WOMEN FOR MARKET UPTAKE OF RENEWABLE HEATING AND COOLING

Mapping of framework conditions for market uptake of RHC

Deliverable 1.1

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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WECF WOMEN ENGAGE FOR A COMMON FUTURE EV

HFT HOCHSCHULE FUR TECHNIK STUTTGART

EUREC EUREC EESV

WR WHITE RESEARCH SPRL

PEDAL PEDAL CONSULTING SRO

EAP ENERGY AGENCY OF PLOVDIV ASSOCIATION

EGC EUROPEAN GREEN CITIES APS

ECWT EUROPEAN CENTRE FOR WOMEN AND TECHNOLOGY

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Introduction

Women hold great potential as agents of change, driving the clean energy transition and getting us closer to meeting the EU's climate and energy targets for 2030. W4RES taps into this potential to support the uptake of renewable energy in heating and cooling (RHC), a market that urgently needs to shift more to RES.

The report identifies key challenges regarding market uptake of RHC, along with their gender dimension and best practices for further investigation. Our purpose is to analyse how policies and measures differ in order to reflect the different objectives, contexts, opportunities and challenges.

The objective of our task is to map framework conditions on local, national and EU-level to identify and analyse factors hindering or enabling the uptake of RES solutions in our targeted heating and cooling markets. In addition, gender aspects are scrutinized to identify if, and to what extent, these are addressed or at least considered in relevant frameworks and policies.
We first identified and collected information via desk research using diverse relevant online sources (e.g. scientific publications, policy documents, white papers, study reports, etc.). The mapping exercise has a pan-European scope but emphasises conditions in the countries of our focal markets (GR, IT, DE, BE, DK, SK, NO, BU). To identify the genders aspects, we combined desk research with interviews with decision makers in relevant authorities in their RHC ecosystem in order to explore the degree to which gender equality is mainstreamed in policy objectives and priorities, as well as to assess whether policy intentions are actually carried out in practice through relevant initiatives.

Methodology

As aforementioned, the main objective of the task 1.1 is to map framework conditions on local, national and EU-level to identify and analyse factors hindering or enabling the uptake of RES solutions in targeted heating and cooling markets. In addition, the report deepens the understanding of the gender dimension and the degree to which policy objectives and priorities are considering gender equality.
In order to create this broader map, we have combined a double methodology. On the one hand, we have conducted a desk research to gather meaningful information to be used as a contextual baseline. We have reviewed the ample literature, studies and policy documents available to uncover barriers and drivers across key framework conditions influencing uptake in local markets: culture and institutions, access to human capital, knowledge creation and networking, market conditions along with demand and supply structures, access to finance, tax and regulations, infrastructure and political support. In parallel, we have analysed policies and measures (e.g. regulatory incentives, financial instruments, etc.) for supporting the deployment of RHC and how these differ to reflect respective priorities, contexts and opportunities (e.g. RHC in National Energy and Climate Plans).
On the other hand, we also have analysed the gender dimension and links to horizontal gender equality policies. We have employed a gender audit methodology and explored the degree to which gender equality is mainstreamed in policy objectives and priorities, before moving deeper to assess whether policy intentions are actually carried out in practice through relevant initiatives. In order to collect meaningful findings related to the gender dimension we developed a questionnaire with the aim to carry out a survey addressed to relevant regional policy-makers. Together with the gender dimension, we have investigated other aspects to assess the conditions impeding or favouring the uptake of renewable energy in heating and cooling. These interviews have the objective to complement the findings of our desk research with qualitative insights that can reveal areas for intervention as well as good practices.

Summary table of the interviews

Stakeholder group	Country	Sex of respondent
Public Authority	Europe - Belgium	Female
Public Authority	Europe - Belgium	Female
Public Authority	Belgium	Female
Public Authority	Bulgaria	Female
Public Authority	Bulgaria	Female
Public Authority	Denmark	Female
Public Authority	Denmark	Male
Public Authority	Germany	Female
Public Authority	Germany	Female
Public Authority	Greece	Male
Public Authority	Greece	Male
Public Authority	Italy	Female
Public Authority	Norway	Female
Public Authority	Slovakia	Female
Public Authority	Slovakia	Female

European Union

Legislative and policy framework

Renewable heating and cooling

Within the scope of EU regional policies, a new measure will be kicking off in 2021, through a specific article of the Renewable Energy Directive that sets a soft target of 1.3% per year increase in RHC. This measure remains a soft target since it is not binding: the European Commission advised member states to increase the share of renewable energy in their heating demand. The measure is flexible as if a Member State has already reached a certain renewable energy threshold it is not bound by an annual increase. Although the target is rather low, this is the first time that heating and cooling needs included along with a specific provision for RHC into the legislation at EU level. In 2021 there is an opportunity to change this target, because the European Commission realises that heating and cooling hold the decarbonisation potential that other subsectors do not have. Should this change be applied, it is expected to result in an increase in RHC solutions being adopted at Member State level. There is generally a variety of support measures between Member States. Most of these measures concern CAPEX, which offers benefits to more cost-effective technologies.

The main regulatory frameworks affecting heating and cooling derived from renewable sources are listed below:

The **Clean Energy for all European package** is a set of policy proposals aiming to facilitate the transition from current fossil fuels to renewable energy resources. Within this package, the heating and cooling sector is crucial since these policies are contributing to the development of the RHC sector. The main directives are:

1. The **Revised Renewable Energy Directive (REDII)** (2018/2001/EC) sets the EU target for renewables consumption from the previous goal of 20% by 2020 to 32% by 2030 with a clause for a possible upwards revision by 2023.
   All in all, the directive creates an "*enabling environment to accelerate public and private investment in innovation and modernisation in all key sectors. It aims to provide guiding principles on financial support schemes for RES, renewable energy self-consumption, energy communities and district heating. It seeks to enhance mechanisms for cross-border cooperation, simplify administrative processes, strengthen the sustainability and greenhouse gas emissions-savings criteria for biofuels, and mainstream the use of RES in the heating and cooling sector*" (European Sources Online, 2018)
   Going into the details, article 23 introduces new details for the renewable heating and cooling sector:
   - Each member state should annually increase the share of RES by 1.3% in the energy supplied for heating and cooling;
   - Member states should provide and assure an adequate access and information to citizens and in particular, to those in low-income or vulnerable households.
2. The **Revised Energy Performance in Buildings Directive (2018/844/EU)** was created to increase energy efficiency, modernise and decarbonise the European building stock by 2050. The most crucial points are:
   - EU countries must establish strong long-term renovation strategies, aiming at decarbonising the national building stocks by 2050. The strategies should contribute to achieving the national energy and climate plans (NECPs) energy efficiency targets;
   - EU countries must set cost-optimal minimum energy performance requirements for new buildings, for existing buildings undergoing major renovation, and for the replacement or retrofit of building elements like heating and cooling systems, roofs and walls;
   - All new buildings must be nearly zero-energy buildings (NZEB) from 31 December 2020. Since 31 December 2018, all new public buildings already need to be NZEB;

- Energy performance certificates must be issued when a building is sold or rented, and inspection schemes for heating and air conditioning systems must be established;
- Smart technologies are promoted, including through requirements on the installation of building automation and control systems, and on devices that regulate temperature at room level;
- EU countries must draw up lists of national financial measures to improve the energy efficiency of buildings (European Commission, 2021).

3. The **Revised Energy Efficiency Directive ((EU) 2018/2002)** updates the 2030's policy framework and sets the key element of the amended directive. The directive prescribes:
    - Stronger rules on metering and billing of thermal energy by giving consumers clearer rights to receive more frequent and more useful information on their energy consumption, also enabling them to better understand and control their heating bills;
    - A requirement for Member States to have in place transparent, publicly available national rules on the allocation of the cost of heating, cooling and hot water consumption in multi-apartment and multi-purpose buildings with collective systems for such services (European Commission, 2020).

4. The **Regulation on the governance of the Energy Union and climate action ((EU)2018/1999)**.
   The goals of the regulation are:
    - To implement strategies and measures which ensure that the objectives of the Energy Union, in particular the EU's 2030 energy and climate targets, and the long-term EU greenhouse gas emissions commitments are consistent with the Paris Agreement.
    - To promote long-term certainty and predictability for investors across the EU and foster jobs, growth and social cohesion.
    - To reduce administrative burdens, in line with the principle of better regulation. This was done by integrating and streamlining most of the current energy and climate planning and reporting requirements of EU countries, as well as the Commission's monitoring obligations (European Commission, 2020a).

EU Strategy heating and cooling 2016

The Heating and Cooling strategy provides a framework for integrating efficient heating and cooling into EU energy policies. The strategy focuses its action on stopping the energy leakage from buildings, maximising the efficiency and sustainability of heating and cooling systems, supporting efficiency in industry and reaping the benefits of integrating heating and cooling into the electricity system.
Regarding energy efficiency in general, the strategy announces that the following issues are priorities to be addressed: (i) energy efficiency in buildings sector should be improved with special tools and mechanisms to support sustainable and efficient heating and cooling; (ii) supporting energy efficiency in industry, (iii) taking advantage of integrating heating and cooling in the electricity system (European Parliament, 2019).
The strategy aims to increase the use of renewable energy sources as a source for heating and cooling and to support local authorities in this shift to renewables (European Parliament, 2021).

European Green Deal

One of the most important and recent steps the European Union has undertaken is the European Green Deal. It is a set of initiatives the European Commission has developed to cut greenhouse gas emissions, to invest in cutting-edge research and innovation and to preserve Europe's natural environment.
These measures will impact the heating and cooling sector as well. To achieve climate neutrality by 2050 and to cut emission by at least 55% by 2030, the European Union has established a policy framework consisting of a series of policy proposals that will support industries in the innovation path, invest in eco-green technologies, decarbonise the energy sector and enhance the efficiency of the European building stock.

In order to build a sustainable, competitive and inclusive economy, the European Commission has elaborated the Sustainable Europe Investment Plan in order to mobilise public investment and help to unlock private funds through EU financial instruments (European Commission, 2020c).

Action initiatives under the Green Deal
Among the Green Deal initiatives, the most significant for the RHS sector include:

- **European Climate Law** to enshrine the 2050 climate-neutrality objective into EU law. This proposal aims at establishing the framework for achieving climate neutrality and amending Regulation (EU) 2018/1999.
- The adoption of a **European Industrial Strategy** with the aim of guiding and ensuring the transition towards climate neutrality and digital leadership will happened successfully.
- **2030 Climate Target Plan** to further reduce net greenhouse gas emissions by at least 55% by 2030
- **Renewed Sustainable Finance Strategy**. The strategy will contribute to creating an enabling framework for private investors and the public sector to facilitate sustainable investments (European Parliament, 2021c)
- **Strategy for Energy System Integration**
  The strategy aims at creating a climate neutral integrated energy system, improving and developing the current energy production and consumption reality.
  The actions that will guarantee an efficient, resilient and safe energy system are:
    - A more circular energy system, with 'energy-efficiency-first' at its core;
    - Accelerating the electrification of energy demand, building on a largely renewables-based power system;
    - Promoting renewable and low-carbon fuels, including hydrogen, for hard-to-decarbonise sectors;
    - Making energy markets fit for decarbonisation and distributed resources;
    - A more integrated energy infrastructure;
    - Digitalised energy system and a supportive innovation framework (European Parliament, 2021).
- **Renewable energy financing mechanism**
  It is the new mechanism to support renewable energy projects and its main objective is to enable EU countries to work more closely together to achieve their individual and collective renewable energy targets, covering gaps that may have been identified. As a result, it will facilitate a more cost-effective deployment of renewables across the EU, in areas that are better suited for it in terms of geography and natural resources (European Commission, 2020b).
- **Renovation Wave Strategy** has been launched by the European Commission in October 2020 to improve the rate of building's renovation to reduce the greenhouse gas emissions and to increase energy efficiency. This strategy has been designed since buildings are responsible for 40 % of the EU's energy consumption and 36% of its greenhouse gas emissions. One of the objectives of this strategy is to renovate 35 million inefficient buildings by 2030 (European Commission, 2021d).
  The key actions of the strategy are:
  - Stronger regulations, standards and information on the energy performance of buildings to set better incentives for public and private sector renovations, including a phased introduction of mandatory minimum energy performance standards for existing buildings, updated rules for Energy Performance Certificates, and a possible extension of building renovation requirements for the public sector.
  - More accessible and well-targeted funding, including through the 'Renovate' and 'Power Up' Flagships in the Recovery and Resilience Facility (NextGenerationEU), together with simplified rules for combining different funding streams, and multiple incentives for private financing.
  - Increasing capacity to prepare and implement renovation projects, from technical assistance to national and local authorities through to training and skills development for workers in new green jobs.

- Expanding the market for sustainable construction products and services, including the integration of new materials and nature-based solutions, and revised legislation on marketing of construction products and material reuse and recovery targets.
- Creating a New European Bauhaus, an interdisciplinary project co-steered by an advisory board of external experts including scientists, architects, designers, artists, planners and civil society.
- Developing neighbourhood-based approaches for local communities to integrate renewable and digital solutions and create zero-energy districts.
- Promoting the decarbonisation of heating and cooling, which is responsible for 80 % of energy consumed in residential buildings, in particular through revisions of the Renewable Energy and Energy Efficiency Directives and the EU ETS in 2021, as well as making full use of the existing provisions of the Eco-design Framework Directive (European Parliament, 2021d).

Gender equality framework

Equality between women and men is recognised by the EU as a fundamental principle, a core value of the EU and a necessary condition for the achievement of the EU objectives of growth, employment and social cohesion. The European Commission has adopted a 'dual approach' towards realising gender equality: on the one hand it mainstreams a gender perspective in all policies, on the other hand it also implements specific measures to eliminate, prevent or remedy gender inequalities.
The principle of gender equality is enshrined in several EU Treaties and policies:

- Articles 2 and 3(3) of the founding Treaty on European Union (TEU), Articles 21 and 23 of the Charter of Fundamental Rights, and Article 8 of the Treaty on the Functioning of the European Union (TFEU) call for equality between women and men. Article 8 of the TFEU, for example, explicitly requires the Union to 'eliminate inequalities and promote equality between women and men through all its activities'.
- The Treaty of Lisbon includes a commitment to gender equality through Declaration No. 19, annexed to the Final Act of the Intergovernmental Conference that adopted the Treaty.
- The increase of women's participation in the labour market has been indicated as a goal of the EU Economic Growth Policy (Europe 2020 Strategy).
- The Barcelona targets include a specific target on childcare coverage to facilitate the reconciliation of work and private life for both women and men.
- In 2015, all Member States of the United Nations – including all EU Member States – adopted the 2030 Agenda for Sustainable Development and its sustainable development goals (SDGs). Gender equality is a cross-cutting element of all 17 global goals, as well as a standalone goal (SDG 5. Paragraph 20 of the 2030 Agenda explicitly highlights the importance of closing gender gaps and supporting gender equality by systematically mainstreaming the gender perspective, while the SDG framework also includes a specific indicator on gender budgeting (indicator 5.C.1.) (Eige, 2020).

The **framework for Strategic Engagement for Gender Equality 2016-2019** promotes gender equality through:

- Continued monitoring and support for Member States in attaining the Barcelona targets on childcare;
- Taking into account the results of a public consultation on work-life balance;
- Supporting companies' efforts to increase women's labour-market participation by facilitating Diversity Charter platforms;
- Integrating a gender perspective into the implementation of the European Agenda on Migration, addressing barriers to migrant women's employment and helping Member States to make full use of the possibilities offered by the European Social Fund (ESF) in this regard;
- Awareness-raising to promote women's entrepreneurship, including by launching an e-platform for women entrepreneurs (2016), creating a European Network of Women Business Angels (2016) and establishing the Network of Women's Web Entrepreneurs Hubs.

The strategic engagement focuses on the following 5 priority areas:

- Increasing female labour market participation and economic independence of women and men;
- Reducing the gender pay, earnings and pension gaps and thus fighting poverty among women;
- Promoting equality between women and men in decision-making;
- Combating gender-based violence and protecting and supporting victims;
- Promoting gender equality and women's rights across the world (Eige, 2020).

The **European Pillar of Social Rights**, introduced by EU institutions at the Social Summit for Fair Jobs and Growth in November 2017, lays down 20 key principles as a framework for convergence towards better living and working conditions across the EU. It is structured around three categories: equal opportunities and access to the labour market (including 'key principle 2: gender equality'), fair working conditions, social protection and inclusion. Linking these elements to future EU Funds implementation, especially the new European Social Fund Plus (ESF+), is meant to support the pillar's implementation.

The **Work-life Balance Directive** (Directive (EU) 2019/1158) introduces a set of legislative actions designed to modernise the existing EU legal and policy frameworks, with the aims of better supporting a work-life balance for parents and carers, encouraging a more equal sharing of parental leave between men and women, and addressing women's underrepresentation in the labour market.
In particular, the directive includes measures like:

- The introduction of paternity leave.
- Ensuring that two out of the four months of parental leave are non-transferable between parents and compensated at a level that is determined by the Member State.

Additionally, a set of policy measures has been created to provide support to Member States aiming to improve the work-life balance. These include:

- Making better use of EU Funds to improve long-term care and childcare services.
- Removing economic disincentives for second earners that prevent women from accessing the labour market or working full-time.
- Ensuring protection for parents and carers against discrimination or dismissal.

As a result of these measures, the directive aims to improve not only work-life balance but also contribute to an increase in women's employment and families' economic stability (European Commission, 2019).

Gender Equality Strategy 2020-25

The Strategy presents policy objectives and actions to make significant progress towards a gender-equal Europe by 2025. In addition, a gender equality perspective will be included in all EU policy areas. The key objectives are:

- Tackling gender-based violence and gender stereotypes;
- Closing gender gaps in the labour market;
- Achieving equal participation across different sectors of the economy; addressing the gender pay and pension gaps;
- Closing the gender care gap;
- Achieving gender balance in decision-making and in politics (European Commission, 2019a).

In addition, the Commission has set up a Task Force for Equality composed of representatives of all Commission services and of the European External Action Service to ensure concrete implementation of gender mainstreaming at operational and technical level.

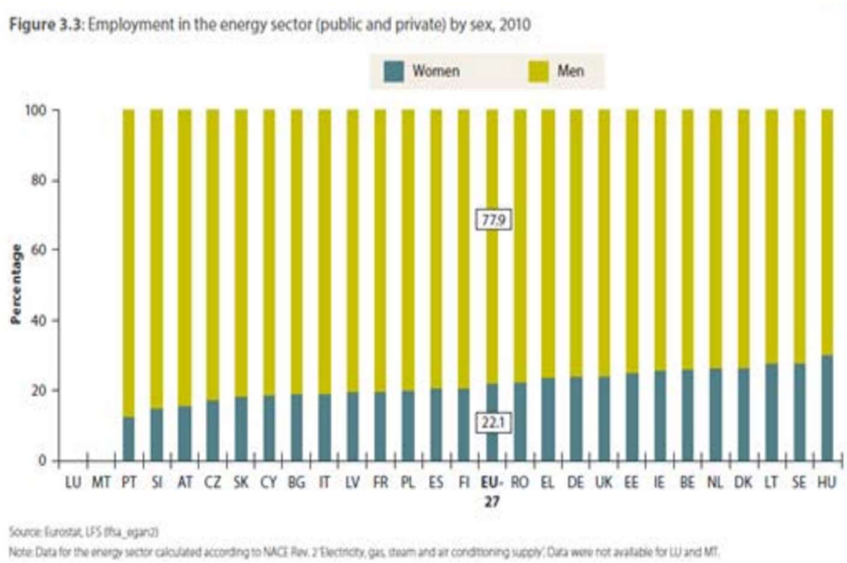
Gender inequalities in the energy sector workforce in Europe

The data disaggregated by gender on employment in the renewable energy sector in the European Union are incomplete. However, a significant gender gap persists in the number of women employed in the energy sector which is largely dominated by male professionals.

In fact, women represent 22.1% of the workforce, usually in administrative positions with limited decision-making power. Even in the renewable energy sector, the traditional distribution of technical jobs carried out by male and female engineers in administrative and communication positions continues to exist.
Some possible reasons for this gender gap have been identified which include:

- Lack of adequate skills in energy-related education; energy-related education
- The difficulty of achieving a balance between family life and work;
- The perception of the energy sector as a male domain and persistent gender stereotypes;
- Insufficient career promotion opportunities and mentoring programs for women (European Parliament, 2019a).

Employment in the energy sector by sex



Source: European Parliament, 2019. Data originally from Eurostat 2015

Gender equality index in the European Union

The Gender Equality Index has been developed by the European Institute for Gender Equality (Eige). It is a composite indicator measuring the concept of gender equality and aims at monitoring progress of gender equality across the EU over time.
In addition, by utilising an intersectional approach, it defines the areas that need improvement and measures the progress of gender equality in the EU.
The index uses a scale of 1 (total inequality) to 100 (total equality) and the scores are based on the gap between women and men and the performance levels in six main domains and their subdomains. The domain of intersecting inequalities highlights how gender inequalities manifest themselves in combination with age, disability, country of birth, education and type of family.
The index is made up of 6 domains and 31 indicators. The core domains and subdomains are divided as follows:

- Work (participation and segregation and quality of work);
- Money (financial resources and economic situation);
- Knowledge (attainment and participation, and segregation);
- Time (care and social activities);
- Power (political, economic and social);
- Health (status, behaviour and access to medical care).

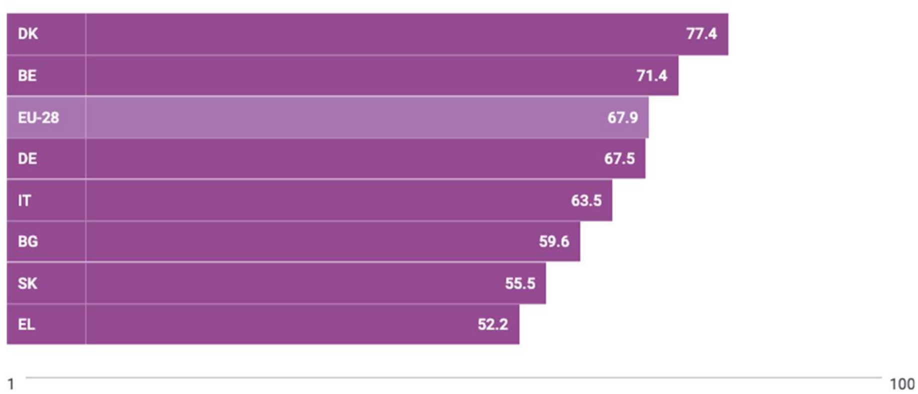
Gender equality index by domain in the European Union in 2019

Source: European Institute for Gender Equality, 2020a

The European Union has an overall score of 69.9 out of 100 points. It is closest to gender equality in the domains of health (88.0 points) and money (80.6 points). At the same time, the weakest areas, where gender inequality is most pronounced, are respectively the domain of power (53.5 points) and knowledge (63.6 points).

