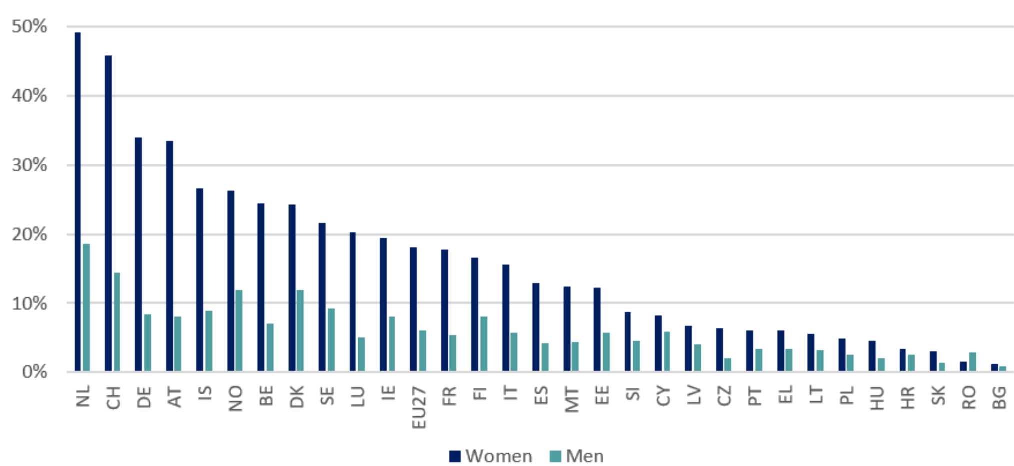
8.2.1 Employment of women by part-time and full-time contracts

Exhibit 108: Share (%) of women among part-time employed persons, 2015 and 2021



Notes: Data are not available: UK & TR (2021); Break in time series: LU (2015), All countries (2021)
Source: Eurostat – Labour Force Survey

Exhibit 109: Ratio (%) of part-time employed persons to all employed persons by sex, 2021



Notes: Break in time series: All countries (2021)
Source: Eurostat – Labour Force Survey

Exhibit 108 and Exhibit 110 show the shares of women among part-time employed persons in the energy sector and in the overall labour market. The high shares of women among part-time employed persons in the overall labour market (between 60% and 80% in most countries) are also present in the energy sector, where the EU27 average is 73.8% in 2015 and 68.1% in 2021. Interestingly, the EU27 average declined between 2015 and 2021 in the energy sector, but stayed at around 75% overall. The countries with the highest shares in the energy sector in 2021 are Greece (97.5%), Portugal (91.2%) and Spain (84%), while Finland (16.9%), Norway (26.1%) and Estonia (33.3%) have the lowest shares.

Exhibit 110 also shows the ratios of part-time employed women and men among all employed women and men in the energy sector and Exhibit 109 depicts the same measure for the overall economy in 2021. It is striking that the ratio for the overall economy is higher for women than men in all but one of the considered countries (Romania) and tends to be at least twice as large. The EU27 average here is around 18% for women and 5% for men. This gap is amplified within the energy sector, where the EU27 average for women and men is respectively 15.2% and 2.4% in 2021. Interestingly, the ratio for men in the energy sector increased from 1.4% in 2015 to 2.4% in 2021, while the ratio for women remained around at about the same level (15.3% and 15.2%). Furthermore, there are large differences in the ratios across countries, with for instance a ratio of 49% for women and 18% for men in the Netherlands while the ratios for men and women in Bulgaria are only around 1-2%.

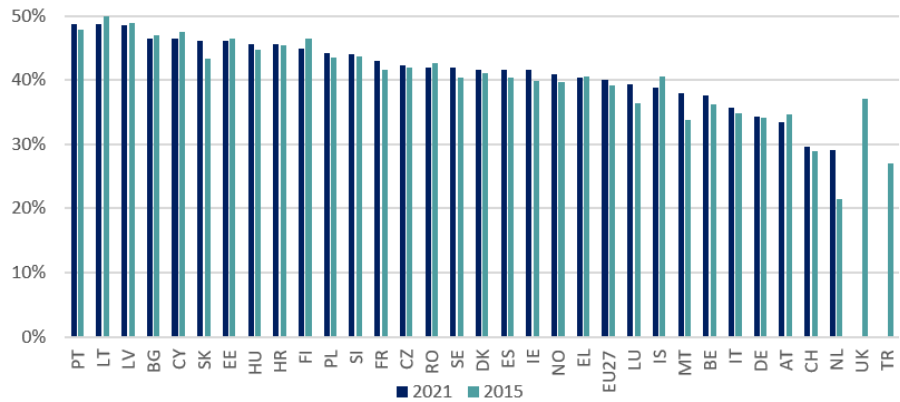
Exhibit 110 and Exhibit 111 and show the shares of women among full-time employed persons in total and in the energy sector. While the EU27 average overall is around 40% for both 2015 and 2021, the share in the energy sector is strikingly lower with 18.4% in 2015 and 22.6% in 2021. The countries with the highest shares in the energy sector in 2021 are France (31.5%), Spain (31.3%) and Portugal (29.4%), while the lowest shares are present in Austria (17%), Slovenia (15.5%) and Switzerland (14.8%). While the EU27 average increased from 2015 to 2021, the share also decreased in some of the observed countries (CY, DK, EE, HR, LT, NO, SI).

Exhibit 110: Share (%) of women among full- and parttime employed persons and ratio (%) of part-time employed persons to all employed persons by sex: energy sector, 2015 and 2021

Country	Share part-time		Share full-time		Ratio 2015		Ratio 2021	
	2015	2021	2015	2021	Women	Men	Women	Men
AU	:	:	:	:	:	:	:	:
AT	(75.20)	(62.31)	(11.75)	(17.01)	(37.52)	(2.57)	(33.28)	(5.82)
BE	(61.82)	(82.35)	(15.99)	17.76	(32.47)	(5.35)	(41.54)	(3.18)
BG	(20.18)	:	18.57	26.43	(0.44)	(0.40)	:	(0.20)
CA	:	:	:	:	:	:	:	:
CH	(63.99)	(70.87)	(12.81)	(14.84)	(50.62)	(7.81)	(47.14)	(6.01)
CY	:	:	(24.10)	(23.04)	:	:	:	(1.88)
CZ	(28.47)	(72.70)	16.21	22.29	(1.52)	(0.74)	(7.88)	(0.91)
DE	85.29	68.17	19.26	19.43	28.28	(1.60)	35.44	(5.82)
DK	(52.77)	(55.18)	25.81	(22.00)	(10.10)	(3.38)	(16.11)	(4.21)
EE	(78.55)	(33.33)	(22.52)	(20.51)	(9.92)	(0.87)	(3.78)	(2.00)
EL	:	(97.52)	23.30	25.36	:	(0.28)	(10.05)	(0.10)
ES	(72.60)	(84.02)	22.47	31.28	(11.85)	(1.53)	(9.96)	(0.94)
EU27	**73.80**	**68.07**	**18.35**	**22.59**	**15.28**	**1.42**	**15.24**	**2.41**
FI	(40.43)	(16.94)	(25.03)	26.10	(7.15)	(3.66)	(1.31)	(2.25)
FR	(72.14)	(71.05)	22.06	31.54	(20.30)	(2.71)	(11.28)	(2.33)
HR	:	:	(24.07)	(21.65)	:	:	:	(1.11)
HU	(26.80)	(82.47)	19.75	22.86	(1.85)	(1.25)	(5.46)	(0.36)
IE	(44.06)	(72.14)	(17.20)	(20.45)	(11.87)	(3.43)	(22.69)	(2.83)
IS	:	:	(17.40)	(22.92)	:	(2.41)	:	(1.34)
IT	76.56	(67.10)	16.46	25.27	16.97	(1.22)	(8.99)	(1.61)
LT	(3.78)	(55.06)	(26.09)	(20.97)	(0.58)	(4.96)	(5.20)	(1.17)
LU	(100.00)	:	(8.10)	:	(39.46)	:	:	(12.57)
LV	:	:	22.37	(19.43)	:	(1.14)	:	(1.34)
MT	:	:	:	:	:	:	:	:
NL	66.69	56.98	15.27	18.67	46.95	(7.38)	33.62	8.57
NO	(67.19)	(26.11)	24.41	23.91	(9.59)	(1.65)	(5.92)	(5.29)
PL	(52.45)	(62.01)	14.79	18.09	(2.54)	(0.41)	(4.77)	(0.67)
PT	(77.47)	(91.15)	26.78	(29.43)	(12.00)	(1.42)	(7.87)	(0.34)
RO	:	:	17.24	17.97	:	:	:	(0.10)
SE	(52.29)	(66.49)	19.61	28.77	(14.96)	(3.74)	(14.62)	(3.35)
SI	(100.00)	(46.63)	(15.86)	(15.47)	(3.82)	:	(4.98)	(1.09)
SK	:	(65.34)	14.70	27.70	:	:	(2.23)	(0.46)
TR	(24.50)	:	5.76	:	(5.36)	(1.05)	:	:
UK	(74.57)	:	19.42	:	(16.25)	(1.57)	:	:
US	:	:	:	:	:	:	:	:

Notes: Break in time series: LU (2015), All countries (2021)
Other: ":" indicates that data are not available; parentheses indicate that data have low reliability
Source: Eurostat – Labour Force Survey

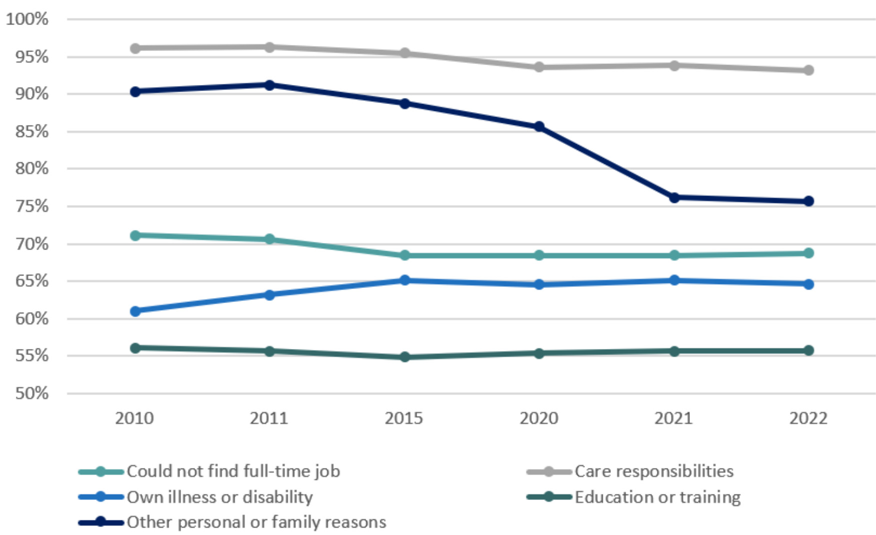
Exhibit 111: Share (%) of women among full-time employed persons, 2015 and 2021



Notes: Data are not available: UK & TR (2021); Break in time series: LU (2015), All countries (2021)
Source: Eurostat – Labour Force Survey

Exhibit 113 shows the share of women among part-time employed persons by reasons for the part-time employment for the energy and construction sectors combined, since data for the energy sector by itself are not available. While women only make up 22.1% of part-time employed persons that could not find a full-time job in 2021, the share of women is much higher among the workers that are part-time employed because of care responsibilities with 86.1% or because of other personal or family reasons with 60.4%. Exhibit 112 depicts the EU27 average for the share of women among part-time employed persons overall by reasons.

Exhibit 112: Share (%) of women among part-time employed persons by reason, EU27 countries



Notes: Break in time series: 2021
Source: Eurostat – Labour Force Survey

Exhibit 113: Share (%) of women among part-time employed persons by reason: energy and construction sectors, 2015 and 2021

Country	Could not find full-time job		Care responsibilities		Other personal/family reasons	
	2015	2021	2015	2021	2015	2021
AU	:	:	:	:	:	:
AT	:	:	92.20	93.14	67.58	(62.29)
BE	:	(59.12)	(87.52)	78.75	(57.05)	(56.41)
BG	:	:	:	:	:	:
CA	:	:	:	:	:	:
CH	(57.24)	(33.84)	87.54	81.77	73.77	(84.43)
CY	(5.16)	(10.36)	:	:	:	:
CZ	:	(32.45)	:	(100.00)	(65.12)	(52.23)
DE	29.42	(26.49)	92.57	87.61	89.78	(67.98)
DK	:	:	:	:	:	(64.35)
EE	:	:	:	:	:	:
EL	(3.12)	(12.94)	:	:	:	:
ES	(20.74)	23.68	(90.43)	95.54	(100.00)	(74.69)
EU27	**17.85**	**22.11**	**89.21**	**86.06**	**77.11**	**60.40**
FI	:	(16.43)	:	:	:	:
FR	(27.36)	46.97	:	83.38	:	71.46
HR	:	:	:	:	:	:
HU	(14.28)	(16.26)	:	:	:	:
IE	(5.87)	:	:	:	:	:
IS	:	:	:	:	:	:
IT	19.06	20.82	98.22	93.38	84.10	79.24
LT	:	:	:	:	:	:
LU	:	:	:	:	:	:
LV	:	:	:	:	:	:
MT	:	:	:	:	:	:
NL	(23.41)	(12.59)	70.90	80.48	:	:
NO	:	:	:	:	:	:
PL	(12.87)	:	:	:	:	(25.25)
PT	(10.89)	(15.16)	:	:	:	:
RO	(0.27)	:	:	:	:	:
SE	(44.45)	:	67.06	:	(35.84)	(44.65)
SI	:	:	:	:	:	:
SK	:	:	:	:	:	:
TR	:	:	(100.00)	:	(33.16)	:
UK	(14.00)	:	81.48	:	62.51	:
US	:	:	:	:	:	:

Notes: Break in time series: All countries (2021)
Other: ":" indicates that data are not available; parentheses indicate that data have low reliability
Source: Eurostat – Labour Force Survey

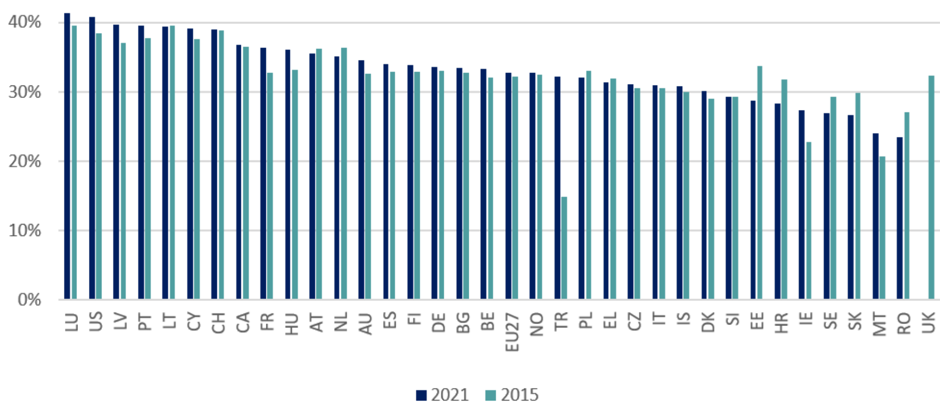
It is striking that for all of the considered reasons women make up a larger share than men, with especially high shares for "Care responsibilities" with around 94% in 2021 and "Other personal or family reasons" with around 76%. From 2010 to 2021 there is a significant decline

(10 p.p.) in the share of women among persons that are part-time employed for other personal or family reasons. Interestingly, the share of women among the part-time employed persons that could not find a full-time job is around 69% in 2021, and is therefore more than three times larger than the share for the energy and construction sectors (22.11%). For the other two reasons the share of women is also smaller in the energy and construction sectors (respectively 86.1% and 60.4%) compared to the overall economy, although to a lesser extent.

8.2.2 Employment of women by self-employment status

Exhibit 114 shows the percentage share of women among self-employed workers in 2015 and 2021 in the whole economy. While most countries and the EU27 average have seen an increase in the share of women in self-employment between 2015 and 2021, notable exceptions include the Netherlands, Austria and Poland where the share declined. The strongest rise in the share of women among self-employed persons was observed in Turkey, where their percentage more than doubled between 2015 and 2021, increasing from approximately 15% to more than 30%. As of 2021, Luxembourg has the highest percentage of women in self-employment while Romania has the lowest.

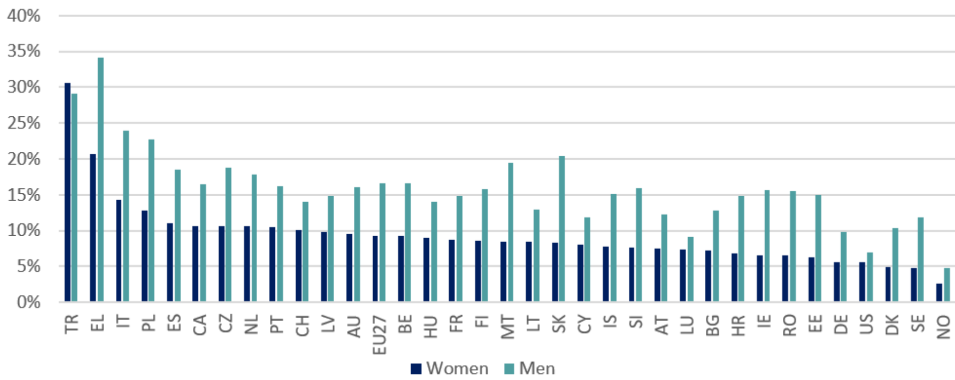
Exhibit 114: Share (%) of women among self-employed persons, 2015 and 2021



Notes: Data are not available: UK (2021); Break in time series: LU (2015), All countries except AU, CA, TR, US (2021)
Source: Eurostat – Labour Force Survey, ILOSTAT (ID: EMP_TEMP_SEX_STE_ECO_NB_A)

Exhibit 115 plots the share of self-employed persons among all employed persons, differentiated by sex. In all analyzed countries with the exception of Turkey, the share of self-employed men among the working population is notably higher than the share of women. On average across the EU27, it is almost twice as high. Turkey and Greece stand out as countries with a comparatively high share of self-employed women among all employed persons with percentages of approximately 30% and 20%, respectively.

Exhibit 115: Ratio (%) of self-employed persons to all employed persons by sex, 2021



Notes: Break in time series: LU (2015), All countries except AU, CA, TR, US (2021)
Source: Eurostat – Labour Force Survey, ILOSTAT (ID: EMP_TEMP_SEX_STE_ECO_NB_A, EMP_2EMP_SEX_ECO_NB_A)

These overall trends are reflected in the energy sector, albeit on a lower level. Exhibit 116 displays the share of women among self-employed persons in the energy sector as well as the share of self-employed workers among all employed persons in the energy sector by sex. The EU-wide average strongly increased by a factor of 1.3 between 2015 and 2021. However, at 19.6% it remains considerably lower than the economy-wide share of more than 30%. A similar development is observed for the ratio of self-employed women among all female employed persons which also increased by a factor of 1.47 from 2015 to 2021 at the EU-level. The ratio for women thus increased more slightly stronger than the same for men which saw an increase by a factor of 1.37 between 2015 and 2021. With a percentage share of 1.5%, however, it remains a fraction of that same measure at the level of the whole economy which stands at approximately 9%.

Exhibit 116: Share (%) of women among self-employed persons and ratio (%) of self-employed persons to all employed persons by sex: energy sector, 2015 and 2021

Country	Energy		Ratio 2015		Ratio 2021	
	2015	2021	Women	Men	Women	Men
AU	:	:	:	:	:	:
AT	:	:	:	:	:	:
BE	:	:	:	:	:	:
BG	:	:	:	:	:	:
CA	:	:	:	:	:	:
CH	:	:	:	:	:	:
CY	:	:	:	:	:	:
CZ	(24.84)	(13.73)	(3.17)	(1.87)	(1.38)	(2.68)
DE	(7.91)	:	(0.49)	1.87	:	:
DK	:	:	:	:	:	:
EE	:	:	:	:	:	:
EL	(24.41)	:	(5.29)	(4.96)	:	:
ES	(35.22)	(14.23)	(5.01)	(3.17)	(1.40)	(4.19)
EU27	**(15.05)**	**(19.64)**	**(1.22)**	**1.80**	**(1.45)**	**2.00**
FI	:	:	:	:	:	:
FR	:	:	:	(0.47)	:	:
HR	:	:	:	:	:	:
HU	:	:	:	:	:	:
IE	:	:	:	:	:	:
IS	:	:	:	:	:	:
IT	(11.35)	(33.81)	(2.48)	4.54	(6.79)	4.86
LT	:	:	:	:	:	:
LU	:	:	:	:	:	:
LV	:	:	:	:	:	:
MT	:	:	:	:	:	:
NL	:	:	:	:	:	(4.76)
NO	:	:	:	:	:	:
PL	:	:	:	:	:	:
PT	:	:	:	:	:	:
RO	:	:	:	:	:	:
SE	:	:	:	:	:	:
SI	:	:	:	:	:	:
SK	(6.17)	:	(3.23)	(8.45)	:	:
TR	:	:	:	(0.91)	:	:
UK	(6.49)	:	(1.68)	6.84	:	:
US	:	:	:	:	:	:

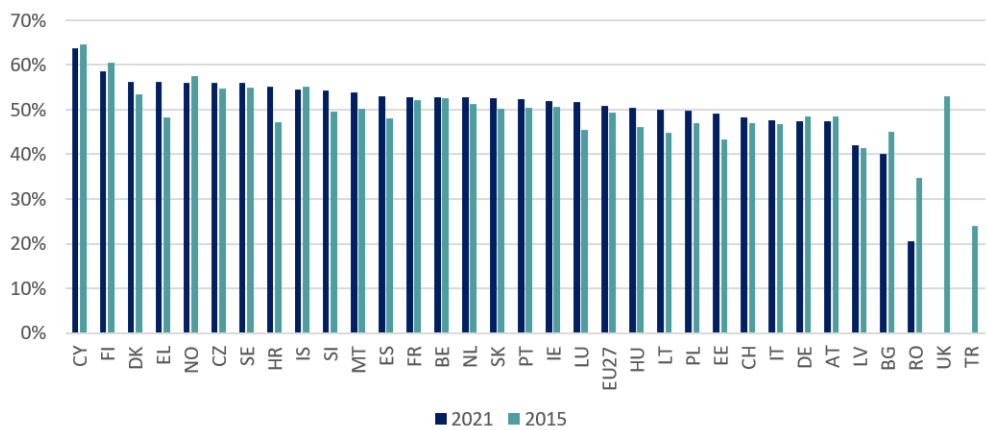
Notes: Break in time series: CZ, ES, EU27, IT, NL (2021)
Other: ":" indicates that data are not available; parentheses indicate that data have low reliability
Source: Eurostat – Labour Force Survey

8.2.3 Employment of women by contract duration

Exhibit 119 presents the proportion of women among those employed on temporary contracts within the energy sector. In 2015, women accounted for 28.4% of such contracts. However, this figure rose to 34.2% in 2021, despite being lower than the share of women on temporary contracts in the overall economy, as depicted in Exhibit 117. Here, the proportions of men and women on temporary contracts in the EU are roughly equal with a slight increase in the share of women on such contracts in 2021 compared to 2015. The comparison reveals that proportion of women among temporary employees in the energy sector is significantly lower than in the overall economy, yet it is increasing at a faster rate. The Netherlands are an exception to this rule as the energy sector's proportion of women among temporary contracted persons actually dropped by close to 11 p.p. during that period.

Exhibit 119 also displays the ratio of individuals with temporary contracts among both genders in the energy sector for 2015 and 2021. The data shows that for both men and women the share of individuals with temporary contracts across EU27 states decreased by approximately 3 p.p. between 2015 and 2021. This indicates that despite an increase in the share of women among persons with temporary contracts, the ratio of women with such contracts has actually decreased. In the EU's energy sector, 9.7% of all women and 6.3% of men were on temporary contracts in 2021. Both ratios are higher in the overall economy as illustrated by Exhibit 118. Women are more likely to be employed on temporary contracts than men are. There, the ratios of temporarily contracted women and men stand at 13.3% and 11%, respectively. The Netherlands and Spain have among the highest ratios within the energy sector in 2021. They are about twice as high as the European average. Exhibit 118 demonstrates that temporary contracts are generally more common in the economy of these two countries.

Exhibit 117: Share (%) of women among employed persons with temporary contracts, 2015 and 2021



Notes: Data are not available: UK & TR (2021); Break in time series: LU (2015), All countries (2021)
Source: Eurostat – Labour Force Survey

Exhibit 118: Ratio (%) of employed persons with temporary contracts to all employed persons by sex, 2021

Notes: Break in time series: LU (2015), All countries (2021)
Source: Eurostat – Labour Force Survey

Exhibit 119: Share (%) of women among employed persons with temporary contracts and ratio (%) of employed persons with temporary contracts to all employed persons by sex: energy sector, 2015 and 2021

Country	Share		Ratio 2015		Ratio 2021	
	2015	2021	Women	Men	Women	Men
AU	:	:	:	:	:	:
AT	:	:	:	:	:	:
BE	:	:	:	:	:	:
BG	:	:	:	:	:	:
CA	:	:	:	:	:	:
CH	(10.26)	(25.00)	(4.27)	(10.25)	(7.56)	(7.03)
CY	:	:	:	:	:	:
CZ	(45.21)	(49.97)	(10.23)	(2.42)	(7.90)	(2.44)
DE	33.90	(33.33)	12.72	8.12	(9.84)	(6.93)
DK	:	:	:	:	:	:
EE	:	:	:	:	:	:
EL	(18.16)	(36.54)	(6.69)	(9.13)	(8.98)	(5.88)
ES	(26.36)	36.55	(15.28)	13.69	18.60	15.95
EU27	**28.43**	**34.15**	**10.06**	**6.63**	**9.71**	**6.30**
FI	:	:	:	:	:	:
FR	(33.24)	43.45	(12.12)	8.40	14.44	9.53
HR	(27.60)	:	(8.34)	(6.94)	:	:
HU	:	:	:	:	:	:
IE	:	:	:	:	:	:
IS	:	:	:	:	:	:
IT	(17.24)	(32.87)	(5.51)	6.20	(9.04)	6.75
LT	:	:	:	:	:	:
LU	:	:	:	:	:	:
LV	:	:	:	:	:	:
MT	:	:	:	:	:	:
NL	(40.75)	(29.88)	(24.93)	11.40	(17.95)	14.22
NO	(32.58)	:	(3.23)	(2.36)	:	:
PL	(17.10)	(22.55)	(8.80)	7.57	(8.25)	(6.53)
PT	:	:	:	:	:	:
RO	:	:	:	:	:	:
SE	(41.53)	:	(11.66)	(4.50)	:	:
SI	(55.55)	:	(32.07)	(5.03)	:	:
SK	(38.39)	:	(5.33)	(1.48)	:	:
TR	(6.58)	:	(5.34)	4.84	:	:
UK	(31.51)	:	(5.07)	(3.12)	:	:
US	:	:	:	:	:	:

Notes: Break in time series: All countries (2021)
Other: ":" indicates that data are not available; parentheses indicate that data have low reliability
Source: Eurostat – Labour Force Survey

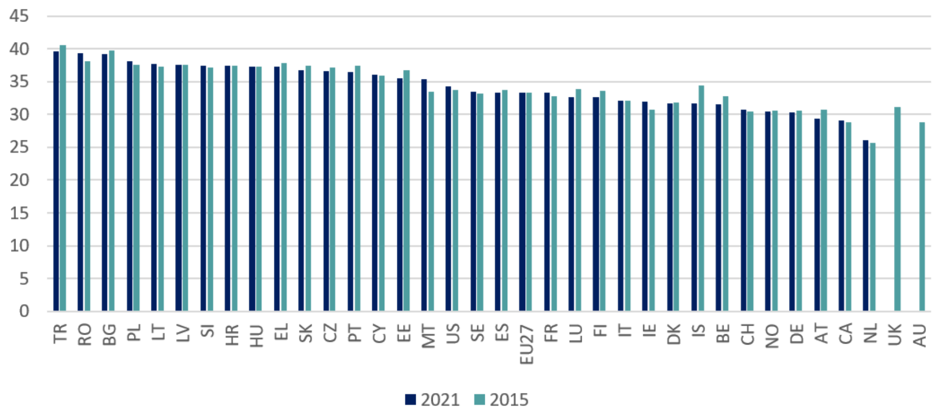
8.3 Working hours and work schedule flexibility

The following final section analyses the distribution of working hours by sex and the importance of flexibility in choosing one's work schedule differentiated by sex and sector.

8.3.1 Actual hours worked by sex

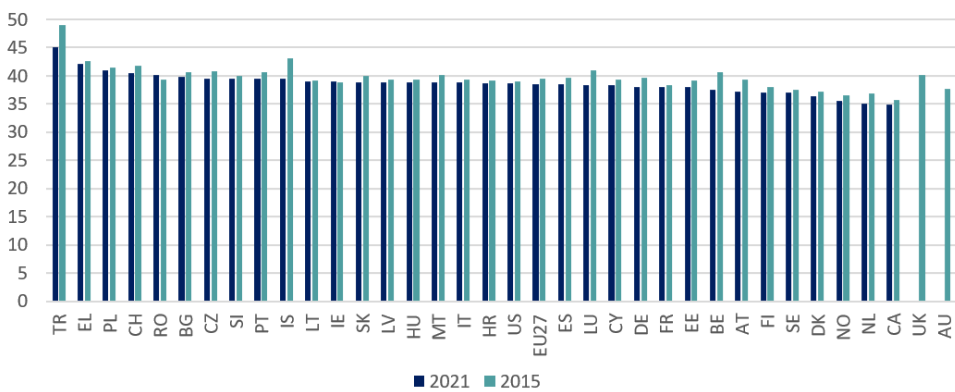
Exhibit 120 and Exhibit 121 depict the average weekly actual hours worked by employed women and men, respectively, in the overall economy for the years 2015 and 2021.

