“Needs, perceptions and challenges in the RHC landscape: Evidence from 8 regions”

Deliverable 1.2

WP1. Assessing RHC market uptake challenges and developing case studies of women-driven solutions

Project title

W4RES - Scaling-up the involvement of women in supporting and accelerating market uptake of renewable energy sources for heating and cooling

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ABBREVIATIONS

BE = Belgium
BG = Bulgaria
DE = Germany
DK = Denmark
EL = Greece
IT = Italy
NO = Norway
RES = Renewable Energy Sources
RHC = Renewable Heating and Cooling
SK = Slovak Republic

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EXECUTIVE SUMMARY

The W4RES project aims at scaling-up the involvement of women in the market deployment and uptake of Renewable Heating and Cooling (RHC) solutions via replicable support measures tested and validated across 8 European countries, Greece, Italy, Germany, Belgium, Denmark, Slovakia, Norway, and Bulgaria.

Within the project, D1.2 plays an important role in the achievement of this goal. The present deliverable aims at improving our knowledge of framework conditions acting as barriers or enablers of RHC market uptake. We adopted a gender lens to identify and analyze the needs, perceptions, and challenges of RHC of diverse market actors and stakeholders in these countries. In addition, gender-disaggregated data was produced, to investigate the role of women with regards to the uptake of RHC.

To account for the perceptions of all key actors in the targeted regional RHC markets, the analysis spanned across representatives from all groups of the quadruple helix: businesses, academia, authorities as well as civil society. Building upon the information collected, D1.2 will allow the consortium to develop and shape the support measures for the uptake of RHC solutions to the actual profiles of final users and the measures to support the increased involvement of women in the sector.

Several research methods were combined, involving both qualitative and quantitative data. A targeted desk research provided the baseline for the collection of existing evidence (in the form of study reports, policy documents, academic papers, etc.).

Based on the literature, interviews were designed to receive new insights deriving from direct experience of the most relevant stakeholders. The interview analysis was based on a semi-structured, in-depth, qualitative study for which a well-tailored sampling scheme was employed to enhance representativeness. The 46 participants selected and interviewed by the partners belong to all four groups of the quadruple helix and both women and men and were asked questions regarding their perceptions regarding the uptake of RHC solutions in their country and the role of women in RHC in the country.

The findings from the desk research and interviews signaled out key issues and dimensions that were then further explored by means of an online multi-component survey. This last task also addressed the four main quadruple helix stakeholder groups identified for the interviews and was conceived as the main quantitative tool to assess perceptions of stakeholders along with some other crucial factors. The survey explored and analyzed the perceptions of 332 different market actors who participated, focusing on the uptake of RHC solutions and the role of women in the sector across the 8 considered countries. The survey analysis provides a first section giving a overview of the sample as a whole followed by a second section containing country-specific insights.

These insights allowed us to define 8 country profiles and measures to support the involvement of women in the uptake of RHC solutions targeted to each country.

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1 INTRODUCTION

1.1 Aim and scope of task T1.2

The W4RES project aims at scaling-up the involvement of women in the market deployment and uptake of Renewable Heating and Cooling (RHC) solutions via replicable support measures tested and validated across 8 European countries. The basic project concept stems from the recognition that women hold great promise as agents of change, supporting a faster progress towards the climate and energy targets for 2030.

The first step towards achieving this goal involves the identification and analysis of the needs, perceptions and challenges of Renewable Heating and Cooling (RHC) of diverse market actors and stakeholders across 8 regions, namely Greece, Italy, Germany, Belgium, Denmark, Slovakia, Norway, and Bulgaria.

To this end, the activities included in Task 1.2 provided a fundamental contribution to the set up and preparation phase of the project and aimed at improving our knowledge of framework conditions acting as barriers or enablers of RHC market uptake. Notably, this analysis will be carried out adopting a gendered lens and producing gender-disaggregated data to investigate the role of women with regards to the uptake of RHC.

To account for the perceptions of all key actors in the targeted regional RHC markets, the analysis spanned across representatives from all groups of the quadruple helix: businesses, academia, authorities as well as civil society. Building upon the actual needs, perceptions, and challenges of our stakeholders from the early stages of the project, allows the consortium to develop and shape the support measures for the uptake of RHC solutions to the actual profiles of final users.

Several research methods were combined, involving both qualitative and quantitative data. A targeted desk research provided the baseline for the collection of existing evidence (in the form of study reports, policy documents, academic papers, etc.). Based on the literature, interviews were designed to receive new insights deriving from direct experience of the most relevant stakeholders. The findings from the desk research and interviews signaled out key issues and dimensions that were then further explored by means of an online survey.

The analysis carried in Task 1.2 used the data collected to elaborate demand-driven recommendations that will facilitate the customization and establishment of support measures for the W4RES project's scope – to scale-up the involvement of women in supporting and accelerating market uptake of renewable energy sources for heating and cooling.

1.2 Outline of the report

Section 1 of the present report introduces the report's main aim and scope together with an overview of its role in the framework of W4RES. Section 1, also gives an overview of the methods used, offering a first picture of the fundaments the analysis is built upon. Section 2 presents the first step into the users' needs analysis, providing the description of the main insights emerging from the existing literature. In Section 3 the findings of the qualitative research method, i.e., the interviews, are presented and discussed, while Section 4 is dedicated to the analysis of the surveys. In the last section, conclusions are drawn and implications for actions tailored to the report's findings are considered.

1.3 Methodological approach

A blended study approach was adopted in task 1.2, collecting meaningful quantitative and qualitative data from primary and secondary sources.
The first of the three activities resulting from this approach was a targeted desk research, which provided the baseline for the collection of existing evidence (e.g., study reports, policy documents case studies etc.) on the barriers faced by stakeholders in RHC and by women specifically.
An interviewed based survey followed the desk research, with the purpose of calibrating our findings and identify any dimensions not previously envisaged. The interviews were targeted to the members from the four groups of the quadruple helix, including both representatives of supply and demand side. The main categories involved were:

- **Authorities**: Regional authorities, policymakers, etc.
- **Business**: Energy suppliers, technology installers, technical consultancies, women-led businesses in RHC, etc.
- **Academia**: Women-led research projects and studies, etc.
- **Civil society**: NGOs, consumer associations, action groups, networks supporting women in RHC.

The interviews targeted to include at least 40 stakeholders to collect insight on the internal dimensions (needs, perceptions, misconceptions, attitudes, etc.) that may influence the willingness and ability of these stakeholders to accept, use and invest in RHC solutions and on the role of women and the barriers they face in the sector.
Initial information retrieved from the interviews contributed to the definition and creation of an **online survey**, **targeting the abovementioned identified groups across the quadruple helix.** To this end, EU Survey, a professional online survey tool supported by the European Commission's ISA² programme, was used to code the surveys.
The dissemination campaign of the survey took advantage of the partner's network in their countries. The target number of respondents was 240 distributed in the 8 countries involved and across the quadruple helix categories.
The whole process was guided by a gender disaggregated analytical approach focusing on understanding the role played by women in the sector and the barriers they encounter in terms of differentiation in offered opportunities, stereotypes, inequalities, access to networks or finance, etc.
The present report contains the results of Task 1.2 and will provide a fundamental input for the upcoming project activities: it produced a profile for each region's RHC sector landscape and the relevant recommendations on how to better shape the W4RES activities on these profiles. This will ensure that the activities carried out in the development and implementation phases of the project will be relevant and effective and have benefited from the participation of the stakeholders and the gender-based approach at the heart of W4RES.

2 DESK RESEARCH

This section of the present "Needs, perceptions and challenges in the RHC landscape" report focuses on the results of the desk research activity. This analysis has been carried out by reviewing important studies, reports, and papers for the purpose of collecting meaningful insights on the needs, perceptions, and challenges of market stakeholders regarding the uptake of RHC solutions and the role of women in the sector. In particular, the desk study mainly focused on the overall barriers that actors face in the market and, in parallel, on the barriers that specifically affect women in the sector.

2.1 Heating and Cooling and the transition to a greener industry

The W4RES project focuses on fostering the Renewable Heating and Cooling (RHC) sector. Heating and Cooling accounts for approximately 50% of Europe's final energy demand with a large amount of energy produced for this scope often getting wasted[1]. In 2018, Eurostat data showed that only 21% of heating and cooling energy consumption was based on renewable energy sources[2], while the rest was produced from natural gas, coal, oil products and non-RES electricity. It is also important to note that the natural gas used for heating and cooling accounts for nearly 80% of EU's demand and it is equivalent to 90% of the European gas imports[3]. The dependence of the sector on non-renewable sources, translates into significant greenhouse gas emissions since the heating sector alone is responsible for about 38% of the overall EU emissions[4]. Based on the above presented facts, the heating and cooling sector will play a crucial role in the EU's transition towards efficient and carbon neutral energy solutions and in achieving long term energy security. According to the scenarios included in the EU's 2050 energy roadmap, the energy demand in the heating and cooling sector needs to be reduced by 40-70% by 2050[5].

While a broad range of technologies that can contribute significantly to decarbonizing the RHC sector already exists, further actions at a societal level need to be taken to increase the penetration of RHC solutions. To achieve the ambitious goal of a "greener" heating and cooling sector, it is important to consider not only the technical and economic challenges of achieving decarbonization, but also the social aspects that can influence the wide adoption of renewables. For example, technologies that are proven feasible in both economic and technical terms, might not be successfully implemented due to social resistance, lack of awareness etc. Since the concept of sustainable development encompasses

[1] European Commission, "An EU Strategy on Heating and Cooling", Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2016) 51 final. Available here

[2] Eurostat "Renewable energy used for heating and cooling" info sheet. Available here

[3] European Commission, "10 things you didn't know about Heating & Cooling" Infographic (2016). Available here

[4] Institute of Electrical and Electronics Engineers (IEEE), Heating and Cooling Future of Europe and Interactions with Electricity, An IEEE European Public Policy Committee Position Statement (2018). Available here

[5] European Commission, "Energy Roadmap 2050", Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, COM(2011) 885 final

not only environmental protection but also an inclusive society of equal opportunities, it is imperative to tackle the social challenges relevant to the realization of a broader decarbonization. It is undeniable that the ongoing energy transformation bears important opportunities for greater inclusion and equality.

The EU heating and cooling strategy derived from the findings of a study carried out by the European Federation of Local and Regional Energy Companies (CEDEC)[6] provided the main policy recommendations that will enhance the RES uptake in the sector. The main points of these recommendations can be summarized as follows: i) Develop a clear pathway for RHC that will enable investments through predictability and transparency, ii) Implement a holistic approach that will focus on individual local circumstances, since heating and cooling by nature depends largely on local circumstances, iii) Offer information and incentives for energy users to employ RHC solutions, iv) Acknowledge the financing role of public banks and institutions in de-risking RHC projects and providing support through a smart combination of public and private funding sources, so that the uptake of RHC can be accelerated considerably. As it becomes evident by these points, to make the heating and cooling sector "greener" it is of critical importance to raise public awareness about the benefits of the community, especially at local level and to promote initiatives and investment schemes that will make the above recommendations feasible. Such an objective can only be reached by ensuring the engagement of representatives from all actors of the quadruple helix (authorities, business, academia, civil society) in a multi-stakeholder cooperation, taking actions at local, regional, national as well as European level.

2.2 Perceptual/behavioral barriers to the uptake of RHC solutions

The heating and cooling sector needs to become more environmentally friendly and for that purpose certain challenges must be overcome to facilitate the uptake of RHC solutions. The next section will explore the factors that hinder a positive outlook on employing renewables for residential use in heating and cooling. These factors are primarily linked to uncertainties at different levels.

2.2.1 Uncertainty around RE prices

Barriers to the uptake of RE and RHC solutions often arise due to a lack of long-term continuity in renewable energy-related policies which negatively influences the deployment of renewables. Their impact is more evident on consumers, the development of a definite energy price and the final energy performance, while also regulations are subject to changes. At the consumer level, households are concerned about their own financial future which is often unstable and difficult to predict. For example, an unstable employment condition or an existing debt can discourage users from adopting renewable solutions[7].

For companies, investing in RHC can generally improve the business activities economically and be beneficial to their public image. Despite this and even though the price of energy derived from fossil fuels has been subject to high fluctuations, the current renewable energy prices remain not

[6] CEDEC, "An EU Heating and Cooling Strategy" (2015). Available here

[7] Ugarte, S., van der Ree, B., Voogt, M., Eichhammer, W., Ordoñez, J., Reuter, M., Schlomann, B., Lloret, P., R. Villafafila-Robles. "Energy efficiency for low-income households". 2016. Available here

competitive. In fact, under present EU market conditions, three out of four key RHC technologies are not cost-competitive (in terms of the Levelized Cost of Energy (LCOE) and Capital Expenditure (CAPEX), without public support) when compared to the alternative average energy carrier price in the EU. In many countries (e.g. Germany and Greece), this state of affairs is due to the fact that fossil fuels are heavily subsidized.

At the moment, heat from solid biomass is the most cost competitive renewable option available. District heating infrastructure make centralized RES H&C solutions also competitive (e.g., within the solar-thermal segment). On the other hand, biogas companies are competing mainly on national markets and current market conditions make them dependent on support schemes. Additionally, even with low operating costs, heat pumps are not cost competitive in the absence of support schemes due to their high upfront investment costs. Similarly, the solar-thermal segment is competitive when support schemes are available to cover part of the upfront investment costs[8].
Even though carbon emissions pose severe societal burdens and costs, the lack of a relevant price tag on the market to illustrate this, renders fossil-fuel based solutions more cost-appealing. This combined with the high investment costs of installing an RHC Solution explains the lack of competitiveness.

2.2.2 Uncertain regulatory landscape

The International Renewable Energy Agency (IRENA) has identified a wide range of barriers and uncertainties that hamper decarbonization from a regulatory perspective. These include among others: poor policy design, discontinuity of policies, split incentives, inconsistent policies, unclear agreements (such as power purchase agreements, feed-in tariffs or self-consumption) and a lack of transparency[9]. These uncertainties and inconsistencies together with retroactive changes in policies and regulations present a significant obstacle for the expansion of renewables since they lower the confidence among investors and developers. Especially for the heating and cooling sector, currently there are limited measures across the sector in EU legislation (compared for example to the electricity or transport sectors), which result to a slow progress, an absence of a long-term policy vision and investor uncertainty[10].

2.2.3 Uncertainty of performance

Uncertainties around the performance of RE and RHC solutions constitute another barrier and generate a lack of trust from the side of consumers. This is caused by the fact that, in the past, energy efficient and RHC technologies in field applications demonstrated a performance that was below the theoretical specifications of the manufacturers. Such uncertainties combined with negative examples from application within the direct environment (e.g., family, neighbors) of consumers lead to a low expected credibility of RHC solutions[11]. A perceived performance risk of such a technology is bound to

[8] European Commission (2019) “Competitiveness of the heating and cooling industry and services” Final report (ENER/C2/2016-501). Available here
[9] IRENA, “Renewable Energy Policies in a Time of Transition” (2018). Available here
[10] European Commission (2016) - Impact Assessment Accompanying the document “Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast)” SWD(2016) 418 final. Available here
[11] Frontier Economics Ltd., “Pathways to high penetration of heat pumps”, 2013. Available here

make it unfavorable for investors and raise concerns about the decision of proceeding into an RHC investment.

2.2.4 Lack of knowledge and misinformation

When looking at the factors hindering the decision to adopt RHC solutions, it is also important to consider the misinformation and the lack of knowledge observable at different levels. Despite the existence of mature RHC solutions, a significant lack of awareness has been noted in the past years which is reflected by the low penetration of RHC solutions. During the last decade, a significant lack of awareness was shown by both the public and the decision makers at the EU level as reported by the studies suggesting that one third of Europeans did not have any knowledge about RHC solutions.
In part this explains the low level of activity within the RCH industry during this period[12]. To this end, various initiatives and regulations and support mechanisms have been developed to bridge this gap and raise further awareness on the decarbonization of the sector, but the situation still seems to be unsatisfactory.

2.2.5 Lack of trained professionals

The scarcity of trained professionals in the RHC section negatively impacts the decision of investors to fund the development of RHC technologies. Since most of RHC technologies are novel and often more complex, their installation demands the intervention of specialized personnel with an interdisciplinary knowledge. For example, the expanding heat pump solutions require specialized drillers, designers, and mechanics, that have received relevant training and/or acquired experience in such technologies. This shift from conventional to new heating and cooling systems, creates a certain skills gap which needs to be bridged[13]. A study from the European Technology Platform on Renewable Heating and Cooling (RHC-Platform), has shown that training programs on RHC in Europe must be increased significantly[14]. This increase does not only concern university level education, but also professional level education and lifelong education opportunities. The same study also recognized the need for developing and establishing relevant accreditation and certification schemes at EU level that must be addressed not only to RCH installation professionals but to all technicians involved at an RHC installation (including installation technicians and drillers).

2.3 Women as facilitators of RHC uptake

Women can be agents of change facilitating the uptake of renewable energy. The decentralized nature of renewable applications brings decision-making relative to energy at the household and community level, where women tend to have a greater voice. Women's inherent virtuousness along with their roles as mothers and protectors of their families and their environmental consciousness have been

[12] AEBIOM, EGEC, ESTIF, "Renewable heat sources: The best available solution to decarbonize the heating sector", Joint position paper May 2017. Available here
[13] European Commission and International Labour Office, "Skills and Occupational Needs in Renewable Energy", 2011. Available here
[14] European Technology Platform on Renewable Heating and Cooling, "Strategic Research and Innovation Agenda for Renewable Heating & Cooling", 2013. Available here

widely acknowledged in the extant literature about climate change and gender[15]. Academic evidence supports the notion that women are more motivated by environmental issues than men. However, studies on citizens' initiatives about decentralized renewable energy systems found that women are often deterred from adopting these new systems by a lack of technical knowledge and lack of time[16]. It is worth mentioning that research has shown how the broader involvement of women in various sectors brings multiple societal benefits. For example, companies investing on women and creating gender-diverse teams, experience greater innovation and creativity in their tasks that reflects in greater revenue growth than their competitors[17]. An increased gender parity in the professional environment is also linked with more effective and inclusive decision making[18], since companies with more women on the board of directors are more likely to invest in renewable energy and reduce carbon emissions[19]. Moreover, as social or business entrepreneurs, women have enormous potential for establishing and managing successful local renewable energy value chains, as they tend to be closer to their community and have good knowledge of local circumstances[20].

Apart from leadership roles, women as consumers are often the primary energy managers in their home and play a key role in shaping purchase and spending decisions for energy techs[21]. As a result, considering that decisions for investments and the utilization of RHC solutions are taken by businesses, homeowners, cities and communities at regional and local level, women in these positions have the ability to accelerate the market uptake of RHC from multiple perspectives: be it as entrepreneurs or decision-makers in businesses, as policymakers in relevant authorities or as consumers. The involvement of women, can make them effective spokespeople for the use of RHC, endorsing marketing messages and amplifying the effects of women-to-women communication strategies amongst an energy consumer segment (i.e., households and the residential sector) in which RHC can be deployed rapidly and typically without prior investment in new infrastructure, yet with large benefits for the economy as well as individual consumers.

2.3.1 State of the art of women's engagement

Despite the evident societal benefits deriving from an increased engagement of women in decision-making positions, women covering these roles are still underrepresented. The 2020 Global Gender Gap Report of World Economic Forum has emphasized that gender inequality has not been fully solved in any of the 153 countries in the world[22]. According to International Labor Organization's Report

[15] Allen, Elizabeth & Lyons, Hannah & Stephens, Jennie. (2019). Women's leadership in renewable transformation, energy justice and energy democracy: Redistributing power. Energy Research & Social Science. 57. 101233. Available here

[16] Clancy, Joy & Feenstra, Marielle. (2019). Women, Gender Equality and the Energy Transition in the EU. Available here

[17] G. Pellegrino, S. D'Amato, A. Weisberg – The gender dividend: Making the business case for investing in women, Retrieved from Deloitte, New York, 2011. Available here

[18] European Commission, "Structural change in research institutions: Enhancing excellence, gender equality and efficiency in research and innovation" (2012). Available here

[19] R. Pearl-Martinez, J. Stephens, Toward a gender diverse workforce in the renewable energy transition, Sustain. Sci. Pract. Policy 12 (1) (2016). Available here

[20] Glemarec, Y., Bayat-Renoux, F., & Waissbein, O. (2016). Removing barriers to women entrepreneurs' engagement in decentralized sustainable energy solutions for the poor. AIMS Energy, 4(1), 136-172. Available here

[21] SEforALL (2017). Scaling sustainable access pathways for the most vulnerable and hardest to reach people. Available here

[22] World Economic Forum, "Gender Gap Report 2020". Available here

World Employment Social Outlook, the rate of employed women is 48.5%, while the rate of employed men is 75%[23]. In Europe, a relative lack of female entrepreneurs is also observed – women represent roughly 52% of the overall European population but constitute only 34.4% and 30% of the EU's self-employed population and startup entrepreneurs respectively[24]. Based on the available data, it is possible to discern that a significant gender gap exists in the number of women in positions in both public and private sectors (including civil society initiatives) to influence the energy transition.

In particular, the energy sector remains one of the most gender imbalanced sectors in the economy globally. Despite recent efforts to promote and encourage women's participation, it is evident that women still face structural and cultural barriers. A recent study on the Gender Perspective of the Renewable Energy Sector by the International Renewable Energy Agency (IRENA)[25] involved a survey which attracted close to 1,500 respondents from 144 countries working for private companies, government agencies, non-governmental organizations, academic institutions, and other entities relevant to the renewable energy sector. The survey's findings have shown that women represent 32% of the fulltime employees of responding organizations, which is substantially higher than the 22% average of the global oil and gas sector. This higher percentage is attributed to the multi-disciplinary dimension of the renewable energy sector which exerts an appeal on women. Despite that, the female involvement is still low, and it is noteworthy that most involved women cover administrative positions. Specifically, female participation on administrative jobs was calculated at 45%, while the respective proportion on science, technology, engineering, and mathematics (STEM) jobs, that influence decision making the most, was as low as 28%. In addition, female involvement in key decision-making positions to renewable energy is extremely low. Globally, women represent only 6% of ministerial positions that are responsible for national energy policies and programs, accounting for less than a third of employees across fields within scientific research and development[26].

On this point, it is worth noting that within the EU only a very limited amount of gender-disaggregated data in relation to employment in the renewable energy sector is available[19]. This shortage is strongly related to the scarcity of empirical studies that evaluate gender relevant factors and is the main reason behind the lack of awareness of decision makers on the subject of gender related impact of energy policies. The International Labor Organization (ILO) reports that gender- disaggregated data in green jobs is globally limited due to the following main reasons: I) delayed reporting of official national statistics, ii) data not being collated and iii) in some cases collected but not reported or analyzed to be used beyond its collection[27]. It is undeniable that the lack of gender- disaggregated data limits the awareness on key energy challenges, such as energy poverty (please see section 2.3.2.4.2). Overall, gender-disaggregated data reflects a wider range of social characteristics and contributes to more effective policy making and better response to societal challenges.

2.3.2 Barriers for women in the renewable energy sector

The situation described in the previous section gives an overview of the limited participation of women in the renewable energy sector. The main socio-economic barriers that women experience find their roots in the gender inequalities and biases that persist and can be divided into:

[23] International Labour Organisation, "World Employment Social Outlook – Women" (2018). Available here
[24] European Commission and European Investment Bank, "Funding women entrepreneurs How to empower growth" (2020). Available here
[25] IRENA, "Renewable Energy: A Gender Perspective" (2019). Available here
[26] EIGE, Gender and Energy, 2016, Luxembourg: Publications Office of the European Union. Available here
[27] ILO, "Gender Equality and Green Jobs – Policy Brief" (2015). Available here

- **Perceptions of gender roles** – linked to the environment.
- **Entry barriers** – referring to the obstacles encountered when entering the sector.
- **Barriers in job retention and career advancement** – referring to the professional hindrances that women of the sector face either in continuing their career or advancing it.
- **Access to energy barriers** – referring to the obstacles that women face as consumers due to the lack of a gender perspective in energy policies.

Perceptions of gender roles

To examine the obstacles that women are facing to access the renewable energy sector and conclusively the RHC sector, it is important to shed light on the limiting factors that are influencing women entering this specific job market. The pursuit of a degree in Science, Technology, Engineering and Mathematics (STEM) is a prerequisite to enter this market and in general for a career in renewable energy. However, the degree of female participation in STEM subjects through all levels of tertiary education is extremely low. In Europe, female graduates from STEM schools at B.Sc. and M.Sc. levels are 32% and 36% respectively. This figure is 23% lower than the corresponding average rates for the tertiary education. Female representation in doctoral graduates is slightly higher, reaching 39% (9 % lower than their share in other fields) [28].
The major barriers that affect women's decision to engage in STEM studies are linked with perceptions of gender roles. These are regarded as the most important barriers for entering the energy sector and are driven by cultural and social norms. STEM skills are critical for developing many career paths in renewable energy, but the prevailing views of women's capabilities and interest discourage them from pursuing such career choices. These assumed gender norms are deriving from multiple and overlapping factors that influence girls at an early age in their choices of higher education and consequently negatively impact the possibility of having a career in the renewable energy sector. These factors can be grouped as follows: I) individual level, ii) family and peer level, iii) school level and iv) societal level[29].

Individual level factors

These factors can be divided into three different categories that influence the individual.
Self-perception stereotypes and STEM identities: Socially constructed gender stereotypes about STEM education are prevalent and during the socialization process girls learn and develop gender roles. Research has demonstrated that such stereotyped ideas about gender roles appear at an early stage, even in families that promote gender equality[30]. Two predominant stereotypes in relation to gender and STEM are that "boys are better than girls at math and science" and "science and engineering careers are masculine domains"[31]. Such stereotypes, as highlighted by research, have a negative impact on girl's interest, engagement, and achievement in STEM from a very early age[32].
Self-efficacy: Gender stereotypes and biased perceptions are also leading to a reduced self-efficacy from girls in STEM subjects, which also affects the outcomes of their education in STEM subjects,

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[28] European Commission, "She Figures 2018" (2019). Available here
[29] UNESCO (2017) Cracking the code: Girls' and women's education in science, technology, engineering and mathematics (STEM). Available here
[30] Lippa, R. A. 2005. Gender, nature and nurture, 2nd edn. Mahwah, NJ, Lawrence Erlbaum Associates. Available here
[31] Hill, Catherine & Corbett, Christianne & Rose, Andresse. (2010). Why So Few? Women in Science, Technology, Engineering, and Mathematics. American Association of University Women. Available here
[32] McGuire L, et al "A. STEM gender stereotypes from early childhood through adolescence at informal science centers". J Appl Dev Psychol. 2020 Mar-Apr;67:101109. Available here

performance, and aspirations for STEM related careers[33]. According to the OECD's Programmed for International Student Assessment, PISA of 2015, there is a clear relationship between the gender gap in science self-efficacy and the gender gap in science performance, particularly among high-achieving students[34]. This relationship indicates that the awareness of differences in science performance influences self-efficacy.

Interest and engagement: Undeniably, interest is one of the main factors for the engagement of girls in STEM subjects at school years, their subject choices in higher education and their career plans. A meta-analysis of gender differences in occupational interests, showed a consistent finding over time and across age groups that usually "men prefer working with things and women prefer working with people"[35]. This preference combined with prevalent teaching practices, especially at earlier grades, is deterring girls from engaging with STEM studies. The lack of role models and mentorship opportunities is also to be considered as an obstacle from engaging with STEM subjects[36]. Presenting successful cases of women in STEM, can benefit and stimulate engagement and motivation among girls.

Family and peer level factors

These factors refer to the influence from family and peer environment and can be grouped under three main categories.

Parental background: Parents with traditional expectations of gender roles can amplify gender-based behaviors and attitudes in children, reinforcing negative stereotypes about gender and ability in STEM[37]. The OECD's Programmed for International Student Assessment, PISA of 2012, has shown that there is a higher probability for boys compared to girls to engage in science-related activities outside school[38]. The influence that parents have on the career choices of their children has proven to be significant. Research suggests that the career choices of girls are influenced more by their parents' expectations, while the career choices of boys are more influenced by their own interests[36]. However, parents with STEM-related backgrounds are more likely to familiarize girls with such subjects and the prospects of a related career and break the belief that STEM-careers are not compatible with family life[39]. Various studies have demonstrated that women with a STEM career are more likely to have parents with STEM backgrounds, than their male colleagues[40].

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[33] Adedokun, O. A., Bessenbacher, A. B., Parker, L. C., Kirkham, L. L. and Burgess, W. D. 2013. Research skills and STEM undergraduate research students' aspirations for research careers: Mediating effects of research self-efficacy. Journal of Research in Science Teaching, Vol. 50, No. 8, pp. 940-951. Available here

[34] OECD. 2016. PISA 2015 Results (Volume I): Excellence and Equity in Education. Paris, Organization for Economic Co-operation and Development. Available here

[35] Su, R., Rounds, J. and Armstrong, P. I. 2009. Men and things, women and people: A meta-analysis of sex differences in interests. Psychological Bulletin, Vol. 135, No. 6, pp. 859. DOI: 10.1037/a0017364. Available here

[36] Knezek, G., et al, D. 2015. Gender differences in conceptualizations of STEM career interest: Complementary perspectives from data mining, multivariate data analysis and multidimensional scaling. Journal of STEM Education, Vol. 16, No. 4, pp. 13-17. Available here

[37] Wang, M. T. and Degol, J. 2013. Motivational pathways to STEM career choices: Using expectancy-value perspective to understand individual and gender differences in STEM fields. Developmental Review, Vol. 33, No. 4, pp. 304-340. Available here

[38] OECD. 2015. The ABC of Gender Equality in Education: Aptitude, Behaviour, Confidence. Paris, Organization for Economic Co-operation and Development. Available here

[39] Tan, E., Calabrese Barton, A., Kang, H. and O'Neill, T. 2013. Desiring a career in STEM-related fields: How middle school girls articulate and negotiate identities-in-practice in science. Journal of Research in Science Teaching, Vol. 50, No. 10, pp. 1143-1179. Available here

[40] Plasman, Jay et al. (2020). Parents' Occupations and Students' Success in STEM Fields: A Systematic Review and Narrative Synthesis. Adolescent Research Review. Available here

Other family characteristics: The socio-economic status of the household also plays a significant role, since a higher-than-average status has been associated with higher scores in mathematics for both boys and girls[36]. This can be attributed to parents providing additional learning support, the family's higher academic expectations, and less conventional beliefs about gender roles and career paths in STEM[41]. In addition, families with limited resources are often likely to not have the funds, time, or connections to promote STEM learning for their children[42]. Ethnicity, native language, immigrant status and family structure may also affect a girls' participation and performance in STEM[42]. However, despite lower performance, students from immigrant background, are 50% more likely than non-immigrant students with the same science scores, to expect to have a science-related career[30].
Peer influence: Peer influence is also affecting to a high extent children's beliefs, behaviors, academic achievement, and motivation, especially during adolescence. Students that interact mainly with peers who value academic achievements and performance have higher chances to appreciate more STEM[43]. In a similar fashion, girls can be discouraged from following STEM subjects, if their peers and direct environment view such subjects as unsuitable for women. Female peers may significantly affect a girl's interest and confidence in STEM depending on their own experience and performance[44].

School-level factors

The influencing factors at school level are grouped into the following categories:
Teachers: The quality of teaching and pedagogical competence can be a crucial factor affecting the participation and learning achievements of girls in STEM. While most research performed on teacher quality is not focusing on gender differences, some studies that have noted teachers as being of a special influence on the engagement and participation of girls in STEM subjects. For example, in a US study, teachers were highlighted as the only significant predictor of a girl's interest and confidence in STEM at low grades[45]. Several studies have found that girls' perceptions, interest, and confidence in STEM subjects as well as STEM-related career aspirations are positively influenced by female teachers[46] [47]. Similarly, as the UNESCO's 2016 Global Education Monitoring Report demonstrated, girls have higher chances to show a high performance in introductory STEM subjects and follow STEM careers when taught by female teachers[48].
Teaching methods: The PISA 2012 study, indicated that the usage of cognitive-activation strategies, which promote a more interactive learning, can improve performance in STEM. Specialized teaching strategies (such as participatory or inquiry-based teaching) have been found particularly helpful to girls

[41] Tenenbaum, H. R. and Leaper, C. 2003. Parent-child conversations about science: The socialization of gender inequities? Developmental Psychology, Vol. 39, No. 1, pp. 34-47. Available here
[42] Bystydzienski, J. M., et al. 2015. High school is not too late: Developing girls' interest and engagement in engineering careers. The Career Development Quarterly, Vol. 63, No. 1, pp. 88-95. Available here
[43] Jones, M. et al (2012). Relationships Among Adolescents' Perceptions of Friends' Behaviors, Academic Self-Concept, and Math Performance. Journal of Educational Psychology. 104. 19-31. Available here
[44] Leaper, C., Farkas, T. and Brown, C. S. 2012. Adolescent girls' experiences and gender-related beliefs in relation to their motivation in math/science and English. Journal of Youth and Adolescence, Vol. 41, No. 3, pp. 268-282. Available here
[45] Heaverlo, C. A., Cooper, R. and Lannan, F. S. 2013. Stem development: Predictors for 6th-12th grade girls' interest and confidence in science and math. Journal of Women and Minorities in Science and Engineering, Vol. 19, No. 2, pp. 121-142. Available here
[46] Unterhalter, E., et al. 2014. Interventions to Enhance Girls' Education and Gender Equality. Education Rigorous Literature Review. London, Department for International Development. Available here
[47] Stearns, E., et al. 2016. Demographic characteristics of high school math and science teachers and girls' success in STEM. Social Problems, Vol. 63, No. 1, pp. 87-110. Available here
[48] UNESCO. 2016. Global Education Monitoring Report 2016: Education for People and Planet: Creating Sustainable Futures For All. Paris, UNESCO. Available here

and reducing the gender gap in STEM achievement, while being beneficial for all students[43]. For increasing the engagement of girls to STEM, teachers have also to be aware of and manage gender dynamics in classroom interactions, between teachers and students and among students themselves. *Learning materials*: Inhibiting factors to the involvement of women in STEM subjects are widely presented in learning materials as well. For example, explicit and implicit messages on the representation of both genders, that are conveyed in school textbooks can reinforce the existing stereotypes and discourage girls from pursuing STEM careers[49]. In addition, many traditional STEM topics are illustrated through learning material in a way that is more aligned to the interest of boys[50]. Therefore, curricula and other teaching materials should consider the perspective, learning style and interests of girls to be more appealing.

Societal level factors

Factors hindering the engagement of women in STEM studies and defining the perceptions about the fields of study or employment that can be more appropriate for men and women are to be found at the societal level. An increased participation of women in STEM education is more common in more inclusive societies where female representation is high in all four strands of the quadruple helix[51]. In this sense, setting up supportive policies and legislation can be effective for empowering female participation in STEM fields and in the RHC sector. At this point it is useful to note that mass media have a significant influence at societal level on gender bias and stereotypes. Specifically, for gender bias in STEM studies, the portrayal of STEM professionals through the media can affect the way that girls can consider their future professional identities and options[52].

Entry barriers

Low female participation in STEM studies is reflected in a low number of female professionals in the renewable energy sector. Even when women pursue a career in renewable energies, they encounter barriers that prevent them from having a high-end career within the sector. As a matter of fact, women in the renewable energy sector are more likely to be employed in non-technical, lowly paid, administrative, and public relations positions than in technical, managerial, or policymaking positions[53]. Below the main factors that are obstructing women from following a career in the renewable energy sector after the involvement in STEM studies:

Perceptions about the nature of the sector

Negative perceptions about certain trades in the renewable energy sector (such as construction workers, electricians, heavy duty mechanics etc.) persist among women that have undertaken STEM studies and act as a barrier. Women occupied in engineering trades sometimes face issues such as harassment and feeling undermined which creates a feeling of exclusion as "not being one of the

[49] Eurydice. 2010. Gender Differences in Educational Outcomes: Study on the Measures Taken and the Current Situation in Europe. Brussels, Eurydice. Available here

[50] Baker, D. 2000. Teaching for Gender Difference. Research Matters - to the Science Teacher. National Association for Research in Science Teaching. Available here

[51] McDaniel, A. 2015. The role of cultural contexts in explaining cross-national gender gaps in STEM Expectations. European Sociological Review, Vol. 32, No. 1, pp. 122-133. Available here

[52] Steinke, J. 2016. Cultural representations of gender and science. Portrayals of female scientists and engineers in popular films. Science Communication, Vol. 27, No. 1, pp. 27-63. Available here

[53] IRENA, "Renewable Energy and Jobs" (2013). Available here

boys”[54]. This kind of misperception comes from the conviction that these jobs require greater physical strength. While this was true in the past years, the mechanization and automation of many tasks have minimized the importance of physical strength for carrying out such tasks. However, the perception that women are less suitable for technical jobs compared to men, even if they have the same or higher qualifications, still exists[55]. Moreover, women’s self-perception still plays an important role as such perceptions can either discourage women from looking for relevant career opportunities, but also result in obstacles for hiring women or advancing them within the sector.

Lack of access to career information

Unlike men, women tend to have restricted access to information about positions in non-traditional sectors, including energy. Usually, such information is available through personal networks that can be critical for entering a sector. Women are reported to face bigger difficulties approaching such networks in non-traditional occupations, what puts them in a disadvantaged position in obtaining timely and accurate information for identifying job vacancies[28]. Especially for renewable energy careers that are often not promoted enough through formal channels (i.e., career counsellors, student employment advisors, career fairs, etc.). Many women employed within the sector report that they had no information about renewable energy careers during their student years[56].

Application and hiring practices.

Studies from the conventional energy sector and other non-traditional occupations such as mining, have shown that women tend to follow different approaches when applying for job openings. Men are often found to apply even when they meet part of the job’s requirements, while women tend to apply only when meeting all requirements[21]. Moreover, positions as the ones from the energy sector, traditionally were not designed having women in mind and considering that at most cases, managers are highly likely to be men, they might not regard women as suitable candidates. In fact, GWNET, the Global Women’s Network for the Energy Transition, has recognized prevailing hiring practices as the most important barrier for women to enter the renewable energy sector together with cultural and social norms[57]. It is also worth mentioning that hiring managers might prefer not hiring women, to avoid providing the benefits that are foreseen by legislation or by the organization’s policies[58].

Apprenticeships can serve as an entry point for women in the renewable energy sector, since their completion can provide the required skillset and knowledge for pursuing a relevant career. Nevertheless, an extreme gender imbalance has also been noted. Even if there is a lack of gender-disaggregated data, there are indications that female participation in apprenticeships on non-traditional to women sectors is low[59]. Considering that as in job openings, securing a trade apprenticeship can regularly involve informal networking, women can face similar difficulties in being selected as an apprentice.

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[54] McFarland, J., Are there jobs for women in green job creation?, Women & Environments International, Vol. 94/95, 2015, pp. 22-25. Available here

[55] Baruah, Bipasha. (2016). Renewable inequity? Women's employment in clean energy in industrialized, emerging and developing economies. Natural Resources Forum. 41. 10.1111/1477-8947.12105. Available here

[56] Baruah, B. (2018), Barriers and Opportunities for Women’s Employment in Natural Resources Industries in Canada, Natural Resources Canada. Available here

[57] GWNET, “Women for Sustainable Energy: Strategies to Foster Women’s Talent for Transformational Change” (2019). Available here

[58] IRENA, “Renewable Energy: A Gender Perspective” (2019).

[59] O’Brien, C. (2018), Apprenticeships: A welcome growth in numbers, The Irish Times, 23 March. Available here

Barriers to job retention and career advancement

Finding a balance between work and family responsibilities is one of the main reasons leading women to drop a job position, especially around the childbearing years. As a result, it is more common among women not to be able to advance within their working sector or not to be able to retain their position. Long or multiple breaks during the career path may cause women to no longer possess up-to-date skills or lack knowledge of the latest scientific advances and technologies. In addition, women that are taking multiple career breaks, often experience a negative effect on their career advancement since their employer can question their commitment.

Wage gaps

As in other sectors, the renewable energy sector is alco characterized by wage inequity between men and women. Despite the lack of gender-disaggregated data in relation to employment in the renewable energy sector, there are indications in OECD countries that women still earn less than men on average in the sector[60] [28]. Similarly, to other sectors, the causes behind this gap are varied and include: the general phenomenon of women's being widely employed in lower paid, non-technical, administrative positions and/or junior positions, their comparatively weaker negotiating positions, the high probability for having career breaks for parenting and the prevailing misperception and gender bias that are met in many employers.

Work requirements

The 2019 IRENA survey on the renewable energy sector has demonstrated that rigid or hectic work schedules are often regarded as a key barrier for women to retain their position[28]. This condition of course, is not limited to the renewable energy sector, and show the need for a broad societal change. Mobility requirements are also a considerable issue for women working in the sector, since many positions have in-field requirements (i.e., project planners or installers). This type of positions might require frequent travels, relocation and/or prolonged periods away from home and family since the locations of many renewable energy projects tend to be determined in isolated areas with no provisions for the families of workers[56]. Although this might be challenging for both men and women, women with family-related responsibilities (i.e., childcare) face a significant disadvantage. Furthermore, many women who are able and willing to work in the sector might not be given the option to be employed due to persistent male-biased norms that can often be unintended or unconscious[61]. In addition, the renewable energy sector is not very flexible in terms of providing opportunities for part-time work that would be a solution for women with increased household responsibilities, since the majority of the sector's workforce is comprised of full-time workers[62].

The glass ceiling

The term "glass ceiling" refers to the lack of equal representation of women in decision-making roles, where certain barriers prevent women from rising to more responsible and influential positions, regardless of their experience and qualifications. This is not only observed within the renewable energy sector but in several business sectors and is mainly attributed to the prevalent gender stereotypes and biased perceptions. Despite the low-level of available gender-disaggregated data, the 2019 IRENA

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[60] Antoni, M., M. Janser, and F. Lehmer (2015), The hidden winners of renewable energy promotion: Insights into sector-specific wage differentials, Energy Policy, Vol. 86, pp. 595 613. Available here
[61] Carpenter, J. P., P. H. Matthews, and A. Robbett (2015), Compensating differentials in experimental labor markets, IZA Discussion Papers 8820, Institute for the Study of Labor (IZA), Bonn. Available here
[62] ILO, "Skills and Occupational Needs in Renewable Energy", 2011. Available here

survey on the renewable energy sector gives some preliminary insights that can work as a reference for future research. According to the survey's findings, men accounted for 65% of board members from the participating in the survey private sector firms[28]. Similar levels of male majority were found as well on national agencies and intergovernmental organizations that participated in the survey, but NGOs presented more gender-balanced boards. Increasing female participation in decision-making levels, is critical for establishing more supportive institutional environments where women can feel more empowered and equal in non-traditional to women sectors[63].

Access to energy barriers

The concept of access to energy is broader than availability and connectivity of electricity and includes the concept of affordability. The gender perspective is attracting national and international attention during the last years, since tackling gender inequity in energy access is reflected in the Sustainable Development Goals (i.e., access to clean and affordable energy and achieving gender balance in employment). To ensure that the issue of inequity in energy access is considered in future RHC deployment this aspect will need to be considered in future energy pricing policies. The main barriers that need to be overcome through these policies are identified below:

Cultural and social norms

Prevailing cultural and social norms preventing women from choosing non-traditional employment sectors along with limited access to information, skills and training have also an impact on women's engagement with the economic and political spheres. As a matter of fact, these factors are also discouraging women from being engaged with local energy initiatives. Such initiatives can be integral for improving access to energy and the quality of life at a local level. In addition, running a decentralized energy system often requires deep knowledge of regulations, business models, and financing that women are often lacking, as well as a large amount of time, that women often lack due to home caring activities [21].

Energy poverty

An unjust and unequal access to energy efficiency policies is bound to cause the so-called 'Matthew-effect' of energy transition: the ones having the possibility to invest in energy efficiency benefit from such policies, whereas the poor remain in energy poverty. The establishment of inclusive and supportive energy policies for vulnerable groups are key priorities in the EU[64]. Inequalities in access are more evident, as energy prices between Member States demonstrate high differences. Within the period between 2008 and 2015 the average energy prices increased notably, with electricity (15% to 25%) and gas (10%) showing the highest raise[65].

Increased energy prices have a strong impact on single-person households relying on just one single income, the majority of which are female-headed households, sometimes with children. Considering this fact and existing wage gaps, women are more likely to experience energy poverty. The literature reports that female-headed households are more common and therefore tend to be at higher risk of energy poverty. It is also noteworthy that among the female-headed households, energy poverty was

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[63] Agarwal, B. (2010), Does women's proportional strength affect their participation? Governing local forests in South Asia, World Development, Vol. 38/1, pp. 98 112. Available here

[64] Sovacool, Benjamin & Dworkin, Michael. (2015). Energy justice: Conceptual insights and practical applications. Applied Energy. 142. 435-444. 10.1016/j.apenergy.2015.01.002. Available here

[65] Ecofys, Prices and costs of EU Energy, Utrecht, The Netherlands, 2016. Available here

higher for single-parents-households and women of 65 years and above[66].For this reason, gender issue for access to energy is timelier than ever[67] [19]. However, there is a lack of awareness of the gender dimension of energy poverty in Member States, not only at the national and regional level, but also among civil society and the academia[19]. This is largely attributed to the limited availability of gender-disaggregated data.

Energy consumption

Current gender-neutral energy policies do not allow to set up of a regulatory and policy landscape for an inclusive and energy efficient society. The current schemes fail to address energy poverty and to consider the perception of women in energy consumption. From a consumer's perspective, women represent a significant target group to be taken under consideration. Women usually spend more time at home and manage most of home energy consumption, since according to the global labor force participation rates, women reach a 49% while men's rate is of 75%[68]. However, according to surveys conducted by the OECD, women tend to be more sustainable consumers and more sensitive to ecological, environmental and health concerns[69]. Similarly, results from EIGE studies suggest that men consume more energy than women, due to higher intensity of use, while women are more likely to feel more responsible for their ecological footprints and more willing to support "green" measures[70].