According to the European Institute for Gender Equality, there has been an improvement in the Gender Equality Index of 4.1 points since 2010 and in particular, the domain of power has improved by 11.6 points since 2010.

Gender Equality Index in 2019



Source: European Institute for Gender Equality, 2020a

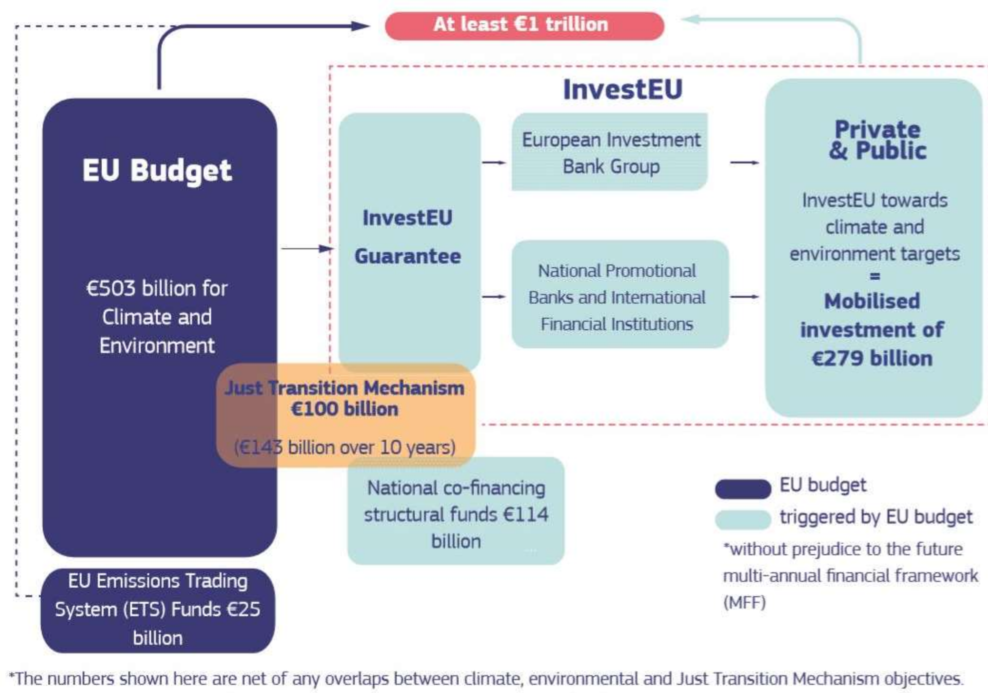
Financial framework

Several funding instruments have been considered in this report. These include:

- Grants from public and private organisation, including the EU, national and regional authorities, foundations and NGOs;
- Equity funds from public authorities (both at EU and national level) and major financial institutions Financial schemes supported by public organisation and major financial institutions, including loans ang guarantees;
- Subsidies and support schemes to privates or companies (e.g. tax detraction, fiscal incentives, etc.).

The European Green Deal Investment Plan has three main objectives:

- To increase funding for the transition, and mobilise at least EUR 1 trillion to support sustainable investments over the next decade through the European Union budget and associated instruments, in particular InvestEU Programme;
- To create an enabling framework for private investors and the public sector to facilitate sustainable investments;
- To provide support to public administrations and project promoters in identifying, structuring and executing sustainable projects (Mondaq, 2020).



Source: European Commission, 2020e

According to the Commission, a combination of funds provided by the European Union budget and public and private investments, will achieve to mobilize at least EUR 1 trillion over the next decade, as follows:

- Climate and environmental spending under European Union budget will provide EUR 502 billion from 2021 to 2030, this will trigger additional national co – financing of EUR 114 billion for climate and environment. This budget will be distributed across multiple programs such as the European Agricultural Fund for Rural Development, the European Agricultural Guarantee Fund, the European Regional Development Fund, the Cohesion Fund, Horizon Europe and the LIFE program[1];
- The **InvestEU Fund** will leverage around EUR 279 billion of private and public climate and environmentally – related investments over the period 2021 – 2030 by providing a European Union budget guarantee to reduce the risk of financing and investment operations;
- The **Just Transition Mechanism** includes financing from the European Union budget, co-financing from the Member State as well as contributions from InvestEU and the European Investment Bank to reach EUR 150 billion of investments to be mobilized over 2021 – 2027;
- The **Innovation and Modernisation funds**, which are not part of the European Union budget, are partially financed through revenues from auctioning of carbon allowances under the Emissions Trading Scheme and they will provide at least EUR 25 billion for European Union transition to climate neutrality.

[1] For the next long-term EU budget 2021 - 2027

InvestEU Fund

InvestEU dedicates at least 30% of mobilised investments to climate- and environment-related projects. It also contributes to the Just Transition Mechanism with a new dedicated InvestEU scheme to mobilise €45 billion of sustainable investments in the regions most affected by the transition challenges.

The fund also promotes sustainability practices among public and private financiers and project promoters, by setting standards for tracking climate-related investments and assessing the environmental and social impact of projects.

Finally, the InvestEU programme will provide technical assistance and advisory support through the InvestEU Advisory Hub. It will help public and private project promoters identify, develop and implement green investment projects (European Parliament, 2021a).

Just Transition Mechanism

While all Member States, regions and sectors needs to contribute to the transition, the scale of the challenge is not the same. Some regions will be particularly affected and will undergo a profound economic and social transformation. This is reason behind the Just Transition Mechanism, a financial tool to ensure an equal transition towards a climate-neutral economy. The Just Transition consists of three main sources of pillars:

- **Pillar 1 or the Just Transition Fund**. The fund is equipped with 17.5 billion. This amount corresponds to fresh money made available to support EU countries in their transition, out of which €7.5 billion coming from the new Multiannual Financial Framework and €10 billion from the Next Generation EU. The fund also supports research and innovation, environmental rehabilitation, clean energy, as well as the transformation of existing carbon-intensive installations when these investments lead to substantial emission cuts and job protection (European Commission, 2021b; European Parliament, 2021b).
- **Pillar 2 or Just Transition scheme under InvestEU**, is focused on just transition objectives. InvestEU not only supports investment in projects in just transition territories (regions having an approved transition plan under the Just Transition Fund rules), but also in other regions, provided that they benefit the just transition territories.

  Similarly, InvestEU supports investments in a wider range of projects compared to the Just Transition Fund, such as projects for energy and transport infrastructure, including gas infrastructure and district heating, but also decarbonisation projects, economic diversification and social infrastructure.
- **Pillar 3 or public sector loan facility under European Investment Bank backed by the European budget**. The EIB loan facility is the third pillar of the Just Transition Mechanism.

  With a contribution from the EU budget of €1.5 billion, the public sector loan facility enables the EIB to lend €10 billion, which is in turn expected to mobilise between €25 and €30 billion of public investments supporting just transition objectives over the period 2021-2027.

  These loans would provide public sector entities with resources to implement measures to facilitate the transition to climate neutrality. Supported investments ranges from energy and transport infrastructure, district heating networks, energy efficiency measures including renovation of buildings, as well as social infrastructure (European Commission, 2021f).

Horizon Europe

Horizon Europe is EU's next funding programme for research and innovation for the next seven years (2021-2027) with a proposed budget of €100 billion. Committing at least 35% of its budget for climate priorities, Horizon Europe is the main financing instrument for research and innovation at EU level. Projects focused on renewable H&C will also benefit from Horizon Europe financing.

The new Horizon Europe programme has a new feature: Research and innovation mission-oriented areas. Mission on climate-neutral and smart cities will be the most relevant for the H&C sector.

Moreover, European Partnerships are listed as new features of the Horizon Europe programme.

The Horizon Europe proposal lays down the conditions and principles for establishing European Partnerships. Currently, from the full list of partnerships the following can be considered as of relevance to the RHC sector:

- **Clean Energy Transition Partnership:** It aims to foster joint actions between Horizon Europe and national funding programmes on common R&I priorities, building on – and bringing forward – the work carried out in the SET-Plan.
- **Build4People:** This partnership provides a cross-cluster structure, bringing together public and private sectors to create research pathways based on a holistic view of the built environment for sustainability and better living.

Clean energy technologies are considered in both partnerships (RHC Platform, 2020a).

Cohesion Policy 2021 – 2027

For the next long-term EU budget 2021-2027, the Commission proposes to modernise Cohesion Policy. Thematic Objectives (TOs) of the new Cohesion Policy are reduced from 11 to 5 (Paragraph 5, Title II proposed CPR):

- Smart Europe (innovation, digitalisation, support for SMEs);
- Green Europe (carbon free economy, implementation of the Paris Agreement, promotion of renewable energy sources);
- Connected Europe (strategic transports and digital networks);
- Social Europe (social rights, quality employment, education, social inclusion etc);
- Citizens' Europe (supporting locally-led development strategies, urban development, etc) (RHC Platform, 2020a).

Life Programme

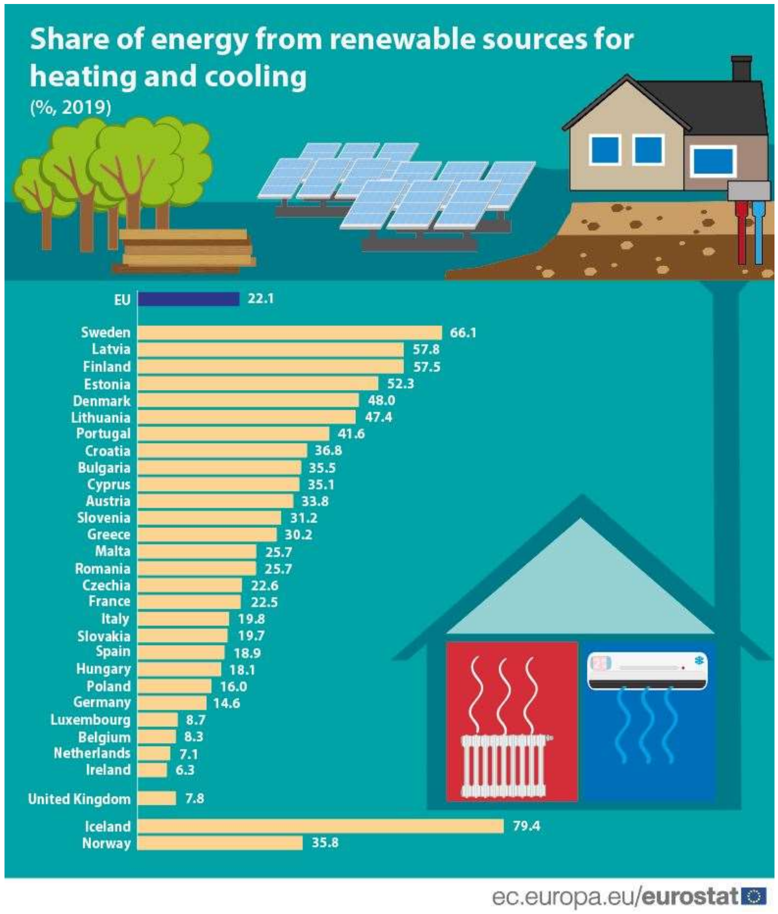
LIFE is the only EU funding programme dedicated to environmental and climate objectives. The Clean Energy Transition sub-programme is a new feature of LIFE 2021-2027. It is the first time that the clean energy transition is specifically covered within LIFE programme.

It is a continuation of the market uptake activities that are currently funded under Horizon 2020. The aim is to support the shift towards a clean energy, especially in regions that lag behind and have difficulty to absorb funding from the European structural and investment funds. It encourages investments in projects focusing in particular on energy efficiency and small-scale renewables (RHC Platform, 2020a).

Market framework

In 2018, the EU reached a share of 18.0% (18.9% EU 27) of renewable energy in gross final energy consumption, against a target of at least 20% (20.615 % for EU 27) for 2020, and above the indicative trajectory of 16% for 2017/2018. In addition, the EU as a whole is also above the slightly more ambitious trajectory defined by Member States themselves in their National Renewable Energy Action Plans (NREAPs). Recent years have seen a steady growth in the overall share of renewable energy sources (RES) at EU level and in the sectoral shares of renewable energy in electricity (RES-E), heating and cooling (RES-H&C), and to a lesser extent, transport (RES-T).

With regard to individual sectors, at EU level the renewable energy share in electricity and heating and cooling has been systematically above the levels defined by Member States in their NREAPs (European Commission, 2020d).



Source: Eurostat, 2020

Heating and cooling in the EU is still heavily dependent on fossil fuels (75 %), with a more modest but growing share of renewable energy (18 %).
Concerning the current RHC landscape in the EU, their penetration compared to other sectors (e.g. RES for electricity) is significantly lacking.
Biomass is the most prominent in all Member States. In the current landscape around 20% of RES are used for heating and cooling and out of this 20% around 8% is being represented by biomass. Most of biomass energy is used in residential applications, but an increasing portion is allocated for district heating applications. Interestingly, industrial applications show a significant growth within the last years in most EU countries. Industries that use biomass in their processes prefer biomass solutions since they can re-utilise biomass for other needs (for example food industry and paper).

At the moment, bioenergy is the most competitive solution in terms of cost and prices, which is attributed to its dominance in RHC. Industries with a circular economy approach also find biomass solutions appealing and can also bring a competitive edge to their competition. Carbon pricing is also influencing the adoption of biomass, which makes energy intensive industries to look for RE solutions in general.
According to the respondent, there is certainly space for growing for RHC deployment considering that we are starting from a rather low point. Projections for the next 5 years show a growth of RHC in EU of around 25% which represents a moderate progress compared to the situation 10 years before, but it is not high enough if we consider the amount of efforts put into that direction.
There are several projects in Europe that involve a mix of RE technologies which also show a trend for the development of solutions that are inclusive to differentiated technologies. For example, some applications in district heating are using solar/thermal energy during summer and biomass during winter. From a technical point of view, there are still possible areas of improvement. Bioenergy, for example, can address

specific technical needs that cannot be met by other technologies (such as certain demands in energy intensive industries for certain levels of temperature or steam pressure).

Overall, there are many opportunities for the RHC sector through support measures but still an increased deployment is required. The majority of RES measures are focused on electricity production and hence support measures have to be increased for RHC as well. In some Member States there are well designed support measures that take under consideration possible negative externalities, while in other Member States this is not the case. This results in a low RHC penetration. The cost of the technologies has to be taken under consideration as well as the low cost of fossil fuels.
There are some barriers to the RHC sector that mainly concerns the costs of these solutions. For the residential sector, it is often observed that installers often advise to homeowners to change their appliances with heating and cooling solutions, when the existing appliance is no longer performing. This makes homeowners to take rushed decisions, since they need to change their appliance immediately and usually, they trust their installers. Usually, installers are advising their customers to install a product that they are already familiar with (usually gas-based or oil-based appliances). At most times there is a lack of knowledge among installers on RHC and often installers are not trained to set up RCH solutions. For district heating and industrial applications, the most important challenge is related to cost. Fossil-based boilers for example are often more cost-efficient than RHC. If the carbon prices are high enough like in Sweden, RHC solutions can be cost competitive. In cases that carbon prices are at a low level, in parallel with the low cost of fossil fuels, then RHC are not appealing for industrial or district heating applications. In certain countries in order to tackle this challenge, there thoughts of banning the installation of new fossil fuel appliances at a residential level. Such discussions have been held in Austria or France where they are even considering banning gas-based appliances. Such approaches together with carbon pricing can help into tacking those barriers.
In addition, a further barrier is represented by the lack of awareness on the part of consumers regarding the specificity of the heating system they have in the house and the maintenance intervals.

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Belgium

Legislative and policy framework

Renewable heating and cooling

Since Belgium is a federal State, competences have been distributed among the Federal State and the 3 Regions (Flanders, Wallonia and Brussels-Capital). The Special Institutional Reform Act of 8th August 1980 defines the breakdown of powers between the various institutions. The regional aspects of energy include:

- The distribution and local transmission of electricity over networks whose nominal voltage is equal to or less than 70,000 volts;
- The public distribution of gas;
- The use of firedamp and blast furnace gases;
- The distribution networks of remote heat supplies;
- The reuse of slagheaps;
- New sources of energy, with the exception of sources linked to nuclear energy;
- The recovery of energy by industries and other users;
- The rational use of energy.

However, the Federal Authorities have the power in matters where the issues of technical and economic indivisibility require homogeneous implementation on a national level, i.e.:

- The national industrial development programme for the electricity sector;
- The cycle of nuclear fuels;
- The major infrastructures for the storage, distribution and production of energy;
- Pricing.

The policy for the rational use of energy, including its application in the construction sector, therefore comes under regional powers.
In addition, each Region has the autonomy in determining renewable support policies. Yet the federal government is mandated to arrange support to offshore wind and hydro power as well as renewable heating (partly) and renewable fuels.

National Energy and Climate Plan 2021-2030

The plan aims to define measures adapted to different dimensions:

- Decarbonisation dimension: reduction of GHG emissions by 35% in 2030 compared to 2005 for non-ET sectors, a Belgian contribution of 17.4% of renewable energies compared to gross final energy consumption;
- Energy efficiency dimension: Belgium has set a contribution to the European target of 32.5% by 2030 (15% in primary energy and 12% in final energy);
- Energy security dimension: one of the most important challenges for Belgium, in the short and medium term. A radical shift in the electricity mix due to the planned gradual phase-out of nuclear power by 2025 is planned;
- The internal energy market dimension: regarding energy transport infrastructure, efforts will be made in the coming years to strengthen the existing interconnections with France and the Netherlands;
- Research, Innovation and Competitiveness dimension : Belgium is committed to devoting at least 3% of its gross domestic product overall to R&D (Climate Laws, 2020).

As for the national targets, Belgium now aims at a gross final energy consumption level of 35,4 Mtoe, 6,2 Mtoe i.e. 17.5% of which to be contributed by Belgium renewable energy sources. For now, the Belgium government sees little scope to raise its ambitions regarding reducing the level of gross final energy consumption and increasing the share of renewable energy sources (EurObserv'ER, 2020).

National Renewable Energy Action Plan

Under the EU Directive 2009/28/EC Member States are obliged to submit to the European Commission National Renewable Action Plans (NREAPs) outlining pathways which will allow them to meet their 2020 renewable energy, energy efficiency and GHG cuts targets.

The 2020 targets for Belgium were the following:

- Overall target: 13% of share of energy generated from renewable sources in gross final energy consumption;
- Heating and cooling: 12% of heat consumption met by renewable sources;
- Electricity: 21% of electricity demand met by electricity generated from renewable energy sources;
- Transport: 10% of energy demand met by renewable energy sources.

The support for renewables offered in Belgium (federal level only) was established in order to successfully develop RE sector and reach above enlisted targets:

- Green Certificates schemes;
- Contribution to the fixing of connection costs for offshore wind parks;
- Tax reduction on energy-saving investment for individuals;
- Tax deductions for investments for the benefit of companies (IEA, 2017).

At the federal level, the main objectives of the Belgian policies related to the heating and cooling sector are to promote the development, installation and usage of RES-installations. In this sense, it is possible to find:

- Training programmes for RES-installers and a single certification body (called RESCert) was created for the three regions. The association RESCert provides certification for six technologies in the biomass, solar, geothermal and heat pump sectors. Installers who successfully participated in a training programme in one of the acknowledged training centres can apply for a certificate of competence from RESCert. (Res Legal, 2019).
- A certification scheme for heat pumps installation;
- An indirect fiscal mechanism for research, development and demonstration (RD&D) programmes has been created in the form of a partial exemption of 80% of the business tax for organisation active in the field of research and development;
- Indirect fiscal subsidies exist for the research and development sector in the form of a partial exemption of 80% of the business tax for organisations active in the field of research and development;
- The creation of a Fedesco, a public energy service company in charge of achieving and financing projects of energy saving in public federal buildings as third-party investors (Res Legal, 2019).

Region-specific complementary measures regarding the renewable heating and cooling sector include:

- Flanders: a renewable heating quota scheme; obligation to conduct energy auditing and use renewable heat in schools and public office buildings; R&D by the Environment and Energy Innovation Platform MIP), Energy Regulation transposing the buildings obligations for heat from renewable energy into Flemish law, Strategy on Heating and Cooling introducing area-based RESH policies, training programmes for installers of heat pumps and PV installations
- Wallonia: RD&D investment support, building renovations to comply with energy performance of buildings (PEB) regulation including RES-H requirements, a zero-percent interest loans programme for RES-H implementation, investment subsidies biogas and biomass CHP installations, biomass heating plants, aerothermal, geothermal as well as solar thermal installations, training programmes for RES-E and RES-H installers
- Brussels: support measures specified in the Air and Climate Energy Plan (PACE) including energy efficiency subsidies for all buildings partly based on calls for projects and for renovation of public buildings, with the Walloon and Flemish training programmes for installers of solar water heaters, heat pumps and PV installations covering Brussels as well. The National Renewable Energy Action Plan foresees a share of 30% of renewable energy for new public buildings in the Brussels-Capital region by 2025.

According to one of the respondents, it would be necessary to make policies and RHC solutions more accessible to the public also thanks to the use of subsidies and incentives. In addition, looking at Belgium as a whole, there are areas much less densely populated than Brussels so there is a need for targeted solutions depending on the demographic of the areas.

Gender equality

In 2002, the Belgian Constitution explicitly affirmed the principle of equality between women and men by including a specific provision in an amendment to Article 10.

However, Belgium has long had experience of gender mainstreaming, having implemented legal measures to promote gender equality and equal opportunities at federal and regional level, in both the private and public sectors, since the 1980s (Eige, 2020). The overall legal framework for gender mainstreaming at federal level was established in 2007 through a Gender Mainstreaming Law. This law was designed to structurally integrate a gender dimension into all federal policy. Manuals, guidelines and tools for the implementation of the Gender Mainstreaming Law are issued by the Institute for the Equality of Women and Men (IEWM). This Institute is the permanent government body responsible for gender equality. The Deputy Prime Minister and Minister of Employment, Economy and Consumers represent the highest level of government dealing with gender equality.