Exhibit 120: Average actual hours worked by employed women, 2015 and 2021



Notes: Data are not available: UK & AU (2021); Break in time series: LU (2015), All countries except CA, TR, US (2021)
Source: Eurostat – Labour Force Survey, ILOSTAT (ID: HOW_TEMP_SEX_ECO_NB_A)

Exhibit 121: Average actual hours worked by employed men, 2015 and 2021



Notes: Data are not available: UK & AU (2021); Break in time series: LU (2015), All countries except CA, TR, US (2021)
Source: Eurostat – Labour Force Survey, ILOSTAT (ID: HOW_TEMP_SEX_ECO_NB_A)

Exhibit 122: Average actual hours worked by employed persons by sex: energy sector, 2015 and 2021

Country	2015		2021	
	Women	Men	Women	Men
AU	:	:	:	:
AT	(32.98)	38.59	32.13	35.71
BE	34.85	39.57	31.35	36.40
BG	39.90	39.98	39.49	39.63
CA	:	:	:	:
CH	33.77	41.94	34.62	41.79
CY	:	(36.51)	:	(34.93)
CZ	37.55	39.06	35.83	38.59
DE	34.15	40.25	34.15	38.73
DK	35.55	39.82	(37.72)	40.07
EE	(37.82)	39.61	(42.10)	39.79
EL	39.28	40.84	37.47	39.90
ES	37.49	39.21	36.63	38.83
EU27	**36.53**	**39.53**	**36.30**	**39.02**
FI	(34.35)	37.84	35.13	38.17
FR	35.21	37.22	35.90	38.61
HR	(39.06)	40.60	(39.64)	38.96
HU	37.85	38.47	36.81	39.03
IE	:	39.94	:	40.39
IS	:	44.27	:	38.49
IT	35.87	39.05	36.53	39.32
LT	(39.83)	38.77	(37.59)	40.53
LU	:	40.65	:	(36.16)
LV	39.76	40.14	:	39.17
MT	:	:	:	:
NL	31.76	39.61	34.16	36.85
NO	36.45	40.93	(37.69)	38.63
PL	39.00	40.42	38.23	39.72
PT	37.24	39.93	(38.72)	39.72
RO	40.03	39.16	39.25	39.71
SE	35.90	37.70	35.97	38.59
SI	(38.24)	39.73	(37.69)	39.00
SK	38.40	39.75	(36.47)	38.72
TR	42.25	46.52	:	44.97
UK	36.41	42.77	:	:
US	37.22	43.23	39.33	43.80

Notes: Break in time series: LU (2015), All countries except TR, US (2021)
Other: ":" indicates that data are not available; parentheses indicate that data have low reliability
Source: Eurostat – Labour Force Survey, ILOSTAT (ID: HOW_TEMP_SEX_EC2_NB_A)

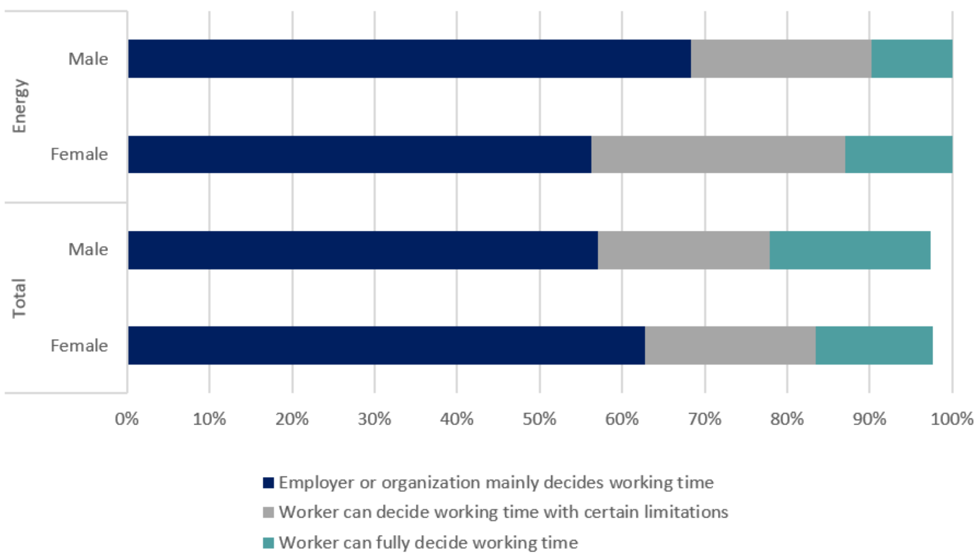
The average actual hours worked by women decreased marginally by 0.1 p.p. to 33.27 hours in the EU, while men's hours dropped more significantly by 0.96 p.p. to 38.57 weekly hours. Exhibit 122 presents the same metrics for the energy sector. Here, the actual hours worked by employed men in the EU was on the same level as in 2015 but did not decrease just as much as in the overall economy and stands at 39.02 hours a week. In contrast, employed women in the EU's energy sector worked 0.23 fewer hours per week. In the energy sector, actual worked hours of men were highest in Turkey and the United States at 44.97 and 43.80 hours, respectively, in 2021. On the contrary, average actual hours worked by employed men in the energy sector decreased significantly in Austria (-2.88), Belgium (-3.17), Luxemburg (-4.49), the Netherlands (-2.76) and Norway (-2.3).

The data shows that women generally work fewer average actual hours than men do. However, there are exceptions within the energy sector. For instance, in Estonia, while actual hours worked by employed women decreased in the overall economy, they increased by more than 4 p.p. in the country's energy sector. In 2021, employed Estonian women within the energy sector worked an average of 42.10 actual hours per week, which is more than the average of 39.79 actual hours worked per week by employed Estonian men. A similar but less pronounced trend can be observed in Croatia's energy sector where women worked an average of 39.64 actual hours and men worked slightly less at an average of 38.96 actual hours in 2021. A striking increase in actual worked hours of employed women in the energy sector took place in Estonia (+ 4.28), the Netherlands (+ 2.40) and the United States (+2.11).

8.3.2 Work time flexibility by sex and sector

Exhibit 123 shows the distribution of work schedules by sector and sex. While work times are more flexible for men in the aggregate economy, the opposite is true in the energy sector where approximately 32% of men and 43% of women have some or full discretion over their work schedule.

Exhibit 123: Distribution (%) of variability of working time for employed persons by sex and sector, EU27 countries



Notes: Data from 2019 survey; Totals are based on own calculations
Source: Eurostat – Labour Force Survey

9 Annex IV: Tabular report on survey of energy sector companies

9.1 Description of the sample

Exhibit 124: Valid responses to CATI survey of energy sector companies

Country	Responses
Austria	89
Belgium	79
Bulgaria	90
Croatia	50
Cyprus	29
Czech Republic	80
Denmark	64
Estonia	77
Finland	70
France	90
Germany	100
Greece	77
Hungary	79
Ireland	69
Italy	100
Latvia	68
Lithuania	70
Luxembourg	30
Malta	13
Netherlands	91
Poland	88
Portugal	90
Romania	86
Slovakia	59
Slovenia	50
Spain	100
Sweden	89
TOTAL EU27	***1,977***
Norway	107
Iceland	30
Switzerland	128
Turkey	127
Australia	99
Canada	97
UK	99
USA	96
TOTAL	***2,760***

The tables below give an overview of the breakdown of responses according to key structural variables.

Exhibit 125: Total responses by country group and company size class

Size class → / Country group ↓	up to 9 employees	10 to 49 employees	50 to 249 employees	250 or more employees	Total
Anglophone	19	104	37	8	**168**
Baltic	26	134	44	11	**215**
Central-Eastern	53	350	144	35	**582**
Continental	66	340	139	62	**607**
Northern	45	213	77	25	**360**
Southern	41	370	93	32	**536**
Non-Europe	27	154	92	19	**292**
Total sample	*277*	*1,665*	*626*	*192*	**2,760**
EU27	*188*	*1,221*	*438*	*130*	***1,977***

All companies; n = 2,760

Exhibit 126: Total responses by country group and subsector (multiple answers)

Subsector → / Country group ↓	Renewables	Oil & gas	Nuclear	Coal	Transmission & distribution	Retail & Wholesale	Storage incl. batteries	Hydrogen	Total
Anglophone	71	72	8	13	27	19	19	7	**168**
Baltic	96	40	2	2	76	47	25	3	**215**
Central-Eastern	193	115	12	32	137	64	45	17	**582**
Continental	361	241	27	22	223	128	152	43	**607**
Northern	173	115	12	10	118	80	66	26	**360**
Southern	170	154	8	18	141	138	106	15	**536**
Non-Europe	78	111	10	16	61	42	29	17	**292**
Total sample	*1,142*	*848*	*79*	*113*	*783*	*518*	*442*	*128*	***2,760***
EU27	*860*	*539*	*48*	*76*	*554*	*362*	*312*	*81*	***1,977***

All companies; n = 2,760

Exhibit 127: Total responses by country group and renewable sector (multiple answers)

Subsector → / Country group ↓	**Hydropower**	**Wind**	**Solar**	**Bioenergy**	**Waste**	**Geothermal**	**Ocean energy**	**Heat pumps**	**Total**
Anglophone	5	12	27	11	11	7	3	38	**64**
Baltic	6	5	34	46	11	4	1	29	**86**
Central-Eastern	19	14	103	23	14	12	3	89	**183**
Continental	76	41	226	103	52	135	11	253	**352**
Northern	41	35	65	39	27	47	12	96	**164**
Southern	20	20	97	23	13	34	4	94	**153**
Non-Europe	13	14	27	8	18	15	7	41	**77**
Total sample	*180*	*141*	*579*	*253*	*146*	*254*	*41*	*640*	***1,079***
EU27	*112*	*93*	*456*	*218*	*96*	*176*	*21*	*496*	***809***

All companies operating in the renewables sector; n = 1,079 (missings excluded)

Exhibit 128: Total responses by country group and company age

Age class → / Country group ↓	**Less than 2 years ago**	**Between 2 and 5 years ago**	**Between 6 and 20 years ago**	**More than 20 years ago**	**Total**
Anglophone	0	3	43	122	**168**
Baltic	2	2	74	137	**215**
Central-Eastern	4	14	201	361	**582**
Continental	2	11	124	469	**607**
Northern	6	7	71	276	**360**
Southern	3	10	156	364	**536**
Non-Europe	4	10	75	203	**292**
Total sample	*21*	*57*	*744*	*1,384*	***2,760***
EU27	*12*	*38*	*537*	*744*	***1,977***

All companies; n = 2,760

Exhibit 129: Total responses by country group and R&I-intensity (share of workforce engaged in R&I)

R&I-intensity → Country group ↓	none	up to 20%	21 to 40%	41 to 60%	61 to 80%	81 to 100%	Total
Anglophone	56	88	12	3	4	3	**166**
Baltic	97	88	13	4	1	5	**208**
Central-Eastern	353	186	20	5	5	2	**571**
Continental	335	205	23	10	7	9	**589**
Northern	196	123	18	7	1	5	**350**
Southern	240	237	36	6	4	2	**525**
Non-Europe	116	131	19	5	5	9	**285**
Total sample	*1,393*	*1,058*	*141*	*40*	*27*	*35*	***2694***
EU27	*1,076*	*704*	*90*	*20*	*17*	*17*	***1,924***

All companies; n = 2,694, missings excluded

9.2 Share of women in workforce

9.2.1 Total workforce

Exhibit 130: Share of women in total workforce (classes)

Women share → Country group ↓	none	up to 20%	21 to 40%	41 to 60%	61 to 80%	81 to 100%	Total	Ø (in %)
Anglophone	0.0 %	43.6 %	36.9 %	12.1 %	5.4 %	2.0 %	100.0 %	28.1
Baltic	3.2 %	48.7 %	32.3 %	9.5 %	5.8 %	0.5 %	100.0 %	25.0
Central-Eastern	1.1 %	43.1 %	37.2 %	13.5 %	4.2 %	0.9 %	100.0 %	26.9
Continental	0.9 %	58.0 %	28.9 %	8.6 %	3.4 %	0.2 %	100.0 %	22.5
Northern	4.8 %	55.1 %	26.4 %	10.8 %	1.9 %	1.0 %	100.0 %	21.8
Southern	4.6 %	48.3 %	31.3 %	12.1 %	3.0 %	0.6 %	100.0 %	24.1
Non-Europe	1.5 %	53.1 %	31.5 %	12.3 %	1.2 %	0.4 %	100.0 %	23.0
Total sample	*2.4 %*	*50.4 %*	*31.9 %*	*11.3 %*	*3.4 %*	*0.7 %*	*100.0 %*	*24.3*
EU27	*2.1 %*	*48.7 %*	*32.7 %*	*11.7 %*	*3.9 %*	*0.8 %*	*100.0 %*	*25.0*

Only companies with >9 staff; n = 2,470 (missings excluded)

9.2.2 Senior positions

Exhibit 131: Share of women among senior positions (classes)

Women share ➔ Country group 🡻	none	up to 20%	21 to 40%	41 to 60%	61 to 80%	81 to 100%	Total	Ø (in %)
Anglophone	22.5 %	17.8 %	24.0 %	20.9 %	3.9 %	10.9 %	100.0 %	34.1
Baltic	36.4 %	15.9 %	25.6 %	14.8 %	6.3 %	1.1 %	100.0 %	23.7
Central-Eastern	28.7 %	12.2 %	27.5 %	17.7 %	5.0 %	8.8 %	100.0 %	31.8
Continental	38.4 %	20.5 %	21.5 %	12.7 %	2.1 %	4.9 %	100.0 %	22.1
Northern	36.3 %	17.0 %	28.4 %	10.0 %	3.1 %	5.2 %	100.0 %	23.9
Southern	38.5 %	11.2 %	23.1 %	13.4 %	3.1 %	10.6 %	100.0 %	28.6
Non-Europe	24.7 %	15.0 %	29.1 %	15.9 %	4.8 %	10.6 %	100.0 %	33.3
Total sample	*33.6 %*	*15.3 %*	*25.3 %*	*14.6 %*	*3.8 %*	*7.6 %*	*100.0 %*	*27.7*
EU27	*34.2 %*	*14.6 %*	*24.4 %*	*15.1 %*	*3.9 %*	*7.8 %*	*100.0 %*	*28.0*

All companies with >9 staff; n = 2,247 (missings excluded)

9.2.3 Workforce engaged in R&I

Exhibit 132: Share of women in R&I workforce (classes)

Women share ➔ Country group 🡻	none	up to 20%	21 to 40%	41 to 60%	61 to 80%	81 to 100%	Total	Ø (in %)
Anglophone	45.1 %	11.0 %	8.8 %	16.5 %	5.5 %	13.2 %	100.0 %	30.0
Baltic	49.5 %	8.6 %	17.2 %	8.6 %	2.2 %	14.0 %	100.0 %	26.3
Central-Eastern	57.5 %	9.8 %	11.9 %	11.4 %	2.6 %	6.7 %	100.0 %	19.4
Continental	62.5 %	16.2 %	10.6 %	6.9 %	0.5 %	3.2 %	100.0 %	12.4
Northern	55.6 %	12.1 %	15.3 %	8.1 %	2.4 %	6.5 %	100.0 %	18.9
Southern	47.9 %	10.6 %	12.9 %	13.3 %	6.1 %	9.1 %	100.0 %	25.5
Non-Europe	47.5 %	8.5 %	20.6 %	12.8 %	3.5 %	7.1 %	100.0 %	23.9
Total sample	*53.1 %*	*11.3 %*	*13.6 %*	*11.0 %*	*3.3 %*	*7.8 %*	*100.0 %*	*21.4*
EU27	*53.9 %*	*11.2 %*	*12.3 %*	*10.4 %*	*3.5 %*	*8.6 %*	*100.0 %*	*21.8*

All companies with >9 staff and with R&I activities; n = 1,121 (missings excluded)

9.3 Difficulty in filling vacancies

9.3.1 Experience: last five years

Exhibit 133: Degree of difficulty of filling vacancies over last 5 years

Women share ➔ Country group 🡣	Very difficult (1)	Somewhat difficult (2)	Neither, nor (3)	Rather easy (4)	Very easy (5)	Total	Ø
Anglophone	15.4 %	38.5 %	23.1 %	12.3 %	10.8 %	100.0 %	2.65
Baltic	30.0 %	22.5 %	25.0 %	15.0 %	7.5 %	100.0 %	2.48
Central-Eastern	36.6 %	24.1 %	17.9 %	11.6 %	9.8 %	100.0 %	2.34
Continental	35.8 %	33.3 %	16.0 %	13.0 %	1.9 %	100.0 %	2.12
Northern	14.4 %	33.0 %	27.8 %	20.6 %	4.1 %	100.0 %	2.67
Southern	20.6 %	35.0 %	30.6 %	8.8 %	5.0 %	100.0 %	2.43
Non-Europe	18.0 %	28.0 %	26.0 %	20.0 %	8.0 %	100.0 %	2.72
Total sample	*25.3 %*	*31.4 %*	*23.5 %*	*13.9 %*	*6.0 %*	*100.0 %*	*2.44*
EU27	*29.8 %*	*29.6 %*	*22.2 %*	*12.6 %*	*5.9 %*	*100.0 %*	*2.36*

All companies with >9 staff and with vacancies over last 5 years; n = 736 (missings excluded)

9.3.2 Expectation: next 2-3 years

Exhibit 134: Degree of expected difficulty of filling vacancies in next 2-3 years

Women share → Country group ↓	Very difficult (1)	Somewhat difficult (2)	Neither, nor (3)	Rather easy (4)	Very easy (5)	Total	Ø
Anglophone	22.4 %	27.6 %	36.2 %	8.6 %	5.2 %	100.0 %	1.98
Baltic	29.8 %	42.6 %	17.0 %	10.6 %	0.0 %	100.0 %	1.87
Central-Eastern	37.8 %	33.6 %	19.3 %	7.6 %	1.7 %	100.0 %	1.65
Continental	27.2 %	38.5 %	27.8 %	4.7 %	1.8 %	100.0 %	1.84
Northern	10.2 %	38.8 %	38.8 %	11.2 %	1.0 %	100.0 %	2.86
Southern	20.3 %	33.5 %	20.9 %	15.8 %	9.5 %	100.0 %	2.20
Non-Europe	5.4 %	32.3 %	36.6 %	20.4 %	5.4 %	100.0 %	2.76
Total sample	*22.2 %*	*35.3 %*	*27.5 %*	*11.1 %*	*3.9 %*	*100.0 %*	*2.11*
EU27	*26.4 %*	*36.7 %*	*24.7 %*	*9.5 %*	*2.7 %*	*100.0 %*	*1.86*

All companies with >9 staff; n = 742 (missings excluded)

9.4 Change of women's share in workforce and among applications

Exhibit 135: Change in women's share in total workforce over last 5 years

Change → Country group ↓	Increased a lot	Increased somewhat	Unchanged	Decreased	Total
Anglophone	8.7 %	38.3 %	47.7 %	5.4 %	100.0 %
Baltic	5.8 %	20.1 %	67.7 %	6.3 %	100.0 %
Central-Eastern	9.3 %	22.1 %	61.7 %	6.9 %	100.0 %
Continental	8.3 %	35.6 %	52.5 %	3.6 %	100.0 %
Northern	9.6 %	30.8 %	51.0 %	8.7 %	100.0 %
Southern	9.7 %	35.8 %	48.1 %	6.5 %	100.0 %
Non-Europe	8.8 %	40.1 %	47.3 %	3.8 %	100.0 %
Total sample	*8.9 %*	*31.6 %*	*53.7 %*	*5.8 %*	*100.0 %*
EU27	*8.5 %*	*29.9 %*	*55.9 %*	*5.7 %*	*100.0 %*

All companies with >9 staff; n = 2,463 (missings excluded)

Exhibit 136: Change in women's share among senior positions over last 5 years

Change ➔ Country group ➔	Increased a lot	Increased somewhat	Unchanged	Decreased	Total
Anglophone	10.1 %	22.3 %	64.9 %	2.7 %	100.0 %
Baltic	1.6 %	12.2 %	83.1 %	3.2 %	100.0 %
Central-Eastern	4.0 %	12.5 %	80.3 %	3.2 %	100.0 %
Continental	3.6 %	14.5 %	78.3 %	3.6 %	100.0 %
Northern	5.5 %	21.9 %	69.1 %	3.5 %	100.0 %
Southern	4.5 %	20.7 %	70.2 %	4.7 %	100.0 %
Non-Europe	7.3 %	21.8 %	67.9 %	3.1 %	100.0 %
Total sample	*4.7 %*	*17.3 %*	*74.4 %*	*3.6 %*	*100.0 %*
EU27	*4.2 %*	*15.5 %*	*77.1 %*	*3.3 %*	*100.0 %*

All companies with >9 staff; n = 2,462 (missings excluded)

Exhibit 137: Change in women's share in R&I workforce over last 5 years

Change ➔ Country group ➔	Increased a lot	Increased somewhat	Unchanged	Decreased	Total
Anglophone	5.9 %	15.8 %	73.3 %	5.0 %	100.0 %
Baltic	2.1 %	7.3 %	87.5 %	3.1 %	100.0 %
Central-Eastern	2.0 %	10.0 %	86.6 %	1.5 %	100.0 %
Continental	4.6 %	19.2 %	73.6 %	2.5 %	100.0 %
Northern	3.0 %	22.2 %	70.4 %	4.4 %	100.0 %
Southern	5.2 %	25.5 %	65.9 %	3.4 %	100.0 %
Non-Europe	5.1 %	18.6 %	75.0 %	1.3 %	100.0 %
Total sample	*4.1 %*	*18.1 %*	*75.0 %*	*2.8 %*	*100.0 %*
EU27	*3.7 %*	*14.9 %*	*78.9 %*	*2.5 %*	*100.0 %*

All companies with >9 staff and with R&I activties; n = 1,195 (missings excluded)

Exhibit 138: Change in women's share in applications for open positions in R&I over last 5 years

Change ➔ Country group 🡻	Increased a lot	Increased somewhat	Unchanged	Decreased	Total
Anglophone	2.1 %	18.1 %	71.3 %	8.5 %	100.0 %
Baltic	0.0 %	5.7 %	89.7 %	4.6 %	100.0 %
Central-Eastern	0.5 %	8.3 %	84.9 %	6.3 %	100.0 %
Continental	2.2 %	15.6 %	74.6 %	7.6 %	100.0 %
Northern	1.6 %	7.3 %	85.4 %	5.7 %	100.0 %
Southern	5.9 %	16.5 %	70.5 %	7.1 %	100.0 %
Non-Europe	2.1 %	11.0 %	80.8 %	6.2 %	100.0 %
Total sample	*2.5 %*	*12.5 %*	*78.3 %*	*6.7 %*	*100.0 %*
EU27	*2.4 %*	*10.5 %*	*80.5 %*	*6.5 %*	*100.0 %*

All companies with >9 staff and with R&I activties; n = 1,120 (missings excluded)

9.5 Companies' attitudes towards gender balance

Exhibit 139: Agreement to "Our company strives to increase women's share in the total workforce"

Agreement ➔ Country group 🡻	Fully agree (1)	Somewhat agree (2)	Neither, nor (3)	Somewhat disagree (4)	Do not agree at all (5)	Total	Ø
Anglophone	41.6 %	20.8 %	32.9 %	2.0 %	2.7 %	100.0 %	2.03
Baltic	8.2 %	12.5 %	48.4 %	8.2 %	22.8 %	100.0 %	3.25
Central-Eastern	19.4 %	16.7 %	44.4 %	8.8 %	10.6 %	100.0 %	2.74
Continental	28.3 %	22.9 %	34.0 %	7.7 %	7.1 %	100.0 %	2.42
Northern	35.1 %	24.0 %	31.0 %	4.5 %	5.4 %	100.0 %	2.21
Southern	33.1 %	19.8 %	33.7 %	5.6 %	7.8 %	100.0 %	2.35
Non-Europe	42.6 %	22.9 %	28.3 %	3.5 %	2.7 %	100.0 %	2.01
Total sample	*29.1 %*	*20.2 %*	*36.2 %*	*6.3 %*	*8.2 %*	*100.0 %*	*2.44*
EU27	*24.3 %*	*19.4 %*	*39.8 %*	*6.9 %*	*9.6 %*	*100.0 %*	*2.58*

All companies with >9 staff; n = 2,443 (missings excluded)

Exhibit 140: Agreement to "Our company strives to increase women's share among executive positions"

Agreement ➔ / Country group ➔	Fully agree (1)	Somewhat agree (2)	Neither, nor (3)	Somewhat disagree (4)	Do not agree at all (5)	Total	Ø
Anglophone	33.3 %	23.1 %	33.3 %	2.0 %	8.2 %	100.0 %	2.28
Baltic	4.9 %	12.0 %	45.9 %	7.1 %	30.1 %	100.0 %	3.46
Central-Eastern	15.2 %	16.3 %	46.1 %	9.2 %	13.2 %	100.0 %	2.89
Continental	23.7 %	22.0 %	35.9 %	10.3 %	8.1 %	100.0 %	2.57
Northern	28.2 %	21.5 %	36.9 %	5.4 %	8.0 %	100.0 %	2.44
Southern	26.1 %	18.9 %	34.4 %	7.6 %	13.0 %	100.0 %	2.63
Non-Europe	33.5 %	23.2 %	32.7 %	4.7 %	5.9 %	100.0 %	2.26
Total sample	*23.1 %*	*19.5 %*	*38.2 %*	*7.6 %*	*11.6 %*	*100.0 %*	*2.65*
EU27	*19.0 %*	*19.0 %*	*40.7 %*	*8.1 %*	*13.2 %*	*100.0 %*	*2.78*

All companies with >9 staff; n = 2,435 (missings excluded)

Exhibit 141: Agreement to "Our top management shows full commitment to gender equality"

Agreement ➔ / Country group ➔	Fully agree (1)	Somewhat agree (2)	Neither, nor (3)	Somewhat disagree (4)	Do not agree at all (5)	Total	Ø
Anglophone	79.2 %	10.1 %	7.4 %	3.4 %	0.0 %	100.0 %	1.35
Baltic	67.0 %	11.7 %	13.8 %	4.8 %	2.7 %	100.0 %	1.65
Central-Eastern	67.9 %	11.7 %	13.8 %	3.6 %	3.1 %	100.0 %	1.63
Continental	63.3 %	16.9 %	11.3 %	4.3 %	4.3 %	100.0 %	1.70
Northern	75.4 %	10.9 %	7.3 %	2.6 %	3.8 %	100.0 %	1.49
Southern	70.9 %	10.3 %	10.7 %	4.3 %	3.8 %	100.0 %	1.60
Non-Europe	69.1 %	16.0 %	10.7 %	1.5 %	2.7 %	100.0 %	1.53
Total sample	*69.2 %*	*12.8 %*	*11.1 %*	*3.6 %*	*3.3 %*	*100.0 %*	*1.59*
EU27	*67.9 %*	*12.7 %*	*12.0 %*	*3.8 %*	*3.6 %*	*100.0 %*	*1.63*

All companies with >9 staff; n = 2,468 (missings excluded)

9.6 Perceived impact of increased gender balance on economic performance

Exhibit 142: Agreement to "Increasing the share of women in our workforce will have positive impact on our economic results"

Agreement ➔ Country group ➔	**Fully agree (1)**	**Somewhat agree (2)**	**Neither, nor (3)**	**Somewhat disagree (4)**	**Do not agree at all (5)**	**Total**	**Ø**
Anglophone	47.0 %	16.1 %	30.2 %	3.4 %	3.4 %	100.0 %	2.00
Baltic	10.4 %	21.3 %	43.7 %	6.6 %	18.0 %	100.0 %	3.01
Central-Eastern	22.7 %	18.0 %	38.6 %	7.8 %	12.7 %	100.0 %	2.69
Continental	22.5 %	20.3 %	40.9 %	5.7 %	10.6 %	100.0 %	2.62
Northern	26.2 %	21.0 %	42.3 %	3.6 %	6.9 %	100.0 %	2.44
Southern	38.8 %	17.3 %	34.8 %	4.4 %	4.8 %	100.0 %	2.19
Non-Europe	44.3 %	21.6 %	24.6 %	4.9 %	4.5 %	100.0 %	2.03
Total sample	*29.2 %*	*19.3 %*	*37.2 %*	*5.5 %*	*8.9 %*	*100.0 %*	*2.46*
EU27	*23.8 %*	*19.2 %*	*40.8 %*	*5.8 %*	*10.4 %*	*100.0 %*	*2.60*

All companies with >9 staff; n = 2,419 (missings excluded)

9.7 Perceived obstacles to improved gender balance in the company

Exhibit 143: "Scarce supply of qualified women on the labour market"

Agreement → / Country group ↓	Fully agree (1)	Somewhat agree (2)	Neither, nor (3)	Somewhat disagree (4)	Do not agree at all (5)	Total	Ø
Anglophone	23.7 %	26.6 %	23.7 %	9.4 %	16.5 %	100.0 %	2.68
Baltic	22.8 %	22.1 %	24.3 %	9.6 %	21.3 %	100.0 %	2.85
Central-Eastern	19.6 %	18.1 %	29.8 %	9.9 %	22.6 %	100.0 %	2.98
Continental	37.3 %	19.5 %	18.2 %	11.4 %	13.5 %	100.0 %	2.44
Northern	31.2 %	29.5 %	24.7 %	7.2 %	7.5 %	100.0 %	2.31
Southern	23.7 %	24.4 %	25.3 %	7.1 %	19.4 %	100.0 %	2.74
Non-Europe	23.8 %	25.0 %	29.9 %	8.2 %	13.1 %	100.0 %	2.62
Total sample	*26.8 %*	*22.8 %*	*25.0 %*	*9.0 %*	*16.4 %*	*100.0 %*	*2.65*
EU27	*27.6 %*	*21.1 %*	*23.6 %*	*9.5 %*	*18.3 %*	*100.0 %*	*2.70*

All companies with >9 staff; n = 2,158 (missings excluded)

Exhibit 144: "Female employees having more difficulty to manage work-life balance"

Agreement → / Country group ↓	Fully agree (1)	Somewhat agree (2)	Neither, nor (3)	Somewhat disagree (4)	Do not agree at all (5)	Total	Ø
Anglophone	13.4 %	21.8 %	28.2 %	11.3 %	25.4 %	100.0 %	3.14
Baltic	7.1 %	20.6 %	23.4 %	11.3 %	37.6 %	100.0 %	3.52
Central-Eastern	10.0 %	17.6 %	21.4 %	14.1 %	36.8 %	100.0 %	3.50
Continental	9.9 %	18.0 %	22.4 %	20.7 %	29.0 %	100.0 %	3.41
Northern	4.4 %	13.9 %	21.1 %	16.0 %	44.6 %	100.0 %	3.83
Southern	19.5 %	24.1 %	16.4 %	14.1 %	25.9 %	100.0 %	3.03
Non-Europe	12.7 %	20.9 %	25.4 %	10.7 %	30.3 %	100.0 %	3.25
Total sample	*11.5 %*	*19.3 %*	*21.6 %*	*15.0 %*	*32.5 %*	*100.0 %*	*3.37*
EU27	*10.6 %*	*18.6 %*	*20.3 %*	*16.0 %*	*34.5 %*	*100.0 %*	*3.45*

All companies with >9 staff; n = 2,182 (missings excluded)

Exhibit 145: "Turnover among female employees higher than among men"

Agreement ➔ / Country group 🡻	Fully agree (1)	Somewhat agree (2)	Neither, nor (3)	Somewhat disagree (4)	Do not agree at all (5)	Total	Ø
Anglophone	7.8 %	9.2 %	29.1 %	12.8 %	41.1 %	100.0 %	3.70
Baltic	2.1 %	5.7 %	20.0 %	12.1 %	60.0 %	100.0 %	4.22
Central-Eastern	3.0 %	6.6 %	22.5 %	15.0 %	53.0 %	100.0 %	4.09
Continental	3.2 %	6.9 %	24.1 %	17.4 %	48.4 %	100.0 %	4.01
Northern	2.8 %	5.3 %	19.9 %	13.5 %	58.4 %	100.0 %	4.19
Southern	10.6 %	13.3 %	28.7 %	10.8 %	36.7 %	100.0 %	3.50
Non-Europe	4.1 %	9.9 %	28.4 %	11.9 %	45.7 %	100.0 %	3.85
Total sample	*4.9 %*	*8.3 %*	*24.7 %*	*13.8 %*	*48.2 %*	*100.0 %*	*3.92*
EU27	*4.0 %*	*7.1 %*	*23.3 %*	*14.4 %*	*51.3 %*	*100.0 %*	*4.02*