2.4 Conclusions

Based on the findings of this desk research, promoting the engagement of women within the renewable energy sector is expected to be **highly beneficial** for society as a whole and for higher deployment of renewables in Member States. Apart from the well-documented benefits of gender-balanced organizations with women in decision-making positions, that stand out for **economic growth and performance**, further benefits are expected to be brought at the **societal level**. Women's increased awareness of their ecological footprint makes them the primary target for the adoption of solutions that bring a lower environmental burden. Additionally, a non-biased renewable energy sector that is not influenced by gender stereotypes will be more inclusive and aligned with sustainable development goals for a higher gender balance, with equal rights for both genders. The emerging issues of energy poverty and the lack of awareness in different consumption needs between genders are also an important societal challenge requiring a gender focus and the development of relevant policies. Therefore, facilitating the participation of women in the renewable energy sector by tackling the barriers presented above, represents a significant priority for a more inclusive, sustainable, and resilient society.

[66] Sánchez, Carmen & Sanz-Fernández, Ana & Aja, Agustín. (2014). Income, energy expenditure and housing in Madrid: Retrofitting policy implications. Building Research & Information. 43. 1-13. Available here
[67] EIGE, Gender Equality Index 2017: measuring gender equality in the European Union 2005 – 2015, Report, 2017, Luxembourg: Publications Office of the European Union. Available here
[68] ILO Infostories, "The gender gap in employment: What's holding women back?", 2017. Available here
[69] OECD, "Gender and Sustainable Development – Maximising the Economic, Social and Environmental Role of Women", 2008. Available here
[70] EIGE, Review of the Implementation in the EU of area K of the Beijing Platform for Action: Women and the Environment Gender Equality and Climate Change, Report, 2012, Publications Office of the EU. Available here

3 INTERVIEWS

3.1 Interview's methodology

This section describes the methodology employed for identifying the needs, requirements of the stakeholders and includes the following elements:

1. Interview and Sampling Methodology
2. Participant target groups
3. Procedure followed
4. Interview Questionnaires Overview

Moreover, the project's Privacy Policy (Annex I), the Consent Form (Annex II), the Data Subject Request Form (Annex III) and the interview questionnaire (Annex IV) are annexed to this report.
With that in mind, the following sections present each element of the methodology in detail.

3.1.1 Interview and sampling methodology

The interview-based analysis of the needs, perceptions and challenges of the stakeholders and market actors, in the RHC market, will be based on a semi-structured, in-depth, qualitative study. In particular, a well-tailored sampling scheme was employed in order to include participants from all four groups of the quadruple helix - both women and men - and to enhance representativeness. Participants involved in the interviews varied across stakeholder roles and geographic locations and were selected by the project members, after being identified as impactful to the project's expected outcomes.

3.1.2 Target groups

The stakeholders interviewed were divided into the four main categories of the Quadruple Helix:

- **Authorities:** Regional authorities, policymakers, etc.
- **Business:** Energy suppliers, technology installers, technical consultancies, women-led businesses in RHC, etc.
- **Academia:** Women-led research projects and studies, etc.
- **Civil society:** NGOs, consumer associations, action groups, networks supporting women in RHC.

All project partners contributed to the identification of five potentially relevant stakeholders, from one or more of the aforementioned groups, in each considered country. Specifically, two out of these five stakeholders were chosen among authorities/policymakers. The remaining three belonged to any or each one of the other categories. The interviews addressed both female and male respondents.
The reason behind this choice is linked to the optimization of project activities. As a matter of fact, both tasks T1.2 and T1.1 were running interviews addressing the same group of stakeholders, namely authorities and policymakers, in parallel. For this reason, an additional questionnaire was created for this specific category, combining questions for both T1.1 and T1.2. For the other categories, the questionnaire originally developed for T1.2 was used (see Annex 1 and Annex 2).

Partners were assigned a minimum number of five interviewees within their region and according to their foreseen PM effort for this task. Accordingly, the allocation of interviewees to the partners was as follows:

	Greece (Q-Plan)	**Germany (S2i)**	**Belgium (WR)**	**Italy (APRE)**	**Denmark (EGC)**	**Slovakia (PEDAL)**	**Norway (ECWT)**	**Bulgaria (EAP)**	
Authorities	2	2	2	2	2	2	2	2	
Business, Academia, Civil society	3	3	3	3	3	3	3	3	
TOTAL	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**Total: 40**

Table 1 Stakeholder's assignment per partner

The total number of interviews resulting from Table.1 is **40** (minimum number of foreseen interviews under WP1:36)**.**
Finally, the actual total number of interviews carried out was as follows:

	Greece (Q-Plan)	**Germany (S2i)**	**Belgium (WR)**	**Italy (APRE)**	**Denmark (EGC)**	**Slovakia (PEDAL)**	**Norway (ECWT)**	**Bulgaria (EAP)**	
Authorities	2(m,m)	2(f,f)	3 (f,f,f)	1(f)	2(m,f)	2(f,f)	2(f,m)	2(f,f)	
Business	1(f)	5 (m,m,m,f,f)	1 (f)	1(f)	-	2(m,m)	-	1(m)	
Academia	2(f,m)	1(f)	1 (f)	3(m,f,f)	1(f)	1(m)	1 (f)	1(f)	
Civil society	-	2(m,f)	1 (f)	-	2(f,m)		1(f)	2(f,f)	
TOTAL	**5**	**10**	**6**	**5**	**5**	**5**	**3**	**6**	**Total: 45**

Table 2 Actual numbers of interviews carried out and sex of respondents (f = female; m = male)

Of the total 46 respondents that participated to the interviews were 15 of them were male and 31 of them were female

3.1.3 Procedure followed

Participants were recruited from a variety of different contexts, namely businesses, academia, authorities, and civil society. It must be underlined that the privacy of the participants was assured at all stages of the interview study, in compliance with the principles of GDPR.
All interviewees were invited to participate over the phone/Skype since the current Covid-19 measures do not facilitate face-to-face interviews. The procedure to be followed is based on the following phases and steps:

Phase I: Identify potential participants and make efforts to recruit them for the interview process. Estimated timeline 2 weeks.

In synergy with all the partners participants from the stakeholder groups of the 8 target regions were identified, invited, and informed of the data management plan concerning the content of their interviews ensuring their anonymity and compliance with GDPR rules. The participants were in fact provided with the "Privacy Policy", included in Annex I, the "Informed Consent Form", included in Annex II, and the Data Subject Request Form, included in Annex III, before carrying out the interview. The interviewees completed, signed, and returned the Consent Form before participating in the interview process so as to abide by personal data protection laws and regulations.
The interviewee was then informed of the estimated duration of the interview (30 minutes) and provided with the questionnaire. Finally, all the W4RES interviewers were able to thoroughly prepare for the interview using the interview guide redacted by WR that was circulated among the partners.

Phase II: Conduct the interview process via digital means. Estimated timeline: 01/12/2020 – 31/01/2021.

The second phase regards the actual implementation of the interview through digital means. The interviews were based on questionnaires according to the interviewees' sector, i.e., combined questionnaire for T1.1&T1.2 and lasted approximately 30 to 40 minutes. The interviewees had the chance to give their feedback and were encouraged to participate to following activities.

Phase III: Share the reporting templates with White Research for analysis and send the consent forms to the project coordinator for safekeeping. Estimated deadline 04/02/2021.

As a last step, interviewers reported the findings from the interviews in the specific Reporting Template that was provided by White Research for further analysis and integration. The study as well as the integrity and privacy of the participants were assured at all stages of the study, in compliance with the principles of GDPR.
Eventually, the overall timeline that was originally estimated to expand over 5-6 weeks, was extended until the end of February to allow for the collection of a bigger number of interviews.

3.1.4 Interview questionnaire overview

To investigate the existence of any gaps hindering the involvement of stakeholders in the RHC sector, and to evaluate the perception of all stakeholders with respect to the position of women in the RHC sector, the following research questions have been defined:

I) **Identify needs, perceptions and challenges of market actors and stakeholders across the quadruple helix in the 8 regions regarding the uptake of RHC solutions.**
II) **Identify needs, perceptions and challenges of market actors and stakeholders across the quadruple helix in the 8 regions regarding the role of women in RHC.**

Based on the research questions, the interview questions have been grouped according to the following topics:
i. Perceptions regarding the uptake of RHC solutions in the country

The focus of the first group of questions was to gather valuable feedback on defining the general perceptions around the RHC sector in the 8 considered regions. In particular, the first block addresses the first research question and aims to identify key internal dimensions and aspects influencing willingness and ability to accept, use, promote or hinder investments in RHC and get insights on the role that each stakeholder can play in supporting the uptake of RHC and the local RHC opportunities and challenges she/he encounters.

ii. Perceptions regarding the role of women in RHC in the country

The second part of the questionnaire focused on the main scope of the project – the role of women in RHC and aims at responding to the second research question. Specifically, the second block aimed to define the current progress towards achieving gender equality and the gaps and barriers that hinder or slow down an active involvement of women in the RHC landscape, e.g., differentiation in offered opportunities, stereotypes, inequalities, access to networks or finance, etc.

3.2 Analysis of interviews

This section presents the analysis of the information that was collected through the interviews and aims to showcase the key insights that arose from the interviewees' knowledge and experience on the current deployment of RHC solutions in their country and the role of women in the sector.

Based on the scope of the questionnaire, the following high-level question topics were developed:

1. **Perceptions regarding the uptake of RHC solutions in the country**
- Uptake of RHC solutions
- Factors facilitating the uptake of RHC solutions and the participation in the sector
- Factors limiting the uptake of RHC solutions
- Inclusiveness of the RHC sector
- Possible measures to support the uptake of RHC solutions

2. **Perceptions regarding the role of women in RHC in the country**
- Women's involvement in the RHC sector
- Perceived benefits deriving from the involvement of women
- Perceptions regarding the barriers faced by women in the RHC sector
- Measures to support the involvement of women in the RHC sector

(for the full questionnaire(s) see Annex 1 and Annex 2)

The analysis in the following section is based on the information included in the interview reports provided by the W4RES partners interviewing the different stakeholders in their countries.

3.2.1 Belgium

Perceptions regarding the uptake of RHC solutions in Belgium

Uptake of RHC solutions

Most of the respondents agree that **the potential of RHC technologies in Belgium is underestimated** and very few initiatives are put in place. The decarbonization of electricity energy production has recently accelerated in the country but the same does not apply to the RHC sector which has issues that are much more difficult to tackle. Respondents declared that the situation has been improving,

but the progress is going slowly. A respondent claimed that overall in Belgium, around 50% of building are heated by gas, and around 35% by fossil fuels (mostly crude or fuel oil) and that in urban areas like Brussels for example, heating is accountable for around 60% of CO_2 emissions.
In newly built houses there is a good penetration of **heat pumps** and powered by renewable energy sources, **geothermal energy**. **District heating** based on renewable is also reported as increasingly popular, but the process of refurbishment of already existing buildings is moving forward too slowly.
The other most prominent types of RHC technologies and sources employed in Belgium according to the respondents are **solar thermal, geothermal, bioenergy solutions, solar district heating** used mainly in building applications.
One of the respondents identified **Combined Heat and Power (CHP)** as a solution with good potential as well even if it remains a niche. CHP is generating mostly electricity by capturing the heat that would otherwise be wasted for the buildings' energy needs. Such systems are perceived as efficient by the respondent and are supported by a certificate system making the technology economically and financially interesting.

Factors facilitating the uptake of RHC solutions and the participation in the sector

Overall, it appears that there is a growing trend in large scale applications and that on the **technical front** all the RHC solutions listed above are seen as perfectly feasible in the country. One of the respondents referred to the "Certification PEB" (a system for energy certification for houses) as a facilitating factor. In order to allow the potential tenants to evaluate the different apartments in terms of their energy efficiency performance, every house and every office on sale or available for rent, need to have the already mentioned Energy Performance of Buildings Certificate, which identifies its energy efficiency level.
On the more regional level the interviewees suggested another facilitating factor: the specific article of a recent renewable energy directive is setting a soft target of 1,3 % increase per year in RHC. It was argued that even if the target is not radically ambitious and still not binding, it is the first time that at EU level the needs for heating and cooling are being taken seriously under consideration and the first time that a specific provision for RHC being incorporated in legislation.
For most of the respondents, the driver to a career in energy was **personal interest and passion** in the topic. For some of the respondents, this passion started during their studies.

Factors limiting the uptake of RHC solutions

Considering the limiting factors, respondents observed that:

- **Installers lack the appropriate knowledge** of RHC solutions and they tend to advise homeowners to buy fossil fuel heaters because they are more familiar with them.
- RHC solutions are demanding **high cost of solutions** (such as district heating) and cannot compete with the low prices of carbon. The **return on investments is too low** or often very uncertain, which discourages a further expansion of the sector.
- Respondents belonging to the civil society category identified in the **lack of regulatory framework and middle/long term political vision** the main obstacle for the investors willing to enter the RHC sector together with a **lack of technical knowledge and capacity at local administration level**.
- **Complexity of the RHC sector**, where the stakeholder involvement is much larger. With more actors involved in the decisions and in the implementations the process slows down significantly.
- **Lack of technical instruments** (those required to setting up district heating for example).
- **Lack of awareness** on the specificities of the heating systems and on the real impact in terms of C02 of heating and cooling constitutes an important factor.

- **Low quality of many RHC projects** asking for funding and the inability to transfer financial arrangements put in place for electricity production to heating and cooling.
- Not all the buildings especially in more densely populated urban areas have the **spatial requirements** for installations such as heat pumps and solar panel on their roofs.
- Houseowners replace their installations at the end of their current system lifecycle. The urgency caused by the need to replace the system, leads them to turn to traditional installations that they know and trust, not considering the deployment of RHC solutions.

Inclusiveness of the RHC sector

While the energy independence gained through installation of RHC could empower some of the more vulnerable categories, **access to the funding** necessary to install such solutions still **constitutes a major barrier** for lower income families and other vulnerable categories. Overall, it is reported that in Belgium the **accessibility to financing varies from region to region** and the lack of knowledge regarding the existence of solutions and financing options is the main obstacle to the further development of the sector.

Respondents claimed that there is a big difference between owners of houses, tenants and those who live in social housing facilities. For the owners of houses and buildings RHC is taking up but more vulnerable groups are not building new houses. **Social housing companies are** increasingly more interested in RHC tech, sometimes becoming even frontrunners in the sector pushing for change. From their perspective they can offer solutions for more vulnerable groups. On the other hand, those who live in existing buildings are the most difficult to reach and most of those who fall in the categories of vulnerable social groups rent apartments. The tenants, not owning the house they live in, are reported to be much harder to get involved in the transition towards RHC solutions.

Possible measures to support the uptake of RHC solutions

The main measures recommended by the respondents were the following:

- Setting up energy **communities**.
- **Awareness raising, support and counselling for homeowners** incentivizing the shift towards RHC not only at the end of the previous appliance lifecycle, but also earlier when the customer does not have to make rushed decisions.
- **Introducing RHC targets at national level** in parallel with support for meeting the targets, both for industries and for buildings and individuals (e.g., subsidies, structural funds).
- **Increasing carbon pricing measures** to make traditional appliances less appealing.
- **Targeted financing for social housing** that showed to be front runners in the RHC field and are motivated to drive change. Moreover, social housing is often owned by the public sector, which makes them a good case for examples of a successful application of RHC.
- Development of **effective policies.**

Perceptions regarding the role of women in RHC in Belgium

Women's involvement in the RHC sector

In general, respondents from Belgium report a **lack of female involvement in the more technical side of the energy sector and in the top leadership decision-making positions**. Most women in the sector tend to cover positions in marketing and awareness rising, while technical positions (e.g., installation of solutions) are mainly covered by men. The policy field is more populated by women with the gender gap shrinking considerably.

Overall, it is reported that the share of **women choosing technical education is much lower** than men which translates into less women involved in the more technical sectors. Most women employed in the sector have a background in economics, architecture, environmental transition. At the same time, another field of work/study that has become relevant within heating and cooling is policy and data (support for the bankability of projects). There the inflow of girls is much bigger than in hardcore engineering.
Finally, in Belgium there are **several energy associations in which women have leadership roles** or are members of the board of administration, but as confirmed by other respondents across the categories they are still a minority.

Perceived benefits deriving from the involvement of women

One of the respondents belonging to the authority group argued that it would be desirable to guarantee equality of opportunities and treatment in the energy sector while the gender specific contributions to its development are not particularly different from one another.
Overall, respondents declared that in general the development of **any sector benefits from a diversified participation** and that companies and organization that are mor or less gender balance perform better than the ones that are male dominated, or female dominated. The RHC sector, being dominated by 50 years old white males, is slowing down its modernizing potential and its possible impact on the society. Respondents agree that **a more inclusive society can definitely increase the overall quality of life, fairness, and happiness**.

Perceptions regarding the barriers faced by women in the RHC sector

In Belgium, respondents identify the fact that women tend to be under-represented in the sector and mainly in positions of influence and decision making. The main barriers faced by women in the sector as identified by the respondents were the following:

- The **gender gap in technical education** related to the energy sector is the main factor driving the disproportionate distribution in the workforce. It is what respondents defined as “old school mindset” that dictates that women are not suited for STEM studies.
- The **gender-specific stereotypes** are in turn what causes the lack of engagement in technical education for women. Prejudices about women and their supposed lack of knowledge relating to the sector are still quite common.
- Interestingly, one of the respondents also mentioned **self-discrimination** and the consequent lack of confidence as a barrier. Because of this vicious cycle of discrimination, women decide to not even apply for jobs even if they are the most qualified for the position.
- Other kinds of barriers identified by the respondents include an increasing mobility required for women working in the sector which becomes challenging when they must **balance work with family life.**
- **Networks** in Belgium’s RHC sector are substantially male dominated. Female respondents argued that this makes it more difficult for a woman to integrate in these networks.

Measures to support the involvement of women in the RHC sector

The main measures suggested by the respondents to support the engagement of women include:

- **Shared maternity/paternity leave** mirroring the measures adopted in some of the Scandinavian countries. This model involves a basic maternity leave for 8 weeks to allow for physical recovery with a possible extension of up to a year only if it is shared between the mother and father.

Sharing the absence from workplace at the beginning of both parents' career would be positive for mothers.

- **Business advice** supporting young women and young entrepreneurs in general willing to enter the RHC sector.
- **Support to women choosing to pursue an education in STEM** and in the early steps of their professional career through career consultancy in University for example.
- Valorize the communication skills of the women operating in the RHC sector by focusing on developing new and more efficient strategies to reach to the end-users.
- Support programs for **female entrepreneurship.**
- Simplifying **access to funding** for women's businesses.
- Gender based hiring **quotas.**
- **Gender smart policies** both at work and community level.

3.2.2 Bulgaria

Perceptions regarding the uptake of RHC solutions in Bulgaria

Uptake of RHC solutions

Respondents declared that in Bulgaria the most prominent types of RHC technologies employed are **thermal pumps**. In general, RHC solutions are supported by some national and international funding programs but are still underutilized. It was observed that the potential of **geothermal energy is under-exploited**, and that price of installations remain high, despite the respondents perceive RHC as a valuable resource.

Another respondent identifies also **solar energy**, together with the more expensive **hydroelectric** and **wind generated energy** as the most popular types of installations in Bulgaria. **Solar panels** In Bulgaria seem to be more used in rural areas.

Other **underused resources** listed were **biomass** and **waste generated heat**, with difference among Bulgarian sub-regions in their availability.

Factors facilitating the uptake of RHC solutions and the participation in the sector

One of the respondents on the provider side of the market argued that the **demand for RHC solutions seems to be increasing**. Another interviewee argued that in Bulgaria there are already many players (especially providers) acting in the variety of RHC subsectors – from small scale to large scale installations and power plants, to decentralized RES Systems - PVs, biomass systems, biogas, geothermal energy, and heat pump.

Recently, RHC related technologies available in Bulgaria seem to have become **less expensive over time**, which is facilitating their uptake.

Overall, it was observed that **the national policy framework has favored the renewable energy sources**. According to the interviewees, the national policies supporting the RHC sector are the Energy Efficiency Act, the Energy from Renewable Sources Act, and the Energy Act. Preferential feed-in tariffs were also included in this list, together with some local level financial mechanisms supporting the installation of new heating systems in old houses.

The **European funding programs and projects** were also identified by the respondents as an important support for the development of the RHC sector in Bulgaria.

Most of the respondents decided to enter the RHC sector following their interests and passion for its complexity and the interconnection with different fields such as security and global development.

Factors limiting the uptake of RHC solutions

The main barriers identified by the respondents operating in Bulgaria were the following:

- **Lack of information on RHC technologies on the user end**. With more information, it is argued, users will be more inclined to make long term investments on RHC solutions which in turn will make installations cheaper and more efficient.
- **Lack of awareness of the core issue linked to the green transition process**. Users take the access to energy for granted and seem to not be sensible to concerns relating to energy efficiency.
- **The density of the population in urban areas** cause some technical problems preventing the adoption of specific RHC technologies because of their demanding space requirements.
- **Overlapping regional and national competences** at different institutional level seem to add complexity to the sector from the user perspective that does not know where to get support.
- The **lack of human capital in the sector** on which the integration of RHC technologies depends, limits their scope of action to short term solutions.
- The **lack of financial resources** for innovating technologies. The lower energy prices compared to the rest of EU countries do not stimulate the adoption of new technologies of new technologies which would require some considerable investment at the beginning but pays off in the medium or long term.
- The **lack of interest in the RHC sector from authorities** and a rigid regulatory framework.
- **Unfavorable regulatory framework** for decentralized capacities for self-consumption and prosuming, coupled with user-unfriendly bureaucratic procedures hinder the individual implementation of small RES installations.
- **Lack of implementation of national and local policies** regarding the energy sector.
- **The requirements for RES installations are too general** and a more technology specific approach to regulations is needed. Another respondent observed that in Bulgaria there is **no differentiation between RHC and other RES capacities in the official market statistics**, which makes extremely complicated to provide any market-base evidence.
- **Political instability**, which fails to ensure long term strategies increasing uncertainty which in turn discourages investments and therefore slows down the further technological innovation.
- **Lack of synergies between communities** that could lead to medium to large scale projects supporting the adoption of RHC solutions.
- Lack of comparable **innovation potential** among SME compared to the EU SMEs. For a long period, the energy sector of the region was **dominated by state and government companies** which resulted in lower interest in entrepreneurship in this sector.
- **RES target achievements**. One of the respondents argue that due to the favorable conditions and the extremely advantageous feed-in tariffs, the RES targets for 2020 were achieved very quickly. This had a contradictory effect on the energy system. The legislation was modified and is now not so favorable, so less people invest in these solutions, as unfortunately they were developed more as business investments than green solutions.

Inclusiveness of the RHC sector

According to many of the respondents, the RHC sector in Bulgaria **does not engage enough with vulnerable groups**, for which the problem with lack of awareness and information is amplified.
Respondents observe that in general, RES capacities are mainly exploited by companies and public organizations in medium and big installations, with households not benefitting from RE technologies.
In addition, **energy poverty** in some regions of Bulgaria leaves houses only partially heated and the barrier of the initial considerable investment is often insurmountable for more vulnerable groups. The

situation of vulnerable groups varies from area to area with some virtuous examples of collaboration between NGOs and local authorities.
Nevertheless, the development of targeted policies at the national level has indeed started according to one of the respondents belonging to the authority category.

Possible measures to support the uptake of RHC solutions

The measures recommended by the respondents to support the uptake of RHC solutions were the following:

- **Raise awareness** and disseminate information especially in **smaller size communities** across the country to increase the sensibility to energy efficiency.
- Delegate the **control of the implementation of energy policies on a local level** getting local authorities and NGOs involved in the process. The perceived distance between users and authorities should be reduced through more intense dialogue and targeted support.
- Continue the development of **incentives targeted to more vulnerable groups** and low-income families in general.
- **Public support** for investments in the RHC sector. Promotion of understandable and easily available financial mechanisms (some type of voucher system).
- Identify existing residential and industrial **buildings that meet the requirements** for RHC installations.
- Include the development of the RCH sector as a priority for future regional programs.
- Support **for curricula and educational programs** on RHC related fields
- **Subsidies** for companies that demonstrated the capacity to develop new solution.
- Deeper **engagement of authorities** at national and local level with international partners in best practice sharing**, internal training** and awareness raising. Creation of pilot projects, face-to-face seminars (incl. practical support and study visits) or interactive platforms to **share good practices**, the problems, and the solutions to specific RHC cases.
- **Establishment of a specialized and highly expert-based local hub** aiming to make RHC solutions more popular and to inform the interested parties about the benefits of RHC for them.
- **Change in the regulatory framework** allowing small, decentralized installations to be deployed more easily, through less administrative and bureaucratic burden for the end-user and the local authorities and responsible bodies.
- **Wide market promotion** of RHC technologies with a distinct segregation of the energy production types and the end users – businesses and households.
- Arrangement of individual and **case-by-case consultations** services for all interested users.

Perceptions regarding the role of women in RHC in Bulgaria

Women's involvement in the RHC sector

Multiple respondents observe that **women participate in the RHC sector even in managing positions**.

However, respondents also noticed that women knowledge and skills are often underestimated in work environments, partly due to the stereotypes linked to the traditional lack of participation of women in STEM education programs.
In Bulgaria, women's reduced participation in STEM education programs is reflected by their **reduced presence in the business and more technical positions** in the RHC sector. Respondents also argued

that women tend to favor less physically demanding tasks of which the installations activities are a good example.
Another respondent belonging to the civil society category argues that women still dedicate more time than men taking care of the family and that **prejudices against women damage their credibility** in the RHC sector.

Perceived benefits deriving from the involvement of women and known women-led initiatives

Many of the respondents value the involvement of women in the sector without identifying any gender related benefit. They encourage both genders' participation in the sector. However, respondents also highlight the flexibility and the gender specific soft skills that the RHC sector could benefit from if women were to be more involved. Along these lines respondents argued that women are more open-minded toward new technologies and solutions, more concerned about the health and the environment and they are better at bringing on board more groups of end users such as household owners.
On the user end, respondents identify the **role of women in the household as a crucial factor that could drive the transition process.**
The examples of women led initiatives in provided by the respondents are the following:

- ABEA is chaired by a woman.
- Bulgaria's minister of energy is a woman.
- Move.bg (NGO).
- Energy related initiatives led by women: Schneider Electric Bulgaria

Perceptions regarding the barriers faced by women in the RHC sector

Some of the respondents argue that in Bulgaria women do not face particular barriers to their participation to the RHC sector. On the other hand, multiple other respondents argued that women seem to be met with distrust when negotiating with customers, **culturally associating gender with different level of technical competences**.

Measures to support the involvement of women in the RHC sector

Concerning the support to the involvement of women in the RHC sector, respondents suggested the following measures:

- Supporting and **increasing the visibility for women led initiatives** and encourage the participation of women in the research sector linked to RHC.
- Focus on **market development programs stimulating entrepreneurship** while guaranteeing equitable access to both men and women.
- Promoting **hands-on training sessions for young women** during (or towards the end of) their education would help their involvement in their future professional environment of the RHC sector.
- **Mentoring programs** and increased visibility for successful women in the STEM field would are also identified as possible measures.
- Promote **targeted RHC-related training for women**, including in the field of RES installations,.
- **Coaching for female start-up entrepreneurs**, together with a **dedicated financial pipeline** for start-ups managed by women with a special focus on the technical solutions.
- **Dedicated promotional events** for such businesses at the local technical fairs and exhibitions (namely, the Annual Plovdiv Technical Fair, the South-East Exhibition for EE and RES) to support the dissemination of such solutions and that they are managed by women.

- **Competency building** such as education on the Green deal aspects, workshops, green market niches training events.

3.2.3 Denmark

Perceptions regarding the uptake of RHC solutions Denmark

Uptake of RHC solutions

Respondents claim that **heat pumps** are the most used RHC solutions now in Denmark and that, overall, decentralized supply with RES (PVT or heat pumps) supplementing district heating has a lot of potential in the country. It was also argued that due to the **climate** of the region, heating systems are very demanding and at the moment, households are not able to be **completely independent** in the production of heat from renewable sources and must mix RHC solutions with fossil fuels. However, it is expected that future developments in the technologies will allow households to be more independent.

From the interviews it also emerged that younger generations in Denmark are perceived as more **motivated** and more inclined to renovate their houses while older cohorts tend to be less interested in RHC solutions creating a considerable split in the market.

According to the respondents there seems to be a lot of **excess heat** coming from companies using steam for their production for example. This heat is **dispersed** while it would ideally be possible to make use of it heating up the water for **domestic use**, they suggest for district heating. Despite the good potential the interviewee observed that the RHC technologies are **not specialized** enough yet to do so.

Factors facilitating the uptake of RHC solutions and the participation in the sector

Respondents in the authority category point out that Municipalities in Denmark provide guidance and information to the end users after elaborating their vision for the RHC sector. It was reported that some **municipalities** run **subsidy schemes** for energy advisory services in terms of isolations of floors, ceilings, and walls.

Through the action of **Collective District Heating Supply Companies** heat pumps can be bought and installed at competitive prices.

Energy communities have also been identified as a positive development for the RHC sector in Denmark. According to the respondent, an energy community is where local players in housing associations, detached houses, the municipality, small businesses, and shops join forces in a community to provide renewable energy to the local community.

An Interviewee identified the **National Building Fund** (LBF) as a positive factor for the development of the danish RCH sector. LBF, it was pointed out, has the assignment to support the renovation and maintenance of social housing within the framework of the building regulations.

Despite their diversified background (engineering, atmospheric chemistry, policymaking, and research) the interviewees have in common a passion and an interest for the green transition and the belief that RHC is part of a larger and comprehensive solution to humanity's challenges.

Factors limiting the uptake of RHC solutions

The main barriers identified by the respondents operating in Denmark were the following:

- The level of **buildings insulation** in Danish cities varies greatly even between houses managed by the same collective district Heating Supplies. Because of poorly isolated buildings (especially houses built in the 1960s and the 1970s) these companies cannot guarantee a heating system powered completely by renewable sources and must use gas as a backup.
- The **relative low competitiveness of RHC solutions** is identified by multiple respondents as a significant barrier.
- **Lack of awareness, environmental consciousness, and willingness to change** well established habits.
- **Regulatory barriers** preventing the creation of decentralized energy supply systems. The previously mentioned energy communities and social hosing organizations are not allowed to sell locally produced renewable energy to other potential buyers that are not their tenants.
- The difficulty to predict **energy price developments**, raising the **investment risks**.
- The lack of support in terms of **feasibility assessment** and business and technical potential analysis.
- The **lack of available specialized workforce** for technical tasks.
- The **volatile nature of the** energy supply from RES.

Inclusiveness of the RHC sector

Respondents declared that **low-income families and other vulnerable categories do not have easy access to RHC solutions** in Denmark. Without a capital available to invest, these groups depend on banks loans to renovate their house. Often, according to the respondents, these requests are denied regardless of the technical quality of the project or the soundness of the investments.
One of the respondents declared that energy communities could support vulnerable groups. At the same time, the interviewee also noted that the legislation complicates the establishment of said communities and makes them compete with the public owned energy companies.
Another respondent focused on what were defined as **political challenges concerning implementing RHC solutions in existing social housing** in Denmark. The interviewee argued in favor of more local, decentralized energy supply solutions that currently are not allowed. Despite the EU-electricity market directive, it was argued, social housing organizations are not allowed to sell locally produced renewable energy to others than their own tenants. Often, these groups are reported to lack time and interest to do the paperwork and plan the renovations, with other financial concerns taking priority over deployment of RHC solutions.

Possible measures to support the uptake of RHC solutions

According to the respondents from Denmark, the best measures to encourage the uptake of RHC solutions and renovation of old houses are the following:

- **Tax deductions**, for example in the form of a craftsman deduction for better insulations. The same respondent argued against the imposition of strict disincentives.
- **Nudging and advertising** RHC solutions to increase their visibility and popularity.
- **Imposing a C02 tax** able to cause an observable shift in consumer and producer behavior raising prices of traditional heating systems.
- **Mapping and identification of older building** and the establishment of targeted advisory and support services for end-users.
- **Investing in large scale projects** or channel more external funding in the sector. This recommendation stems from the perceived financing difficulties to fund small scale projects.

Perceptions regarding the role of women in RHC in Denmark

Women's involvement in the RHC sector

In Denmark, according to the respondents, there are **more men than women who studied and work in the energy field**. Women are perceived as more represented in the public administration but still underpaid compared to their colleagues, often because they decide to spend more time with their family.

Compared to the past, interviewees claim that women are now deciding to enroll in STEM related education programs more than they used to.

Perceived benefits deriving from the involvement of women

According to the respondents, women generally have a more **holistic approach**, with great **communication skills**. Women are also perceived to be more interested in climate change related issues and **more motivated** to participate to the transition process.

The examples of woman-led initiatives provided during the interviews were the following:

- The organization "Energy Forum", with 2 female board members out of 10 and a woman as head of secretariat.
- The Social Housing Organizations in Avedøre with their three chairwomen and the Energy Community in the same city.
- BO-VEST's technical director.

Perceptions regarding the barriers faced by women in the RHC sector

The main barriers faced by women in the sector as reported by the respondents were the following:

- Women's role in the family that does not allow them to fully engage in the sectors, taking away time from them and often guiding their **professional decisions** towards safer and less entrepreneurial jobs.
- **Societal stereotypes** discourage women to be ambitious in the more technical side of the energy sector.
- **Lack of female role models** in the sector.

Measures to support the involvement of women in the RHC sector

Interviewees suggested several support measures:

- Multiply the effort **to communicate to women** on the demand side of the RHC sector.
- Continuing support for **quota.**
- **Reduction of the gender-pay gap**.
- Reach out to potential female STEM students and **make successful cases of women in RHC more visible**. Citing a recent study another respondent suggested to **target girls in education** that are between 11 and 14 years old to not lose their potential interest in the climate and environment related careers.

3.2.4 Germany

Perceptions regarding the uptake of RHC solutions in Germany

Uptake of RHC solutions

The interviews showed how multiple RHC solutions are perceived to be used with different levels of popularity and many with untapped potential in Germany. **Biogas and biomethane** are used in cogeneration and wood is used in block heating plants. **Heat pumps** seem to be widely used, but most of them are powered by coal and should not be considered as renewable energies. **Solar Panels** on the roofs are also common and absorption heat plants are used sporadically. One respondent declared that **waste heat extraction** and **solar thermal fields** are potentially good solutions for, respectively, urban, and rural areas in Germany.

Multiple respondents agree that many technologies have a good potential but are underutilized in Germany. More specifically, geothermal energy, wastewater heat extraction, structural and natural shading, and insulation solutions. According to the respondents, in Germany there has been a shift from gas to oil and the electricity generation has been prioritized over the heat generation. For this reason, solar thermal has not been developing as quickly as it might have.

Furthermore, all the respondents agree that, because of the weather and characteristics of the region, **cooling is not widely used**, with **private households mostly relying on heating technology**. However, at least some day-care centers and schools will have to consider renovating their cooling systems because of the increasing temperatures over the summer.

An interviewee belonging to the authority category argued that the policies of the government were not ambitious enough to reach its climate goals. In his opinion this institutional **long-term vision** is of fundamental importance since the way the RHC sector is perceived and regulated influences the actual uptake of the sustainable technologies tremendously.

Finally, as a highly industrialized country, it is suggested that in Germany targeting specifically the industrial sector would make the difference in the transition process.

Factors facilitating the uptake of RHC solutions and the participation in the sector

Multiple respondents agree that the regulations for the building sector in the form of the R*enewable Energy Sources Act (EEG)* created a **favorable legal framework** for the uptake of renewable energy technology, for example driving the price of PV down. The recent introduction of the C02 levy in the mobility sector was identified by one of the respondents as a step forward for Germany as it will also be renegotiated as part of the Green Deal at the EU level and possibly integrated into the regional emission trading scheme.

One respondent also declared that the RHC sector is relatively “permeable” to new actors and business willing to innovate. This, in his opinion provides some opportunities for initiatives supported by low investment and highly innovative ideas, no matter the background of the entrepreneur.

Multiple respondents declare that there is **increasing interest in RHC solutions** and that customers awareness can be a big driver for change in Germany facilitating the transition.

Respondents with different backgrounds such as architecture, journalism and policymaking seemed to share the passion and interest in the sector and the idea that RHC is a sector with a good long-term perspective. Some of the respondents mentioned that their professional network of contact helped them to get involved in the sector as well.

Factors limiting the uptake of RHC solutions

The following barriers to the uptake of RHC solutions have been identified by the respondents:

- In the recent past the **oil price has been relatively low** disincentivizing the use of RHC. This low price is caused in large parts by longstanding presence of public subsidies that have significantly hindered the uptake of RHC solutions.
- In general, the **public opinion is skeptical and lacks confidence in the efficiency of RHC solutions**, often due to misinformation spreading via internet. As a result, potential customers often have **incorrect or insufficient information**.
- **Lack of awareness and acceptance** of the feasibility of adopting RHC solutions. This might be linked to the discomfort (compared to traditional installations) and requirements in terms of space connected to RHC solutions, as reported by another respondent.
- Banks **are often not willing to loan money for investments in the RHC sector** as they consider it not profitable.
- A respondent from the business category reports that it is much **difficult to operate in existing buildings**.
- **Tenants cannot intervene on the apartment they are renting**. At the same time, it is the building owner that needs to decide which technologies and measures to implement and since he does not benefit from the savings (the cost is borne by the tenants), he has no incentive to take the initiative to install renewable solutions.
- The **framework regulatory conditions and the political will** are indicated to be not as supportive as they should be to the transition process. Interestingly, the Energy Sources Act (EEG) previously mentioned as a facilitating factor was identified as a barrier by a different respondent belonging to the business category, because of the **costs and the administrative procedures** associated with it.
- On the topic of bureaucratic procedures, another respondent declared that the **complex contract management** with municipality often puts the project at risk.
- Some accidents occurred in the production of energy using geothermal technologies and the **lack of trust** in these solutions makes its further development more difficult.
- Finally, there is often **limited space in many buildings for boilers installations** and the high cost of RHC tech installations with a long-term return on investment. Innovative solutions such as RHC often cannot prove they will be sustainable in few years and require a longer-term vision that disincentivize industrial companies to get involved in the transition process.

Inclusiveness of the RHC sector

When asked about the inclusiveness of the RHC sector, respondents pointed to the situation of the **tenants, who have the price of electricity and heat as given** and must accept paying a higher rent if they want to live in an apartment that take advantage of RHC solutions. In this regard, RHC is not seen as accessible for the entirety of the German population, with some respondents calling climate protection a "*luxury*".
One of the respondents added that **older cohorts are less likely to commit to renovations** because they do not want to plan long term due to their age.
The **initial investment is also a barrier for the more vulnerable categories** with lower income and not enough savings to sustain this financial effort.

Possible measures to support the uptake of RHC solutions

The recommended measures emerged from the interviews range from financial support to awareness raising to regulatory and legislative interventions. The suggested measures are the following:

- **Political support** from policymakers, trade press and associations to the actors that drive innovation and pilot new technologies. The lack of funds often reduces the visibility of innovators who struggle to gain influence. The **political and public actors should lead by example** or force long-term planning on actors, public agencies, businesses, or citizens. An example provided refers to the establishment of regulatory framework conditions on municipal level (also together with the players in the region) based on long-term planning and objectives.
- **Enhance transparency and permeability of information** between political decision-makers, expert committees, and academic bodies.
- **Renew the energy tax system** with one respondent claiming that the tax on CO2 should be increased from 25 €/ton to 100€/ton. This measure should be established as a binding long-term strategy to encourage investments, reduce uncertainty, and create incentives for the market to turn to RHC solutions without employing subsidies or imposing regulations.
- Multiple respondents identified the **refurbishment of existing buildings** as the key process that Germany should be focusing more on. This could be achieved through:
  - **Regulatory requirements for newly built houses**. One respondent suggests it would be possible to introduce the obligation to have a PV installed and to have oil heating banned, another respondent suggests that new public buildings should be pilot projects showing that powering buildings 100% from renewable sources is possible.
  - **Encouraging the installations of new technologies and bonuses for virtuous users** (ex. those who produce as much electricity as they consume). For already existing buildings it would be desirable to switch from oil to pellets when the space requirements for a heat pump are satisfied, while on new buildings photovoltaic should be taken more in consideration alongside the already popular heat pumps.
  - **Encouraging investment** by obliging landlords to pay higher prices for energy if their building is not energy efficient.
- Change the **requirements or legal standards** for buildings, basing them on an **overall CO2 balance** of the building itself. The interviewee argued that rather than pursuing the current strategy, which prescribes the thickness of an insulation in the wall, this measure would really help steering for example the building market towards a higher energy efficiency.
- **Information campaign and awareness raising**.
- **Integrate Renewable Energy related training** in all the professions participating to the construction industry. At the same time establish a competence network of craftsmen that, through a certification, signals to the customers which crafts are qualified to work with RHC solutions.
- Establish **free consultancy services** for homeowners, provided ideally by the public sector.
- Set up **targeted assistance and advisory services** for SMEs.
- Encourage the adoption of RHC solutions for **social housing.**
- Implement **large scale measures** not aiming merely at achieving minor changes within the current state. The laws, it was argued, currently do not target what they should, fearing they would be rejected as too radical and unpopular impositions. In other words, the interviewee argues in favor of a more proactive approach to stimulate behavioral changes.
- Stimulate **the outsource of installations** to renewable energy provider. These actors are expected to have more incentives in saving in production of electricity and will push for renovations making in turn renewables become more interesting for widespread use.
- Allocation of funds to support targeted to key subsectors with a good potential (for example development of radiant panel heating technologies)

Perceptions regarding the role of women in RHC in Germany

Women's involvement in the RHC sector

Overall respondents think women are not as involved in the RHC sector as they should. The participation rate estimated by respondents is **10% with women mostly active at the margins** (finance, marketing) but **not in core positions** such as engineering, planning, technical consultancy. In the RHC sector, technical roles and roles in the local administration are also perceived as male dominated by most of the German respondents. One of the respondents declared that with a few exceptions, decision-makers in the region hardly take gender differences into account.
It is argued that the degree of involvement varies from region to region, with East Germany perceived as more populated by female company directors if compared to the rest of the country. The stereotypes prevailing define **women as unlikely to be at the head of business in RHC**. Female respondents in leadership roles reported that they are seen as unusual and met with surprise.
There is also a consensus over the fact that on the demand side **the decision within the household concerning RHC is often handled by men**.

Perceived benefits deriving from the involvement of women

The respondents agree on the positive impact that women can have on the development of the sector in Germany. Some respondents highlight the different approach in terms of **personal and soft skills** that women can bring to all work environments. One of the respondents argued that women's perspective can stimulate the introduction of more behavioral solutions, for example addressing the way the room temperature is managed in terms of air conditioning to be combined with the more technical development currently dominated by men. Starting to get more women involved seems to be very important because the increasing visibility would have a **multiplier effect** helping the further efforts to get even more women engaged. It also emerged that women's perspective is equally important in **designing awareness campaigns targeted to other women**.
One respondent belonging to the business category declared that the development of the sector in general should be the priority regardless of the gender of the leadership positions. The same respondent insists on the necessity to engage with households and individuals targeting the decision makers within those contexts as efficiently as possible, regardless of their gender.
The examples of woman-led initiatives provided during the interviews were the following:

- Vattenfallwärme.
- WTA (Scientific Technical Worksheets for Monuments), co-run by a double team composed of a man and a woman.
- Fraunhofer ISE.
- Hypothia, a network of women at technique.

Perceptions regarding the barriers faced by women in the RHC sector

When asked about the main barriers women face in Germany, most of the respondents identify that:

- The **lower proportion of women willing to pursue a STEM education** and willing to work in the field limits their involvement. The **expectations and the stereotypes** that women are immersed in since their young age shapes their decision in that direction.
- **Women in management positions are more likely to be replaced** than their male counterparts with a seemingly lower tolerance for mistakes in both the private sector and in the local administrations. This low tolerance comes both from other members of the team and from

women themselves who seem more prone to withdraw from their position because of perceived mistakes.
- **Companies or organizations have structures in place** that do not allow women to easily reconcile their professional career and their family.

Measures to support the involvement of women in the RHC sector

The respondents argue in favor of:

- **Encouraging young women** to consider pursuing an education in more **technical disciplines**.
- Respondents suggest women should be supported more in terms of **parental leave** and when they go back to work and with more services such as **day-care centers**.
- The respondents disagree on the implementation of quotas with some respondents arguing they are not desirable and others saying that given the structural problems faced by women, quotas could be beneficial, even if not the best long-term solution.

3.2.5 Greece

Perceptions regarding the uptake of RHC solutions in Greece

Uptake of RHC solutions

The respondents observed a steady **increase in the uptake of renewable technologies in Greece,** mostly in the form of solar panels (which is also the main renewable source of energy) and wind turbines. **Solar water heaters** were first introduced in 1970s and, according to the respondents, Greece has sufficient energy potential in electricity especially in the form of solar energy because of its geographical location.
At the same time, it was estimated that Greece is still at 50% of its renewable energy potential and that the investments in buildings renovation lag behind.
Overall, the respondents agree that in Greece **biomass** (for both domestic and industrial use) and **hydrogen** are sources of energy that are **currently underutilized**. Some respondents say there has been an increase in the use of biomass since 2009 even if they point out that this kind of solution still releases C02 in the atmosphere. Next to biomass and hydrogen, **geothermal energy also shows some potential**, but respondents underline the lack of awareness in the region on this topic.
Finally, some of the respondents highlight the **potential of the use of waste** as an energy resource.

Factors facilitating the uptake of RHC solutions and the participation in the sector

The respondents observed that **some national policies support the uptake of RHC solutions** in Greece. In particular, the respondents belonging to the authority category listed:

- The **licensing procedure followed by investors** has recently been simplified in order to overcome bureaucratic barriers.
- **Competitive mechanisms have been developed** in order to foster equality and transparency in the market under the principle long-term capital cost-recovery.
- The recent development of wholesale market through Target Model constitutes another effort to integrate green technology in a competitive market where rules and prices follow market signals on a level-playing field.

Overall, it appears that the main factors that motivated the respondents to pursue their career in the sector were their **personal interest in RHC and passion for the energy transition**. Generally, respondents agree that through their studies they were able to cultivate their passion and contribute to the renewable energy sector.

Factors limiting the uptake of RHC solutions.