At the federal level, Belgium adopted three anti-discrimination acts in 2007: the General Anti-Discrimination Federal Act, the Racial Equality Federal Act, and the Gender Act.

In addition to these laws, a Gender Mainstreaming Law was adopted in 2007, transposing the resolutions of the BPfA, with the aim of integrating gender in all federal policy fields. Article 3 of the Gender Mainstreaming Law calls for the implementation of a ‘gender test’ for all laws and regulations, which would require the minister responsible to conduct an ex ante gender impact assessment.

Finally, the first Federal Plan on gender mainstreaming contained 75 federal policies, committing different members of government to gender mainstreaming. It was followed by a plan for the 2015-2019 period. This plan consists of two parts:

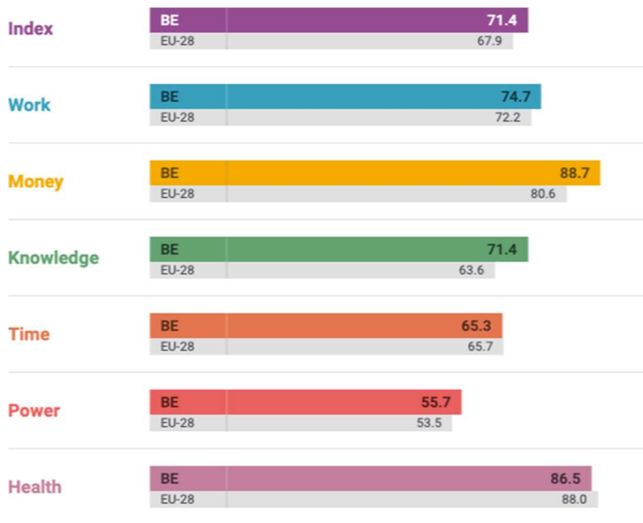
- Collective commitment of government members to the implementation of gender mainstreaming and its main instruments;
- Commitment by government members to prioritise gender mainstreaming in one or more policies within their jurisdiction (Eige, 2020).

Gender equality index in Belgium

Belgium ranks 9th in the European Union on the Gender Equality Index with 71.4 out of 100 points. The highest scores are in the domain of money (88.7 points) and health (86.5 points). Gender inequalities are most pronounced in the domains of time (65.3 points) and power (55.7 points).

In addition, the European Institute for Gender Equality points out that Belgium ranks second in the EU for domains related to money and knowledge (Eige, 2020a).

Gender equality index by domain in Belgium in 2019



Source: European Institute for Gender Equality, 2020a

Results of the interviews

Despite the commitments, according to an interviewee, in Belgium there are still problems of discrimination and stereotypes. First of all, during the education path where there is the stereotype according to which science is not for women, turning into what is defined as a vicious circle of discrimination. Women decide not to even apply for a job even if they are the most qualified for the position.

Another interviewee also pointed out that if we refer to technical education, there is a lack of female involvement which results in a low participation of women in technical jobs in general. However, she sees a largest gap in technical positions than in administrative or policy positions. According to her view, the barriers that women are facing withing the RHC sector are the same that they experience for other technical sectors, for this reason she thinks the main issue is the large gender gap in technical education.

Finally, she does not believe in a specific gender-led contribution but she pointed out that society should be more inclusive and open to the contribution of women in terms of fairness, equal salary and opportunities etc.

At the same time, she does not foresee a specific development of the RHC sector by the involvement of more women. The interviewee would work on social equity and similar policies in order to achieve an indirect impact on energy poverty and possibly achieve a more serious reduction in the risk of energy poverty for women.

She also thinks that supporting women in choosing some sort of technical career and technical / scientific education would certainly reduce the gap. This may also apply to other sectors. There are many initiatives and measures to reduce this gap. Finally, she does not believe that if decision makers took gender differences into account, this would have a significant impact for the RHC industry.

Financial framework

Concerning the renewable heating and cooling sector, the federal government provides support to companies that invest in renewable heat and cooling technologies by offering a tax deduction measure and indirect measures such as applicable RD&D programs.

In the following tables, the financial instruments provided by the state of the regions are summarised:

PROGRAMME	Fonds de transition énergétique (Energy Transition Fund)
TARGET AREA	Belgium
TYPE OF INSTRUMENT	Subsidy
OBJECTIVE AND SUPPORTED ACTIONS	The aim of the Energy Transition Fund is to encourage and support research, development and innovation in the field of energy The Fund supports innovative projects within the framework of federal energy competences.

	Projects that meet all relevant criteria and relate to research and development, investment in research infrastructure or innovation by SMEs.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration and integrated actions
BENEFICIARIES	Start-up, SME,
TOTAL AMOUNT	25 million euros
TIMEFRAME	One year 2021
WEBSITE	https://economie.fgov.be/fr/themes/energie/transition-energetique/fonds-de-transition

PROGRAMME	Aide à l'investissement en matière d'énergies renouvelables (cogénération ou process)
TARGET AREA	Wallon Region
TYPE OF INSTRUMENT	Guarantee and subsidy
OBJECTIVE AND SUPPORTED ACTIONS	Promoting environment protection and renewable and sustainable energy. Any company with a head office located in the Walloon Region and who carries out a program investment to promote environmental protection or the sustainable use of energy.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, thermal energy storage and cogeneration
BENEFICIARIES	SME, mid-cap and large company
TOTAL AMOUNT	N/A
TIMEFRAME	N/A
WEBSITE	https://recherche-technologie.wallonie.be/fr/menu/acteurs-institutionnels/service-public-de-wallonie-services-en-charge-de-la-recherche-et-des-technologies/departement-de-la-recherche-et-du-developpement-technologique/direction-des-projets-de-recherche/projet-de-recherche-industrielle/projet-de-r-d-en-recherche-industrielle.html

PROGRAMME	Aid for research and technology innovation
TARGET AREA	Wallon Region
TYPE OF INSTRUMENT	Grant and subsidy , which can cover 40 to 70% of the eligible expenditure within the framework of an R&D project.
OBJECTIVE AND SUPPORTED ACTIONS	The objective is to encourage companies that carry out an investment program aimed at protecting the environment or the sustainable use of energy in the Walloon Region.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage and cogeneration
BENEFICIARIES	SME, mid-cap and large company
TOTAL AMOUNT	N/A
TIMEFRAME	N/A
WEBSITE	https://www.wallonie.be/fr/demarches/beneficier-daides-la-recherche-et-linnovation-technologique

PROGRAMME	Financial support for the development or implementation of your innovative R & D project
TARGET AREA	Brussel – Capital Region
TYPE OF INSTRUMENT	Guarantee and subsidy (pre-finance 15% to 70% of the cost)
OBJECTIVE AND SUPPORTED ACTIONS	Supporting projects that ultimately aim to develop or implement innovative products, processes or services. This covers industrial research projects, experimental development and process or organizational innovation. Supported actions: • Industrial research • Experimental development • Organisational innovation

TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration and integrated actions
BENEFICIARIES	SME, mid-cap and large companies
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://innoviris.brussels/fr/rd-projects

PROGRAMME	Easy'green
TARGET AREA	Wallon Region
TYPE OF INSTRUMENT	Loan
OBJECTIVE AND SUPPORTED ACTIONS	The objective is to promote SME and start-up to participate, through their investments, in the energy transition and the reduction of CO2 emissions. The supported actions are all innovative projects that help reducing the GHG emissions
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration and integrated actions
BENEFICIARIES	SME and start-up
RESOURCES	N/A
TIMEFRAME	Depending on the project
WEBSITE	http://www.novallia.be/reussir-ma-transition-energetique/easygreen-cest-quoi

PROGRAMME	Financiële steun voor het realiseren van een innovatieve vernieuwing (Financial support for the realization of an innovation)
TARGET AREA	Flemish Region
TYPE OF INSTRUMENT	Subsidy 25 to 50% of the project budget with a minimum of € 25,000 and a maximum of 3 million euros
OBJECTIVE AND SUPPORTED ACTIONS	The objective is to promote innovation. Supported actions: enterprises that make certain ecological professional investments in Flanders
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration and integrated actions
BENEFICIARIES	Start-up, SME, mid-cap and large companies, NGOs and public law organizations
RESOURCES	N/A
TIMEFRAME	Max 2 years
WEBSITE	https://www.vlaio.be/nl/subsidies-financiering/ontwikkelingsproject

PROGRAMME	Onderzoeksproject (Research project)
TARGET AREA	Flemish Region
TYPE OF INSTRUMENT	Subsidy 25-60% - min. EUR 100.000
OBJECTIVE AND SUPPORTED ACTIONS	Expansion or strengthening of their research and development activities. The implementation of individual projects by one or more companies. The project is based on an innovative idea that requires new knowledge and that research and possibly development activities must be carried out.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration and integrated actions
BENEFICIARIES	Start-up, SME and mid-cap company
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://www.vlaio.be/nl/subsidies-financiering/onderzoeksproject

PROGRAMME	Belastingkrediet voor onderzoek en ontwikkeling (Tax credit for research and development)
TARGET AREA	Belgium

TYPE OF INSTRUMENT	Tax credit
OBJECTIVE AND SUPPORTED ACTIONS	Investments environmentally friendly or for R&D/patents
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration and integrated actions
BENEFICIARIES	Start-up, SME, mid-cap and large company
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://www.vlaio.be/nl/subsidies-financiering/subsidiedatabank/belastingkrediet-voor-onderzoek-en-ontwikkeling

PROGRAMME	Energy Bonuses 2021 – heating category
TARGET AREA	Brussels-Capital Region
TYPE OF INSTRUMENT	Bonus (work could be reimbursed up to 70% of the amount invoiced)
OBJECTIVE AND SUPPORTED ACTIONS	Applicable in the event that an oil-fired boiler, or an oil or coal-fired stove is replaced during the installation of a boiler (C1), a heat pump (C4 / C5) or a solar water heater (C7)
TECHNOLOGIES COVERED	Efficient boiler, hot air generation or gas air heater, thermal regulation, heat pump, collective chimney casing, solar water heater and EPB period control
BENEFICIARIES	All citizens, companies or communities who are planning work on their building in the Brussels-Capital Region
RESOURCES	N/A
TIMEFRAME	End of 2021
WEBSITE	https://environnement.brussels/thematiques/batiment-et-energie/primes-et-incitants/les-primes-energie-2021

Social and cultural framework

In Belgium, the production of heat from renewable energy has up to now primarily concerned the initiative of individuals.
According to one the respondents, the new RHC technologies are not yet in people's mentality and often people want green energy but do not necessarily want to pay for it. Even if they want to, often they cannot afford doing it. For Instance, in Brussels a lot of people do not own their houses and do not control the energy source. The tenants are not worried about energy waste or energy efficiency because they do not pay its costs directly. Even though we know people have a more ecological mindset in terms of reducing plastic waste etc we are far from being aware of the damage caused by energy waste.

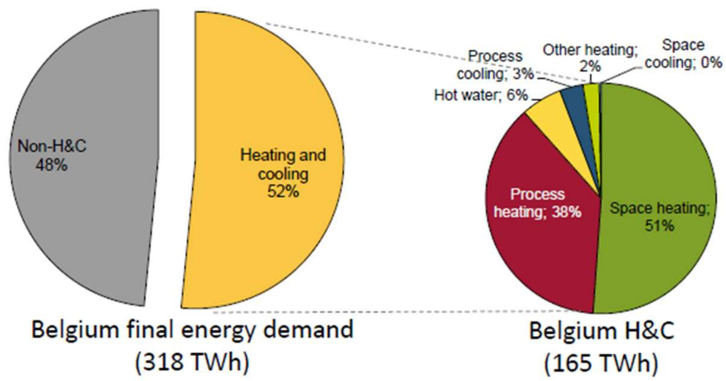
In addition, the few subsidies that are available are for solar and they eventually involve a return after years from the initial investments. This still implies that the household must have the money available right away and not everyone can afford it. Moreover, the reimbursements for house renovations comes after some time and the administrative procedure is not as simple and accessible as it should be. These policies are not enough to push people to use these resources to join the transition.
All in all, the renewable solutions as of right now are not economically sustainable.

Market conditions

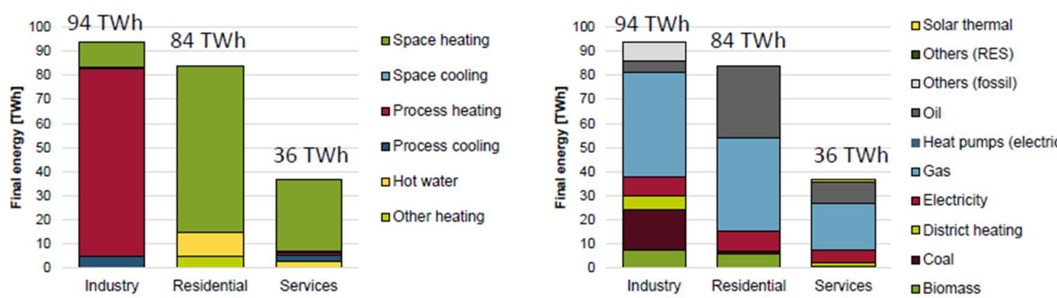
Concerning the current RHC landscape in Belgium, the production levels are relatively low and the potential for renewables in Belgium is deemed relatively low as well. This because the country is rather flat, densely populated, and not very sunny. Large-scale use of hydro power, onshore wind turbines and solar solutions face difficulties regarding the challenges posed by spatial planning and public support. With a population density of 372 persons/km2 (1-1-2017) Belgium is the EU member state with the third highest population density, which tends to affect public acceptance of onshore wind and ground-mounted PV negatively (EurObserv'ER, 2020).

There are some solutions that are starting to pick up in the sector of heating and cooling. The focus is mostly on solar and wind, but hydrogen is complementary to those technologies and there is still a lot to be done. On the topic of hydrogen, the vision in terms of its use for heating and cooling is absent.

Belgian H&C comprises roughly half of its final energy demand. Very little cooling process needs, but very high need for space and process heating. Belgium accounts for only 3% of the EU28's total delivered H&C demand.



Source: Heatroadmap, 2017



Source: Heat RoadMap, 2017

Belgian industries are overwhelmingly dominated by process heating, other sectors by space heating.
Its industry relies much more on fossil fuels, especially coal and gas, while some biomass and district heating are used as well. The industry and residential sector use approximately the same amount of gas.

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Bulgaria

Legislative and policy framework

Renewable heating and cooling

According to the requirements laid down and the provisions of Directives 2012/27/EU on energy efficiency and 2010/31/EU on the energy performance of buildings (Directive 2010/31/EU) the most relevant plan concerning the RHC sector in Bulgaria are:

- National Energy Efficiency Action Plan 2014—2020;
- National Plan for nearly zero-energy buildings 2015—2020;
- National plan for improving the energy performance of heated and/or cooled State-owned buildings occupied by the public administration;
- National long-term programme to promote investments in the implementation of measures improving the energy performance of buildings of the public and private national residential and commercial building stock (European Commission, 2019).

Bulgaria's primary energy efficiency priorities and policy objectives are as follows:

- Achieving energy savings of 8 325 GWh by 2020;
- Achieving annual energy savings of 1.5 % of the volume of energy sales;
- Taking action to improve the energy performance of at least 5 % of the total gross floor area of all heated and/or cooled public buildings used by the civil service;
- Increasing the number of nearly zero-energy buildings;
- Ensuring that secure and affordable energy is available to all consumers;
- Minimising the adverse effects of energy use on human health and the environment;
- Improving living standards in Bulgaria.
- Increasing the competitiveness of the Bulgarian economy.

National Renewable Energy Action Plan (NREAP)

Under the EU Directive 2009/28/EC, Bulgaria has set the National Renewable Action Plans (NREAPs) outlining the pathway to meet its 2020 renewable energy, energy efficiency and GHG cuts targets. Bulgaria 2020 renewable energy targets are:

- Overall target: 16% of share of energy generated from renewable sources in gross final energy consumptions;
- Heating and Cooling: 24% of heat consumption met by renewable energy sources;
- Electricity: 21% of electricity demand met by electricity generated from renewable energy sources;
- Transport: 8% of energy demand met by renewable energy sources;

Measures indicated promoting the use of energy from renewable energy source that facilitate achievement of above enlisted targets:

- Feed-in tariff system;
- Obligatory connection of RES plant to the network;
- Long-term power purchase agreements (25 years for electricity purchased from geothermal and solar plants, 15 years from hydropower plants up to 10MW and from any other type of renewable plant);
- Obligatory purchase of the electricity from renewable energy producers;
- Guarantees of origin;
- Compulsory blending of biofuels;
- Zero rate of excise duty for pure biofuels;
- Short and long-term programmes aiming at development of renewables (IEA, 2018).

It is estimated that Bulgaria will achieve the national target for the share of renewable energy in gross final energy consumption by 2030 (27.09 %) by achieving the following sectoral targets:

- 30.33 % share of energy from renewable sources in electricity;
- 42.60 % share of energy from renewable sources in the sector of energy for heating and cooling;
- 14.2 % share of energy from renewable sources in transport.

In order to comply with the EU Directive 2012/27/EU that aims to establish a common framework to promote energy efficiency within the EU, Bulgaria has developed **National Energy Efficiency Action Plan 2014-2020**. The national 2020 energy savings target at final energy consumption level is 716 ktoe/year. In order to achieve this target Bulgaria has introduced measures such as: energy taxes or carbon dioxide taxes that aim to reduce final energy consumption; financing schemes and instruments or fiscal incentives that lead to the application of energy-efficient technology or techniques and have the effect of reducing end-use energy consumption; and training and education in the field of energy efficiency. The plan also introduces financial mechanisms to promote measures for energy efficiency improvement that include national funds and programmes and operational programmes such as: Energy Efficiency and Renewable Sources Fund; Operational Programme "Innovation and Competitiveness 2014-2020; National programme for energy efficiency of multi-family buildings; National Trust Eco fund – Investment programme for climate and others (Jensen et al., 2018).
Under the EU Directive (2012/27/EU), Bulgaria set a target to increase energy efficiency by 25% until 2020 (5 Mtoe primary energy savings in 2020) and to reduce energy intensity by 50% until 2020 compared to 2005 levels.

Energy from Renewable Sources Act
The Energy from Renewable Sources Act replaces the Renewable and Alternative Energy Sources and Biofuels Act (2008), which was the first national legislation entirely dedicated to the renewable energy sources, mainly introducing the requirements of the related EU directives. The 2008 Act established support mechanisms that provided for 'equal preferential treatment for producers of electricity (green certificates); mandatory inclusion of utilities generating electricity from RES and biofuels into the national grid; establishing preferential prices for purchasing energy generated from RES (feed-in tariffs); and reducing the administrative burden on producers. The Act resulted in a rapid development of RES (wind and photovoltaic), which put upward pressure on electricity prices. As a result, in June 2011 the Parliament adopted the Energy from Renewable Sources Act. The new legislation kept RES preferential treatment options but introduced a preference for energy from biomass and shifted the balance of power from RES producers to grid operators and allowed for a substantial reduction of the prices of energy from photovoltaic (Climate Law, 2021).

The **National Plan for Nearly Zero-Energy Buildings 2015-2020** was adopted by the Council of Ministers in December 2015. The plan contains:

- The national definition and the technical parameters of NZEB, reflecting the national conditions;
- The national targets for increasing the number of NZEB depending on the classification of the types of buildings;
- Policies and mechanisms, including those of a financial nature, to stimulate the construction of NZEB.

The definition of NZEB is given in the Energy Efficiency Act of 15 May 2015. A NZEB is a building that simultaneously fulfils the following conditions:

- The energy consumption of the building, defined as primary energy, complies with Class A on the scale of energy consumption classes for buildings of the relevant type; and
- Not less than 55% of the energy consumed (supplied) for heating, cooling, ventilation, domestic hot water and lighting is energy from RES produced on-site or near the building (Energy performance of buildings, 2016).

Summary of policies:

- Installers of renewable energy facilities have to be registered and certified by the State Agency for Metrological and Technical Surveillance.
- Buildings with a useful total built-up area (TBA) over 500 square metres and which are occupied by a public body or frequently visited by citizens are subject to an obligatory energy efficiency audit and have to provide an energy performance certificate.
- Any investment project for a new building with a total floor coverage of over 1000 m² must comply with the possibilities of using decentralised systems for the use of renewable energy. In these buildings, at least 15 percent of the total heating and cooling needed for the building shall have to be produced from renewable sources (Res Legal, 2019).

In addition, a positive factor is that the local authorities, such as municipalities, have structured their initiatives such as campaigns for exchange old heating elements by contemporary ones which uses RHC sources.

Gender equality

Bulgaria has been influenced by the EU and international agreements as regards gender mainstreaming policy and has also resulted from the alignment of Bulgarian legislation with the EU acquis Communautaire. The principle of equality precedes accession to the EU, however, as it was already enshrined in the Constitution of the Republic of Bulgaria in Article 6.
Bulgaria also adopted the law on equality between women and men in 2016 and the national strategy for promoting equality between women and men 2016-2020. Furthermore, gender mainstreaming is included in the 2017 National Action Plan (NAP) for the period 2019-2020.
The Bulgarian Ministry of Labour and Social Policy (MLSP) is the highest responsible body for gender equality.