All companies with >9 staff; n = 2,146 (missings excluded)

Exhibit 146: "Beliefs that men are better suited for certain types of jobs than women"

Agreement ➔ / Country group 🡻	Applies fully (1)	Somewhat applies (2)	Neutral (3)	Somewhat does not apply (4)	Does not apply at all (5)	Total	Ø
Anglophone	10.6 %	19.0 %	23.2 %	4.9 %	42.3 %	100.0 %	3.49
Baltic	23.4 %	31.2 %	14.9 %	11.3 %	19.1 %	100.0 %	2.71
Central-Eastern	22.5 %	31.6 %	18.9 %	8.9 %	18.0 %	100.0 %	2.68
Continental	9.9 %	23.2 %	18.8 %	13.9 %	34.2 %	100.0 %	3.39
Northern	8.5 %	20.1 %	13.7 %	13.0 %	44.7 %	100.0 %	3.65
Southern	20.6 %	27.6 %	17.4 %	9.3 %	25.1 %	100.0 %	2.91
Non-Europe	11.1 %	20.9 %	22.5 %	7.4 %	38.1 %	100.0 %	3.41
Total sample	*15.5 %*	*25.4 %*	*18.3 %*	*10.3 %*	*30.4 %*	*100.0 %*	*3.14*
EU27	*16.0 %*	*27.6 %*	*17.4 %*	*11.5 %*	*27.5 %*	*100.0 %*	*3.07*

All companies with >9 staff; n = 2,185 (missings excluded)

Exhibit 147: "Female employees not getting as much support from their superiors and colleagues as men"

Agreement ➔ / Country group ➔	Applies fully (1)	Somewhat applies (2)	Neutral (3)	Somewhat does not apply (4)	Does not apply at all (5)	Total	Ø
Anglophone	4.9 %	4.9 %	19.0 %	8.5 %	62.7 %	100.0 %	4.19
Baltic	2.9 %	5.0 %	17.9 %	15.7 %	58.6 %	100.0 %	4.22
Central-Eastern	5.4 %	5.4 %	14.3 %	11.4 %	63.6 %	100.0 %	4.23
Continental	4.4 %	6.7 %	11.6 %	12.4 %	64.8 %	100.0 %	4.26
Northern	2.1 %	5.2 %	7.6 %	11.0 %	74.2 %	100.0 %	4.50
Southern	7.9 %	12.2 %	13.4 %	9.3 %	57.1 %	100.0 %	3.95
Non-Europe	6.9 %	6.1 %	11.7 %	8.9 %	66.4 %	100.0 %	4.22
Total sample	*5.2 %*	*7.1 %*	*12.9 %*	*10.9 %*	*63.9 %*	*100.0 %*	*4.21*
EU27	*4.2 %*	*6.6 %*	*12.7 %*	*11.4 %*	*65.1 %*	*100.0 %*	*4.27*

All companies with >9 staff; n = 2,184 (missings excluded)

Exhibit 148: "Lack of company support for work-family balance"

Agreement ➔ / Country group ➔	Applies fully (1)	Somewhat applies (2)	Neutral (3)	Somewhat does not apply (4)	Does not apply at all (5)	Total	Ø
Anglophone	8.5 %	10.6 %	14.1 %	12.0 %	54.9 %	100.0 %	3.95
Baltic	1.4 %	7.1 %	20.0 %	13.6 %	57.9 %	100.0 %	4.20
Central-Eastern	5.8 %	4.9 %	20.9 %	9.7 %	58.7 %	100.0 %	4.11
Continental	5.3 %	8.6 %	17.3 %	15.4 %	53.5 %	100.0 %	4.04
Northern	4.5 %	8.0 %	11.9 %	15.0 %	60.5 %	100.0 %	4.19
Southern	11.4 %	14.3 %	17.3 %	7.7 %	49.3 %	100.0 %	3.69
Non-Europe	10.2 %	12.2 %	8.2 %	14.3 %	55.1 %	100.0 %	3.92
Total sample	*7.0 %*	*9.4 %*	*16.2 %*	*12.1 %*	*55.2 %*	*100.0 %*	*3.99*
EU27	*5.9 %*	*8.3 %*	*16.3 %*	*12.2 %*	*57.3 %*	*100.0 %*	*4.07*

All companies with >9 staff; n = 2,173 (missings excluded)

Exhibit 149: "Lack of role models for female employees"

Agreement ➔ Country group 🡻	Applies fully (1)	Somewhat applies (2)	Neutral (3)	Somewhat does not apply (4)	Does not apply at all (5)	Total	Ø
Anglophone	9.8 %	17.5 %	21.0 %	10.5 %	41.3 %	100.0 %	3.56
Baltic	5.9 %	15.4 %	23.5 %	14.0 %	41.2 %	100.0 %	3.69
Central-Eastern	5.1 %	9.7 %	33.6 %	12.1 %	39.4 %	100.0 %	3.71
Continental	6.8 %	17.7 %	29.1 %	15.0 %	31.4 %	100.0 %	3.47
Northern	9.4 %	21.3 %	21.6 %	11.8 %	35.9 %	100.0 %	3.44
Southern	13.5 %	13.0 %	26.2 %	9.5 %	37.8 %	100.0 %	3.45
Non-Europe	4.5 %	16.7 %	22.4 %	11.8 %	44.7 %	100.0 %	3.76
Total sample	*8.0 %*	*15.4 %*	*26.8 %*	*12.1 %*	*37.7 %*	*100.0 %*	*3.56*
EU27	*7.0 %*	*13.7 %*	*28.0 %*	*12.6 %*	*38.7 %*	*100.0 %*	*3.62*

All companies with >9 staff; n = 2,142 (missings excluded)

Exhibit 150: "Women are overlooked when deciding on promotions"

Agreement ➔ Country group 🡻	Applies fully (1)	Somewhat applies (2)	Neutral (3)	Somewhat does not apply (4)	Does not apply at all (5)	Total	Ø
Anglophone	4.2 %	6.3 %	13.3 %	5.6 %	70.6 %	100.0 %	4.32
Baltic	2.1 %	5.7 %	15.0 %	16.4 %	60.7 %	100.0 %	4.28
Central-Eastern	3.6 %	6.7 %	14.6 %	12.1 %	63.0 %	100.0 %	4.24
Continental	3.0 %	7.6 %	18.0 %	13.8 %	57.6 %	100.0 %	4.15
Northern	0.7 %	3.1 %	13.3 %	10.5 %	72.4 %	100.0 %	4.51
Southern	6.9 %	10.1 %	12.6 %	8.9 %	61.6 %	100.0 %	4.09
Non-Europe	4.9 %	7.3 %	8.9 %	8.9 %	70.0 %	100.0 %	4.32
Total sample	*3.8 %*	*7.1 %*	*14.0 %*	*11.1 %*	*64.0 %*	*100.0 %*	*4.24*
EU27	*3.4 %*	*7.0 %*	*14.5 %*	*12.0 %*	*63.2 %*	*100.0 %*	*4.25*

All companies with >9 staff; n = 2,179 (missings excluded)

9.8 Measures implemented by companies

9.8.1 Take-up

Exhibit 151: Measures implemented by companies to support the role of women in the organisation - Part 1

Measure ➔ / Country group ➔	Training measures to raise awareness about gender	Mentoring, coaching, or networking for women	Flexible work arrangements (beyond what is required by law)	Job-sharing for management positions	Monitoring of gender equality based on indicators
Anglophone	52.4 %	57.0 %	85.1 %	38.5 %	43.8 %
Baltic	21.2 %	12.3 %	76.6 %	54.9 %	14.1 %
Central-Eastern	26.2 %	30.2 %	68.1 %	39.5 %	18.6 %
Continental	34.4 %	35.2 %	77.8 %	27.6 %	37.1 %
Northern	36.4 %	37.2 %	77.6 %	39.0 %	38.3 %
Southern	49.3 %	39.3 %	63.2 %	56.7 %	40.1 %
Non-Europe	46.9 %	56.3 %	80.3 %	44.0 %	41.4 %
Total sample	*37.2 %*	*37.0 %*	*73.4 %*	*41.9 %*	*33.0 %*
EU27	*32.1 %*	*31.3 %*	*71.9 %*	*39.9 %*	*27.6 %*

All companies with >9 staff; n = xxx (missings excluded)

Exhibit 152: Measures implemented by companies to support the role of women in the organisation - Part 2

Measure ➔ / Country group ➔	Analysis of gender pay gaps	Cooperation with education system stakeholders	Self-imposed quotas for share of women in decision-making	Policy or strategy for promoting gender equality	Establishment of a position responsible for gender equality
Anglophone	44.4 %	51.7 %	47.6 %	61.0 %	43.9 %
Baltic	21.5 %	18.7 %	8.6 %	27.8 %	6.9 %
Central-Eastern	20.1 %	21.2 %	18.0 %	26.0 %	13.9 %
Continental	46.2 %	36.0 %	24.4 %	39.3 %	28.6 %
Northern	46.5 %	33.9 %	20.1 %	53.7 %	21.0 %
Southern	41.5 %	38.2 %	33.5 %	45.7 %	35.1 %
Non-Europe	43.1 %	44.0 %	41.0 %	53.5 %	38.8 %

Measure ➔ Country group ➔	Analysis of gender pay gaps	Cooperation with education system stakeholders	Self-imposed quotas for share of women in decision-making	Policy or strategy for promoting gender equality	Establishment of a position responsible for gender equality
Total sample	*37.4 %*	*33.5 %*	*26.2 %*	*41.5 %*	*26.1 %*
EU27	*32.4 %*	*29.1 %*	*21.4 %*	*36.4 %*	*20.7 %*

All companies with >9 staff; n = xxx (missings excluded)

9.8.2 Perceived effectiveness

Exhibit 153: Perceived effectiveness of training measures to raise awareness about gender equality

Effectiveness ➔ Country group ➔	Very effective (1)	Somewhat effective (2)	Neither, nor (3)	Somewhat ineffective (4)	Not effective at all (5)	Total	Ø
Anglophone	36.0 %	28.0 %	29.3 %	1.3 %	5.3 %	100.0 %	2.116
Baltic	12.5 %	40.0 %	30.0 %	12.5 %	5.0 %	100.0 %	2.58
Central-Eastern	42.9 %	21.1 %	25.6 %	3.0 %	7.5 %	100.0 %	2.11
Continental	26.4 %	28.0 %	32.4 %	6.0 %	7.1 %	100.0 %	2.39
Northern	20.6 %	40.2 %	31.8 %	5.6 %	1.9 %	100.0 %	2.28
Southern	41.7 %	29.8 %	20.9 %	4.3 %	3.4 %	100.0 %	1.98
Non-Europe	30.8 %	40.8 %	19.2 %	5.0 %	4.2 %	100.0 %	2.11
Total sample	*33.0 %*	*31.2 %*	*26.1 %*	*4.8 %*	*4.9 %*	*100.0 %*	*2.17*
EU27	*32.1 %*	*29.5 %*	*27.3 %*	*4.9 %*	*6.2 %*	*100.0 %*	*2.24*

All companies with >9 staff and that have implemented the measure; n = 892 (missings excluded)

Exhibit 154: Perceived effectiveness of mentoring, coaching or networking for women

Effectiveness ➔ Country group ➔	Very effective (1)	Somewhat effective (2)	Neither, nor (3)	Somewhat ineffective (4)	Not effective at all (5)	Total	Ø
Anglophone	32.9 %	31.8 %	28.2 %	4.7 %	2.4 %	100.0 %	2.12
Baltic	26.1 %	30.4 %	17.4 %	17.4 %	8.7 %	100.0 %	2.52
Central-Eastern	43.5 %	34.4 %	15.6 %	3.2 %	3.2 %	100.0 %	1.88
Continental	23.9 %	33.0 %	33.5 %	3.7 %	5.9 %	100.0 %	2.35
Northern	26.4 %	49.1 %	19.1 %	3.6 %	1.8 %	100.0 %	2.05
Southern	38.0 %	33.7 %	20.3 %	4.3 %	3.7 %	100.0 %	2.02
Non-Europe	35.6 %	37.0 %	14.4 %	7.5 %	5.5 %	100.0 %	2.10
Total sample	*33.4 %*	*35.8 %*	*21.8 %*	*4.8 %*	*4.1 %*	*100.0 %*	*2.10*
EU27	*33.7 %*	*34.3 %*	*22.6 %*	*4.8 %*	*4.6 %*	*100.0 %*	*2.12*

All companies with >9 staff and that have implemented the measure; n = 893 (missings excluded)

Exhibit 155: Perceived effectiveness of flexible work arrangements such as remote work from home or part-time work (beyond what is required by law)

Effectiveness ➔ Country group ➔	Very effective (1)	Somewhat effective (2)	Neither, nor (3)	Somewhat ineffective (4)	Not effective at all (5)	Total	Ø
Anglophone	56.3 %	30.2 %	11.1 %	0.0 %	2.4 %	100.0 %	1.62
Baltic	43.9 %	31.7 %	15.8 %	4.3 %	4.3 %	100.0 %	1.93
Central-Eastern	43.8 %	38.2 %	11.5 %	2.5 %	3.9 %	100.0 %	1.84
Continental	51.6 %	31.4 %	12.9 %	1.9 %	2.2 %	100.0 %	1.72
Northern	43.2 %	35.0 %	15.4 %	3.8 %	2.6 %	100.0 %	1.87
Southern	46.7 %	30.9 %	12.8 %	3.9 %	5.6 %	100.0 %	1.91
Non-Europe	49.8 %	32.7 %	10.0 %	3.3 %	4.3 %	100.0 %	1.80
Total sample	*47.6 %*	*33.2 %*	*12.7 %*	*2.9 %*	*3.6 %*	*100.0 %*	*1.82*
EU27	*47.3 %*	*34.0 %*	*12.8 %*	*2.7 %*	*3.2 %*	*100.0 %*	*1.81*

All companies with >9 staff and that have implemented the measure; n = 1,787 (missings excluded)

Exhibit 156: Perceived effectiveness of job-sharing for management positions

Effectiveness ➔ Country group 🡻	Very effective (1)	Somewhat effective (2)	Neither, nor (3)	Somewhat ineffective (4)	Not effective at all (5)	Total	Ø
Anglophone	39.3 %	21.4 %	28.6 %	1.8 %	8.9 %	100.0 %	2.20
Baltic	37.1 %	39.2 %	18.6 %	4.1 %	1.0 %	100.0 %	1.93
Central-Eastern	35.0 %	38.5 %	18.5 %	3.0 %	5.0 %	100.0 %	2.05
Continental	24.1 %	24.1 %	29.7 %	9.0 %	13.1 %	100.0 %	2.63
Northern	31.0 %	39.7 %	22.4 %	0.9 %	6.0 %	100.0 %	2.11
Southern	43.5 %	29.0 %	19.7 %	3.0 %	4.8 %	100.0 %	1.97
Non-Europe	38.1 %	25.7 %	20.4 %	6.2 %	9.7 %	100.0 %	2.24
Total sample	*36.0 %*	*31.6 %*	*21.7 %*	*4.0 %*	*6.6 %*	*100.0 %*	*2.13*
EU27	*35.3 %*	*34.1 %*	*20.6 %*	*3.7 %*	*6.3 %*	*100.0 %*	*2.12*

All companies with >9 staff and that have implemented the measure; n = 996 (missings excluded)

Exhibit 157: Perceived effectiveness of monitoring of gender equality based on indicators

Effectiveness ➔ Country group 🡻	Very effective (1)	Somewhat effective (2)	Neither, nor (3)	Somewhat ineffective (4)	Not effective at all (5)	Total	Ø
Anglophone	35.9 %	26.6 %	34.4 %	3.1 %	0.0 %	100.0 %	2.05
Baltic	8.3 %	45.8 %	25.0 %	4.2 %	16.7 %	100.0 %	2.75
Central-Eastern	22.3 %	30.9 %	33.0 %	5.3 %	8.5 %	100.0 %	2.47
Continental	25.5 %	32.8 %	27.6 %	4.7 %	9.4 %	100.0 %	2.40
Northern	25.0 %	30.2 %	35.3 %	2.6 %	6.9 %	100.0 %	2.36
Southern	34.4 %	28.6 %	26.6 %	4.2 %	6.3 %	100.0 %	2.20
Non-Europe	26.9 %	31.7 %	28.8 %	5.8 %	6.7 %	100.0 %	2.33
Total sample	*27.7 %*	*30.9 %*	*29.8 %*	*4.3 %*	*7.3 %*	*100.0 %*	*2.33*
EU27	*23.4 %*	*31.3 %*	*31.1 %*	*5.1 %*	*9.1 %*	*100.0 %*	*2.45*

All companies with >9 staff and that have implemented the measure; n = 786 (missings excluded)

Exhibit 158: Perceived effectiveness of analysis of gender pay gaps

Effectiveness ➔ Country group 🡓	Very effective (1)	Somewhat effective (2)	Neither, nor (3)	Somewhat ineffective (4)	Not effective at all (5)	Total	Ø
Anglophone	46.9 %	18.8 %	28.1 %	3.1 %	3.1 %	100.0 %	1.97
Baltic	31.6 %	31.6 %	21.1 %	10.5 %	5.3 %	100.0 %	2.27
Central-Eastern	26.5 %	29.4 %	31.4 %	2.0 %	10.8 %	100.0 %	2.42
Continental	45.1 %	25.1 %	21.3 %	3.0 %	5.5 %	100.0 %	1.99
Northern	37.7 %	26.8 %	25.4 %	6.5 %	3.6 %	100.0 %	2.12
Southern	29.6 %	28.6 %	25.5 %	4.6 %	11.7 %	100.0 %	2.40
Non-Europe	36.8 %	27.4 %	25.5 %	3.8 %	6.6 %	100.0 %	2.16
Total sample	*36.9 %*	*26.7 %*	*25.0 %*	*4.2 %*	*7.2 %*	*100.0 %*	*2.18*
EU27	*32.1 %*	*29.1 %*	*27.1 %*	*4.9 %*	*6.8 %*	*100.0 %*	*2.25*

All companies with >9 staff and that have implemented the measure; n = 879 (missings excluded)

Exhibit 159: Perceived effectiveness of cooperation with education system stakeholders for attracting more girls and women into the sector

Effectiveness ➔ Country group 🡓	Very effective (1)	Somewhat effective (2)	Neither, nor (3)	Somewhat ineffective (4)	Not effective at all (5)	Total	Ø
Anglophone	31.2 %	40.3 %	20.8 %	2.6 %	5.2 %	100.0 %	2.11
Baltic	16.1 %	19.4 %	38.7 %	12.9 %	12.9 %	100.0 %	2.87
Central-Eastern	25.5 %	35.8 %	23.6 %	4.7 %	10.4 %	100.0 %	2.39
Continental	28.4 %	26.8 %	26.8 %	10.0 %	7.9 %	100.0 %	2.42
Northern	24.2 %	32.3 %	27.3 %	7.1 %	9.1 %	100.0 %	2.45
Southern	38.8 %	27.5 %	20.8 %	3.9 %	9.0 %	100.0 %	2.17
Non-Europe	23.9 %	34.5 %	24.8 %	7.1 %	9.7 %	100.0 %	2.44
Total sample	*29.0 %*	*31.0 %*	*24.7 %*	*6.5 %*	*8.8 %*	*100.0 %*	*2.35*
EU27	*25.1 %*	*31.8 %*	*24.9 %*	*8.0 %*	*10.2 %*	*100.0 %*	*2.46*

All companies with >9 staff and that have implemented the measure; n = 794 (missings excluded)

Exhibit 160: Perceived effectiveness of self-imposed quotas for share of women in decision-making bodies

Effectiveness ➔ Country group ➔	Very effective (1)	Somewhat effective (2)	Neither, nor (3)	Somewhat ineffective (4)	Not effective at all (5)	Total	Ø
Anglophone	42.9 %	27.1 %	18.6 %	4.3 %	7.1 %	100.0 %	2.06
Baltic	25.0 %	18.8 %	12.5 %	25.0 %	18.8 %	100.0 %	2.94
Central-Eastern	21.1 %	34.4 %	37.8 %	1.1 %	5.6 %	100.0 %	2.36
Continental	22.7 %	28.1 %	27.3 %	4.7 %	17.2 %	100.0 %	2.66
Northern	20.7 %	29.3 %	27.6 %	8.6 %	13.8 %	100.0 %	2.66
Southern	33.5 %	31.0 %	24.7 %	3.2 %	7.6 %	100.0 %	2.20
Non-Europe	36.3 %	26.5 %	27.5 %	2.9 %	6.9 %	100.0 %	2.18
Total sample	*29.6 %*	*29.3 %*	*26.8 %*	*4.3 %*	*10.0 %*	*100.0 %*	*2.36*
EU27	*26.2 %*	*29.8 %*	*27.6 %*	*4.7 %*	*11.6 %*	*100.0 %*	*2.45*

All companies with >9 staff and that have implemented the measure; n = 662 (missings excluded)

Exhibit 161: Perceived effectiveness of policy or strategy for promoting gender equality across the organisation

Effectiveness ➔ Country group ➔	Very effective (1)	Somewhat effective (2)	Neither, nor (3)	Somewhat ineffective (4)	Not effective at all (5)	Total	Ø
Anglophone	43.8 %	24.7 %	25.8 %	4.5 %	1.1 %	100.0 %	1.94
Baltic	21.2 %	38.5 %	25.0 %	7.7 %	7.7 %	100.0 %	2.43
Central-Eastern	37.0 %	31.9 %	23.7 %	4.4 %	3.0 %	100.0 %	2.05
Continental	26.2 %	32.5 %	29.1 %	6.8 %	5.3 %	100.0 %	2.32
Northern	25.5 %	34.8 %	31.7 %	5.6 %	2.5 %	100.0 %	2.25
Southern	44.5 %	30.3 %	16.5 %	3.7 %	5.0 %	100.0 %	1.94
Non-Europe	36.5 %	26.3 %	24.8 %	5.1 %	7.3 %	100.0 %	2.20
Total sample	*34.3 %*	*31.1 %*	*24.9 %*	*5.2 %*	*4.5 %*	*100.0 %*	*2.15*
EU27	*30.7 %*	*32.2 %*	*26.9 %*	*5.4 %*	*4.8 %*	*100.0 %*	*2.21*

All companies with >9 staff and that have implemented the measure; n = 998 (missings excluded)

Exhibit 162: Perceived effectiveness of establishment of a position with responsibility for gender equality

Effectiveness ➔ Country group ➔	Very effective (1)	Somewhat effective (2)	Neither, nor (3)	Somewhat ineffective (4)	Not effective at all (5)	Total	Ø
Anglophone	36.9 %	32.3 %	24.6 %	3.1 %	3.1 %	100.0 %	2.03
Baltic	30.8 %	7.7 %	15.4 %	0.0 %	46.2 %	100.0 %	3.23
Central-Eastern	26.0 %	30.1 %	30.1 %	4.1 %	9.6 %	100.0 %	2.41
Continental	31.1 %	25.0 %	25.7 %	4.7 %	13.5 %	100.0 %	2.45
Northern	20.3 %	29.7 %	29.7 %	6.3 %	14.1 %	100.0 %	2.65
Southern	32.7 %	31.5 %	23.8 %	4.8 %	7.1 %	100.0 %	2.22
Non-Europe	33.0 %	28.0 %	24.0 %	3.0 %	12.0 %	100.0 %	2.33
Total sample	*30.7 %*	*28.7 %*	*25.5 %*	*4.3 %*	*10.8 %*	*100.0 %*	*2.36*
EU27	*27.9 %*	*29.1 %*	*26.0 %*	*4.2 %*	*12.8 %*	*100.0 %*	*2.45*

All companies with >9 staff and that have implemented the measure; n = 631 (missings excluded)

10 Annex V: Tabular report on survey of energy sector employees

10.1 Description of the sample

Exhibit 163: Total valid responses per country and gender

Country	Women	Men	Non-binary/ other	n.a.	Total
Austria	11	1	0	0	12
Denmark	6	4	0	1	11
France	36	40	1	8	85
Germany	43	40	1	3	87
Italy	38	34	0	6	78
Netherlands	16	14	0	0	30
Poland	14	45	0	5	64
Spain	41	37	0	6	84
Sweden	10	27	0	0	37
Remaining EU27	15	14	0	2	31
TOTAL EU27	***230***	***256***	***2***	***31***	***519***
Non-EU	22	16	0	2	40
Country missing	1	3	0	0	4
TOTAL	***253***	***275***	***2***	***33***	***563***

All respondents; n = 563

The tables below give an overview of the breakdown of responses according to key structural variables.

Exhibit 164: Total responses by energy subsector (multiple answers)

Subsector ➔	Renewables	Oil & gas	Nuclear	Coal	Transmission & distribution	Retail & Wholesale	Storage incl. batteries	Hydrogen	HVAC	Research & Consulatnavy	Total
Total sample	210	159	29	121	27	92	54	54	54	118	**563**
EU27	187	145	27	113	25	86	49	47	52	101	**519**

All respondents; n = 563

Exhibit 165: Total responses by renewables subsector (multiple answers)

Subsector →	Hydropower	Wind	Solar	Bioenergy	Waste	Geothermal	Ocean energy	Heat pumps	Total
Total sample	64	95	139	65	40	30	10	72	**210**
EU27	53	82	119	57	35	23	8	66	**187**

All employees working in the renewables sector; n = 210

Exhibit 166: Total responses by seniority level

Seniority level →	Entry level	Assistant	Technical Expert, Specialist, Clerk	Team Manager, Supervisor	Senior Manager	Director / Board Level	Total
Total sample	54	57	201	124	85	22	**543**
EU27	48	55	191	114	73	18	**499**

All respondents; n = 543 (missings excluded)

Exhibit 167: Total responses by country group and company size class

Size class →	up to 9 employees	10 to 49 employees	50 to 249 employees	250 or more employees	Total
Total sample	31	87	122	311	**551**
EU27	29	77	119	283	**508**

All respondents; n = 551 (missings excluded)

Exhibit 168: Total responses by country group and company age class

Company age →	Less than 2 years ago	Between 2 and 5 years ago	Between 6 and 20 years ago	More than 20 years ago	Total
Total sample	36	44	165	289	**534**
EU27	33	41	158	259	**491**

All respondents; n = 534 (missings excluded)

Exhibit 169: Total responses by energy subsector (multiple answers)

Job role ➔	Engineering	Field Services	Technical	Management / Project mgt.	Project Services	Administration	Finance	Legal	Personnel / HRM	Sales / Business development / PR	Research	Total
Total sample	132	63	134	164	44	92	34	11	33	65	37	**558**
EU27	116	58	126	142	41	88	29	10	31	60	28	**514**

All respondents; n = 558 (missings excluded)

Exhibit 170: Total responses by educational attainment

Attainment ➔	Secondary school (ISCED1-2)	Secondary school (ISCED 3)	Vocational school (ISCED 5B)	Bachelor's degree (ISCED 6B)	Master's degree (ISCED 7)	Professional degree (ISCED 6A/7)	Doctorate degree (ISCED 8)	Total
Total sample	48	71	87	93	158	27	45	**529**
EU27	48	71	86	79	145	23	35	**487**

All respondents; n = 529 (missings excluded)

Exhibit 171: Total responses by field of education and training (multiple answers)

Education field➔	Education	Arts and humanities	Social sciences	Business, administration & law	Natural sciences and mathematics	ICTs	Engineering, manuf., construction	Agriculture, forestry, fisheries, veterinary	Health and welfare	Services	Total
Total sample	9	14	26	97	56	24	176	3	5	17	**402**
EU27	6	14	24	87	48	23	152	3	5	16	**361**

All employees; n = 402 (missings excluded)

10.2 Overview of key variables according to gender

Exhibit 172: Overview of key variables according to gender

	Women	Men	Total
In renewables sector	40.3%	35.6%	37.3%
In conventional energy sector	59.7%	64.4%	62.7%
STEM educated	36.8%	56.4%	44.2%
Full-time contract	82.1%	96.0%	89.9%
Part-time contract	16.7%	2.9%	9.1%
Other type of contract	1.2%	1.1%	1.1%
With care responsibility	51.4%	52.0%	49.0%
Up to 29 years	48.4%	56.5%	52.5%
30-49 years	42.0%	30.4%	36.5%
50 years or older	9.6%	13.0%	11.0%
In company sized <50	19.0%	23.7%	22.1%
In company sized 50-249	56.7%	57.4%	56.4%
In company sized 250+	24.3%	18.9%	21.4%
Member of group facing discrimination	27.5%	9.3%	18.5%

All employees; n = 563

10.3 Intention to leave the position / sector

Exhibit 173: Intention to change job / sector according to key structural variables

	Planning to work for other organisation within 3 years	Would take job in another organisation if offer attractive	Planning to leave energy sector within 3 years
Women	35.3%	66.3%	26.7%
Men	33.8%	66.9%	24.6%
In renewables	36.0%	72.1%	26.7%
In conventional energy	34.6%	63.3%	25.1%
STEM educated	36.6%	66.4%	23.4%
Not STEM educated	34.0%	66.8%	27.6%

	Planning to work for other organisation within 3 years	Would take job in another organisation if offer attractive	Planning to leave energy sector within 3 years
Up to 29 years	36.2%	67.1%	21.2%
30-49 years	39.6%	70.9%	41.0%
50 years or older	17.9%	54.8%	17.9%
Care responsibility	33.3%	68.4%	21.5%
Without care responsibility	37.0%	64.8%	29.9%
Women w. care resp.	35.2%	66.7%	25.2%
Men w. care resp.	31.7%	70.0%	18.7%
Total sample	*35.2%*	*66.6%*	*25.7%*

All employees; n = 529-539 (missings excluded); Sum of percentages for responses 4, 5 and 6 on 6-point response scale

10.4 Career related perceptions: Overview

Exhibit 174: Career related perceptions according to key structural variables

In my present company...➔	**CAREER1** Job relevant to career goals and vocational growth.	**CAREER7** Salary is growing quickly	**CAREER3** Job encourages to continuously gain new job-related **k**nowledge	**CAREER6** Being promoted faster than colleagues	**CAREER2** Job provides good opportunities to realise career goals	**CAREER8** Salary has grown more quickly than for my colleagues	**CAREER5** Promotion speed is fast	**CAREER4** Job enables to continuously improve professional capabilities.
Women	4.33	3.02	4.46	2.99	4.07	2.90	3.11	4.30
Men	4.38	3.27	4.55	3.30	4.24	3.35	3.34	4.50
In renewables	4.44	3.16	4.73	3.21	4.25	3.22	3.40	4.58
In conventional en.	4.31	3.18	4.41	3.16	4.09	3.12	3.17	4.30
Women in renewables	4.38	2.98	4.71	2.88	4.19	2.84	3.13	4.54
Men in renewables	4.47	3.34	4.70	3.52	4.34	3.59	3.69	4.62
STEM educated	4.55	3.12	4.70	3.19	4.36	3.16	3.30	4.58
Not STEM educated	4.20	3.22	4.39	3.17	3.97	3.15	3.22	4.26
Up to 29 years	4.46	3.18	4.46	3.26	4.27	3.08	3.27	4.45