A diverse set of limiting factors emerged from the interviews. Some are of **financial and economical nature**:

- **Low price of energy in Greece** and the incentives available for the lower income household might disincentivize the transition towards RES technologies.
- Smaller scale installations were associated by some of the respondents to a **low return on investments**. This was identified as an additional barrier for small businesses trying to compete in the RHC market.
- The respondents also highlighted the **high cost of RHC installations** compared to alternative solutions available.
- The existence of some **technical barriers,** such as a limited storage energy capacity, and limited grid capacity.
- The **unclear institutional framework**, lacking a specific action plan for renewables.
- The **obstacles related to licensing, financing, procedural issues**.
- **Cumbersome bureaucracy.**
- The **lack of incentives** for Greek citizens, mainly financial ones.
- **Lack of awareness** concerning the impact of climate change, the opportunities linked to innovative RHC solutions in terms of sustainability and energy independence.
- **Shortage of specialized competences or specialized professional profiles** on the Greek job market.
- **Preoccupations of the public opinion regarding the modification of the living environment** required to build the facilities linked to RHC. One of the respondents argued that the trade-off between the size and efficiency of wind turbines parks specifically and their use of the environment must be taken into consideration, as well as the opposition of the communities whose main employment sector is tourism.

Inclusiveness of the RHC sector

The RHC sector in Greece seems to not be as inclusive as the respondents think it should be. **Vulnerable groups do not have enough information** concerning RHC technologies and the **high initial cost** of installations together with the reduction in electricity costs for low-income families motivates these groups to keep their traditional and less expensive energy technology.
Some respondents identified the decrease in energy prices in Greece through **competitive bidding mechanisms** as a step forward to include lower income households in the RES market uptake, and other interviewees argued in favor of **Public Private Partnership Schemes** to tackle energy poverty.

Possible measures to support the uptake of RHC solutions

Regarding possible measures to support the uptake of RHC solutions, various opinions emerge from the interviews:

- One of the respondents representing the authority's category is skeptical towards the **implementations of more subsidies**, while another respondent of the same category identifies it as a good incentive.
- **Tax exemptions for RE projects.**
- **Financing support tools** such as the removal of income criteria to supporting programs to simplify the access to the support itself, a premium system for consumers reducing electrical consumption, cutting red tape in public and private bodies and coordinate with municipalities and incentivizing investments from the private sector.
- **Support measures for sustainable buildings design** for urban areas through demand side management incentivizing energy production in single households.
- Promotion of **awareness raising campaigns** and supporting the establishment of energy communities.
- Setting up **consulting services with technical experts** would establish a market for this kind of services and multiply its positive effects.
- Harmonization of energy policies on issues such as energy savings programs.
- Reduction of red tape, overall bureaucratic obstacles to action.
- Promotion of **Public Private Partnership Schemes** to tackle energy poverty.

Perceptions regarding the role of women in RHC in Greece

Women's involvement in the RHC sector

Respondents declared that **women are generally given the same opportunities as men**, especially in the government and research sector. It was however noted that women holding more technical positions are very few and that **the industry is mostly populated by male**. This situation seems to be slowly evolving into a more balanced participation over time but now the gender gap remains significant.

Perceived benefits deriving from the involvement of women

In general, the respondents agree that **women represent an opportunity for the development of the sector** because of their professional and personal skills. The respondents generally encourage a greater involvement of women, in some cases specifying that women can be more openminded and environmentally conscious than their male colleagues. In terms of skills and potential, the consensus is that women are often extremely **competent** even in the fields where they are underrepresented.
The examples of woman-led initiatives provided during the interviews were the following:

- RAE (Regulatory Authority for Energy) and CRES (Center for Renewable Energy Sources & Savings) have remarkable executives from both genders.
- The General Secretary of the Ministry of Environment and Energy.

Perceptions regarding the barriers faced by women in the RHC sector.

The respondents declare that even though there are not explicit barriers for women to the pursuit of their career in RHC, the following challenges can still be identified:

- **Being an entrepreneur is more difficult as a woman**.
- **Lack of awareness** regarding the difficulties women face in their work environment and the advantages of a more gender balanced team.
- **Lack of support for mothers** (especially in smaller private sectors firms).

- It was also noted that **societal stereotypes** are still quite present in the Greek society, but that there is a slow shift in the sensibility. The younger generation of workers in the RHC sector seems to be more and more aware of gender related issues.

Measures to support the involvement of women in the RHC sector

The respondents argue in favor of:

- **Coaching and support for women wiling to become entrepreneurs**.
- **Support measures for mothers** during working hours (especially young mothers).
- Targeted **social welfare measures such as tax relief periods or increased remuneration for women who have children**.
- **Promotion of awareness in gender equality through awareness campaigns** targeting both men and women in coordination with national and European authorities.

Some other respondents explicitly oppose the imposition of quotas.

3.2.6 Italy

Perceptions regarding the uptake of RHC solutions in Italy

Uptake of RHC solutions

Overall, it was reported that the **uptake of RHC solutions in Italy is slow**, with several obstacles hindering the adoption of the work of research centers on a market which covers 70% of the energy demand of the residential sector.

For what concerns the research and development of new technologies related to the final user's energy efficiency, respondents reported that in Italy there are numerous **centers of excellence** with mostly the same share of public and private sector participation.

Looking at the actual market uptake, RHC solutions are reported to be used only in a very limited way. Respondents provided figures showing that in the heating sector, less than 20% of overall energy consumption originated from renewable sources. Approximately 11.2 Mtoe of energy from RES was consumed in 2017, approximately 10.3 Mtoe of which was consumed directly (through individual boilers, stoves, chimneys, solar panels, heat pumps, plants for using geothermal heat) and approximately 0.9 Mtoe in the form of derived heat consumption (for example through biomass-fired district heating systems). Nevertheless, **RHC solutions are perceived as a considerable opportunity** for the development of many areas across Italy, especially for the south. There is a consensus among the interviewees over the fact that further effort should be carried out in the integration of renewables in the H&C sectors.

At the same time, respondents argued that there seems to be a growing interest around RHC solutions as outlined by the 2030 Integrated National Plan for Energy and Climate, where there is an explicit reference to RHC for both existing buildings and new ones. Italy's strategy is in line with the EU targets aiming for a +1,3% per year share of energy from RES in the gross final consumption of energy for heating and cooling, and a share of 33% of gross final energy consumption coverage in 2030. In addition, Italy was recommended to put an increased level of ambition for renewables in the heating and cooling sector to meet the indicative target included in Article 23 of the Directive 2018/2001.

From the interviews it also emerged that, because of its economic viability, the most adopted RHC technology in Italy is based on the use of **solid biomass** (approximately 7.9 Mtoe used in 2017), which was primarily used in the household sector in the form of firewood and pellets. **Heat pumps** also play an important role (2.65 Mtoe), and the main opportunities for a further development of the sector lie in the promotion of **biomethane**, maximum **reuse of waste** heat from process energy in industry, and development of **integrated multi-resource systems**. The use of **geothermal energy** has a good potential while remains underutilized now.

Factors facilitating the uptake of RHC solutions and the participation in the sector

According to the interviewee belonging to the institutions category, **regional development programs**, national instruments such as the thermal account and the existing sector specific tax deductions are the most significant facilitating factors for the uptake of RHC solutions.
One of the respondents working in the bioplastic sector suggested that the possibility to transform waste materials into a resource has good potential for the development of the RHC sector in Italy and that this more sustainable practice would especially reduce plastics 'disposal cost.

Similarly, to multiple other countries, the respondents declared that their passion and their interests were the main reasons why they started operating in the RHC sector.

Factors limiting the uptake of RHC solutions

The following barriers to the uptake of RHC solutions have been identified by the respondents:

- **Lack of information**. End users' expectations about the durability and efficiency of sustainable materials are based on their experience with fossil-based ones and are often misplaced.
- Technical issues that limit the implementation such as **space requirements** for some specific kind of RHC installations.
- The **lack of feasibility assessment**, business / technical potential analysis.
- **Uncertainty** about the performance of innovative technologies.
- **Perceived excessive costs** linked to innovative solutions.
- **Lack of awareness** of the impact of global warming.
- **Lack of institutionally defined spaces for public engagement** within authorization procedures. This negatively affects the procedures themselves and the relationship between citizens and public institutions.
- High **costs linked to the maintenance of the cooling towers**. Tax reductions and other financial incentives for the development of solar cooling remain insufficient to promote this technology.
- **Limited availability of trained technicians** and installers.
- The need to limit the polluting emissions characteristic of biomass installations limits the further development of these technologies. Currently, the Emilia-Romagna region has been condemned by the EU for exceeding emission limits (dust).

Inclusiveness of the RHC sector

When asked about the inclusiveness of the RHC sector the interviewees argued that in Italy the **cost of RHC installations is a barrier for more vulnerable categories**. The problems linked to the access to funding and the lack of relevant information is seen as even more prominent for those who have less resources and for regions such as the islands that are seen as suffering from an economic disadvantage. One of the respondents belonging to the academia category declared that the **residential status** (whether an end user is an owner or a tenant) and the type of heating and cooling systems (centralized or independent) are factors which influence the capacity to invest in energy efficiency improvements for citizens. The interviewee added that **low-income families often live in poorly insulated houses** and frequently use second hand or old equipment with poor energy efficiency. Furthermore, in his opinion **women are particularly affected by energy poverty**, with lone female-headed households and older women especially at a higher risk of energy poverty than men. Over the past decades, the proportion of lone-parent households has increased, most of them are headed by mothers.

Possible measures to support the uptake of RHC solutions

The measures suggested by the respondents were the following:

- Introduction of **tax incentives** and more funding programs supporting RHC solutions from the research stage to the industry level and market uptake.
- Introduction of **vouchers schemes** for support services or consultancy for the people on the receiver side.
- Streamline procedures linked to (and strengthen controls over) to the tax deduction called "Super bonus 110%".
- Increase funding for the renovation of public buildings and for the efficiency gain of the Public Administration.
- **Support to research** aiming at finding sustainable solutions for RHC sector. For the academic sector, research events could also be a specific leverage to improve knowledge about the topic.
- Greater support to **technology transfer** to enhance local industrial development. The respondents specified that such support could be achieved through specific financed calls for proposals for consortia of public and private subjects aimed to increase the Technology Readiness level (TRL) of technologies tested in research institutes by local companies and/or new start-ups.
- **Awareness raising**. Get stakeholders such as universities, energy companies, etc. involved to disseminate their knowledge on RHC technologies to policy makers and local administrators.
- **Support to business initiatives** in the form of market research, business planning, access to finance support, networking, and mentoring.
- Development of **industry-academia programs** focused on hands-on training for new professionals identifying the required skills needed for RHC and REC, knowledge gaps, and retraining opportunities.
- Promotion of targeted initiatives **filling the knowledge gap** of end-users, coupled with an underlying incentive system set up by national or supernational authorities.
- **Focus on more isolated regions** such as geographical islands as a starting target group to improve access to renewable heating and cooling technologies, to deal with their economic disadvantage.

Perceptions regarding the role of women in RHC in Italy

Women's involvement in the RHC sector

A respondent declared that the **participation of women in the RHC sector is still low**, citing for example the 1 to 4 ratio of female to male working units in Emilia Romagna region. There have been attempts to improve the situation, such as the calls for proposal linked to national funding programs in which the scoring for the allocation of funds is facilitated for enterprises with predominantly female participation.

One of the interviewees analyzed the participation of women in the industries developing energy efficiency technologies and the collected data show that In Italy the share of women employed in this sector is clearly quite low (22%). He also reported that men are more likely to be motivated to invest by environmental concerns, reducing energy wastage and cost-saving, whereas women are more motivated to invest in energy efficiency to improve comfort of their houses and to become more independent of utilities and that women are also more sensitive to social pressure than men.
Another respondent argued that women are **underrepresented in the sector in particular in decision making positions**, at all scales (business, academia, and policymaking). Finally, there seems to be consensus over the fact that there are **cultural issues negatively affecting female participation** through the way in which power and decision making are managed in Italy.

Perceived benefits deriving from the involvement of women

According to one of the respondents, improving the **involvement of women in the RHC sector would contribute to Italy's development and to the growth of the RCH sector**. This, it was argued, is because women make decisions considering a **greener long term development vision**, looking for "safe" solutions for their children and for the future generations. The interviewee also believes that a better gender balance would **give confidence to other women** to pursue certain career path, multiplying the beneficial effects to the overall society.
The example of a woman in the renewable energy sector provided during the interviews indicated that the department of Energy Efficiency reporting to the Italian Ministry of Economic Development, is led by a woman.

Perceptions regarding the barriers faced by women in the RHC sector

The barriers faced by women in the RHC sector in Italy identified by the respondents were the following:

- **Societal stereotypes** on the role of women in the family and its potential in certain educational fields.
- Male colleagues **not recognizing the authority** and competences of their female co-workers.
- Women happen to be judged from their appearance more than their male colleagues.
- **Women are particularly affected by energy poverty**, with lone female-headed households and older women especially at a higher risk of energy poverty than men.

Measures to support the involvement of women in the RHC sector

- **Business and financial support**, especially in the technology transfer process.
- **Grants** dedicated to women with entrepreneurial potential in the sector.
- **Awareness campaigns** on barriers faced by women on the workplace.
- **Design targeted initiatives** to promote educational and re-training paths addressed to women, considering the specific needs of local communities.
- **Dissemination of good practices** and successful cases of career development could be a way to attract girls to carried out academic courses for electrical engineers.
- **Favor access** to the sector with specific training addressed to re-skill unemployed women.

- **Collect and assess gender disaggregated data** on the different access and use of energy and energy efficiency devices, the differences of needs of low incomes household to better understand the dimension of gender-based differences in the RHC sector.

3.2.7 Norway

Perceptions regarding the uptake of RHC solutions in Norway

Uptake of RHC solutions

Regarding the uptake of RHC technologies, respondents reported that Norway uses its **vast hydro power resources** to produce an increasing amount of electricity used for heating and cooling. It was argued that Norway produces more electricity from hydro power than it consumes, and almost 60 % of the total energy consumption in Oslo is electricity from hydro power. **District heating market** has grown rapidly due to new waste to energy plants with instances in which there is an obligation to connect with regulated prices, and other cases in which no obligation and no price regulation is applied. District heating is supervised by the Norwegian Water and Energy Directorate, and there has been little change in district heating regulation since the 1980's. The overall framework for construction and operation of district heating facilities is regulated by the Energy Act and attached regulation, and mandatory connection of district heating supply to end-users is regulated by the Planning and Building Act. Although most of the energy used in the building sector is either electricity from renewable hydropower or district heating, there is still some use of fossil heating oil and gas. The use of heating oil has, however, dropped significantly since 2009 to under 1.3% on a national level.
Heat prices are generally **capped** based on electric heating and the use of fossil fuels directly for heating is much lower than the EU average.
The respondents also pointed out that Norway has in common with the other Nordic countries the characteristic of having a rather **liberal and open energy market** and provides a quite strong position of the consumer in choosing of heating and cooling systems and solutions.
Norway's **ambitious targets** in terms of reduction of greenhouse emission levels are contained in the Oslo's Climate and Energy Strategy, which is a Paris Agreement-compatible Climate Action Plan. The GH emissions are set to be reduced by 95% by 2030 taking 1990 as a reference year. Other targets set include a 100% renewable energy target in the public transport and heating sectors by 2020, reducing CO_2 emissions by 50% below 1991 level by 2030, and become carbon neutral in 2050.
In addition, the tax for electricity used in energy production and in district heating/cooling production has been reduced from the original 16.32 øre per kWh to 0.48 øre per kWh in 2017. A **tax deduction exists** on the local grid tariff, decided by the energy authority if larger enterprises or a district heating company have a possibility for flexible loads in the energy production.
The need to use heat pumps and electric boilers has been identified by the respondents as a priority.

Factors facilitating the uptake of RHC solutions and the participation in the sector

One of the respondents belonging to the authority category reported that in Norway the Renewable Energy Directive proposal states that district heating and cooling suppliers should provide information to end-consumers on their energy performance and the share of renewable energy in their systems, and customers of "non-efficient district heating and cooling" systems should be allowed to disconnect from the system to produce RES heating or cooling themselves, or to switch to third party RES/waste

heat supplier. This is defined as a facilitating factor. Another respondent reported that strict national buildings regulations, more energy efficient products and increased use of district heating drove the electricity use per capita down.
The city of Oslo was given as an example to illustrate the successful implementation of policies such as the Passive House or equivalent standards that since 2014 all new municipal buildings must comply with. Oslo, it was argued, has 14 passive house buildings in use, numerous kindergartens, nursing homes, schools and office buildings which comply with the mentioned standards. The city has also been a catalyst for new national building codes, which took full effect in 2017 and introduced a support scheme for households and businesses, the Oslo Climate and Energy Fund. The fund was built up in the early 80s through an extra tax on the energy bill: it supports renewable energy production such as solar energy and gives also grants to facilitate the shift from non-clean burning stoves to clean burning stoves. The Fund contributed to a significant increase in the energy savings levels of the city.

The respondents shared the interest and passion for the renewable energy sector, its implications in terms of security and everyday life across different cultures and regions of the world.

Factors limiting the uptake of RHC solutions

The following barriers to the uptake of RHC solutions have been identified by the respondents:

- **Lack of long-term planning** and support for large scale projects.
- **Technical barriers including ageing networks** with low efficiency high operating temperatures, which are not compatible with many renewable sources.

Inclusiveness of the RHC sector

Regarding the inclusiveness of the RHC sector in Norway, from the Interviews it emerged that there is an ongoing discussion about what is defined as the *Ecomodern masculine domination of environmental politics.* The inclusiveness of the RHC sector in particular is perceived as not taken into account in depth: according to the interviewees the issue of the access to RHC for vulnerable groups and minorities deserves more attention.

Possible measures to support the uptake of RHC solutions

The recommended support measures that emerged from the interviews with Norwegian stakeholders were the following:

- Combination of **context-specific solutions** maximizing the responsiveness to heating and cooling needs, resource availability, level of development of the renewable energy sector, existing infrastructure, and macroeconomic conditions.
- **Support the direct use of bioenergy, solar thermal and geothermal energy**.
- Increase energy efficiency through continued support for funds, e.g. the Climate and Energy Fund.
- Providing financial benefits for prosuming (a prosumer is someone who both produces and consumes energy).
- Increase the number of residential prosumers and transition to a low-carbon energy system.
- Enhancement of energy literacy and general awareness in the general population to illustrate the importance of the energy transition and energy efficiency.

Perceptions regarding the role of women in RHC in Norway

Women's involvement in the RHC sector

During the interviews, the respondents provided the following figures to illustrate the situation of the involvement of women in the RHC sector:

- Respondent reported that women's **employment in the STEM** sector increased from 14% to 44 % in the last 10 years and attributed this improvement to the work of the Norwegian STEM Alliance.
- The **percentage of women employed** in the RHC sector in Norway was at 21% in 2020, with the same percentage for female engineers being at 11%.
- Among men 14% have four or more years of university education while 21% of the women have a university degree or minimum 4 years university education. The interviewee sees this as a significant advantage in the long run.

The interviewee also declared that the increase in the number of women employed in business and public administration dealing with RHC has been small, but steady in the last 5 years.
Stereotypes and **biases** are perceived by the interviewees as gradually decreasing. At the same time, the **self-esteem** of women starting their career in the energy sector seems to be improving and women´s **networking** is perceived as more organized and effective.
On the consumer side, it was reported that even in large urban centers such as Oslo it is men that still deal with the main prosumer related issues while women perform the traditional energy-consuming tasks.

Perceived benefits deriving from the involvement of women

Respondents agree that gender parity has a fundamental bearing on the **growth** and **competitiveness** of economies and societies. It was also argued that a gradual increase of the involvement of the number of women in the RHC sector, has a slow positive effect on changing behavioral patterns on family level, on organizational level and on regional level in the long run.
As an example of woman-led initiative, interviewees mentioned the Power Woman Network.

Perceptions regarding the barriers faced by women in the RHC sector

The main barriers faced by women in the sector as reported by the respondents were the following:

- **Stereotypical view** of the (perceived) lack of skills and knowledge of women in the STEM related field.
- Presence of **male dominated RHC sector networks**.
- Tendency to designs **one-fits-all subsidy programs** not taking into account the diversification of the target groups especially in terms of *prosuming* related policies.

Measures to support the involvement of women in the RHC sector

- Increasing corporate responsibility for ensuring a **facilitating work environment for female professionals** in the RHC sector.
- **Stronger visibility of women in STEM** and RHC is key to motivate girls to choose STEM education, women to work in STEM and RHC and female professionals to pursue their careers in the energy sector.

- **Mentoring and networking** for creating a stimulating peer-learning environment and a supporting community for women in the RHC sector
- **Awareness raising** activities aimed at clarifying the role and the impact of the active involvement of women in energy issues.
- Analyze prosuming behaviors through gender lenses to increase the number of residential prosumers and transition to a low-carbon energy system getting women more involved than they currently are in the household decision making.

3.2.8 Slovak Republic

Perceptions regarding the uptake of RHC solutions in the Slovak Republic

Uptake of RHC solutions

The respondents operating in the Slovak Republic declared that the use of RHC is on the rise in their country. The **widespread use of biomass** was highlighted multiple times during the interviews, although most of the respondents warn against the use of wood of inappropriate quality, arguing that only centrally managed large systems ensure proper monitoring of the use of biomass. Furthermore, all the respondents agree on the **high potential of geothermal energy** in Slovakia even if the price of this last solution is extremely high and as of right now it constitutes mostly untapped potential.
At the same time **gas boiler installations as of right now remain more attractive**. According to the respondents, RES solutions are not affordable especially for low-income families. The return on investment materializes only in the long term and competing with gas is estimated to be almost impossible in the current state of affairs.
From the interviews it also emerged that with no support from the state investors prefer cheaper non RHC solutions even for new buildings.

Factors facilitating the uptake of RHC solutions and the participation in the sector

The main facilitating factor that emerged from the interviews, revolves around the fact that **national legislations require new buildings to meet the standards of energy consumption** (class A0).
Regarding the factors that motivated the respondents to enter the sector, all the respondents declared that they pursued their career in the RHC sector because of their **passion** and **interests** that motivated them to study in this field.

Factors limiting the uptake of RHC solutions

The following barriers to the uptake of RHC solutions have been identified by the respondents:

- The **low return on investments and high price of installations** were identified as limiting factors. According to the respondents, heat pumps specifically require complex installations, high prices and administrative burden factors that make them very unattractive.
- **Almost all the participants to the interviews agreed that the RHC market is saturated**, with a lot of supply with low demand.
- Customers are not able to compare prices between these numerous solutions available because of the **lack of openness and transparency**.

- **Low levels of technical knowledge** of the RHC technologies among consumers in the Slovak Republic. The amount of information available to the consumers seems to be very large and dense, limiting their capacity to make fully informed decision.
- **Lack of reliable statistical data on the effectiveness of subsidy-like measures** and **lack of targeted support**.
- **Lack of appropriate public financial and technical support for management of geothermal wells** coupled with lack of specific competences.
- The **national legislation that prevents the disconnection of individual users from the district heating networks** they are currently part of. This is seen by most of the respondents as a limiting factor because it does not allow the installations of individual boilers. However, one of the respondents disagrees in this regard and suggests that these larger systems should be upgraded, and single households should remain connected to them to benefit in terms of efficiency from larger scale systems.

Inclusiveness of the RHC sector

Respondents agree on the fact that **more vulnerable groups do not have the opportunity to invest** in RES. In fact, the initial investment required, and the long-term return perspective is a barrier for low-income families and older cohorts. These barriers are particularly relevant for the social groups living in older buildings that would need to be refurbished to adopt RHC solutions.
One of the respondents remarked that the price of heat pumps is decreasing, which means that it might soon become more accessible for low-income households.
Generally, the more vulnerable groups take less environmentally conscious decisions because they cannot afford otherwise. So most of the respondents agree that **public subsidies play a major role in guaranteeing access to RHC for all**.

Possible measures to support the uptake of RHC solutions

Respondents indicated the following measures to support the uptake of RHC solutions:

- The respondents argued in favor of an **increased visibility for good practices and awareness raising campaigns** about the impact of RHC.
- Importance was also attributed to the **training of local administrations and municipalities**.
- Another suggestion revolved around the development of **calculators on the return on equipment**, meant to help the customers to find the right combinations of heating and cooling equipment including RES solutions, and to be informed on preliminary investment costs and expected returns.
- **Case-by-case support** coupled with **information on the lifecycle of the different facilities** raising awareness on the impact of RHC technologies.
- Others identified measures involved **tax relief, subsidies, and discounts on high quality raw materials**, especially for biomass fuel.
- The academia and business respondents argue in favor of the **state subsidies for renovation of already existing buildings** and allowing the disconnection from central heating sources.
- Some of the respondents from the academia and business categories argued in favor of **simplified legislation and administrative procedures** especially covering subsidies and discounts in order to alleviate the regulatory burden.

Perceptions regarding the role of women in RHC in the Slovak Republic

Women's involvement in the RHC sector

In general, respondents in the Slovak Republic observe that the **participation of women in the sector is not a problem** for their country. Women, they say, are mainly represented in positions in **research, and public administration**.

At the same time, another respondent argues that the representation of women is **low in the energy sector**, especially in top management positions in the industry and in the more technical construction related position.

Perceived benefits deriving from the involvement of women

There seems to be a consensus among respondents over the fact that **increasing the share of women in the RHC sector is desirable**, but it would not help the development of the sector significantly. In other words, most of the respondents agree on the inherent value of an improved engagement of women in the sector but they do not explicitly establish a direct causal relationship between it and the development of the sector.

Some other respondents note that the **awareness of gender related issues and of the benefits of involving women more in the sector has not developed** in the Slovakian society yet.

Perceptions regarding the barriers faced by women in the RHC sector

Most of the respondents declared that there are no significant barriers to the involvement of women in the sector. However, the following limiting factors were mentioned:

- **Societal stereotypes.**
- **Lack of support for mothers.**
- **Lack of awareness** on gender equality issues and the benefit of an increased female participation in the sector.
- **Low attractiveness of the private sector for women**. The public sector is reported to offer a more comprehensive job security.

Measures to support the involvement of women in the RHC sector

The suggested measures to improve women's' degree of involvement in the sector were the following:

- **Welfare measures**, including:
    - More child-care facilities.
    - Increased tax relief for childcare.
    - Providing flexible working hours.
    - Housework.
- **Financial support from the state**, e.g., for care, food, etc. especially in the case of single-parent families).
- Technical support.
- Skills training.
- Support for participation in professional conferences (in person, online).
- Support for entrepreneurs to inform about uptake of innovative technologies.
- Dissemination case studies of successful women in RHC and of good practices.

4 SURVEY

The last component of the deliverable is the survey. Based on the analysis of the preliminary qualitative data emerging from the interviews, a multi-component survey has been developed. This last task will also address the four main quadruple helix stakeholder groups identified for the interviews, i.e. business, academia, policy makers and civil society. The survey is conceived as the main quantitative tool to assess perceptions of stakeholders along with some crucial factors. The main purpose is to collect quantitative evidence on the perceptions and challenges of market actors concerning the uptake of RHC solutions and the role of women in the sector across the 8 considered countries. These insights will ultimately help define 8 country profiles.

4.1 Survey methodology

The main idea behind the survey design is to obtain a clear identification of key factors correlated to the market uptake of RHC solutions through a gender disaggregated analytical approach.
To better address different perspectives across the quadruple helix, the survey has been designed to include questions that are specifically targeted to each group. The survey has been divided into broad sections covering the most relevant topics to be addressed.
As for the interviews, to analyze needs, perceptions and challenges of market actors and stakeholders through a gender lens, the following research questions were defined:

I. **Identify needs, perceptions and challenges of market actors and stakeholders across the quadruple helix in the 8 regions regarding the uptake of RHC solutions.**
II. **Identify needs, perceptions and challenges of market actors and stakeholders across the quadruple helix in the 8 regions regarding the role of women in RHC.**

The survey was coded on the EUSurvey software and translated in the following languages: English, German, French, Bulgarian, Danish, Greek, Italian, Dutch and Slovak. As advised by ECWT, the partner based in Norway, it was agreed that disseminating the survey in English to the potential respondents operating in Norway was an appropriate strategy and that a translation in Norwegian was not necessary.

4.1.1 Sampling methodology and target groups

The target audience of this task followed the sampling scheme employed for the interviews, i.e. including four main categories of the Quadruple Helix:

- **Authorities:** Regional authorities, policymakers, etc.
- **Business:** Energy suppliers, technology installers, technical consultancies, women-led businesses in RHC, etc.
- **Academia:** Women-led research projects and studies, etc.
- **Civil society:** NGOs, consumer associations, action groups, networks supporting women in RHC.

Once again, the objective was to reach a diversified set of participants with different roles in the RHC sector, operating in the 8 countries directly within the scope of W4RES. The identified target of completed surveys set in the project objectives was **240**, including all four groups of stakeholders. An indicative minimum number of 30 responses per country was envisaged.

In addition to the insights relative to the 8 countries directly linked to W4RES, respondents from other countries were able to participate to the survey as well. This addition was envisaged to possibly complement the analysis and to broaden the network of contacts among which the survey would circulate.

4.1.2 Survey questionnaire overview

The survey was designed to cover following main components:

- **Section A) General information**
- **Section B) Renewable Heating and Cooling (RHC) landscape in my country**
- **Section C) Perceptions regarding the role of women in RHC in my country**

For the full survey questionnaire see Annex 3.

Section A) General information

Section A aimed to gather information on the respondent to gather some information about its role in the RHC sector. More specifically the data collected included:

- Gender
- Stakeholder Group (one of the four Quadruple Helix categories)
- Country where they operated.
- Profession
- Educational background
- Level of Education (Primary, Secondary or Tertiary)

The answer choices in this section were in the following form: **yes/no**, **one choice** from a defined list of choices or **multiple choice**.

Section B) Renewable Heating and Cooling (RHC) landscape in my country

Mirroring the rationale behind the interview's questionnaire and the research questions mentioned above, Section B of the survey explored how respondents perceive the uptake of RHC solutions in their country.

- **Perceptions regarding the uptake or RHC in the respondents' country.** Respondents were asked to quantify the level of deployment of RHC technologies, identify the most prominent RHC in their country and their main applications and their view of the framework conditions to the RHC uptake.
- **Opportunities and support measures for RHC uptake in the respondents' country.** This sub-section focused on the perception of the level of awareness of the respondents, the general public and the perceived impact and accessibility of support measures of different nature such as financial and technical.
- **Main barriers for RHC uptake in the respondents' country.** Respondents were here asked to provide their opinion on the factors limiting the uptake of RHC solutions, by classifying a set of given barriers and by being given the opportunity to integrate the list.

The answers are in the following formats: one choice from a defined list of choices or multiple choice, agreement on a 1 to 5 scale and fields in which the respondent could add what was not already included in the options given by the questionnaire.

Section C) Perceptions regarding the role of women in RHC in the respondents' country

Finally, Section C aimed at collecting insights on how respondents perceive the level of involvement of women in the RHC sector. Once again following the structure of the interviews questionnaire the questions were organized in the following subsections:

- **General perception on female involvement in the RHC sector in the respondents' country .** In this sub-section the respondents were asked to provide their views on the topic by assessing the participation of women in key sectors and their likelihood to cover decision-making positions. They were asked their opinion on the potential benefits of an increased involvement of women and if that should be an objective to pursue.
- **Main barriers for the involvement of women in RHC uptake in the respondents' country.** The respondents were here asked to give a score from 1 to 5 to the importance of a given set of barriers grouped in the following types: perceptions of gender roles, barriers on the career pathway, barriers to career retention and advancement and barriers to equal access to energy.
- **Measures to support the involvement of women in RHC.** In the last subsection the questions focused on the most appropriate measures to support women's participation in the RHC sector. The measures were investigated in detail distinguishing between business support, technical support, awareness raising, capacity building (distinguishing the topic and the target audience).

Similarly, to the last section, the answers are in the following formats: one choice from a defined list of choices or multiple choice, agreement on a 1 to 5 scale and fields and once again the respondents were allowed to integrate the list of options given by the questionnaire.

4.1.3 Data collection

The data collection has been administered online, leveraging the database of contacts disposed by the consortium partners. The survey was actively disseminated by means of **direct email campaigns performed by the partners** to personally address the targeted stakeholders among their network of contacts in their countries. The stakeholders were first identified by each partner among their contacts, who were then invited to share the surveys' links to their own contacts, counting therefore on a ripple effect.

The target audience of the survey was a relatively specific and restricted subset of the more general renewable energy field, consisting of actors that operate in a relatively small-sized sector such as the Renewable Heating and Cooling one. To reach this relatively limited pool of potential respondents in the most efficient way possible, different methods were employed in addition to the already mentioned email campaign. Targeted profiles were identified and contacted **through LinkedIn** and asked to disseminate the survey further. In coordination with all the partners, the survey was disseminated through **social media outreach campaigns** through the project and the partners social media pages on different platforms such as LinkedIn, Twitter and Facebook. To support these efforts, it was agreed to disseminate the survey links through the **partners website newsletters**, the **European Technology and Innovation Platform on Renewable Heating & Cooling (RHC-ETIP)**, and through mutual collaboration with **other projects' consortia**.

The search for respondents proved to be more complicated for determinate categories of stakeholders in determinate countries, but a more targeted approach allowed the collection of a satisfactory number of responses reaching and passing the target of 240 (see table below).

Responses have been gathered from Monday the 08th of February to Monday the 15th of March. The total amount of complete surveys collected was 332. The table below provides an overview of the distribution per country and per Quadruple Helix category.

	Greece	*Germany*	*Belgium*	*Italy*	*Denmark*	*Slovakia*	*Norway*	*Bulgaria*	*Other*	
Authority	5	16	5	3	4	11	1	11		
Business	39	11	9	15	8	5	7	5	6	
Academia	28	8	5	35	3	5	4	7	6	
Civil Society	6	8	5	21	8	12	1	9		**Total**
TOTAL	78	43	24	74	23	33	13	32	12	332

Table 3 Stakeholders reached per country

4.2 Analysis of the survey

4.2.1 General description of the sample

Table 4 presents the sample distribution per country. We can see that throughout our data collection process we managed to collect a total set of 332 responses covering all pilot countries. A more detailed distribution of our sample is given in Table 5 and 6, where we can see the relevant breakdown based on demographics, in total and per country. In general, it becomes evident that our sample included mostly female participants (65.36%) with tertiary education (89.76%). Regarding the different type of stakeholders that participated, we can see that there is a relevant balance between the quadruple helix stakeholders, with a slight increased participation from business (31.63%) and academia (30.42%).

Country	Number	Share
Belgium	24	7.23%
Denmark	23	6.93%
Greece	78	23.49%
Norway	13	3.92%
Bulgaria	32	9.64%
Germany	43	12.95%
Italy	74	22.29%
Slovak Republic	33	9.94%
Other	12	3.61%
Total	332	100.00%

Table 4: Sample distribution between targeted countries.

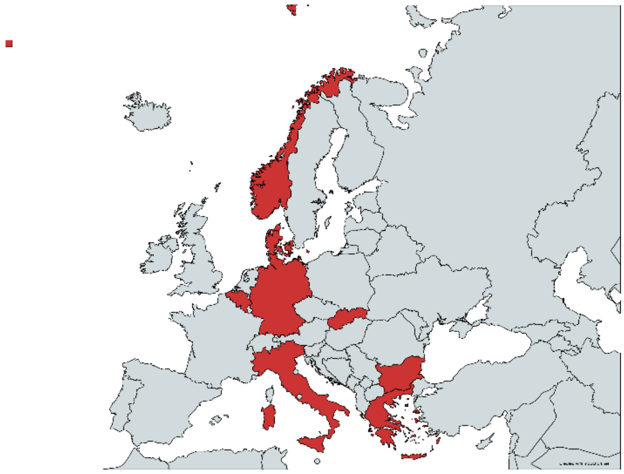


Figure 1: Map of targeted countries

Within countries, Table 2 shows that in many cases we managed to keep a balance between the quadruple stakeholder groups, with the exceptions of Greece, Norway and Slovak Republic, where there has been an increased participation of the business sector (50% - 53.85% - 50% respectively).

	Total		**Belgium**		**Denmark**		**Greece**		**Norway**	
Type of stakeholders	No.	Share	No.	Share	No.	Share	No.	Share	No.	Share
Business	105	31.63%	9	37.50%	8	34.78%	39	50.00%	7	53.85%
Academia	101	30.42%	5	20.83%	3	13.04%	28	35.90%	4	30.77%
Policy makers	56	16.87%	5	20.83%	4	17.39%	5	6.41%	1	7.69%
Civil Society	70	21.08%	5	20.83%	8	34.78%	6	7.69%	1	7.69%
Total	332	100.00%	24	100.00%	23	100.00%	78	100.00%	13	100.00%
Gender										
Male	115	34.64%	12	50.00%	8	34.78%	37	47.44%	3	23.08%
Female	217	65.36%	12	50.00%	15	65.22%	41	52.56%	10	76.92%
Total	332	100.00%	24	100.00%	23	100.00%	78	100.00%	13	100.00%
Educational level										
Primary	18	5.42%	1	4.17%	16	69.57%	0	0.00%	0	0.00%
Secondary	16	4.82%	0	0.00%	2	8.70%	2	2.56%	1	7.69%
Tertiary	298	89.76%	23	95.83%	5	21.74%	76	97.44%	12	92.31%
Total	332	100.00%	24	100.00%	23	100.00%	78	100.00%	13	100.00%

Table 5 Sample distribution based on demographics and stakeholder types (continue)

	Bulgaria		**Germany**		**Italy**		**Slovak Republic**	
Type of stakeholders	No.	Share	No.	Share	No.	Share	No.	Share
Business	5	15.63%	11	25.58%	15	20.27%	5	15.15%
Academia	7	21.88%	8	18.60%	35	47.30%	5	15.15%
Policy makers	11	34.38%	16	37.21%	3	4.05%	11	33.33%
Civil Society	9	28.13%	8	18.60%	21	28.38%	12	36.36%
Total	32	100.00%	43	100.00%	74	100.00%	33	100.00%
Gender								

Male	9	28.13%	12	27.91%	22	29.73%	9	27.27%
Female	23	71.88%	31	72.09%	52	70.27%	24	72.73%
Total	32	100.00%	43	100.00%	74	100.00%	33	100.00%
Educational level								
Primary	0	0.00%	0	0.00%	1	1.35%	0	0.00%
Secondary	0	0.00%	2	4.65%	2	2.70%	7	21.21%
Tertiary	32	100.00%	41	95.35%	71	95.95%	26	78.79%
Total	32	100.00%	43	100.00%	74	100.00%	33	100.00%

Table 6: Sample distribution based on demographics and stakeholder types (continue)

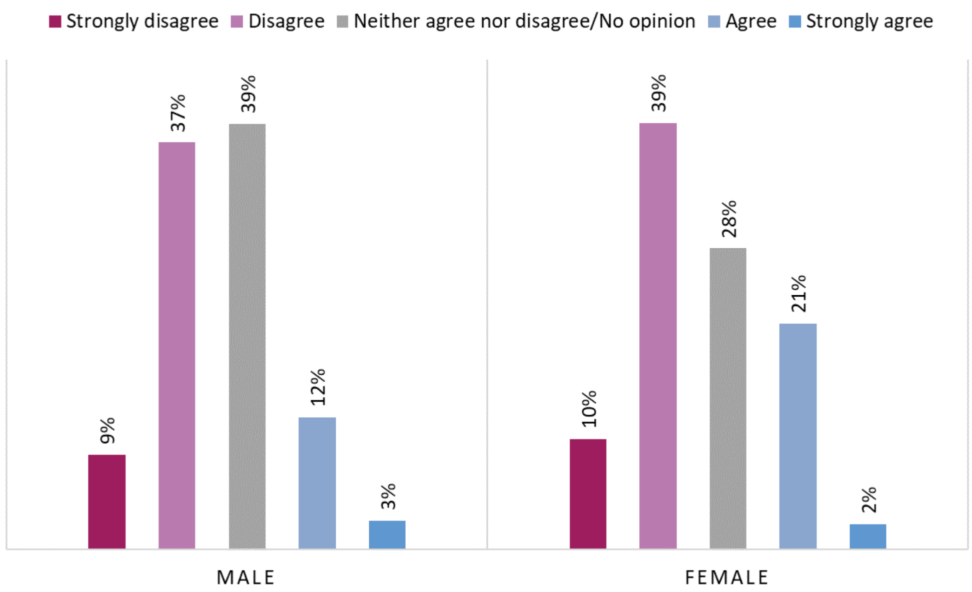
The analysis of the results is provided in two discrete parts. In the first part, we provide a general overview regarding participants' perceptions regarding the deployment, the potential and the application markets of RHC technologies, where we investigate potential variations in terms of gender, stakeholder types and countries. We also provide a detailed descriptive analysis regarding gender-based roles, career paths and equal access to energy solutions. In the second part of the analysis, we focus on each country specifically, trying to provide more targeted insights regarding potential actions related to the types of business and technical support that women in RHC can receive. We also provide information on key topics that should be used for training, capacity building and awareness raising for women in RHC, and we highlight the most relevant stakeholder groups that should be targeted in each country.

4.2.2 Section A: General perceptions regarding the RHC technologies and the role of women in RHC

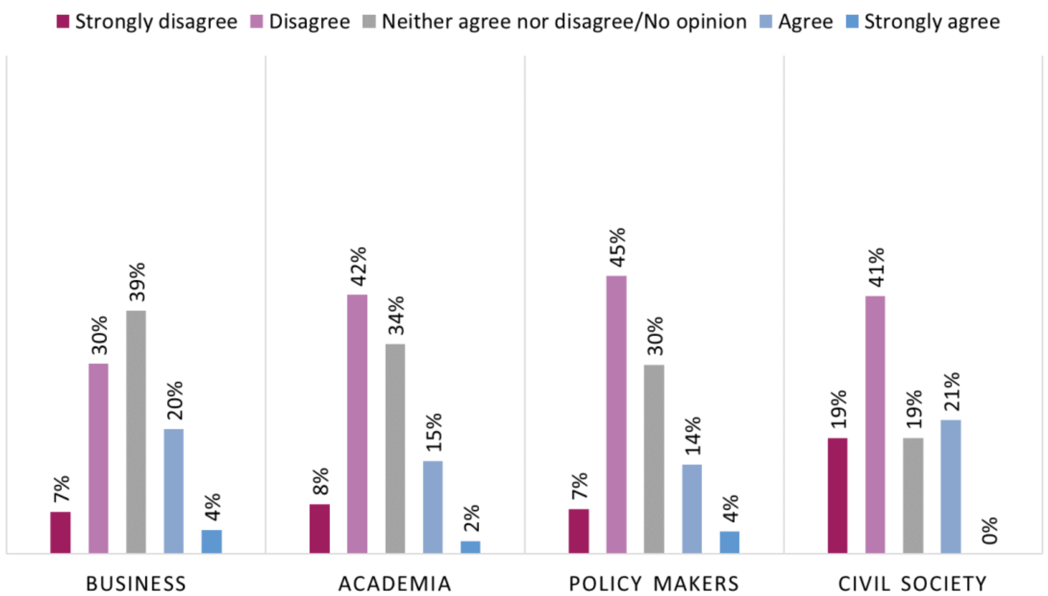
Starting from the *general perceptions' analysis* regarding the wide deployment of RHC solutions, Fig.2 shows the level of agreement of our respondents in terms of gender, stakeholder type and country. As we can see, there are no significant differences in responses between men and women, as in both cases there is a strong perception that RHC technologies are not being widely used in their countries (46% for men – 49% for women).

When taking a closer look at the same responses based on stakeholder types, our results indicate that, again, there is a general disagreement regarding the broad utilisation of renewables in heating and cooling solutions. More specifically, participants from civil society indicate a stronger disagreement (19%), compared to the other groups, which might result due to the lack of information compared to the other three groups. However, at the same time, civil society is the stakeholder group with the highest agreement level (21%) together with the business sector (20%). This indicates that there is a potential confusion regarding the application of RHC technologies in the civil society actors, calling for more targeted and efficient awareness raising campaigns.

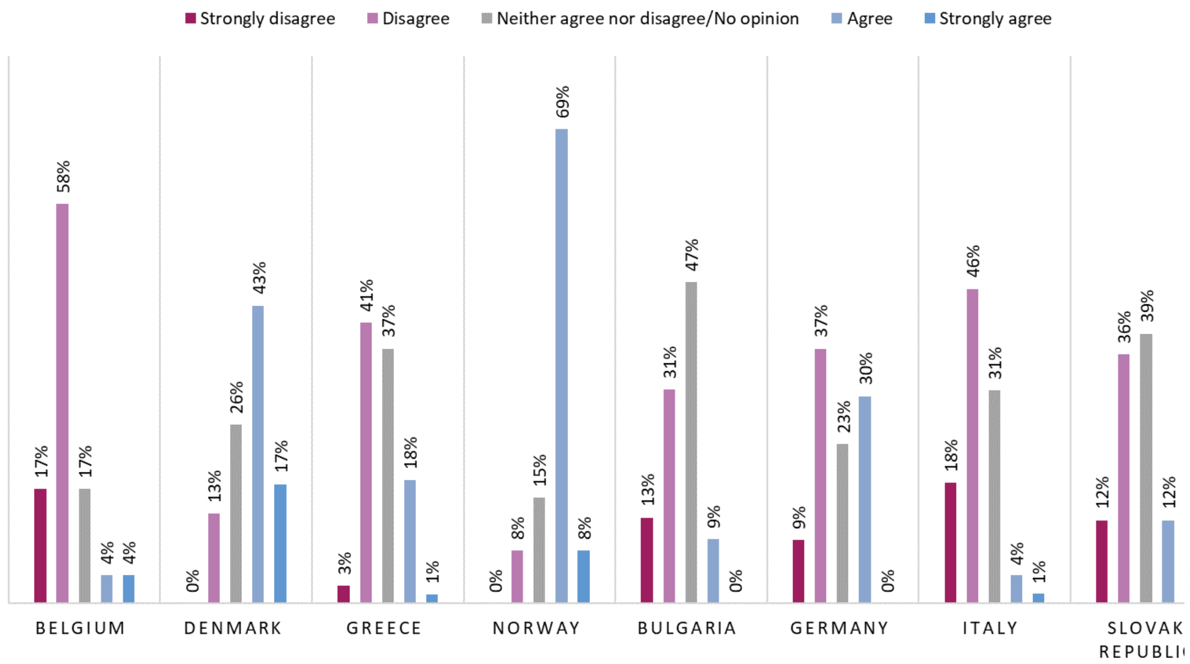
At a country level, we can see that there is a general disagreement regarding the fact that the RHC technologies are being widely used in all countries, with the exception of Denmark and Norway. Throughout our analysis, we will see that these two countries seem not to follow a similar pattern in relation to the other six countries included in our analysis, fact which might relate to the different socio-economic, environmental, cultural and policy approaches being used in them by policymakers and other relevant stakeholders.