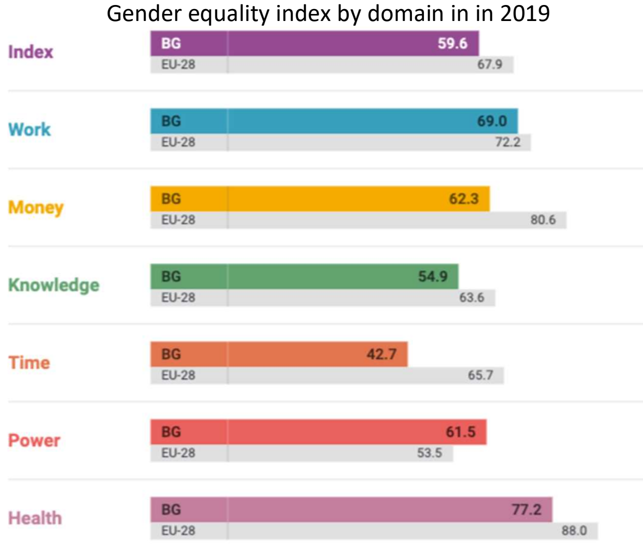
The **Law on Equality between Women and Men** sets out a legal obligation to implement gender mainstreaming. By bringing the national legislation in line with the EU standards, it establishes the foundations for state policy in this field. The concept of gender mainstreaming is included in the Law, with coordination entrusted to the MLSP and the National Council on Equality between Women and Men.
Since 1 January 2004, the **Law on Protection from Discrimination** prohibits discrimination on a broad range of grounds: sex or gender, race, ethnicity, human genome, nationality, citizenship, origin, religion and belief, education, conviction, political affiliation, personal or social status, disability, age, sexual orientation, family status, property status and any other grounds defined by law or an international treaty to which Bulgaria is a party.
The National Strategy for Promoting the Equality of Women and Men 2016–2020 is the key policy document in the field of gender equality and gender mainstreaming. The Strategy promotes a dual approach to gender equality by including a gender perspective in all policies and at all levels, together with specific actions targeting groups of women and men who may find themselves in disadvantaged or vulnerable situations.
The Strategy is implemented through annual national plans for promoting gender equality, which include concrete actions and measures, responsible bodies and performance indicators. The plans cover the measures to be implemented by institutions, social partners and NGOs working on the implementation of state policy on equality between women and men. The national plans cover five priority areas, as per the Strategy:

- Increasing women's participation in the labour market and equality of economic independence;
- Reducing the gender pay gap and income gap;
- Promoting equality between women and men in decision-making processes;
- Combating gender-based violence and protection and support for victims;
- Changing gender stereotypes in society in different spheres of public life.

The activities of the Strategy are primarily funded by the state and municipal budgets, European programmes and other international sources (Eige, 2020).

Gender equality index in Bulgaria
Bulgaria ranks 19th in the Eu on the Gender Equality Index with a total score of 59.6 out of 100 points. Gender inequalities are more pronounced in the domains of time (42.7 points) and knowledge (54.9 points). While the highest scores are in the domains of health (77.2 points) and work (69.0 points).
Overall, Bulgaria is 8.3 points behind the European average.

Gender equality index by domain in in 2019



Source: European Institute for Gender Equality, 2020a

Results of the interviews
Both respondents refer that, according to their perception, inequality between women and men is not a major issue in Bulgaria. Women are perceived as fairly represented in management positions and as possessing equal skills and initiative. Respondents think there is equal and non-gender-specific support for entrepreneurship for both men and women.
The respondents did not identify specific measures that could further support women involvement. Overall, they argue, support for both women and men should focus on market development, programs that stimulate entrepreneurship. Gender aspects alone do not seem to be a priority issue for the respondents.

Financial framework

The use of renewable energy for heating and cooling is promoted through a grant from the Bulgarian Energy Efficiency Fund and through an exemption for building owners from property tax. In general, all heating technologies are eligible for support. Buildings with a useful total built-up area (TBA) over 500 square meters and which are occupied by a public body or frequently visited by citizens are subject to an obligatory energy efficiency audit and must provide an energy performance certificate. Any investment project for a new building with a total floor coverage of over 1000 m² must comply with the possibilities of using decentralised systems for the use of renewable energy. In these buildings, at least 15 percent of the total heating and cooling needed for the building shall have to be produced from renewable sources (EurObserv'ER, 2020).
In the following tables, the financial instruments provided by the state of the regions are summarised:

PROGRAMME	Bulgarian Energy Efficiency and Renewable Sources Fund
TARGET AREA	Bulgaria
TYPE OF INSTRUMENT	Loan or Guarantees
OBJECTIVE AND SUPPORTED ACTIONS	The fund supports projects aiming at improving the energy efficiency and supporting the use of renewable energy in public, industrial and residential buildings.

	Supported actions: • Refurbishment of buildings • Thermal insulation • Reconstruction of heat sources and heat distribution networks • Reconstruction of heating, ventilation, air-conditioning and lighting systems • Small cogeneration plants
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration and integrated actions
BENEFICIARIES	Municipalities, private individuals, SME, companies and universities/hospitals
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	http://www.res-legal.eu/search-by-country/bulgaria/single/s/res-hc/t/promotion/aid/loan-bulgarian-energy-efficiency-fund-bgeef/lastp/111/ https://www.bgeef.com/en/

PROGRAMME	Tax regulation mechanism
TARGET AREA	Bulgaria
TYPE OF INSTRUMENT	Tax incentive
OBJECTIVE AND SUPPORTED ACTIONS	The use of renewable energy technologies in buildings is promoted through a system of tax incentives for building owners. The incentive scheme provides that a building that has been granted a class A or B energy performance certificate can be exempted from property tax for a longer period of time if renewable energy technologies are used in the building.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration and integrated actions
BENEFICIARIES	Building owners
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	

PROGRAMME	Operational programme “Innovations and Competitiveness”
TARGET AREA	Bulgaria
TYPE OF INSTRUMENT	
OBJECTIVE AND SUPPORTED ACTIONS	Aim: addressing the needs, overcoming the challenges, and seizing the opportunities for development of Bulgarian economy. The Programme is focused on five priority axes: 1. Technological development and innovation 2. Entrepreneurship and SME growth capacity 3. Energy and resource efficiency 4. Removing bottlenecks in security of gas supplies 5. Technical Assistance
TECHNOLOGIES COVERED	N/A
BENEFICIARIES	SME
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://ec.europa.eu/regional_policy/en/atlas/programmes/2014-2020/bulgaria/2014bg16rfop002

PROGRAMME	EEA Grants’ Energy programme
TARGET AREA	Bulgaria
TYPE OF INSTRUMENT	Grant
OBJECTIVE AND SUPPORTED ACTIONS	The programme will aim to improve Bulgaria’s energy security by addressing funding gaps in support for renewable energy and energy efficiency measures.

TECHNOLOGIES COVERED	Hydropower, geothermal energy, geothermal energy training, energy efficiency in building and industry, rehabilitation and modernisation of municipal infrastructure
BENEFICIARIES	Municipality, industries,
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://eeagrants.org/news/programme-agreement-signed-energy-programme-bulgaria

Social and cultural framework

There are several socio-economic challenges that exist in Bulgaria:
• Low labour productivity;
• Low quota of high-tech production;
• Demographic crisis - aging of the population.
Furthermore, the main challenges are energy poverty and the lack of an "energy culture" on how to use energy efficiently. In many cases, energy is regarded as a given resource and there does not seem to be much awareness of these issues.
One respondent reported that although technologies are available, there is a substantial lack of communication and information. Then there are the financial aspects, the sector is not inclusive and existing policies do not consider social groups as vulnerable. Furthermore, although the State has made several progresses, there is a weak capacity to control the application of these policies.

Market conditions

According to one of the respondents, the main type of RHC technology that is most widespread in Bulgaria is solar energy, both in terms of number of installations and installed capacity. Water and wind power follow, but their use is more expensive in terms of installations. The same goes for geothermal energy since it is an expensive technology and more difficult in terms of technological use for users.
Obviously, both financially and technically, their application is feasible. There are more than 2500 installations made in 2020.The underused sources are biomass.
In addition, not all sub-regions in Bulgaria are supplied equally with renewable energy resources. It also depends on some particularities of the local mentality of the region.

The main challenges are related to energy poverty in terms of inadequate heating, which is related to some regional characteristics of the population, e.g. an owner and resident of a large family that is only partially heated. Additionally, RHC technologies and RES in general are relatively expensive as an initial investment, and users do not always consider the benefits of this investment over the long term.
According to another respondent, another challenge is the lack of a more flexible state energy policy that provides for an energy balance between renewable and conventional sources. This balance should ensure security of supply by increasing the level of clean air using RHS, gas and nuclear energy.

The challenges facing the industry are the following:

- Bulgarian exports mainly include low-tech products;
- The internationalization of Bulgarian companies is low;
- The contribution of foreign direct investment in technology transfer is limited;
- Industrial production is extremely energy-intensive and inefficient from an energy point of view;
- Labour productivity is low, due to the above factors.

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Denmark

Legislative and policy framework

Renewable heating and cooling

The policies and measures to promote energy efficiency in buildings are a combination of economic incentives (taxes on energy), regulation (primarily the requirements in building codes both for new and existing buildings and energy certification of buildings) and information, training, etc. The energy efficiency obligation was also an important instrument to promote Investment for energy efficiency solutions in existing buildings.

Renewable energy sources for heating purposes are exempt from the tax obligations on the production, supply and use of energy sources. The use of biogas for heating purposes is supported through a direct tariff (Res Legal, 2019).

Denmark's Integrated National Energy and Climate Plan

Denmark's integrated National Energy and Climate Plan (NECP)is based on the National Energy Agreement of 29 June 2018 between all parties in the Parliament, and on the Climate and Air Proposal of the Government from 9 October 2018. The plan exposes the key objectives and its measures :

- Decarbonisation: reduction of GHG emissions, transport green transition with a stop to sales of all new diesel and petrol cars as of 2030, ban on burning of straw residues on fields, public afforestation and a grant scheme for afforestation on private agricultural land and subsidy for conversion of arable land on organic soils to nature;
- Renewable energy: three new offshore wind farms of at least 800 MW each, reduction of the electrical heating tax and of the electricity tax, support of geothermal energy;
- Energy efficiency: to build a competitive subsidy scheme related to private enterprises, efficiency of existing buildings through renovation;
- Energy security: stable energy supply thanks to laws on responsibilities regarding electricity supply, gas supply and emergency plans, prevention of risks in the energy system, increased international cooperation, interconnectivity concerning energy supply (Climate Change Laws of the World, 2021).
- Research**:** Denmark has committed to spend 580 mill. DKK in 2020 and 1 billion DKK in 2024 on research, development and demonstration (R&D) of new technologies related to energy and climate. A large share will go to the EUDP programme, which funds projects in line with SET Plan objectives. Moreover, the new Danish government has proposed to increase spending to green research, development and demonstration by 1 billion DKK in 2020. (Danish Ministry of Climate, Energy and Utilities, 2021)

Energy agreement 2018

In 2018, the Danish government signed an energy agreement with the unanimous support of all parties in the Danish parliament. The parties have allocated funding that sets a course towards a share of renewable energy of approximately 55% by 2030. The agreement will also give Denmark a share of renewable energy in electricity above 100% of consumption, while ensuring that at least 90% of district heating consumption is based on energy sources other than coal, oil or gas by 2030 (Ministry of Foreign Affairs, 2018).

The Government's Energy Proposal:

- Establishes a roadmap for achieving the government's goal of at least 50% renewable energy in 2030.
- Immediately eases taxes on electricity and taxes on electricity for heating purposes for more than DKK 3.5 billion in 2025. An additional annual sum of DKK 500 million was allocated to a renewable energy reserve from 2025.
- Charts a new course towards a market-based energy system, laying the groundwork for a future where sustainable energy can be established without subsidies.

- Accelerates the phase-out of coal through a modernisation of the heating sector.
- Modernise the heating sector. The energy agreement aims at granting greater flexibility and promoting new green solutions and technologies.
- Provides greater freedom for district heating plants by eliminating regulatory constraints on the heat production of district heating plants. This by giving them the freedom to invest in transitions to greener energy, e.g. heat pumps, biomass and geothermal systems, thus enabling the transition towards a renewable energy system. The regulatory relief for individual district heating plants will depend on the size of their district heating areas. The last constraints are expected to be lifted by 2030 at the latest.
- Gives consumers a greater freedom of heating choice. The power to obligate consumers to be connected to the collective heating system will be abolished. This will allow for investment in other individual heating solutions, e.g. heat pumps for single homes.
- Allocates 540m DKK in the period 2018-2023 for targeted efforts to help heating plants and consumers, and to help manage stranded costs.
- Aims at improving the legal and regulatory framework for the heating sector, supporting the increase in voluntary investment in green solutions.
- Reduces the electric heating tax from 30.7 øre / kWh to 15.5 øre kWh from 2021

Law to enhance energy savings in order to implement the EU directive 2012/27/EU into danish legislation.
The Act promotes energy savings and energy efficiency among consumers in accordance with climate and environmental considerations and considerations of security of supply and economy. The Act ensures the prioritization of energy saving activities, promotes cooperation and coordination on the conduct of activities and promotes the efficient use of energy through campaigns, market introduction and information.
The Act applies to streamlining and reduction of energy use in products, plants, processes and buildings, including plants for buildings' own supply of energy, and to information to consumers about energy consumption and energy-conscious behaviour.

Danish Building Regulation
The BR10 is a performance-based code that requires a mandatory energy frame calculation to establish maximum energy demand for residential and non-residential buildings. The code addresses all thermal envelope requirements and energy-using efficiency standards in the calculation, including, heating, cooling, ventilation, hot water, lighting (only non-residential), heat recovery and conversion and distribution losses (IEA, 2019).

Danish Building Regulation 2018
The 2018 version of the Danish building regulations - codes (BR18) update regulations from 2015 (BR15) and specify detailed requirements for building construction under the Building Act. The requirements of the building regulations are primarily designed to ensure building construction achieves minimum standards in fire, safety, and health terms. Energy efficiency requirements are also included. Violation of the building regulations can result in a penalty in the form of a fine (IEA, 2020). The codes set targets for energy consumption in new buildings. For existing buildings, the codes have efficiency requirements which shall be met when a building is renovated.

Energy savings in state owned institutions
In addition to the requirements in EED art. 5 (which is implemented by the alternative approach in Denmark). The circular outlines obligations to undertake energy-saving measures in state owned institutions. The target is to reduce the energy consumption with 14 % in 2020 compared with consumption in 2006. The purpose of the circular is to reduce the state's energy consumption, including by implementing a decision to reduce the state's energy consumption by at least 14 per cent. in 2020 compared to the year 2006. Furthermore, the circular aims to limit the state's water consumption. This must be done by

promoting energy-efficient behaviour in state institutions and by ensuring energy-efficient operation and maintenance of the buildings that the state owns and rents (IEA, 2020(a)).

Regulatory test zones

In a regulatory test zone, selected innovative energy and supply solutions can be granted a temporary exemption from rules that prevent the implementation of projects. A regulatory test zone is an opportunity to test innovative energy and supply solutions under real conditions in the test zones, time-limited dispensations can be granted from specific rules to experiments with new business models, new technology and new solutions. There are some criteria that must be met before a project, upon application, can be considered for a regulatory test zone (Danish Energy Agency, 2021a).

Law on the promotion of savings in energy consumption 2019

The Act promotes energy saving and energy efficiency among consumers in accordance with climatic and environmental considerations and security of supply considerations.
The objectives are:

- Ensure the priority of energy saving activities,
- Promote cooperation and coordination in carrying out activities e
- Promote the efficient use of energy through campaigns, marketing and information.

The law applies to the rationalization and reduction of energy use in products, plants, processes and buildings, including energy supply systems for buildings, and to consumer information on energy consumption and energy-conscious behaviour.

Gender equality

The Danish constitution does not enshrine the principles of gender equality. Gender mainstreaming, derived mainly from the influence of the European Union, was introduced into Danish national legislation through the Gender Equality Law which requires public authorities to seek to promote and incorporate gender equality throughout planning and administration.
From 2001 to 2013, gender mainstreaming was implemented through a steering committee which was then replaced by an inter-ministerial network made up of staff-level representatives from all ministries.
Denmark has adopted a number of four-year action plans on gender mainstreaming. The National Strategy for Future Work with Gender Mainstreaming Assessment in the Public Sector ensures that all political initiatives are assessed to secure gender equality.

Four acts focus on gender equality: the Law on Gender Equality; the Law on Equal Pay; the Law on Equal Treatment; and the Law on Maternity/Paternity/Parental Leave.
Since 2000, gender mainstreaming obligations have been implemented at all levels of public administration and in decision-making. The legal basis is the Law on Gender Equality, influenced by the Amsterdam Treaty. The Law on Gender Equality stipulates that all public institutes should conduct gender impact assessments every three years (Eige, 2020).

Gender equality index in Denmark

Denmark ranks 2nd in the European Union with a total score of 77.4 out of 100 points, which is 9.5 points above the EU's score. Denmark has great scores in the following domains:

- Health (89.7 points);
- Money (86.8 points);
- Time (83.1 points);
- Work (79.7 points, ranking 2nd in the EU).

The domain of power still remains weak (66.2 points), although the score is above the European average of 12.7 points (Eige, 2020a).

Gender equality index by domain in in 2019

Source: European Institute for Gender Equality, 2020a

Results of the interviews

The interviewee reported that in the public administration there is an inequality in terms of pay mainly due to family-related responsibilities.

The situation regarding gender equality has improved a lot in the 1970s, but in the last forty years there has not been much progress.

According to the other interviewee, in Denmark, there are only a few women in the RHC sector and he does not believe that increasing their involvement will contribute to the development of the region and the RCH sector. At the same time, in his perception, the low participation of women in the RHC sector is also due to the lack of technical education.

Financial framework

Renewable energy sources for heating purposes are exempt from tax obligations on the production, supply and use of energy sources, thereby receiving a tax benefit in comparison to other fuels for heating purposes. Moreover, the use of biogas for heating purposes is supported through a direct premium per gigajoule of biogas used (EurObserv'ER, 2020).

In the following tables, the financial instruments provided by the state of the regions are summarised:

PROGRAMME	EUDP (Energy Technology Development and Demonstration Program)
TARGET AREA	Denmark
TYPE OF INSTRUMENT	Funding or grants.
OBJECTIVE AND SUPPORTED ACTIONS	The objective of the EUDP is to create growth and jobs, increase the security of supply, and contribute to the green transition that will make Denmark independent of fossil energy by 2050. Support to develop and demonstrate new energy technologies.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling and heat pump. The program supports a wide spectrum of energy technologies, i.e. renewable energy technologies, energy efficiency technologies, conversion technologies such as fuel cells and hydrogen, integration of energy systems including storage, more efficient methods for recovery of oil and gas and storage of CO2.
BENEFICIARIES	Private companies and universities
RESOURCES	N/A
TIMEFRAME	N/A

WEBSITE	https://ens.dk/sites/ens.dk/files/Forskning_og_udvikling/strategi_-_eudp_og_gldk_2020-2030.pdf

PROGRAMME	Tax regulation mechanism
TARGET AREA	Denmark
TYPE OF INSTRUMENT	State regulation mechanism
OBJECTIVE AND SUPPORTED ACTIONS	Heating from renewable sources is exempt from these taxes. Companies producing, processing, possessing, receiving, or dispatching renewable energy products are exempt from paying tax. In Denmark, different taxes are levied on the production, processing, possession, receipt, and dispatch of fossil fuels for heating purposes, for example the energy tax on mineral oil products, taxes on coal, lignite and coke or the carbon dioxide tax on certain energy products. Renewable energy sources are exempt from these taxes, as they are not classed as taxable in the specific regulations. The amount of tax relief is equal to the tax rate entitled persons are exempt from.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration
BENEFICIARIES	Mid-cap and large companies
RESOURCES	The costs of the tax reliefs are borne by the state
TIMEFRAME	N/A
WEBSITE	https://www.skm.dk/foreign

PROGRAMME	Financial risk coverage in connection with geothermal drilling
TARGET AREA	Denmark
TYPE OF INSTRUMENT	Financial scheme supported by the state
OBJECTIVE AND SUPPORTED ACTIONS	Denmark has extensive geothermal resources, which in the future could meet a large share of Denmark's heating consumption needs with clean energy. The Energy Agreement promotes the adoption of new green solutions and technologies, including geothermal heat. The modernisation of the heating sector will help open the heating market for new technologies in collective heat production, thus providing the opportunity to increase the share of RE technologies (e.g. geothermal heat) in central areas. The reduced electrical heating tax will also make the use of heat pumps to extract geothermal heat considerably cheaper. The scheme providing financial risk coverage in connection with geothermal drilling was introduced in 2017. The scheme provides the option of limiting financial risk in connection with geothermal drilling. Companies with geothermal permits can also apply for coverage by the scheme, which they must pay for themselves. The scheme will be extended until the end of 2024. The parties agree to conduct an analysis of geothermal heat under the new framework to ensure that subsidy conditions are competitive with biomass in heat production.
TECHNOLOGIES COVERED	Geothermal and district heating and cooling
BENEFICIARIES	Mid-cap and large companies
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://ens.dk/en

PROGRAMME	Danish Green Investment Fund
TARGET AREA	Denmark
TYPE OF INSTRUMENT	Loan
OBJECTIVE AND SUPPORTED ACTIONS	The Danish Green Investment Fund (GIF) is an independent state fund for co-financing economically viable projects that facilitate and support sustainable

	development in the country. Privately-held companies, non-profit housing associations, and public-sector companies and institutions (with budgets separate from the municipalities, regions and the state) can apply for a loan from the fund. The fund was established as part of the 2014 'Et Grønnere Danmark' (A Greener Denmark) programme which seeks to bridge the gap between traditional bank financing and equity capital. The individual loans have a maximum maturity of 30 years, and the fund is generally able to finance up to 60 % of the total costs associated with the given project.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage and integrated solutions
BENEFICIARIES	University, research centre, public authorities, start-up, SME, mid-cap company, large company, NGO
RESOURCES	The fund was established as part of the agreement “Et Grønnere Danmark” (“A Greener Denmark”) from 2014 and has a net capital of up to DKK 200 million as well as a state guaranteed lending limit of up to DKK 5 billion in capital to co-finance projects within following areas:
TIMEFRAME	2014 – ongoing
WEBSITE	https://gronfond.dk/en/om-fonden/

PROGRAMME	Danish Eco-Innovation Programme (MUDP)
TARGET AREA	Denmark
TYPE OF INSTRUMENT	Public funded scheme
OBJECTIVE AND SUPPORTED ACTIONS	MUDP is a public-funded scheme with a general focus on water, climate change adaptation, circular economy and recycling of waste, cleaner air, noise pollution, hazardous chemicals, industrial environmental performance, and ecological and sustainable construction. • The initiatives on eco-innovation include three main activities: • Development, testing, and demonstration of eco-efficient technology (subsidy scheme) • Environmental cooperation and green exports • Partnerships for eco-innovation The subsidy scheme targets Danish companies (private and public); stakeholders; and institutions working with environmental technology.
TECHNOLOGIES COVERED	Geothermal, solar thermal, biomass and integrated solutions
BENEFICIARIES	University, research centre, public authorities, start-up, SME, mid-cap company, large company, NGO
RESOURCES	The budget in 2018 is approximately 86 million. DKK (€11m)
TIMEFRAME	2007 – ongoing
WEBSITE	https://eng.ecoinnovation.dk/

Social and cultural framework

Based on the perceptions of the interviewees, there is no lack of knowledge and sensitivity regarding sustainability and heating and cooling derived from renewable energies. Since the 1970s and 1980s, steps have been taken to convert heating into renewable energy sources. According to her, the challenge lies in facilitating energy restructuring.