In my present company...➔	**CAREER1** Job relevant to career goals and vocational growth.	**CAREER7** Salary is growing quickly	**CAREER3** Job encourages to continuously gain new job-related **k**nowledge	**CAREER6** Being promoted faster than colleagues	**CAREER2** Job provides good opportunities to realise career goals	**CAREER8** Salary has grown more quickly than for my colleagues	**CAREER5** Promotion speed is fast	**CAREER4** Job enables to continuously improve professional capabilities.
30-49 years	4.42	3.00	4.75	3.02	4.21	3.11	2.93	4.63
50 years or older	4.6	2.72	4.94	2.93	4.32	3.00	2.93	4.78
Care responsibility	4.42	3.18	4.48	3.23	4.22	3.17	3.26	4.46
No care responsibility	4.29	3.16	4.57	3.12	4.07	3.14	3.25	4.35
Total sample	*4.36*	*3.17*	*4.53*	*3.18*	*4.15*	*3.15*	*3.25*	*4.40*

All employees; n = 515-552 (missings excluded)

10.5 Support for work-life-balance

Exhibit 175: Statements on support for work-life-balance according to key structural variables

	Employer provides facilities and flexibility to fit work in and around one's family life	**Current working hours / patterns suit personal cirumstances**	**Line manager actively promotes flexible working hours / patterns**
Women	69.9%	72.9%	66.1%
Men	66.3%	69.6%	59.9%
In renewables	72.1%	69.1%	71.6%
In conventional en.	65.2%	70.8%	57.2%
Women in renewables	72.3%	71.3%	73.5%
Men in renewables	71.1%	68.0%	68.0%
STEM educated	66.9%	71.3%	66.7%
Not STEM educated	68.5%	69.2%	59.2%
STEM educated women	72.2%	69.6%	68.2%
STEM educated men	63.7%	72.2%	65.6%
Up to 29 years	67.3%	70.5%	65.2%

	Employer provides facilities and flexibility to fit work in and around one's family life	Current working hours / patterns suit personal cirumstances	Line manager actively promotes flexible working hours / patterns
30-49 years	69.2%	68.9%	68.3%
50 years or older	74.2%	66.7%	69.7%
Care responsibility	67.9%	72.2%	65.1%
No care responsibility	67.7%	68.1%	60.1%
Women w. care resp.	71.9%	74.4%	68.8%
Men w. care resp.	65.0%	70.9%	62.4%
Company size <50	59.6%	67.5%	58.4%
Company size 50-249	70.5%	67.3%	61.9%
Company size 250+	69.9%	72.4%	65.0%
Total sample	*67.8%*	*70.1%*	*62.6%*

All employees; n = 535-537 (missings excluded); Sum of percentages for responses 4 and 5 on 5-point response scale

10.6 Perception on payment and gender pay gap

Exhibit 176: Statements on payment and gender pay gap according to key structural variables

	Satisfied with the payment I receive[349]	I think that women are paid less than men for the same job[350]
Women	54.8%	36.9%
Men	58.8%	24.6%
In renewables	57.6%	34.5%
In conventional en.	55.7%	28.0%
Women in renewables	56.6%	43.8%
Men in renewables	59.2%	25.8%
STEM educated	55.2%	28.6%
Not STEM educated	57.4%	32.1%

349 Sum of percentages for responses 4 and 5 on 5-point response scale

350 Sum of percentages for responses 5 and 6 on 6-point response scale

	Satisfied with the payment I receive[349]	I think that women are paid less than men for the same job[350]
Up to 29 years	56.8%	31.8%
30-49 years	49.5%	32.7%
50 years or older	45.5%	26.7%
Care responsibility	57.1%	29.7%
No care responsibility	55.7%	31.3%
Company size <50	51.8%	29.9%
Company size 50-249	59.6%	33.0%
Company size 250+	57.2%	30.2%
Total sample	*56.4%*	*30.5%*

All employees; n = 518-539 (missings excluded)

10.7 Perception of subtle gender bias

Exhibit 177: Average responses to questions about subtle gender bias according to key structural variables - Part I

About current employer: ➔	Good relationship with most co-workers	Some people are not comfortable being subordinate to a woman	My company provides supports for balancing work and family demands	Male staff members receive more respect from other departments	Own ideas are valued within workplace	Collegial work environment	People see ambitiousness differently for men and women
Women	5.12	3.57	4.47	3.44	4.33	4.47	3.73
Men	5.08	3.18	4.31	2.82	4.26	4.51	3.16
In renewables	5.14	3.46	4.61	3.29	4.58	4.63	3.52
In conventional en.	5.06	3.33	4.23	3.05	4.11	4.40	3.41
Women in renewables	5.13	3.79	4.63	3.66	4.67	4.68	3.94
Men in renewables	5.13	3.09	4.60	2.84	4.49	4.56	3.05
STEM educated	5.12	3.26	4.43	3.08	4.43	4.60	3.33
Not STEM educated	5.06	3.48	4.32	3.19	4.16	4.39	3.55
Up to 29 years	4.97	3.39	4.48	3.03	4.27	4.47	3.46
30-49 years	5.23	3.20	4.44	3.38	4.67	4.61	3.57

About current employer: ➔	Good relationship with most co-workers	Some people are not comfortable being subordinate to a woman	My company provides supports for balancing work and family demands	Male staff members receive more respect from other departments	Own ideas are valued within workplace	Collegial work environment	People see ambitiousness differently for men and women
50 years or older	5.06	3.19	4.58	3.00	4.61	4.75	3.47
Care responsibility	5.14	4.37	3.13	4.35	4.47	3.42	3.10
No care responsibility	5.04	4.37	3.15	4.23	4.50	3.48	3.00
Company size <50	5.07	2.99	4.35	2.92	4.39	4.25	3.36
Company size 50-249	5.18	3.51	4.33	3.28	4.33	4.51	3.47
Company size 250+	5.09	3.43	4.41	3.16	4.27	4.58	3.47
Total sample	*5.09*	*3.38*	*4.37*	*3.14*	*4.29*	*4.49*	*3.45*

All employees; n = 501-531 (missings excluded)

Exhibit 178: Average responses to questions about subtle gender bias according to key structural variables - Part II

About current employer: ➔	Men sometims jump in when a woman is speaking and take over the conversation	Some of my male colleagues are only superficially supportive of women' s struggles	I work in an organisation where policies emphasize equity	I think that women are paid less than men for the same job	I receive positive feedback about my abilities from colleagues	I have a mentor who is in a senior leadership position	I receive one-on-one formal mentoring
Women	3.17	3.68	4.35	3.76	4.55	3.54	3.25
Men	2.93	3.28	4.41	3.25	4.60	3.56	3.48
In renewables	3.16	3.55	4.46	3.66	4.73	3.76	3.42
In conventional en.	2.98	3.42	4.34	3.40	4.45	3.40	3.33
Women in renewables	3.30	3.78	4.54	4.01	4.84	3.79	3.37
Men in renewables	3.00	3.30	4.35	3.32	4.67	3.80	3.49
STEM educated	3.06	3.39	4.55	3.39	4.61	3.57	3.33
Not STEM educated	3.05	3.54	4.24	3.59	4.52	3.5	3.39
Up to 29 years	2.95	3.42	4.45	3.45	4.61	3.68	3.49

About current employer: ➔	Men sometims jump in when a woman is speaking and take over the conversation	Some of my male colleagues are only superficially supportive of women' s struggles	I work in an organisation where policies emphasize equity	I think that women are paid less than men for the same job	I receive positive feedback about my abilities from colleagues	I have a mentor who is in a senior leadership position	I receive one-on-one formal mentoring
30-49 years	3.35	3.58	4.47	3.48	4.61	3.28	3.07
50 years or older	3.16	3.29	4.41	3.33	4.53	2.66	2.67
Care responsibility	3.35	3.43	4.40	3.50	4.49	3.55	3.41
No care responsibility	3.41	3.51	4.37	3.50	4.63	3.51	3.32
Company size <50	2.80	3.24	4.16	3.39	4.60	3.20	3.14
Company size 50-249	3.09	3.43	4.47	3.67	4.67	3.65	3.51
Company size 250+	3.11	3.54	4.44	3.49	4.54	3.62	3.39
Total sample	*3.05*	*3.47*	*4.39*	*3.50*	*4.56*	*3.53*	*3.37*

All employees; n = 492-525 (missings excluded)

Exhibit 179: Perceived discrimination against women according to key structural variables

	Men sometims jump in when a woman is speaking and take over the conversation	Male staff members receive more respect from other departments	People see ambitiousness differently for men and women	Some people are not comfortable being subordinate to a woman	Some of my male colleagues are only superficially supportive of women's struggles with inequities
Women	22.6%	31.6%	35.0%	32.5%	35.5%
Men	21.8%	16.3%	19.9%	26.0%	20.9%
In renewables	25.4%	29.1%	31.4%	33.7%	33.2%
In conventional en.	19.8%	21.1%	25.2%	26.1%	24.6%
Women in renewables	28.1%	38.0%	41.7%	40.8%	38.3%
Men in renewables	23.7%	18.5%	20.9%	26.4%	28.1%
STEM educated	23.8%	23.9%	24.1%	26.4%	26.0%

	Men sometims jump in when a woman is speaking and take over the conversation	Male staff members receive more respect from other departments	People see ambitiousness differently for men and women	Some people are not comfortable being subordinate to a woman	Some of my male colleagues are only superficially supportive of women's struggles with inequities
Not STEM educated	20.3%	24.4%	30.4%	31.3%	29.5%
STEM educated women	25.5%	33.3%	30.7%	28.7%	32.6%
STEM educated men	22.8%	17.7%	20.3%	25.2%	22.3%
Up to 29 years	20.8%	23.3%	29.5%	29.7%	28.5%
30-49 years	28.6%	30.8%	29.5%	22.4%	28.9%
50 years or older	22.6%	18.8%	31.3%	22.6%	25.8%
Care responsibility	21.8%	23.7%	26.4%	27.1%	25.9%
No care responsibility	22.1%	24.7%	28.7%	31.0%	30.0%
Women w care resp.	21.0%	29.9%	32.2%	28.1%	31.9%
Men w care resp.	22.8%	17.5%	21.5%	26.8%	21.1%
Company size <50	17.8%	18.6%	24.0%	22.3%	25.5%
Company size 50-249	18.5%	27.5%	27.5%	33.3%	26.9%
Company size 250+	24.6%	24.7%	28.7%	29.0%	28.7%
Total sample	*22.0%*	*24.2%*	*27.5%*	*29.0%*	*27.8%*

All employees; n = 492-513 (missings excluded); sum of percentages for responses 5 and 6 on 6-point scale

10.8 Discrimination and other negative experiences

Exhibit 180: Negative experience according to key structural variables

	Gossip and slander	Involved in quarrels or conflicts	Unpleasant teasing	Harassment on social media	Undesired sexual attention	Threats of violence	Physical violence	Bullying	Any of these
Women	30.0%	31.8%	23.3%	9.5%	8.9%	4.5%	4.1%	12.4%	53.1%
Men	21.0%	30.1%	16.3%	6.6%	4.4%	8.1%	5.2%	12.5%	43.1%
In renewables	28.3%	31.5%	23.4%	7.7%	8.1%	5.1%	4.1%	12.8%	52.3%
In conventional en.	23.9%	31.3%	17.4%	8.0%	6.1%	7.7%	4.9%	12.7%	45.8%
Women in renewables	36.4%	28.3%	26.3%	8.2%	10.2%	2.0%	3.1%	12.5%	56.7%
Men in renewables	20.6%	34.4%	20.8%	7.2%	6.2%	8.2%	5.2%	13.4%	47.9%
STEM educated	26.6%	32.5%	19.0%	8.3%	5.8%	6.2%	4.6%	14.8%	50.4%
Not STEM educated	24.7%	30.4%	20.2%	7.5%	7.9%	7.1%	4.7%	10.9%	46.4%
Up to 29 years	32.7%	33.8%	25.5%	8.4%	8.4%	9.0%	5.9%	15.7%	54.5%
30-49 years	29.1%	32.7%	17.3%	2.9%	4.9%	1.9%	0.0%	4.0%	50.0%
50 years or older	25.0%	48.5%	15.6%	3.1%	0.0%	6.1%	0.0%	18.2%	56.3%
Care responsibility	23.0%	32.5%	17.8%	8.1%	6.3%	7.3%	4.4%	12.5%	49.6%
No care responsibility	28.4%	30.1%	21.6%	7.7%	7.6%	6.0%	4.8%	12.9%	46.8%
Member of group facing discrimination	47.3%	48.9%	36.6%	18.3%	19.1%	17.0%	14.0%	29.3%	73.9%
Not member of a group facing discr.	20.0%	26.8%	15.6%	5.8%	4.3%	4.3%	2.7%	8.9%	42.0%
Total sample	*25.6%*	*31.3%*	*19.7%*	*7.9%*	*6.9%*	*6.7%*	*4.6%*	*12.7%*	*48.3%*

All employees; n = 519-524 (missings excluded); Percentages indicate at least experienced "a few times" during last 12 months

11 Annex VI: Tabular report on survey of students in tertiary education

11.1 Description of the sample

Exhibit 181: Total valid responses per country of study and gender

	Women	Men	Non-binary/ other	n.a.	Total
France	49	51	1	1	102
Germany	56	50	1	1	108
Italy	65	26	1	0	92
Lithuania	4	17	0	0	21
Netherlands	7	17	0	0	24
Poland	59	32	1	0	92
Spain	45	49	2	0	96
Remaining EU27	24	13	1	1	39
TOTAL EU27	***309***	***255***	***7***	***3***	***574***
Non-EU	25	44	4	1	74
TOTAL	***334***	***299***	***11***	***4***	***648***

All respondents; n = 648

Exhibit 182: Total responses by type of study programme

Education field➔	Bachelor's or equivalent	Master's or eqivalent	Ph.D.	Vocational Education and Training programme	College programme	Technical or trade school programme	Professional certification programme	Total
Total sample	359	183	30	31	20	11	12	**646**
Studying in EU27	307	171	24	30	17	11	12	**572**

All students; n = 646 (missings excluded)

Exhibit 183: Total responses by field of education and training (multiple answers)

Education field➔	Education	Arts and humanities	Social sciences	Business, administration & law	Natural sciences and mathematics	ICTs	Engineering, manuf., construction	Agriculture, forestry, fisheries, veterinary	Health and welfare	Services	Total
Total sample	50	83	76	105	89	49	156	9	80	12	**648**

Education field➔	Education	Arts and humanities	Social sciences	Business, administration & law	Natural sciences and mathematics	ICTs	Engineering, manuf., construction	Agriculture, forestry, fisheries, veterinary	Health and welfare	Services	Total
Studying in EU27	49	80	73	100	75	46	117	7	71	11	**572**

All students; n = 648

Exhibit 184: Total responses by studying STEM currently and/or earlier (multiple answers)

Education field➔	Current studies		Early studies (not completed)		Total
	STEM	not STEM	STEM	not STEM	
Women	99	235	18	45	**334**
Men	173	126	24	37	**299**
Total sample	277	371	42	86	**648**
Studying in EU27	222	352	35	80	**572**

All students; n = 648

Exhibit 185: Total responses by attitude to climate change

Seriousness➔	1 = Not at all a serious problem	2	3	4	5	6	7	8	9	10 = An extremely serious problem	Total
Women	0	1	5	3	25	24	42	56	51	126	**333**
Men	2	3	9	16	22	30	36	58	47	73	**296**
Total sample	2	4	14	19	48	54	81	118	99	205	**644**
Studying in EU27	2	3	10	14	36	46	76	110	90	186	**573**

All students; n = 644 (missing excluded)

Exhibit 186: Total responses by perceived importance of energy transition

Seriousness→	1 = Not important at all	2	3	4	5	6	7	8	9	10 = Extremely important	Total
Women	0	3	8	7	32	39	51	70	41	81	**332**
Men	0	7	4	10	26	47	46	51	34	70	**295**
Total sample	0	10	12	18	60	86	98	122	77	159	**642**
Studying in EU27	0	7	9	16	50	77	89	109	68	145	**570**

All students; n = 642 (missing excluded)

11.2 Overview of key variables according to gender

Exhibit 187: Overview of key variables according to gender

	Women	Men	Total
In STEM education	29.6%	57.9%	42.7%
Not in STEM education	70.4%	42.1%	57.3%
Dropped out of earlier study programme	19.0%	20.7%	20.0%
Moderate to very strong interest in career in energy sector[351]	42.9%	66.6%	54.3%
Good fit for career in energy (self-perceived) [352]	52.6%	65.9%	59.1%
Born outside EU but studying in EU	7.2%	10.1%	8.5%
Member of group facing discrimination	21.6%	22.9%	23.1%

All students; n = 548

351 Responses ‘moderately’, ‘strongly’ and ‘very strongly considering the prospect of pursuing a career in the energy sector’

352 Responses 6 to 10 on 10-point scale

11.3 Reason for choice of subject (field of education and training)

Exhibit 188: Reason for choice of subject field (multiple answers) - Part I

Reasons stated ➔	Always expected to work in this field	Field in which I excel during my studies	Interested in the subject matter	Influence of faculty members or teaching assistants	Influence of advisor or mentor	Was recommended to me	Because of relative(s) in the field
Women	39.2%	18.0%	59.0%	7.5%	5.7%	11.1%	5.1%
Men	42.8%	21.1%	56.9%	5.7%	8.4%	14.7%	7.7%
In STEM education	35.0%	20.2%	66.4%	10.1%	10.8%	14.4%	6.1%
Not in STEM education	45.8%	20.2%	51.8%	4.0%	3.8%	11.1%	6.5%
Women in STEM education	23.2%	19.2%	75.8%	15.2%	10.1%	13.1%	5.1%
Men in STEM education	40.5%	20.2%	60.7%	7.5%	11.6%	15.6%	6.9%
Total sample	*41.2%*	*20.2%*	*58.0%*	*6.6%*	*6.8%*	*12.5%*	*6.3%*

All students; n = 547 (missings excluded)

Exhibit 189: Reason for choice of subject field (multiple answers) - Part II

Reasons stated ➔	Because of friend(s) in the field	Career fairs and career counsellor	Prospects for personal development	Looking for a challenging job	Work conditions, salary, benefits	Good prospects for employment (career opportunity)	Social aspect of expected job
Women	3.9%	3.0%	29.3%	18.9%	15.9%	24.0%	11.4%
Men	1.7%	4.7%	21.7%	17.1%	19.4%	27.1%	7.7%
In STEM education	1.8%	4.3%	26.0%	20.9%	20.6%	33.6%	6.1%
Not in STEM education	3.5%	3.5%	25.6%	16.2%	15.1%	19.7%	12.1%
Women in STEM education	2.0%	3.0%	30.3%	26.3%	17.2%	31.3%	5.1%
Men in STEM education	1.7%	4.6%	23.7%	17.9%	22.5%	34.1%	6.4%
Total sample	*2.8%*	*3.9%*	*25.8%*	*18.2%*	*17.4%*	*25.6%*	*9.6%*

All students; n = 648 (missings excluded)

11.4 Attitudes to climate change and the energy transition

Exhibit 190: Perceived importance of climate change and the energy transition

	How serious a problem is climate change at this moment?		How important is the success of the energy transition for combatting climate change?	
	Average response on 10-point scale[353]	% "extremely serious"	Average response on 10-point scale[354]	% "extremely important"
Women	8.29	37.8%	7.67	24.4%
Men	7.63	24.7%	7.51	23.7%
In STEM education	8.03	31.1%	7.62	26.1%
Not in STEM education	7.93	22.9%	7.61	23.8%
Women in STEM education	8.49	40.8%	7.88	26.8%
Men in STEM education	7.62	25.9%	7.48	26.5%
Total sample	*7.99*	*31.8%*	*7.62*	*24.8%*

All students; n = 642-644

	Opinions on climate change and energy transition have influenced study choice		Opinions on climate change and energy transition will influence career choices	
	Average response on 5-point scale[355]	% strong influence[356]	Average response on 5-point scale[357]	% strong influence[358]
Women	2.41	23.4%	3.00	35.8%
Men	2.72	31.8%	3.12	39.0%
In STEM education	2.98	38.8%	3.42	50.9%
Not in STEM education	2.26	19.3%	2.79	27.2%
Women in STEM education	3.00	41.8%	3.42	48.5%
Men in STEM education	2.95	36.5%	3.40	51.5%

353 1 = "Not at all a serious problem"; 10 = "An extremely serious problem"
354 1 = "Not important at all "; 10 = "Extremely important"
355 1 = "Not at all"; 5 = "Very strongly"
356 Sum of responses "yes, a little" and "yes, a lot" in %
357 1 = "Not at all"; 5 = "Very strongly"
358 Sum of responses "yes, a little" and "yes, a lot" in %

	Opinions on climate change and energy transition have influenced study choice		Opinions on climate change and energy transition will influence career choices	
	Average response on 5-point scale[355]	% strong influence[356]	Average response on 5-point scale[357]	% strong influence[358]
Total sample	2.56	27.7%	3.06	37.5%

All students; n = 627-640

Exhibit 191: Considering prospect of pursuing a career in the energy sector

Response ➔	(1) Not at all	(2) Slightly	(3) Moderately	(4) Strongly	(5) Very strongly	Moderate to strong (3-5)	Ø
Women	31.9%	25.2%	20.2%	12.3%	10.4%	42.9%	2.40
Men	15.7%	17.7%	26.3%	21.5%	18.8%	66.6%	3.10
In STEM education	9.6%	14.0%	25.1%	24.0%	27.3%	76.4%	3.45
Not in STEM education	35.1%	27.1%	22.1%	10.8%	5.0%	37.8%	2.23
Women in STEM education	13.4%	20.6%	23.7%	15.5%	26.8%	66.0%	3.22
Men in STEM education	7.6%	10.6%	24.7%	29.4%	27.6%	81.8%	3.59
Total sample	*24.2*	*21.5%*	*23.4%*	*16.4%*	*14.5%*	*54.3%*	*2.76*

All students; n = 620-647 (missings excluded)

Exhibit 192: Perceived alignment of skills, interests, and values with a career in the energy sector

	How well do your skills, interests, and values align with a career in the energy sector?	
	Average response on 10-point scale[359]	% rather well[360]
Women	5.32	52.6%
Men	6.41	65.9%
In STEM education	5.10	75.2%
Not in STEM education	6.82	47.0%
Women in STEM education	6.44	72.7%

359 1 = "Not at all a serious problem"; 10 = "An extremely serious problem"

360 Responses 6 to 10 on 10-point scale

	How well do your skills, interests, and values align with a career in the energy sector?	
	Average response on 10-point scale[359]	% rather well[360]
Men in STEM education	7.08	77.1%
Total sample	*5.84*	*59.1%*

All students; n = 640 (missings excluded)

11.5 Criteria for choice of job / career

Exhibit 193: Job content preferences according to key structural variables

Job content ➔	1 Hands-on work that involves practical tasks and activities	2 Analyzing data and working with numbers	3 Interacting and working directly with people	4 Creative work that allows for innovation and problem-solving	5 Research and gathering information	6 Working with technology and digital tools	7 Planning and organising projects or events	8 Writing, communication, and content creation	9 Working in a team and collaborating with others	10 Continuous learning and staying updated with industry trends
Women	3.94	3.42	3.97	4.01	3.68	3.93	3.82	3.76	4.14	3.89
Men	3.79	3.83	3.98	3.95	3.63	4.05	4.09	3.70	4.14	3.86
In STEM education	3.70	3.86	3.96	3.92	3.54	4.11	4.18	3.69	4.25	3.93
Not in STEM education	3.98	3.45	3.96	4.01	3.75	3.9o	3.77	3.77	4.08	3.84
Women in STEM education	3.66	3.72	3.91	3.89	3.51	4.09	4.09	3.66	4.21	3.97
Men in STEM education	3.73	3.92	3.99	3.94	3.55	4.12	4.22	3.68	4.25	3.89
Total sample	*3.86*	*3.62*	*3.96*	*3.97*	*3.66*	*3.99*	*3.95*	*3.73*	*4.15*	*3.88*

All students; n = 632-637 (missings excluded)

Exhibit 194: Factors influencing choice of employer/sector according to key structural variables – Part I

Job content ➔	Salary	Employee benefits, i.e. non-salary perks, incentives, advantages	Job security	Job location	Working conditions	Work-life balance	Flexibility in the workplace	Opportunities for advancement
Women	4.47	3.99	4.44	3.62	4.11	4.25	3.92	4.19
Men	4.30	3.94	4.38	3.57	3.97	4.22	3.86	4.15
In STEM education	4.30	3.91	4.39	3.60	4.02	4.28	3.88	4.16
Not in STEM education	4.46	4.00	4.41	3.60	4.08	4.21	3.90	4.17
Women in STEM education	4.34	3.87	4.34	3.75	4.18	4.37	3.87	4.17
Men in STEM education	4.26	3.93	4.42	3.52	3.92	4.20	3.89	4.16
Total sample	*4.39*	*3.96*	*4.40*	*3.60*	*4.06*	*4.24*	*3.89*	*4.17*

All students; n = 629-634 (missings excluded)

Exhibit 195: Factors influencing choice of employer/sector according to key structural variables – Part II

Job content ➔	Training opportunities	International mobility opportunities	Job content	Intellectual and personal challenges	Level of responsibility	Degree of independence	Contribution to society	Equitable treatment of people	Relationship with colleagues
Women	3.97	4.19	4.31	4.16	4.06	4.52	4.50	4.50	4.20
Men	3.88	4.09	4.18	4.00	4.10	4.34	4.34	4.16	4.02
In STEM education	3.77	4.10	4.24	4.04	4.11	4.35	4.37	4.27	4.10
Not in STEM education	4.02	4.18	4.25	4.12	4.06	4.48	4.46	4.39	4.11
Women in STEM education	3.81	4.16	4.34	4.18	3.97	4.38	4.42	4.44	4.29
Men in STEM education	3.79	4.06	4.19	3.96	4.17	4.35	4.35	4.17	4.01
Total sample	*3.92*	*4.15*	*4.25*	*4.08*	*4.08*	*4.43*	*4.43*	*4.34*	*4.11*

All students; n = 627-634 (missings excluded)

12 Annex VII: Foresight analysis – Main findings

12.1 Key messages

1. The goal of achieving gender parity in the energy sector by 2050 cannot be considered a self-fulfilling prophecy. Current growth trends and various influ-ential factors indicate a likely stagnation or even decline in the proportion of women in the industry. Despite an increase in women's education and work-force participation, the specific nature of energy-related roles, gender stereo-types, and the limited impact of corporate gender equality measures contrib-ute to this challenge. To ensure progress, concerted efforts are needed from the energy sector, educational institutions, and policymakers. Policy interven-tions, strategic industry initiatives, and comprehensive educational reforms are essential to counter these trends and work towards achieving true gender pari-ty in the energy industry.

2. Success hinges on strategic collaboration between companies, educational in-stitutions, and policymakers. Achieving gender parity in the energy sector by 2050 demands a nuanced understanding of complex interplays involving na-tional, situational, and organisational factors. National contexts, including governance, societal expectations, and education structures, significantly im-pact gender dynamics. Policies promoting inclusive childcare, dismantling gen-der stereotypes, and fostering STEM education are imperative. Situational fac-tors such as company size, regional disparities, and industry-specific demands pose challenges. Organizations must focus on professionalisation, fostering networks, demonstrating commitment through policies, nurturing inclusive corporate cultures, and ensuring career permeability. Policymakers must sup-port these efforts with targeted policies, comprehensive educational reforms, and stringent monitoring to create a truly equitable energy sector.

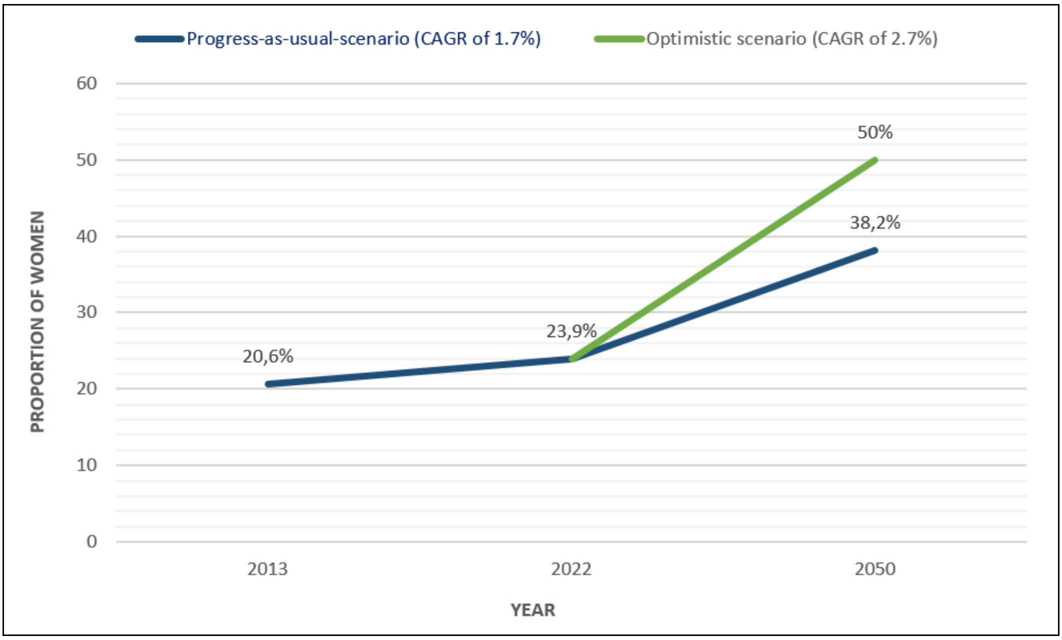
3. A core of actions was identified that might build the foundation for a proac-tive intersectoral strategy for gender parity. Policymakers must encourage companies to establish mentoring programmes and flexible work models, ena-bling women’s professional growth while balancing family life. It is crucial to foster an inclusive corporate culture, to show that the energy industry is not just about engineering jobs while, at the same time, challenging stereotypes through transparent business initiatives supported by public funding. Collabo-rative efforts between educational institutions and the industry, promoting gender-sensitive curricula and breaking down societal stereotypes, are essen-tial. Media campaigns challenging gender norms further contribute to creating an environment where gender equality is actively promoted, motivating more women to pursue STEM and energy careers.