(a) by gender



(b) by stakeholder group



(c) by country

Figure 2: General perceptions regarding the wide deployment of RHC solutions

Moving on to the prominent RHC technologies that are being used, Fig.3 indicates that there are no great variations in perceptions between men and women. As we can see, solar thermal and photovoltaics are highlighted as the most promising technologies for both genders, whereas heat pumps lie at the second place, followed by biomass. District HC heating and thermal storage, alongside geothermal applications seem to be the lease prominent RHC technologies, as suggested by the survey participants. The same results also apply in the case where the respondents were asked to indicate the least utilised RHC technologies. In Fig.4, we can see that participants believe that district HC heating and thermal storage, together with geothermal applications, are most underutilised RHC technologies. Again, there are no great differentiations in terms of gender.

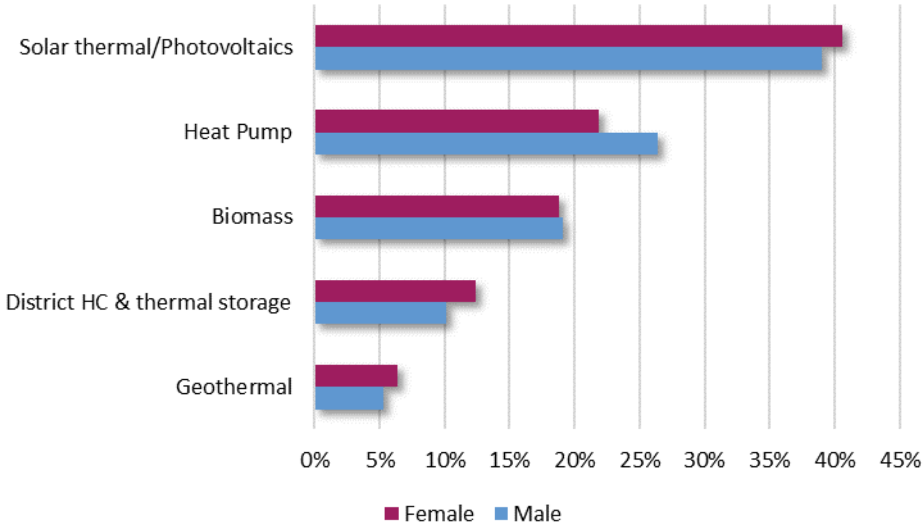


Figure 3: Most prominent RHC technologies by gender.

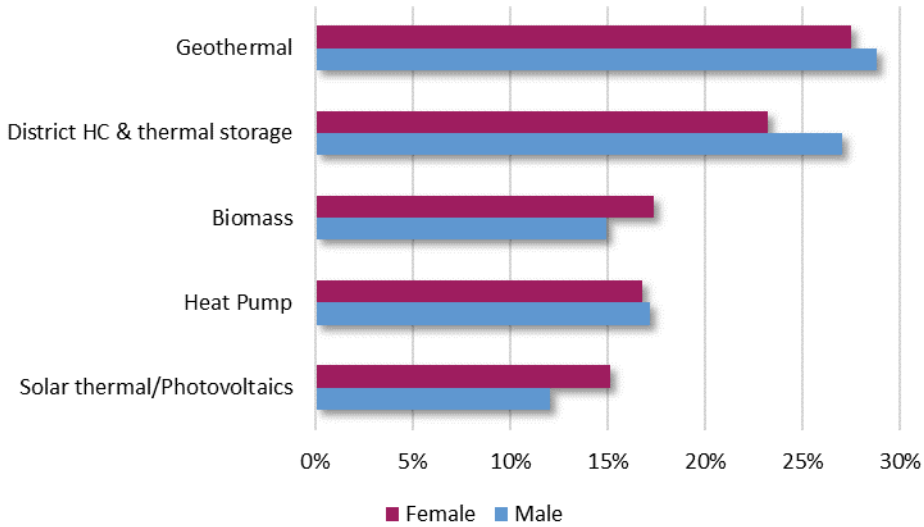


Figure 4: Most currently underutilised RHC technologies by gender

When performing the same analysis at a country level, we can see that some variations arise between the pilot countries (Fig. 5 & 6). First, we can see that there is a general trend indicating that solar thermal and photovoltaics, together with heat pumps are the most prominent RHC technologies in many of our pilot countries (Belgium, Greece, Bulgaria, Germany and Italy). Denmark indicates an interesting case, where district heating and thermal storage have received an increased attention as the most prominent RHC technology, whereas participants from Slovak Republic highlight the importance of biomass as a widely used RHC technology in their country (Fig.5). Responses referring to the underutilised RHC technologies have shown that, in all cases, geothermal applications are being used the least. At the same time, district heating and thermal storage are also an underutilised technology for RHC in many cases, whilst participants from Denmark indicate their country still lacks a broad use of solar thermal and photovoltaics RHC applications (Fig.6).

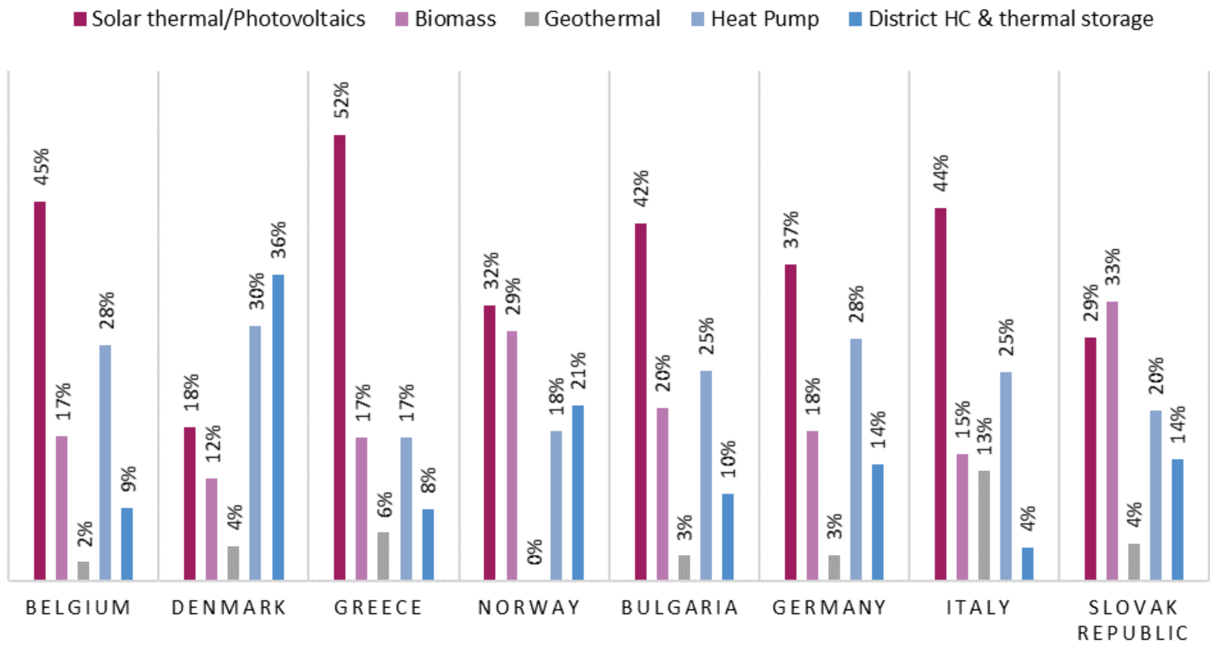


Figure 5: Most prominent RHC technologies by country

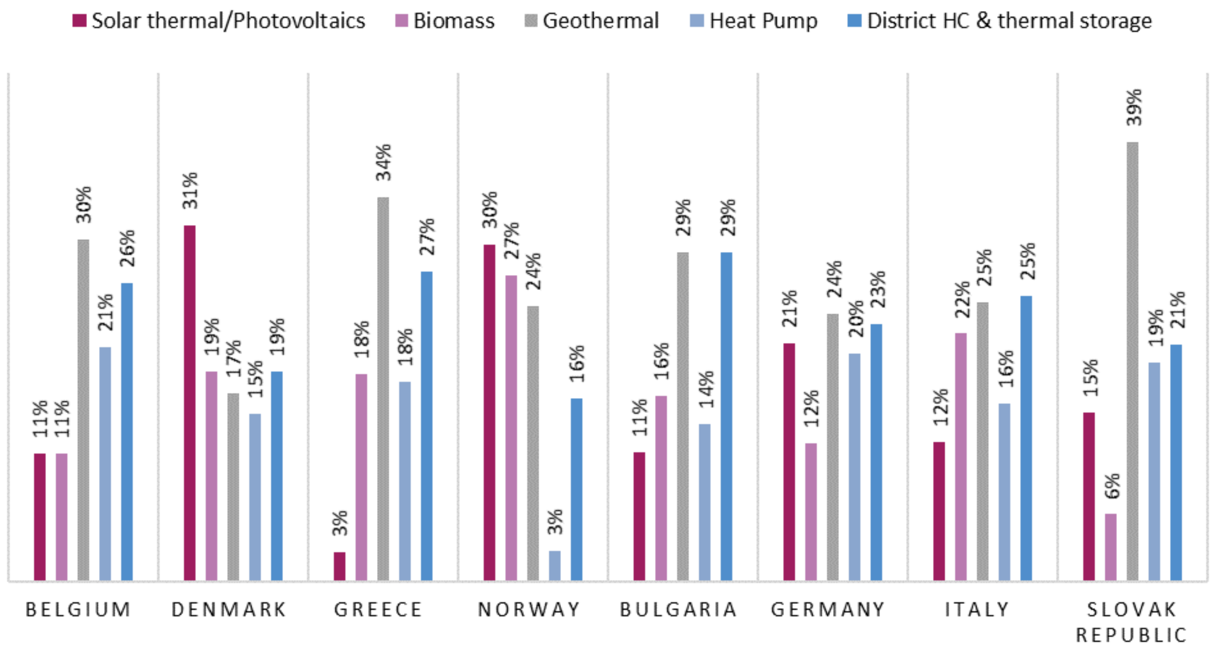


Figure 6: Most currently underutilised RHC technologies by country

After having identified the most and least prominent RHC technologies, our survey data provided us with the opportunity to take a closer look at the potential application markets where these solutions could be used. Fig. 7 shows the decomposition of responses based on the gender factor. As we can see, there are no significant differences between men and women, as both believe that residential applications are the most prominent market where RHC applications can be used. Public buildings and industrial heating are the next two most popular areas, whereas commercial buildings seem to receive the least attention from our survey respondents. When we decompose our sample based on the quadruple helix stakeholder types, we can see that some differences arise between them. More specifically, business participants strongly point out the importance of industrial heating applications as a potential market for RHC solutions, showing a lower interest in the residential sector which is strongly highlighted by participants coming from academia and civil society. Academia also indicates a very low interest on applying RHC solutions in commercial building, compared to all other stakeholder groups. Given the variations between the different stakeholder groups, it is important that discussions need to be promoted between them, towards triggering interactions that can result in a more effective sharing of information.

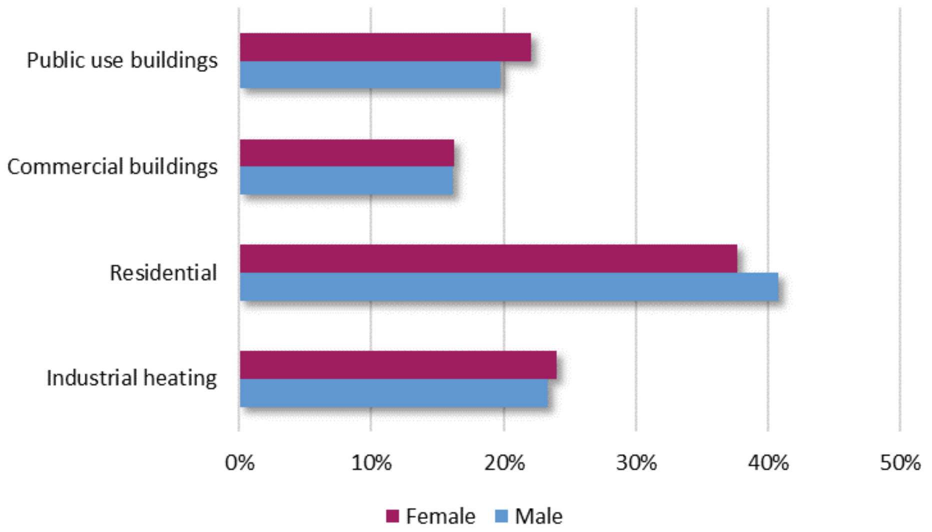


Figure 7: Application markets of RHC technologies by gender.

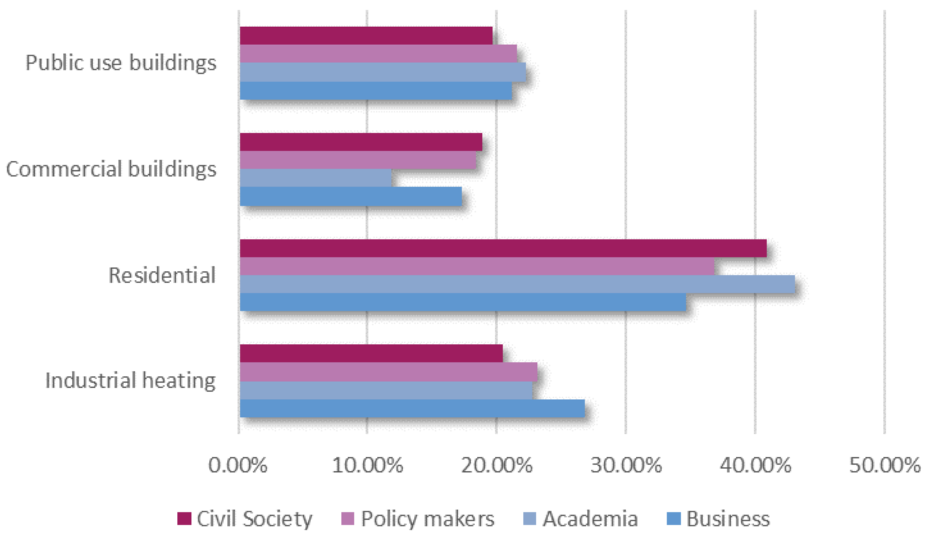
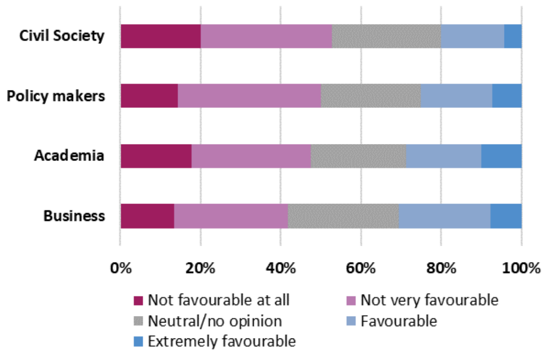
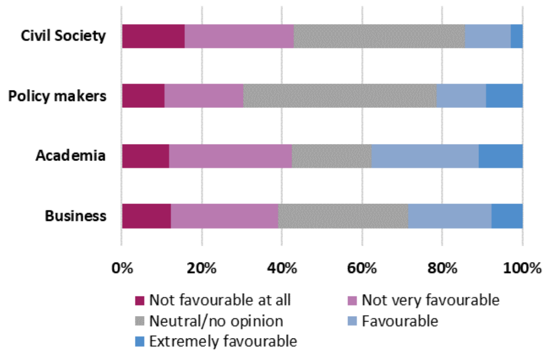


Figure 8: Application markets of RHC technologies by stakeholder groups

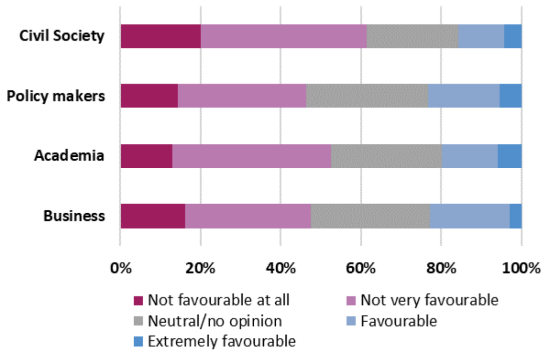
Even though the identification of the RHC technologies and the markets that they can be applied to is an essential factor, it is also important to take a closer look at the different framework conditions that apply in the RHC sector. Therefore, our analysis provides a set of insights about the various stakeholders' groups' perceptions regarding the extent to which they think different types of framework conditions are favourable for the adoption of RHC technologies in their country. Fig.9 presents our findings for a set of five different types of framework conditions.



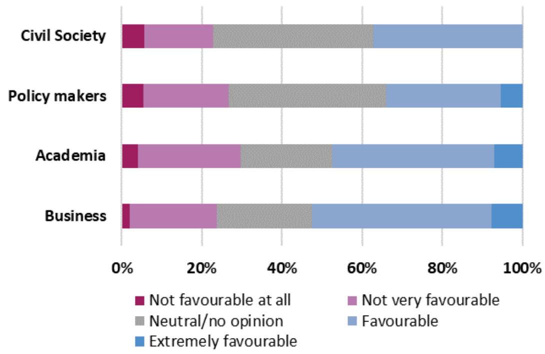
(a) Financial framework conditions



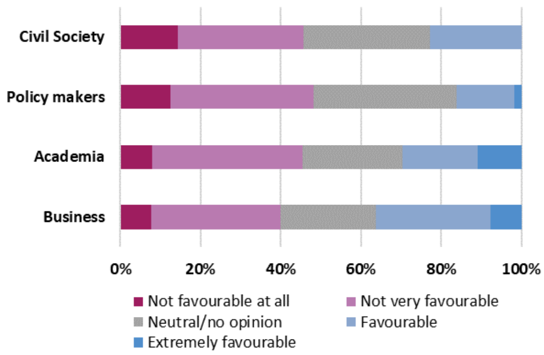
(b) Political framework conditions



(c) Legal framework conditions



(d) Market framework conditions



(e) Social framework conditions

Figure 9 Results indicating how favourable are the different framework conditions to RHC uptake in the overall sample, by stakeholder group.

Starting with the civil society group, we can see that in almost all cases they feel that framework conditions are not favourable for RHC solutions, as over 40% of these stakeholders have a negative perception for the current state-of-the-art related to the financial, political, legal and social framework conditions. The market framework is the only case where this stakeholder type indicates an increased positive perception regarding the existing framework conditions. In the case of policy makers, they also tend to have a negative attitude in almost all cases, with exception of the political framework conditions, where they keep a neutral positioning without showing any strong positive nor negative opinion (Fig.9b). Academia and business stakeholders seem to follow a similar pattern, characterised by a negative attitude regarding the financial and legal framework, a more neutral approach in the case of political and social conditions, and a generally positive perception for the current market conditions. This latter positive attitude might result due the fact that these two stakeholder groups might have better information understanding related to market aspects, and therefore, they feel that the market is a favourable place for boosting RHC technologies.

To get a more in-depth insight regarding individuals' perceptions on current framework conditions, we were able to provide a more detailed analysis on participants' opinions related to specific opportunities and support measures on the RHC sector. In general, participants in all countries are largely aware of the benefits that RHC solutions bring to their countries (Fig.10), and at the same time, they believe that the development of energy communities would facilitate the uptake of RHC solutions in their countries. Another interesting finding is that, even though in many cases they believe that there is a satisfactory level of awareness on RHC in their countries, they feel that the public is not well informed on existing support measures and financial opportunities for RHC solutions. On the contrary, there is a general positive feeling in most countries, apart from Germany, that the current policies favour the uptake of RHC solutions. In general, we can see that there is a missing link between technological and financial-related aspects for the uptake of RHC solutions, as participants feel that a large share of the general public has the technical knowledge of RHC solution, but it is not easy for them to access financial and support measures in their countries.

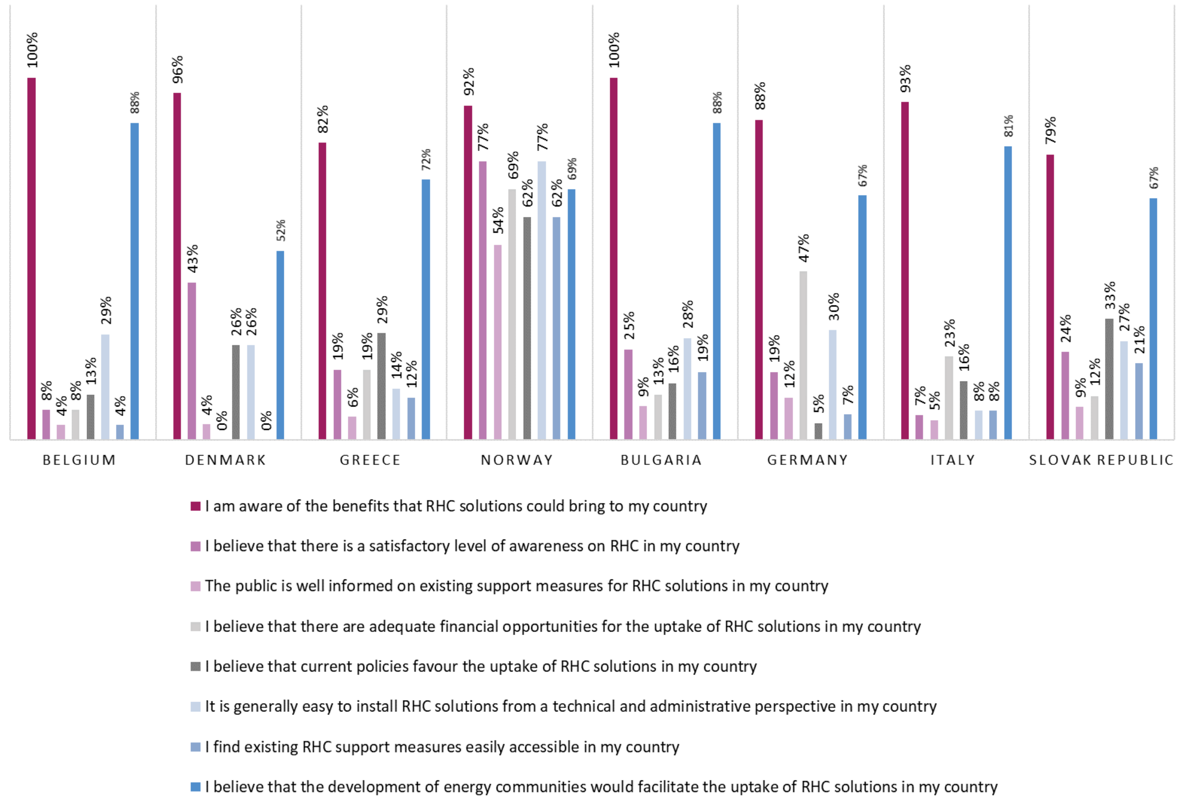


Figure 10: Participants' beliefs related to opportunities and support measures related to RHC uptake by country.

Moving on to a more focused question, Table 7 presents the results related to a set of identified barriers for the uptake of RHC solutions in the selected countries. As we ca see, high installation costs and, thus, higher competitiveness of traditional solutions are two of the most acknowledged barriers in all 8 countries. Moreover, barriers related to the existing policy framework, such as lack of policy support, uncertainty of regulations and unclear legal situation for consumers, tenants and landlords, are also on the top of the list of barriers. In addition, insufficient information about the benefits of RHC solutions, as well as potential state financial support measures that might exist seem to receive significant attention by survey participants in most countries. It is interesting to notice that in the cases of Denmark and Norway there seems to be sufficient awareness raising policies, the results show that only a small share of respondents believe that there is a lack of information about the benefits of RHC solutions (17% and 15%, respectively).

In the last places of our list, we can find technology and skills-related barriers, such as lack of suitable technologies, lack of skilled personnel for installing RHC solutions and providing support, as well as scarcity of renewable energy resources. This shows that the main barriers related to the uptake of RHC solutions are not related to lack of technological know-how, but instead, they mostly derive due insufficient communication and awareness raising channels between the different types of stakeholders. This is an important outcome that needs to be further investigated by policy makers, towards achieving a more meaningful and efficient development of policies and actions for the uptake of RHC solutions.

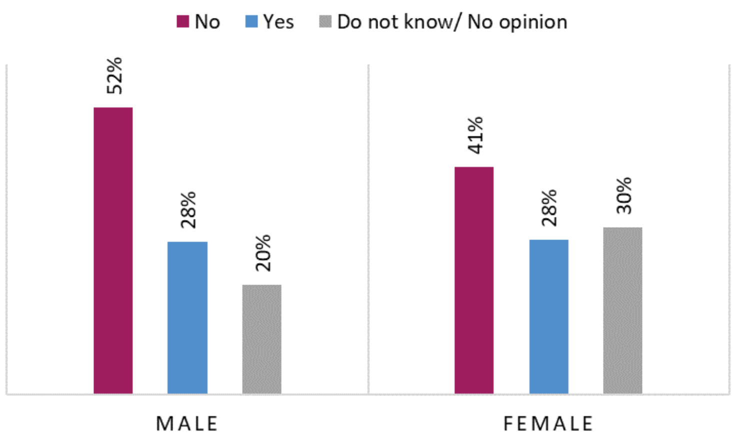
Table 7: General levels of agreement regarding the barriers affecting the uptake of RHC technologies in the selected countries.

	Belgium	Denmark	Greece	Norway	Bulgaria	Germany	Italy	Slovak Republic
High installation cost	71%	70%	76%	23%	75%	65%	58%	73%
Higher competitiveness of traditional solutions	79%	70%	60%	38%	41%	72%	41%	70%
Lack of policy support	75%	74%	67%	0%	63%	65%	68%	48%
Insufficient information about the benefits of RHC solutions	58%	17%	73%	15%	66%	56%	74%	67%
Uncertainty of regulations	71%	61%	67%	8%	66%	53%	59%	39%
Unclear legal situation for consumers, tenants and landlords	67%	48%	55%	8%	59%	72%	57%	52%
Lack of information about state financial support	42%	65%	73%	0%	69%	33%	66%	58%
Unequal access for vulnerable groups of society	63%	39%	63%	15%	56%	67%	57%	33%
Lack of environmental public awareness	38%	17%	68%	8%	56%	49%	64%	52%
Uncertainty around the performance of RHC technologies	54%	26%	46%	15%	47%	63%	42%	48%
Risky investments for consumers	58%	52%	42%	15%	56%	42%	30%	39%
Volatility in energy provision from renewables	21%	35%	38%	15%	47%	51%	30%	39%
Lack of suitable technologies	13%	9%	46%	8%	50%	16%	39%	39%
Lack of skilled personnel for installing RHC solutions and providing support	29%	0%	32%	0%	41%	53%	31%	30%
Scarcity of renewable energy resources	17%	9%	15%	8%	6%	7%	12%	12%

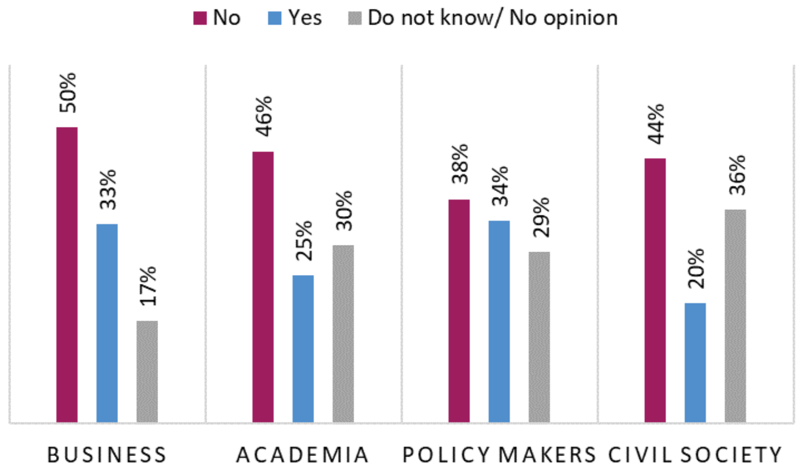
Note: Results in the figure include the share of participants that have stated that they 4=Agree or 5=Strongly agree with the statement provided in the question.

Taking a closer look on the awareness levels related to RHC solutions, Fig. 11 shows participants' perceptions regarding the levels to which they think that local businesses and initiatives are aware of the benefits of RHC solutions, and hence, they are willing to deploy them. As we can see, there are no significant variations between men's and women's perceptions, as they both believe that there is a significant lack of awareness (52% and 41% respectively). When we decompose our sample based on stakeholder types (Fig.11b), we can see that there is a similar trend between business, academia and civil society participants, who point out this lack of awareness, fact which is also highlighted by policy makers but to a much lower extent. It seems that there is a high share of policy makers (34%) -higher than all other stakeholder groups- that believe that local businesses or other initiatives are aware of the benefits of RHC solutions and are ready to deploy them. This gap between policy makers' and all other stakeholder groups' perceptions might be an interesting starting point for discussions between them, as it seems that there is no common understanding of the current RHC state-of-the-art awareness levels.

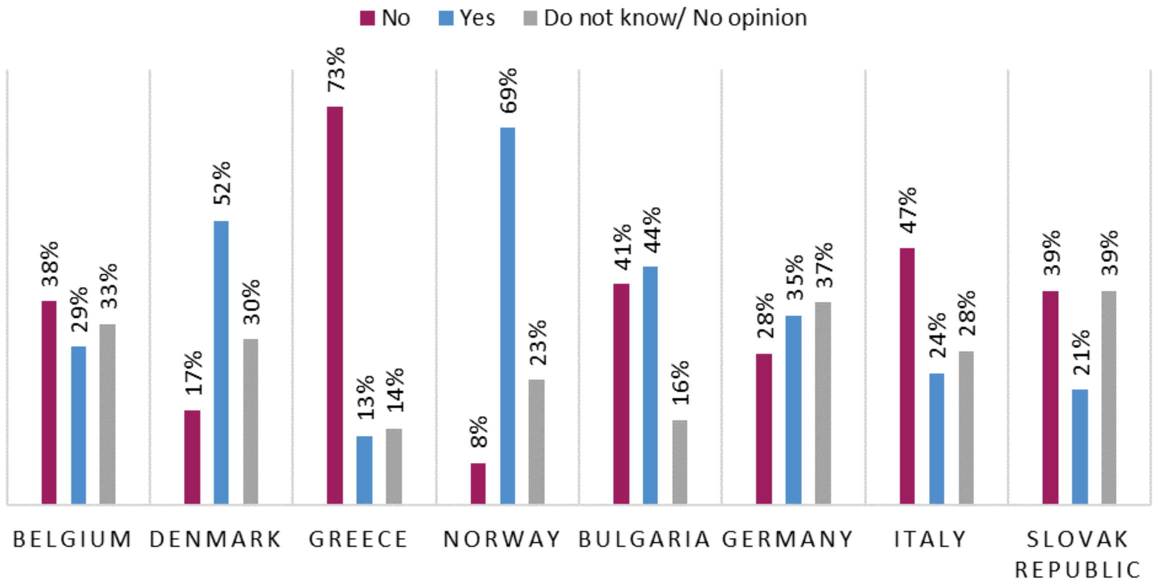
Results by country are also very interesting. Fig.11c indicates that there are two groups of countries: (i) the ones who believe that local businesses or other initiatives *are* aware of the benefits of RHC solutions and are ready to deploy them (Denmark, Norway, Bulgaria, and Germany); and (ii) the ones who believe that local businesses or other initiatives *are not* properly aware of the benefits of RHC solutions and are ready to deploy them (Belgium, Greece, Italy and Slovak Republic). In this case it is interesting to notice the large differentiation between Denmark and Greece.



(a) by gender



(b) by stakeholder group

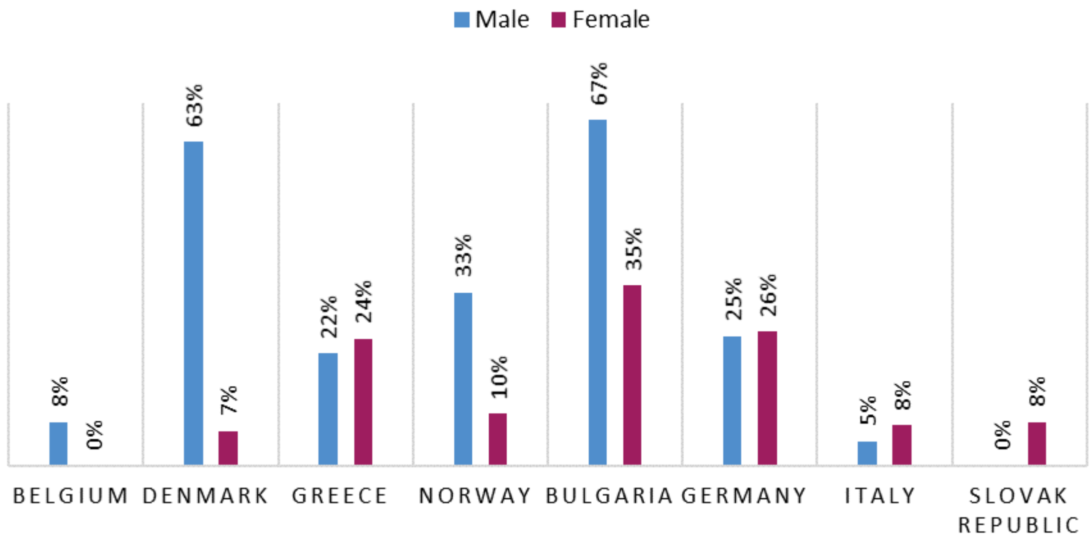


(c) by country

Figure 11: Awareness of local businesses or other initiatives of the benefits of RHC solutions and willingness to deploy them.

Moving on the *gender-related analysis* of our survey, our analysis has tried to extract meaningful information relevant to potential gender-based perceptions, drivers and barriers in the RHC sector. In all cases we try to investigate whether significant diversifications rise between genders, stakeholder types and countries participating in our survey.

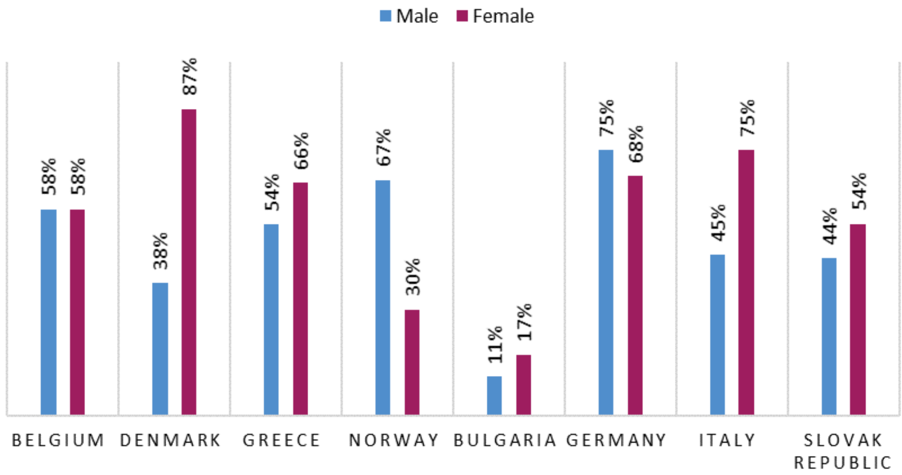
Starting from general perceptions regarding women's participation in the RHC sector per country, Fig.12 presents our findings by gender. More specifically, Fig.12 depicts the shares of participants that agree or strongly agree with the statement that women participate as much as men in the RHC sector in their countries. It becomes evident that there is a differentiation between the male and female perspective in some cases, such Denmark, Norway, and Bulgaria, where a larger share of men believe that equal gender participation in RHC has been achieved (63% - 33% - 67% respectively), compared to the corresponding share of women participants (7% - 10% - 35% respectively). In the cases of Greece, Germany and Italy, we can see that there is no significant variations between the male and female perspectives on the matter.



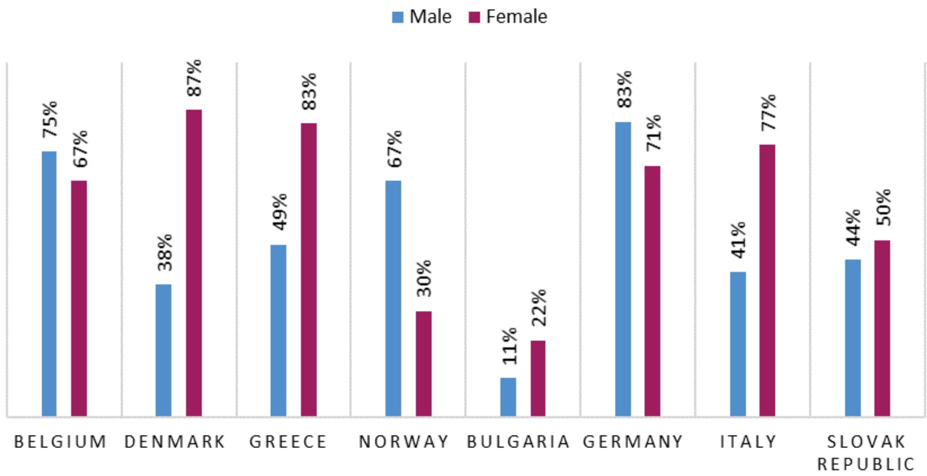
Note: Results in the figure include the share of participants that have stated that they 4=Agree or 5=Strongly agree with the statement provided in the question.

Figure 12: Share of agreement regarding the fact that women participate as much as men in the RHC sector by country.

Moving on to the perceptions regarding women's participation on decision-making positions in public authorities relevant to RHC, results presented in Fig.13a show that there is a general common understanding between the two genders, as there is no significant differentiation between their responses. We can see that, in general, there is an increased share of male and female participants who believe that there is a lack of women on decision-making positions in public authorities relevant to RHC. It is important to highlight the case of Bulgaria, where we can see that there a completely opposite situation, as only 11% of male and 17% of female participants agree (or strongly agree) with this statement. Regarding women's participation in decision-making positions in the business sector, our results indicate a similar situation (Fig.13b). Again, Bulgaria makes the difference with very low shares of agreement with this statement (11% men – 22% women). In this case, we can see that Greece seems to experience a more severe variation between the opinions between men and women participants, compared to the previous case.



(a) Lack of women on decision-making positions in public authorities relevant to RHC

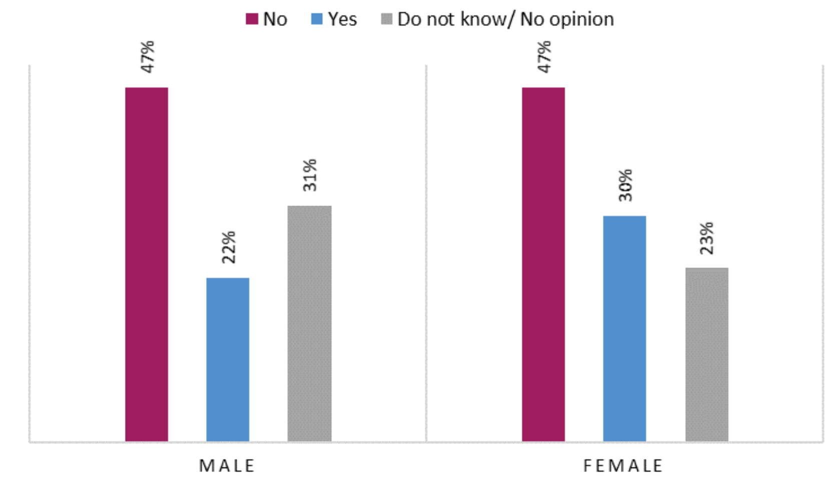


(b) Lack of women on decision-making positions in the business sector relevant to RHC

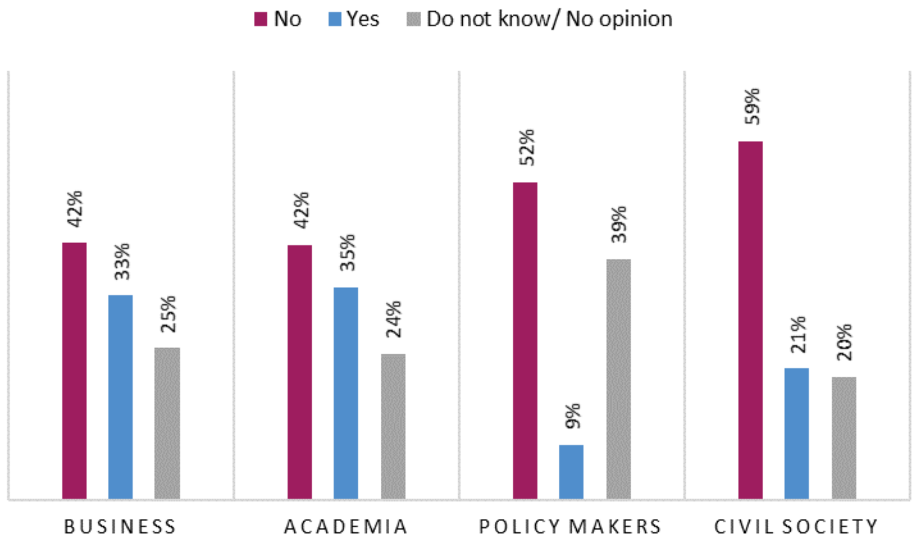
Note: Results in the figure include the share of participants that have stated that they 4=Agree or 5=Strongly agree with the statement provided in the question.

Figure 13: Share of agreement regarding women's participation in decision-making positions the RHC sector.

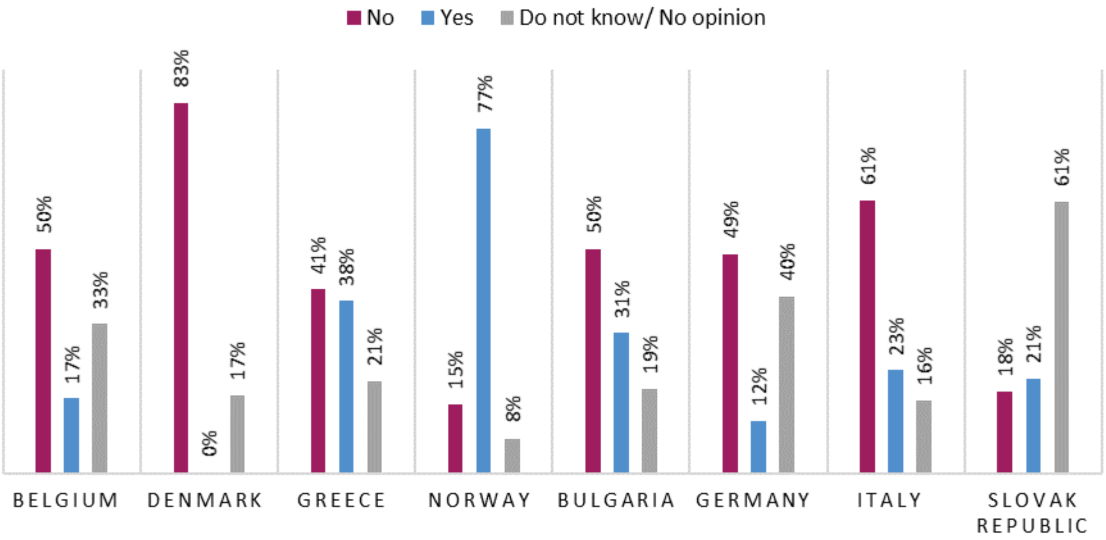
As a next step to women's participation in decision-making processes, we also investigated our participants' perceptions regarding to whether decision makers consider gender-based differences. Our analysis shows that there is a common perception that decision makers do not consider gender-based differences (Fig.14). One interesting finding when decomposing by gender, is that the share of female participants who believe that decision makers do consider gender-based differences (30%) is higher when compared to the similar share of male respondents (22%). Moreover, even though business and academia participants indicate a balanced perception for this aspect, civil society and policy makers are strongly convinced that decision makers do not consider gender-based differences (59% and 52% respectively). Finally, the country-based decomposition shows that only Greece and Bulgaria have an increased share of their participants, believing that gender-based specificities are taken into account throughout decision-making processes (38% and 31% respectively).



(a) by gender.



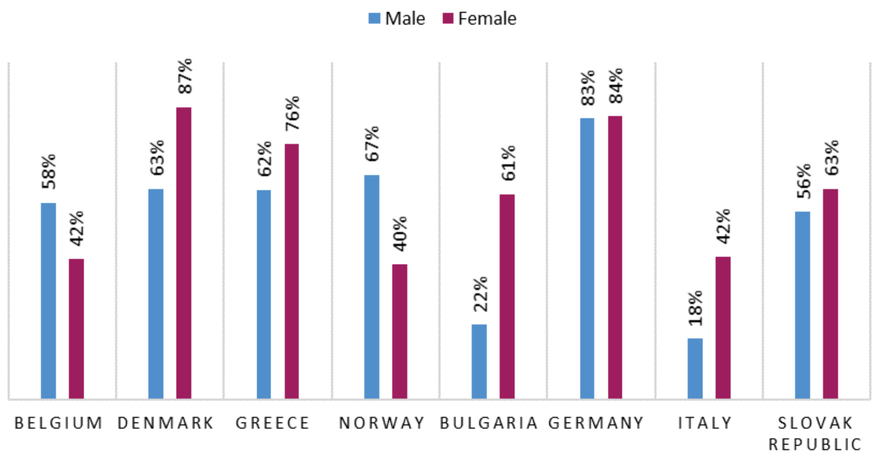
(b) by stakeholder group.