Christensen, Friis and Skjølsvold (2017) analysed the implications of smart grid technologies in households for everyday practices related to electricity consumption. The analysis is based on qualitative interviews with Danish households who installed photovoltaic panels in combination with electric vehicles, heat pumps or domestic batteries (for local electricity storage).
Most households reported changing their habits regarding energy-consuming activities by developing new routines and planning their electricity consumption.

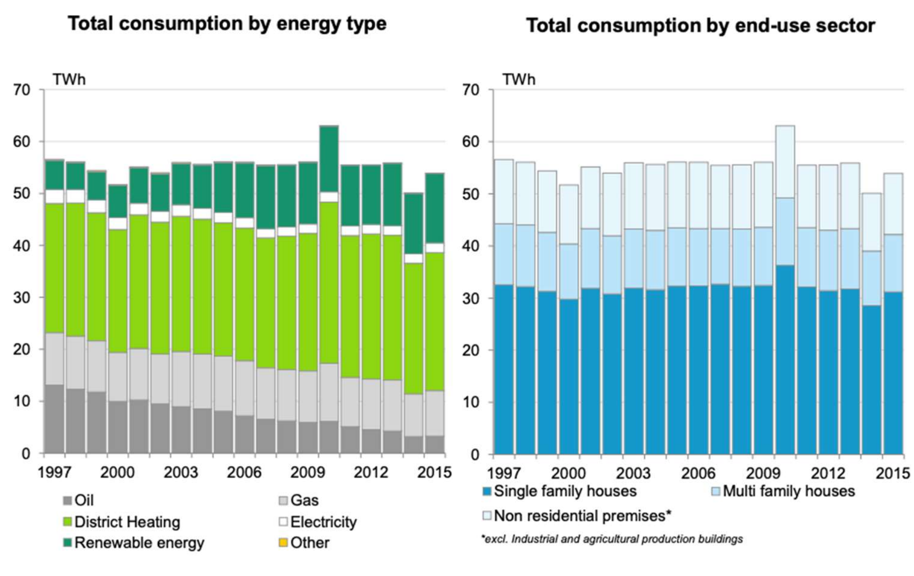
According to the study, families have positively assessed both the economic savings and the possibility of consuming self-produced energy. Therefore, the reasons that push people to invest in these systems are not only of economic reason but are also linked to the idea of self-sufficiency and resilience with respect to the network. Furthermore, the authors found that the idea of self-sufficiency attracted several respondents, mostly males.

Denmark has also experienced growing opposition to terrestrial wind energy over the past 10 years and lately, also to coastal wind farms.
In particular, civil society has opposed these projects when there are concerns about the environmental impact of large wind farms and the scenario in areas where the local economy depends on tourism. Social acceptance is low for RES projects such as huge wind turbines and large solar parks because they degrade the environment and provoke reactions in neighbouring communities.
However, with the creation of the first energy communities, local acceptance of RES is expected to increase along with citizen engagement.
These changes are necessary as it is of primary importance to reduce residential energy consumption.
In this sense, according to Mette and Gram-Hanssen, gender is central to the performance of residential practices for this energy consumption (2020). It would therefore be important to include gender in residential energy research, in the analysis of surrounding institutions, in the study of the performance of energy-related practices and, consequently, to analyse how gender is influenced and affects sustainable transitions (Mette and Gram-Hanssen, 2020).

Market conditions

The total energy consumption for heating buildings in the residential and service sectors in Denmark was 54 TWh in 2015. Single-family homes accounted for 58%, multi-family houses 20% and non-residential buildings 22% of the question. District heating accounted for nearly 50% of the total energy for heating and hot water in the Danish residential and service sectors in 2015.
Total energy consumption for heating and hot water in the residential and service sectors decreased by -0.3% annually in 1997-2015. In particular, the direct use of oil decreased by -7% per year in 1997-2015 rapidly, while the use of renewable energies increased by 5% per year between 1997 and 2015. The consumption of district heating in the residential and tertiary sectors it remained rather stable.

Energy consumption for heating in Denmark for the residential and service sectors



Source: Nordic Council of Ministries, 2017. Data originally from Danish Energy Agency, 2016

Employment in the energy sector 2016
In 2016, the energy sector as a whole employed 73,400 full-time employees, corresponding to the 3% of the total number of full-time employees in Denmark. The green share of energy employment is increasing and now amounts to 43 per cent.
Main results from the analysis:

- In 2016, the green share of energy employment amounted to 43% of the total energy employment corresponding to almost 31,200 man-years. This is an increase of just over 3,000 man-years compared to 2014, when green energy employment amounted to 27,900 man-years.
- Distributed by municipality, the figures show that there is a predominance of energy jobs in Jutland, and that there are a few municipalities where energy jobs make up more than 10% of the municipality's workplaces. This applies not least in Ikast-Brande, where over 25% is engaged in energy (Danish Energy Agency, 2021).

According to one of the interviewees, the opportunities related to the heating and cooling sector are related to the improvement of the infrastructure linked to cooling systems that waste a lot of energy. Furthermore, he reports that companies that use heat also have great potential, which is underutilised. In particular, a solution should be found to make the system more efficient and use the excess heat to heat the water used in homes.
While the challenges of this sector are linked to the poor insulation of houses which would make other interventions inefficient. In fact, houses should be better insulated, to be able to heat them with lower temperatures and to be able to exploit renewable energy sources. This problem is particularly relevant in the capital region, where the population density is particularly high.
An additional barrier is represented by the fact that renovating homes involves huge costs that private homeowners with low incomes and the elderly can hardly afford. Furthermore, undertaking this type of project involves time, skills, and energy that these people do not have and which, consequently, can represent an obstacle to their spread. It therefore seems that this type of solution is not very inclusive and accessible.

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Germany

Legislative and policy framework

Renewable heating and cooling

Energy Concept

With the Energy Concept from 2010, Germany set ambitious energy and Climate Targets for 2020 and 2050. In order to achieve the 2020 targets, the "Climate Action Programme 2020" was adopted in 2014. The Programme includes several measures to tap energy and GHG savings potentials, as e.g. the National Action Plan on Energy Efficiency (NAPE) and the climate-friendly building and housing strategy. The long-term strategy to achieve a climate neutral Germany in 2050 was set in 2016 with the "Climate Action Plan 2050". For the first time, the plan also includes sectoral GHG targets for 2020. With the "Climate Action Law" from November 2019, the sectoral 2030 targets have been made legally binding. In addition, the "Energy Efficiency Strategy 2050" was adopted in December 2019. It defines a new energy efficiency target for 2030 and thereby contributes to the new EU target for 2030, bundles the necessary measures in a new "National Action Plan for Energy Efficiency" (NAPE 2.0) and contains specifications for the design of a dialogue process "Roadmap Energy Efficiency 2050".

Integrated national energy and climate plan 2019

The Energy and Climate Plan addresses all five dimensions of the EU Energy Union: decarbonisation, energy efficiency, energy security, internal energy markets and research, innovation and competitiveness.
Several measures and strategies are implemented to address the five dimensions of the EU Energy Union :

- Decarbonisation: implementation of the Climate Action Plan 2050 and the Climate Action Programme 2030, better regionalisation of growth of renewable energies, increase the consumption of self-generated electricity, subsidies for electrically powered vehicles (environmental bonus), etc;
- Energy efficiency: energy efficiency strategy for buildings, tax incentives for energy-related building renovations, carbon pricing in the heating and transport sectors, etc;
- Energy security: Act on the Security of the Electricity and Gas Supply, national preventive action and emergency plans for natural gas, etc;
- Internal energy market: promote interconnectivity (regional cooperation), etc;
- Research, innovation, competitiveness: greater involvement of start-ups, increased technology transfer (Climate Change Laws of the World, 2021).

Energy Efficiency Strategy for Buildings

In 2015 the federal government adopted its strategy for the energy transition in the context of buildings, with its energy efficiency strategy for buildings. The implementation of this strategy therefore contributes substantially to achieving the target set for renewable energy in heating and cooling, and at the same time to increasing energy efficiency.
In the heating and cooling sector, according to the Renewable Energies Heat Act and derived from the new version of the EU directive promoting renewable energy sources, the target set for the share of renewable energy in final energy consumption for heating and cooling uses is 14% in 2020. At European level, according to this new version of the Renewable Energy Directive, Member States must strive to achieve an increase in the share of renewable energies in the heating and cooling sector which is 1.3% per year. This equates to a 27% share in 2030, a target assumed by the federal government. It also clarifies that the future deployment of renewable energy needs to be significantly accelerated in order to achieve the national climate action targets for 2030 in industry (mainly process heating) and buildings.

Renewable Energies Heat Act (EEWärmeG)

Renewable Energies Heat Act (EEWärmeG) aims to increase the share of renewable energies in heat provision to 14% by 2020. The Act makes the use of renewable energy for space and hot water heating mandatory for new buildings. It also stipulates budget requirements to this end for the Market Stimulation Programme. While the Act applies only to new buildings, it leaves room for individual German States to enact policies addressing the existing building stock.
Owners of buildings that are to be newly erected are obliged by the EEWärmeG to use a certain percentage of renewable energy for heating purposes (water and space heating). The minimum percentage depends on the renewable energy technology used. Various alternative measures are also permitted:

- Energy Saving Regulation (EnEV) requirements for buildings must be increased by 15%;
- At least 50% of energy for heating purposes must be supplied by combined heat and power (CHP);
- Energy supply by a district heating network, if heating is generated mainly by the use of renewable energy technologies, waste heat or CHP.

Energy concept
For the buildings sector, the Energy Concept defines the objective of an almost climate-neutral stock of buildings by 2050; this target is carried over to the operational level by means of the Energy Efficiency Strategy on Buildings.

Combined Heat and Power Act
The Act provides framework for funding the particularly efficient technology of combined heat and power generation based on the application of a surcharge.
Pursuant to the CHP Act, the operators of funded combined heat and power installations are entitled to the payment of a supplement for a limited period of time. The CHP Act is thus creating incentives for investment in what are highly efficient, low-carbon combined heat and power installations, with the aim of raising the level of combined heat and power-based power generation.
This Act aims to increase electricity generation from combined heat and power plants, to support the launch of the fuel cell sector and funding for construction and expansion of heating and cooling systems. The Act intends to contribute to an increase in electricity generation from combined heat and power by 25% by 2020 through the modernisation of existing and construction of new combined heat and power plants (Climate Change Laws of the World, 2021).

Law for conservation, modernisation and expansion of cogeneration
The law on cogeneration revises the 2002 Combined Heat and Power Act to encourage combined heat and power (CHP) generation plants using renewable energies, district heating, heat and cold storage, and reduce CHP from hard coal and brown coal unless necessary. It details how the financial support for existing and new installations, which was increased from €750 million to €1.5 billion, will be used. Subsidies are limited in time and added to market-based electricity price. Projects concerned by the scheme are newly constructed and "modernised" plants with a focus on increased energy efficiency (Climate Change Laws of the World, 2021).

Building Energy Act (Gebäudeenergiegesetz - GEG)
Entered into force on November 1, 2020. In the course of the decision-making on the GEG, the German Bundestag has also repealed the so-called 52 GW solar cap in the Renewable Energy Sources Act ("EEG 2017").
The Buildings Energy Act lays down energy requirements for existing buildings that must be complied with when such buildings undergo extensive renovation. In this respect, the European specifications on the overall energy efficiency of buildings (Directive 2010/31/EU) are also implemented and the regulation of the lowest energy building is integrated into the unified energy saving law.
The aim of the Buildings Energy Act is to reduce bureaucracy and simplify energy-saving legislation for buildings. The regulations of the EnEV and the EEWärmeG will be taken over as far as possible in terms of content and partly revised and simplified where possible. The Act thus replaces the EnEG, the EnEV and the

EEWärmeG and is intended to establish a new, uniform, coordinated set of rules for the energy requirements of new buildings, existing buildings and the use of renewable energies for the heating and cooling of buildings. In particular, this is intended to facilitate the application and enforcement of the provisions now brought together in the Buildings Energy Act. The previously existing discrepancies and inconsistencies - such as diverging definitions, unequal treatment of electricity from renewable energies and varying requirements for plant technology - have now been eliminated (Deloitte, 2021).

Gender equality

The Basic Law of the Federal Republic of Germany of 1949 (Grundgesetz, GG) – which is essentially the German constitution – guarantees the principle of gender equality (Article 3 II GG). Article 3 II GG specifically refers to equality between women and men and obliges the German state to promote gender equality and to tackle existing inequalities. The principle of gender mainstreaming is enshrined in law and is official policy in all ministries at federal and regional/local level. In a Cabinet Resolution of 23 June 1999, the federal government recognised the aim of gender equality as a guiding principle for its activities and adopted gender mainstreaming as the joint strategy of all federal ministries.

Legislative and policy framework

German constitutional law implies a commitment by the state to an active and effective equality policy. Article 3 (2) of the Basic Law states that men and women are equal and that the state is obliged to enforce equal rights for women and men and to work to eliminate existing disadvantages (Article 3 (2), second sentence, Basic Law).

In addition to the Basic Law, the gender equality principle is enshrined in many other laws, such as

- the General Equal Treatment Act of 2006 (Allgemeines Gleichbehandlungsgesetz – AGG) focusing on discrimination in employment,
- the Federal Body Composition Act of 2015 (Bundesgremienbesetzungsgesetz – BGremBG),
- the Act to enforce equality between women and men in the federal administration of 2001 (Gesetz zur Durchsetzung der Gleichstellung von Frauen und Männern in der Bundesverwaltung – DGleiG) and
- the Federal Equality Law of 2015 (Bundesgleichstellungsgesetz – BGleiG).

General Equal Treatment Act

According to the AGG, its aim is to prevent and eliminate discrimination on the ground of gender. The focus of the scope of this civil law is, therefore, on 'mass transactions' that affect a large number of cases, for instance in labour law and all areas of employment, as well as access to and supply of goods and services available to the public, including housing.

The Act covers discrimination in employment and social legislation, private law and civil service law. It focuses mainly on job discrimination for reasons of gender, race or ethnic origin, religion or belief, age, disability and sexual orientation (European Parliament, 2015).

Federal Equality Law (Bundesgleichstellungsgesetz – BGleiG)

The BGleiG addresses the elimination and prevention of discrimination based on sex, as well as the promotion of equality and work-life balance as a consistent guiding principle in all areas of responsibility and decisions of the departments within its scope. An obligation to implement and comply with gender equality (notably gender mainstreaming) in federal laws, such as in child and youth welfare, is set out in Article 9(3) of the Code of Social Law III (Eige, 2020a).

Gender equality should therefore be ensured, secured, and promoted in all political, agenda-setting and administrative measurements of the government (national and regional).

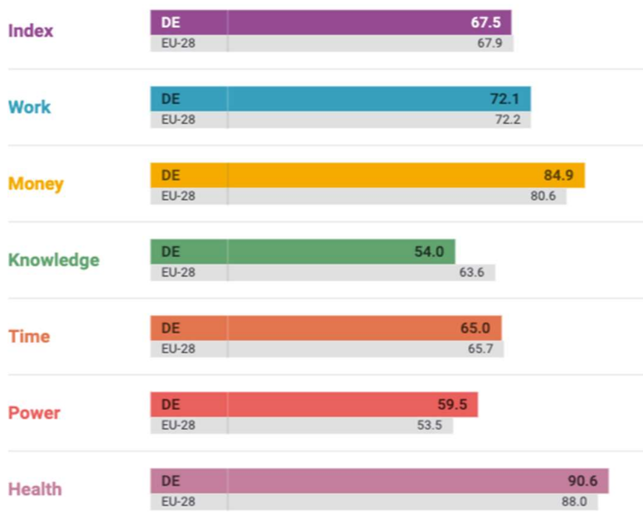
In practice, gender mainstreaming is not always implemented. This is especially the case where policy makers do not recognise any practical link between their policy field and questions of gender equality (Eige, 2020a).

Gender equality index in Germany

With a total score of 67.5 points, Germany ranks 12th in the EU on the Gender Equality Index, 0.4 points below the EU's score.

The domains of health (90.6 points, ranking 6th in the EU) and money (84.9 points) show the highest performance in the country, while gender equalities are most pronounced in the domain of knowledge (54.0 points, 9.6 points behind the EU score).

Gender equality index by domain in Germany in 2019



Source: European Institute for Gender Equality, 2020

Results of the interviews

According to the interviewee, women do not participate in the RHC sector as much as men. She points out that, also in Advisory Boards, quotas are not considered early on or it is not managed in such a way that there are enough women. In her point of view, overall, the improvements are minimal and take a very long time.

According to the interviewee, gender equality is integrated quite clearly into its unity. However, you also reported that at the local level, although the federal government has set non-mandatory minimum targets for quotas (30%), there are still problems related to gender discrimination.

Furthermore, from her point of view of her, the involvement of women in the RHC sector will contribute to the development of the region and the sector, as the perception in technology is different for women.

The interviewee perceives the same barriers present in the political sphere. In particular, for managerial positions, where very often women are subjected to strong pressure and are not treated equally.

You also reported barriers to access to information and, above all, a lack of awareness on the part of women themselves of their potential.

The interviewee also reported that there have been slight improvements in support for female entrepreneurs. However, in her opinion, it is necessary to improve working conditions and support measures in order to reconcile work and family life.

Regarding women's-led initiatives in the RHC sector, she gave the example of the Women's Academy dealing with these topics and the Women's Service Club.

There are therefore networks of women dealing with this topic, but they are not very widespread.

Financial framework

Market incentive program

The program promotes the use of renewable energies in heating (e.g. solar thermal & biomass-based heating systems; heat pumps) through investment grants or repayment grants for low-interest loans. Funding is provided for both residential and non-residential buildings.
The installation of heating systems that are operated entirely using renewable energy, such as heat pumps and biomass systems, is supported with an investment grant of up to 35 percent. If an old oil heating system is replaced, the funding rate may be increased to 45 per cent.
Gas hybrid heating systems with a renewables-based share of at least 25 per cent – for example through the integration of solar thermal energy – can be supported with an investment grant of up to 30 per cent. If an old oil heating system is replaced, the funding rate may be raised to 40 per cent.
Gas condensing boilers that have been built ready to integrate renewable energy later on in time can be supported with an investment grant of up to 20 per cent.
Funding is also provided for setting up heat networks and heat storage units.

In the following tables, the financial instruments provided by the state of the regions are summarised:

PROGRAMME	Federal funding for efficient heating networks (heating network systems 4.0)
TARGET AREA	Germany
TYPE OF INSTRUMENT	Subsidy
OBJECTIVE AND SUPPORTED ACTIONS	The federal funding for efficient heating networks (Wärmenetzsysteme 4.0) addresses innovative heating network systems with a predominant share of renewable energies and waste heat.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration, integrated solutions and overall system with high share of renewable energy (>50%)
BENEFICIARIES	University, research centre, public authorities, start-up, SME, mid-cap company, large company, NGO
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	Link

PROGRAMME	Kraft-Wärme-Kopplungsgesetz (KWKG) Innovative KWK-Systeme
TARGET AREA	Germany
TYPE OF INSTRUMENT	Subsidy
OBJECTIVE AND SUPPORTED ACTIONS	In addition to high efficiency and the integration of renewable energies, innovative CHP systems should also meet the requirements of sector coupling.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, cogeneration, integrated solutions
BENEFICIARIES	Only operators of innovative CHP systems are entitled to apply
RESOURCES	N/A
TIMEFRAME	2018 -2025
WEBSITE	Link

PROGRAMME	Kraft-Wärme-Kopplungsgesetz (KWKG) KWK Zuschlag für Wärme/ Kälte Speicher
TARGET AREA	Germany
TYPE OF INSTRUMENT	Subsidy
OBJECTIVE AND SUPPORTED ACTIONS	CHP plants with heat or cold storage can be operated more flexibly and thus compensate for the volatile electricity generation from renewable energies. This is becoming increasingly important against the background of increasing electricity generation from renewable energies. The funding is therefore intended to stimulate investment in storage technologies.
TECHNOLOGIES COVERED	Thermal energy storage
BENEFICIARIES	Only operators of CHP systems are entitled to apply (CHP needs to deliver at least 50% of the stored heat/ cold)

RESOURCES	N/A
TIMEFRAME	Initial Operation until 31/12/2025
WEBSITE	Link

PROGRAMME	Kraft-Wärme-Kopplungsgesetz (KWKG) Wärme- und Kältenetze
TARGET AREA	Germany
TYPE OF INSTRUMENT	Subsidy
OBJECTIVE AND SUPPORTED ACTIONS	In order to increase efficiency in the area of electricity and heat generation, the Federal Government supports the expansion of combined heat and power generation, in particular through the Combined Heat and Power Act (KWKG). In addition to electricity remuneration for CHP plants and the promotion of heat and cold storage facilities, the KWKG provides for investment support for heating and cooling networks.
TECHNOLOGIES COVERED	DHC networks
BENEFICIARIES	Grid operators need to cover 75% of the demand with CHP (additional spreads with RES, and industrial surplus heat are possible)
RESOURCES	N/A
TIMEFRAME	Initial Operation until 31/12/2025
WEBSITE	https://www.bafa.de/DE/...