12.2 Parity in the energy sector of 2050 – A self-fulfilling prophecy?

This chapter seeks to familiarise readers with the main factors influencing the gender ratio in the energy industry. Additionally, it explores measures and possible strategies for business, higher education, and policy to effectively contribute to gender parity in the energy industry within the framework of these influencing factors. Concrete recommendations of action are formulated which provide the reader with the basis to design a comprehensive gender equality policy for the energy sector or to position an effective contribution to it.

First, we explain why we believe that the expectation of gender parity in a more sustainable energy sector in 2050 will not be a self-fulfilling prophecy.[361]

Exhibit 196: Projected share of women among employees in the energy industry, Based on the CAGR calculated for 2013 to 2022



Source: Own calculations, based on Eurostat data (Labour Force Survey, NACE Rev. 2 sectors B05, B06, C19, D35)

According to Eurostat data, the share of women in the European energy sector was 20.6 percent in 2013 and increased to 23.9 percent in 2022. By applying the Compound Annual Growth Rate (CAGR) calculated from this data, we can project the share of women for the year 2050. In Exhibit 196, the CAGR of the years 2013 to 2022 (1.7 percent) is projected into the year 2050. According to this estimation, the share of women in the energy sector would reach 38.2 percent, assuming no change in growth dynamics. This means that by 2050, which is 27 years from now, the proportion of women will still fall short of the minimum 40% defined by EIGE as 'gender balance' (EIGE, 2022). To achieve full parity, a considerably higher CAGR of 2.7 percent would be necessary (Exhibit 196, optimistic scenario).

However, as the result of the foresight conducted in the study, we do not believe that the progress-as-usual scenario is even realistic. Considering the factors explained in more detail in the following sections, a significant slowdown in the growth of the share of women in the energy sector seems more accurate. We base this assessment on the following trends:

A central result is that the expansion of green, renewable energies does not automatically lead to a stronger inclusion of women in the labour market of the energy industry. **Functional**

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361 A self-fulfilling prophecy is “a negative or positive belief or expectation that affects a person’s […] actions in a way that leads to the fulfillment [*sic*] of those expectations” (Midlarsky & Rosenzweig, 2018, p. 1). We use this term for the parity in energy challenge because our impression is that the current belief in a steady increase in the proportion of women in energy professions is not based on factual structural factors, which we explain below.

aspects are decisive for the share of women in the different areas of the energy transition. Notably, the proportion of women is particularly low in hydrogen energy, which is very research-intensive, and in heat pumps, which are heavily dependent on manual labour. Heat pumps, in particular, are a central element of the energy transition policy in many European countries. However, the disparities in female representation across energy sectors are generally not very large. In the renewable energy sector, the average workforce representation of women ranges for 30 percent in wind power to 20 percent in heat pumps and 18 percent in geothermal energy.

Recent studies indicate a so-called '**gender equality paradox**'. This paradox suggests that with increasing prosperity and higher levels of equality in a country, gender stereotypes regarding aptitude for STEM studies become more pronounced (Breda et al., 2020). Thus, a progressive shift in values towards higher representation of women in STEM subjects within the EU may not be realised. The opposite might be the case, with increased prosperity leading to lower participation of women in STEM fields.

Over the past decade, the higher labour force participation of women in STEM occupations has been largely due to an increase in their share among academic degree holders (Striebing et al., 2020). Already today, the share of women among graduates with tertiary education in the EU-27 has reached a plateau at 57 percent.[362] This figure stood at 58 percent in 2013. It is expected that the **catch-up effect for women in labour force participation** based on academic education will stagnate. Moreover, within the group of women with tertiary degrees, there is no discernible shift towards more STEM degrees.[363]

A substantial **expansion of care provision** for children and elderly, as well as an increase in the equitable sharing of care responsibilities between men and women seems unlikely. This would require massive, concerted investment in the care system across numerous European countries, along with a significant shift in societal values regarding gender roles. The origins of such a progressive shift in values remain unclear.

Another important finding of the study is that **companies have limited strategic control** over the proportion of women in their workforce. Using the data we gathered from a global survey of around 2,700 HR managers, we calculated what best predicts the proportion of women in the workforce in the energy industry. We compared the explanatory power of the sector as an indicator of the specific requirements in the energy industry (e.g., strong focus on STEM research, sales activities or manual labour), the respective home country of a company, government involvement and the gender equality measures implemented. The result: sectoral characteristics have the greatest explanatory power for the share of women in the workforce. The effect of gender equality measures in a company appears to contribute only marginally to explaining the low share of women. However, the context, commitment, and conditions for implementation success vary widely. If the measures presented in this study are fully implemented by the Business, Higher Education and Policy sector, their effect should increase significantly.

Section 12.6 of this chapter presents a series of indicators that give an impression of how the factors mentioned above are characterised for the EU27 and several non-EU countries.

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[362] Own calculations for years 2013 and 2021, based on the Eurostat dataset "Graduates by educational level, programme orientation, gender and field of education". online data code: educ_uoe_grad02.

[363] See Eurostat dataset "Graduates in tertiary education, in science, math., computing, engineering, manufacturing, construction, by sex – per 1000 of population aged 20-29". (online data code: educ_uoe_grad04).

The country-by-country analysis shows that the employment rates in the individual sub-sectors of the energy transition vary greatly. While already almost one in five employees in Germany worked in the heat pump sector in 2021, in other countries such as Croatia, Slovenia and Belgium, just 1 per cent of employees worked in this sector. In general, there are very pronounced gender-related STEM biases in the EU27, least of all in Romania and (by some distance) other Eastern and South-Eastern European countries. In all EU27 countries, women already make up the majority of graduates with tertiary education qualifications, with a minimum of 54 per cent in Luxembourg and a maximum of 65 per cent in Poland and Latvia. A positive effect on the proportion of women in the energy sector due to endeavours of couples to reconcile career and family is unlikely. Across all EU27 countries, the proportion of young children who are cared for only by their parents has decreased only marginally in the last decade. The proportion of women among engineering graduates at Bachelor level is also stagnating across the EU27.[364] In summary, the arguments presented lead us to the point of not assuming a continued linear growth of the share of women in the energy industry. A stagnation at a slightly higher level than today seems more plausible to us. The share of women participating in the labour force and of women with tertiary education might continue to increase. However, the proportion of women among graduates in tertiary education has already reached a plateau. If the probable growth of the proportion of women's participation in the labour market and in tertiary education slows down or reverses, we see no reason why the share of women in the energy industry should not decline further.

Parity in the Energy Sector of 2050 will therefore by no means be a self-fulfilling prophecy but will require increased joint efforts by the energy industry, education sector, and policy. In this report, we present a comprehensive toolbox and possible strategies to help achieve the parity target after all. First, however, we would like to give the reader a brief overview of the many factors that influence the proportion of women in the energy industry.

12.3 Parity in 2050 - What forces are at work?

It is important to realise that the share of women in companies in the energy sector depends on a mixture of national and situational contextual conditions, as well as the company's own commitment to the advancement of women. Due to the interplay of the following factors, the strategic steering options for all decisive actors (companies, educational institutions, and politics) are very limited and the parity goal can only succeed with a high strategic commitment of the individual stakeholders.

12.3.1 National context factors affecting the parity goal

National context can be systematised into Governance, Society and Education (based on Kwan, 2022).

Governance: Encompassing standards, regulations, and funding implemented by companies and regional programmes – has a significant impact on gender dynamics in the energy sector (EIGE, 2017 & OECD Family Database, 2022). This includes guidelines on women's workforce share and factors such as **variations in daycare availability** and the

[364] For country-specific forecasts of the proportion of women, the respective patterns of the factors mentioned should be taken into account. For example, in Germany, a possible positive effect on the proportion of women in the energy sector may be counteracted by a higher childcare rate for young children due to the expansion of the heat pump sector and the high STEM stereotypes. In Poland, on the other hand, presumably higher childcare rates and low STEM stereotypes could be inhibited by a stagnation of female bachelor's degrees in engineering.

distribution of parental leave and care, which exhibit significant international differences (OECD Family Database, 2022). Addressing these governance factors is vital for fostering gender equality by enhancing childcare options, implementing inclusive policies, and promoting women's participation in the energy sector. The importance of this is, among others, supported by a NEA study in which women in the nuclear energy sector "overwhelmingly [stated] that pregnancy, family responsibilities, and/or accommodating a spouse's career have negative impact on their careers" (NEA, 2023, p. 10).

Society: Social expectations of gender roles, such as the perception of men as breadwinners and women as part-time workers, contribute to the gender disparities in the labour market (Kwan, 2022). In addition, **societal norms** often dictate that care work for family members, such as children or sick parents, often falls on women. These expectations can limit women's access to full-time employment and career advancement opportunities. Additionally, there are strongly **gendered images** associated with industries and occupations, particularly in STEM fields, which are often seen as masculine domains (Prietl, 2017). These gendered stereotypes can discourage women from pursuing careers in STEM and contribute to their underrepresentation in these fields.

Education: The issue is not that girls universally have no access to STEM education, but rather the presence of **systematic barriers and biases** that can deter them from pursuing it. In many education systems, there is a trend towards early **specialisation** which might discourage students from exploring STEM fields if they did not initially select them. More open and flexible education systems that allow students to decide on their specialisation at a later stage can increase the appeal of STEM fields to a broader range of students, including girls (Alam & Sanchez Tapia, 2020). Implementing mandatory gender mainstreaming in educational institutions is also crucial to promote equal opportunities for all genders and ensure inclusive educational environments.

12.3.2 Situational-organisational factors affecting the parity goal

Situational-organisational factors are difficult to influence by individual organisations and thus form essential framework conditions for the achievable effectiveness of gender equality measures in the industry.

Fluctuation of personnel and size of the company: A company that **grows** has more opportunities to fill new positions with women, enabling a faster change in the gender ratio compared to a shrinking or stagnant organisation. **Company size** is relevant, as well. Replacing a position that was previously held by a man or a woman with a person of another gender has stronger implications for the gender ratio in **smaller companies** (or at higher hierarchical levels with fewer employees). For example, for the nuclear sector it is found that the share of women among new hires (28.%) is higher than the workforce percentage (24.9%). However, the proportion of women among STEM hires is only 24.6 percent (NEA, 2023, p. 9).

Regional context: Regional context is another factor that can influence the gender ratio in companies in the energy industry. Several aspects come into play, including the **location** of the company's headquarters, the **level of recruiting** (global or national), national and regional differences in the **proportion of women among STEM graduates**, the **attractiveness of the area** (urban areas might have more choice in selecting employees than rural ones), and **regional concentrations of certain sectors** of the energy industry.

Different characteristics of the energy industry sectors, such as coal, wind, or hydrogen, can influence the gender ratio in companies. The orientation of a company towards research, service, or production, as well as the specific content focus of a company, can also influence the positions available for women. For example, women in Germany are significantly more likely to be found in commercial and service occupations and very rarely work as plant and machine operators or craftswomen (DESTATIS, 2021). That is, an important contextual condition of the share of women in the energy industry sectors is the extent to which a technology for energy production and distribution requires the influence of manual labour (as it is very pronounced for heat pump technology). The gendered image of a sector, negotiated in the context of societal and technical developments, might also be a relevant characteristic (Gupta, 2015 & Blackburn, 2002).

12.3.3 Organisational factors affecting the parity goal

The following set of potentially positive factors for women's advancement can be directly influenced by the organisation. However, correlations between measures for the advancement of women and their effects are often fuzzy. In principle, it is recommended to manipulate the following factors (based on Lagesen et al., 2022) through a broad set of measures with high commitment (Schmidt & Graversen, 2020).

Professionalisation: The efforts an organisation makes or can make, to recruit women and the resources available are crucial factors in promoting gender diversity among employees (Lagesen et al., 2022). This includes the level of professionalism within the organisation, which is measured by the **efforts and resources** invested in the HR area to promote gender equality. This encompasses the presence of **equal opportunity policies** and the number of HR managers employed by the company, as they are related to the capacity for management of corporate culture. Moreover, an organisation's commitment to further education combined with an open and positive climate is integral to professionalisation. Developing **HR innovations** to create opportunities for upskilling, recognising transferrable skills from degrees not directly related, and facilitating re-entry into the workforce through skill development programmes can greatly contribute to increasing gender diversity.

Networking: Networking and visibility have a positive impact on increasing the representation of women in the workforce (Striebing et al., 2022). This refers to the establishment of **cross-company or HR-specific networks** that facilitate mutual learning and the exchange of experiences among professionals. Additionally, the **source of recruitment** plays a crucial role, such as directly hiring from study programmes offered by regional and national universities (Lagesen et al., 2022). By fostering networking opportunities and recruiting from diverse educational institutions, organisations can enhance women's participation and contribute to a more balanced gender representation in the workforce. However, it is important to avoid one-sided cooperation with the same educational institution without a concept of women's advancement, as it may also contribute to the formation of a homogenously male workforce.

Commitment: Efforts to advance women within an organisation become evident in **strategic plans** and **specific policies** addressing harassment and gendered violence. The allocation of **resources** for recruiting women, the regular **monitoring** of equality figures, and the imposition of **sanctions** for non-compliance with gender quotas also contribute to gender diversity (Lagesen et al., 2022). Additionally, a clear commitment from political and organisational **leaders** positively influences the promotion of gender equality.

Corporate Culture: The **corporate culture** of a company, whether it is a start-up, family business, or multinational corporate group, can have a significant impact on the exclusion of women (Lagesen et al., 2022). The **company's self-image**, which is closely tied to its size, demographics, and market sector, also plays a role. For instance, if women are in the

minority in the company, they are more likely to experience a marginalising work culture (Striebing, 2022). It is essential for organisations to cultivate an inclusive corporate culture that values diversity and provides equal opportunities for all employees, irrespective of gender. The **way leadership is lived** is also an important part of the corporate culture. Leadership and culture are those aspects that tolerate or encourage certain behaviours or not.

Permeability of Careers: The permeability of careers within companies is a crucial factor in promoting gender diversity. Companies that require a broader **range of professional degrees** have the potential to draw from a larger pool of female professionals (Lagesen et al., 2022), considering the underrepresentation of women in STEM fields compared to the humanities. Additionally, the **permeability of professional development opportunities** within organisations is important. The negative effects of rigidly separated career paths in areas such as research and development, production, sales, and administration can hinder women's advancement (Lagesen et al., 2022). By creating more flexible and interconnected career paths, organisations can facilitate the upward mobility and growth of female professionals, enhancing gender diversity within the workforce.

12.4 A comprehensive toolbox of measures

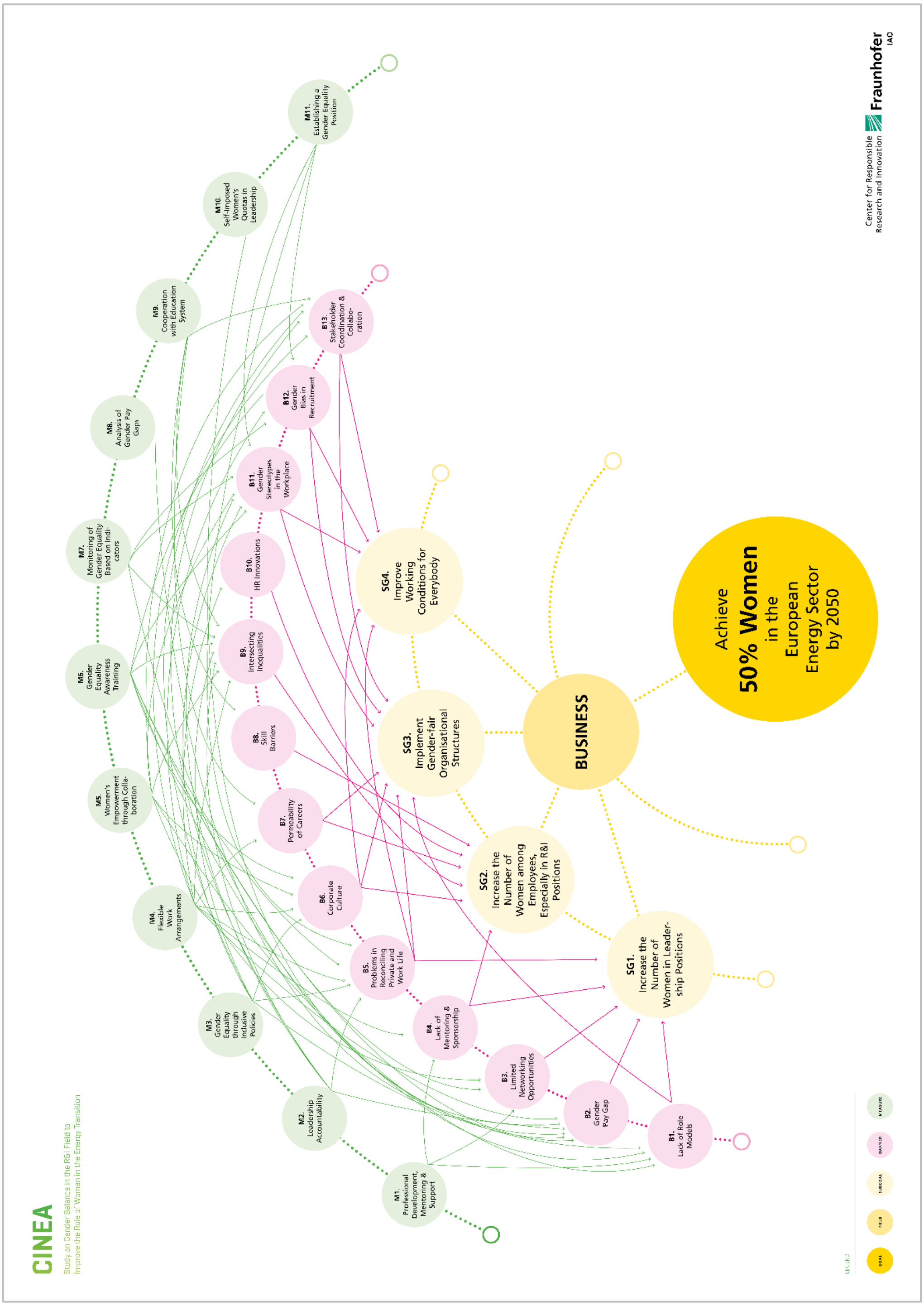
12.4.1 Introduction

The vision of gender equality in the energy sector in 2050 will - according to the assessment of this report - not happen by itself. Business, Policy and Higher Education can use the comprehensive toolbox of possible measures now at their disposal to achieve this goal in a systematic way. Within the framework of the research project carried out, possible instruments were identified and compiled, with an unparalleled range, using expert knowledge and artificial intelligence, which can contribute to achieving the parity target. It is the task of all stakeholders involved to use these instruments as broadly and bindingly as possible so that they can make an effective contribution towards achieving parity in 2050.

The detailed process for producing the toolbox explained below is explained in chapter 6.3. Additionally, detailed descriptions of the gender equality barriers and gender equality measures included in the toolbox’s visualisations can be found in section 12.7. In a strategy workshop with experts on the interface between the European energy sector and gender equality policy, it was discussed how the respective measures could be prioritised and strategically bundled. On the following pages the reader finds visualisations of the barriers-measures interrelationships identified in the project, as well as a presentation of the results of the strategy workshop.

12.4.2 What business can do

Exhibit 197: Business graph “Targets, Barriers and Measures to Achieve Parity in Energy Sector”



Source: Own visualization (Fraunhofer CeRRI)

The role of business

Companies in the energy sector play a key role as employers and decision-makers on matters concerning the energy transition. To achieve parity, efforts need to be stepped up to attract, retain, and promote female employees across all segments of the energy value chain. Companies must progress beyond paying lip service to gender equality to the analysis and resolution of structural barriers that keep women from realising their full potential within (often long-established) organisational contexts and cultures.

Prioritisation of measures

The experts participating in the workshop selected a range of measures they viewed as of critical importance for making progress towards gender balance. These include:

Professional Development, Mentoring and Support (M1) -- Research has established solid evidence for the impact of well-designed mentoring programmes. The most advanced employers incorporate mentorship into their reward systems, i.e., create a culture of competition among managers according to their success in building powerful mentor-mentee relationships. 'Well-designed' in this context refers to schemes that are guided by clear purposes, include indicators of success, and have the necessary resources. Such schemes tend to be expensive, however, since they require significant time commitment from senior employees. Sponsorship of women employees by men in decision-making roles can be very effective.

Leadership Accountability (M2) -- The fact that many managers publicly promote gender equality should not blind us to the fact that (in some EU member states more than in others) a large number, especially in engineering-dominated sectors, still tend to ignore their responsibility for the issue. If managers are expected to practice what they preach, they need to be held accountable, as research by McKinsey and others has found (Hunt et al., 2020). A top-down approach is often the most effective, i.e., the most senior managers need to publicly endorse gender equality to provide guidance and set the example for its implementation. Leadership accountability typically requires agreement on objective indicators, setting ambitious targets, systematic data collection, and transparent reporting (see M7 below). It is preferable to involve third-party expertise to avoid 'politically correct whitewashing' of the status quo.

Flexible Work Arrangements (M4) -- While there was agreement among the workshop participants that well-managed flexible work arrangements are essential to enable women (and men) to balance work and family demands, they also warned that flexibility (especially as part-time work) can disadvantage female employees if they feel stronger pressure than men for being responsible for the care work. Implementation of flexible work arrangements should therefore be accompanied by holistic approaches to develop an organisational culture that includes awareness about the gendered priorities concerning work-family balance and the provision of different types of flexible work.

Monitoring of Gender Equality Using Indicators (M7) -- Databased monitoring of gender equality is often a 'low-hanging fruit', as the necessary data is typically already there, ready to be used for the analysis of gender-related structures and developments within an organisation. Without a serious commitment to monitoring, companies cannot claim to achieve progress, as there is no proof and you do not know what is really going on.

Cooperation with Education System Stakeholders (M9) -- Experts representing either the business or the education system agreed that internships for students can work very well in creating awareness about career possibilities in STEM-dominated fields, such as the energy sector. Internships can enable students to get to know a professional field, and companies can benefit significantly from cultural enrichment and fresh recruitment opportunities. There are also positive accounts of universities supporting Ph.D. training with a period spent in industry. More generally, however, workshop participants agreed that collaboration between businesses and higher education tends to suffer from a lack of mutual understanding of job roles and career pathways. In some countries, such as the UK, there is limited mobility between these spheres: talent that leaves university for the business sector is very unlikely to return to academic jobs. The business sector should also cooperate with higher education institutions to attract highly qualified women from non-engineering majors, as there are women with non-technical backgrounds who could excel in the energy sector as well.

To a lesser extent, experts also agreed on the significance of **Self-imposed Quotas on the Share of Women in Leadership Roles (M10)**. In the Nordic countries, e.g., Iceland, quotas for the Board of Directors have been established and work well. Quotas can also be a useful approach for publicly listed companies that need to demonstrate to the shareholders that they are taking serious action to address gender inequalities. If companies were to implement quotas for the share of women among new hires, that would have an immediate and strong effect. However, given the current labour market shortages, this is unlikely to occur any time soon.

Experts did not consider the remaining measures as unimportant – rather, they often need to be part of the bigger plan. For instance, establishing a person or group with responsibility for gender equality can be required to avoid fragmentation of actions across the organisation creating an impression that nobody feels responsible. What needs to be avoided is gender equality becoming a "siloed problem", allocated solely to a certain person or group, making others feel free from taking responsibility.

Strategic view of the measures

In an exercise involving extensive discussion, experts were asked to arrange the selected measures according to their perceived importance (see last section) and potential for achievement. This was done using a matrix with a timespan and impact dimension, and distinguishing between short-term, mid-term, and long-term implementation horizons. The participants agreed that measures with impact in the short-term are very hard to find because of the **relevance of the companies' internal organisational culture**. For example, a policy recommending leadership accountability could be introduced quickly, but consistent and lasting effects on organisational culture may take several years.

Experts agreed that **government-level action to promote gender equality can make a big difference**. For instance, in some European countries, companies of a certain size are expected to publish data regarding the gender pay gap (e.g., in the UK). This can work as a trigger for challenging deeply embedded decision-making structures within an organisation to explain the pay discrimination against women employees.

Experience shows that the existence and support of women's groups within an organisation can also help speed up the implementation of measures to advance gender equality.

Another result of the discussion was the recommendation to cluster interrelated measures that can be implemented together and produce better overall results. From an organisational viewpoint, different **departments within a company should collaborate closely** together towards the goal of supporting gender equality (e.g., PR, CSR, HRM, …). However, in practice, this is hardly the case even in more advanced organisations due to the hierarchical structuring of company functions.

In summary, within the framework of the goal "Parity in Energy in 2050", the gender equality responsibilities related to Business include actions:

- to implement the political gender equality goals with high-level commitment from leaders. This top-level commitment should be reflected in comprehensive and binding measures with demonstrable positive effects;

- to build bridges to higher education institutions, as well as to regular and vocational schools, to provide students with little knowledge of employment opportunities in the energy sector to envision their future career in this field of work;[365] and

- to promote career flexibility and inclusive corporate culture with transparent action plans to minimise conflicts between work and life responsibilities; create appreciation of diversity; and encourage career pathways spanning different company functions.

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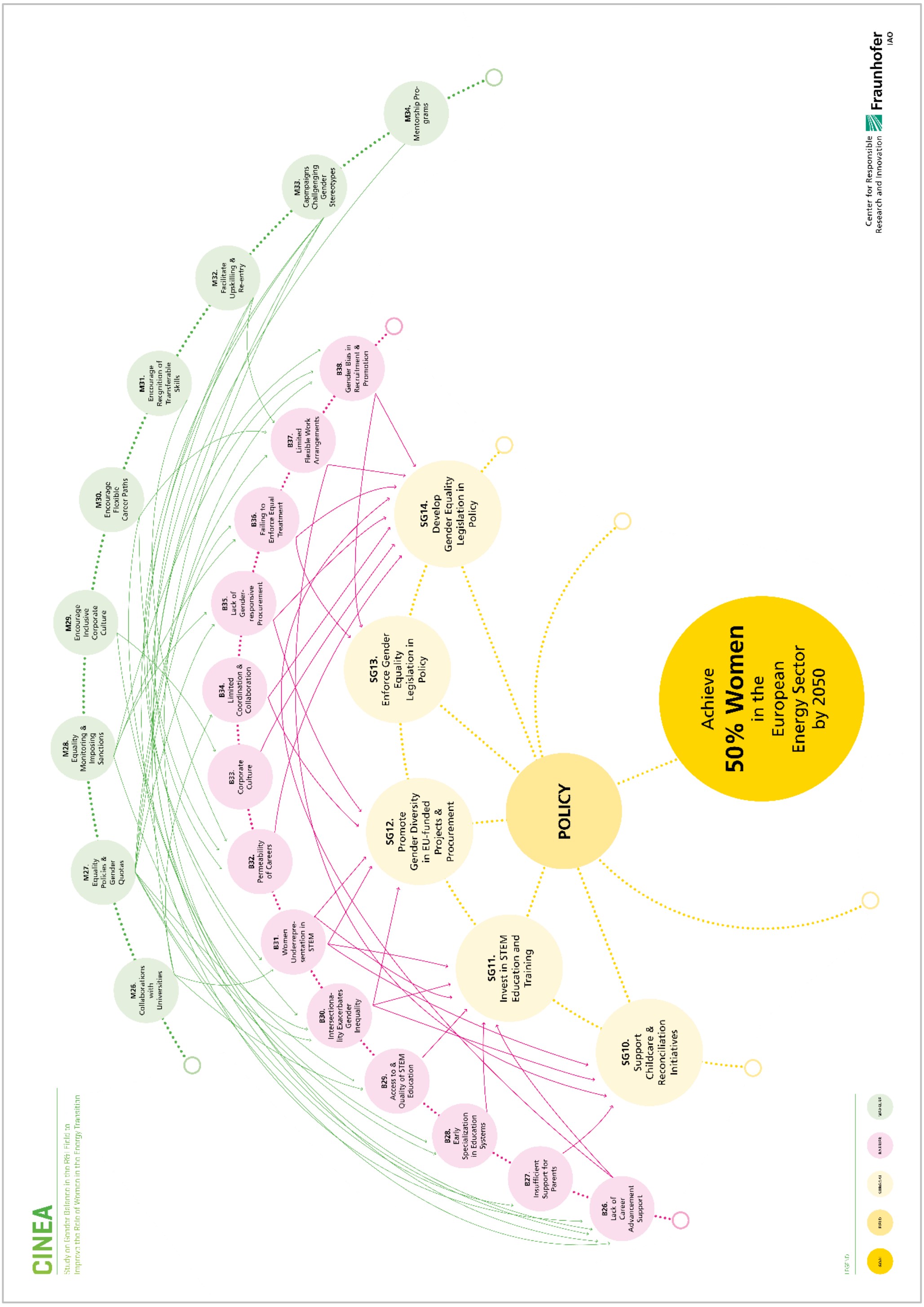
365 Such cooperation measures must have a clear focus on the advancement of women, otherwise, they risk merely reinforcing the homogeneity of the current workforce.

12.4.3 What policies we need

Exhibit 198: Policy graph “Targets, Barriers and Measures to Achieve Parity in Energy Sector”



Source: Own visualization (Fraunhofer CeRRI)

The role of policy

Policies create decisive framework conditions under which the development of the share of women in the energy sector will take place by 2050. Depending on how this framework is set, it can considerably influence the versatility, the broad impact, and the binding nature of the gender equality measures to be implemented by companies and higher education.

Promoting gender equality in research and innovation is a priority for the European Commission. It is part of the European Commission's Gender Equality Strategy 2020-2025, which sets out the Commission's wider dedication to gender equality across all EU policies. By implementing these measures, organisations can create an environment that supports women's advancement, ensures their safety, and demonstrates a strong commitment to gender equality.

However, especially regarding the promotion of gender equality in the private sector and the general workforce, European and national policies are extremely cautious to act as directives for action (Striebing et al. 2020).

Prioritisation of measures

Experts singled out several policy measures as paramount to advancing gender equality in the energy sector. Among these, the most prominent ones were Encouraging Upskilling & Re-entry (M32), Inclusive Corporate Culture (M29), and Flexible Career Paths (M30).

The prioritised policies share a common thread: they strive to create a supportive environment for women within the energy sector. The **Encouragement of Upskilling & Re-entry** (M32) initiative was hailed for its ability to swiftly integrate existing female workforce into new roles, especially vital in transitioning to sustainable energy practices. It was also acknowledged for enabling a more life-phase-oriented career development and, thus, better reconciliation of work and care responsibilities. This policy was further noted for its feasibility, as potential for seamless integration within and across existing company structures.

Similarly, the policy of **Encouraging Flexible Career Paths** (M30) found favour due to its role in empowering women to effectively balance their professional and family lives. By enabling women to pursue careers in the energy sector without compromising their family responsibilities, this policy actively promotes participation and inclusivity.

In the case of **Inclusive Corporate Culture** (M29), experts underlined the critical nature of institutional change. This measure not only acknowledges the intrinsic value of employees but also underscores the importance of fostering a workplace atmosphere that not only accepts but celebrates diversity. Transparency emerged as a key theme here, with suggestions pointing toward linking corporate culture inclusivity to public funding, making the efforts of organisations visible to the public eye.