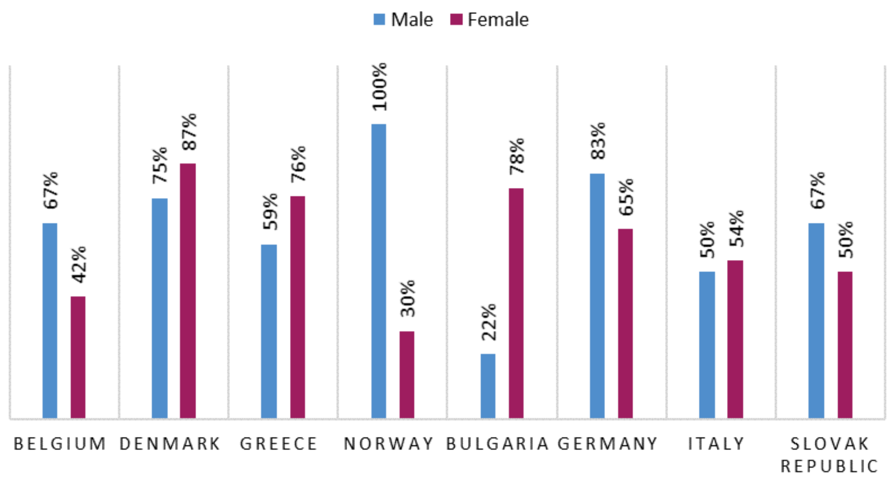
(c) by country.

Figure 14: Perceptions that decision makers consider gender-based differences.

In addition to the previous general perceptions regarding women's participation in the RHC sector, we also investigated aspects related to the need for further empowerment and attractiveness of the RHC sector to women. Results related to the need for further empowerment of women towards being more engaged with the RHC sector indicate that countries can be grouped into two categories. In the first case, we have countries (Belgium, Norway, and Germany) where men are those who mostly agree with the fact that women need more empowerment for increasing their engagement in the RHC sector; whilst, in the second group of countries (Denmark, Greece, Bulgaria, Italy, and Slovak Republic), women themselves feel to a larger extent that they need further empowerment. The same country patterns also apply in the case of RHC sector attractiveness. Again, we can see that for Belgium, Norway, and Germany, a larger share of men believes that the RHC sector needs to become more attractive in terms of professional engagement for women, whereas the opposite occurs for the cases of Denmark, Greece, Bulgaria, and Italy. Here, it is interesting to notice that Slovak Republic is the only country that indicates a changes patter compared to the previous variable.



(a) Belief that women need empowerment for being more engaged with the RHC sector



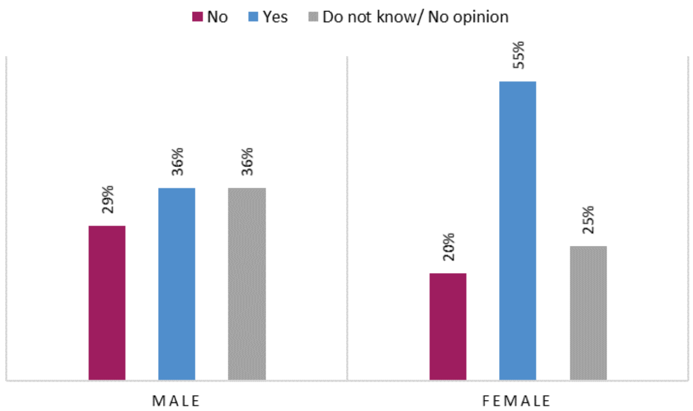
(b) Belief that the RHC sector needs to become more attractive in terms of professional engagement for women

Note: Results in the figure include the share of participants that have stated that they 4=Agree or 5=Strongly agree with the statement provided in the question.

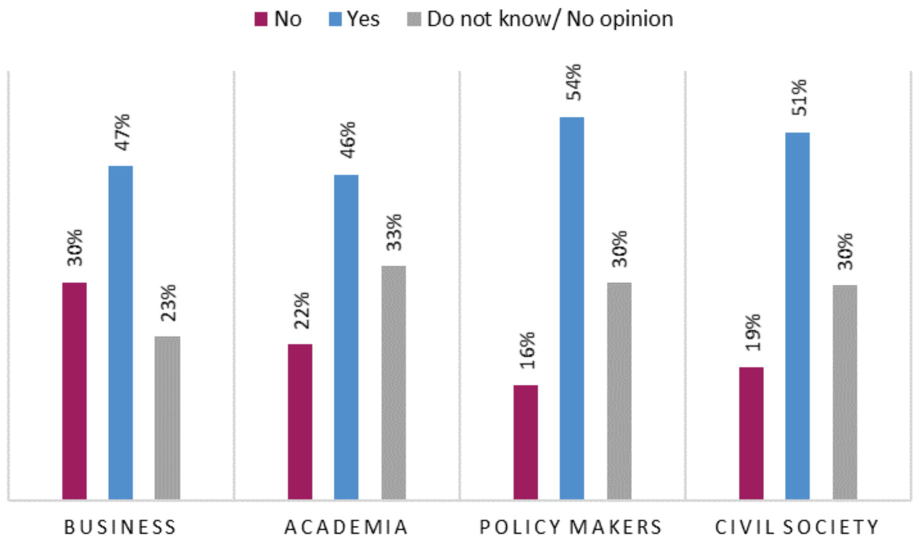
Figure 15 : Share of agreement regarding beliefs related to women's participation in RHC.

Apart from general perceptions related to women's empowerment and attractiveness in relation to the RHC sector, we also considered more targeted barriers and issues that need to be tackled related to actual women participation in RHC-related occupations. Fig.16 presents the main findings related to whether women working in RHC or seeking such work face gender-related barriers. As we can see, female participants are much more in favour of this perception, as in many cases they might have personally experienced gender-based barriers when trying to enter the RHC sector, or other relevant sectors. This is a significant difference that needs to be considered when designing policies and actions targeting to promote an equal participation of women in RHC, given that their personal experiences might provide a much closer look at the reality. At the same time, we cannot find significant variations when we decompose our sample results based on the four stakeholder types. In general, we can see that all groups of quadruple helix stakeholders believe strongly that there are barriers for women trying to enter the RHC market, as in all cases over 45% have answered positively in this question (47% business – 46% academia – 54% policy makers – 51% civil society).

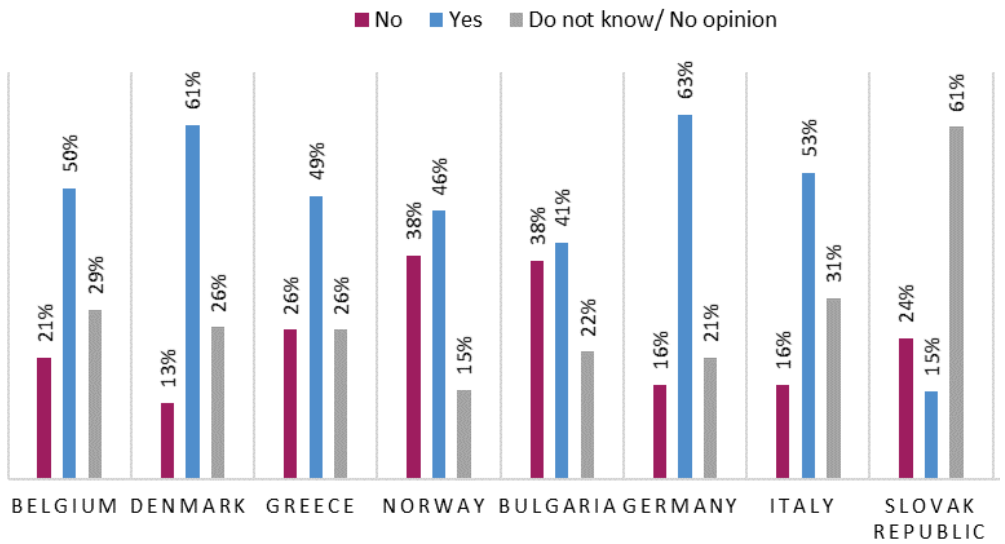
Another interesting decomposition of this question refers to country disparities. By taking a closer look at the answers provided by different country participants, we can see that there are three different groups of countries. First, we have five countries (Belgium, Denmark, Greece, Germany and Italy) that follow the previous pattern, indicating increased levels of positive answers to this question. Second, for the cases of Norway and Bulgaria there seems to be a not so strong perception that women working in RHC or seeking such work face gender-related barriers, as the shares of positive and negative answers in these cases are pretty much balanced. Third, in the case of Slovak Republic, we can see that there is a reverse pattern, where 23% of the participants believe that women do not face any barriers related to RHC working conditions, and only 15% believes the opposite. In this latter case it also interesting to notice the very large share of participants who did not provide any answer to this question, indicating a neutral attitude.



(a) by gender.



(b) by stakeholder group.

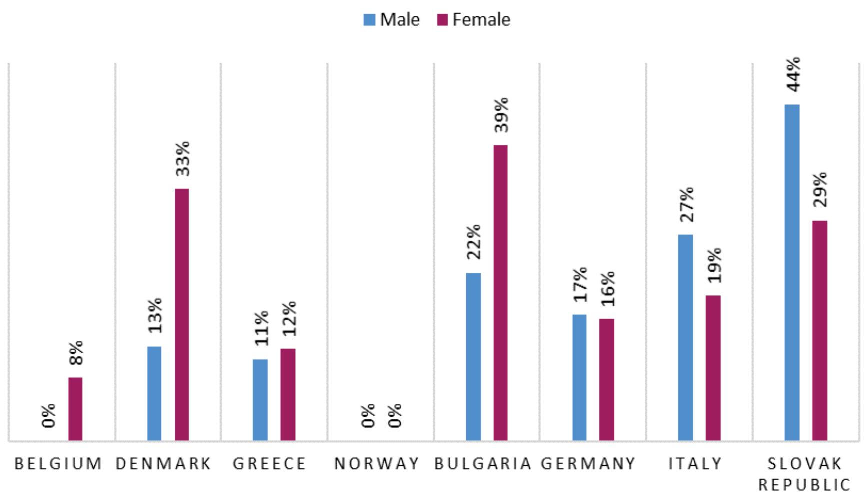


(c) by country.

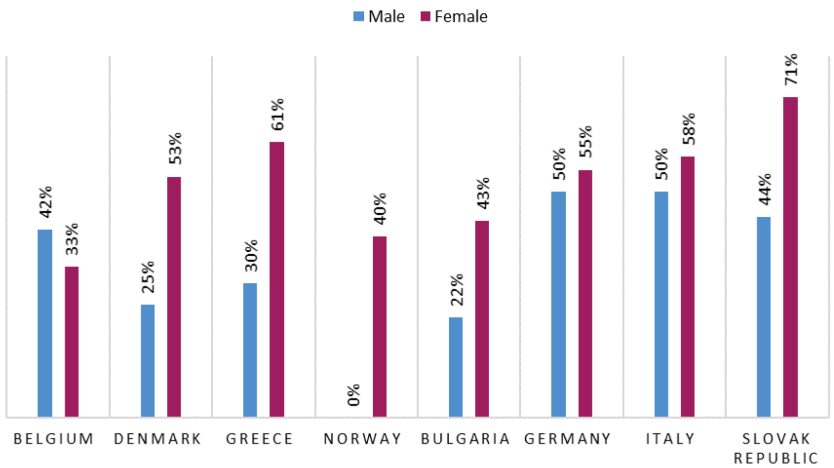
Figure 16 Perceptions that women working in RHC or seeking such work face gender-related barriers.

The last part of the survey analysis aims to provide a more insightful understanding of the barriers that women phase when they choose to work in the RHC sector or seeking such work. Therefore, we chose to focus on three specific types of barriers, related to: (i) women's career pathways (Fig.17); (ii) women's career retention (Fig.18); and (iii) general perceptions on gender role (Fig.19).

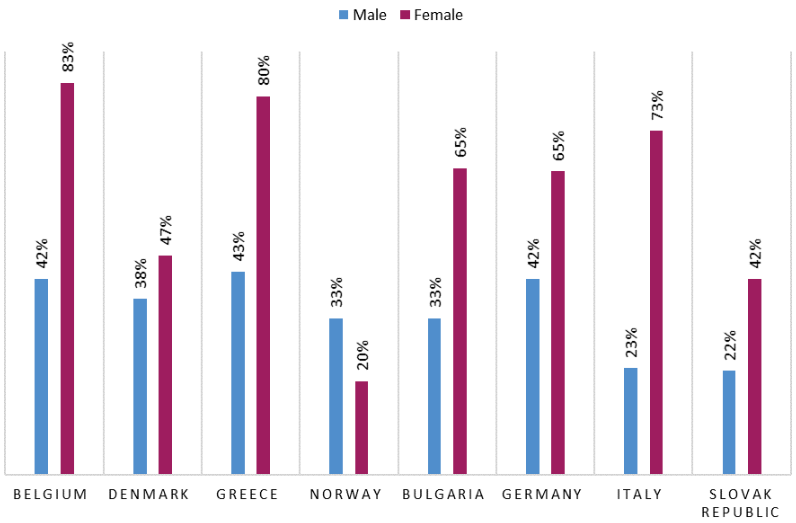
In the first case, we consider that women's career pathways' barriers are affected by skills, wage gaps and prevailing hiring practices (Fig.17). Our results indicate that in the case of Denmark and Bulgaria there is a significant share of women (33% and 39%) who agree with the statement that not many women have the required skillset to enter the RHC sector. This is in line with our previous findings for these countries, that pointed out that a large of women believe that more empowerment towards women is needed for making them more engaged with the RHC sector. At the same time, in the cases of Italy and Slovak Republic there seems to be an increased bias from the men's side (27% and 44%) that women do not have the necessary skills for working in the RHC sector. In terms of the wage gaps, our results indicate a common trend between countries -apart from Belgium- that women more strongly believe that gender wage gaps can be considered as a barrier related to women's career pathway in the RHC sector. The same also applies for the case of prevailing hiring practices related to women, that might exist in the RHC sector, as there is a very large share of women participants in all countries believing that it can act as a barrier to their career pathway (Fig.17c).



(a) Belief that not many women have the required skillset to enter the RHC sector



(b) Wage gap between men and women

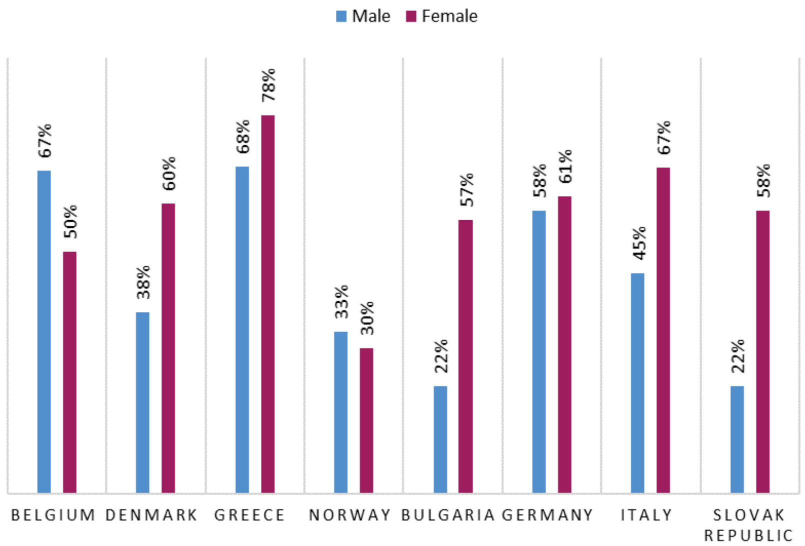


(c) Prevailing hiring practices related to women

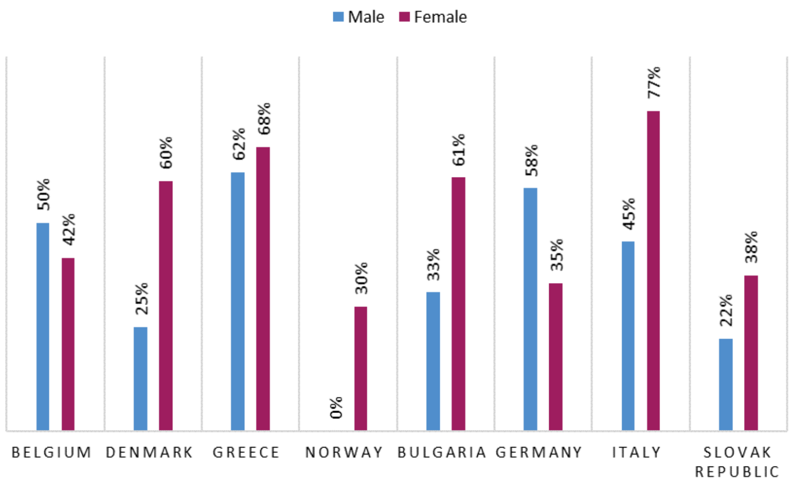
Note: Results in the figure include the share of participants that have stated that they 4=Agree or 5=Strongly agree with the statement provided in the question.

Figure 17: Share of agreement related to women's career pathway barriers in RHC.

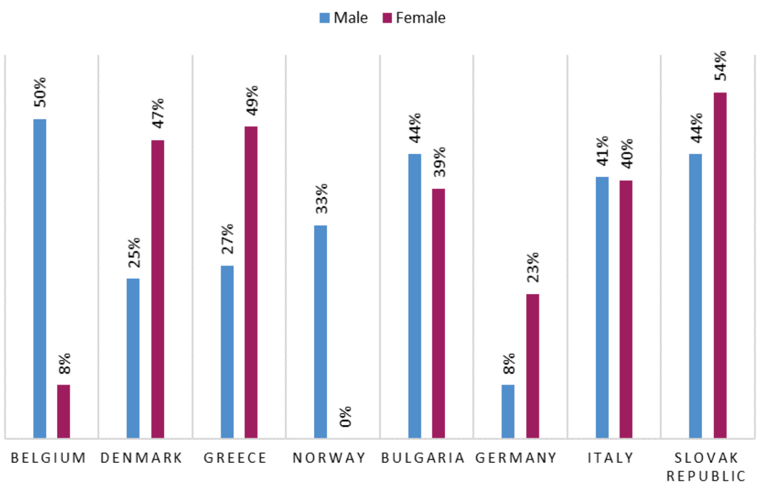
Regarding women's career retention barriers in RHC, we have identified three main aspects that might affect it (Fig.18). First, maintaining work-life balance is a significant challenge for women in this sector, as it can be seen from our results in Fig.18a. Both sexes seem to recognise this issue as a significant barrier to women's career retention, and only in the cases of Bulgaria and Slovak Republic there seems to be a large gap between women's and men's perceptions. Lack of support for female entrepreneurs is also considered as a key barrier for women (Fig.18b), and specifically, in the case of Belgium and Germany the share of men recognising this barrier is higher compared to women. Finally, when it comes to mobility requirements, our results do not provide a clear pattern between countries (Fig.18c). Belgium is an interesting case, where only a very small share of women consider this as a barrier to their career retention (8%).



(a) Maintaining work-life balance is challenging for women in the sector



(b) Lack of support for female entrepreneurs in the sector

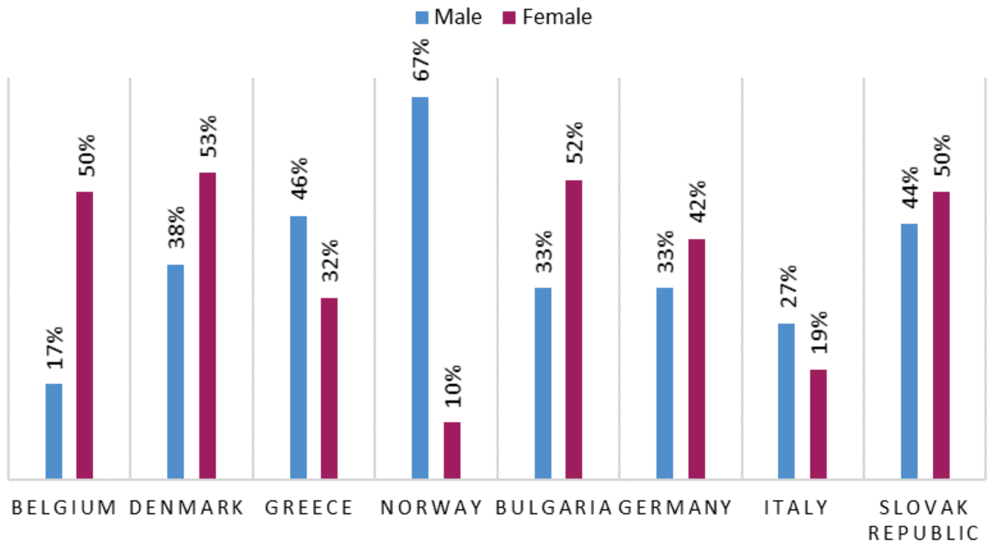


(c) Mobility requirements of RHC jobs make them less appealing to women

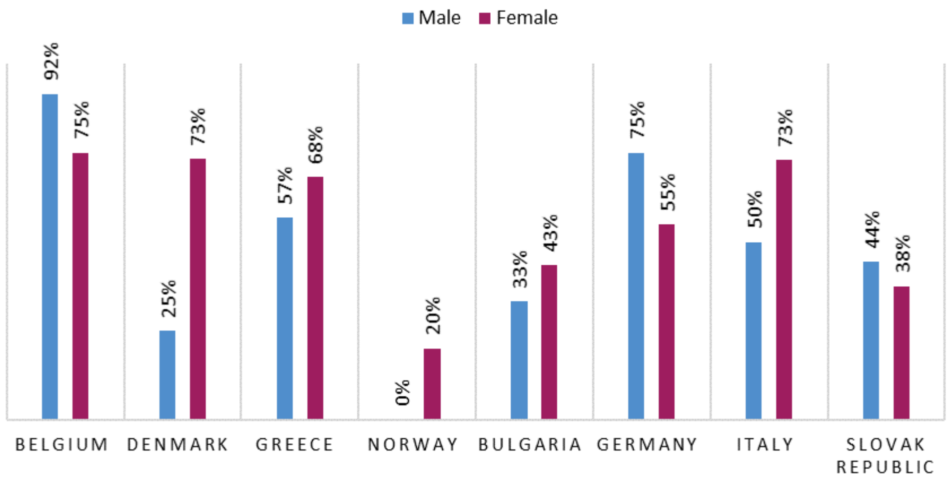
Note: Results in the figure include the share of participants that have stated that they 4=Agree or 5=Strongly agree with the statement provided in the question.

Figure 18: Share of agreement related to women's career retention barriers in RHC.

As a last step, our analysis provides some insights regarding general perceptions on gender role. As we ca see, there is a group of countries where a significant share of female participants believes in this general gender-role perception (Belgium, Denmark, Bulgaria, Germany and Slovak Republic), whereas in the case of Greece, Norway and Italy this share is much smaller. Finally, stereotyped ideas about gender roles acting as a barrier towards encouraging girls to choose STEM studies seem to be higher in the cases of Belgium, Greece, Germany and Italy, based on the perceptions of our survey participants.



(a) STEM studies and RHC jobs are less appealing to women



(b) Stereotyped ideas about gender roles do not encourage girls to choose STEM studies

Note: Results in the figure include the share of participants that have stated that they 4=Agree or 5=Strongly agree with the statement provided in the question.

Figure 19: Share of agreement regarding general perceptions on gender role.

4.2.3 Section B: Country analysis

Below, we present a descriptive analysis per country to provide more targeted insights regarding the main types of supporting activities, awareness raising actions and targeted groups that could be addressed in each pilot country.

Belgium

In the case of Belgium, we have managed to collect an overall sample of 24 responses (Table 5), covering all different types of stakeholders (9 Business – 5 Academia – 5 Policy makers – 5 Civil Society). Our sample is balanced in terms of gender (50%-50%), whereas almost all participants have tertiary education background (95.83%).

Taking a closer look at the specific activities that could further enhance women participation in RHC (Fig.20), we can see that in the Belgian case networking, mentoring and guidance activities are the most popular responses amongst survey participants. This means that business support activities related to these two aspects are the most relevant towards boosting a more equal participation of women in RHC, followed by the development of umbrella organisations and marketing and advertising activities. Finally, we can see that access to financial support, market research and business planning are considered to be less essential aspects for boosting women participation.

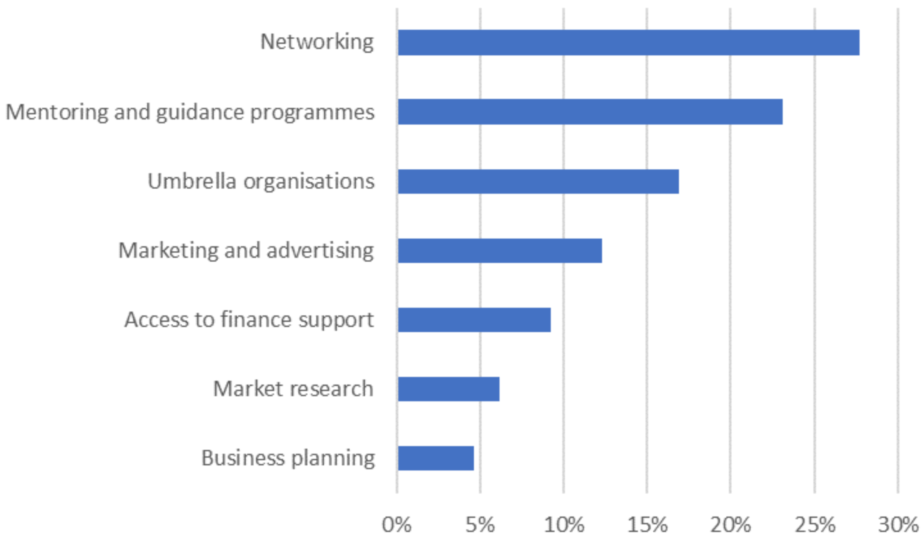


Figure 20: Type of business support for women participation in RHC (BE)

When moving on to the type of technical support that is more relevant to women participation (Fig.21), our results indicate that consultancy on the implementation and monitoring, technical advice on concept design and development of RHC projects, and feasibility studies to support go-no-go decisions are the most highlighted actions that can act as catalysts to women participation in RHC projects. Energy and environmental analysis, together with energy adults and performance certifications seem to attract less importance, as less that 20% of the received responses indicated them as relevant types of technical support for fostering women involvement in RHC.

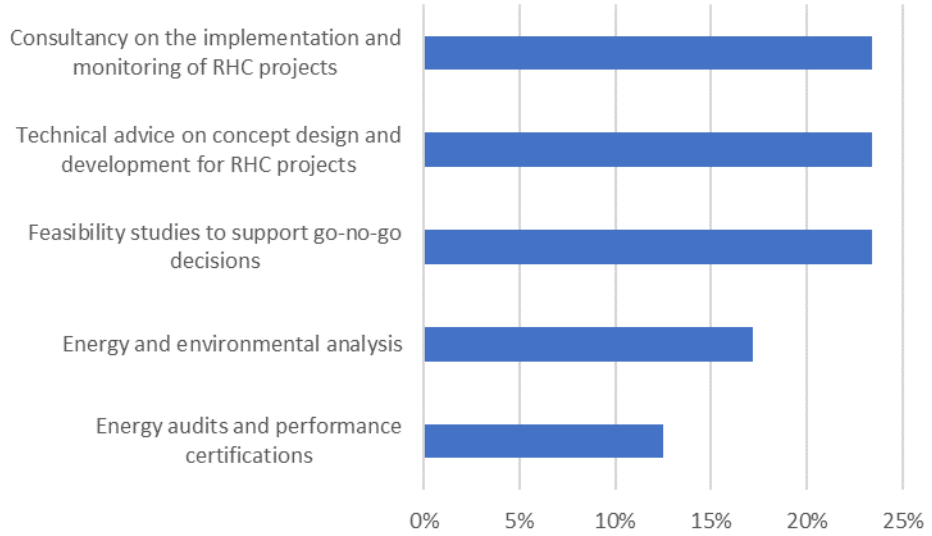


Figure 21: Type of technical support for women participation (BE)

Our analysis has also indicated a set of key topics for targeted training for women capacity building in the Belgian context (Fig.22). As it can be seen, gender awareness raising campaigns should be the top priority for boosting female involvement in RHC, alongside gender neutral remuneration actions. At the same time, aspects related to gender-smart work policies, gender analysis, impact assessment and evaluation form a second group of topics that should be included in capacity building activities. Gender-sensitive stakeholder analysis, audits, gender disaggregated data collection and budgeting seem not to attract a lot of attention in our survey participants' responses, as they indicate lower shares.

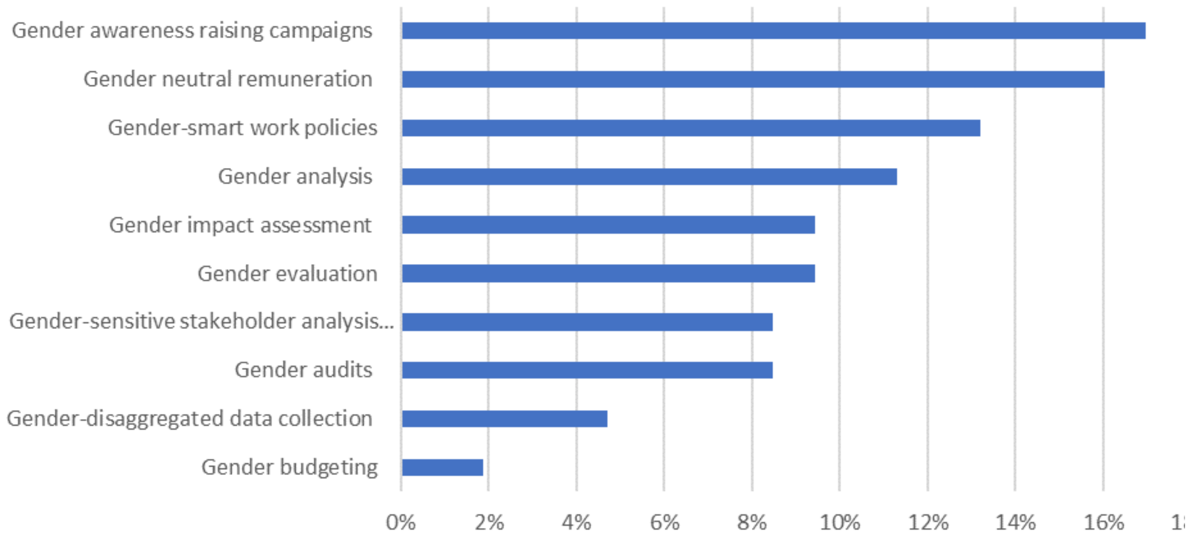


Figure 22: Key topics for targeted training for capacity building (BE)

When it comes to awareness raising activities, Fig. 23 shows that activities related to economic, environmental and social benefits of RHC solutions, alongside the highlight of available RHC opportunities are the most effective ways to raise awareness in women. Moreover, supporting women's involvement in RHC and the indication personal development opportunities to increase income through RHC are the next ones in our list. Activities focusing on gender-related challenges in the RHC market, as well as activities relevant to state/public financial support have received very low attention in our Belgian sample.

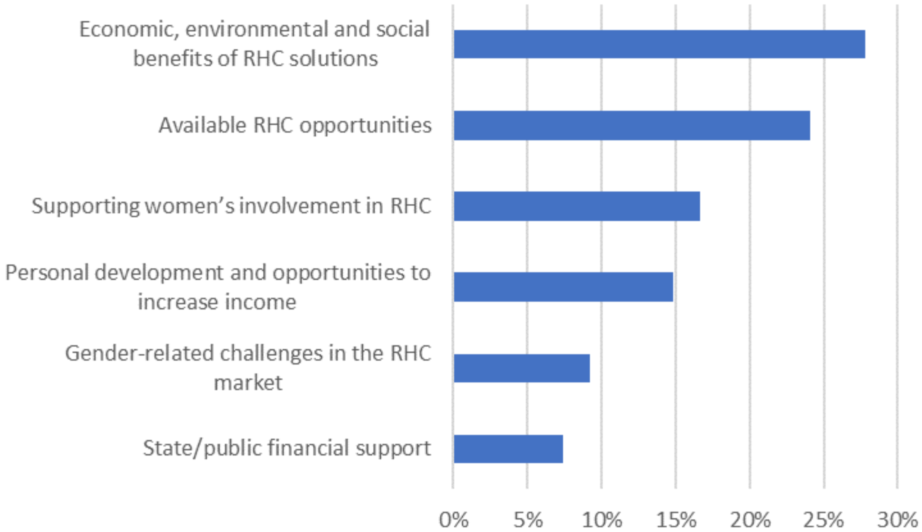


Figure 23: Awareness raising activities (BE)

In addition, when it comes to the stakeholder groups that need to be addressed, in order for awareness raising activities to have a wider impact, we can see that industry actors, STEM female students and policy makers are on the top of this list (Fig.24). General public appears in the fourth place, whereas researchers, woman associations and communities, and start-up communities have received less that 10% of the total responses.

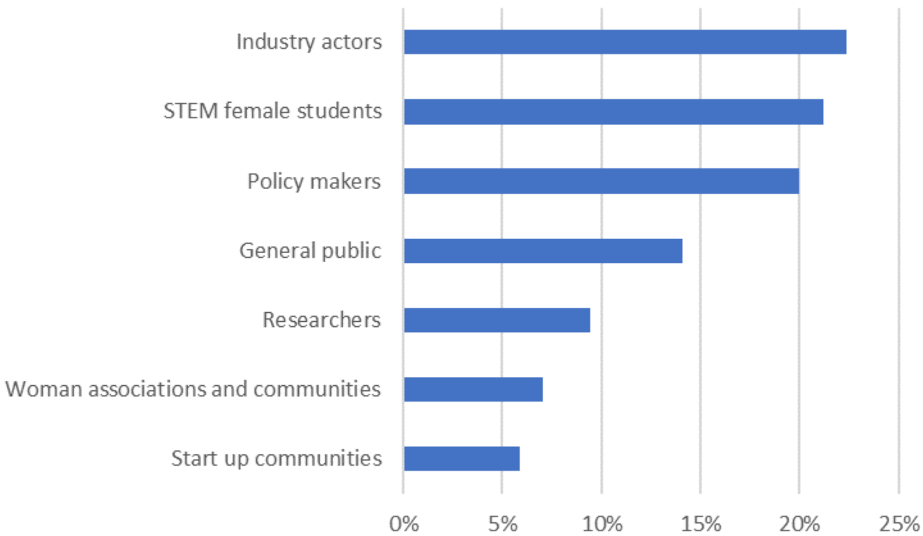


Figure 24 : Groups to be addressed (BE)

Finally, results related to the willingness to support women participation in RHC through different channels are given in Fig.25, below. As we can see, activities related to actual participation in workshops and relevant initiatives do not receive very high support based on our survey participants' responses. On the contrary, people are much willing to promote women involvement in RHC by promoting success cases of women and by improving gender just communication in the sector. Here, we can see that individuals are much more willing to participate in actions that are not so time consuming and do not require an actual participation, but instead they are in favour of actions that relate to boosting information flows and knowledge around women participation in RHC.

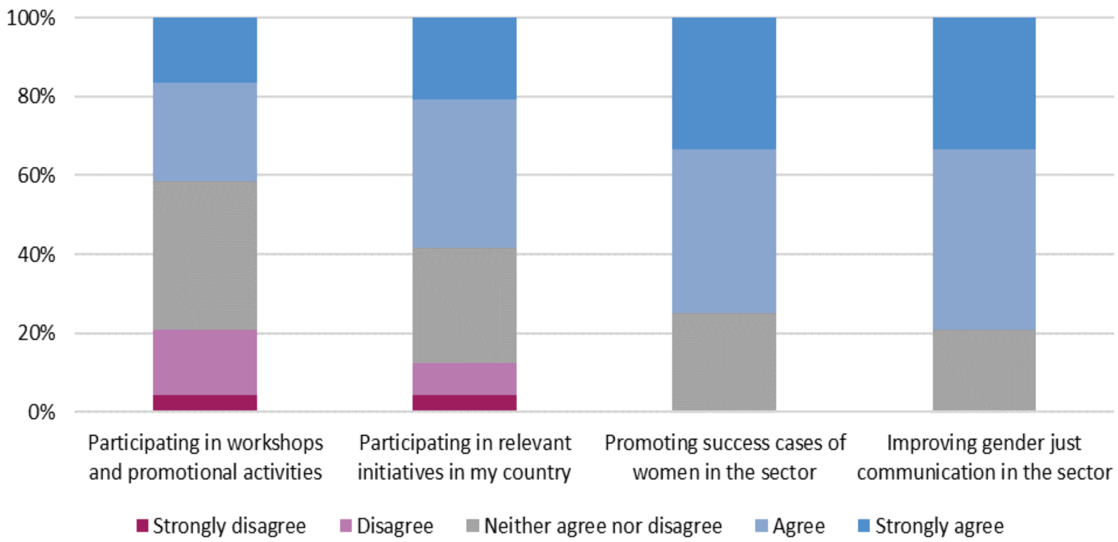


Figure 25: Willingness to support women participation in RHC (BE)

Bulgaria

In the case of Bulgaria, we have managed to collect an overall sample of 32 responses (Table 6), covering all different types of stakeholders (9 Business – 5 Academia – 5 Policy makers – 5 Civil Society). Within our sample 65% of respondents were female and the remaining 34.64% was male, and almost all the participants had a tertiary education background (89.76%).

Taking a closer look at the specific activities that could further enhance women participation in RHC (Fig 26), we can see that in the case of Bulgaria access to finance support, mentoring and guidance activities are the most popular responses amongst survey participants. This means that support services related to these two aspects are the most relevant towards boosting a more equal participation of women in RHC, followed by the marketing and advertising, business planning and the development of umbrella organisations activities. Finally, we can see that networking and market research are considered to be less essential aspects for boosting women participation.

Figure 26: Type of business support for women participation in RHC (BG)

When moving on to the type of technical support that is more relevant to women participation (Fig. 27), our results indicate that technical advice on concept design and development of RHC projects and energy and environmental analysis are the most highlighted actions that can act as catalysts to women participation in RHC projects. Consultancy on the implementation and monitoring, together with feasibility studies to support go-no-go decisions and energy audits and performance certifications seem to attract less importance, as less that 20% of the received responses indicated them as relevant types of technical support for fostering women involvement in RHC.

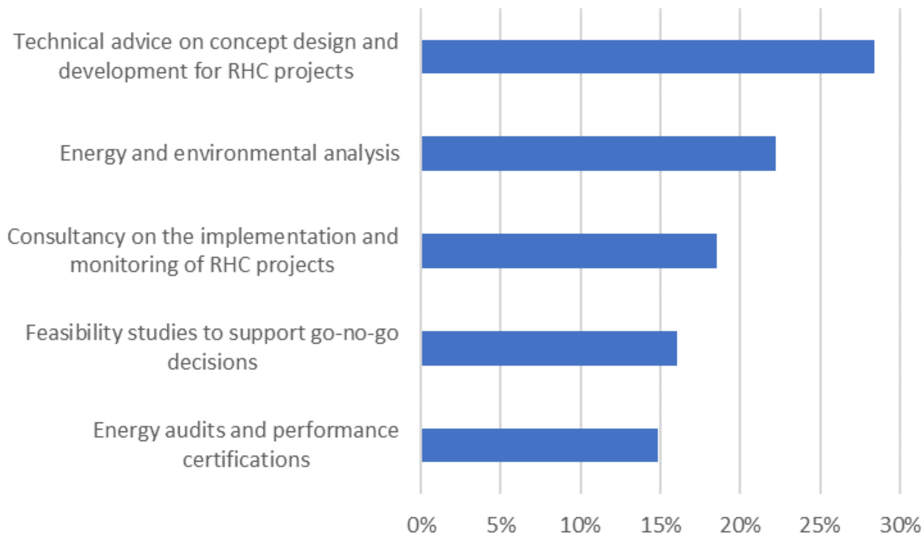


Figure 27: Type of technical support for women participation (BG)

Our analysis has also indicated a set of key topics for targeted training for women capacity building in the context of Bulgaria (Fig 28). As it can be seen, gender neutral remuneration actions should be the top priority for boosting female involvement in RHC (only option selected by over 20% of the respondents), alongside gender-smart work policies and to a lesser extent, gender analysis (selected by slightly over 10% of the respondents). At the same time, aspects related to gender evaluation and gender awareness raising campaigns form a second group of topics that should be included in capacity building activities. Gender disaggregated data collection, gender-sensitive stakeholder analysis and gender impact assessment follow closely in terms of relatively low popularity and gender audits and budgeting seem not to attract a lot of attention in our survey participants' responses, as they indicate lower shares.

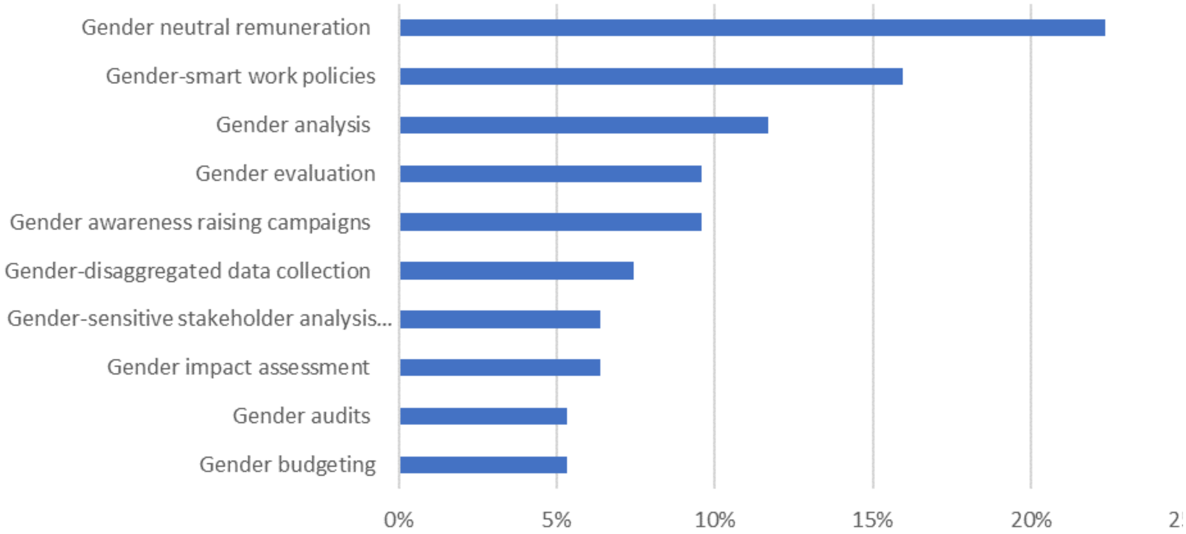


Figure 28 : Key topics for targeted training for capacity building (BG)

When it comes to awareness raising activities, Fig 29 shows that activities related to economic, environmental, and social benefits of RHC solutions, alongside the increased visibility for available RHC opportunities and personal development opportunities to increase income through RHC are the most effective ways to raise awareness in women and have been selected by around 20% of the respondents. Moreover, the options state/public financial support and supporting women's involvement in RHC are the next ones in our list. Activities focusing on gender-related challenges in the RHC market have received very low attention in our Bulgarian sample.

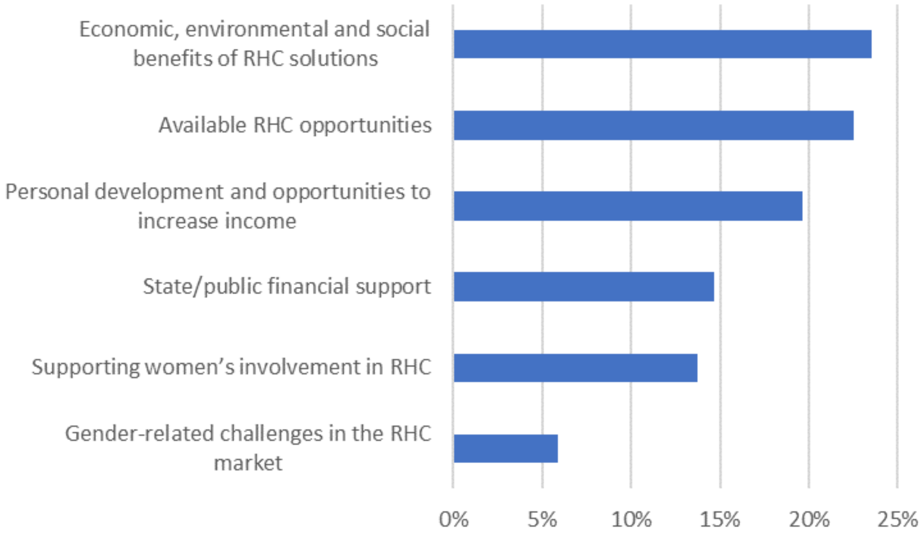


Figure 29: Awareness raising activities (BG)

In addition, when it comes to the stakeholder groups that need to be addressed, in order for awareness raising activities to have a wider impact, we can see that the general public, STEM female students and policy makers are on the top of this list (Fig 30). Researchers, woman associations and communities form a second group collecting around 10% of the responses, whereas start up communities have received a relatively small portion the total responses.

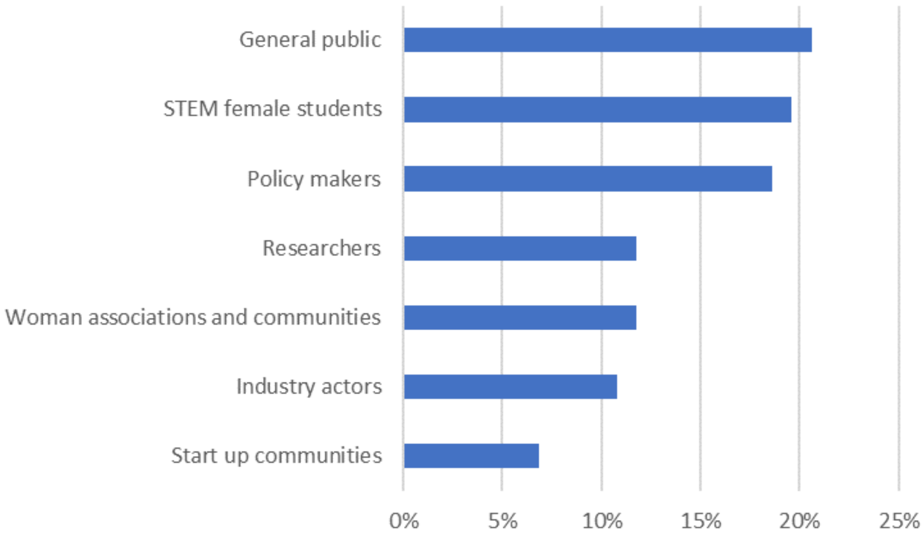


Figure 30 Groups to be addressed (BG)

Finally, results related to the willingness to support women participation in RHC through different channels are given in Fig.31, below. Promoting success cases of women seem to be the most popular of the four, collecting the most responses claiming “agreement” and “strong agreement” (around 80% of the responses combined) and virtually no explicit opposition. Participating in workshops and promotional activities, participating in relevant initiatives and improving gender just communication in the sector also see a comparable share of positive responses (around 70-75%) with the presence of a minor proportion of the respondents saying they would not be willing to use these channels to support women participation.