PROGRAMME	The environmental innovation program
TARGET AREA	Germany
TYPE OF INSTRUMENT	Grant and subsidy
OBJECTIVE AND SUPPORTED ACTIONS	Support large-scale demonstration projects for avoiding or reducing environmental pollution. Expansion/ improvement, commissioning of project, expert reports
TECHNOLOGIES COVERED	Environmental
BENEFICIARIES	University, research centre, public authorities, start-up, SME, mid-cap company, large company, NGO
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://www.umweltinnovationsprogramm.de/

PROGRAMME	Heating with Renewable Energies - Market incentive program / BAFA part
TARGET AREA	Germany
TYPE OF INSTRUMENT	Market incentive program
OBJECTIVE AND SUPPORTED ACTIONS	Promote systems for the use of renewable energies in the heating market. Financial support for heating system replacement or expansion
TECHNOLOGIES COVERED	Solar thermal, biomass and heat pump
BENEFICIARIES	University, research centre, public authorities, start-up, SME, mid-cap company, large company, NGO, individual
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	Link

PROGRAMME	Federal funding for efficient buildings - Heating optimization
TARGET AREA	Germany
TYPE OF INSTRUMENT	Grant
OBJECTIVE AND SUPPORTED ACTIONS	Promote heating optimization through highly efficient pumps and hydraulic balancing. Replacement of heating circulation pumps and hot water circulation pumps with highly efficient ones
TECHNOLOGIES COVERED	Heat pump
BENEFICIARIES	University, research centre, public authorities, start-up, SME, mid-cap company, large company, NGO and individual

RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	Link

PROGRAMME	IKK - Energetic Urban Redevelopment - District Supply
TARGET AREA	Germany
TYPE OF INSTRUMENT	Loan and Subsidy
OBJECTIVE AND SUPPORTED ACTIONS	Invest in energy-efficient supply systems Investments in efficient systems for heating, cooling, water and waste water
TECHNOLOGIES COVERED	District heating and cooling, thermal energy storage, integrated solutions and waste heat
BENEFICIARIES	Public authority and community Association
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://www.kfw.de/partner/KfW-Partnerportal/Architekten-Bauingenieure-Energieberater/F%C3%B6rderprodukte/IKK-Energetische-Stadtsanierung-Quartiersversorgung-%28201%29/index.jsp

PROGRAMME	Renewable Energies - Standard - The promotional loan for electricity and heat
TARGET AREA	Germany
TYPE OF INSTRUMENT	Loan
OBJECTIVE AND SUPPORTED ACTIONS	RES development
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, cogeneration, integrated solutions
BENEFICIARIES	University, research centre, start-up, SME, mid-cap company, large company, NGO
RESOURCES	Eur 50 million
TIMEFRAME	Minimum loan term is 2 years
WEBSITE	https://www.kfw.de/inlandsfoerderung/Unternehmen/Energie-Umwelt/F%C3%B6rderprodukte/Erneuerbare-Energien-Standard-%28270%29/

PROGRAMME	CORNET - Industrial Collective Research
TARGET AREA	Germany
TYPE OF INSTRUMENT	Grant
OBJECTIVE AND SUPPORTED ACTIONS	To increase the competitiveness of entire industrial sectors, preferably SMEs. International Collective Research projects
TECHNOLOGIES COVERED	Research
BENEFICIARIES	University, research centre, start-up, SME, mid-cap company, large company, NGO
RESOURCES	N/A
TIMEFRAME	2 years
WEBSITE	https://www.aif.de/english/cornet/about-cornet.html

PROGRAMME	Renewable Heat
TARGET AREA	Hamburg
TYPE OF INSTRUMENT	Grant
OBJECTIVE AND SUPPORTED ACTIONS	Provide renewable heat solutions to Hamburg Measures that reduce energy requirements, improve efficiency and increase the share of renewable energies.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration, integrated solutions and replacement of heating systems

BENEFICIARIES	University, research centre, public authorities, start-up, SME, mid-cap company, large company, NGO
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://www.ifbhh.de/foerderprogramm/erneuerbare-waerme

PROGRAMME	Green Bonds
TARGET AREA	Germany, Europe, North and South America
TYPE OF INSTRUMENT	Bond
OBJECTIVE AND SUPPORTED ACTIONS	Generate proceeds to serve sustainable projects. Sustainable projects in the field of renewable energies, sustainable waste management, energy efficiency and clean mobility solutions.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration, integrated solutions
BENEFICIARIES	University, research centre, public authorities, start-up, SME, mid-cap company, large company, NGO, private and farmers
RESOURCES	EUR 1.1 billion
TIMEFRAME	N/A
WEBSITE	Link

PROGRAMME	Green Bond Framework
TARGET AREA	North Rhine-Westphalian region
TYPE OF INSTRUMENT	Bonds
OBJECTIVE AND SUPPORTED ACTIONS	Support the North Rhine-Westphalian region. Support for SMEs to stimulate growth, employment and innovation
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration, integrated solutions
BENEFICIARIES	SME
RESOURCES	Eur 13 billion
TIMEFRAME	Up to 50 years
WEBSITE	Link

PROGRAMME	Thuringian Development Bank - solar invest
TARGET AREA	
TYPE OF INSTRUMENT	Equity
OBJECTIVE AND SUPPORTED ACTIONS	Provide investment incentives for the sustainable generation of electricity and heat from solar radiation energy. Enable companies to identify and use potential for energy savings and to promote resource efficiency. Investments, project support, consulting services
TECHNOLOGIES COVERED	Integrated solutions and energy efficiency
BENEFICIARIES	University, research centre, public authorities, start-up, SME, mid-cap company, large company, NGO
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://www.aufbaubank.de/Foerderprogramme

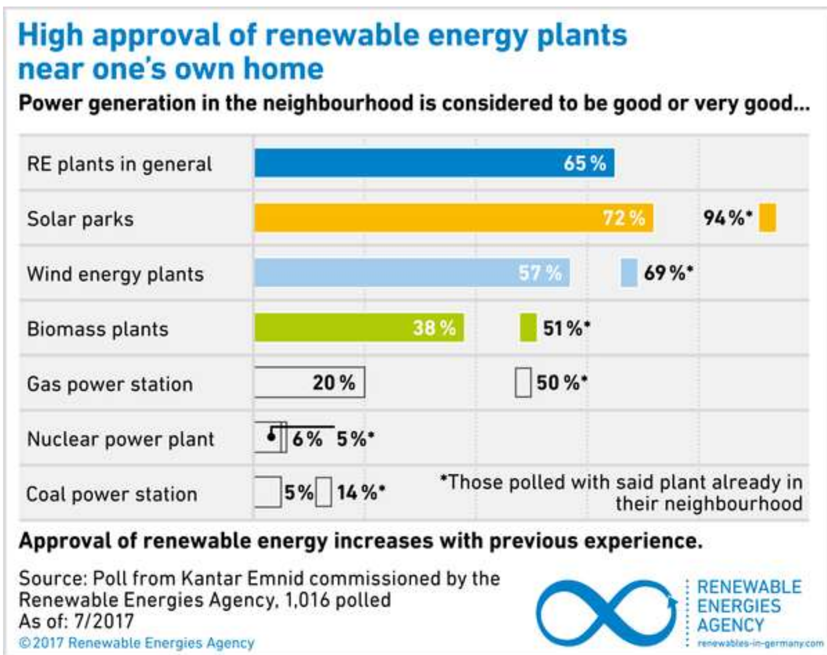
PROGRAMME	Marktanreizprogramm 2020 - Fernwärme
TARGET AREA	Germany
TYPE OF INSTRUMENT	Repayment bonus
OBJECTIVE AND SUPPORTED ACTIONS	The KfW Renewable Energies "Premium" Programme supports larger systems for the use of renewable energies in the heating market that are particularly worthy of promotion with low-interest loans from KfW and with repayment grants financed by the Federal Ministry of Economics and Energy The KfW Programme is an initiative of the Federal Ministry of Economics and Energy

	and KfW for a sustainable energy supply for the future and for environmental and climate protection.
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, heat pump, thermal energy storage, integrated solutions, Biomass-fired CHP, pipelines for crude biogas
BENEFICIARIES	Public authorities, mid-cap and large companies, NGO
RESOURCES	N/A
TIMEFRAME	2018 - 2021
WEBSITE	https://www.kfw.de/inlandsfoerderung/Unternehmen/Energie-Umwelt/Finanzierungsangebote/Erneuerbare-Energien-Premium-(271-281)/

Social and cultural framework

In Germany, renewable energies are widely supported by the population on a socio-political dimension. Solar energy and wind energy are the most appreciated among the renewable energy resources, followed by hydropower. While bioenergy and biothermal are definitely not appreciated as much as the previous ones, thus ranking lowest amongst the renewable energies (Schumacher, 2019).

In her research, proximity seems particularly important with regards to wind and biogas plants with more than half of the respondents wanting a minimum distance from their homes, while distance from small-scale PV was not relevant for most of the respondents. In addition, eye contact has more often been named as a relevant problem for large-scale installations than for small-scale residential PV (Schumacher, 2019).

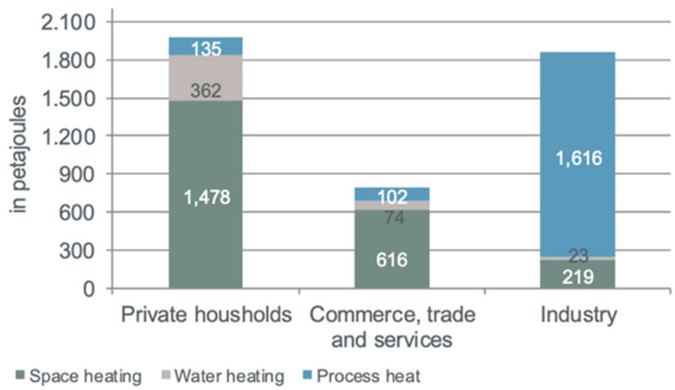


Market conditions

Heating accounts for more than half (54 %) of final energy consumption in Germany and it is responsible for around 26 % of total annual greenhouse gas emissions.

Space heating in buildings accounts for the largest proportion of final energy consumption for heating in Germany, or 50 %. A breakdown by sector shows that in private households and in commerce, trade and services the heating of buildings accounts for the bulk of heating requirements. In each of these sectors, approximately three fourths of the heating requirements are for space heating. In the industrial sector the dominant form of heat use is process heat, accounting for 87 % of industrial heat consumption (Brüggemann, 2016).

Final consumption of sectors for heating purposes in 2014.



Source: BMWi; excluding transport. Energy consumption of transport for space heating: 12.6 PJ.

Opportunities

Existing buildings offer great savings potential. Around half of all residential buildings in Germany – almost 9 million – are inadequately insulated, 90 % of which are old buildings erected before 1978. Energy savings can be achieved through the modernisation of the building envelope (insulation, windows) and technical refurbishment such as renewing and optimising heating and hot water systems (Brüggemann, 2016).

As reported by one of the authorities interviewed, there has been a shift from oil to gas and there is more focus on heat pumps. The reasons are that gas has fewer emissions than oil and the heat pump is suitable for the smaller area. District heating is a bit more difficult; thermal energy is not strongly represented. The first attempts have already been made to convert thermal power plants to gas and biomass. Refrigeration is a difficult subject, but a field with a high potential for development.

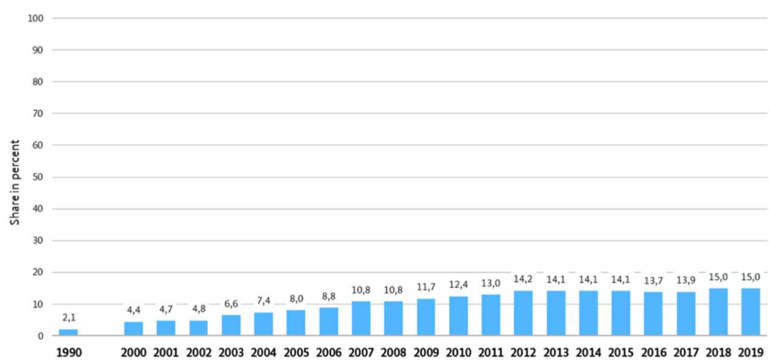
In some technologies, for example geothermal, there are different approaches that can be used for RHC, but in some cases there are problems, such as damage in cities, which were related to technological difficulties. Biomass has a wide range of technologies and applications. However, the interaction between technology and raw material is problematic and the unit cost is high. Furthermore, the resources are also limited.

Finally, solar thermal has not spread as widely as hoped, which is related to the fact that the focus has been heavily on electricity generation and heat generation has often not been realized in practice. Retrofits are also often more difficult.

Increasing renewable energies for heating

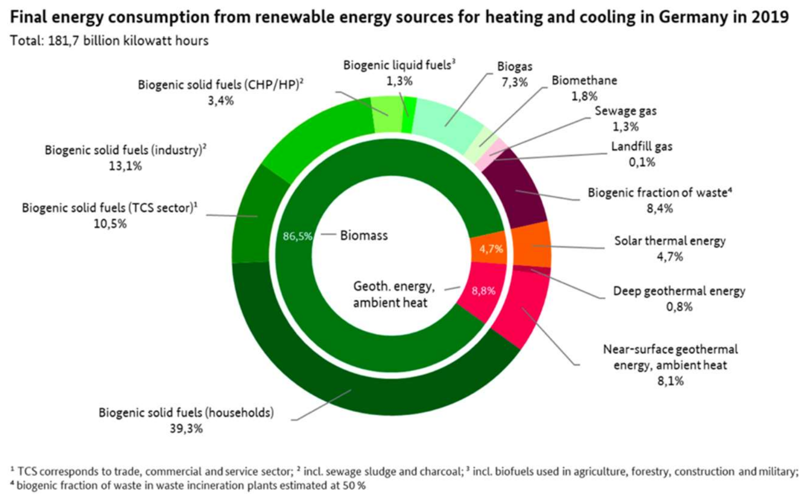
Although the proportion of renewable energies in heating and cooling in Germany rose from 4.4 to 15 % between 2000 and 2019, their development momentum remains substantially below the increased share in electricity generation.

Development of renewable energy share of final energy consumption for heating and cooling in Germany



Source: BMWi, 2020

By far the most important source of renewable heat is biomass, at 86.5 %. Geothermal energy and heat pumps contribute 8.8 % to renewable heat generation, followed by solar thermal energy at 4.7 %. As biomass use competes for land with food production and nature conservation and because of the high importance of forests as carbon sinks, in the long term there will be limits to its use, so the use of solar thermal energy and geothermal energy / heat pumps will have to be promoted more strongly in the future. Looking further ahead, the closer interconnection of the heat and electricity system will gain importance through the use of electricity from wind power and photovoltaics for heating (Brüggemann, 2016).



Source: BMWi, 2020

According to the interviewee, the main market opportunity for RHC in Germany relates to the fact that it is a highly industrialized country. If it were possible to develop solutions in the industrial production sector and implement economically sustainable concepts, this would lead to the spread of these solutions. Cooling, however, is not so widely applicable in Germany.
In addition, to increase the adoption of RHC, the respondent suggested it would be necessary to rethink the communication campaigns, re-evaluating who are the real and hidden decision makers on this topic, which is often overlooked.

According to one of the interviewees, the most important challenge is the energy efficiency of buildings. In her opinion, local heating networks are widespread and consolidated in some regions, while in others there is still reluctance in this regard.
She also reported that the main problem is that in the short term the costs of RES are still quite high compared to those of gas.
An interesting example is Baden-Württemberg, where local heating planning has been made mandatory for the 100 largest cities and municipalities. In the same region, a residual heat concept was also non and a competence centre is being established to address the needs and characteristics of the various territories.
According to the interviewee, the Federal Building Energy Act is inadequate and would need to be revised on the basis of a CO2 balance.
In Baden-Württemberg, the Renewable Heat Act which prescribes 50% renewable energy when a boiler is replaced. However, in her point of view, not enough boilers are replaced and the requirements are not clear enough.
According to the interviewee, the opportunities of the RHC sector are linked to technological development, such as the extraction of waste heat from wastewater and the development of more efficient cooling devices.
There is also a potential market linked to contracting measures, which is currently underutilised and which could represent a local added value also for companies, service providers, local public services.

With regard to the main challenges, the interviewee emphasizes how important it is to provide a perspective and a clear line with respect to investments and avoid imbalances between sectors derived from taxation on CO2 emissions.

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Greece

Legislative and policy framework

Renewable heating and cooling

The current framework does not foresee specific provisions for RHC but only for the cogeneration of electricity and heating. There are no other provisions for RHC technologies and solutions in existing legislation and except for the European Directive 2001/2018 known as the RES Directive. Since the RES directive provides regulations for RHC, the law is expected to provide for positive provisions and measures to be implemented.

Greece's National Energy and Climate Plan

The National Energy and Climate Plan (NECP) has set the following key objectives: reducing greenhouse gas (GHG) emissions for making possible the transition to a climate neutral economy by 2050, waste management is an important part of the plan (revising the national and regional waste management plans) and to increase the RES in gross final energy consumption. Also to improve energy efficiency with measures related to transport and buildings and to phase out lignite in power generation by 2028. All these will take place by implementing a relevant front-loaded programme (Climate Change Laws of the World, 2021).
A significant contribution of RES is also projected to occur for heating and cooling purposes given that the share will amplify from 31% in 2020 to 43% in 2030.

National plan for increasing the number of nearly zero-energy buildings

The building stock in Greece consists primarily of residential buildings and several other tertiary sector buildings, of which a census is taken every ten years across Greece. The policy for the energy performance of buildings by 2020 is formulated by institutional actions relating primarily to the implementation of EU directives. Priority is given to the actions relating to the building stock:

- Implementing interventions for energy savings, improving energy efficiency and the use of RES in residential and tertiary sector buildings.
- Developing energy management systems in public and tertiary sector buildings.
- Promoting awareness-raising and informative actions to foster the rational use of energy.
- Strengthening the provision of energy services (ESCOs).
- Fostering research and technological development in technologies related to RES and energy savings (Ministry of the Environment and Energy, 2017).

Law 3661/2008 on Measures to reduce energy consumption in buildings and other provisions

This law sets up the minimum requirements for energy efficiency in new and existing buildings, adopting a methodology for the calculation of energy consumption in buildings. It makes energy performance certificates compulsory in all new buildings. Also, for large buildings under renovation whether to be sold or rented, their energy efficiency is to be upgraded to the minimum requirements of the energy efficiency regulation set by this law. The law also requires the licensing procedures for buildings to include a study on passive solar system heating/cooling/electricity production systems that uses renewable energy (Climate Change Laws of the World, 2021).

Law 4414/2016: A new support scheme for renewable electricity in Greece

In 2016 the Greek Parliament passed the national support scheme for electricity from renewables and highly efficient cogeneration of heat and power.
The scheme aims to reform the existing support scheme in line with European Commission guidelines. The aim is to promote better integration of renewable energies into the national electricity market at an optimal level of costs and benefits, while leveraging renewable energies so that Greece can achieve the 2020

renewable electricity generation target. at the same time, the level of support is limited so as not to over-reward renewable energy projects (Norton Rose Fulbright, 2016).

Regulation on the energy performance of buildings (KENAK)

The Regulation on the energy performance of buildings provided for the introduction of an integrated energy design of buildings to improve their energy performance, guaranteeing energy savings and protecting the environment. KENAK aims to reduce the amount of conventional energy consumed for heating, cooling, air conditioning, lighting, and domestic hot water. It establishes the methodology used to calculate the energy performance of buildings to estimate the quantities of energy consumed by buildings for heating, cooling, air conditioning, lighting and hot water; establishes the minimum energy performance requirements and categories for the energy classification of buildings; establishes the minimum specifications for the architectural design of buildings, the thermal characteristics of the structural elements of the envelope and the specifications for the E / M (Electrical and Mechanical) systems of new buildings in the design phase and those undergoing major renovation; defines the contents of the building energy performance project; specifies the format and content of the building's energy performance certificate; establishes the procedure used to carry out energy inspections of buildings and the procedure used to carry out inspections of heating and cooling systems.

Law 4342/2015

In 2015, the law provided the necessary framework for Greece to fully comply with Directive 2012/27 / EU on energy efficiency. Article 7 also provides for a refurbishment target of 3% of the total floor area of heated and / or cooled buildings owned and occupied by the central government. Paragraph 12 of the aforementioned article is very important, as it provides, in view of achieving the aforementioned objective, that the Regions and Municipalities prepare an Energy Performance Plan with specific objectives and actions for saving and energy efficiency, which must be reviewed every 2 years.

RES-Heating building obligations

For buildings for which a planning application was submitted to the relevant Planning authority after 01.01.2011, it is mandatory that hot water demand is partly covered by solar panels (min. percentage: 60% per annum). This requirement is waived where the hot water demand is covered by other energy supply systems based on RES, CHP, by district heating or heat pumps. After 31.12.2019, all new buildings will have to cover their entire primary energy consumption using the aforementioned technologies. In addition, all buildings should be almost zero energy buildings from 2021 onwards (art.9 Law No. 4122/2013) **(**Res Legal, 2019).

Law 4602/2019 establishes the fundamental principles for the exploration, exploitation and management of the geothermal potential of Greece which forms an integral part of the National Energy and Climate Plan for 2030. Currently, geothermal energy is mainly used for direct needs such as aquaculture plants, geothermal heat pumps, ground heating and greenhouse heating. However, the new law intends to create a solid legal framework to stimulate investor interest in further exploiting geothermal opportunities, particularly for power generation.

The rights of exploration, exploitation and management of geothermal energy belong to the Greek state and can be exercised or rented exclusively by it. The new law provides for further specialized parameters in addition to those outlined in the previous regulatory framework, in order to structure and organize the effective management of these resources (Watson Fraley and Williams, 2019).

The modernization of the environmental legislation, Law 4685/2020

The law introduced reforms to address the significant delays that investors faced in the process of receiving permits for RES projects and to enable the country's energy transition in line with current environmental policies. The goal is to align the timescales with the requirements of the Directive (EU) 2018/2019 on the promotion of the use of energy from renewable sources.

The main tools used by the new law to speed up the licensing process to encourage investment in RES projects are: (i) structural reforms in the context of environmental licensing; and (ii) changes to the first phase of the licensing framework for RES projects, including the replacement of the generation license for RES projects with a RES producer certificate. The new environmental law has also changed the framework applicable to Natura 2000 sites, to include the creation of RES plants among the activities permitted within these sites. (Omran, Mavrommati, Skiathiti, 2020)

Gender equality

Articles 4, 22 and 116 of the Greek Constitution enshrine the principle of gender equality, including positive measures in favour of women, where necessary. The articles respectively affirm equal rights and duties, equal pay for work of equal value and non-discrimination based on gender.

In 2010, an integrated national strategy for gender mainstreaming was launched in the framework of the National Program for Substantive Gender Equality 2010-2013. Building on this national program, the most recent principles and objectives for improving gender equality in Greece are found in the National Action Plan (NAP) on Gender Equality 2016-2020, introduced in 2017 following the latest Recommendation of the Committee on the Elimination of Discrimination Against Women in Greece in 2013.

The production of sex-disaggregated data is rather limited, although the new law 4604/2019 aims to improve the dissemination of sex-disaggregated statistics by public services and legal entities. Gender equality - with respect to issues such as the gender pay gap (the most recent official estimate is from 2014), differences in retirement behaviour and even harassment in the workplace - has yet to be placed at the centre of the political discussion.