While these policies might not directly address early gender awareness, they play a crucial role in reshaping the energy sector into an inclusive space for all genders and minority groups. These policies, akin to the educational measures, serve as vital bridges, connecting women with opportunities in the energy industry. Importantly, they acknowledge the value of existing talent, fostering an environment where everyone, regardless of gender, can thrive and make meaningful contributions – not being locked up in professional silos due to early-year study decisions or family time.

Strategic view of the measures

In the expert workshop, the experts reviewing policy-related measures focused on the time horizon of the measures to be implemented.

Short-Term Measures refer to the immediate strategies that are essential for the progress of gender equality within the energy sector. Experts have suggested initiating Campaigns Challenging Gender Stereotypes (M33). They were inspired by the influential "Scully Effect" (21CF et al., n.d.). Participants emphasised the importance of media collaborations in challenging gender roles and promoting rapid societal change.

Furthermore, experts emphasised the need for organisations to establish Flexible Career Paths (M30) that focus on revising parental leave policies and promoting a healthier work-life balance. This is crucial in addressing the challenges faced by female employees and making the workplace more inclusive and attractive for women in the short term.

The participants also recommended Facilitating Upskilling & Re-entry (M32) programmes for women entering or re-entering the workforce. These programmes focus not only on technical expertise but also on essential soft skills. This comprehensive approach bolsters inclusivity and ensures that women have the necessary tools for success.

Although not explicitly listed as a measure, experts emphasised the importance of collaboration and diverse perspectives. They recommended implementing multi-disciplinary research grants that encourage a wide range of fields and foster inclusivity as a short-term measure. Additionally, experts discussed the need for rapid reskilling initiatives, specifically targeting women in related sectors. These initiatives aim to bridge skill gaps, ensure quick, short-to-medium-term impact, and facilitate smoother transitions into the energy sector.

Mid-Term Measures are strategies implemented over a moderate timeframe. In this domain, experts underscored the pivotal role of Gender Quotas (M27). Acknowledged for their substantial impact, quotas take precedence despite the time required for contractual adjustments. They emerged as a fundamental strategy for achieving significant and lasting gender balance within the energy sector in the medium term.

Long-Term Measures are comprehensive strategies implemented over an extended period, aimed at fostering profound and enduring change. During the discussion, experts proposed that the energy sector should invest in long-term efforts to promote cultural change initiatives. These initiatives should focus on Encouraging an Inclusive Corporate Culture (M29) that fosters diversity. To achieve this, experts proposed a forward-thinking approach towards transparency in pay that links funding with positive reinforcement for gender equality plans. This shift from punitive measures to constructive encouragement would help create an environment that values equality.

Equality monitoring in the Equality Monitoring & Imposing Sanctions (M28) measure, grounded in data-driven insights and continuous evaluation, should operate without immediate sanctions as proposed by the experts. This would highlight the significance of a progressive, evolving framework that promotes enduring change. Integrating funding with gender equality contract requirements would ensure that gender equality plans are an integral part of the funding acquisition process, leading to long-lasting transformation within the energy sector.

Furthermore, although it is not currently included among the proposed measures, experts have also suggested the inclusion of new educational fields such as renewable energy, nature conservation, and climate change, starting from primary school through to universities. This is aimed at promoting a diverse education system and highlighting its vital role in facilitating the sustainable transformation of the energy sector over the long term.

Interconnections between the measures can either reinforce or hinder each other's effectiveness. Experts recognised that Gender Quotas (M27) were intrinsically linked to Equality Monitoring (M28) efforts, underscoring the need for data-driven decision-making. Additionally, Gender Quotas were linked to Campaigns Challenging Gender Stereotypes (M33) as these campaigns lay the societal groundwork necessary to make quotas more acceptable and necessary in the eyes of the public and stakeholders. Upskilling & Re-entry (M32) was seen as a practical pathway to achieve gender balance, empowering women with skills tailored to positions targeted by quotas.

Experts have suggested that the measures of Flexible Career Paths (M30) and Inclusive Corporate Culture (M29) are closely connected, highlighting the importance of flexible career paths in promoting inclusive work cultures. Encouraging flexible career options, especially in relation to parental leave, helps to promote inclusivity. It was deemed essential to continuously monitor equality (M28) to maintain an inclusive workplace.

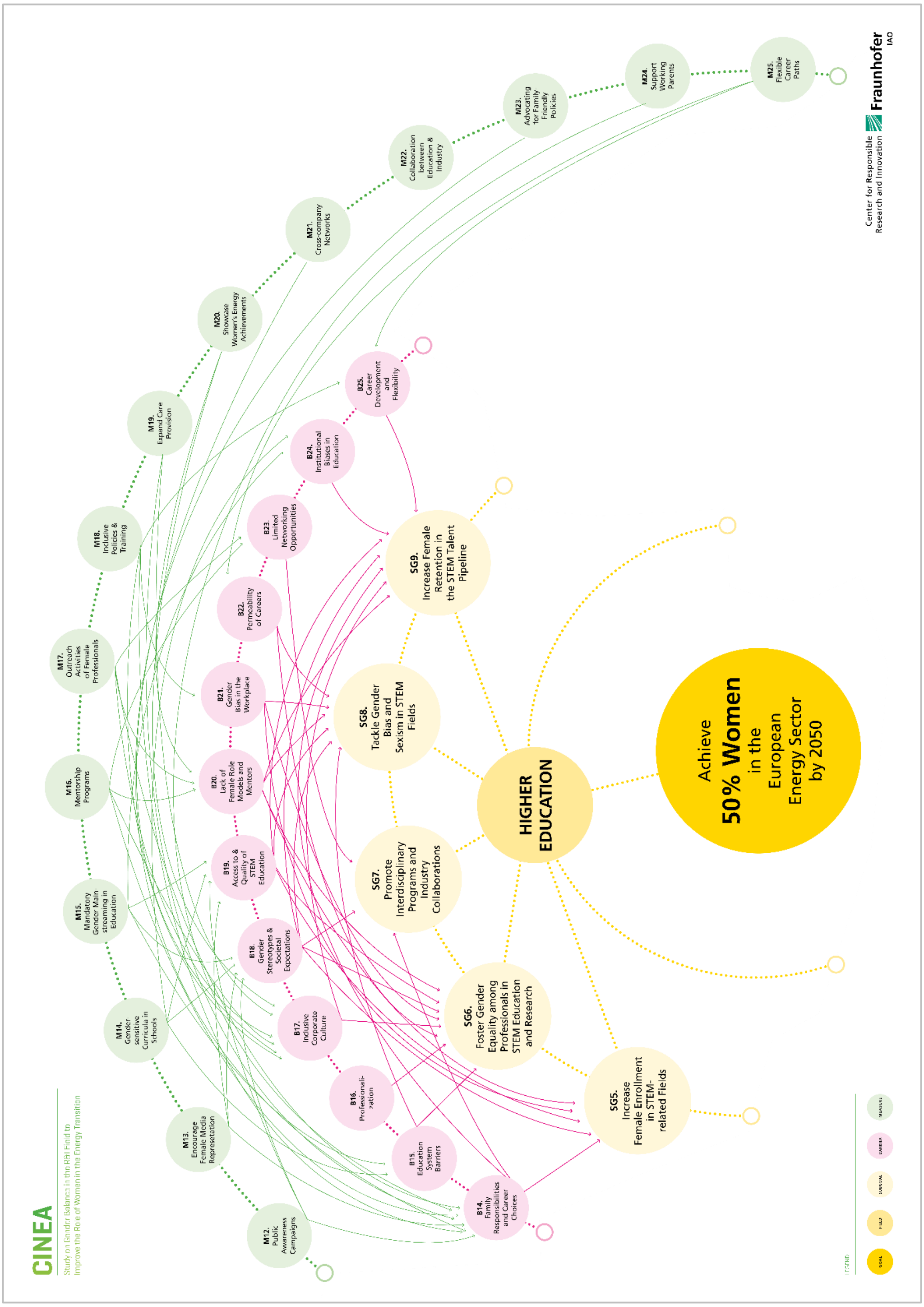
Experts also highlighted the need for societal mindset shifts to streamline processes for smaller enterprises. Strategic planning within budget constraints was underscored, with a focus on initiatives with the highest potential impact. The collective perspective emphasised the responsibility of educational institutions to amplify the visibility of women in STEM, cultivating social networks, ensuring gender-sensitive education, and nurturing inclusive work environments. These efforts collectively pave the way for achieving gender parity in the energy sector.

To summarise, to achieve gender parity in energy in 2050, policy actions should help:

- create an effective legal framework for realistic gender equality measures in the energy sector by binding regulations for a variety of corporations, taking into account the dependence on the number of female graduates in STEM fields (by applying so-called cascade models [EIGE, n.d.]);
- support women's advancement and ensure gender equality through political initiatives, such as upskilling and re-entry programmes, the promotion of inclusive corporate cultures and flexible career paths;
- challenge gender stereotypes through media campaigns and advocating for family-friendly policies; and
- show commitment from political leaders towards the target of parity in the energy sector by 2050.

12.4.4 What Higher Education can contribute

Exhibit 199: Higher Education graph "Targets, barriers and measures to achieve parity in energy sector"



Source: Own visualization (Fraunhofer CeRRI)

The role of Higher Education

The skilled workers in the energy industry are initially trained in the general education system. To achieve our political goal of increasing the share of women in the energy industry, a comprehensive consensus must be reached with the representatives of the education system to ensure the necessary preconditions for this (first and foremost, to achieve sufficient qualification of a satisfactory number of female professionals). As a direct precursor to a possible career entry into the energy sector, the educational institutions of academic and vocational training are particularly challenged in this regard.

Educational silos are harmful: the earlier the education system forces a person to follow a certain profile (e.g., STEM or linguistic), the more likely this decision is influenced by social stereotypes. The goal of coordination between the energy industry and higher education should be to enable a high degree of permeability of educational and professional careers. This allows women without a distinct STEM profile to pursue a career in the energy industry in later phases of their education.

Prioritisation of measures

From the toolbox created for Higher Education to promote gender equality in the energy sector, the consulted experts prioritised three measures in particular: Mentorship programmes (M16), Collaboration between Education & Industry (M22), and Gender-sensitive Curricula in Schools (M14).

The three prioritised measures have in common improvements in connecting girls and women with STEM disciplines and energy companies. For the **mentorship programmes** and **collaborations between education and industry**, the experts emphasised the high importance of effective social networks designed according to current findings of diversity research (see Dobbin & Kaleev, 2022) as a bridge between studies and career entry in the energy sector. Ideally, personal contact between female students and successful STEM professionals could help ignite women's interest in working in the energy sector whilst pursuing their studies.

On the other hand, the schools that precede vocational and academic education are also of great strategic importance for the goal of parity. The **gender-sensitive design of STEM subjects**, STEM studies or STEM-related training should and can increase women's tendentially lower interest in STEM and, in the long term, also their interest in professions in the energy sector.

Strategic view of the measures

The consulted experts sorted the measures for the Higher Education toolbox into four thematic clusters, to which they attributed medium to high impact potential. The clusters were linked to whether a possible impact can be expected in the short term or only in the long term.

Visibility measures encompass public awareness campaigns (M12), promotion of women's presence in the media (M13), outreach activities by female professionals (M17), and presentation of women's energy achievements (M20). In essence, all of these measures aim to present STEM fields to a wider or more targeted audience as a field of work in which women can be successful and are already active today. The aim here is to influence girls (their parents and teachers!) in the career orientation phase to make a decision that tends to be less gender-stereotyped towards taking up an apprenticeship in the STEM field or for a career in the energy sector. The package of measures has been attributed a short-term effectiveness, as the possible effects of the corresponding measures tend to be evaluable directly after their implementation.

Reconciliation advocacy includes Advocating for Family-Friendly Policies (M23), Support Working Parents (M24), and Flexible Career Paths (M25). This refers to the role of higher education institutions as advocates for a gender-equitable and inclusive work culture in companies in the energy sector. In the view of the consulted experts, such a role does not belong to the primary responsibility of educational institutions. Nevertheless, it must be mentioned as part of a comprehensive toolbox: if educational institutions participate in collaborations with companies in the energy sector, they can work towards a more inclusive work culture within their framework. The Higher Education expert group perceived the package of measures to have short to medium-term impact potential.

Collaboration measures are Mentorship Programmes (M16), Cross-University Networks (M21), and general formats of Collaboration between Education and Industry (M22). The goal of the mentorship programmes and the intersectoral collaborations, which were particularly prioritised by the expert panel, is to establish social contacts between STEM students and professionals in the energy sector, ultimately influencing the students' choice of employer. Cross-university networks, on the other hand, aim to transfer knowledge on good practice between educational institutions. The experts considered this package of measures to be effective in the medium term, as the returns from cooperation are usually more indirect.

Cultural change measures were considered by the expert group to be particularly effective in the long term against the background of sustainable implementation. The strategy package includes Gender-Sensitive Curricula in Schools (M14), Mandatory Gender Mainstreaming in Education (M15), and Inclusive Policies and Training (M18). The measures aim to improve the study climate for female students. Especially in fields of study where women are traditionally in a minority position, a climate perceived as hostile and sexist can negatively influence the choice of profession in the same field. Another goal of this package of measures is to make the traditionally male-dominated content of STEM fields more accessible to girls and women.

In summary, within the framework of the goal "Parity in Energy in 2050", the responsibility of the higher education system is:

- to make the work of women in STEM fields even more visible;
- to promote the social network of its female students to potential employers;
- to make its own STEM education more gender-sensitive and inclusive, and thus more connectable and attractive for women and other potentially marginalised groups of people; and
- to also work towards a gender-sensitive inclusive work culture vis-à-vis business partners.

12.5 How to achieve parity in the energy sector by 2050

As a result of the study conducted on the likelihood, framework conditions, and strategic steering options towards parity in 2050 in the energy sector, we identified a series of recommendations for action and illustrated them with examples of good practice. The recommendations for action link central goals with measures that appear to be effective and can thus form the basis for an intersectoral strategy roadmap of business, policy, and higher education.

- **Overcoming Structural Barriers:** To ensure the professional development of women in the energy sector, companies should implement **comprehensive mentoring programmes** integrated into reward systems. These programmes establish strong mentor-mentee relationships, offering guidance and support. An analysis of a 5-year period of mentoring experience at Sun Microsystems has shown that mentoring returns good value for the time and money it takes. The ROI on mentoring can be 1,000% or better and grows as the programme matures. The caveat is that “strong and visible long-term executive sponsorship and funding are needed for mentoring to thrive and become part of an organizational culture” (Dickinson et al., 2009, p. 64).

- **Promoting Inclusive Corporate Culture:** Fostering an inclusive corporate culture that celebrates diversity can be achieved by ensuring that organisational processes and practices are transparent, and by linking the organisation’s corporate mission and operations with public interests and needs, e.g., societal responsibility and sustainability. Transparency in how corporate decisions are made, backed by public interest, enhances the visibility of the organisational diversity efforts, challenging stereotypes and promoting more considerate and accepting of difference attitudes in society. A 2019 McKinsey analysis found that companies in the top quartile of gender diversity on executive teams were 25 percent more likely to experience above-average profitability than peer companies in the fourth quartile. This was up from 21 percent in 2017 and 15 percent in 2014 (Hunt et al., 2020).

- **Facilitating Work-Life Balance and Non-Linear Career Pathways:** Introducing flexible work models, especially regarding parental leave, is crucial. These models enable **an inclusive work environment and support for working parents. This especially allows women to balance professional and family responsibilities effectively and encourages people with substantial care responsibility not just to fulfil a job, but to pursue a career**. Furthermore, upskilling and reentry should be promoted: the younger men and women are forced to take a certain career path, the more gender-stereotyped this decision will tend to be. Professional silo careers from school STEM profile, via STEM studies into STEM professions, should be broken down. A 2023 survey of employees in the UK has found that “six per cent of employees say they have left a job in the last year specifically due to a lack of flexible working, and 12% have changed their careers/profession due to a lack of flexible working options within the sector. This represents almost 2 million and 4 million workers respectively“(CIPD, 2023, p. 18).

- **Counteracting a Competitive Culture:** According to a Goldin (2021), there are two main issues with career paths that make them challenging for women: insufficient flexibility due to demanding schedules and a strong emphasis on competition. The second factor, among others, also explains why a large number of women (78.6%, see table 1) choose to work in the health and social sector. While this sector may have drawbacks such as shift work and limited flexibility, it offers less competition. On the contrary, in engineering, which typically offers flexible working hours and a high level of independence and therefore has a low gender pay gap, it is crucial to ensure that excessive competition does not undermine these positive aspects.

- **Fostering Interest in STEM Careers:** Educational institutions and the employing organisations in the energy industry should c**ollaborate on mentorship programmes**. Personal interactions between female students and energy sector professionals during their studies can spark interest in STEM and energy careers. By overcoming social stereotypes, these interactions encourage a more diverse group of students to explore and pursue careers in male-dominated STEM fields. Since 2016, the Enel Group has been promoting numerous initiatives for girls in middle and secondary schools and has engaged more than 20,000 female students worldwide in open and innovative educational initiatives that have involved many Enel staff members as testimonials and role models (Enel Group, 2022).

- **Creating Gender-Sensitive Study Environments:** Schools and universities should integrate gender-sensitive curricula into STEM education. These curricula require validation that gEneSys can provide to help make male-dominated fields more accessible to girls and women exploring careers in energy. A 'gender-inclusive' curriculum is one that has been consciously designed to recognise and acknowledge the evidence that males and females are likely to bring different cultural experiences to their learning experience. In an applied area such as engineering, this would include students' experiences of the applications of engineering in daily life, which may vary according to gender, race, culture, and class (Mills et al., 2010).

- **Increasing the Attractiveness of Higher Technical Degree Programmes** can be achieved by making the social effects of technical degree programmes more visible and critically reflecting on them during students' studies or by designing them in a more interdisciplinary way. By creating an inclusive educational framework, educational institutions empower women to pursue STEM careers, ensuring a diverse talent pool in the energy sector. Research advises that "for an equitable sustainable education in the areas of energy and sustainable society, science and technology knowledge should be acquired in conjunction with humanities and arts, through a multidisciplinary approach that infuses technical training with social sciences, arts, ethics, and business" (Skowronek et al., 2022, p. 1).

- **Increasing the Visibility of Non-Engineering Jobs in Energy:** While achieving gender parity in technical professions is a commendable goal, it is currently unrealistic due to the influence of women's personal preferences. Dislikes and preferences for a profession are often formed in childhood and can be difficult to change later in life. In almost all OECD countries boys are more likely pursue a career in science and engineering than girls.[366] Furthermore, a study demonstrated that brief information on the costs of studying and the potential salaries by field of study had a greater impact on male participants, leading them to choose more technical fields with higher earnings prospects (Peter et al., 2023). Women, on the other hand, were less likely to choose little-paid social subjects, but often went into other non-technical fields instead. Once women have made a decision against entering the technical field, it becomes challenging to alter their choices. Therefore, it is important to advertise and promote non-engineering positions in the energy sector, which still require a high level of qualification, in order to increase their visibility and attract more women.

- **Challenging Gender Stereotypes:** Media and society should conduct awareness campaigns challenging gender stereotypes. These campaigns play a pivotal role in influencing public perception. By challenging existing norms, these initiatives create a societal environment where gender equality is not only accepted but actively promoted. This, in turn, motivates girls and women to consider and pursue STEM and energy-related careers. Researchers found that, when implemented correctly, entertainment-education

[366] OECD (2018) 'PISA 2018 Results Where all Students Can Succeed. Volume II'.

outreach was an extremely effective and cost-efficient method of changing individual attitudes, behaviours, and beliefs (Singhal & Rogers, 2012). This phenomenon creates an opportunity for media and society to make a positive difference in the overall composition of STEM top talent.

Exhibit 200: Share of women in EU27 different fields of work (2022)

Field of work	Share of women (EU27)
Human health and social work	78.6%
Education	72.7%
Financial and insurance activities	52.6%
Energy[367]	24.5%
Construction	10.4%

Source: Own calculations, based on Eurostat dataset.[368]

It is difficult to identify all the factors behind the proportion of women in the individual occupational fields listed in Exhibit 200, as each profession has very individual and dynamic characteristics. The macro differences can perhaps best be explained by the gender image associated with each occupation. This image encompasses various factors, including compatibility with personal life and competitiveness (Goldin, 2021). To encourage more women to pursue careers in traditionally male-dominated fields, it is crucial to soften and de-stereotyped their gender images.

367 The energy sector is defined as comprising the following NACE codes: B05 (Mining of coal and lignite), B06 (Extraction of crude petroleum and natural gas), C19 (Manufacture of coke and refined petroleum products), D35 (Electricity, gas, steam and air conditioning supply).

368 See Eurostat dataset "Employment by sec, age and economic activity (from 2008 onwards, NACE Rev. 2) - 1000". (online data code: lfsq_egan2).

12.6 Country-specific indicators

Country	Share of women in energy (2022)[369]	Compound annual growth rate of share of women in energy (2013-2022)[370]	Share of women among graduates with tertiary education in 2021 (Growth since 2013 in percentage points)[371]	Compound Annual Growth Rate in female Bachelor's graduates in engineering (2010-2020)[372]	Proportion of children under 3 years cared only by their parents in 2022 (Growth since 2014 in percentage points)[373]	Share of employment in the heat pump sector in the total energy sector (2021)[374]	Implicit gender-math stereotype (GMS)[375]
EU27							
France	32.2%	2.3%	55.8% (-0.3)	1.8%	39.0% (-2.2)	11.3%	0.281

369 Own calculations based on Eurostat dataset "Employment by sec, age and economic activity (from 2008 onwards, NACE Rev. 2) - 1000". (online data code: lfsq_egan2).; The energy sector is defined as comprising the following NACE codes: B05 (Mining of coal and lignite), B06 (Extraction of crude petroleum and natural gas), C19 (Manufacture of coke and refined petroleum products), D35 (Electricity, gas, steam and air conditioning supply).

370 Own calculations based on Eurostat dataset "Employment by sec, age and economic activity (from 2008 onwards, NACE Rev. 2) - 1000". (online data code: lfsq_egan2).; The energy sector is defined as comprising the following NACE codes: B05 (Mining of coal and lignite), B06 (Extraction of crude petroleum and natural gas), C19 (Manufacture of coke and refined petroleum products), D35 (Electricity, gas, steam and air conditioning supply); percentages marked with a * should be interpreted with caution as their variances are high.

371 Own calculations based on Eurostat dataset "Graduates by education level, programme orientation, sex and field of education" (online data code: educ_uoe_grad02) and on the OECD dataset "Graduates by field".

372 Own calculations based on Eurostat dataset "Graduates by education level, programme orientation, sex and field of education" (online data code: educ_uoe_grad02) and on the OECD dataset "Graduates by field".

373 Own calculations based on Eurostat dataset "Children cared only by their parents by age group - % over the population of each age group – EU-SILC survey" (online data code: ilc_caparents).

374 Own calculations based on the 21st annual overview barometer from EurObserv'ER: https://www.eurobserv-er.org/21st-annual-overview-barometer/; For interpreting this indicator, it is important to know, that the share of women is usually lower in the heat pumps sector than the average in the energy sector.

375 See Table 2 in Breda et al. (2020); the higher the GMS, the higher the gender gap in the the agreement to the math-related statements „Doing well in math is completely up to me“ and „My parents believe that math is important for my career“.

Country	Share of women in energy (2022)[369]	Compound annual growth rate of share of women in energy (2013-2022)[370]	Share of women among graduates with tertiary education in 2021 (Growth since 2013 in percentage points)[371]	Compound Annual Growth Rate in female Bachelor's graduates in engineering (2010-2020)[372]	Proportion of children under 3 years cared only by their parents in 2022 (Growth since 2014 in percentage points)[373]	Share of employment in the heat pump sector in the total energy sector (2021)[374]	Implicit gender-math stereotype (GMS)[375]
Spain	31.7%	4.6%	56.5% (0.7)	5.8%	37.3% (-11.8)	8.3%	0.149
Portugal	31.3%	n.a.	58.5% (-0.8)	3.0%	27.8% (0.4)	3.4%	0.01
Belgium	28.1%	3.8%*	59.6% (0.5)	10.3%	35.1% (-3.9)	1.0%	0.346
Sweden	28.1%	1.3%	61.6% (-0.1)	7.2%	40.9% (-1.0)	4.4%	0.244
Latvia	28.0%	2.2%*	64.9% (-4.1)	-5.5%	59.6% (-10.0)	1.5%	0.17
Finland	27.8%	0.1%	60.7% (0.5)	0.3%	53.9% (-9.2)	2.4%	0.217
Ireland	27.6%	n.a.	55.3% (1.6)	22.7%	64.6% (16.9)	0.4%	0.218
Germany	26.8%	1.3%	51.1% (0.4)	3.2%	69.2% (7.5)	17.2%	0.411
Italy	26.5%	3.2%	57.7% (-1.8)	24.9%	43.4% (-7.0)	13.8%	0.186
Slovakia	26.4%	9.5%*	61.4% (-2.2)	-14.5%	74.0% (6.0)	1.0%	0.257
Hungary	26.4%	2.4%	59.3% (-4.6)	7.4%	58.8% (-8.9)	2.4%	0.38
Denmark	26.3%	0.5%	56.2% (-1.3)	6.6%	21% (-9.4)	3.7%	0.291
Netherlands	24.0%	3.0%*	56.1% (-0.8)	9.9%	16.2% (-7.0)	5.3%	0.357

Country	Share of women in energy (2022)[369]	Compound annual growth rate of share of women in energy (2013-2022)[370]	Share of women among graduates with tertiary education in 2021 (Growth since 2013 in percentage points)[371]	Compound Annual Growth Rate in female Bachelor's graduates in engineering (2010-2020)[372]	Proportion of children under 3 years cared only by their parents in 2022 (Growth since 2014 in percentage points)[373]	Share of employment in the heat pump sector in the total energy sector (2021)[374]	Implicit gender-math stereotype (GMS)[375]
Lithuania	23.8%	-0.6%	61.6% (-1.7)	-5.2%	65.8% (6.8)	1.6%	0.189
Estonia	23.6%	3.3%*	62.0% (-3.4)	-4.3%	52.9% (-6.6)	1.0%	0.172
Greece	22.3%	2.1%	59.2% (0.4)	0.2%	39.2% (2.6)	1.8%	0.18
Austria	21.9%	4.9%	55.3% (-0.6)	7.5%	51.4% (-5.2)	3.6%	0.365
Bulgaria	20.8%	-1.4%	61.4% (0.7)	-9.0%	71.7% (-1.5)	1.4%	0.103
Cyprus	20.0%	n.a.	64.0% (2.9)	0.4%	25.3% (-6.5)	0.1%	n.a.
Croatia	18.7%	-2.2%*	60.9% (2.1)	13.2%	52.7% (-12.8)	0.9%	0.241
Czech Republic	17.9%	0.6%	60.5% (-1.3)	1.0%	65.4% (5.0)	2.0%	0.328
Romania	17.7%	1.5%	59.3% (-0.4)	-4.0%	55.6% (1.5)	2.2%	0.016
Poland	17.6%	-0.2%	64.9% (-1.5)	0.7%	52.2% (-8.1)	8.7%	0.149
Slovenia	15.5%	0.0%	60.3% (-1.2)	17.3%	33.3% (-5.4)	0.3%	0.165
Luxembourg	10.6%	n.a.	53.8% (0.0)	25.9%	41.1% (6.0)	0.1%	0.234

Country	Share of women in energy (2022)[369]	Compound annual growth rate of share of women in energy (2013-2022)[370]	Share of women among graduates with tertiary education in 2021 (Growth since 2013 in percentage points)[371]	Compound Annual Growth Rate in female Bachelor's graduates in engineering (2010-2020)[372]	Proportion of children under 3 years cared only by their parents in 2022 (Growth since 2014 in percentage points)[373]	Share of employment in the heat pump sector in the total energy sector (2021)[374]	Implicit gender-math stereotype (GMS)[375]
Malta	n.a.	n.a.	59.7% (4.0)	-0.4%	32% (-28.6)	0.3%	n.a.
Non-EU Countries							
Australia	n.a.	n.a.	56.9% (-0.7)	3.3%	n.a.	n.a.	0.278
Canada	n.a.	n.a.	56.5% (-2.1)	4.8%	n.a.	n.a.	0.148
Switzerland	21.0%	2.2%	49.6% (1.4)	8.8%	n.a.	n.a.	0.4
Iceland	26.0%	n.a.	68.0% (3.5)	-0.4%	n.a.	n.a.	0.133
Norway	23.5%	-7.7%	56.9% (-1.8)	0.4%	43.6% (3.0)	n.a.	0.172
Türkiye	8.7%	n.a.	52.5% (5.4)	22.5%	n.a.	n.a.	-0.015
UK	n.a.	n.a.	58.6% (1.5)	4.6%	n.a.	n.a.	0.206
USA	22.7%	n.a.	60.1% (1.6)	9.2%	n.a.	n.a.	0.082

12.7 Overview: Definitions of barriers and measures

12.7.1 Application field: Business

Business structural barriers

NR	Barrier	Barrier Explanation
B1	**Lack of Role Models**	The energy sector has historically been male-dominated, resulting in a lack of female role models in leadership positions. This can make it difficult for women to envision themselves in these roles and may discourage them from pursuing leadership opportunities.
B2	**Gender Pay Gap**	The gender pay gap persists in the energy sector, with women earning less than their male counterparts. This can contribute to a perception that women's work is less valuable and may discourage women from pursuing leadership positions.
B3	**Limited Networking Opportunities**	Networking is crucial for career advancement, but women may have fewer opportunities to build professional relationships due to gender segregation in the energy sector. This can result in women being excluded from informal networks and decision-making processes, which can impact their career progression.
B4	**Lack of Mentoring and Sponsorship**	Women may have limited access to mentors and sponsors who can provide guidance, support, and advocacy for their career advancement. This can hinder their professional growth and limit their opportunities for leadership roles.
B5	**Problems in Reconciling Private and Work Life**	Women often face a disproportionate burden of caregiving and household responsibilities, making it difficult to balance work and personal life. Consequently, they may opt for less demanding roles or exit the workforce, restricting their career advancement opportunities. Many companies lack gender equality-promoting policies, including flexible work arrangements, parental leave, and gender-neutral recruitment, further hindering women's career progression.
B6	**Corporate Culture**	A company's corporate culture can significantly impact the exclusion of women. A culture that perpetuates gender stereotypes, tolerates discriminatory behaviour, or lacks diversity and inclusion initiatives can create an unwelcoming environment for women, discouraging them from pursuing careers in the energy sector.
B7	**Permeability of Careers**	The permeability of careers within companies is a crucial factor in promoting gender diversity. Companies that require a broader range of professional degrees have the potential to draw from a larger pool of female professionals, considering the underrepresentation of women in STEM fields compared to the humanities. Additionally, the permeability of development opportunities within organisations is important. The negative effects of rigidly separated career paths in areas such as research and development, production, sales, and administration can hinder women's advancement. By creating more flexible and interconnected career paths, organisations can facilitate the upward mobility and growth of female professionals, enhancing gender diversity within the workforce.
B8	**Skill Barriers**	Women's representation among graduates in post-secondary non-tertiary and tertiary education is relatively low in STEM-related fields of study, particularly in Information & Communication, Technologies & Engineering, and Manufacturing & Construction. The typical differences in skills and interests between men and women often emerge in the early stages of

		education. There is a close connection between the development of cognitive abilities, personal motivations, and socialisation processes.
B9	**Intersecting Inequalities**	The combination of several identity features can compound gender inequality in the energy sector. Women from marginalised groups may face additional barriers to accessing opportunities and advancing in the industry, such as discrimination or lack of access to education and training. This can limit the diversity of perspectives and experiences in the energy sector, perpetuating gender inequality in the industry.
B10	**HR Innovations**	Energy companies operate within a complex network of stakeholders and must consider the needs of customers, suppliers, investors/shareholders, membership organisations, banks, NGOs, local authorities and communities, and their employees. This complex web enables diverse job profiles that can go beyond a classic STEM profile. HR departments must recognise these opportunities for innovation and the associated opportunities for gender equality and create appropriate job descriptions and competency profiles.
B11	**Gender Stereotypes in the Workplace**	Women often face gender stereotypes and unconscious bias in the workplace, which can hinder their career progression. These biases can manifest in various ways, such as being overlooked for promotions, receiving less challenging assignments, or being perceived as less competent than their male counterparts.
B12	**Gender Bias in Recruitment**	Gender bias in recruitment processes can limit women's access to opportunities in the energy sector. Implementing gender-balanced selection panels and bias-free recruitment processes can help address this barrier.
B13	**Stakeholder Coordination & Collaboration**	Limited coordination and collaboration between stakeholders, such as energy companies, academia, and research institutions, can hinder the implementation of gender-fair organisational structures. Facilitating knowledge-sharing and best practices exchange among these stakeholders can help overcome this barrier.