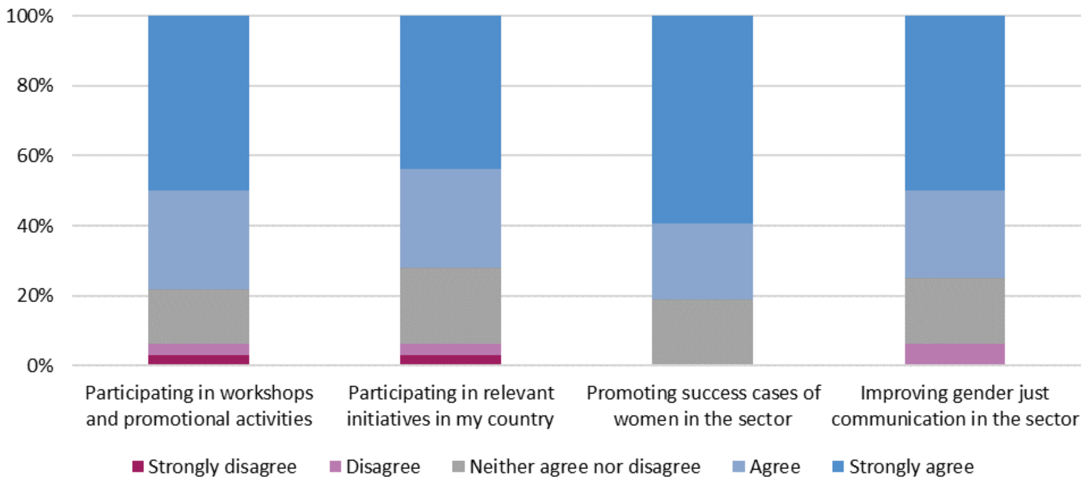


Figure 31: Willingness to support women participation in RHC (BG)

Denmark

In the case of Denmark we have managed to collect an overall sample of 23 responses (Table 5), covering all different types of stakeholders (8 Business – 3 Academia – 4 Policy makers – 8 Civil Society). Within our sample the proportions in terms of gender saw a majority of female (65.22) over male respondents (34.78%). Slightly more than a fifth of the respondents have tertiary education background (21.74%), a small minority has secondary education and most of them have primary education (69.57%).

Taking a closer look at the specific activities that could further enhance women participation in RHC (Fig.32), we can see that in the Danish case access to finance support is the most popular response amongst survey participants. Business support activities related to this aspect is the most relevant towards boosting a more equal participation of women in RHC, and is followed by two groups of options including networking and business planning at around 15% of the responses and umbrella organization and mentoring and guidance programmes receiving the attention of slightly more than 10% of the respondents. Finally, we can see that market research is considered to be less essential aspects for boosting women participation.

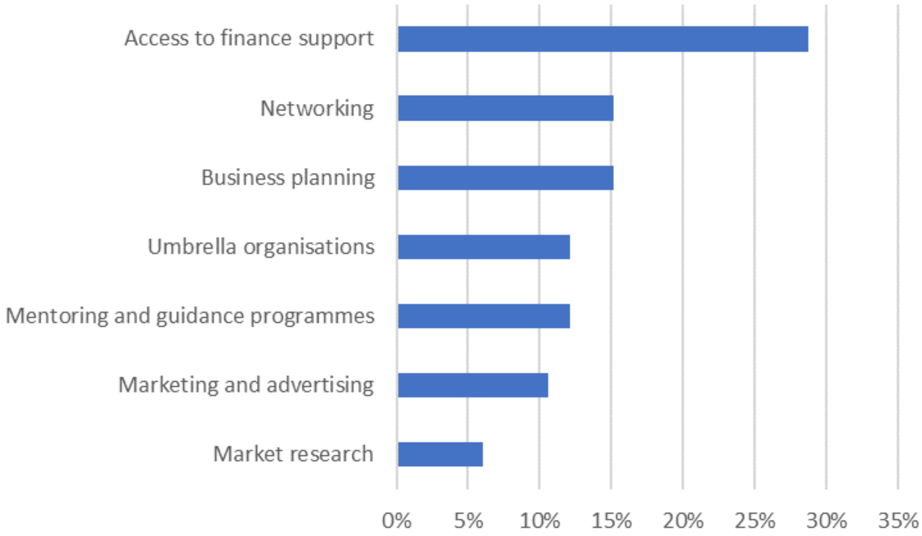


Figure 32 Type of business support for women participation in RHC (DK)

When moving on to the type of technical support that is more relevant to women participation (Fig.33), our results indicate that technical advice on concept design and development for RHC project is by far the most highlighted action that can act as catalysts to women participation in RHC projects for respondents in Denmark. Consultancy on the implementation and monitoring of RHC projects and feasibility studies to support go-no-go decisions follow collecting the attention of over 20% of our sample, while Energy and environmental analysis seem to attract less attention. Energy audits and performance certifications is the least popular option among the danish respondents, as indicated by the share lower than 10%

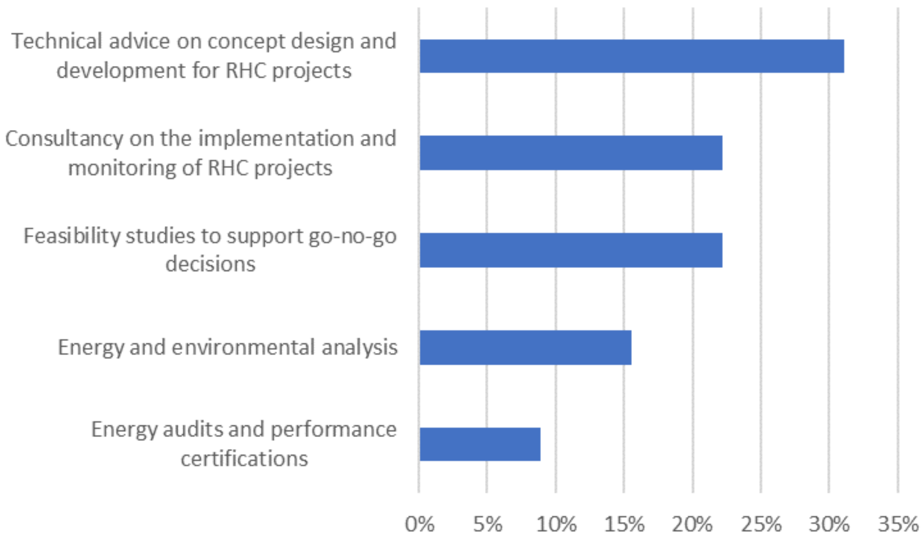


Figure 33 : Type of technical support for women participation (DK)

Our analysis has also indicated a set of key topics for targeted training for women capacity building in the context of Denmark (Fig 34). As it can be seen, gender neutral remuneration should be the top priority for boosting female involvement in RHC, alongside gender awareness raising campaigns and gender-smart work policies. At the same time, aspects related to gender analysis and evaluation and gender disaggregated data collection form a second group of topics that should be included in capacity building activities. Gender impact assessment, gender audits and gender-sensitive stakeholder analysis follow in terms of attention received and gender budgeting seem not to attract a lot of attention in our survey participants' responses, as it indicated by the lower share.

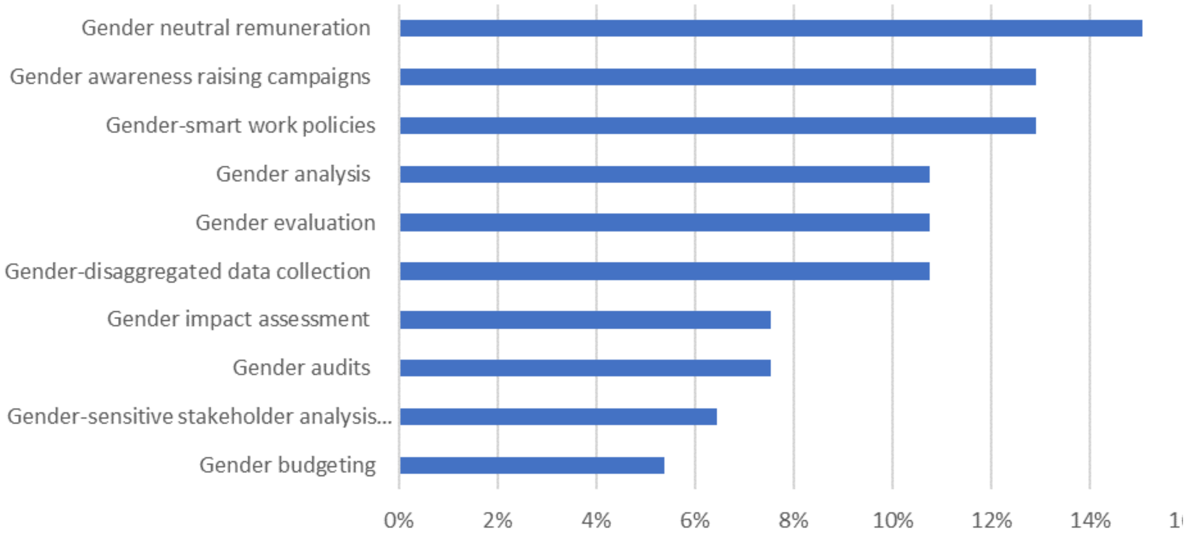


Figure 34: Key topics for targeted training for capacity building (DK)

When it comes to awareness raising activities, Fig 35 shows that activities related to state/public financial support, alongside supporting women's involvement in RHC are the most effective ways to raise awareness in women. Moreover, increased visibility for available RHC opportunities is next in our list followed by economic, environmental and social benefits of RHC solutions and gender-related challenges in the RHC market. Activities focusing on personal development opportunities to increase income through RHC, have received very low attention in our Danish sample.

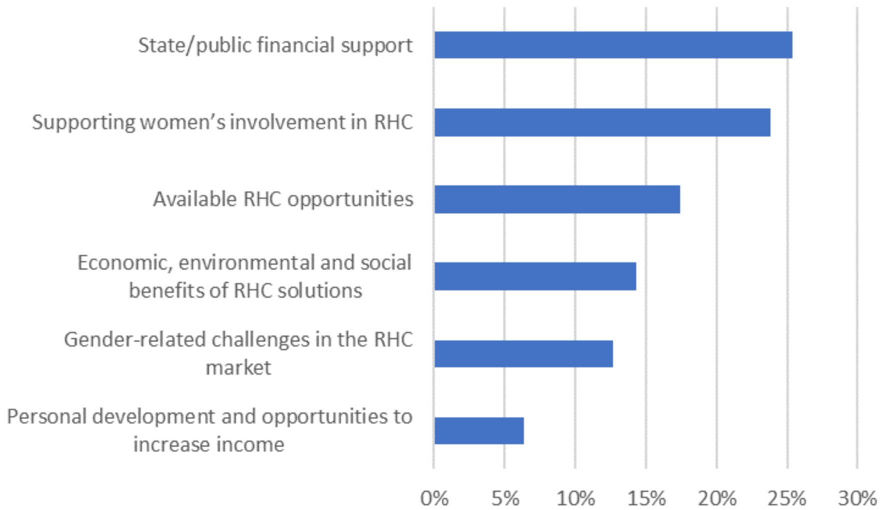


Figure 35: Awareness raising activities (DK)

In addition, when it comes to the stakeholder groups that need to be addressed, in order for awareness raising activities to have a wider impact, we can see that policy makers and industry actors are on the top of this list (Fig 36). STEM female students appears in the third place with over 15% of the responses, and is followed by general public with slightly more than 10%. Researchers, start-up communities and women association communities have received around 5% of the total responses.

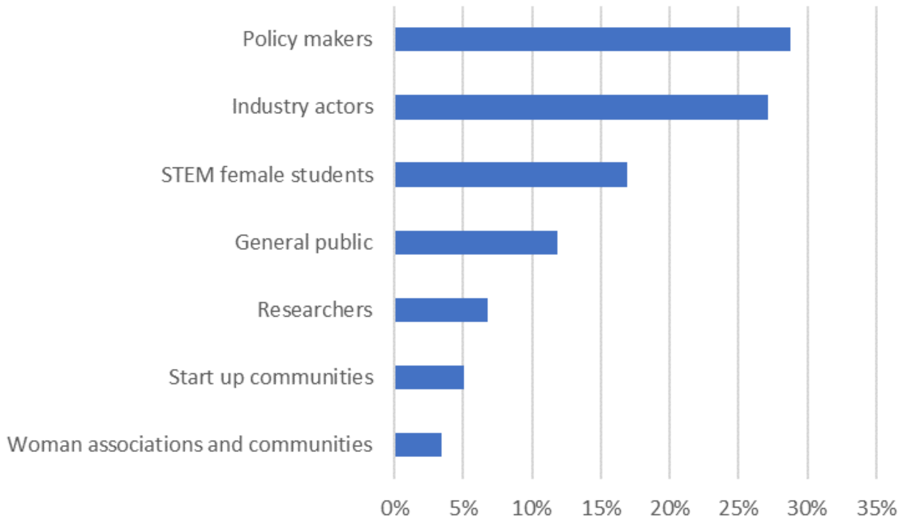


Figure 36 Groups to be addressed (DK)

Finally, results related to the willingness to support women participation in RHC through different channels are given in Fig.37, below. Promoting success cases of women is the best option out of the four, with around slightly more than 20 % of respondents strongly disagreeing with the option and around 40% of the respondents declaring they would be willing to use these channels too support women participation. As we can see, the activities related to participation in workshops collected the approval of 30% of the respondents together with participation to relevant initiatives and improving gender just communication in the sector. These channels seem to be more polarising than promoting success cases of women in the sector, as they attract a significant share of negative responses (around 40%).

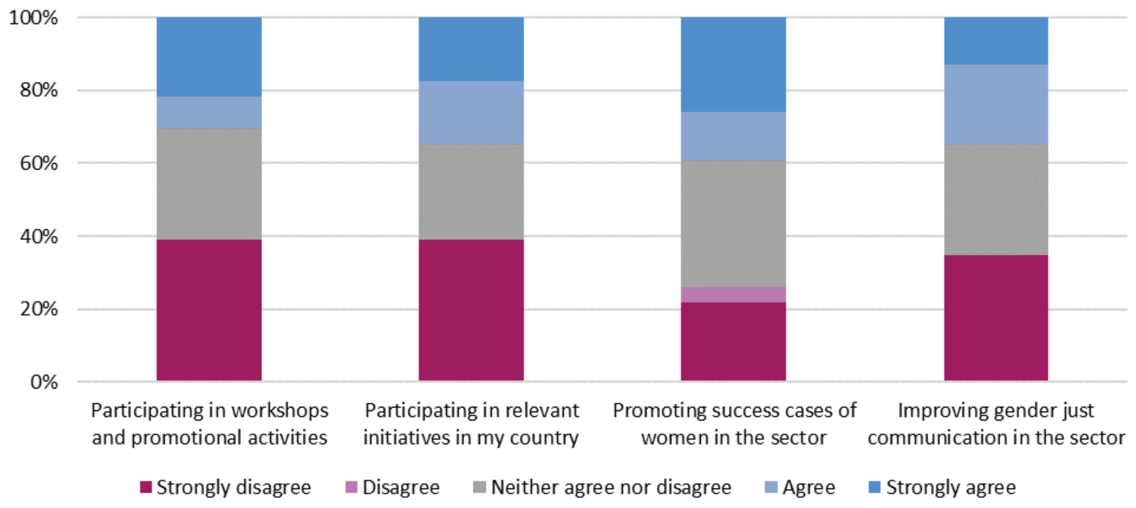


Figure 37 : Willingness to support women participation in RHC (DK)

Germany

In the case of Germany we have managed to collect an overall sample of 43 responses (Table 6), covering all different types of stakeholders (11 Business – 8 Academia – 16 Policy makers – 8 Civil Society). Within our sample 27.91% of the participants are male and 72.09% are female, and almost all participants have tertiary education background (95.35%).

Taking a closer look at the specific activities that could further enhance women participation in RHC (Fig.38), we can see that in the case of Germany mentoring and guidance programmes, alongside networking are the most popular responses amongst survey participants. This means that business support activities related to these two aspects are the most relevant towards boosting a more equal participation of women in RHC, followed by the development of umbrella organisation and access to finance support. Finally, we can see that marketing and advertising, business planning and especially market research are considered to be less essential aspects for boosting women participation.

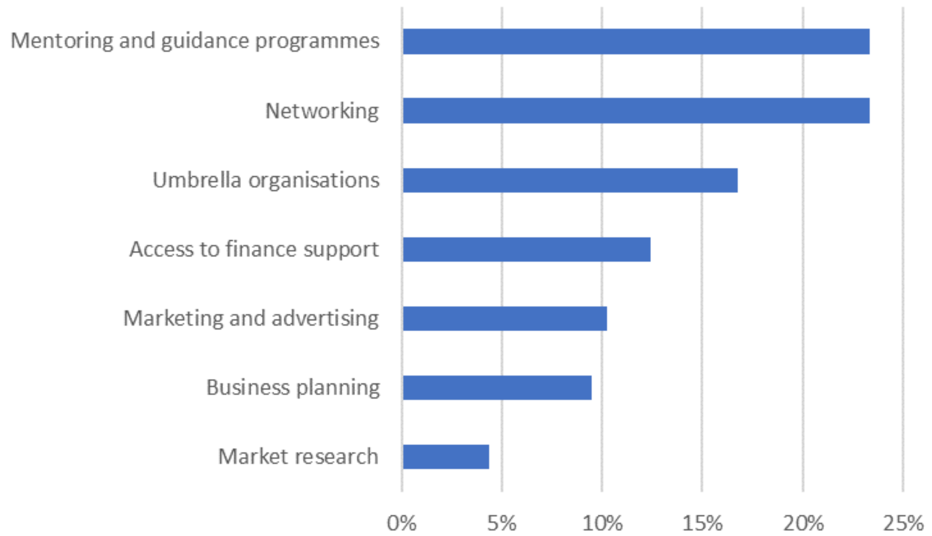


Figure 38: Type of business support for women participation in RHC (DE)

When moving on to the type of technical support that is more relevant to women participation (Fig.39), we can see that in the case of Germany consultancy on the implementation and monitoring of RHC projects are the most popular responses amongst survey participants, closely followed by technical advice on concept design and development of RHC projects. This means that support activities related to these two aspects are the most relevant towards a targeted technical support activity for women in RHC, followed by the development of eenergy and environmental analysis. Finally, we can see that energy audits and performance certifications and feasibility studies to support go-no-go decisions are considered to be comparatively less essential aspects for boosting women participation attracting the attention of around 10 to 15% of the respondents.

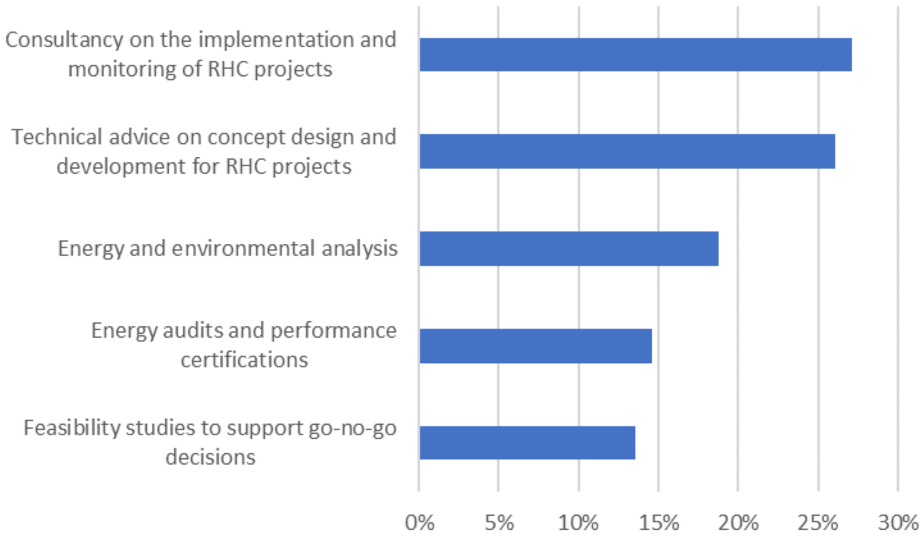


Figure 39 : Type of technical support for women participation (DE)

Our analysis has also indicated a set of key topics for targeted training for women capacity building in Germany (Fig 40). As it can be seen, gender neutral remuneration actions should be the top priority for boosting female involvement in RHC by a large margin. At the same time, aspects related to gender smart work policies gender awareness raising campaigns and gender disaggregated data collection form a second group of topics that should be included in capacity building activities collecting between 10 and 15% of the responses. Gender analysis, gender audits, gender impact assessment, gender-sensitive stakeholder analysis and gender budgeting received slightly more than 5% of the responses. Finally gender evaluation received very low attention.

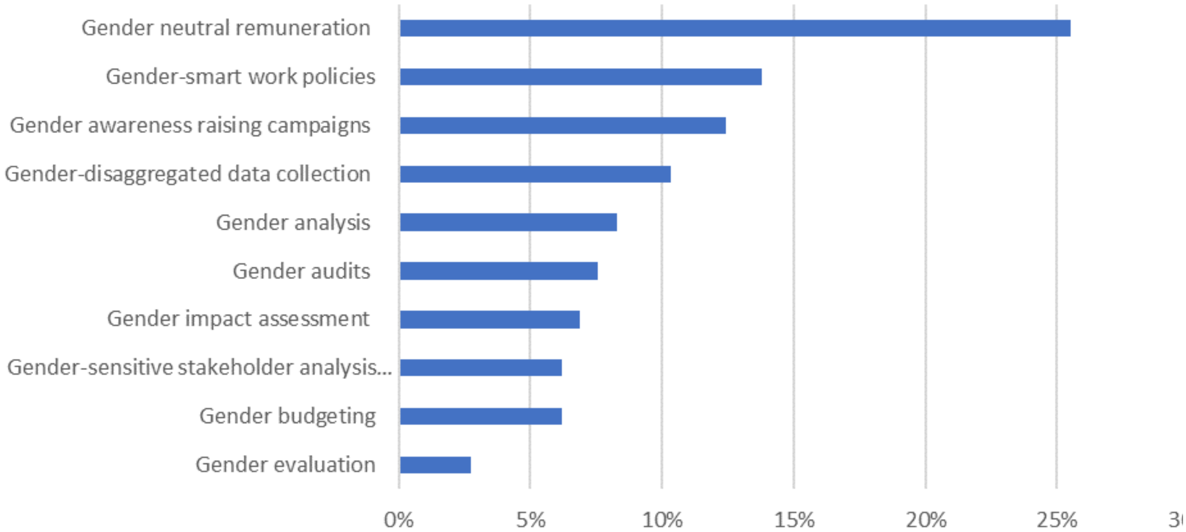


Figure 40: Key topics for targeted training for capacity building (DE)

When it comes to awareness raising activities, Fig 41. shows that activities related to economic, environmental and social benefits of RHC solutions are the most effective ways to raise awareness in women. Moreover, supporting women's involvement in RHC and personal development opportunities to increase income through RHC are the next ones in our list. Activities focusing on increased visibility for available RHC opportunities, as well as activities relevant to state/public financial support and gender-related challenges in the RHC market have received very low attention in our German sample, respectively receiving around 15%, 10% and 5 % of the responses.

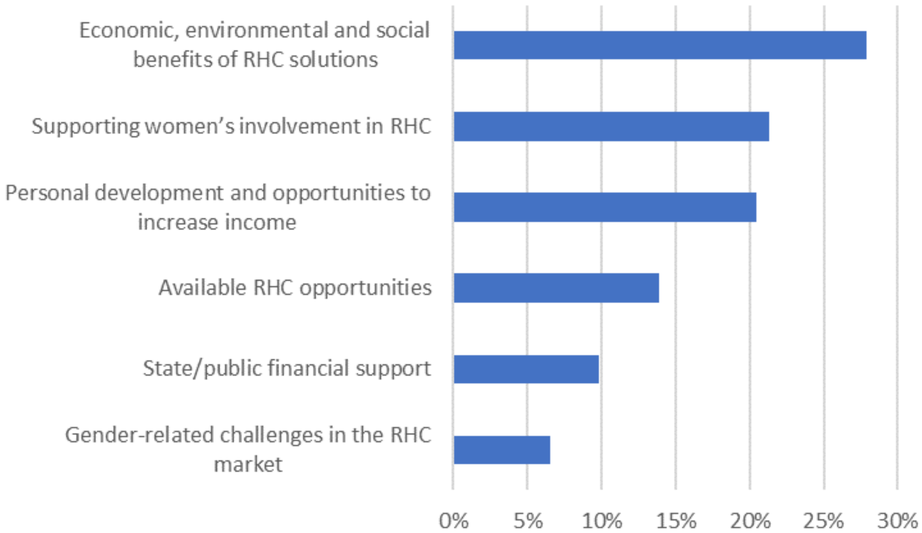


Figure 41: Awareness raising activities (DE)

In addition, when it comes to the stakeholder groups that need to be addressed, in order for awareness raising activities to have a wider impact, we can see that policy makers and industry actors are on the top of this list, followed closely by STEM female students (Fig 42). Researchers and the general public appear in the fourth and fifth place, whereas woman associations and communities and start-up communities have received less that 10% of the total responses.

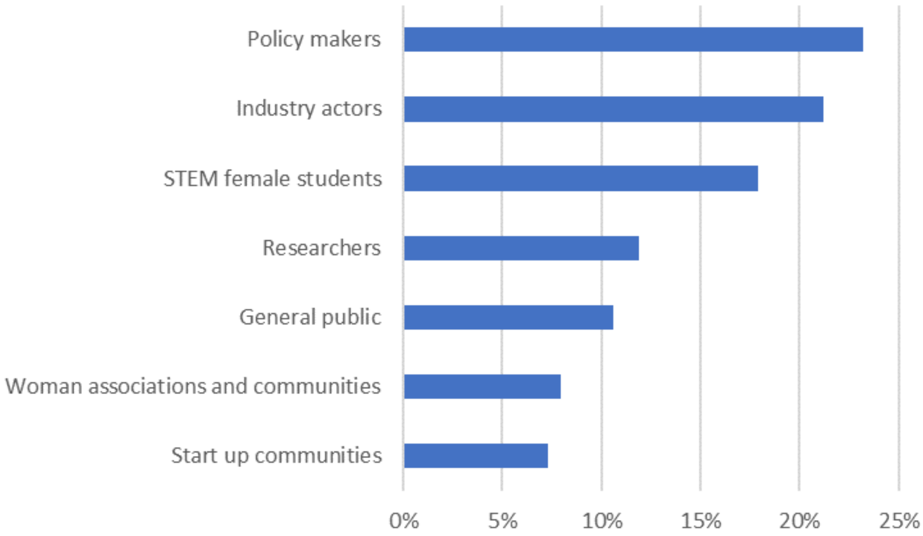


Figure 42 Groups to be addressed (DE)

Finally, results related to the willingness to support women participation in RHC through different channels are given in Fig.43, below. As we can see, the participation to workshops and promotional activities attracted slightly more approval of the other three options (around 60%) and a level of disapproval among the participants for slightly below 20% of the respondents.

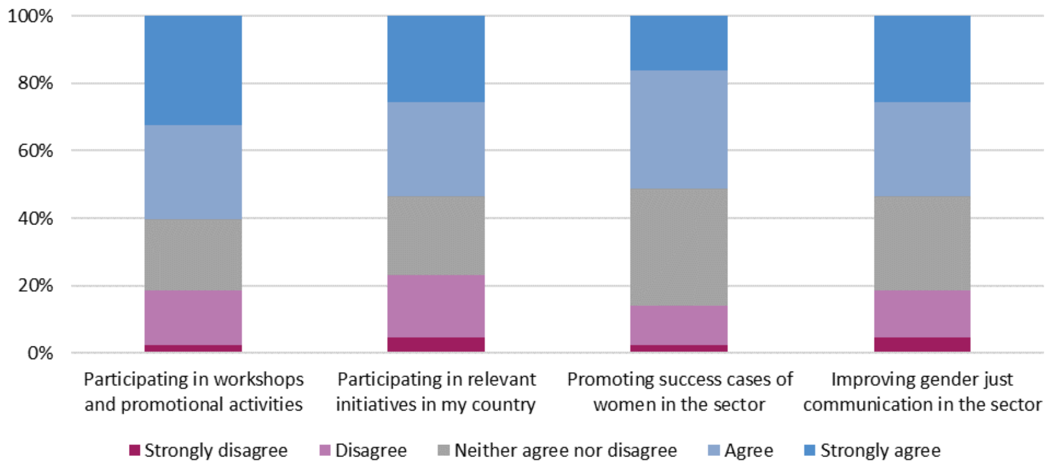


Figure 43: Willingness to support women participation in RHC (DE)

Greece

In the case of Greece we have managed to collect an overall sample of 78 responses (Table 5), covering all different types of stakeholders (39 Business – 28 Academia – 5 Policy makers – 6 Civil Society). Our sample is balanced in terms of gender with a slightly higher proportion of female respondents (47.44% male – 52.56% female), whereas almost all participants have tertiary education background (97.44%).

Taking a closer look at the specific activities that could further enhance women participation in RHC (Fig.44), we can see that in Greece mentoring and guidance activities and networking are the most popular responses amongst survey participants. This means that support activities related to these two aspects are the most relevant towards boosting a more equal participation of women in RHC, followed very closely by access to financial support. The development of marketing and advertising activities, umbrella organisations, business planning and market research are considered to be less essential aspects for boosting women participation, attracting the attention of less of 15% of the respondents.

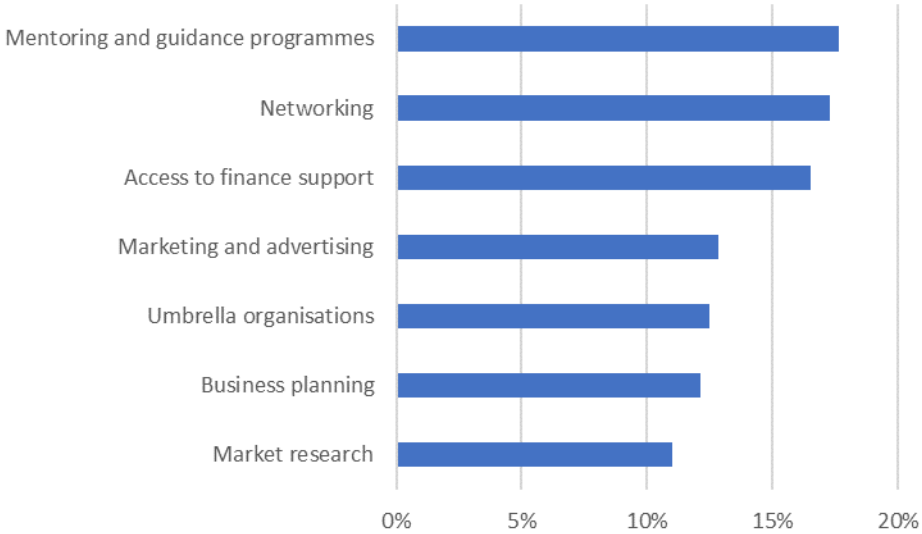


Figure 44: Type of business support for women participation in RHC (EL)

When moving on to the type of technical support that is more relevant to women participation (Fig.45), our results indicate that consultancy on the implementation and monitoring of RHC projects, energy and environmental analysis are the most highlighted actions that can act as catalysts to women participation in RHC projects, as they have been selected by over 20% of the respondents. Feasibility studies to support go-no-go decisions, together with technical advice on concept design and development of RHC projects and seem to attract less attention, as less that 20% of the received responses indicated them as relevant types of technical support for fostering women involvement in RHC. Finally, energy audits and performance certifications ranked last in this list of technical support measures.

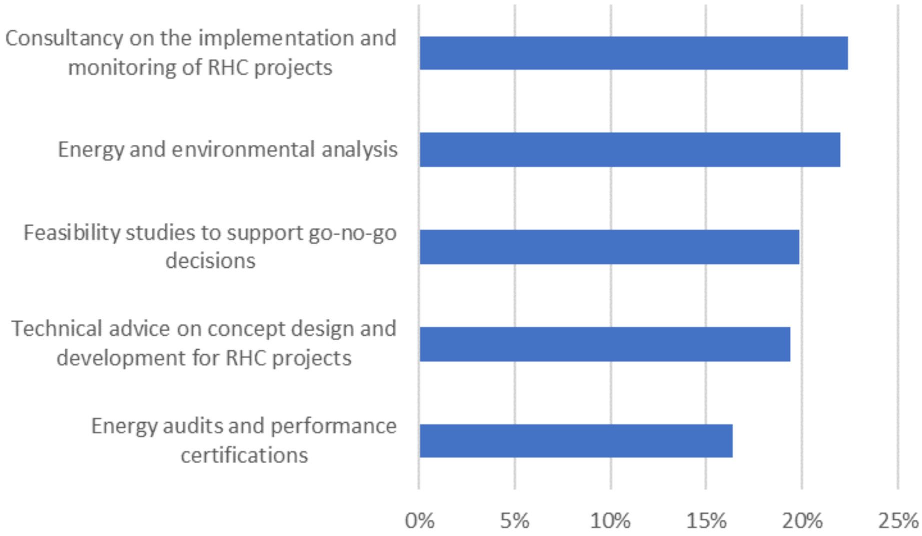


Figure 45: Type of technical support for women participation (EL)

Our analysis has also indicated a set of key topics for targeted training for women capacity building in Greece (Fig 46). As it can be seen, gender-smart work policies should be the top priority for boosting female involvement in RHC, followed by gender neutral remuneration actions, gender awareness raising campaigns and gender audits, which is the last action receiving more that 10% of the responses. Aspects related to gender-sensitive stakeholder analysis attracts slightly more attention than the group of topics including gender analysis, evaluation, impact assessment, gender disaggregated data collection and gender budgeting which seems not to attract a lot of attention in our survey participants' responses, as they indicate comparable lower shares.

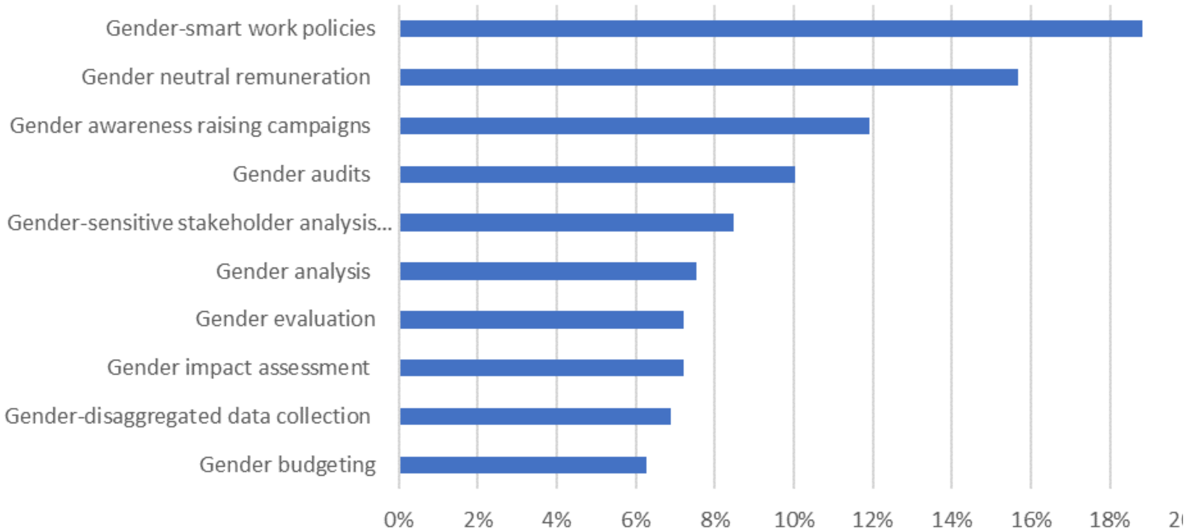


Figure 46: Key topics for targeted training for capacity building (EL)

When it comes to awareness raising activities, Fig 47 shows that activities related to economic, environmental and social benefits of RHC solutions alongside the increased visibility for available RHC opportunities are the most effective ways to raise awareness in women. Moreover, state/public financial support is third on our list followed by personal development opportunities to increase income through RHC and supporting women's involvement in RHC. Activities focusing on gender-related challenges in the RHC market, have received very low attention in our Greek sample.

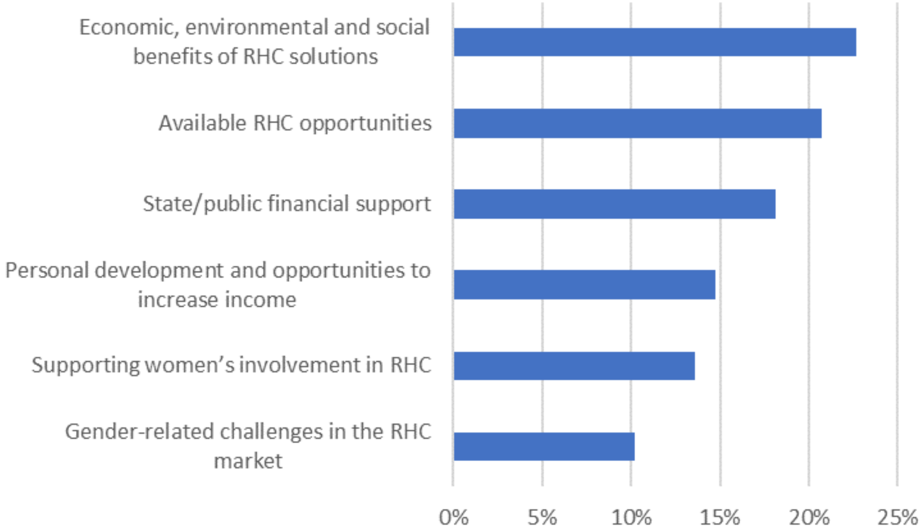


Figure 47: Awareness raising activities (EL)

In addition, when it comes to the stakeholder groups that need to be addressed, in order for awareness raising activities to have a wider impact, we can see that Policy makers, the general public and industry actors are on the top of this list (Fig 48). Start up communities, STEM female students and researchers appear to be in a slightly less popular group of stakeholders, whereas women associations and communities have received less that 10% of the total responses.

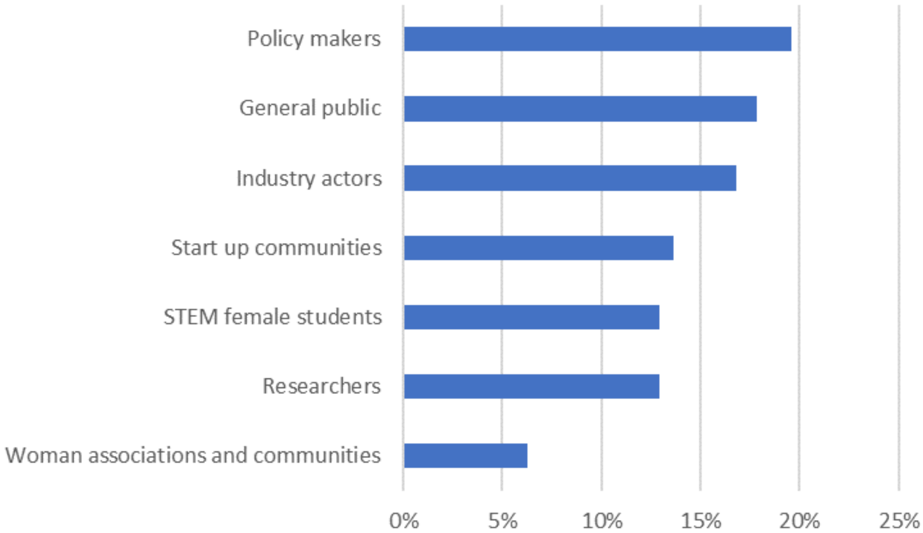


Figure 48: Groups to be addressed (EL)

Finally, results related to the willingness to support women participation in RHC through different channels are given in Fig.49, below. As we can see, people are much willing to promote women involvement in RHC by participating in relevant initiatives in their country and promoting success cases of women in the sector. Improving gender just communication in the sector and participating in workshops and promotional activities remain relatively popular even if marginally behind the first two options and with a higher (even if minoritarian) share of respondents not willing to use those channels to support women involvement in the sector.

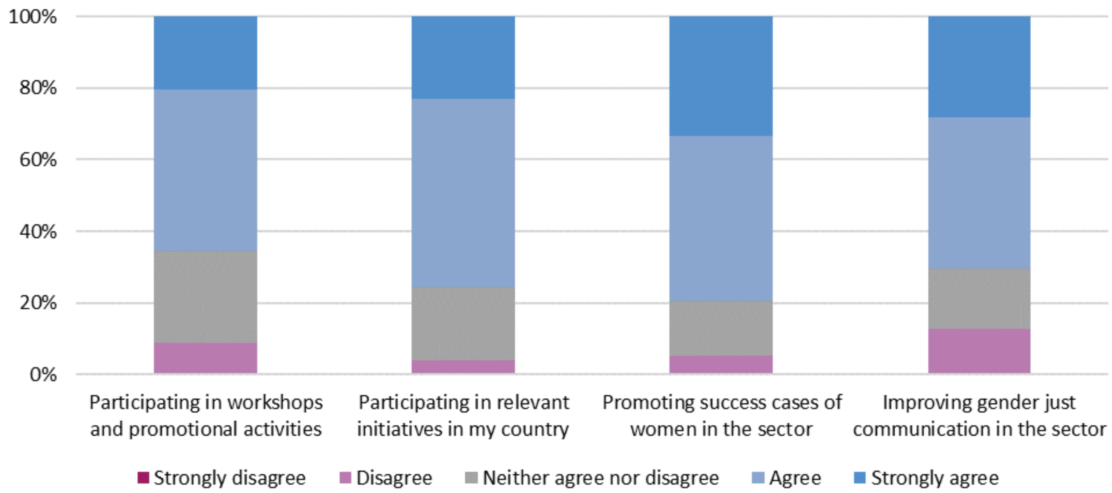


Figure 49: Willingness to support women participation in RHC (EL)

Italy

In the case of Italy, we have managed to collect an overall sample of 74 responses (Table 6), covering all different types of stakeholders (15 Business – 35 Academia – 3 Policy makers – 21 Civil Society). Within our sample male participants were less numerous (27.91) than female participants (72.09%) and almost all participants have tertiary education background (95.95%).

Taking a closer look at the specific activities that could further enhance women participation in RHC (Fig.50), we can see that in the case of Italy access to financial support is the most popular responses amongst survey participants. Between 15% and 20% of the respondents selected mentoring and guidance activities and networking and this means that business support activities related to the three previously mentioned aspects are the most relevant towards boosting a more equal participation of women in RHC. The development of umbrella organisation and business planning follow in the ranking attracting the attention of 10 to 15% of the participants. Finally, we can see that marketing and advertising and market research in particular are considered to be less essential aspects for boosting women participation.

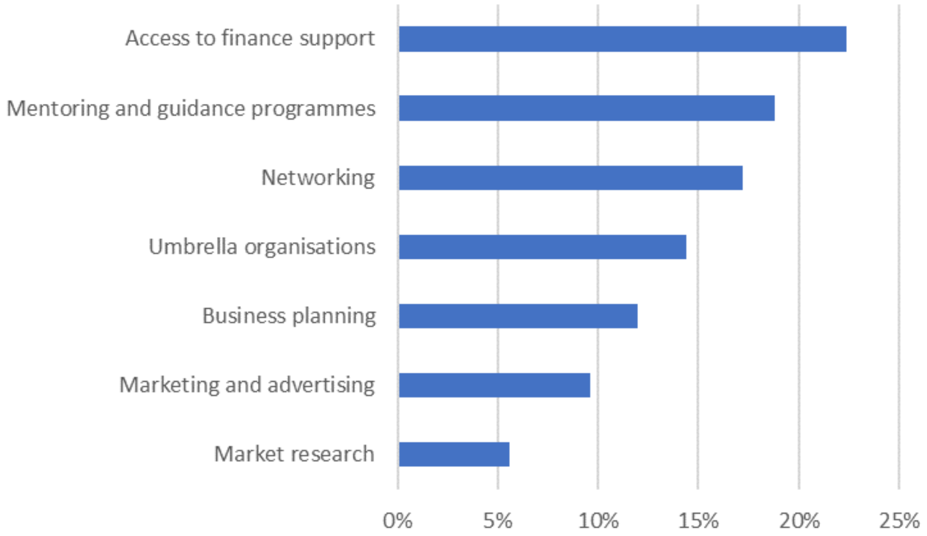


Figure 50 : Type of business support for women participation in RHC (IT)

When moving on to the type of technical support that is more relevant to women participation (Fig.51), our results indicate that consultancy on the implementation and monitoring of RHC projects is the most highlighted actions that can act as catalysts to women participation in RHC projects, followed closely by energy and environmental analysis, feasibility studies to support go-no-go decisions and technical advice on concept design and development of RHC projects. energy audits and performance certifications seem to attract relatively less attention, as less that 15% of the received responses indicated them as relevant types of technical support for fostering women involvement in RHC.