The General Secretariat for Gender Equality (GSGE) published the National Action Plan 2016-2020 in February 2017 as a roadmap for gender equality policy for the coming years. The Plan is based on the principles and strategic objectives set by the National Program for Gender Equality 2010-2013 and takes particular note of the challenges that emerged during the economic crisis. As a national strategy, it covers all regions. The Plan is structured in six areas:

- Social inclusion of women facing multiple discrimination;
- Fight violence against women;
- Health
- Labour market, reconciliation between professional and family life;
- Education, training, stereotypes, media, culture, sport;
- Equal participation in the decision-making process.

The 2016-2020 NAP defines objectives and describes / proposes actions for each of these six areas. It includes a variety of horizontal interventions in public policy and vertical actions / policies targeting women and men in areas where inequalities prevail.

However, the NAP does not set specific objectives or indicators for assessing its objectives.

Law 4604 on the promotion of substantive gender equality, the prevention of and the fight against gender-based violence, adopted in March 2019, contributes to the promotion of gender mainstreaming. The law establishes legislative measures to strengthen the national gender apparatus, as well as several government actions aimed at gender mainstreaming. Consequently, every ministry should

- Develop quantitative and qualitative indicators on gender issues for the purpose of assessing the integration of the gender dimension in all relevant measures and policies;
- Analyse the consequences of draft laws through mandatory gender impact assessments;
- Publish an online report on the progress of gender discrimination.

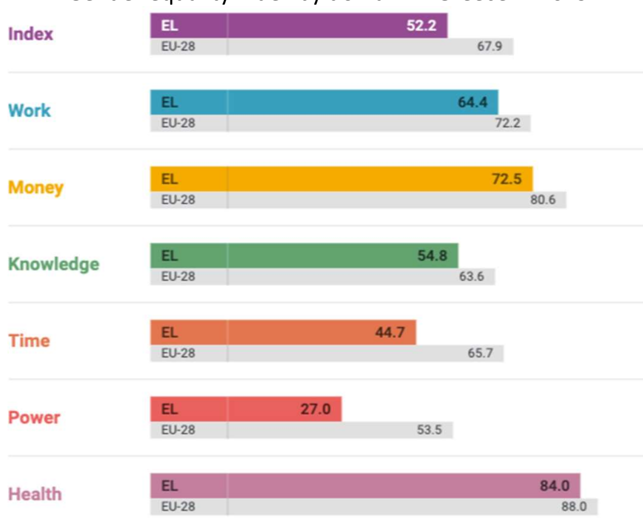
The law sets out a full range of measures, including: use of gender-neutral language in official government documents; provisions against gender stereotypes and discrimination in the media and advertising; a quota system (minimum 40% female candidates) for each constituency in parliamentary and European elections (the same regulation already exists for municipal and regional elections, law 4555/2018); and the establishment of an autonomous office for equality in each of the 13 regions of the country (article 7, while the municipal and regional committees for equality are updated to article 8) (Eige, 2020).

Gender equality index in Greece

According to the European Institute for Gender Equality, Greece ranks last in the EU on the Gender Equality Index with 52.2 out of 100 points. The rank has remained unchanged since 2010 and the score is 15.7 points below the EU average.

Concerning the domains, the highest scores can be witnessed in the domains of health (84.0 points) and money (72.5 points). Greece shows poor performance in the domains of power (27.0 points), time (44.7 points) and work (64.4 points), ranking 27th in all the three domains.

Gender equality index by domain in Greece in 2019



Source: European Institute for Gender Equality, 2020

Results of the interviews

According to one of the interviewees, there is an intense presence of women within their organizational structure and distinctions are not made in the selection of personnel based on gender criteria but on scientific qualifications. Hence, according to the interviewed Greek regulator, gender equality is a rule.

In addition, the interviewee refers not to perceive specific gender barriers and reports the fact that there are many examples of women in management and consulting positions within the public sector.

In her view, there is no lack of educational aspects in gender discrimination, but women that set up their own business are significantly less than men. This also applies to the energy sector. The interviewee hypothesises that societal stereotypes or the lack of social support for single mothers (and mothers in general) may direct women to safer working environments in terms of wage remuneration (i.e. Public Sector).

According to the interviewee, there are no specific measures taken to support women in the renewable energy sector, there are only on a larger scale. A slight effort has been noted in Greece in this direction, where it would lead to a more dynamic presence of women in RHC entrepreneurship. Some measures are in place but are not implemented properly or are still at an early stage of implementation.

The measures that could support the involvement of women in the RHC are related to entrepreneurship.

According to the interviewee, women are not lagging behind in education or skills, but they likely lack social awareness, information, funding opportunities, specialists who can help them, and a child education system that can support working mothers during working hours.

Another measure could be the development of organizations' awareness of gender equality. This is the case of large private companies where special organizational rules based on gender equality support the involvement of women in decision-making positions, but this is not the case for small businesses and the public sector.

Financial framework

In Greece, the support framework that existed till recently in the RES heating and cooling sector was oriented mainly towards providing economic support for RES-Heating systems through the form of tax deductions in the residential sector and subsidy schemes in the tertiary sector and in industry.

The 2016 Development Law stipulates support for combined heat and power plants and renewable heating and cooling installations in the form of two types of income tax credits or investment subsidies. Interest-free loans and subsidies are offered for the installation of renewable energy equipment, including notably solar thermal, in existing residential and other buildings. In addition, Greece is supporting RD&D (Research, Development and Demonstration) activities. The introduction of new energy efficiency standards promotes, or even imposes the installation of renewable energy generation equipment in new buildings and in public buildings (EurObserv'ER, 2020).

In the following tables, the financial instruments provided by the state of the regions are summarised:

PROGRAMME	Development Law
TARGET AREA	Greece
TYPE OF INSTRUMENT	Subsidy
OBJECTIVE AND SUPPORTED ACTIONS	The Development law foresees support for CHP plants and RES H&C plants (for self-consumption, but not only) (art.9 par.8 Law No.4399/2016). More specifically, subsidies, leasing subsidies, and subsidies for the creation of new jobs are provided.
TECHNOLOGIES COVERED	Aerothermal energy, hydrothermal energy, solar thermal energy, biogas, biomass and geothermal energy
BENEFICIARIES	All enterprises based in Greece or have a branch in Greece at the time the Development Law enters into force, are eligible as long as they are: • 1) private enterprises • 2) commercial companies • 3) cooperatives and • 4) social cooperative companies (art. 6 Law No. 4399/2016)
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://www.res-legal.eu/en/search-by-country/greece/single/s/res-hc/t/promotion/aid/subsidies-development-law-2/lastp/139/

PROGRAMME	Energy Saving at Home II[2]
TARGET AREA	Greece
TYPE OF INSTRUMENT	Subsidy and loan
OBJECTIVE AND SUPPORTED ACTIONS	The Programme "Energy Saving at Home II" aims at improving the energy performance of residential buildings through the provision of interest-free loans and subsidies for the installation of RES plants and energy-saving measures.
TECHNOLOGIES COVERED	Aerothermal energy, hydrothermal energy, solar thermal energy, biogas, biomass and geothermal energy
BENEFICIARIES	The addressees of the programme are the owners of blocks of flats and detached houses. The owners of individual flats /houses should: • Use the flat/house as main residence • Should be legally built

[2] The current program has been upgraded into Autonomous Saving (Exoikonomo Aftonomo) with total budget 850 million Euros. (https://ypen.gov.gr/energeia/energeiaki-exoikonomisi/exoikonomo-aftonomo/). New financial supporting tools like this will be given to the country either with the form of subsidy or of grand, with total budget more than a billion.

	• The energy certificate of the building should be lower than or equal to class D • Should not be characterised as "demolished" (ch. 2 par 1.2 "Energy Saving at Home II" Programme Implementation Guide). There are special provisions with regard to blocks of flats as well as other categories. The percentage funded by a subsidy or an interest-free loan depends on the personal or family income of the applicant.
RESOURCES	The total budget of the programme is € 292.43 million.
TIMEFRAME	Open until the funds are exhausted.
WEBSITE	https://www.res-legal.eu/en/search-by-country/greece/single/s/res-hc/t/promotion/aid/subsidy-ii-combined-with-loan-energy-saving-at-home-ii/lastp/139/

PROGRAMME	Tax regulation mechanism I (Law No. 2238/1994 on the Income Tax)
TARGET AREA	Greece
TYPE OF INSTRUMENT	Tax relief
OBJECTIVE AND SUPPORTED ACTIONS	Law No. 2238/1994 provides for an income tax relief for natural and legal persons who have performed an energy upgrading of their building either at their own expense or through participation in national programmes (e.g. Exoikonomo).
TECHNOLOGIES COVERED	Aerothermal energy, hydrothermal energy, solar thermal energy, biogas, biomass and geothermal energy
BENEFICIARIES	Natural and legal persons of Greek nationality and Greek descent (art. 2 Law No. 2238/1994).
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://www.minfin.gr/?q=ell

PROGRAMME	**Tax regulation mechanism II (Development Law)**
TARGET AREA	Greece
TYPE OF INSTRUMENT	Tax relief
OBJECTIVE AND SUPPORTED ACTIONS	The Development Law that came into force in July 2016, foresees support for CHP plants and RES H&C plants (for self-consumption, but not only) (art.9 par.8 Law No.4399/2016). More specifically, income tax relief and stabilization of income tax coefficient are provided.
TECHNOLOGIES COVERED	Aerothermal energy, hydrothermal energy, solar thermal energy, biogas, biomass and geothermal energy
BENEFICIARIES	All enterprises based in Greece or having a branch in Greece at the time when the Development Law enters into force, are eligible as long as they are including: • Private enterprises, • Commercial companies • Cooperatives and • Social cooperative companies (art. 6 Law No. 4399/2016)
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://www.res-legal.eu/en/search-by-country/greece/single/s/res-hc/t/promotion/aid/tax-regulation-mechanism-ii-development-law/lastp/139/

Social and cultural framework

According to one respondent, the challenge that limits the further growth of RES penetration faces on several occasions' serious opposition from civil society especially when there are concerns over the environmental impact of large wind farms and/or the scenery in areas where the local economy is depended on tourism. Social acceptance is low for RES projects such as huge wind turbines and large solar parks because they degrade both the environment and provoke reactions in neighbouring communities. In the case of the wind turbines, smaller scale wind parks can be constructed which are more environmentally friendly and socially accepted however they are not energy efficient. In the case of photovoltaic parks, it is supported that this technology has reached a point of saturation in terms of the required space that they demand (it is not efficient to replace crops to build Photovoltaic panels). In terms of finance the profit margin is decreasing that may lead to the formation of either energy communities or mergers and acquisitions of energy companies as big businesses are keen to acquire small and mid-size players to enhance their competitiveness, capital growth and expansion.

The acceptance of RES is directly influenced by the perception of the benefits deriving from their use. The high costs of installation and maintenance, the lack of trust, the lack of knowledge and insufficient support of investments in RES by the state contribute negatively to the spread of renewables. The advantages of RES need to be highlighted more. Social support and the provision of information on the potential benefits of technological advances in renewable energy can promote the interaction and participation of local communities in the acceptance of RES. Furthermore, an increased role of local authorities would result in an effective policy solution for renewable energy projects. (Ntanos, Stamatios & Kyriakopoulos, Grigorios & Chalikias, Miltiadis & Arabatzis, G. & Skordoulis, Michalis & Galatsidas, Spyros & Drosos, Dimitrios. 2018).

Market conditions

In Greece, the total heat production from RES has steadily increased over the years. The country has achieved both the NREAP 2012 target and the 2011/2012 interim target. In part, this is due to the economic crisis and the resulting lower energy consumption.
Furthermore, the 2020 target for heating and cooling from renewable sources has also already been met. The target share according to NREAP 2012 is 16.2%, while the effective share of RES in the sectoral gross final energy demand amounts to 24.4%.
Greece still suffers from economic difficulties which are also affecting the energy market. In Greece, biomass is a crucial energy source for RES heating, alongside solar thermal generation. (HAEE, 2020)

The Greek energy sector still depends on fossil fuels, most of which are imported. Energy needs are covered by petroleum products, used in the transport sector, for heating and for energy production (diesel generators in non-interconnected islands), natural gas, also imported, lignite and renewable energy sources (RES).
The decline in primary production is attributed to the decrease in the production of lignite for the generation of electricity.
The contribution of RES to primary energy production and gross consumption is 2,501 ktoe (37%) and 2,640 ktoe (9%) respectively. While the total contribution (final energy consumption) of RES for heating and cooling in 2016 was 1120 ktoe, compared to 2015 it was observed a decrease of 365 ktoe.

Table: Contribution (final energy consumption) of RES in heating and cooling (ktoe)

Energy Source	2015	2016
Geothermal (GSHPs excluded)	9.9	10.1
Solar	196.4	200.2
Biomass	1072.1	910.2
Heat Pumps	206.7	238.6
TOTAL	1485.1	1120.5

Source: HAEE, 2020

Greece is currently undergoing major energy reforms, which aim to promote the use of renewable energy sources and, therefore, to reach the 20% share of energy from RES in 2020. Geothermal energy could contribute significantly to achieving the objectives of above, however this resource remains partially exploited. NREAP's specific targets for geothermal energy can only be achieved by the GSHP sector, which is likely to reach 50 ktoe (final consumption) by 2020. Greece, thanks to its geology, has a rich geothermal capacity with both high (mainly in the South Aegean volcanic arc) and low enthalpy -a measurement of energy in a thermodynamic system- geothermal fields, and numerous geothermal locations nationwide that can be exploited.
However, the Greek geothermal energy sector has huge prospects and could offer great opportunities for investors, as well as for the local or national economy. (HAEE, 2020).
Biomass, hydrogen and offshore wind are currently under-utilized level and certainly have a great potential for the global energy transition. A lot of attention has been given to hydrogen, so in the future it can be channelled to the natural gas grid and to its potential as a transportation fuel especially in the aviation and shipping sector. On the other hand, the penetration of wind power could be more active as well as tidal-wave energy initiatives which are almost negligible in Greece. Offshore wind turbines also raise issues such as the delimitation of territorial waters that further complicates the prospect of investments until they are resolved. Greece is at the 50% of its renewable energy potential and a lot of emphasis must be given to such projects. Major infrastructure investments are in development both for the electricity grid and for natural gas. Another impediment for RES is the limits of energy storage technology. The significant saturation of solar energy due to spatial limits and the concentration of the population in large cities creates demand for investments in energy storage.

It is also important to highlight the impediments and barriers due to the Greek economic situation:

- The reduction in income and the change in household consumption patterns following the economic crisis which have led to the decline in thermal comfort conditions and the increase in levels of energy poverty, and which make investments to improve performance difficult energy of buildings.
- The growing difficulty in accessing bank loans. The bank loan was the key financing tool to meet the needs of consumers and investments in Greece. In recent years, national financial institutions have gradually begun to include more and more energy performance projects in their loan portfolios resulting from legislative initiatives and the adoption of energy performance standards.

However, the increased vulnerability of banks and the need to guarantee refinancing have led to a reduction in the number of banks available and the range of funding instruments available (Papachristou, Arvanitis, Mendrinos, Dalabakis, Karytsas and Andritsos, 2019).

Despite these barriers, Greece is implementing comprehensive energy sector reforms to foster competitive energy markets, create opportunities for investors, support the transformation of the energy system and provide sustainable outcomes for the environment and Greek society (HAEE,2020).

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Italy

Legislative and policy framework

Renewable heating and cooling

In Italy, grid operators are obliged to give priority access to renewable energy plants in the operation of their grids. They are also obliged to give priority dispatch to electricity from renewable sources.
District heating and cooling networks are managed at local level. National legislation provides only the framework legislation. DL 28/11, Art. 22, c. 3 provides an obligation for all municipalities above 50.000 inhabitants to establish, in cooperation with Provincial authorities and coherently with the regional energy plans, development plans for district heating and cooling with the aim to increase usage of the energy produced also from RES.
Municipalities below 50,000 inhabitants can also develop such plans, however there is no obligation in place. (EEA)

The National Energy and Climate

The Plan is a ten-year integrated document mandated by the European Union to each of its member states in order for the EU to meet its overall greenhouse gases emissions targets. The plan establishes key objectives:

- To accelerate the transition from traditional fuels to renewable sources by promoting the gradual phasing out of coal for electricity generation in favour of an electricity mix based on a growing share of renewables;
- To implement policies and measures in order to reduce greenhouse gases (phase out of coal, higher CO2 price, acceleration of renewables and energy efficiency in manufacturing process level);
- To use a mix of fiscal, economic, regulatory and policy instruments to ensure an energy efficiency;
- To become less dependent on imports by increasing renewable sources and energy efficiency and to diversify sources of supply through the use of natural gas, including liquefied natural gas (LNG);
- To ensure a greater degree of market integration and the development of processes, products and knowledge for the use of renewables, energy efficiency and network technology.

FER1 Decree to incentivise the production of energy from renewable sources

The FER1 decree supports the production of energy from renewable sources in order to achieve the European targets by 2030 defined in the Integrated National Plan for Energy and Climate. It provides incentives for the diffusion of photovoltaic, wind, hydroelectric and purification gas plants.
The aim is to promote the effectiveness, efficiency, and sustainability of the sector, both in environmental and economic terms, by promoting the creation of thousands of new jobs through the implementation of a transition to low-carbon energy.

National Energy Strategy (Interministerial Decree of 8 March 2013)

The National Energy Strategy (NES), which has a double time horizon (2020 and 2050), directs efforts towards substantially improving the competitiveness of the energy system and environmental sustainability. Core targets of the National Energy Strategy 2017 are the reduction of the final energy consumption by a total of 10 Mtoe by 2030; to reach a 28% share of renewables in total energy consumption by 2030, 55% share of renewables in electricity consumption by 2030; to strength supply security; to narrow the energy price gap; and phasing out the use of coal in electricity generation by 2025.
The NES lays down long-term indicative objectives for 2050.
Among the most important:

- The need to strengthen efforts in energy efficiency. Primary consumption will have to fall in the range of 17-26% by 2050 compared to 2010, by decoupling economic growth from energy consumption. In particular, efforts in building and transport are be critical;

- Renewable energy penetration is expected to reach levels of at least 60% of gross final consumption by 2050, with much higher levels in the electricity sector;
- A substantial increase in the degree of electrification, which will almost double by 2050, reaching at least 38%, particularly in electricity and transport
- The key role of gas for the energy transition, despite a reduction of its weight both in percentage and in absolute value in the span of the scenario

Legislative Decree 10th June 2020, n.48

Transposition of the EU Directive 2018/844 about Energy Performance of Buildings into the Italian legislative framework. The decree provides that the Minister of Economic Development (MISE), by July 2020, draws up the long-term strategy to support the restructuring of the national park of residential and non-residential buildings, both public and private, in order to obtain a decarbonised housing stock and energy-efficient by 2050, facilitating the transformation, sustainable also in terms of costs, of existing buildings into nearly zero buildings. The long-term restructuring strategy will be reflected in the Integrated National Energy and Climate Plan and includes:

- A survey of the national building stock, based if the case requires it, on statistical samplings and on the share of renovated buildings expected in 2020;
- The identification of approaches to effective peace restructuring;
- A review of the policies and actions in place, as well as changes aimed at improving their effectiveness;
- The proposal of policies and actions, including long-term ones, aimed at stimulating effective and cost-effective restructuring;
- The proposal of policies and actions, including long-term ones, aimed at accelerating the energy requalification of all public buildings;
- Integration of energy efficiency interventions in buildings with interventions for the reduction of seismic and fire risk, aimed at safety;
- A reliable estimate of energy savings.

The strategy provides for the setting of periodic indicative targets for 2030, 2040 and 2050, including the achievement of an annual rate of renovation of buildings, in order to improve energy performance, of at least 3% (ENEA, 2019).

Decree for energy efficiency requirements in buildings (2015)

The Ministerial Decree of 26 June 2015 completes the transposition of the European Directive EPBD 2002/91 / EC. This legislative measure includes three different decrees. The first ("Application of calculation methodologies for energy performance and definition of minimum building requirements) also defines the requirements of nearly zero-energy buildings and sets the new minimum EP requirements and individual components, which will come into effect from October 2015. A new calculation methodology for the energy performance is introduced. In the second decree ("Reference scheme for technical project reports for the application of minimum building requirements), the format for technical project reports is defined , relating to new and almost zero-energy buildings, related retrofitting and technical systems. The latest decree ("Upgrade of national guidelines for the energy certification of buildings) includes the national guidelines for Energy Performance Certificates (EPC), in force since October 2015 (IEA, 2021)

Decree-Law n. 34 of 19 May 2020 on urgent measures on health, support to work, the economy and social policies related to the epidemiological emergency from COVID-19

This document, named the "relaunched decree" by the government, was released through the Council of Ministers press release no. 45 on the 14th of May 2020 and entered into force on the 19th of May 2020. It aims at enabling Italy to cope with the Covid-19-induced crisis and allow economic recovery.
The decree-law notably modifies fiscal rules to incentivise energy efficiency, photovoltaic installations, and charging stations for electric vehicles at article 119.

The 2021 Budget Law then extends the tax deductions for the energy efficiency of buildings (Ecobonus) and the tax deductions for renovations (Home Bonus) to 31 December 2021, in relation to the expenses incurred from 1 January to 31 December 2021.

Programme for energy renovation of buildings owned by the central government (PREPAC)
The Interministerial Decree 16/9/2016 defines the implementing requirements of the Programme for energy renovation of buildings owned by the central government (PREPAC). The Program has the objective of making at least 3% of the useful area of the State's building stock more efficient per year.
The coordination and monitoring of the progress of the Program is entrusted to a control room composed of the Ministry of Economic Development and the Ministry of the Environment. (IEA, 2021).