Business measures

NR	Measure	Measure explanation
M1	**Professional Development, Mentoring and Support**	Mentoring, sponsorship, and career development programmes are vital in aiding women to reach their career aspirations. These initiatives provide access to networks, resources, and experienced leadership guidance, enhancing skills, confidence, and preparation for leadership roles. Training, coaching, and mentoring further equip women for success and advancement.
M2	**Leadership Accountability**	Leaders should be held accountable for promoting gender equality in their organisations. They should ensure that women are represented in all areas of the organisation and that they have the same opportunities and resources as men. Leaders should also ensure that women are included in decision-making processes and that their voices are heard.
M3	**Gender Equality through Inclusive Policies**	Inclusive policies and gender-neutral recruitment practices promote women's representation and equal opportunities in both organisations and the energy sector. This includes flexible work arrangements, anti-discrimination policies, gender-neutral job ads, application procedures, and hiring decisions.

M4	**Flexible Work Arrangements**	Flexible work arrangements like part-time, job sharing, and telecommuting enable women to balance careers and family without neglecting responsibilities. Job sharing, particularly in management roles, enhances skills, confidence, and leadership readiness for women.
M5	**Women's Empowerment through Collaboration**	Women-centric networking events foster connections, resource-sharing, and skill enhancement. These events boost women's confidence and leadership qualification. Cross-company collaboration promotes women's representation and equal opportunities in the energy sector through mentoring, sponsorship programmes, and joint gender equality initiatives.
M6	**Gender Equality Awareness Training**	Training measures to raise awareness about gender equality can help leaders and employees become aware of the importance of gender equality and learn how they can contribute to creating an inclusive and fair work environment.
M7	**Monitoring of Gender Equality based on Indicators**	Monitoring gender equality based on indicators can help companies and organisations measure and evaluate their progress in promoting gender equality. This includes indicators such as the percentage of women in leadership positions, the percentage of women in technical professions, and the gender pay gap.
M8	**Analysis of Gender Pay Gaps**	Analysing gender pay gaps can help companies and organisations identify wage differences between women and men and take action to reduce these differences.
M9	**Cooperation with Education System**	Cooperation with education system stakeholders can help attract more girls and women to the energy sector. Companies can, for example, visit schools and universities to inform girls and women about career opportunities in the energy sector and encourage them to be interested in technical professions.
M10	**Self-Imposed Women's Quotas in Leadership**	Self-imposed quotas for the share of women in decision-making bodies can help ensure that women are represented in all areas of the organisation and that they have the same opportunities and resources as men. These quotas can help ensure that women are included in decision-making processes and that their voices are heard.
M11	**Establishing a Gender Equality Position**	The establishment of a position with responsibility for gender equality can help companies and organisations coordinate and monitor their efforts to promote gender equality. This position can help make gender equality an important issue in the organisation and take action to promote gender equality.

12.7.2 Application field: Higher Education

Higher Education structural barriers

NR	Barrier	Barrier Explanation
B14	**Family Responsibilities and Career Choices**	The availability and social acceptance of care facilities, along with supportive policies like parental leave and flexible work arrangements, play a pivotal role in shaping women's career choices. To address the gender gap, it's crucial to advocate for policies that promote work-life balance and equalise care responsibilities between genders. Women often shoulder the majority of care work, hindering their access to full-time employment and career growth. To mitigate this challenge, expanding care services for both children and the elderly, and encouraging equitable sharing of care responsibilities between men and women, is essential.

B15	**Education System Barriers**	Systematic barriers and biases in education systems can deter girls from pursuing STEM education. More open education systems that allow students to decide their specialisation later can increase the appeal of STEM fields to a broader range of students, including girls. Implementing mandatory gender mainstreaming in educational institutions is also crucial to promote equal opportunities for all genders and ensure inclusive educational environments.
B16	**Professionalisation**	The efforts an organisation makes, or can make, to recruit women and the resources available are crucial factors in promoting gender diversity. This includes the level of professionalism within the organisation, which is measured by the efforts and resources invested in the HR area to promote gender equality. Offering opportunities for upskilling, recognising transferrable skills from degrees not directly related, and facilitating re-entry into the workforce through skill development programmes can greatly contribute to increasing gender diversity.
B17	**Inclusive Corporate Culture**	To retain women in STEM careers, addressing the marginalising work culture and lack of support is essential. Organisations must prioritise fostering an inclusive corporate culture that values diversity and provides equal opportunities for all employees, regardless of gender. By doing so, they can create a supportive work environment where women feel included and empowered, ultimately promoting greater gender diversity and equality within the company.
B18	**Gender Stereotypes and Societal Expectations**	Societal norms and gender stereotypes discourage women from pursuing STEM careers, hindering inclusivity. Similarly, expectations around traditional gender roles contribute to labor market gender disparities. Addressing these issues, promoting an inclusive image of STEM, and challenging gender stereotypes are essential steps to attract and retain more women in these fields and create a more equitable labor market.
B19	**Access to and Quality of STEM Education**	Although girls generally have access to STEM education, there are systematic barriers and biases that can deter them from pursuing it. Encouraging more open education systems that allow students to decide their specialisation later can increase the appeal of STEM fields to a broader range of students, including girls.
B20	**Lack of Female Role Models and Mentors**	The underrepresentation of women in STEM fields can lead to a lack of role models and mentors for young women considering careers in these areas. Increasing the visibility of successful women in STEM and providing mentorship opportunities can help inspire and support more women to enter and persist in these fields.
B21	**Gender Bias in the Workplace**	Women in STEM fields often face gender bias, which can result in higher turnover intention and discourage them from pursuing careers in the energy sector. Addressing gender bias through inclusive policies, training, and awareness-raising initiatives can help create a more supportive work environment for women.
B22	**Permeability of Careers**	The permeability of careers within companies is a crucial factor in promoting gender diversity. Companies that require a broader range of professional degrees have the potential to draw from a larger pool of female professionals, considering the underrepresentation of women in STEM fields compared to the humanities. By creating more flexible and interconnected career paths, organisations can facilitate the upward mobility and growth of female professionals, enhancing gender diversity within the workforce.
B23	**Limited Networking Opportunities**	This barrier can arise from factors such as a lack of access to industry events, conferences, mentorship programs, or networking platforms that predominantly cater to men. As a result, women may have fewer

		opportunities to establish relationships, seek career advice, or access valuable resources that can help them progress in their careers.
B24	**Institutional Biases in Education**	Systematic barriers and biases in education systems can deter girls from pursuing STEM education. More open education systems that allow students to decide their specialisation later and implementing mandatory gender mainstreaming in educational institutions can promote equal opportunities for all genders and ensure inclusive educational environments.
B25	**Career Development and Flexibility**	Rigidly separated career paths and limited development opportunities within organisations can hinder women's advancement in STEM fields. Creating more flexible and interconnected career paths and offering opportunities for upskilling and re-entry into the workforce can facilitate the growth and retention of female professionals in STEM.

Higher Education measures

NR	Measure	Measure explanation
M12	**Public Awareness Campaigns**	Implement public awareness campaigns to challenge gender stereotypes and promote a more inclusive image of STEM fields.
M13	**Encourage Female Media Representation**	Encourage media representation of women in STEM roles to normalise their presence in these fields.
M14	**Gender-Sensitive Curricula in Schools**	Introduce gender-sensitive curricula in schools to foster an early interest in STEM subjects among girls.
M15	**Mandatory Gender Mainstreaming in Education**	Implement mandatory gender mainstreaming in educational institutions to promote equal opportunities for all genders and ensure inclusive educational environments.
M16	**Mentorship Programmes**	Establish mentorship programmes that connect female students with women working in STEM fields.
M17	**Outreach Activities of Female Professionals**	Encourage female STEM professionals to engage in outreach activities, such as school visits and career fairs, to inspire young girls.
M18	**Inclusive Policies and Training**	Implement inclusive policies, training, and awareness-raising initiatives to address gender bias and create a more supportive work environment for women.
M19	**Expand Care Provision**	Expand care provision for children and elderly, making it easier for women to balance work and family responsibilities.
M20	**Showcase Women's Energy Achievements**	Encourage energy companies to showcase diverse role models and success stories, highlighting the achievements of women in various roles within the sector.
M21	**Cross-University Networks**	Establish cross-university networks to facilitate mutual learning of higher education institutions about the promotion of women STEM talent and successful cooperation formats with industry.
M22	**Collaboration between Education and Industry**	Foster collaborations between educational institutions and the energy industry, creating opportunities for internships, research projects, and job placements.

M23	**Advocating for Family-Friendly Policies**	Advocate for policies supporting parental leave and flexible working arrangements in the energy sector, promote a culture of work-life balance within the energy industry, and emphasising the importance of mental health and well-being.
M24	**Support Working Parents**	Encourage energy companies to provide on-site childcare facilities or subsidies for childcare services.
M25	**Flexible Career Paths**	Encourage energy companies to create more flexible and interconnected career paths, allowing for upward mobility and growth of female professionals.

12.7.3 Application field: Policy

Policy structural barriers

NR	Barrier	Barrier Explanation
B26	**Lack of Career Advancement Support**	Limited mentorship and sponsorship opportunities for women in the energy sector can impede career growth and networking prospects. The absence of adequate support for career advancement further restricts opportunities for skill development and networking, perpetuating gender inequality within the industry. Overcoming these barriers is crucial for achieving a more balanced and equal professional landscape.
B27	**Insufficient Support for Parents**	Inadequate childcare facilities, services, and insufficient parental leave policies present challenges for women in balancing work and family responsibilities. These issues can elevate turnover rates and perpetuate gender inequality within the industry. Women often find themselves at a crossroads, having to choose between their careers and family duties. Addressing these challenges is vital for fostering a more equitable and supportive work environment.
B28	**Early Specialisation in Education Systems**	Early specialisation in education systems can limit the ability of women to explore different fields and career paths, potentially leading to a lack of diversity in the energy sector. Women may be discouraged from pursuing careers in the energy sector if they are not exposed to the field early on in their education or if they are encouraged to specialise in other areas.
B29	**Access to and Quality of STEM Education**	Limited access to and poor quality of STEM education can limit the ability of women to develop the skills necessary to work in the energy sector. This can perpetuate gender inequality in the industry, as women may not have the same opportunities to develop the skills and knowledge necessary to succeed in STEM fields.
B30	**Intersectionality Exacerbates Gender Inequality**	Gender stereotypes and societal expectations can hinder women from entering specific career paths within the energy sector, fostering gender inequality. Women may shy away from traditionally male-dominated roles, like engineering or operations, due to societal norms and stereotypes. Moreover, intersectional inequalities tied to race, ethnicity, and socioeconomic status compound gender disparities in the energy field. Marginalised women encounter additional barriers like discrimination and limited access to education and training, further constraining diversity and perpetuating gender inequality in the industry.
B31	**Women Underrepresentation in STEM**	Women are underrepresented in STEM fields, which limits their ability to work and thrive in these areas. This can perpetuate gender inequality in the energy sector, as STEM fields are critical to the development and implementation of new technologies and innovations in the industry. The

		lack of diversity in STEM fields can also lead to a lack of diversity in the energy sector as a whole, limiting the perspectives and experiences that are brought to the table.
B32	**Permeability of Careers**	Rigidly separated career paths in areas such as research and development, production, sales, and administration can hinder women's advancement. By creating more flexible and interconnected career paths, organisations can facilitate the upward mobility and growth of female professionals.
B33	**Corporate Culture**	The corporate culture of a company can have a significant impact on the exclusion of women. If women are a minority in a company, they are more likely to experience a marginalising work culture.
B34	**Limited Coordination & Collaboration**	Inadequate collaboration and knowledge-sharing among energy companies, academia, and research institutions can hinder the development and implementation of effective gender equality policies and practices.
B35	**Lack of Gender-Responsive Procurement**	The absence of procurement policies that prioritise gender diversity in EU-funded projects can limit the opportunities for women-owned businesses and female professionals in the energy sector.
B36	**Failing to Enforce Equal Treatment**	Weak enforcement mechanisms for gender equality laws can result in inadequate progress towards gender balance in the energy sector.
B37	**Limited Flexible Work Arrangements**	Inflexible work options and rigid schedules pose challenges for women in managing both their professional roles and personal responsibilities. This struggle can result in higher turnover rates, perpetuating gender inequality. Women are often compelled to choose between their careers and personal duties, underlining the need to address these work-life balance challenges for a more equitable industry.
B38	**Gender Bias in Recruitment and Promotion**	Women often face discrimination and bias during recruitment and promotion, which can hinder their career advancement in the energy sector.

Policy measures

NR	Measure	Measure explanation
M26	**Collaborations with Universities**	Collaborate with regional and national universities to recruit female graduates from STEM-related fields, increasing the pool of female professionals available for EU-funded projects and procurement in the energy sector.
M27	**Equality Policies and Gender Quotas**	Address intersecting inequalities through comprehensive packages of measures, including equal opportunity policies, harassment prevention, and gender quotas.
M28	**Equality Monitoring and Imposing Sanctions**	Regularly monitor equality figures and impose sanctions for non-compliance with gender quotas to ensure progress towards gender diversity in EU-funded projects and procurement.
M29	**Encourage Inclusive Corporate Culture**	Encourage organisations to create an inclusive corporate culture that values diversity and provides equal opportunities for all employees, irrespective of gender.

M30	**Encourage Flexible Career Paths**	Encourage organisations to develop more flexible and interconnected career paths, facilitating the upward mobility and growth of female professionals.
M31	**Encourage Recognition of Transferable Skills**	Encourage organisations to recognise transferable skills from degrees not directly related to the energy sector, allowing for a broader range of professional degrees to be considered.
M32	**Facilitate Upskilling and Re-entry**	Provide opportunities for upskilling and re-entry into the workforce through skill development programmes, contributing to increased gender diversity in the energy sector.
M33	**Campaigns Challenging Gender Stereotypes**	Launch campaigns to challenge gender stereotypes and promote a more inclusive image of STEM careers, targeting both students and the general public. These campaigns can showcase successful women in the energy sector and emphasise the importance of gender diversity in the industry.
M34	**Mentorship Programmes**	Establish mentorship programmes that connect female students with female professionals in the energy sector, providing guidance and support for career development.

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13 Annex VIII: Sources of data on gender balance in the energy sector

Source / Name	Scope	Sectors covered	Method				
			Secondary		Primary data collection		
			Compilation of statistics from official sources	Own survey (professionals, companies)	Own survey (institutions)	Publicly available company data	Expert interview survey
ADECCO / AEMENER (2020)[376]	ES	Energy		X			
ASSET (2021)[377]	EU28	Energy (NACE sectors)	X		X		
Atomico "The State of Europe Tech" (2022)[378]	EU (selected), UK	Start-ups, venture capital	X	X		X	
BCG "Untapped Reserves" (2021)[379]	Global	Energy		X			
BCG/ WoNY (2018)[380]	BG, CZ, HR, HU, PL, RO, RS, SI, SK, UA	Energy			X	X	
BMWK (2022)[381]	G7	Energy	X		X		

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381 Federal Ministry for Economic Affairs and Climate Action (2022) 'G7 Report on Gender Equality & Diversity in the Energy Sector', Berlin: BMWK, available online: Link.

Source / Name	Scope	Sectors covered	Method				
			Secondary		Primary data collection		
			Compilation of statistics from official sources	Own survey (professionals, companies)	Own survey (institutions)	Publicly available company data	Expert interview survey
European InvestmentBank (EIB)(2020)[382]	EU28, US, Israel	Start-ups, venture capital				X	
EQUALby30/ DIVERSIO (2021)[383]	Global	Energy		X		X	
IRENA (2022)[384]	Global	Solar PV		X			
IRENA (2020)[385]	Global	Wind Energy		X			
IRENA (2019)[386]	Global	Renewables		X			
IEA Gender and Energy Data Explorer (2023)[387]	Global	Energy (disaggregated)	X			X	
IEA/OECD (2021)[388]	Global	Energy	X				
JRC (2020)[389]	EU28	Energy	X				

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Source / Name	Scope	Sectors covered	Method				
			Secondary		Primary data collection		
			Compilation of statistics from official sources	Own survey (professionals, companies)	Own survey (institutions)	Publicly available company data	Expert interview survey
Electricity Human Resources Canada (2020)[390]	CA	Energy		X	X	X	X
MTalent (2021)[391]	CL	Energy			X		X
NES Fircroft / Energy Jobline / POWERful Women (2022)[392]	Global	Energy		X			
POWERful WOMEN / PWC (2021)[393]	UK	Energy				X	
PWC (2022)[394]	DE	Energy				X	
Women in Energy Iceland/ EY (2021)[395]	IC	Energy			X	X	

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14 Annex IX: Current and recently finished EU-funded projects of relevance to the topic

Exhibit 201: List of EU-funded projects of major relevance for stakeholder engagement in the present study

ACRONYM	Full project name	Programme	Start	End	Coordinator	CORDIS	Website
ACT	Communities of Practice for Accelerating Gender Equality and Institutional Change in R&I across Europe	Horizon 2020	2018	2021	FUNDACIO PER A LA UNIVERSITAT OBERTA DE CATALUNYA, Spain		
ASSET	Advanced system studies for energy transition	EU funded contract study	2017	2021	ATOS SPAIN		
BECoop	Unlocking the community energy potential to support the market uptake of bioenergy heating technologies	Horizon 2020	2020	2023	WHITE RESEARCH, Belgium		
CALIPER	Linking research and innovation for gender equality	Horizon 2020	2020	2023	VILABS Greece		
EFFORTI	Evaluation Framework for Promoting Gender Equality in R&I	Horizon 2020	2016	2019	Fraunhofer, Germany		
EmpowerMED	Empowering women to take action against energy poverty in the Mediterranean	Horizon 2020	2019	2023	FOCUS DRUSTVO ZA SONARAVEN RAZVOJ, Slovenia		
ENABLE.EU	Enabling the Energy Union through understanding the drivers of individual and collective energy choices in Europe	Horizon 2020	2016	2019	ISTITUTO DI STUDI PER L'INTEGRAZIONE DEI SISTEMI, Italy		
Energy-SHIFTS	Energy Social Sciences Humanities Innovation Forum Targeting the SET-Plan	Horizon 2020	2019	2022	ANGLIA RUSKIN UNIVERSITY, UK		
GE Academy	Gender Equality Academy	Horizon 2020	2019	2021	VILABS OE, Greece		
GEECCO	Gender Equality in Engineering through Communication and Commitment	Horizon 2020	2017	2021	TECHNISCHE UNIVERSITAET WIEN, Austria		
gender STI	Gender Equality in Science, Technology and Innovation Bilateral and Multilateral Dialogues	Horizon 2020	2020	2023	UNIVERSIDAD POLITECNICA DE MADRID		

ACRONYM	Full project name	Programme	Start	End	Coordinator	CORDIS	Website
Gender-SMART	Gender SMART Science Management of Agriculture and life sciences, including Research and Teachning	Horizon 2020	2019	2022	C.I.R.A.D. EPIC, France		
GENERA	Gender Equality Network in the European Research Area	Horizon 2020	2015	2018	DESY, Germany		
gEneSys	Transforming Gendered Interrelations of Power and Inequalities in Transition Pathways to Sustainable Energy Systems	Horizon Europe	2023	2026	CONSIGLIO NAZIONALE DELLE RICERCHE (CNR), Italy		
GRANteD	Grant Allocation Disparities from a Gender Perspective	Horizon 2020	2019	2023	JOANNEUM RESEARCH Austria		
INSPIRE	European Centre of Excellence on Inclusive Gender Equality in Research & Innovation: Creating Knowledge & Engaging in Collaborative Action	Horizon Europe	2022	2026	FUNDACIO PER A LA UNIVERSITAT OBERTA DE CATALUNYA		
LeTSGEPs	Leading Towards Sustainable Gender Equality Plans in research performing organisations	Horizon 2020	2020	2023	UNIVERSITA DEGLI STUDI DI MODENA E REGGIO EMILIA, Italy		
MATES	Maritime Alliance for fostering the European Blue economy through a Marine Technology Skilling Strategy	Erasmus+	2018	2021	Centro Tecnológico del Mar – Fundación CETMAR, Spain		
MINDtheGEPs	Modifying Institution by Developing Gender Equality Plans	Horizon 2020	2021	2025	UNIVERSITA DEGLI STUDI DI TORINO		
MORE4	Mobility Patterns and Career Paths of EU Researchers	EU funded contract study	2019	2020	PPMI, Italy		
PLOTINA	Promoting gender balance and inclusion in research, innovation and training	Horizon 2020	2016	2020	ALMA MATER STUDIORUM - UNIVERSITA DI BOLOGNA		
PROSEU	Empowering ordinary citizens to play a key role in Europe's transition to clean energy	Horizon 2020	2018	2021	FCIENCIAS, Portugal		
RES4City	Renewable Energies System for Cities	Horizon Europe	2022	2025	National University of Ireland, Maynooth		
RES-SKILL	Res-skilling coal industry workers for the renewable energy sector	Erasmus+	2020	2023	Promea, Greece		

ACRONYM	Full project name	Programme	Start	End	Coordinator	CORDIS	Website
SCORE	Consumer co-ownership in Renewable Energy	Horizon 2020	2018	2021	EUROPA-UNIVERSITAT VIADRINA FRANKFURT (ODER), Germany		
SEANERGY	Sustainability Educational programme for greener fuels and energy on ports	Horizon Europe	2022	2025	MAGELLAN CIRCLE - EUROPEAN AFFAIRS CONSULTANCY, Portugal		
SKILL BILL	Skill to Boost Innovation and professional fulfillment in a sustainable economy	Horizon Europe	2022	2025	AzzeroCO2		
SocialRES	Fostering Socially Innovative and Inclusive Strategies for Empowering Citizens in the Renewable Energy Market of the Future	Horizon 2020	2019	2022	WIP Renewable Energies, Germany		
SONNET	Social Innovation in Energy Transitions	Horizon 2020	2019	2022	Fraunhofer, Germany		
SPEAR	Supporting and Implementing Plans for Gender Equality in Academia and Research	Horizon 2020	2019	2023	SYDDANSK UNIVERSITET, Denmark		
TRANSIT	Transition to a Sustainable Future through Training and Education	Horizon Europe	2022	2025	Foundation for Innovation and Research, Malta		
W4RES	Scaling-up the involvement of women in supporting and accelerating market uptake of renewable energy sources for heating and cooling	Horizon 2020	2020	2023	Q-PLAN INTERNATIONAL, Greece		

15 Annex X: Indicators for mapping the role of women in R&I for the energy transition

15.1.1 Existing indicator frameworks and indicators

In this section we review the quantitative indicators that can be used for mapping the status and development regarding gender balance in the energy sector, with a special view at R&I related to the energy transition. For this purpose, we focus on indicators available from sources of secondary data (see section 6.1.1). This helped us design of our own primary data collection activities (see sections 6.1.1 and 6.1.2). for filling data gaps.

Exhibit 202: Indicators for gender equality proposed by Expert Group on Policy Indicators for Responsible Research and Innovation

Criteria	Performance indicators		Perception indicators
	Process indicators	**Outcome indicators**	
Gender equality	Percentage of Member State funding programmes explicitly including gender requirements Percentage of research institutions (including universities) that (a) have gender equality plans and (b) provide documentation of their implementation Percentage of research institutions that document specific actions that minimise /reduce barriers in work environment that disadvantage one sex (e.g. flexibility of working hours) Percentage of research institutions that document specific actions aiming to change aspects of their organisational culture that reinforce gender bias Percentage of research institutions that provide training/support for researchers in regard to the inclusion of gender dimensions in the content of research Percentage of schools (primary and secondary) that have programmes promoting gender equality issues in regard to career choices	Percentage of women on advisory committees Percentage of women in expert groups Percentage of women on proposal evaluation panels Percentage of women in projects throughout the whole life cycle (in full-time equivalent) Percentage of women that are principal investigators on a project Percentage of women that are first authors on research papers Percentage of research projects including gender analysis/gender dimensions in the content of research Percentage of women taking part in research mobility programmes	Perception of gender roles in science amongst young people and their parents, e.g. percentage of young people who believe that science careers are equally suitable for both women and men; percentage of parents who believe their children (daughters) will have equal opportunities to pursue a career in STEM Perception of people working in the area of R & I in regard to gender equality, e.g. percentage of women in R & I, who believe they have equal opportunities to pursue their careers in R & I in comparison to men

Source: Expert Group on Policy Indicators for Responsible Research and Innovation[396]

396 European Commission (ed)(2015) 'Indicators for promoting and monitoring Responsible Research and Innovation. Report from the Expert Group on Policy Indicators for Responsible Research and Innovation', EUR 26866 EN, Brussels: European Commission, DG for Research and Innovation.

Several attempts have been undertaken to develop indicator frameworks for mapping countries' performance concerning the role of women in research and innovation or the green transition, respectively. Many of these have been used to design composite indicators, i.e., gender equality indices, see chapter 15.1.2 below. The report of the **Expert Group on Policy Indicators for Responsible Research and Innovation** appointed by the EC's DG RTD in 2014 focuses on gender equality among five other key areas[397]. The indicators suggested by the expert group are reproduced in Exhibit 202. Some of these have been incorporated into the latest version of the She Figures report (since 2003, latest edition: 2021), itself a major reference itself for the structuring of sets of indicators on gender in R&I[398]. For other indicators suggested by the expert group, data availability remains a challenge.

Attempts for indicator development on the **role of women in the energy transition** typically distinguish between[399]:

- Gender gaps in energy access;
- Gender gaps in the energy labour market;
- Gender gaps in energy-related education;
- Gender gaps in decision-making.

Based on these approaches, and taking account of the exact scope of the present study (e.g., energy consumption is not covered) as well as the structure of the conceptual framework presented in the previous chapters, we sort indicators into the following four categories:

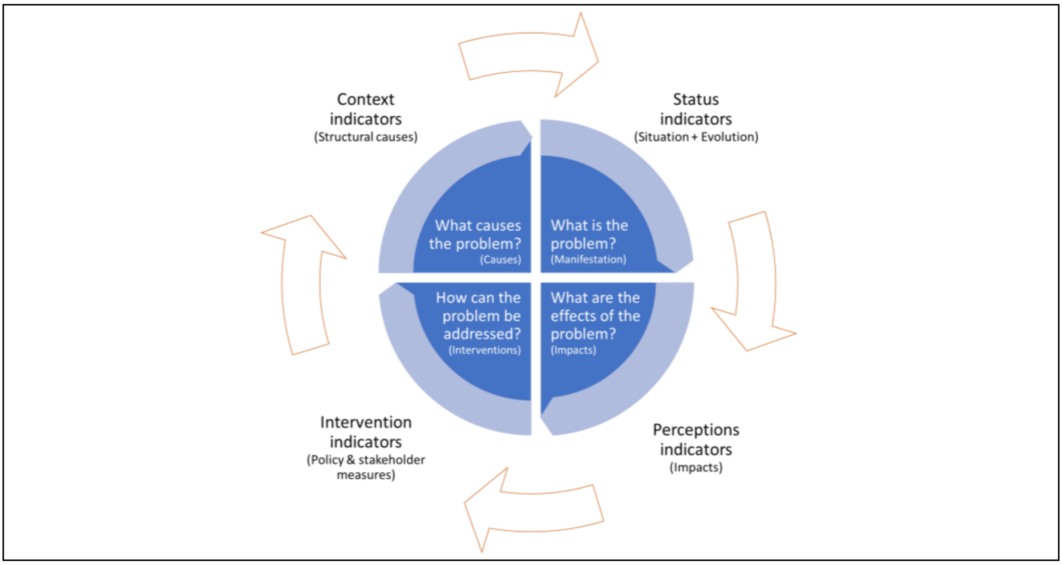
- The structural causes of the issue (**Context indicators**)
- Current situation and development of the issue (**Status indicators**)
- Perceptions and evidence about the impacts of the issue (**Perception indicators**)
- Policy approaches and stakeholder measures to tackle the issue (**Intervention indicators**)

397 European Commission (2015) 'Indicators for promoting and monitoring Responsible Research and Innovation. Report from the Expert Group on Policy Indicators for Responsible Research and Innovation', EUR 26866 EN, Brussels: European Commission, DG for Research and Innovation, available online: Link.

398 European Commission (2021) 'She Figures 2021: Gender in Research and Innovation: Statistics and Indicators', Luxembourg: Publications Office of the European Union, available online: Link.

399 Compare, for instance: EIGE (2016) 'Gender and Energy', Luxembourg: Publications Office of the European Union, available online: Link.

Exhibit 203: Framework for assessment of indicators for the present study



Source: The authors

15.1.2 Context indicators

Context indicators are here understood as statistical measures on the issues and factors that are hard to change directly via policy interventions but undergo longer-term processes of transformation. We also discuss here composite indicators, i.e., indices, being used for mapping the overall status and progress in achieving gender equality in a country (or another geographical unit of reference, e.g. region). The status as reflected in context indicators frames the environment in which developments concerning gender equality in a specific sector (energy) are playing out.

National culture

The relevance of culturally embedded social norms and deeply entrenched gendered structures and processes for explaining differences in EU Member States' performance when it comes to gender balance, e.g., in the energy sector, is generally acknowledged. Because such norms are very hard to change in the short to medium term, they are understood for our purposes as context factors.