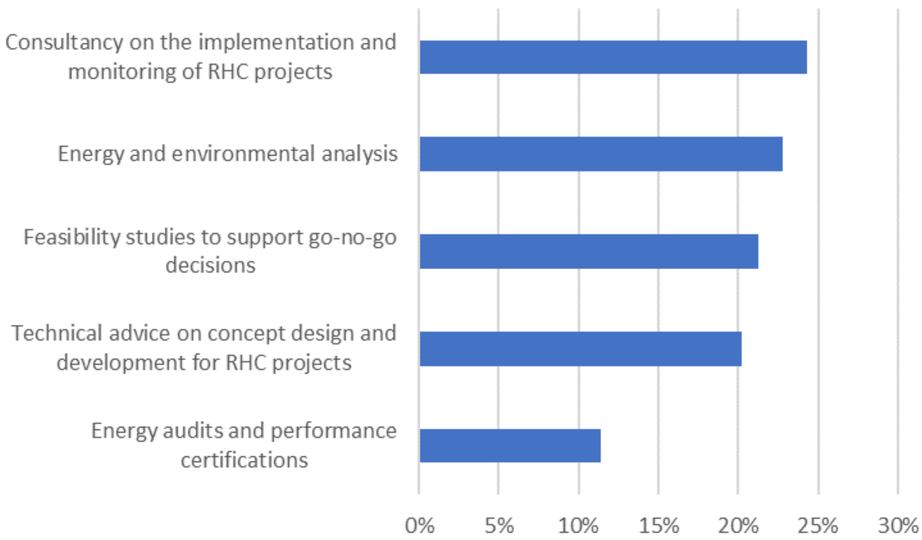


Figure 51: Type of technical support for women participation (IT)

Our analysis has also indicated a set of key topics for targeted training for women capacity building in the context of Italy (Fig 52). As it can be seen, gender neutral remuneration should be the top priority for boosting female involvement in RHC, virtually tied with gender-smart work policies. At the same time, aspects related to gender analysis and awareness raising and campaigns form a second group of topics that should be included in capacity building activities. Gender audits, gender impact assessments, gender disaggregated data collection and gender sensitive stakeholder analysis seem not to attract a lot of attention in our survey participants' responses, as they indicate shares lower than 10%. Finally, the least popular options for our sample were gender evaluation and gender budgeting.

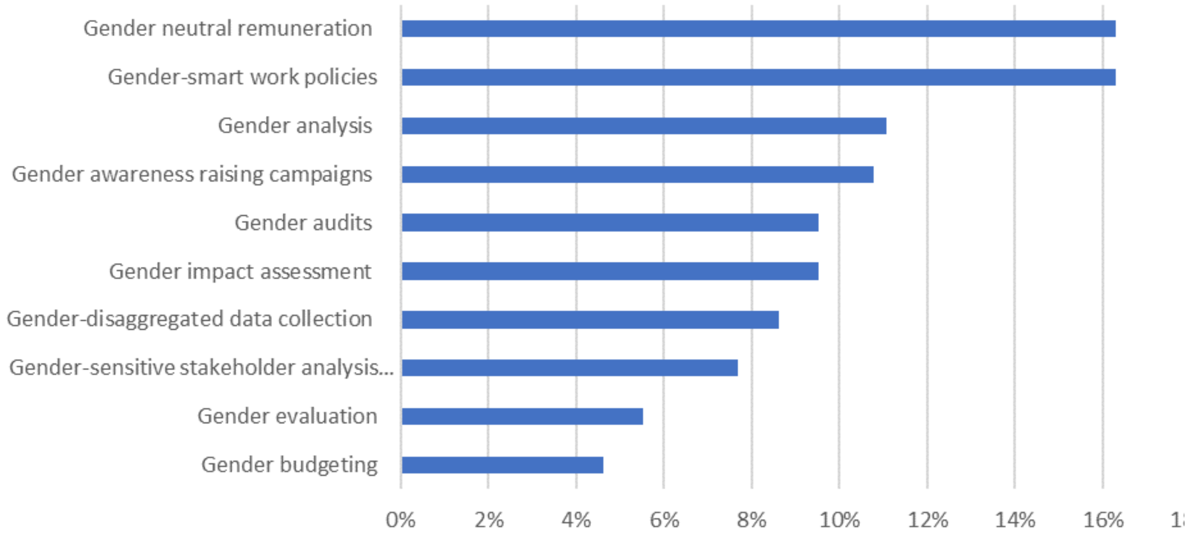


Figure 52 Key topics for targeted training for capacity building (IT)

When it comes to awareness raising activities, Fig 53 shows that activities related to economic, environmental, and social benefit of RHC solutions are perceived by a considerable margin as the most effective ways to raise awareness in women. Moreover, state/public financial support is the next options in terms of popularity in our list, closely followed by supporting women's involvement in RHC, the increased visibility for available RHC opportunities and the personal development and opportunities to increase income, options that received the attention of slightly more thatn 15% of our respondents. Activities focusing on gender related challenges in the RHc market have received very low attention in our Italian sample.

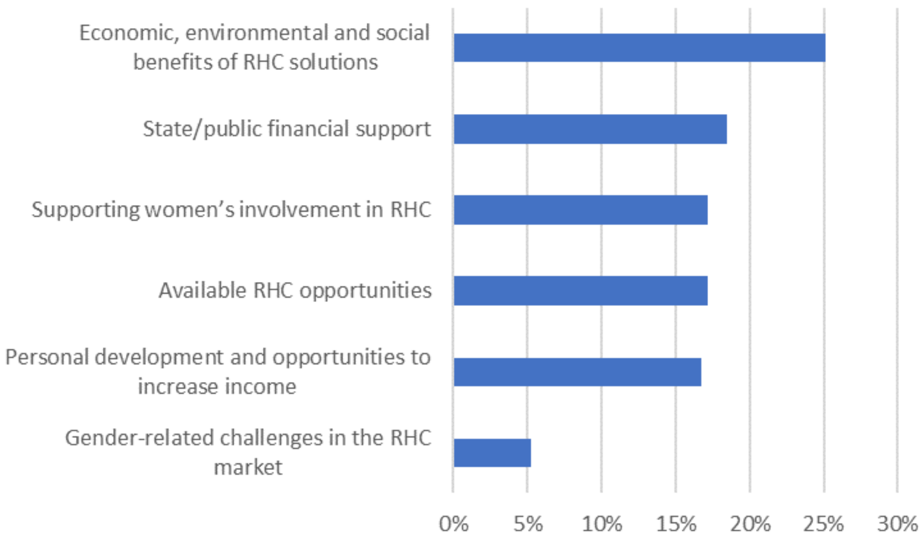


Figure 53 Awareness raising activities (IT)

In addition, when it comes to the stakeholder groups that need to be addressed, in order for awareness raising activities to have a wider impact, we can see that policymakers are on the top of this list (Fig 54). Industry actors comes second and is closely followed by general public and STEM female students. Researcher is the last option that gathered the attention of over 10% of our sample whereas woman associations and communities and start up communities have received much lower shares.

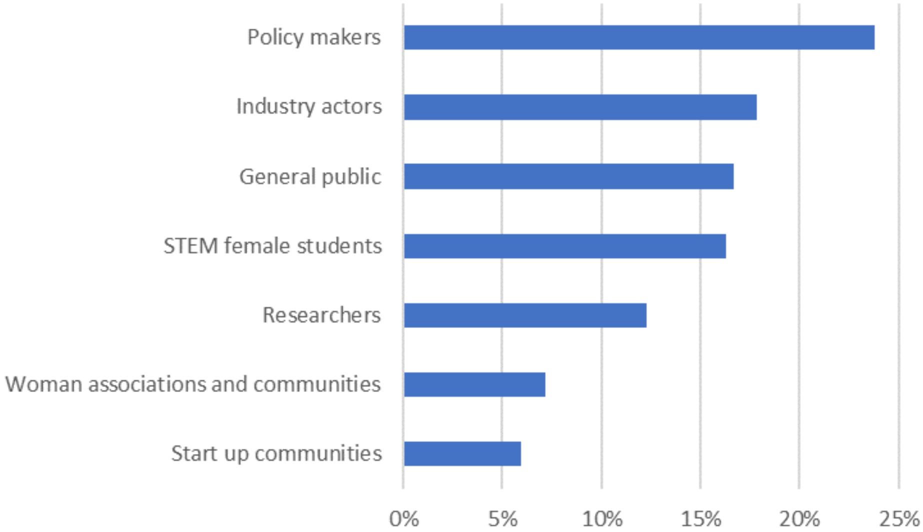


Figure 54 Groups to be addressed (IT)

Finally, results related to the willingness to support women participation in RHC through different channels are given in Fig. 55, below. As we can see, activities related to promoting success cases of women in the sector receive very high support and the lowest figure in terms of negative reactions based on our survey participants' responses, alongside with improving gender just communication in the sector. The participants are much willing to promote women involvement in RHC also by participating in workshops and promotional activities and participating in relevant activities in their country even if the share of respondents explicitly disagreeing is slightly higher for these two options if compared to the first two mentioned.

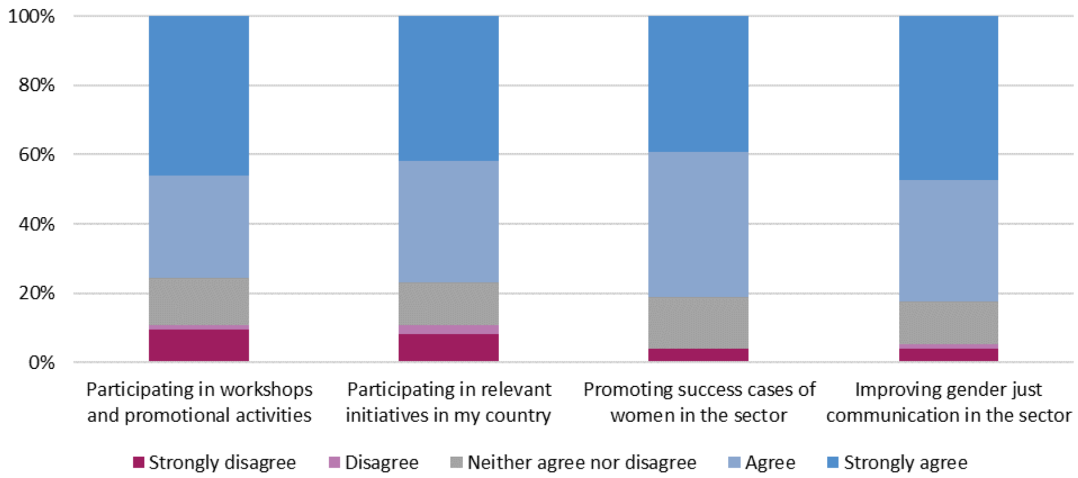


Figure 55: Willingness to support women participation in RHC (IT)

Norway

In the case of Norway we have managed to collect an overall sample of 13 responses (Table 5), covering all different types of stakeholders (7 Business – 4 Academia – 1 Policy makers – 1 Civil Society). Within our sample female respondents (76.92%) are more numerous than male respondents (23.08), whereas almost all participants have tertiary education background (92.31%).

Taking a closer look at the specific activities that could further enhance women participation in RHC (Fig. 56), we can see that in the Norwegian case the development pf umbrella organisation are the most popular responses amongst survey participants. Support activities related to this aspect are the most relevant towards boosting a more equal participation of women in RHC, followed by networking and access to financial support, virtually tied at second place. Mentoring and guidance programmes attracted the attention of slightly less than 20% of the participants and finally, we can see that marketing and advertising and especially business planning and market research are considered to be less essential aspects for boosting women participation.

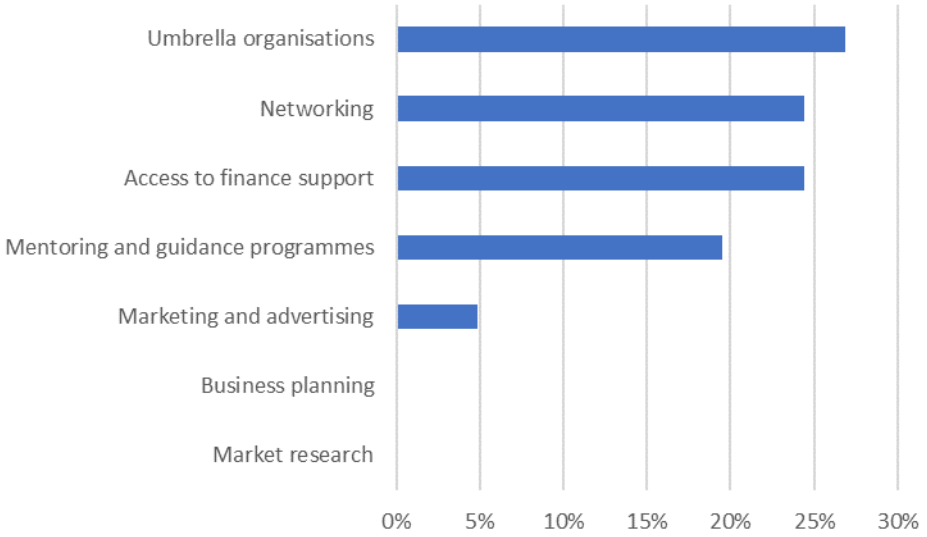


Figure 56: Type of business support for women participation in RHC (NO)

When moving on to the type of technical support that is more relevant to women participation (Fig.57), our results indicate that technical advice on concept design and development of RHC projects, and energy audits and performance certifications are the most highlighted actions that can act as catalysts to women participation in RHC projects attracting respectively the attention of over 30% and 25% of the participants. Energy and environmental analysis comes in third place in this ranking, while feasibility studies to support go-no-go decisions together with consultancy on the implementation and monitoring of RHC projects and seem to attract less attention, as less than 20% of the received responses indicated them as relevant types of technical support for fostering women involvement in RHC.

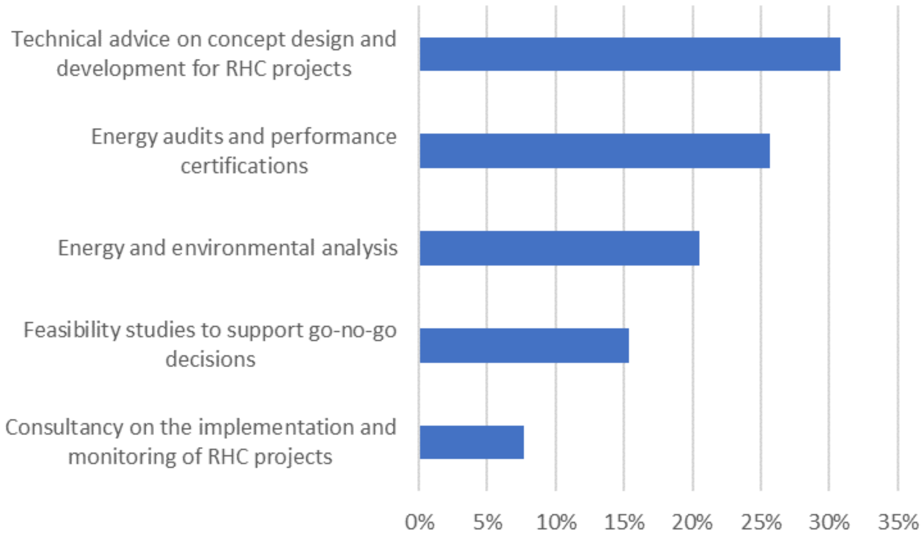


Figure 57: Type of technical support for women participation (NO)

Our analysis has also indicated a set of key topics for targeted training for women capacity building in the context of Norway (Fig 58). As shown, gender audits should be the top priority for boosting female involvement in RHC, alongside gender disaggregated data collection. At the same time, aspects related to gender-smart work policies, gender budgeting followed by gender sensitive stakeholder analysis form a second group of topics that should be included in capacity building activities attracting the attention o over 10% of the respondents. Gender evaluation, gender neutral remuneration, gender awareness campaigns and gender impact assessment rank lower in this list and gender analysis seem not to attract a lot of attention in our survey participants’ responses, as it indicates lower shares.

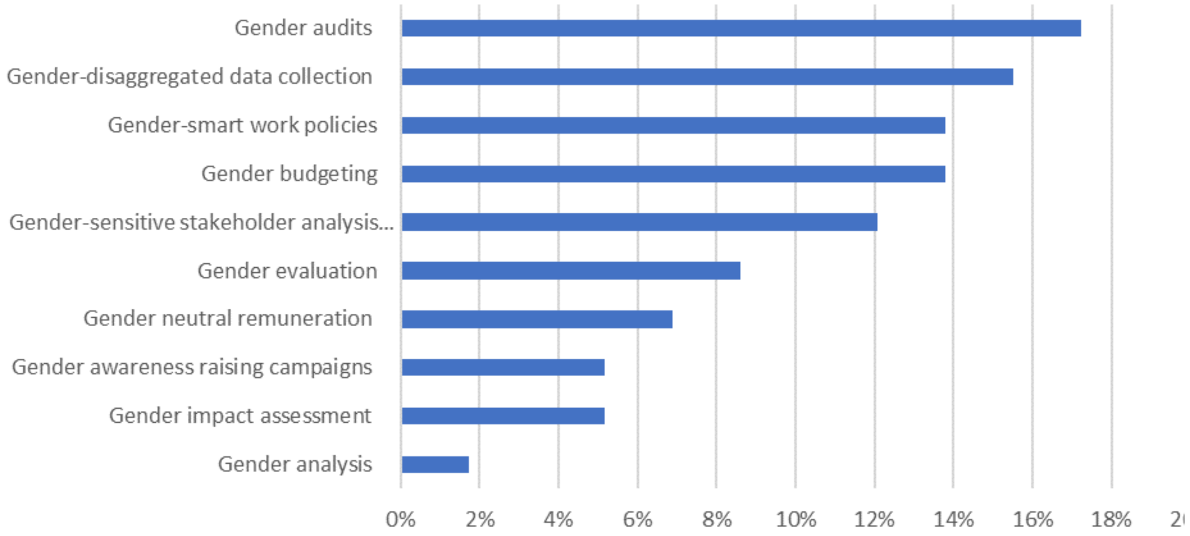


Figure 58: : Key topics for targeted training for capacity building (NO)

When it comes to awareness raising activities, Fig 59. shows that activities related personal development and opportunities to increase income, is the most effective ways to raise awareness in women. Moreover, state/public financial support and supporting women's involvement in RHC are the next ones in our list. Activities focusing on available RHC opportunities as well as activities relevant to gender-related challenges in the RHC market have received the attention of slightly less than 15% of our sample, while economic, environmental and social benefits of RHC solutions was the least popular option.

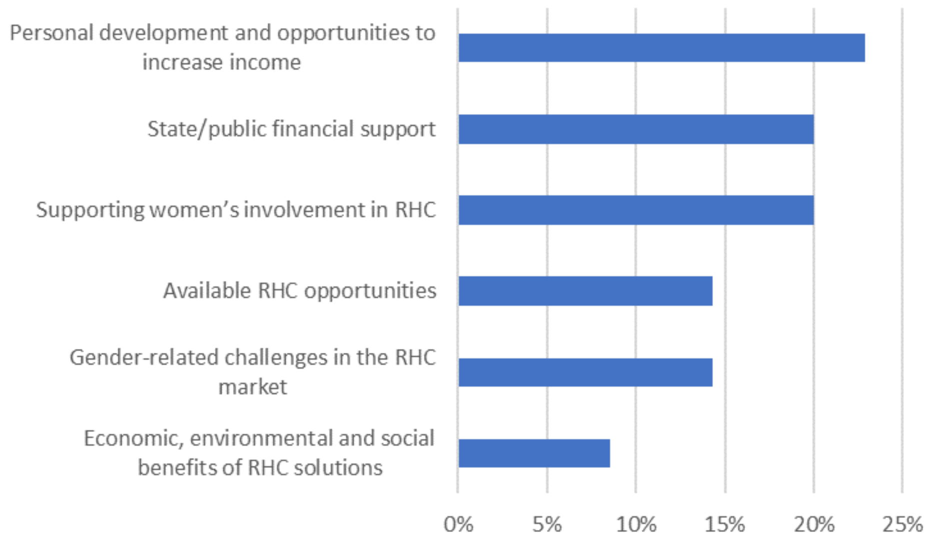


Figure 59: Awareness raising activities (NO)

In addition, when it comes to the stakeholder groups that need to be addressed, in order for awareness raising activities to have a wider impact, we can see that policymakers and industry actors are on the top of this list (Fig 60). researchers and start up communities appear in third and fourth place respectively attracting the attention of 15 to 20% of the participants. STEM female students have received slightly more than 10% of the responses while general public and woman associations and communities groups were selected by a even lower share of respondents

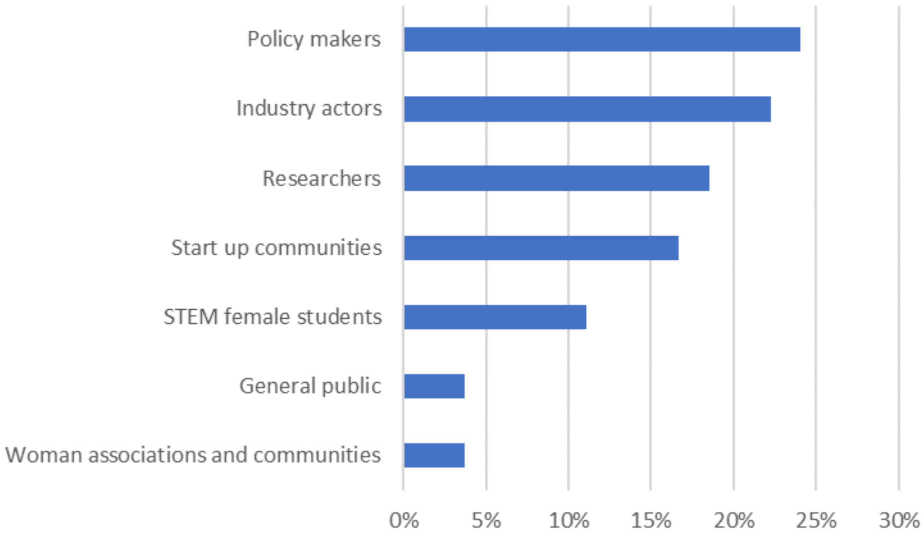


Figure 60: Groups to be addressed (NO)

Finally, results related to the willingness to support women participation in RHC through different channels are given in Fig.61, below. As we can see, activities related to participating in relevant initiatives collecting the approval of over 80% of the participants. Around 70% of the participants would be willing to support women participation by improving gender just communication in the sector, and slightly more than 60% of them would support promoting success cases of women in the sector as in the case of the option "participating in workshops and promotional activities". This last channel for woman participation collected the highest amount of negative feedback even if the figure shows that it remains a clear minority (slightly more than 20%).

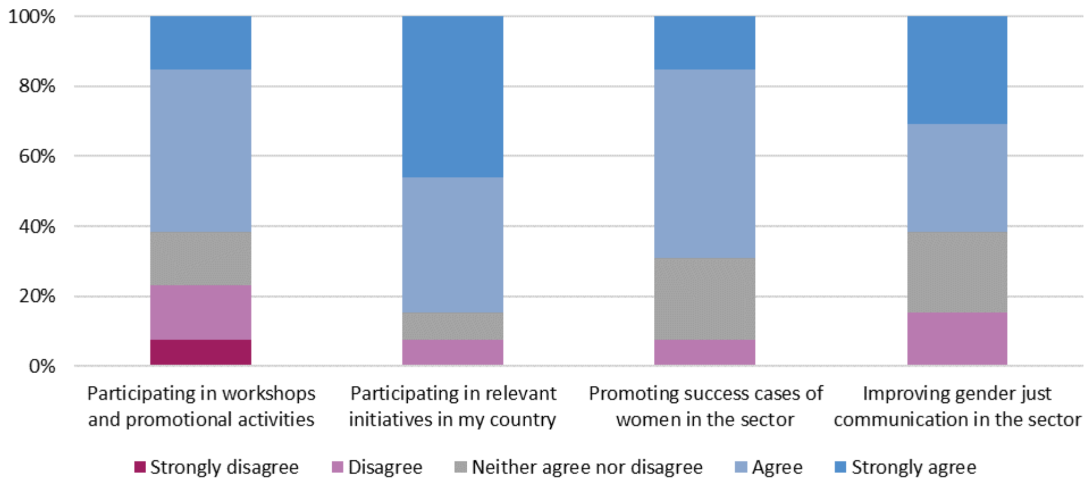


Figure 61: Willingness to support women participation in RHC (NO)

Slovak Republic

In the case of the Slovak Republic we have managed to collect an overall sample of 33 responses (Table 6), covering all different types of stakeholders (5 Business – 5 Academia – 11 Policy makers – 11 Civil Society). Within our sample Our sample is balanced in terms of gender (50%-50%), whereas almost all participants have tertiary education background (95.83%).

Taking a closer look at the specific activities that could further enhance women participation in RHC (Fig. 62), we can see that in the case of The Slovak Republic, mentoring and guidance activities are the most popular responses amongst survey participants, closely followed by access to financial support, This means that business support activities related to these two aspects are the most relevant towards boosting a more equal participation of women in RHC, followed by the development of marketing and advertising activities and networking, Finally, we can see that umbrella organizations, market research, and in particular business planning are considered to be less essential aspects for boosting women participation.

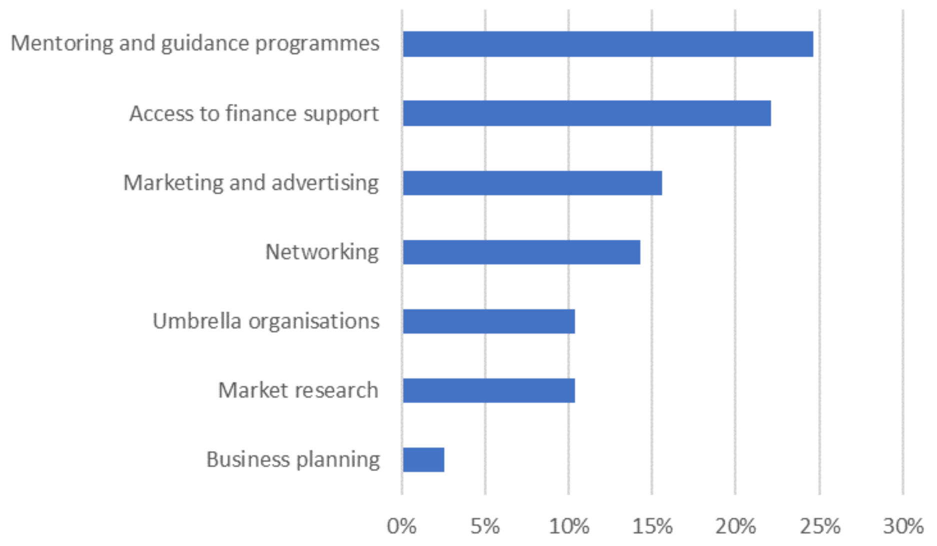


Figure 62: Type of business support for women participation in RHC (SK)

When moving on to the type of technical support that is more relevant to women participation (Fig.63), our results indicate that consultancy on the implementation and monitoring of RHC projects are the most highlighted actions that can act as catalysts to women participation in RHC projects. The ranking in terms of priority of these actions seems to be clearly defined with technical advice on concept design and development of RHC projects, together with energy and environmental analysis finding the approval of 20 to 25% of the respondents. Finally, energy audits and performance certifications and feasibility studies to support go-no-go decisions seems to be less popular as less than 20% of the received responses indicated them as relevant types of technical support for fostering women involvement in RHC.

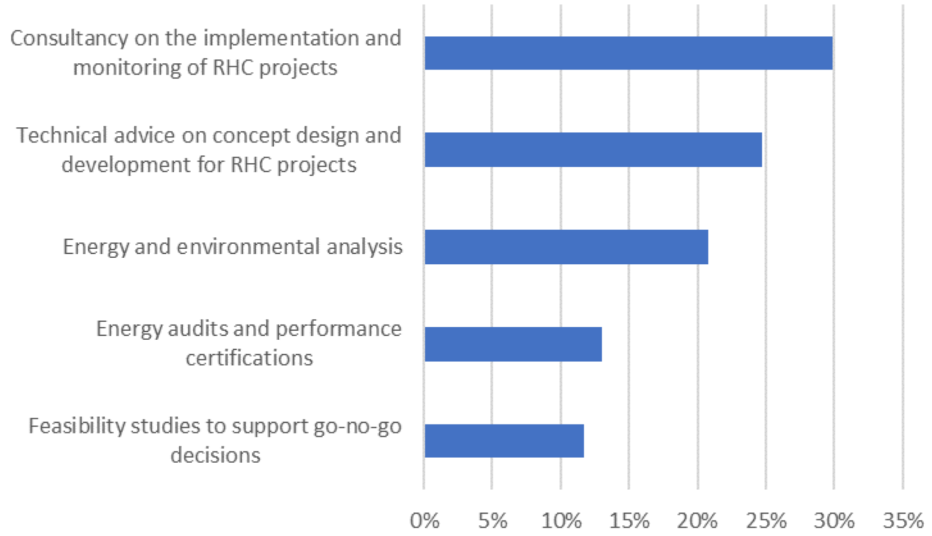


Figure 63 : Type of technical support for women participation (SK)

Our analysis has also indicated a set of key topics for targeted training for women capacity building in the context of the Slovak Republic (Fig 64). As it can be seen, gender neutral remuneration actions should be by far the top priority for boosting female involvement in RHC 9approved by almost a third of the participants), alongside gender-smart work policies with still a solid support of almost 25% of the respondents. At the same time, aspects related to gender awareness raising campaigns and gender-sensitive stakeholder analysis form a second group of topics that should be included in capacity building activities even if significantly less popular than the first two options (around 10% of the responses). gender disaggregated data collection, gender analysis, gender audits gender impact assessment, gender evaluation and, in particular gender budgeting seem not to attract a lot of attention in our survey participants' responses, as they indicate lower shares ranging from just over 5% to close to 1% of the responses.

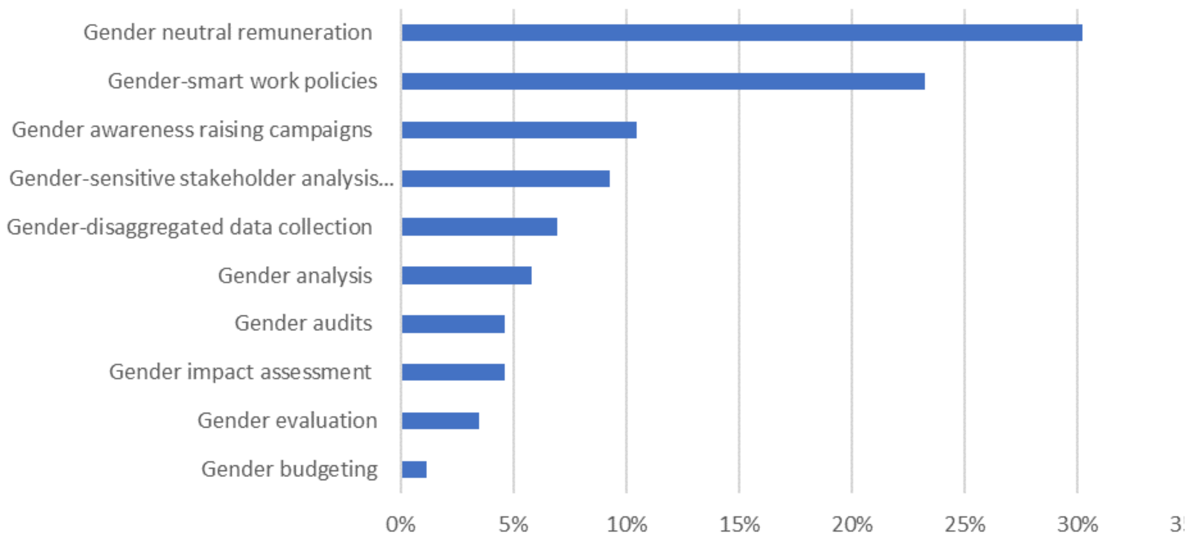


Figure 64: Key topics for targeted training for capacity building (SK)

When it comes to awareness raising activities, Fig 65. shows that activities related to state/public financial support, alongside the supporting women's involvement in RHC are the most effective ways to raise awareness in women. Moreover, increased visibility for available RHC opportunities and personal development opportunities to increase income through RHC are the next ones in our list, closely followed by economic, environmental, and social benefits of RHC solutions. Activities focusing on gender-related challenges in the RHC market have received very low attention in our Slovak sample.

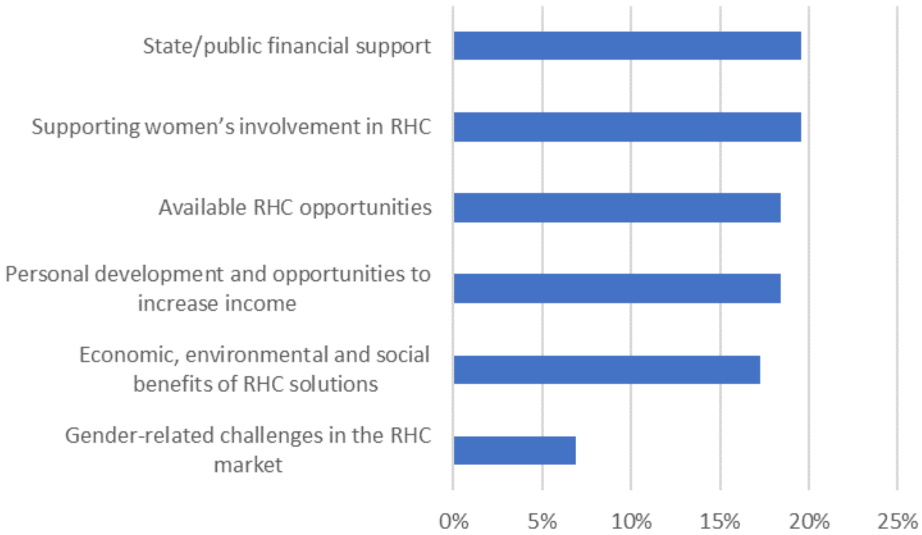


Figure 65: Awareness raising activities (SK)

In addition, when it comes to the stakeholder groups that need to be addressed, in order for awareness raising activities to have a wider impact, we can see that the general public is on the top of this list (Fig.66). Industry actors, policy makers and STEM female students form a second group of relatively popular stakeholder group with around 15% of the responses and are followed by researchers and start up communities both at slightly over 10%. Finally woman association and communities have received less than 10% of the total responses.

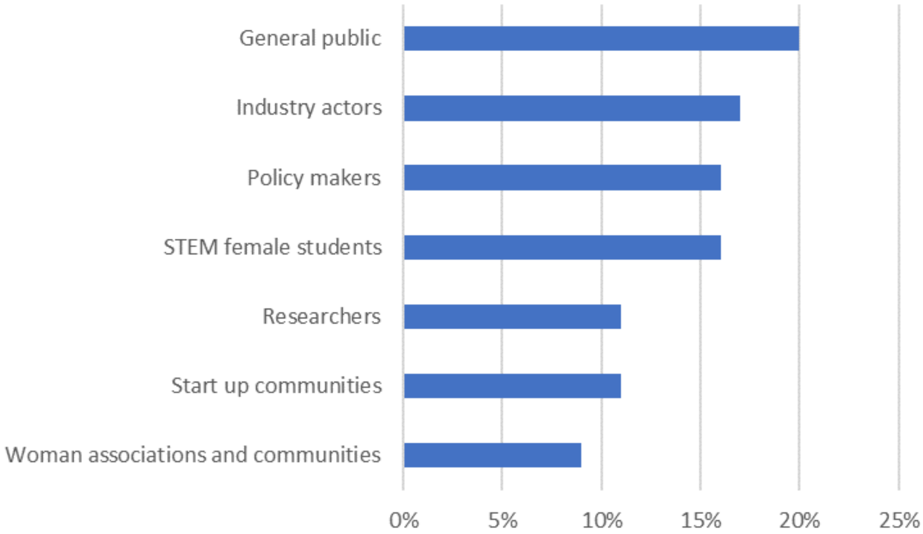


Figure 66: Groups to be addressed (SK)

Finally, results related to the willingness to support women participation in RHC through different channels are given in Fig.67, below. As we can see, activities related to improving gender just communication in the sector and improving gender just communication in the sector receive very high support based on our survey participants' responses both receiving the approval of around 80% of the respondents. People are still positive but less unanimous about promoting women involvement in RHC by participation in workshops and relevant initiatives and by participating in relevant initiatives in their country.

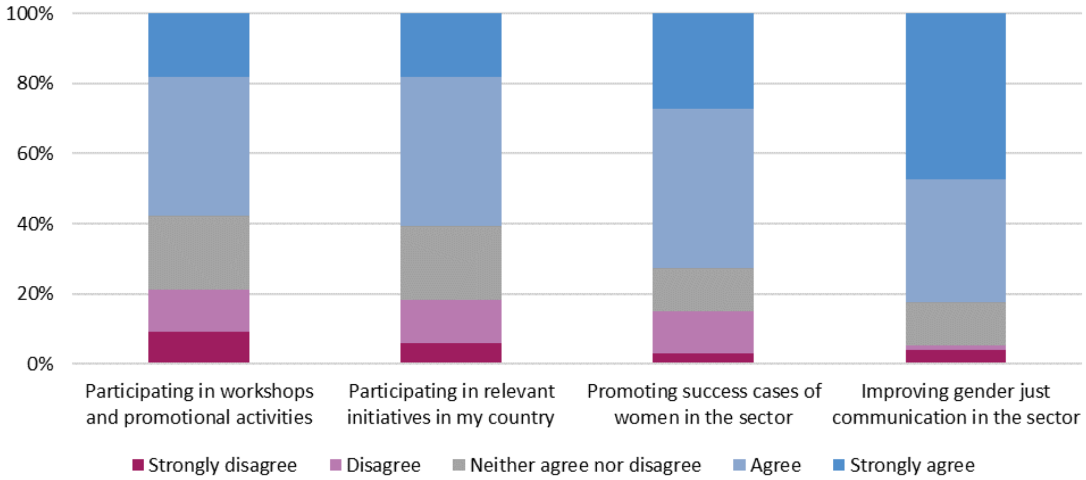


Figure 67: Willingness to support women participation in RHC (SK)

5 CONCLUSIONS

5.1 Country profiles

Country profile 1: Belgium

Uptake of RHC solutions	Main RHC solutions employed	Underused RHC solutions / untapped potential
• Slow progress on the uptake of RHC solutions • Significant underuse especially in already existing buildings	• Heat pumps • District heating based on renewable • Solar Thermal	• Geothermal • Bioenergy • Solar district heating • Combined Heat and Power

Factors facilitating the uptake of RHC solutions and the participation in the sector	Inclusiveness of the RHC sector
• Growing number of large-scale applications • Good level of technical capacity across the entire country • Certification PEB, identifying the buildings' energy efficiency levels • Introduction of an EU soft target specifically related to the increase in RHC	• Difficult access to funding for vulnerable categories • Examples of social housing companies investing in RHC • Tenancy status preventing active transition to RHC solutions

Factors limiting the uptake of RHC solutions	Recommended measures
• Lack of specific competences (installers) • Lack of technical instruments (ex. those required to set up district heating) • Low average quality of RHC projects asking for funding • High cost of RHC solutions • Low and uncertain return on investments	• Setting up energy communities • Awareness raising, support and counselling for homeowners. • Introducing RHC targets at national level • Support for industries, buildings and individuals (e.g., subsidies, structural funds)

• Lack of regulatory framework and middle/long term political vision (administrative / local) • Complexity of the RHC sector implementation process, key decisions taken by multiple stakeholders • Lack of awareness on the specificities of the heating systems and on the impact • Demanding spatial requirements for installations (heat pumps and solar panels) • Unfamiliarity of end users with innovative solutions	• Increasing carbon pricing measures • Targeted financing for social housing • Development of effective policies
Women's involvement in the RHC sector	**Perceived benefits deriving from the involvement of women**
• **Lack of women in technical and top leadership decision-making positions** • More present in marketing and awareness rising and policymaking • Some examples of female leadership in energy associations	• Increased efficiency and performances of businesses • More fresh perspective indirectly increasing quality of life, fairness, and happiness
Perceptions regarding the barriers faced by women in the RHC sector	**Measures to support the involvement of women in the RHC sector**
• The gender gap in technical education • The gender-specific stereotypes • Self-discrimination and the consequent lack of confidence • Increasing mobility requirements for women working in the RHC sector which becomes challenging when they must balance work with family life • Male dominated RHC related networks • Low shares of female enrolment in technical disciplines	• Shared maternity/paternity leave • Business advice • Support to women pursuing an education in STEM • Valorise the communication skills of women operating in the RHC sector • Support programs for female entrepreneurship • Simplified access to funding for women's businesses • Gender based hiring quotas • Gender smart policies both at work and community level

Country profile: Bulgaria

Uptake of RHC solutions

- Differences between urban and rural areas
- RHC uptake supported by national and international funding programs

Main RHC solutions employed

- Solar thermal
- Hydroelectric
- Heat pump

Underused RHC solutions / with untapped potential

- District Heating
- Geothermal
- Biomass

Factors facilitating the uptake of RHC solutions and the participation in the sector

- Increasing demand for RHC solutions
- High number of suppliers
- National policy framework
- European funding programs and projects

Inclusiveness of the RHC sector

- Vulnerable groups lack information regarding RHC solutions
- Low income families cannot afford RHC solutions and do not have access to funding
- Energy poverty problems in many rural areas of the country

Factors limiting the uptake of RHC solutions

- Lack of information on RHC technologies (users)
- Lack of awareness about the green transition process
- High density of the population in urban areas
- Overlapping regional and national competences
- The lack of human capital in the sector
- The lack of financial resources for innovating technologies
- Rigid regulatory framework
- The requirements for RES installations are too general
- Official market statistics are not specifically collecting data on RHC
- Lack of synergies between communities

Recommended measures

- Raise awareness and disseminate information
- Delegate the control of the implementation of energy policies on a local level
- Development of incentives targeted to more vulnerable groups
- Public support for investments in the RHC sector
- Map residential and industrial buildings meeting the requirements for RHC installations.
- Support for curricula and educational programs on RHC related fields
- Subsidies for innovative companies
- Deeper engagement of authorities at national and local level with international partners
- Establishment of a specialized and highly expert-based local hub
- Change in the regulatory framework allowing small, decentralized installations to be deployed more easily

• Lack of comparable innovation potential among SME compared to the EU SMEs. • Past RES target achievements decreasing the political interest in investing in further efforts.	• Wide market promotion of RHC technologies with a distinct segregation of the energy production types and the end users • Arrangement of individual and case-by-case consultations services

Women's involvement in the RHC sector	**Perceived benefits deriving from the involvement of women**
• Low female involvement in STEM education and business and technical positions • Frequent underestimation of women's competences	• Inherent value of a more diverse RHC sector • More open and forward looking opinions • Key role of women in the shift of behavioural patterns of users

Perceptions regarding the barriers faced by women	**Measures to support the involvement of women in the RHC sector**
• Women are met with distrust when negotiating with customers, culturally association of gender with different level of technical competences.	• Increased visibility for women led initiatives and encourage the participation of women in the research sector linked to RHC. • Market development programs stimulating entrepreneurship. • Promoting hands-on training sessions for young women • Mentoring programs • Promote targeted RHC-related training for women, including in the field of RES installations, • Coaching for female start-up entrepreneurs, together with a dedicated financial pipeline for start-ups managed by women with a special focus on the technical solutions • Dedicated promotional events for such businesses at the local technical fairs and exhibitions • Competency building on renewable energy and sustainability

Country profile Denmark

Uptake of RHC solutions	Main RHC solutions employed	Underused RHC solutions / with untapped potential
• The cold weather is a significant obstacle to energy independence • Growing awareness and motivation among younger cohorts	• Heat pumps • District Heating	• Solar Thermal • Biomass • The use of excess heat dispersed by industries

Factors facilitating the uptake of RHC sol. and the participation in the sector	Inclusiveness of the RHC sector
• Local administrations provide information services and guidance to end users • Collective District Heating Supply Companies purchase and install heat pumps at competitive prices • Energy communities allow local stakeholders to join forces in a community • National Building Fund (LBF) supporting renovation and maintenance of social housing buildings	• Unequitable access to RHC solutions for vulnerable groups • High initial investment prices • Denied Financial support from commercial banks • Energy communities are not competitive • Political challenges and regulatory burden concerning implementing RHC solutions in social housing • Overcomplicated application procedures

Factors limiting the uptake of RHC solutions	Recommended measures
• The cold weather increases the demand for heating • The level of buildings insulation in Danish cities varies greatly, and there are some examples of poorly insulated buildings • The low competitiveness of RHC solutions • Lack of awareness, environmental consciousness, and willingness to change well established habits • Regulatory barriers preventing the creation of decentralized energy supply systems	• Tax deductions, for example in the form of a craftsman deduction for better insulations • Nudging and advertising RHC solutions to increase their visibility and popularity • Imposing a C02 tax • Mapping and identification of older building and the

• Unpredictable energy price developments, raising the investment risks. • The lack of feasibility assessment support services • The volatile nature of the energy supply from RES	• Establishment of targeted advisory and support services for end-users • Investing in large scale projects or channel more external funding in the sector
Women's involvement in the RHC sector	**Perceived benefits deriving from the involvement of women**
• Gap in participation between men and women • Women are more represented in the public administration	• More holistic approach and on average higher commitment to green transition • Communication skills allowing to reach end-users
Perceptions regarding the barriers faced by women in the RHC sector	**Measures to support the involvement of women in the RHC sector**
• Women's role in the family that does not allow them to fully engage in the sectors • Societal stereotypes discourage women to be ambitious in the more technical side of the energy sector • Lack of visibility for female role models in the sector	• Multiply the effort to communicate to women on the demand side of the RHC sector • Continuing support for quota • Reduction of the gender-pay gap • Reach out to potential female STEM students and make successful cases of women in RHC more visible

Country profile Germany:

Uptake of RHC solutions	Main RHC solutions employed	Underused RHC solutions / with untapped potential
• Industrial sector key for green transition • Cooling is not widely necessary due to weather conditions • Recent shift from gas to oil and the electricity generation has been prioritized over the heat generation	• Solar thermal • Heat pump • Biogas and biomethane	• Geothermal • District heating • Waste heat extraction

Factors facilitating the uptake and the participation in the sector	Inclusiveness of the RHC sector
• Renewable Energy Sources Act (EEG) • Increasing interest in RHC solutions	• Initial investment is also a barrier for the more vulnerable categories • Only houseowners can intervene on heating systems, low-income families are often tenants • Older cohorts are less likely to commit to renovations

Factors limiting the uptake of RHC solutions	Recommended measures
• Low oil price • The public opinion is sceptical and lacks confidence in the efficiency of RHC solutions, often due to misinformation spreading via internet • Incorrect or insufficient information • Lack of awareness and acceptance of the feasibility of adopting RHC solutions • Banks are often not willing to loan money for investments in the RHC sector • Technical difficulties linked to operating in existing buildings.	• Political support from policymakers, trade press and associations to the innovators. • Enhance transparency and permeability of information between political decision-makers, expert committees, and academic bodies. • Renew the energy tax system the tax on CO2 should be increased from 25 €/ton to 100€/ton. • Refurbishment of existing buildings • Regulatory requirements for newly built houses • Encouraging the installations of new technologies and bonuses for virtuous users • Encouraging investment by obliging landlords to pay higher prices for energy if their building is not energy efficient.

• Tenancy status does not allow interventions on the rented apartment they are renting • The framework regulatory conditions and the political will are not as supportive as they should be • Complex contract management with municipality often puts RHC installations and project at risk • Lack of trust in the safety of geothermal energy solutions • Limited space in many buildings for boilers installations and the • High cost of RHC tech installations with a long-term return on investment	• Change the requirements or legal standards for buildings, basing them on an overall CO2 balance of the building itself • Information campaign and awareness raising • Integrate Renewable Energy related training in all the professions participating to the construction industry • Establish a competence network of craftsmen that, through a certification, signals to the customers which crafts are qualified to work with RHC solutions • Establish free consultancy services for homeowners • Set up targeted assistance and advisory services for SMEs • Encourage the adoption of RHC solutions for social housing • Implement large scale measures • Stimulate the outsource of installations to renewable energy provider • Allocation of funds to support targeted to key subsectors demonstrating good potential
Women's involvement in the RHC sector	**Perceived benefits deriving from the involvement of women**
• Low female involvement • Women mostly active in finance and marketing) but not in positions such as engineering, planning, technical consultancy and at the head of businesses • The decision within the household concerning RHC is often handled by men	• Development and growth of the sector • Personal and soft skills • Multiplier effect for women in the future
Perceptions regarding the barriers faced by women in the RHC sector	**Measures to support the involvement of women in the RHC sector**
• The lower proportion of women willing to pursue a STEM • The expectations and the stereotypes • Women in management positions are more likely to be replaced than their male counterparts • A perceived lack of support for mothers and women in general	• Encouraging young women to consider pursuing an education in more technical disciplines • Support in the form of parental leave and services such as day-care centers.

Country profile Greece:

Uptake of RHC solutions	Main RHC solutions employed	Underused RHC solutions / with untapped potential
• Steady increase in the uptake of renewable technologies • Still at 50% of its renewable energy potential • Investments in buildings renovation lag behind	• Solar thermal, solar water heaters • (Biomass)	• Geothermal • District heating • (Hydrogen)

Factors facilitating the uptake and the participation in the sector	Inclusiveness of the RHC sector
• The simplified licensing procedure followed by investors • Competitive mechanisms fostering equality and transparency in the market • The recent development of wholesale market through Target Model.	• High initial investments costs, lack of information are the main barriers for vulnerable groups • Positive impact of decrease in energy prices in Greece through competitive bidding mechanisms • Public Private Partnership Schemes can help to fight energy poverty

Factors limiting the uptake of RHC solutions	Recommended measures
• Low price of energy in Greece • Smaller scale installations have a low return on investments • High cost of RHC installations compared to alternative solutions available • The existence of some technical barriers, such as a limited storage energy capacity, and limited grid capacity. • The unclear institutional framework, lacking a specific action plan for renewables • The obstacles related to licensing, financing, procedural issues • Cumbersome bureaucracy	• Public subsidies • Tax exemptions for RE projects • Financing supporting tools such as removal of income criteria to supporting programs to simplify the access to the support itself, a premium system for consumers reducing electrical consumption, and coordinate with municipalities and incentivizing investments from the private sector • Support measures for sustainable buildings design through demand side management incentivizing energy production in single households

• The lack of financial incentives for end users • Lack of awareness concerning the impact of climate change, the opportunities linked to innovative RHC solutions in terms of sustainability and energy independence • Shortage of specialized competences or specialized professional profiles on the Greek job market • Preoccupations of the public opinion regarding the modification of the living environment required to build the facilities linked to RHC	• Promotion of awareness raising campaigns and supporting the establishment of energy communities • Setting up consulting services with technical experts • Harmonization of energy policies on issues such as energy savings programs • Reduction of red tape, overall bureaucratic obstacles to action • Promotion of Public Private Partnership Schemes to tackle energy poverty
Women's involvement in the RHC sector	**Perceived benefits deriving from the involvement of women**
• Very few women in more technical positions mostly male populated industry • Women are generally given the same opportunities as men in the government and research sector	• Increased development and growth with new personal and communication skills • More open mentality and increased commitment to green transition
Perceptions regarding the barriers faced by women in the RHC sector	**Measures to support the involvement of women in the RHC sector**
• Entrepreneurship is more difficult as a woman • Lack of awareness regarding the difficulties women face in their work environment and the advantages of a more gender balanced team • Lack of support for mothers (especially in smaller private sectors firms) • Societal stereotypes are still quite present in the Greek society	• Coaching and support for women wiling to become entrepreneurs • Support measures for mothers during working hours (especially young mothers) • Targeted social welfare measures such as tax relief periods or increased remuneration for women who have children • Promotion of awareness in gender equality through awareness campaigns

Country profile Italy:

Uptake of RHC solutions	Main RHC solutions employed	Underused RHC solutions / with untapped potential
• Slow progess, limited uptake • Examples of excellence in the research sector linked to RHC • Growing interest and more frequent commitments in national and local policy documents	• Solar thermal • Heat pumps • Biomass	• District heating • Geothermal • Biomethane • Integrated multi-resource systems

Factors facilitating the uptake of RHC solutions and the participation in the sector	Inclusiveness of the RHC sector
• Regional development programmes • Sector specific tax deductions • Potential use of bioplastic	• High costs of RHC solutions remains a barrier for low income families • Tenants cannot intervene on heating systems of their apartment • Poorly insulated houses an low energy efficiency in some areas of the country • Lone female-headed households and older women are at a higher risk of energy poverty

Factors limiting the uptake of RHC solutions	Recommended measures
• Lack of information • Lack of awareness of the impact of global warming • Technical issues that limit the implementation (ex. space requirements) • The lack of feasibility assessment, business / technical potential analysis • Uncertain performance of innovative technologies • High costs linked to innovative RHC solutions	• Introduction of tax incentives and more funding programs supporting RHC solutions • Introduction of vouchers schemes for support services or consultancy for users • Streamline procedures linked to (and strengthen controls over) the “Super bonus 110%” • Increase funding for the renovation of public buildings • Support to research aiming at finding sustainable solutions for RHC sector • Greater support to technology transfer to enhance local industrial development • Awareness raising

• Lack of institutionally defined spaces for public engagement within authorization procedures • High costs linked to the maintenance of the cooling towers. • Limited availability of trained technicians and installers • The need to limit the polluting emissions characteristic of biomass installations limits the further development of these technologies	• Support to business initiatives (ex. market research, business planning, access to finance support, networking, and mentoring • Development of industry-academia programs focused on hands-on training for new professionals • Promotion of targeted initiatives filling the knowledge gap of end-users
Women's involvement in the RHC sector	**Perceived benefits deriving from the involvement of women**
• Low participation especially in decision-making • Women perceived as more environmentally conscious on average • Stereotypes and cultural issues negatively affecting female participation	• Development and growth of the sector • Greener and more long-term vision • Spillover effect on women in future generation
Perceptions regarding the barriers faced by women in the RHC sector	**Measures to support the involvement of women in the RHC sector**
• Societal stereotypes on the role of women in the family and its potential in STEM educational fields • Male colleagues not recognizing the authority and competences of their female co-workers • Women are particularly affected by energy poverty	• Business and financial support, especially in the technology transfer process • Grants dedicated to women with entrepreneurial potential in the sector • Awareness campaigns on barriers faced by women on the workplace • Promotion of educational and re-training paths addressed to women • Dissemination of good practices and successful cases of career development • Training addressed to re-skill unemployed women • Collect and assess gender disaggregated data

Country profile Norway:

• **Uptake of RHC solutions**	**Main RHC solutions employed**	**Underused RHC solutions / with untapped potential**
• Capped Heat prices based on electric heating standards • Relatively liberal and open energy market • Ambitious targets set in policy documents at national and local level (ex. Oslo)	• Hydropower • District heating	• Solar thermal • Biomass • Geothermal

Factors facilitating the uptake of RHC solutions and the participation in the sector	**Inclusiveness of the RHC sector**
• Tax deduction system in place on some RHC solutions • Local level funding schemes (ex. Oslo Climate and Energy Fund)	• Ecomodern masculine domination of environmental politics • The issue of access to RHC for all is not frequently part of the public debate

Factors limiting the uptake of RHC solutions	**Recommended measures**
• **Lack of long-term planning** and support for large scale projects • **Technical barriers (ex. ageing networks** with low efficiency high operating temperatures)	• Maximize the responsiveness to heating and cooling needs, resource availability, level of development of the renewable energy sector • Invest on existing infrastructure • Improve macroeconomic conditions • Support the direct use of bioenergy, solar thermal and geothermal energy. • Increase energy efficiency (through funds such as the Climate and Energy Fund) • Providing financial benefits for prosuming initiatives especially for residential use

	• Enhancement of energy literacy and general awareness in the general population
Women's involvement in the RHC sector	**Perceived benefits deriving from the involvement of women**
• Steady increase of women participation in STEM related and business sector over the last decade. • Women in the sector tend to be more qualified than men on average • Consumer decision making still dominated by men	• Increased growth and competitiveness • Shift on behavioral patterns within households
Perceptions regarding the barriers faced by women in the RHC sector	**Measures to support the involvement of women in the RHC sector**
• Stereotypical view of the (perceived) lack of skills and knowledge of women in the STEM related field • Presence of male dominated RHC sector networks • Tendency to designs one-fits-all subsidy programs not taking into account the diversification of the target groups especially in terms of prosuming related policies	• Increasing corporate responsibility for ensuring a facilitating work environment for women • Stronger visibility of women in STEM • Mentoring and networking for creating a supporting community for women in the RHC sector • Awareness raising activities focusing on women's role • Analyze prosuming behaviors through gender lenses

Country profile Slovak Republic:

Uptake of RHC solutions	Main RHC solutions employed	Underused RHC solutions / untapped potential
• Strong competition of traditional technologies (especially gas boilers) • Long term investment returns for RHC installations • Without public funding *non* RHC solutions are installed in new buildings	• Biomass • Solar thermal • Heat pump	• Geothermal • District heating

Factors facilitating the uptake and the participation in the sector	Inclusiveness of the RHC sector
• National legislations requiring new buildings to meet energy consumption standards	• RHC are not affordable for low-income families • Decreasing price of heat pumps (possible opportunity) • Public funding needed to support vulnerable groups

Factors limiting the uptake of RHC solutions	Recommended measures
• The low return on investments and high price of installations • Saturation of the RHC market (high of supply and low demand) • Lack of openness and transparency • Low levels of technical knowledge of the RHC technologies (consumers). • Lack of reliable statistical data on the effectiveness of subsidies • Lack of targeted support • Lack of appropriate public financial and technical support for management of geothermal wells • Lack of specific technical competences • Rigidity of national legislation preventing individual users to disconnect from the district heating networks	• Increased visibility for good practices and awareness raising campaigns about the impact of RHC • Training of local administrations and municipalities • Development of calculators on the return on equipment • Case-by-case support coupled with information on the lifecycle of the different facilities • Tax relief, subsidies, and discounts on high quality raw materials, especially for biomass fuel • State subsidies (renovation of already existing buildings) • Simplified legislation and administrative procedures

Women's involvement in the RHC sector	**Perceived benefits deriving from the involvement of women**
• Women are mainly represented in positions in research, and public administration. • Low participation in more technical and top management roles	• Stimulate the awareness of gender-related issues • Inherently desirable but no causal relationship with the development of the sector

Perceptions regarding the barriers faced by women in the RHC sector	**Measures to support the involvement of women in the RHC sector**
• Societal stereotypes • Lack of support for mothers • Lack of awareness on gender equality issues • Low attractiveness of the private sector for women.	• Welfare measures, including • More child-care facilities and Increased tax relief for childcare • Flexible working hours and housework • Financial support from the state, e.g., for care, food, etc. especially in the case of single-parent families). • Support for participation in professional conferences (in person, online) • Skills training and technical support • Support for entrepreneurs in terms of knowledge about the uptake of innovative technologies • Dissemination case studies of successful women in RHC and of good practices

5.2 Observations and considerations

Uptake of RHC solutions

The results of our survey showed that men and women equally perceive the uptake of RHC solutions as too slow. Together with the insights collected during the interview process, it leads to the conclusion that across all the countries considered there is untapped potential in terms of uptake of RHC solutions. The reported situation is nevertheless diversified, ranging from a positive (even if slow or very slow) recent trend of increased penetration in Italy, Slovakia, Belgium and Greece, to more established presence of RHC in Germany, Norway and Denmark. In particular, the survey results suggest that Norway and Denmark seem not to follow a similar pattern in relation to the other six countries included in our analysis, fact which might relate to the different socio-economic, environmental, cultural and policy approaches being used in them by policymakers and other relevant stakeholders.

Both the interviews and the survey data paint a consistent picture that sees solar thermal and photovoltaics as the technologies with most potential across all countries, followed by heat pumps and by biomass. There are country-specific peculiarities regarding some of the RHC solutions, such as district heating in Denmark and biomass in Slovakia. Geothermal applications seem to be the least prominent RHC technologies and often perceived as underutilised. Gender does not seem to affect which RHC solution is perceived as most or least used.

Public buildings and industrial heating emerged as the main target for renovations and for the installations of RHC solutions. However, some perceptions differ across the quadruple helix categories, which suggests that enhanced discussion between different stakeholders might be a step towards a more effective strategy.

Facilitating factors

The regulation surrounding the uptake of RHC solutions is often perceived as having the potential to be very effective as proven by few virtuous examples already put in place at municipal and regional level or in the form of nation-wide frameworks (ex. Renewable Energy Sources Act in Germany or the National Building Fund in Denmark). In general, though, a significant portion of the interviewees often perceive a lack of structural and long-term dimension that is considered vital for the policy related support for the sector.

Limiting factors

The development of the sector is not only limited by barriers relative to policymaking and regulations: financial and technical barriers are present in different forms in all the countries considered in this analysis. High installation costs and, thus, higher competitiveness of traditional solutions is the most acknowledged barrier in all 8 countries alongside the lack of information about the benefits of RHC solutions.

At the same time, the degree to which businesses and end users can access relevant information varies across the countries, with Norway and Denmark reporting much higher level of perceived awareness than the other countries. The survey results showed some examples of unclear understanding of the current situation, leading to the idea that the actors belonging to the QH category identified as "civil society" might benefit from targeted awareness campaigns.

Although the lack of know-how has been reported by some of the interviewees as an important issue to be addressed, the overall perception is that barriers of financial, regulatory, and social nature are more prominent than the technology and skills related limiting factors.

Inclusiveness of the RHC sector

The RHC sector in all the regions is reported to not be accessible for lower income families and vulnerable groups in general, for which the limiting factors such as unbearable initial investment costs and cumbersome administrative procedures are amplified by their lack of resources at large (income, time and specific knowledge). The empowerment of these categories often suffering from energy poverty problems in some of the regions considered is seen as field in which the RHC sector should be focusing more on.

Recommended measures

The recommended measures gathered in this report address the challenges related to the uptake of RHC solutions in multiple different aspects. In terms of financial support measures, the increase in public funding or support seems to be a common recommendation across all the countries to encourage the development of the sector. This support is imagined in different forms such as carbon taxes, tax reliefs and deductions, targeted subsidies for specific categories, or innovative technologies or for a specific purpose (ex. renovation of public buildings) and intend to nudge or shift more directly the behaviour of both producers and consumers. Another recurrent kind of recommended support measure revolves around awareness raising on the importance of the green transition and providing access to information of all sorts which empowers end-users and ideally valorise innovative and valid RHC solutions that lack visibility. Along those lines, a vast majority of the stakeholders argues also in favour of a simplified regulatory and administrative framework. Other recommendations revolve around enhanced institutional cooperation and the support for flexible energy production solutions both as individual producers and in the form of energy communities.

Women's involvement and perceived benefits

Overall, the RHC sector is perceived as disproportionately populated by men especially in top management and more technical positions, although there is a differentiation between the male and female perception of the degree to which women are involved in the sector. In some cases, such Denmark, Norway, and Bulgaria, a larger share of men believe that equal gender participation in RHC has been achieved compared to the corresponding share of women participants, while in other cases (Greece, Germany and Italy) there is no significant variations between the male and female perspectives on the matter.

Some more specific issues were examined, including perceptions and beliefs on women's participation on decision-making positions, whether or not decision makers consider gender-based differences and the need for the RHC to become more attractive in terms of professional engagement for women. The analysis paints a picture of a RHC sector that does not debate enough gender related issues and is far from being able to tackle them. Bulgaria and to a lesser extent Slovakia and Norway stand out as peculiar cases in this regard, as they do in their understanding of existence of barriers for women in the RHC sector. Despite these variations, there seems to be no doubt that the issues at the heart of W4RES are relevant to the RHC sector as it is our search for a better understanding of possible drivers for change and the causes of what we observe today. For example it emerged that the current situation is a consequence, among other things, of a low enrolment rate of young women in STEM related education field. This gender gap is perceived as an obstacle to the development of the sector in terms of missed opportunities: it is argued that women could bring to the table not only their technical knowledge, but also some specific set of soft skills, approaches and motivations needed to have a true impact in the transition to renewable solutions. There are some variations across the countries notably in the case of Bulgaria and Slovakia. There respondents seem to hesitate to establish a direct causal relationship between the increase in efficiency and the increased female participation but agree on the inherent value and the desirability of a more gender balanced composition of the actors involved in the RHC sector.

Barriers faced by women in the RHC sector

The factors limiting female participation are often in common with other sectors such as the difficulties for women to manage family and work simultaneously due to the lack of structured support. For example, most of the respondents recognise this issue as a significant barrier to women's career and only in the cases of Bulgaria and Slovak Republic men's perceptions differs significantly in this regard, if compared to the rest of the population and to the other countries.

However, in the RHC sector these barriers are amplified by some structurally embedded discriminations such as stereotypes on the lower level of competences of women in STEM related field and the predominantly male dominated professional networks. Stereotyped ideas about gender roles acting as a barrier towards encouraging girls to choose STEM studies seem to be higher in the cases of Belgium, Greece, Germany and Italy, based on the perceptions of our survey participants.

Measures to support the involvement of women

In terms of recommended measures for an increased involvement of women, the respondents focused on the support for young women willing to pursue a STEM related education and in a series of measures to support women to not penalize their career development because of their role as mothers. Other recommended measures revolved around an increased visibility for successful women in RHC, support for participation in professional conferenced and networking events, setting up coaching and mentoring programmes. Respondents also recommended focusing on business support, skills training, and technical support, collect and assess gender disaggregated data, and communications campaigns targeted to women on the demand side of the market. Quota systems got mixed reactions, ranged between explicit approval to opposition.

In addition, the final part of the survey (described in section B) aimed at measuring respondent's opinions and agreement concerning the specific support measures that W4RES identifies as necessary to facilitate the uptake of RHC while addressing the gender aspect. W4RES aims at deploying a suite of market uptake support measures which can be tailored and deployed as integrated solutions to the local barriers to RHC uptake and to women's involvement in the sector. These measures include i) business support services, ii) technical support services, iii) capacity building services, iv) awareness raising campaigns, along with the material required for their effective delivery in the targeted countries.

The table below contains an overview by country of the 3 most popular options for each group of market uptake support measures that will be developed by W4RES (i.e. business support, technical support, capacity building and awareness raising) to increase the involvement of women in the sector (see section B of the survey analysis for a more detailed analysis).

Table 8 Three most popular options for each market support measure across the eight countries

	BE	BG	DK	DE	GR	IT	NO	SK
Business support	Networking	Financial sup.	Financial sup.	Mentoring	Mentoring	Financial sup.	Umbrella org.	Mentoring
	Mentoring	Mentoring	Networking	Networking	Networking	Mentoring	Networking	Financial sup.
	Umbrella org.	Marketing / adv.	Business plan.	Umbrella org.	Financial sup.	Networking	Financial sup.	Marketing / adv.
Technical support	Consultancy on implementation	Tech. advice on concept design	Tech. advice on concept design	Consultancy on implementation	Consultancy on implementation	Consultancy on implementation	Tech. advice on concept design	Consultancy on implementation
	Tech. advice on concept design	Energy and env. analysis	Consultancy on implementation	Tech. advice on concept design	Energy and env. analysis	Energy and env. analysis	Energy audits perf. analysis	Tech. advice on concept design
	Feasibility studies (go/ no-go decisions)	Consultancy on implementation	Feasibility studies (go/ no-go decisions)	Energy and env. analysis	Feasibility studies (go/ no-go decisions)	Feasibility studies (go/ no-go decisions)	Energy and env. analysis	Energy and env. analysis
Capacity building topics	Gend. awareness raising campaigns	Gender neutral remuneration	Gender neutral remuneration	Gender neutral remuneration	Gender smart work policies	Gender neutral remuneration	Gender audits	Gender neutral remuneration
	Gender neutral remuneration	Gender smart work policies	Gend. awareness raising campaigns	Gender smart work policies	Gender neutral remuneration	Gender smart work policies	Gender disaggr. data collection	Gender smart work policies
	Gender smart work policies	Gender analysis	Gender smart work policies	Gend. awareness raising campaigns	Gend. awareness raising campaigns	Gender analysis	Gender smart work policies	Gend. awareness raising campaigns
Awareness raising activities	Economic, social, and env. benefits of RHC solutions	Economic, social, and env. benefits of RHC solutions	Public financial support	Economic, social, and env. benefits of RHC solutions	Economic, social, and env. benefits of RHC solutions	Economic, social, and env. benefits of RHC solutions	Personal dev. opportunities to increase income	Public financial support
	Available RHC opportunities	Available RHC opportunities	Support of women in RHC	Support of women in RHC	Available RHC opportunities	Public financial support	Public financial support	Support of women in RHC
	Support of women in RHC	Personal dev. opportunities to increase income	Available RHC opportunities	Personal dev. opportunities to increase income	Public financial support	Support of women in RHC	Support of women in RHC	Available RHC opportunities
Target groups	Industry actors	General public	Policymakers	Policymakers	Policymakers	Policymakers	Policymakers	General public
	STEM female students	STEM female students	Industry actors	Industry actors	General public	Industry actors	Industry actors	Industry actors
	Policymakers	Policymakers	STEM female students	STEM female students	Industry actors	General public	Researchers	Policymakers

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7 ANNEXES

ANNEX 1: T1.1 & T1.2 Interview questionnaire for policy and decision makers

Sections:

Guidelines

Respondent details

a. General information about the respondent

Assessment of the framework conditions with regard to the RHC/RE in the region

a. RHC landscape in the region

b. Main opportunities and challenges for the RHC in the region

c. Perceptions regarding participation and involvement in RHC – facilitators and challenges

d. Possible RHC support measures

Perceptions regarding the role of women in RHC in the region

a. Women's involvement in RHC in the region

b. Perceptions about the barriers faced by women

c. Measures to support the involvement of women in RHC

Guidelines

Target group
Pan-European and International, National, regional authorities and policy makers.
It is essential to identify **two authorities (per each country)** who have a clear overview of the framework conditions (namely, market, political, social, regulatory, institutional) and of the gender dimension. Based on country peculiarities, identify whether it is better to contact national, regional or local authorities or policy makers.

Important recommendations
As you can see, for some questions some sub-questions are present. It would be essential to ask also these questions, or you can also use it as a guideline during the interview. These sub-questions would allow us to have a clearer view of the framework conditions. While the parts in brackets can be used as a support for the discussion (not mandatory).
The answers should be as detailed and precise as possible to allow us to complete the general context.

The interviews for Task 1.1& T1.2 will be conducted between from mid-December 2020 to 20/01/2021 by the regional partners with national, regional or local authorities.

Share the reporting templates with CiviESCo and White Research for the analysis by 22/01/2021.

Respondent details

General information about the respondent

- Sex of respondent: female / male
- Country: …
- Stakeholder group: business / academia / authority / civil society
- Profession/Position: …
- Field of Studies

Assessment of the framework conditions with regard to the RHC in the region

a) RHC landscape in the region

1. What is the **current RHC landscape** in your region?
    - What are the most prominent types of RHC technologies and sources employed in your region? (e.g. specific technology, sector of adoption, market)
    - Is it feasible to apply them both from a financial and technical point of view?
    - Which types are currently under-utilised? Why?

- [Which RHC solutions have the most promising prospects and why? If the interviewee does not mention specific markets or use cases applied in his/her region the interviewer may mention examples. Are there any regional specificities that influence the adoption of RHC solutions?]

2. Which policies support the spread of RHC in your region? Are they national or regional?
    - Which types of RHC are more incentivised by regional/national policies?
    - Are there incentives for the uptake of RHC solutions available?

b) Main opportunities and challenges for the RHC in the region

3. In your opinion, what are the **main opportunities** for the RHC sector in your region? What opportunities are currently underexploited?
    - What are the main market opportunities for the deployment of RHC solutions in your region?

4. . In your opinion, what are the **main challenges** for the RHC sector in your region?
    - What are the key energy challenges in your region/country? (e.g. high urban population, seasonal volatility of RES, energy poverty, energy needs for electricity and H&C, etc.)

(Examples of barriers: lack of sufficient information, uncertainty about technology's performance, uncertainty of regulations, uncertainty of energy price development, scarcity of trained professionals, degree of risk in investment, volatility in the provision of energy from RES, etc.)

c) Perceptions regarding participation and involvement in RHC – facilitators and challenges

5. What **factors influenced** your decision to enter the RHC sector? What factors facilitate or challenge your participation?

- [What are their past experiences? What are the overall benefits of their participation as perceived by their involvement? What problems do they face with the processes, the tools or the other participants they interfaced with?]

6. In your opinion, what are the main **limiting factors** to the participation in RHC/ to the uptake of RHC solutions in your region? If these limiting factors are relieved, would the adoption of RHC projects be guaranteed? Are current policies in your region on the right direction to tackle such limitations?

- [What are the general shortcomings they identified by their participation in the RHC ecosystem? e.g. lack of sufficient information, lack of feasibility assessment and/or business and technical potential analysis, uncertainty about technology's performance (or the knowledge of such services), lack of resources or financial support, uncertainty of regulations, uncertainty of energy price development, scarcity of trained professionals, degree of risk in investment, volatility in the provision of energy from RES, competition from fossil fuels/fewer subsidies compared to traditional fuel. etc.]

7. In your opinion, how **inclusive and accessible** is the RHC sector for all groups of the society (including low-income households, elderly people, with migration background, etc.)? Do you consider that the existing policies take into consideration vulnerable societal groups?

- [Can you provide any examples? Is there a specific societal group to be considered?]

d) Possible RHC support measures

8. If you had the power to increase the uptake of RHC, what **measures** would you put in place to facilitate that effort? If possible, please also consider measures relevant to technical support, business support, and social initiative for the deployment of RHC solutions.

- [General facilitators for RHC uptake (e.g. tax incentives, funding programs, vouchers for support services or consultancy, technical support e.g. from academia, energy consultants or public agencies, etc). The interviewee - if coming from the business sector, or involved in communities and initiatives - can also identify facilitators relevant to his/her sector. Examples for technical support: feasibility studies to support go no-go decisions, technical advice on design and implementation, etc. Examples for business initiatives: market research, business planning, access to finance support, networking, mentoring]

Perceptions regarding the role of women in RHC in the region

a. Women's involvement in RHC in the region

9. How would you describe **participation of women in the RHC sector** and community in your region? Do they participate as much as men?

- [Do you think that women are underrepresented? How would they describe the role of women in their sector (business, academia, policy-making, …)? Are women engaged with decision making?]

10. What is the current situation regarding gender equality in business/public administration dealing with RHC in the region? Have you noticed any progress?

11. Is gender equality integrated into the work unit's program objectives, and, if so, how?

    [What activities are specifically geared towards gender equality?]

12. Do you think that increasing the involvement of women in the RHC sector will contribute to the development of your region and the RHC sector? In which way does their involvement contribute / not contribute?

- [With sustainable development we focus on: benefit for the society, green development, gender balance, improve quality of life, clean energy for all etc.]

13. Are you aware of women-led initiatives as well as successful and/or failed cases in the RHC sector in which women are involved?

- [Can you give us some information about their actions and contribution in your region? Did they receive any support from existing policies?]

b. Perceptions about the barriers faced by women

14. In your experience, do you perceive that women working in the modern RHC sector or seeking such work face **gender-related barriers**? If yes, what kind of barriers and which you consider the most important?

- [What are the biggest barriers faced by women in RHC? (access to education, access to career, career retention and advancement, access to finance, access to information). Do you think discriminatory social norms and gender stereotypes are strong within the RHC sector? Do you think that women lack sector-specific knowledge and skills? What are the main reasons for this?]

15. Do you think that current policies ensure equitable access to energy services between men and women? Should gender be considered in energy policy making?

- [Do you consider that women face higher risks of energy poverty? Do you think that women have different energy demands? If yes should they be taken into consideration for policy making?]

c. Measures to support the involvement of women in RHC

16. What is being done to support women entrepreneurship in RHC? Are you satisfied with these measures?

- [Which bodies/ authorities are mainly involved? Examples for support measures: business support, financial support, technical support, skills training, society-wide awareness raising, policy support, ….]

17. If not, what measures would support women's involvement in RHC (e.g. as entrepreneurs/decision makers/researchers etc)? What type of support would be the most relevant in terms of policy support? Do you think that decision makers in your region take into account gender-based differences?

- [Examples for support measures: business support, financial support, technical support, skills training, society-wide awareness raising, policy support, …. Do you feel that some targeted training in key topics [such as building gender awareness, implementing gender-smart work policies, etc.] could make a difference in helping them integrate a gender perspective? What other topics would be important?]

ANNEX 2: T1.2 Interview questionnaire (Interviews with representatives of Business, Academia and Civil Society)

Sections:

Respondent details

General information about the respondent

- Sex of respondent: female / male
- Country: …
- Stakeholder group: business / academia / authority / civil society
- Profession/Position: …
- Field of Studies

Perceptions regarding the uptake of RHC solutions in the region

a. RHC uptake situation in the region

1. What is your opinion on the **adoption of RHC solutions** in your region? Do you think the potential of RHC solutions is utilised / meets the demand of RHC solutions? Could you please provide some market-base evidence on the RHC adoption in your region?

- [Is there a wide range of RHC technologies that are applicable? Is it feasible to apply them both from a financial and technical point of view? Which RHC solutions have the most promising prospects and why? If the interviewee does not mention specific markets or use cases applied in his/her region the interviewer may mention examples. Are there any regional specificities that influence the adoption of RHC solutions?]

b. Participation and involvement in RHC – facilitators and challenges

2. How do you **participate in the RHC sector/market**? Are you on the receiver side, provider side or both?

- [How do they employ RHC solutions or participate in the RHC sector?]

3. What **factors influenced** your decision to enter the RHC sector? What factors facilitate or challenge your participation?

- [What are their past experiences? What are the overall benefits of their participation as perceived by their involvement? What problems do they face with the processes, the tools or the other participants they interfaced with? Do they face problems with attracting necessary funds, private or public?]

4. In your opinion, what are the main **limiting factors** to the participation in RHC/ to the uptake of RHC solutions in your region? If these limiting factors are relieved, would the adoption of RHC projects be guaranteed?

- [What are the general shortcomings they identified by their participation in the RHC ecosystem? e.g. lack of sufficient information, lack of feasibility assessment and/or business and technical potential analysis, uncertainty about technology's performance (or the knowledge of such services), lack of resources or financial support, uncertainty of regulations, uncertainty of energy price development, scarcity of trained professionals, degree of risk in investment, volatility in the provision of energy from RES, competition from fossil fuels/fewer subsidies compared to traditional fuel. etc.]

5. In your opinion, how inclusive and accessible is the RHC sector for all groups of the society (including low-income households, elderly people, with migration background, etc.)?

- [Can you provide any examples? Is there a specific societal group to be considered?]

c. Possible RHC support measures

6. If you had the power to increase the uptake of RHC, what **measures** would you put in place to facilitate that effort? If possible, please also consider measures relevant to technical support, business support, and possible social initiative for the deployment of RHC solutions.

- [General facilitators for RHC uptake (e.g. tax incentives, funding programs, vouchers for support services or consultancy, technical support e.g. from academia, energy consultants or public agencies, etc). The interviewee - if coming from the business sector, or involved in communities and initiatives - can also identify facilitators relevant to his/her sector. Examples for technical support: feasibility studies to support go no-go decisions, technical advice on design and implementation, etc. Examples for business initiatives: market research, business planning, access to finance support, networking, mentoring]

Perceptions regarding the role of women in RHC in the region

d. Women's involvement in RHC in the region

7. How would you describe **participation of women in the RHC sector** and community in your region? Do they participate as much as men?

- [Do you think that women are underrepresented? How would they describe the role of women in their sector (business, academia, policy-making, …)? Are women engaged with decision making?]

8. Do you think that **increasing the involvement of women** in the RHC sector will contribute to the development of your region and the RCH sector? In which way does their involvement contribute / not contribute?

- [With sustainable development we focus on: benefit for the society, green development, gender balance, improve quality of life, clean energy for all etc.]

9. Are you aware of **women-led initiatives** as well as successful and/or failed cases in the RHC sector in which women are involved?

e. Perceptions about the barriers faced by women

10. In your experience, do you perceive that women working in the modern RHC sector or seeking such work face **gender-related barriers**? If yes, what kind of gender-related barriers do you consider most critical/urgent to overcome?

- [What are the biggest barriers faced by women in RHC? (access to education, access to career, career retention and advancement, access to finance, access to information). Do you think discriminatory social norms and gender stereotypes are strong withing the RHC sector? Do you think that women lack sector-specific knowledge and skills? What are the main reasons for this? Do you think that current policies ensure equitable access to energy services between men and women? Should gender be considered in energy policy making?]

f. Measures to support the involvement of women in RHC

11. What measures would **support women's involvement** in RHC (e.g. as entrepreneurs/decision makers/researchers etc)? What type of support would be the most relevant? Do you think that decision makers in your region take into account gender-based differences?

- [Examples for support measures: business support, financial support, technical support, skills training, society-wide awareness raising, policy support, …. Do you feel that some targeted training in key topics [such as building gender awareness, implementing gender-smart work policies, etc.] could make a difference in helping them integrate a gender perspective? What other topics would be important?]

ANNEX 3: T1.2 Survey questionnaire

Welcome note

Dear participant, welcome to our survey!

The survey lasts **about 10 minutes**. There are no right or wrong answers, this is about your views. All data is anonymised and your privacy is guaranteed.

Thank you for helping us gather relevant information!

What is W4RES all about?

W4RES - *"Scaling up the involvement of women in supporting and accelerating market uptake of renewable energy sources for heating and cooling"* is a 3-year project funded by the European Union within the framework of the H2020 Research and Innovation programme.

W4RES project aims to scale-up the involvement of women in the market deployment and uptake of Renewable Heating and Cooling (RHC) solutions via replicable support measures tested and validated across 8 European countries: Belgium, Bulgaria, Denmark, Germany, Greece, Italy, Norway, Slovakia. The basic project concept stems from the recognition that women hold great promise as agents of change, helping us progress faster towards our climate and energy targets for 2030.

Your participation is contributing to our understanding of the factors impeding or favouring the uptake of renewable energy in heating and cooling in your country and identify the needs, perceptions and challenges of market actors as well as the role of women in the sector.

* I have read the **W4RES Privacy Policy** and I agree to the terms and conditions

- Yes

This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement N° GA 952874.

General information:

1 - Gender: female / male / diverse

2 - Which stakeholder group do you belong to?

Business – Energy supplier – technology installer - technical consultancy /

academia – research project /

authority -policy maker /

citizen – NGO – consumer association

3 - In which country do you live? *List 8 countries*

4 - Profession: …

5 – Education background/Field of studies:

6 – Level of Education: Primary / Secondary / Tertiary

Renewable Heating and Cooling **(RHC) landscape in my country:**

Perceptions regarding the uptake or RHC in my country.

7 - Please indicate your agreement with the following statement [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree/No opinion; 4=Agree; 5=Strongly agree;]

	1	2	3	4	5
I think that Renewable Heating and Cooling (RHC) solutions are widely deployed in my country					
I think that the share of energy coming from RHC must be increased in my country					
I am positive about increasing the use of RHC for promoting sustainability					

8 - RHC solutions in my country

Indicate which of the following RHC technologies are the most prominent in your country (you can choose more than one): ☐ Solar thermal/Photovoltaics ☐ Biomass ☐ Geothermal ☐ Heat Pump ☐ District HC & thermal storage
Indicate which of the following RHC technologies are currently under-utilised in your country (you can choose more than one): ☐ Solar thermal/Photovoltaics ☐ Biomass ☐ Geothermal ☐ Heat Pump ☐ District HC & thermal storage
Indicate the type of applications the RHC technologies are used for in your country (you can choose more than one):

☐ Industrial heating ☐ Residential ☐ Commercial buildings ☐ Public use buildings ☐ Other, please specify
Which of the following markets faces more challenges in your country for the adoption of RHC solutions? ☐ Industrial heating ☐ Residential ☐ Commercial buildings ☐ Public use buildings ☐ Other, please specify

Incentives and support measures for RHC in my country.

9.How favourable are the following framework conditions to RHC uptake in your country? (Not favourable at all, Not very favourable, Neutral/no opinion, Favourable, Extremely favourable)

	1	2	3	4	5
Political conditions (political support, policy priorities)					
Legal conditions (regulations, taxes)					
Market conditions (technology, demand and supply, technicians)					
Social conditions (culture, knowledge, awareness on RHC)					
Financial conditions (financial instruments, incentives)					

10- I believe/feel that:

I am aware of the benefits that RHC solutions could bring to my country					
I believe that there is a satisfactory level of awareness on RHC in my country					
The public is well informed on existing support measures for RHC solutions in my country					
I believe that there are adequate financial opportunities for the uptake of RHC solutions in my country					
I believe that current policies favour the uptake of RHC solutions in my country					
It is generally easy to install RHC solutions from a technical and administrative perspective in my country					
I find existing RHC support measures easily accessible in my country					
I believe that the development of energy communities would facilitate the uptake of RHC solutions in my country (energy community= gathering of collective energy actions that involve all members of the local community)					

Main barriers for RHC uptake in my country

11 - In your opinion, what barriers affect the uptake of RHC solutions in your country?

Please indicate your agreement with the following statement [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree/No opinion; 4=Agree; 5=Strongly agree]

- □ Insufficient information about the benefits of RHC solutions
- □ Uncertainty around the performance of RHC technologies
- □ Volatility in energy provision from renewables
- □ Uncertainty of regulations
- □ Lack of policy support
- □ High installation cost
- □ Risky investments for consumers
- □ Unclear legal situation for consumers, tenants and landlords
- □ Lack of suitable technologies (e.g. platforms, tools, etc.)
- □ Lack of information about state financial support
- □ Lack of skilled personnel for installing RHC solutions and providing support
- □ Lack of environmental public awareness
- □ Unequal access for vulnerable groups of society
- □ Scarcity of renewable energy resources
- □ Higher competitiveness of traditional solutions
- □ Other, please specify: …

Perceptions regarding the role of women in RHC in my country

General perception on female involvement in the RHC sector within my country

12 - Please indicate your agreement with the following statement [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree/No opinion; 4=Agree; 5=Strongly agree]

	1	2	3	4	5	6
Women participate as much as men in the RHC sector in my country						
There is a lack of women on decision-making positions in public authorities relevant to the RHC sector in my country						
There is a lack of women on decision-making positions in the business sector relevant to the RHC sector in my country						
I believe that women need empowerment for being more engaged with the RHC sector						
I believe the RHC sector needs to be more attractive in terms of professional engagement for women						

13 - I believe that the involvement of more women in the RHC sector in my country will be beneficial for…

Please indicate your agreement with the following statement [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree/No opinion; 4=Agree; 5=Strongly agree; 6=Do not know]

	1	2	3	4	5
a quicker RHC market uptake					
greater public awareness around RHC					
the economic development					
the reduction of energy poverty					
obtaining cleaner and more affordable energy					
the air quality improvement					
the quality of life improvement					
Other, please specify					

14 - In your experience, do you perceive that women working in RHC or seeking such work face gender-related barriers?

Yes/No/Do not know

Main barriers for the involvement of women in RHC uptake in my country

15 - The involvement of women in RHC uptake is hindered by the following aspects:

Please indicate your agreement with the following statement [1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree/No opinion; 4=Agree; 5=Strongly agree;]

Perceptions of gender roles					
Science, Technology, Engineering and Mathematics (STEM) studies and RHC jobs are less appealing to women					
Stereotyped ideas about gender roles (from the family, peers, school environment, society) do not encourage girls to choose STEM studies					
Barriers on the career pathway					
Not many women have the required skillset to enter the RHC sector					
Wage gap between men and women					

Lack of networks and mentoring programs for women in the RHC sector					
Prevailing hiring practices					
Barriers to career retention and advancement					
Maintaining work-life balance is challenging for women in the sector					
Lack of support for female entrepreneurs in the sector					
Mobility requirements of RHC jobs make them less appealing to women					
Barriers to equal access to energy					
Gender blind energy policies are hindering women from adopting RHC solutions					
Discriminatory social norms and gender stereotypes hinder women from getting involved in energy initiatives and communities					
Women are more likely to experience energy poverty (lack of access to sustainable modern energy services and products)					
Other types of barriers, please specify					

Measures to support the involvement of women in RHC

Complete according to your opinion the potential of the following measures to favour the involvement of women in RHC solutions uptake in your country.

16 - Do you think that local businesses or other (e.g. social) initiatives are aware of the benefits of RHC solutions and are ready to deploy them?

Yes/No/Do not know/No opinion

17 - What type of business support could strengthen women participation in RHC and thereby facilitate RHC uptake in my country?

Please, select the most interesting solutions from the following list (more than one option can be selected)**:**

- □ Market research
- □ Business planning
- □ Marketing and advertising support
- □ Access to finance support
- □ Networking
- □ Mentoring and guidance programmes
- □ Umbrella organisations for RHC support women's empowerment and apply gender-just policies
- □ Other, please specify: …

18 - What type of technical support could strengthen women participation in RHC and thereby facilitate RHC uptake in my country?

Please, select the 3 most interesting solutions from the following list (more than one option can be selected)**:**

- □ Feasibility studies to support go-no-go decisions
- □ Technical advice on concept design and development for RHC projects
- □ Energy audits and performance certifications
- □ Energy and environmental analysis
- □ Consultancy on the implementation and monitoring of RHC projects
- □ Other, please specify: …

19 - Do you think that decision makers in your country (be they in business, e.g. CEOs, top management, etc. or in public authorities) take into account gender-based differences?

Yes/No/ Do not know/No opinion

20 - What kind of key topics for targeted training for capacity building you think could help decision makers (business, public authorities, etc) take into account gender-based differences?

Please, select the 3 most interesting topics from the following list (more than one option can be selected)**:**

- □ Gender analysis (socio-economic analysis on the impact of gender relations)
- □ Gender audits (assessment and monitoring of gender equality within organisations)
- □ Gender awareness raising campaigns to make the gender related challenges of the sector visible
- □ Gender neutral remuneration for minimising the wage gap
- □ Gender budgeting (preparing budgets or analyzing them from a gender perspective)
- □ Gender evaluation (assessment of all challenges from a gender perspective)
- □ Gender impact assessment (assessment of new and existing measures to identify, in a preventative way, their likelihood of having a negative impact on gender equality)
- □ Gender-disaggregated data collection methods for having further insights on gender
- □ Gender-sensitive stakeholder analysis (analysis of the commitments, capacities and efforts of the different women and men, as well as organisations, in mainstreaming gender and in advancing gender equality and women’s empowerment)
- □ Gender-smart work policies for bridging the gap in the sector
- □ Other, please specify: …

21 - What kind of awareness raising activities you think could strengthen women participation in RHC? (more than one option can be selected)**:**

- ◻ Awareness raising about the economic, environmental and social benefits of RHC solutions
- ◻ Awareness raising about available RHC opportunities
- ◻ Awareness raising on gender-related challenges in the RHC market
- ◻ Awareness raising on supporting women's involvement in RHC
- ◻ Awareness raising on state/public financial support
- ◻ Awareness raising on personal development and opportunities to increase income
- ◻ Other, please specify: …

22 - What groups should we address for the above-mentioned awareness raising activities? (more than one option can be selected)**:**

- ◻ Awareness raising to policy makers
- ◻ Awareness raising to industry actors
- ◻ Awareness raising to the general public
- ◻ Awareness raising to STEM female students
- ◻ Awareness raising to start up communities
- ◻ Awareness raising to woman associations and communities
- ◻ Awareness raising to researchers
- ◻ Other, please specify: …

Willingness to support the involvement of women in RHC

23 - I would be willing to support female participation in RHC by:

Please indicate your agreement with the following statement (1=Strongly disagree; 2=Disagree; 3=Neither agree nor disagree/No opinion; 4=Agree; 5=Strongly agree;)

	1	2	3	4	5
Participating in workshops and promotional activities					
Participating in relevant initiatives in my country					
Promoting success cases of women in the sector					
Improving gender just communication in the sector					
Business respondents:					
Offering RHC related internship positions to female students					
Favouring flexible working and overall working conditions					
Business and academia:					
Providing mentorship to women that just enter the industry					
Academia:					
Promote/facilitate women's engagement with STEM studies					
Policy makers:					

Facilitating gender responsive work policies					
Providing incentives for women entrepreneurs to enter the sector					
Enhancing access to finance for women					
Implement an overall interministerial gender-just energy and climate policy					
Civil society:					
Engaging women in existing initiatives in my country					
Organising information events for women					
Other:…					

Survey end

Thank you for taking part into this survey!

Do you have any questions or comments? You can contact us at info@white-research.eu

Feel free to share the link to the survey with colleagues or partners!