Societal values and common beliefs about women in society differ between national cultures[400]. Several empirically supported theoretical frameworks are available for making sense of such differences. The most well-known is possibly Hofstede's model of "cultural dimensions of international culture", which also includes a masculinity/femininity dimension[401]. The framework developed by the Global Leadership and Organizational Behavior Effectiveness Research Program (GLOBE) comprises a cultural dimension, gender egalitarianism, that "measures the extent to which biological sex of the members of a society

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400 Sachdev, A. (2018) 'Gender Disparity in STEM Across Cultures', Industrial and Organizational Psychology, 11(2): 309-313, available online: Link.

401 Hofstede, G. (1980) 'Culture's consequences: International differences in work-related values', Beverly Hills, CA: Sage.

determines the roles they play in workplaces, homes, and communities"[402]. Such indices have been used to try to explain differences in gender balance in the STEM field between countries[403].

Overall gender equality

Different attempts have been undertaken to measure and track overall levels of gender equality in Europe and beyond. The **EIGE Gender Equality Index** assesses the levels of gender equality across the Member States of the EU based on the EU policy framework. The index is hierarchically structured and is composed of six core domains (Work, Money, Knowledge, Time, Power, and Health). Each core domain is sub-divided into two or three sub-domains, in total there are 14 sub-domains. Further, each sub-domain is divided into one to three indicators. In total, there are 31 indicators across the sub-domains in the last version of the index. There are also two satellite domains, violence, and intersecting inequalities, which due to data unavailability, are currently left apart from the main index calculation.

Regional differences are shown by the **Regional Gender Equality Index (RGEI)** developed by JRC[404], which includes two indices: **Female Achievement Index (FemAI)** and **Female Disadvantage index (FemDI)**. These two composite indices address two specific and complementary aspects of gender equality. The first index measures the female level of achievement compared to the best regional performance. The second quantifies female disadvantage by measuring regional differences when females are doing worse than males. Viewing together the two indices are designed to facilitate the understanding of where women are at disadvantage and where they are performing well across the different regions and between the Member States. The RGEI covers seven domains: 1) Work & Money, 2) Knowledge, 3) Time, 4) Power, 5) Health, 6) Safety, Security & Trust and 7) Quality of Life. The domains organise and aggregate over 30 individual indicators into the two summary measures of gender equality in 270 regions, for which data is available at NUTS2 level.

Other indices focus on individual aspect of gender equality, which are of particular relevance to the present study.

Based on its Executive Opinion Survey, the **World Economic Forum** publishes the Global Talent Competitiveness Index[405]. A subindex thereof is the index on "**Leadership opportunities for women**", as perceived by senior experts with in-depth knowledge of the situation in their own country as compared to the rest of the world.

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402 Emrich, C. G., Denmark, F. L., & Den Hartog, D. N. (2004) 'Cross-cultural differences in gender egalitarianism: Implications for societies, organizations, and leaders', in: House, R. J., Hanges, P. J., Javidan, M., Dorfman, P. W., & Gupta, V. (eds.) 'Culture, leadership, and organizations: The GLOBE study of 62 societies', pp. 343–386, Thousand Oaks, CA: Sage Publications.

403 For example, see: Miller, D.I., Eagly, A.H. and Linn, M.C. (2014) 'Women's Representation in Science Predicts National Gender-Science Stereotypes: Evidence From 66 Nations', Journal of Educational Psychology, available online: Link.

404 Norlen, H., Papadimitriou, E. and Dijkstra, L. (2019) 'The regional gender equality monitor', JRC Technical reports, Luxembourg: Publications Office of the European Union, available online: Link.

405 INSEAD (2022) 'The Global Talent Competitiveness Index 2022: The Tectonics of Talent: Is the World Drifting Towards Increased Talent Inequalities', Fontainebleau: INSEAD, Portulans Institute, and Human Capital Leadership Institute, available online: Link.

Attitudes about sustainability

It has been argued repeatedly that the growing interest among significant numbers of young women in climate change and sustainability more generally opens up new opportunities for attracting women to a career in the energy sector[406]. For this reason, **attitudes about sustainability** can be considered a relevant context factor. Statistical data, albeit often not in time-series format, is available from sources such as **Eurobarometer**, e.g.:

- Special Eurobarometer 527 "Fairness perceptions of the green transition" (2022)[407]

- Flash Eurobarometer 514 "EU's response to the energy challenges"(2022)[408]

The International Energy Agency's Equality in Energy Transitions Initiative (formerly C3E International**)**[409] collects gender-disaggregated data in collaboration with the **Clean Energy Ministerial**[410] to address the lack of such data, which is vital to develop sound policies.

15.1.3 Status indicators

Existing indicators on the status and evolution of the **share of women in the energy sector** are based on different collection approaches and therefore sometimes difficult to compare. The **IEA's Gender and Energy Data Explorer**[411] offers an excellent overview of indicators available, including discussion of data quality issues which may affect comparability across countries and years. It includes the following indicators:

- **Employment:**
  - Gender employment gap (total, by contract type, education level, firm size, occupation level)
  - Gender gap in hours worked (total, by contract type, education level, firm size, occupation level)
  - Gender wage gap (total, by contract type, education level, firm size, occupation level)
  - Gender wage gap conditional on skills (total, by contract type, education level, firm size, occupation level)
  - Senior management:
  - Share of female senior managers (total, by company size, by decade of birth, by position)

- **Entrepreneurship** (sectoral disaggregation: energy vs. non-energy):
  - Average amount raised per start-up for all funding rounds by gender diversity of founders
  - Median amount raised per start-up for all funding rounds by gender diversity of founders
  - Number of founders

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406 Young, C. (2021) 'Calling all girl scientists: climate change needs you', OECD Education and Skills Today, February 11th, available online: Link.

407 European Commission, DG EMPL (2022) 'Special Eurobarometer 527: Fairness perceptions of the green transition', report, available online: Link.

408 European Commission, DG COM (2022) 'Flash Eurobarometer 514: EU's response to the energy challenges', report, available online: Link.

409 https://www.c3e-international.org/

410 http://www.cleanenergyministerial.org/

411 https://www.iea.org/data-and-statistics/data-tools/gender-and-energy-data-explorer

- Probability of success of start-ups by gender diversity of founders
- Share of start-ups with gender diverse founders

- **Innovation** (disaggregation: all technologies, clean energy transition technologies, fossil fuel technologies):

  - Number of inventors by sex (inventor country of residence)
  - Share of female inventors (inventor country of residence)
  - Share of patents with at least one female inventor (fractional patent count by inventor country of residence)

Concerning the **renewables sector**, an often-quoted benchmark in this field is the 2019 study from the **International Renewable Energy Agency (IRENA)**, "Renewable Energy: A Gender Perspective"[412], which analysed 1,400 questionnaires from across the entire globe. For the survey a self-selection sample and online interviewing were used. Newer data is available for the subsectors of Wind and Solar PV, for which separate surveys were conducted in 2019[413] and 2021[414], respectively.

In addition, indicators on women's role in the energy labour market can be derived from surveys undertaken by other stakeholders who have commissioned survey research, such the **Women in Energy Global Study**[415], as **Equal by 30**[416].

Some of these sources are particularly relevant for assessing **working conditions** for women in the energy sector. More established indicators on working conditions, e.g., from Eurofound's European Survey on Working Conditions (ESWC)[417], are not available at a fine-grained level which would allow disaggregation down to the energy sector.

Indicators on **gender balance in start-up activity** are typically based on data on funding received, and stem either from surveys of investors or, more often, from commercial providers of corporate data such as Dealroom.co, Pitchbook or Glassdoor. Examples include the gender data included in Atomico's annual **"The State of Europe Tech"** report[418] and the EIB's indicators on **"Funding women entrepreneurs"**[419].

For the analysis of participation in **energy-related education and training**, **Eurostat**'s education statistics and the directly comparable education indicators compiled by the **OECD**, e.g., on graduates and new entrants by field of education and training, can be readily used.

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412 IRENA (2019) 'Renewable Energy: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

413 IRENA (2020) 'Wind Energy: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

414 IRENA (2022) 'Solar PV: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

415 NES Fircroft and Energy Jobline (2022) 'Women in Energy Global Study 2022', Manchester: NES Fircroft, available online: Link.

416 EQUALby30 / DIVERSIO (2021): 'Advancing Diversity & Inclusion in the Energy Sector', available online: Link.

417 https://www.eurofound.europa.eu/surveys/european-working-conditions-surveys-ewcs

418 Atomico (2022) 'The State of European Tech 2022: The Path Ahead', London: Atomico, available online: Link.

419 Fackelmann, S. and De Concini, A. (2020) 'Funding women entrepreneurs: How to empower growth', Luxembourg: European Investment Bank, available online: Link.

Data on **gender balance in research and science** is reported in the She Figures reports[420] but the reported indicators are not broken down to a fine-grained sectoral/ technology level, i.e., no indicators for R&I related to the energy transition can be directly sourced from them. The MORE4 study produces data on **cross-country mobility of researchers** based on primary survey research[421] but, again, possibilities to disaggregate the data down the level required for analysis of energy related fields are very limited.

15.1.4 Perception indicators

This group of indicators comprises statistical measures about impacts as perceived by, on the one hand, employees/ workers and, on the other hand, companies/ employers. For example, the following indicators have been piloted for measuring perceived impacts of gender imbalances on the women (and men) concerned:

- **Situation**: Perceptions about overall levels of gender equality, and about changes over the past;
- **Discrimination and harassment**: Experience of harassment/ discrimination based on sex, gender identity, or gender expression;
- **Attraction and entry**: Perceived facilitators for and obstacles to entry in the energy industry;
- **Retention and advancement**: Perceived facilitators for and obstacles to retention and career advancement in the energy industry;
- **Work-life balance**: Perceptions about job quality features concerning work-life balance, including options offered by employer, e.g., to grant flexibility;
- **Measures**: Perceived effectiveness and adequateness of measures implemented for boosting gender equality;
- **Priorities**: Relative importance of job quality features, including interest in and uptake of specific options offered by employer;
- **Impacts**: Perceived impact of gender equality issues on own career decisions

Sources for indicators mapping perceptions are mainly surveys conducted by or on behalf of stakeholders operating in the energy sector, such as, again, **IRENA's "Renewable Energy: A Gender Perspective"** series of surveys[422]; the **Women in Energy Global Study**[423]; BCG's "**Untapped Reserves"** studies[424] focusing on the oil and gas sector; and national

420 European Commission (2021) 'She Figures 2021: Gender in Research and Innovation: Statistics and Indicators', Luxembourg: Publications Office of the European Union, available online: Link.

421 https://www.more-4.eu/indicator-tool

422 IRENA (2022) 'Solar PV: A Gender Perspective', Abu Dhabi: International Renewable Energy Agency, available online: Link.

423 NES Fircroft and Energy Jobline (2022) 'Women in Energy Global Study 2022', Manchester: NES Fircroft, available online: Link.

424 von Lonski, U. et al. (2021) 'Untapped Reserves 2.0: Driving Gender Balance in Oil and Gas', BCG & World Petroleum Council, available online: Link.

studies such as one by **Electricity Human Resources Canada** for which surveys of employees and employers in the sector were conducted[425].

15.1.5 Interventions indicators

Indicators on offer and uptake of measures for boosting gender equality

This group of indicators comprises statistical measures about measures and approaches taken by employers, for which the typology presented in chapter 4.2 is applied. Insofar as programmes and policies are concerned which are offered to employees on an optional basis, it is important to distinguish between the:

- Availability of certain programmes and policies;
- Awareness among the target group of these programmes and policies;
- Uptake of these programmes and policies.

Indicators are available from a large number of sources (see previous section), many of which, however, are derived from one-off surveys and/ or are making use of self-selection online surveys likely to be affected by various kinds of non-sampling error.

Maturity and effectiveness

In addition to indicators describing whether certain measures are being used by organisations, attempts have been made to design metrics for measuring the maturity and overall effectiveness of an organisation's combined efforts to boost gender balance and equality. Consultancy BCG, for example, has developed a "Diversity and Inclusion Maturity Assessment Tool" for assessing the degree to which companies in the oil & gas sector address the issue in a holistic way[426]. Similar approaches are being applied by certification schemes which assess company's activities for gender equality based on sets of criteria, such as Great Place to Work's "Best Workplaces for Women" programme[427].

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425 Electricity Human Resources Canada (2020) 'Leadershift: Pathways to Gender Equity', available online: Link.

426 von Lonski, U. et al. (2021) 'Untapped Reserves 2.0: Driving Gender Balance in Oil and Gas', BCG & World Petroleum Council, available online: Link.

427 https://www.greatplacetowork.com/best-workplaces/women

16 Annex XI: Overview of existing statistical indicators on women in the energy sector

Exhibit 204: Selected existing indicators on women in energy - Context indicators

Indicator	Topic	Source (publication)	Source (data)	Countries covered	Frequency, latest
Leadership opportunities for women	Overall gender equality	Global Talent Competitiveness Index	WEF Executive Opinion Survey	Global	annual, since the 1980s
Gender Equality Index - Domain Work	Overall gender equality	EIGE Gender Equality Index	Various	EU27	2013/15/17/19/20/21/22
Gender Equality Index - Domain Money	Overall gender equality	EIGE Gender Equality Index	Various	EU27	2013/15/17/19/20/21/22
Gender Equality Index - Domain Knowledge	Overall gender equality	EIGE Gender Equality Index	Various	EU27	2013/15/17/19/20/21/22
Gender Equality Index - Domain Power	Overall gender equality	EIGE Gender Equality Index	Various	EU27	2013/15/17/19/20/21/22
Gender Equality Index - Domain Time	Overall gender equality	EIGE Gender Equality Index	Various	EU27	2013/15/17/19/20/21/22
Gender Equality Index - Domain Health	Overall gender equality	EIGE Gender Equality Index	Various	EU27	2013/15/17/19/20/21/22
Female Disadvantage Index (FemDI)	Overall gender equality	JRC Regional Gender Equality Index	Various	EU27	2021
Female Achievement Index (FemAI)	Overall gender equality	JRC Regional Gender Equality Index	Various	EU27	2021
Importance given to being in a job that contributes to green transition, by gender	Attitudes about sustainability	Special Eurobarometer 527 Report	Eurobarometer survey	EU27	2022
Perceived ability of one's skills to contribute to green transition, by gender	Attitudes about sustainability	Special Eurobarometer 527 Report	Eurobarometer survey	EU27	2022
Perceived personal responsibility to act to limit climate change, by gender	Attitudes about sustainability	Special Eurobarometer 527 Report	Eurobarometer survey	EU27	2022
Percentage of women among bachelor entrants in selected fields of study	Education & training	SheFigures 2021 (not disaggregated by sex)	Eurostat – Education Statistics + OECD	EU27 + OECD	annual, 2019-2020

Indicator	Topic	Source (publication)	Source (data)	Countries covered	Frequency, latest
Percentage of women among doctoral graduates in selected fields of study	Education & training	SheFigures 2021 (not disaggregated by sex)	Eurostat – Education Statistics + OECD	EU27 + OECD	annual, 2019-2020
Ratio of bachelor graduates to bachelor entrants in selected fields of study, by sex	Education & training	SheFigures 2021 (not disaggregated by sex)	Eurostat – Education Statistics + OECD	EU27 + OECD	annual, 2019-2020
Ratio of Doctoral entrants to master graduates in selected fields of study, by sex	Education & training	SheFigures 2021 (not disaggregated by sex)	Eurostat – Education Statistics + OECD	EU27 + OECD	annual, 2019-2020
Ratio of Doctoral graduates to Doctoral entrants in selected fields of study, by sex	Education & training	SheFigures 2021 (not disaggregated by sex)	Eurostat – Education Statistics + OECD	EU27 + OECD	annual, 2019-2020
Gender employment gap	Employment	IEA Data Explorer	OECD "Detailed dash-board gender inequality in the labour market"	EU27 + OECD	2010, 2014, 2018, 2022
Gender gap in hours worked	Employment	IEA Data Explorer	OECD "Detailed dash-board gender inequality in the labour market"	EU27 + OECD	2010, 2014, 2018, 2022

Exhibit 205: Selected existing indicators on women in energy - Status indicators

Indicator	**Topic**	**Source (publication)**	**Source (data)**	**Countries covered**	**Frequency, latest**
Percentage of women among bachelor graduates in selected fields of study	Education & training	SheFigures 2021 (not disaggregated by sex)	Eurostat – Education Statistics + OECD	EU27 + OECD	annual, 2019-2020
Share of women in tertiary-educated population employed as professionals or technicians (HRSTC) in the energy sector	Employment	SheFigures 2021 (w/o sectoral disaggregation)	Eurostat (LFS) (on demand)	EU27 + IS,NO, CH,UK (-2020)	Annual, 2022
Percentage of women among population employed as scientists and engineers in the energy sector	Employment	SheFigures 2021 (w/o sectoral disaggregation)	Eurostat (LFS) (on demand)	EU27 + IS,NO, CH,UK (-2020)	Annual, 2022
Share of women in total energy sector employment	Employment	ASSET 2021 Report	Eurostat (LFS) (partly on demand)	EU27 + IS,NO, CH,UK (-2020)	Annual, 2022
Share of the energy sector in total women employment	Employment	ASSET 2021 Report	Eurostat (LFS)	EU27 + IS,NO, CH,UK (-2020)	Annual, 2022
Percentage of women employed in the energy sector working part-time	Employment	ASSET 2021 Report	Eurostat (LFS) (on demand)	EU27 + IS,NO, CH,UK (-2020)	Annual, 2022
Percentage of women among self-employed energy professionals	Innovation, entrepreneurship, R&I funding	SheFigures 2021 (w/o sectoral disaggregation)	Eurostat (LFS) (on demand)	EU27 + IS,NO, CH,UK (-2020)	Annual, 2022
Average/ Median amount raised per start-up for all funding rounds by gender diversity of founders	Innovation, entrepreneurship, R&I funding	IEA Data Explorer	Crunchbase, analysed by IEA	Global (partly limited)	Annual, 2000-2021
Number of founders by gender	Innovation, entrepreneurship, R&I funding	IEA Data Explorer	Crunchbase, analysed by IEA	Global (partly limited)	Annual, 2000-2021
Probability of success of start-ups by gender diversity of founders	Innovation, entrepreneurship, R&I funding	IEA Data Explorer	Crunchbase, analysed by IEA	Global (partly limited)	Annual, 2000-2021
Number of inventors by sex	Innovation, entrepreneurship, R&I funding	IEA Data Explorer	OECD Micro-data Lab: Intellectual Property Database	Global (partly limited)	Annual, 2000-2021

Indicator	Topic	Source (publication)	Source (data)	Countries covered	Frequency, latest
Share of female senior managers	Leadership	IEA Data Explorer	Refinitiv analysed by IEA	Global (partly limited)	Annual, 2000-2022
Gender Diversity in Executive Teams	Leadership	Electricity Human Resources: Pathways to gender equity	Own survey of companies in Canada	Canada	One-off, 2020
Gender Diversityon Boards	Leadership	Electricity Human Resources: Pathways to gender equity	Own survey of companies in Canada	Canada	One-off, 2020
Women in leadership roles, by industry	Leadership	WEF Global Gender Gap Report 2022	LinkedIn Economic Graph	Global average only	Unkown, 2022
Share of women hired into leadership, by year and industry	Leadership	WEF Global Gender Gap Report 2022	LinkedIn Economic Graph	Global average only	Unkown, 2022
Share of women among senior positions in energy ministries	Leadership	ASSET 2021 Report	ASSET survey	EU27	One-off, 2021
Share of women in total employment in regulatory institutions for the energy sector	Leadership	ASSET 2021 Report	ASSET survey	EU27	One-off, 2021
Share of women in total employment in TSOs	Leadership	ASSET 2021 Report	ASSET survey	EU27	One-off, 2021
Gender wage gap	Working conditions	IEA Data Explorer	OECD "Detailed dash-board gender inequality in the labour market"	EU27 + OECD	2010, 2014, 2018, 2022
Gender wage gap conditional on skills	Working conditions	IEA Data Explorer	OECD "Detailed dash-board gender inequality in the labour market"	EU27 + OECD	2010, 2014, 2018, 2022
Perceived gender pay gap	Working conditions	IRENA 2022	IRENA online Solar PV survey	Global average only	Unknown, 2022
Perceived reasons for gender pay gap	Working conditions	IRENA 2022	IRENA online Solar PV survey	Global average only	Unknown, 2022

Exhibit 206: Selected existing indicators on women in energy - Perceptions indicators

Indicator	Topic	Source (publication)	Source (data)	Countries covered	Frequency, latest
Share of female inventors	Innovation, entrepreneurship, R&I funding	IEA Data Explorer	OECD Micro-data Lab: Intellectual Property Database	Global (partly limited)	Annual, 2000-2021
Share of patents with at least one female inventor	Innovation, entrepreneurship, R&I funding	IEA Data Explorer	OECD Micro-data Lab: Intellectual Property Database	Global (partly limited)	Annual, 2000-2021
Perceived change in opportunities in tech sector for people from underrepresented demographics	General	Atomico 2022	SOET survey	Europe average only	Annual, 2022
Perceived difficulties in tech due to background and/or identity	General	Atomico 2022	SOET survey	Europe average only	Annual, 2022
Experience of discrimination in tech sector, by gender and ethnicity	Discrimination and harassment	Atomico 2022	SOET survey	Europe average only	Annual, 2022
Perceived relative importance of gender diversity for oneself / supervisor / CEO	Attraction and entry	BCG_2018_Women In Energy	Own online survey	Global average only	2018
Positive aspects of working in the energy sector	Attraction and entry	NES Fircroft 2022 Women in Energy Global Study	Own survey	Global average only	2018, 2019, 2021, 2022
Perceived obstacles to career advancement, by gender	Retention and advancement	BCG_2021 Untapped Reserves 2.0	Own survey of oil and gas sector employees	Global average only	2017, 2020
Perceived reasons for the lack of women in senior management	Retention and advancement	BCG_2021 Untapped Reserves 2.0	Own survey of oil and gas sector employees	Global average only	2017, 2020
Perceived career challenges for women	Retention and advancement	BCG_2021 Untapped Reserves 2.0	Own survey of oil and gas sector employees	Global average only	2017, 2020
Perceived qualities required for senior promotion	Retention and advancement	BCG_2021 Untapped Reserves 2.0	Own online survey	Global average only	2017, 2020
Plans about leaving current job	Retention and advancement	NES Fircroft 2022 Women in Energy Global Study	Own survey	Global average only	2018, 2019, 2021, 2022

Indicator	Topic	Source (publication)	Source (data)	Countries covered	Frequency, latest
Perceived relative importance of job aspects	Priorities	BCG_2021 Untapped Reserves 2.0	Own online survey	Global average only	2017, 2020
Preference for workplace benefits of relevance for all employees	Priorities	NES Fircroft 2022 Women in Energy Global Study	Own survey	Global average only	2018, 2019, 2021, 2022
Main reasons for choosing the energy industry, as reported by employees in the sector	Priorities	BCG_2021 Untapped Reserves 2.0	Own online survey	Global average only	2017, 2020
Perceived change in diversity and inclusion practices in the company	Measures	Atomico 2022	SOET survey	Europe average only	Annual, 2022
Measures adopted by tech companies related to diversity + inclusion	Measures	Atomico 2022	SOET survey	Europe average only	Annual, 2022
Preferences for measures to support women in the energy sector	Measures	IRENA 2022	IRENA online solar PV survey	Global average only	unknown, 2022
"Perceived alignment of the to company to its diversity	Measures	NES Fircroft 2022 Women in Energy Global Study	Own survey	Global average only	2021, 2022
Willingness to adapt to changing circumstances	Work-life balance	BCG_2021 Untapped Reserves 2.0	Own online survey	Global average only	2017, 2020
Preference for workplace benefits of relevance for employees with children	Work-life balance	NES Fircroft 2022 Women in Energy Global Study	Own survey	Global average only	2018, 2019, 2021, 2022
Reasons for plans to change jobs	Retention and advancement	NES Fircroft 2022 Women in Energy Global Study	Own survey	Global average only	2018, 2019, 2021, 2022
Share of companies that implement a given policy or programme ("Attract")	Measures taken	BCG_2021 Untapped Reserves 2.0	Own survey of 50 major oil and gas companies	Global average only	
Share of companies that implement a given policy or programme ("Retain")	Measures taken	BCG_2021 Untapped Reserves 2.0	Own survey of 50 major oil and gas companies	Global average only	
Share of companies that implement a given policy or programme ("Advance")	Measures taken	BCG_2021 Untapped Reserves 2.0	Own survey of 50 major oil and gas companies	Global average only	

Exhibit 207: Selected existing indicators on women in energy - Interventions indicators

Indicator	Topic	Source (publication)	Source (data)	Countries covered	Frequency, latest
Share of companies that implement a given policy or programme ("Visible Leadership")	Measures taken	BCG_2021 Untapped Reserves 2.0	Own survey of 50 major oil and gas companies	Global average only	
Availability of employment benefits of relevance to gender balance	Measures taken	IRENA 2022	IRENA online solar PV survey	Global average only	
Measures implemented in-house to combat harassment and discrimination	Measures taken	BMWK G7 Report on gender equality and diversity in energy-sector	Own survey of G7 Ministries responsible for energy	G7 (CA, DE, FR, IT, JP, UK, US)	One-off, 2022
Use of in-house policies, programs and/or solutions for building an inclusive culture	Measures taken	BMWK G7 Report on gender equality and diversity in energy-sector	Own survey of G7 Ministries responsible for energy	G7 (CA, DE, FR, IT, JP, UK, US)	One-off, 2022
Processes and structures to support the growth and development of diverse talent and advance them into senior leadership roles	Measures taken	BMWK G7 Report on gender equality and diversity in energy-sector	Own survey of G7 Ministries responsible for energy	G7 (CA, DE, FR, IT, JP, UK, US)	One-off, 2022
Types of Flexible working introduced during Covid 19	Measures taken	NES Fircroft 2022 Women in Energy	Own survey	Global average only	
Offer of mentoring programmes	Measures taken	NES Fircroft 2022 Women in Energy	Own survey	Global average only	
Take-up of mentoring	Measures taken	NES Fircroft 2022 Women in Energy	Own survey	Global average only	
Share of companies that implement a given policy or programme ("Foundational Policies and Programs")	Strategies, agendas and plans	BCG_2021 Untapped Reserves 2.0	Own survey of 50 major oil and gas companies	Global average only	
Percentage of Horizon 2020 projects in the energy field integrating a gender dimension	Funding of gender-sensitive research	SheFigures 2021 (w/o sectoral disaggregation)	European Commission, via EU Open Data Portal	EU28 + global	
Percentage of Horizon 2020 projects in the energy field integrating an intersectionality approach	Funding of gender-sensitive research	SheFigures 2021 (w/o sectoral disaggregation)	European Commission, via EU Open Data Portal	EU28 + global	

17 Annex XII Delimitation of the energy sector using SIC codes

Exhibit 208: SIC codes selected for CATI company survey

0133	Sugarcane & sugar beet farms*
1094	Uranium, radium & vanadium ores
12	Coal Mining
13	Oil and Gas Extraction
1623	Pipeline, comm. & powerline construction
1711	Plumbing, Heating and Air-Conditioning
2448	Wood pallets & skids
2813	Industrial Gases
2911	Petroleum refining
3433	Heating equipment exc. warm air furnaces
3511	Steam, gas & hydraulic turbines
3533	Oil & gas field machinery & equipment
3561	Pumps & pumping equipment*
3563	Air & gas compressors
3585	Air-conditioning & warm air heating equipment
3612	Power, distribution & spec. transformers
3691	Storage batteries
3692	Primary batteries, dry & wet
3699	Electrical Machinery, Equipment, and Supplies, Not Elsewhere Classified
3822	Automatic Controls for Regulating Residential and Commercial Environments and Appliances
3823	Industrial Instruments for Measurement, Display, and Control of Process Variables; and Related Products
3825	Instruments for Measuring and Testing of Electricity and Electrical Signals
46	Pipelines excl. Natural Gas
4911	Electric services
4922	Natural gas transmission
4924	Natural gas distribution
4931	Electric & other services combined
4932	Gas & other services combined
4939	Combination utilities N.E.C.
4961	Steam & air - conditioning supply
5063	Wholesale trade: Electrical apparatus & equipment, wiring
5074	Wholesale trade: Plumbing, heating equipment & supplies
5075	Wholesale trade: Warm air heating & air-conditioning equipment
5171	Petroleum bulk stations & terminals
5172	Petroleum & petroleum products
5541	Gasoline service stations
5983	Fuel oil dealers
7378	Computer maintenance and repair*
8711	Engineering services*
8742	Management consulting services*
8748	Business consulting services N.E.C.*
9631	Regulation and Administration of Communications, Electric, Gas, and other Utilities*

* only to be included if engaged in the production of equipment / distribution / consulting / regulation and administration of the generation, storage, management or distribution of energy

18 Annex XIII: List of members of the Advisory and Observer Board

Name	Affiliation	Country	Stakeholder group
Margaret Alston	The University of Newcastle, Australia	AT	Research & innovation
Murielle Antille	Lee Hecht Harrison	CH	Industry
Birna Bragadóttir	SAMORKA	IS	Industry / NGO
Joe Clancy	University of Twente	NL	Research & innovation
Rabia Ferroukhi	International Renewable Energy Agency (IRENA)	UAE	Industry / Policy
Christine Lins	Global Women's Network for the Energy Transition (GWNET)	AT	NGO
Dr Ilaria Meazzini	Royal Society of Chemistry	IT	Research & innovation
Albert Motivans	Equal Measures 2030	US	NGO
Harpa Petursdottir	ON - Orka náttúrunnar	IS	Industry
Lisa Ann Pinkerton	Women in Cleantech & Sustainability	US	NGO
Lucio Pisacane	National Research Council, IRPPS	IT	Research & innovation
Anika Nicolaas Ponder	Institut für Klimaschutz, Energie und Mobilität	DE	Research & innovation
Prof Curt Rice	Norwegian University of Life Sciences	NO	Education / Skills
Prof Dalia Satkovskiene	BASNET Forumas	LT	NGO
Dr Alessandro Sciullo	Universita Degli Studi Di Torino	IT	Education / Skills
Georgina Worrall	POWERful WOMEN	UK	NGO / Industry
R. Cemre Uçar	Turkish Women in Renewable and Energy Network	TR	NGO / Industry
Anna Åberg	International Energy Agency - Users TCP Task on Gender and Energy	SE	Research & innovation

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This report assesses gender balance in the energy sector and identifies strategies for inclusivity. Women make up only 25% of the workforce in EU energy companies, marginally higher in senior roles. Women's involvement in research and innovation stands at 22%, with significant variations across EU states. The report projects the necessity of adding 200,000 women to the EU27 energy sector by 2050 to attain minimal gender balance. Emphasizing the need to promote STEM careers for women, the report includes concrete recommendation for effective measures.

Studies and reports

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