Gender equality

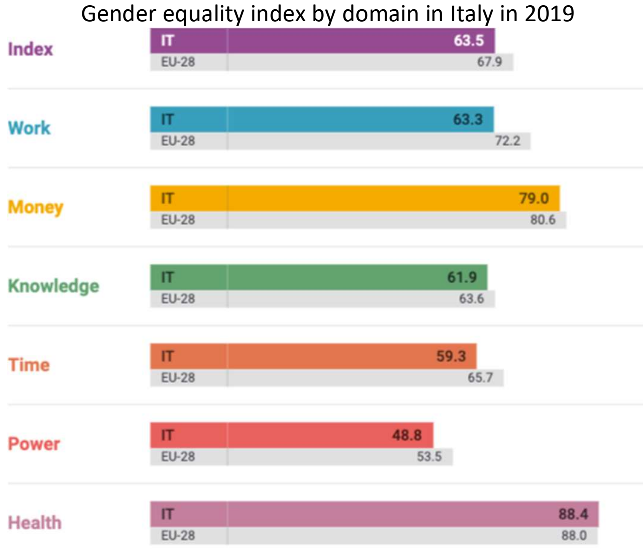
The general principle of equality between women and men is enshrined in Article 3 of the Italian Constitution.
Italy's progress in gender equality stemmed primarily from the need to adopt European Union (EU) directives and the use of European funds in which equal opportunities were a cross-cutting theme. Indeed, from 2000 onwards, gender mainstreaming actions and activities have been coordinated through European Social Funds (ESF) and European Regional Development Fund (ERDF) programmes.
While Italian legislation has made some progress, Italy still falls short of achieving satisfactory policy results and measures to ensure the implementation of gender mainstreaming remain weak (Eige,2021).

The National Code of Equal Opportunities between Women and Men was established with Legislative Decree no. 198 of 2006 and is considered the Italian legal framework on gender equality and women's emancipation. The Code brings together 11 laws on equal opportunities in a single text, in order to rationalize and harmonize the current legislative provisions on gender equality and regulate the promotion of equal opportunities between women and men in the areas of ethical, social and economic relations, and in civil and political rights. It also introduced the principle of gender mainstreaming, obliging the government to take the gender perspective into account.
Since there is no specific national strategy on gender mainstreaming, Italy relies on regional or sectoral good practices. Gender mainstreaming is widely addressed in policies funded by the European Structural and Investment Funds.
Italian legislative activity has mainly dealt with electoral laws and measures to address gender-based violence, provisions on motherhood and work-life balance. New policy interventions have focused on flexibility in the workplace (in both the public and private sectors) to improve work-life balance, while national guidelines for health services and hospitals seek to provide care and health care for women victims of violence. However, welfare and social policy initiatives remain unbalanced and the effect of gender inequality is linked to increasingly evident pension gaps.
There are policy measures that address specific issues (employment, education, health, violence against women, human trafficking, etc.) but they are framed in relation to specific target groups rather than taking a systematic approach to gender equality. Gender mainstreaming is applied inconsistently in the formulation and implementation of laws, regulations and programs in all ministries and decentralized government structures and is very rarely adopted to assess the impact of new laws and measures on gender equality (Eige,2021).

Gender equality index in Italy
Italy ranks 14th in the European Union on the Gender Equality Index with 63.5 out of 100 points, 4.4 points below the EU's score. The highest scores are in the domain of health (88.4 points) and money (79.0 points). Gender inequalities are most pronounced in the domains of power (48.8 points), time (59.3 points) and knowledge (61.9 points). In addition, Italy shows the lowest score in the domain of work (63.3 points) in the EU (Eige, 2020).

According to the European Institute for Gender Equality, the domains of power and knowledge increased their scores by 23.6 points and 8.1 points respectively since 2010 (2020).

Gender equality index by domain in Italy in 2019



Source: European Institute for Gender Equality, 2020

Results of the interviews
The interviewer reported that calls for funding programs (POR, PS, etc.) greatly promote female entrepreneurship also in the RHC sector. However, in the Emilia-Romagna region, in 2020, there were 84,456 female working units, compared to 314,533 male working units, and as regards the supply of electricity, gas, steam and air conditioning, there were 76 female and 729 male workers. There is still a long way to go and the pandemic in this regard does not facilitate this transition.

Financial framework

In Italy there are various mechanisms in place promoting renewable energy sources for heating and cooling. Currently the main national schemes promoting the thermal use of renewable energy sources are the White Certificates, the energy efficiency credits scheme, tax regulation system as well as the building obligation.
In 2005 Italy started its White Certificate Trading scheme. With this scheme Italy obligated its electricity and gas distribution companies to achieve end-use energy savings through energy efficiency improvement initiatives and projects. The mandatory quota set for suppliers of electricity and gas can be also reached through projects involving final users. The distributors may also fulfil their obligation by buying white certificates from other parties in the Energy Efficiency Certificates Market that is organized by the Electricity Market Administrator (GME). Each certificate is worth one tonne of oil equivalent (toe) saved. Since 2013 GSE (Gestore dei Servizi Energetici GSE S.p.A) provides the activities of management, evaluation and certification of the savings associated with energy efficiency projects under the white certificates schemes (www.gse.it).

In the following tables, the financial instruments provided by the state of the regions are summarised:

PROGRAMME	Conto termico 2.0 (Thermal account)
TARGET AREA	Italy
TYPE OF INSTRUMENT	Grant
OBJECTIVE AND SUPPORTED ACTIONS	The objective of the Conto termico is to incentivise actions aiming at increasing energy efficiency and the use of renewable energy by substituting old installations with new ones. Supported actions: • Substitution of an existing installation with a heat pump

	• Substitution of an existing installation with a biomass boiler • New installation solar thermal heating and cooling system
TECHNOLOGIES COVERED	Soral thermal, biomass, heat pump and integrated solutions
BENEFICIARIES	University, research centre, public authority, start-up, SME, mid-cap and large company, NGO, individuals and ESCOs
RESOURCES	900 million
TIMEFRAME	2016 – on going
WEBSITE	https://www.gse.it/servizi-per-te/efficienza-energetica/conto-termico

PROGRAMME	Fondo nazionale efficienza energetica (National Fund for Energy Efficiency)
TARGET AREA	Italy
TYPE OF INSTRUMENT	Loan and guarantee
OBJECTIVE AND SUPPORTED ACTIONS	This fund supports activities aiming at achieving the national energy efficiency targets, set in line with the Kyoto Protocol Building and construction of district heating and cooling systems.
TECHNOLOGIES COVERED	District heating and cooling
BENEFICIARIES	University, research centre, public authority, start-up, SME, mid-cap and large company, NGO and ESCOs
RESOURCES	EUR 310 million (30% as guarantee; 70% as a subsidised loan of 0,25%)
TIMEFRAME	2017 – on going
WEBSITE	https://www.invitalia.it/cosa-facciamo/rafforziamo-le-imprese/fnee

PROGRAMME	Fondo per la crescita sostenibile (Sustainable Development Fund)
TARGET AREA	Italy
TYPE OF INSTRUMENT	Loan
OBJECTIVE AND SUPPORTED ACTIONS	To support experimental research and activities • o support pilot projects, demonstrators and prototypes in areas of strategic interest for the country • To acquire new knowledge with a view to developing new products, and processes • To facilitate internationalisation
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration, integrated solutions
BENEFICIARIES	Research centre, start-up, SME, mid-cap and large company
RESOURCES	N/A
TIMEFRAME	2021-2027
WEBSITE	https://www.mise.gov.it/index.php/it/incentivi/impresa/fondo-per-la-crescita-sostenibile

PROGRAMME	Fondo nazionale per l'innovazione (National Innovation Fund)
TARGET AREA	Italy
TYPE OF INSTRUMENT	Venture capital
OBJECTIVE AND SUPPORTED ACTIONS	To support development of highly innovative companies Strategic investments in innovative start-up, scale-up and SMEs, as well as in capital (Green tech amongst other areas)
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration, integrated solutions
BENEFICIARIES	Start-up and SME
RESOURCES	EUR 1 billion (covering several areas, not only energy)
TIMEFRAME	2019- 2021
WEBSITE	https://www.mise.gov.it/index.php/it/incentivi/impresa/fondo-nazionale-innovazione

PROGRAMME	Programma Operativo Nazionale (PON) Ricerca e Innovazione 2014- 2020
TARGET AREA	Italy
TYPE OF INSTRUMENT	Grant
OBJECTIVE AND SUPPORTED ACTIONS	The objective of this fund is to increase the competitiveness and innovation potential of regions in the South of Italy by creating opportunities for local development; by fostering the creation of innovation labs; by strengthening cooperation between business, research and academia; by supporting new skills and expertise
TECHNOLOGIES COVERED	Geothermal, soral thermal, biomass, district heating and cooling, heat pump, thermal energy storage, cogeneration, integrated solutions
BENEFICIARIES	University, research centre, public authority, start-up, SME, mid-cap and large company, NGO and ESCOs
RESOURCES	N/A
TIMEFRAME	2021 - 2027
WEBSITE	http://www.ponricerca.gov.it/notizie/2020/programma-nazionale-per-la-ricerca-2021-2027-aperta-la-consultazione-pubblica/

PROGRAMME	Tax regulation mechanism
TARGET AREA	Italy
TYPE OF INSTRUMENT	Tax deduction
OBJECTIVE AND SUPPORTED ACTIONS	This scheme allows for a 65% tax deduction ("detrazione") for expenses related to energy efficiency measures including the installation of RES-H technologies, such as Heat Pums or solar thermal collectors (Art. 14 DL 4/6/2013 Art. 1, c. 344 – 347, l. 296/06). The installation of heat generators fueled by combustible biomass is deducted by 50% since 2017 (-Art. 3, par. 4 L 205/17). In the case of private individuals, this disposition is valid for works undertaken up to 31 December 2018 and in the case of common buildings the disposition is valid up to 31 December 2021 (Art. 1, c. 48, L 220/10 in conjunction with Art. 14 DL 4/6/2013 and with Art. 1.2, par.a.1 and 2 L 232/16). For energetic requalification works aimed at improving the winter and summer energy performance of common buildings, the tax deduction will amount to 70% or 75% and works can be undertaken between 1st January 2017 and 31 December 2021 (Art. 1.2, par. a.3 L 232/16).
TECHNOLOGIES COVERED	Biomass, aerothermal, geothermal and solar thermal
BENEFICIARIES	Any party installing eligible plants.
RESOURCES	N/A
TIMEFRAME	N/A
WEBSITE	https://www.agenziaentrate.gov.it/portale/web/english/nse/

PROGRAMME	Super Ecobonus 110%
TARGET AREA	Italy
TYPE OF INSTRUMENT	Tax deductions The beneficiary of the deduction has the possibility to: • irectly access the deduction, thus paying the full amount of the work and receiving 110% of the admitted sums deferred over 5 years; • eceive directly from the person carrying out the interventions a discount on the invoice equal to 110% of the amount of the works supported. The latter will benefit from the deduction in 5 years; • ransfer the credit to a third party, including financial or insurance, by paying a reduced amount for the work, equal to the discounting of the portion sold at year zero. The latter will benefit from the deduction in 5 years.

	Not only the expenses covered by the Superbonus, but also other tax deductions due (according to other existing mechanisms) on works carried out on the property are admitted to the transfer of credit or invoices.
OBJECTIVE AND SUPPORTED ACTIONS	The Superbonus is an instrument activated to rapidly relaunch the construction sector and respond to the important climatic and environmental challenges envisaged for the civil sector by the National Integrated Energy and Climate Plan. The bonus provides for a 110% deduction for expenses incurred by 30 June 2022 (i.e. by 31 December 2022 and 30 June 2023 for specific cases), to be divided into 5 years, within the maximum limit of predefined variable deduction values depending on the size of the building and the type of intervention.
TECHNOLOGIES COVERED	Actions admitted: interventions are subdivided into priority (*trainanti*) and secondary (*trainati*), the latter can be carried out only if jointly with the former. The primary energetic interventions concern thermal insulation and replacement of air conditioning systems; the secondary ones are related to the installation of building automation systems, fixtures, sunshades, heat pump water heaters, architectural barriers, photovoltaic systems with storage systems, infrastructures for charging electric vehicles.
BENEFICIARIES	Natural persons, condominiums, autonomous institutions, public housing or similar entities, housing cooperatives with undivided ownership, non-profit organizations of social utility, associations, and amateur sports clubs
RESOURCES	N/A
TIMEFRAME	Until 2022
WEBSITE	https://www.mise.gov.it/index.php/it/incentivi/energia/superbonus-110

PROGRAMME	Ecobonus
TARGET AREA	Italy
TYPE OF INSTRUMENT	Incentives with 65% and 50% tax credit
OBJECTIVE AND SUPPORTED ACTIONS	For the energy requalification interventions carried out in the single real estate units, differentiated deduction rates are envisaged based on the intervention carried out, in order to better link the economic benefit to the achievable energy savings. For energy redevelopment interventions carried out in the common parts of condominium buildings, up to a deduction of 70% is reached.
TECHNOLOGIES COVERED	Soral thermal, biomass, heat pump, integrated solutions
BENEFICIARIES	
RESOURCES	N/A
TIMEFRAME	2020 - 2022
WEBSITE	https://www.efficienzaenergetica.enea.it/detrazioni-fiscali/ecobonus.html

Social and cultural framework

According to a survey on a sample of a thousand people in November 2020, 78% of Italians think that the future lies in renewables, over 90% are worried about climate change, solar plants are preferred on roofs and wind farms offshore at sea, hydrogen is the choice for the future and as many as 68% believe that polluted air will increase the spread and lethality of Covid-19.

The data of the report attest to the great favour of Italians towards renewable energy: as many as 85% of the interviewees believe that the country, thinking about the future, should focus on solar, 63% on wind and are only around 5% supporters of nuclear power, while those of fossil fuels drop to 4%. 78% of Italians are certain that the energy market of the future will go towards renewables (+ 6% compared to the previous survey). Among other results, it emerges that the majority of respondents are ready to install photovoltaic panels if self-consumption is facilitated and bureaucracy and obstacles are eliminated. However, 70%

believe it is technically complex (+ 20% compared to the previous survey) and expensive and difficult to manage (+ 26%) (QualEnergia, 2020).

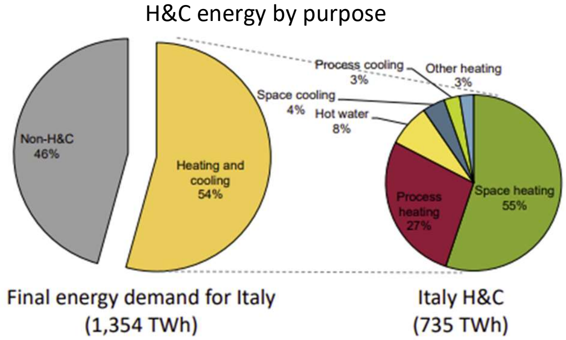
Despite the support for green policies, there are still many groups that oppose the construction of plants for the production of renewable energy. The negative effects that concern these groups are related to the environmental and health impact.
According to the Nimby Forum Observatory, 317 plants were blocked in Italy in 2017 compared to 359 in 2016, down by 11.7% (Agi, 2018).
Again, according to the Observatory, this trend also derives from the lack of information, involvement and participation on the part of public and private project promoters throughout the country (Agi, 2018).

Market conditions

In 2018, RES in Italy found wide diffusion in all sectors of use: thermal (10.7 Mtoe, equal to 19% of the sector total), electricity (9.7 Mtoe, 34% of the sector total) and transport (1 , 25 Mtoe of biofuels; the sectoral share, calculated by applying the criteria of Directive 2009/28 / EC which consider bonuses and electricity, is equal to 7.7%). In particular, in the electricity sector the source that in 2018 provided the main contribution to the production of energy from RES is the hydraulic one (42% of total production, considering the normalized figure); followed by solar photovoltaics (20%), bioenergy (17%), wind (16%, considering the normalized data) and geothermal energy (5%). In the thermal sector, on the other hand, the main sources are solid biomass (about 7 Mtoe, without considering the biodegradable fraction of waste), used mainly in the domestic sector in the form of firewood or pellets, and heat pumps (2.6 Mtoe). In the transport sector, the main contribution is provided by biofuels (GSE, 2020)

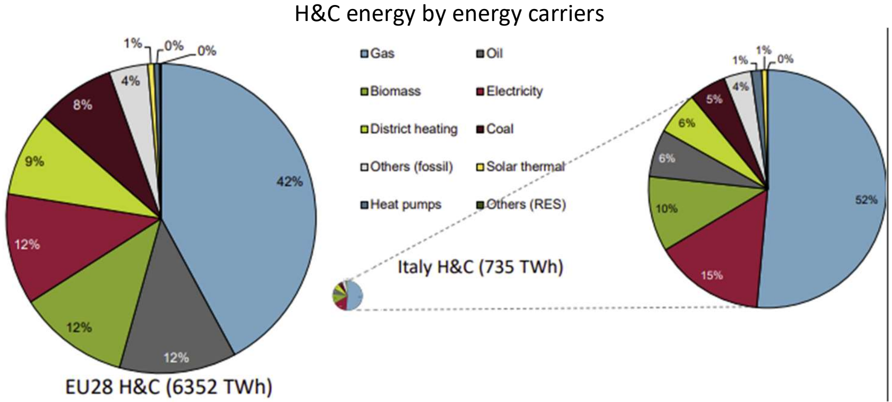
In 2017, H&C comprises 54% of Italy's Final energy demand. Italy has low cooling process needs, but very high need for space and process heating. Italy accounts for 12% of the EU28's total delivered H&C demand and compared to the EU28, it uses more gas and electricity, but less oil, coal and district heating.

H&C energy by purpose



Source: Heat road map, 2017

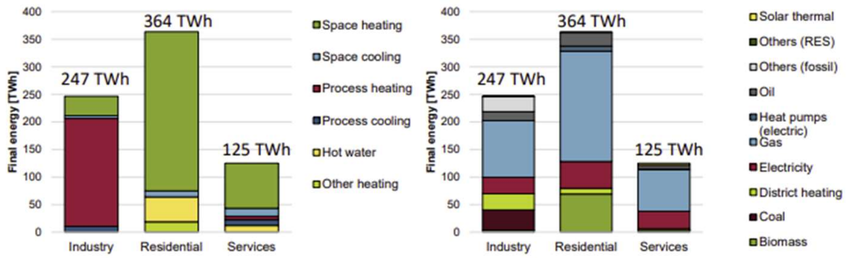
H&C energy by energy carriers



Source: Heat road map, 2017

Italian industries are overwhelmingly dominated by process heating, other sectors by space heating. Italian industry, residential and service sectors use a varied mix of fuels. Italian households use some biomass

Sectors by purposes and energy carriers



Source: Heat road map, 2017

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Norway

Legislative and policy framework

Renewable heating and cooling

The Nordic countries all have very ambitious national policies to reduce emissions and energy use, and the importance of heating sector is recognized in the national strategies and is rolled out also in the counties. These kinds of national strategies are starkly considering the local resources and possible solutions serve as important measures to promote the decarbonisation targets.

The key Norwegian energy and climate targets are:

- Oil ban on residential buildings heating from 2020;
- GHG emissions cut 40% by 2030;
- Low emission society by 2050.

The EUs climate and energy ambitions for 2020 and 2030 is EEA relevant, and therefor impacts Norwegian climate and energy policies directly. However, as Norway is not an EU member the process of assessing the EEA relevance and incorporating EU regulation into national laws is usually a slower process compared to that of EU member countries.

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.

National Renewable Energy Action Plan

Under the EU Directive 2009/28/EC member countries of the European Union are obliged to draft and submit to the European Commission National Renewable Action Plans (NREAPs) outlining pathway which will allow them to meet their 2020 renewable energy, energy efficiency and GHG cuts targets. Norway has adopted the RES Directive as part of the EEA agreement. Norway submitted its National Action Plan in June 2012. Norway 2020 renewable energy targets:

- Overall target: 67.5% of share of energy generated from renewable sources in gross final energy consumption;
- Heating and cooling: 43% of heat consumption met by renewable sources;
- Electricity: 114% of electricity demand met by electricity generated from renewable energy sources;
- Transport: 10% of energy demand met by renewable energy sources.

The Green certificates scheme that Norway has implemented together with Sweden is the main measure to achieve the target (IEA,2021).

Energy Act

The purpose of the 1990 Energy Act is to ensure that energy is generated, converted, transmitted, traded, distributed and used rationally and in the best interests of society. The Act provides a framework for competition in electricity generation and trading. The development and operation of the grid is a natural monopoly, and the Act provides the legal basis for regulating the grid companies. The Energy Act also regulates marketplaces for trade in electrical energy, cross-border interconnectors, district heating facilities, responsibility for system operation, electricity supply quality, energy planning and contingency planning for power supplies.

Developers must apply for licences under the Energy Act to construct wind farms and high-voltage power lines. Distribution grid companies can obtain general local area licences (Norwegian Ministry of Petroleum and Energy, 2019a).

The Renewable Energy Directive

The Renewable Energy Directive (2009/28/EC) establishes a common framework for the promotion of energy from renewable energy sources and was incorporated into the EEA Agreement in 2011. It applies to electricity, heating and cooling and transport, while the 2001 directive only includes electricity. Norway's objective stems from a decision of the EEA Joint Committee. In 2020 Norway intends to cover 67.5% of final energy consumption with energy from renewable sources. (Norwegian Ministry of Petroleum and Energy, 2018).

The Energy Performance of Buildings Directive

The Energy Performance of Buildings Directive (2002/91/EC) was incorporated into the EEA Agreement on 23 April 2004. It defines a common methodology for calculating the energy performance of buildings and requires member states to set national requirements for the energy performance of new and renovated buildings. It includes provisions on energy performance certificates for new and existing buildings and on the inspection of air-conditioning and heating systems above a certain capacity. In December 2009, Norway adopted national regulations implementing the Directive's requirements for energy performance certificates for buildings. From 1 July 2010, it has been mandatory in Norway to hold an energy performance certificate whenever a building is constructed, sold or rented out (Norwegian Ministry of Petroleum and Energy, 2018).

The CHP Directive

The CHP Directive (2004/8/EC) on the promotion of cogeneration based on a useful heat demand in the internal energy market was incorporated into the EEA Agreement on 8 December 2006. The Directive aims to improve energy efficiency and security of supply by promoting highly efficient combined heat and power generation (cogeneration or CHP) where there is a useful heat demand. The Directive has been incorporated into Norwegian law through the Energy Act and the 2007 regulations relating to guarantees of origin for generation of electrical energy (Norwegian Ministry of Petroleum and Energy, 2018).

Oslo's Climate and Energy Strategy is a Paris Agreement-compatible Climate Action Plan setting ambitious targets to cut greenhouse gas emissions in half by 2020, and by 95% by 2030, from the 1990 level.
The target set was 100% renewable energy target in public transport and heating by 2020 and reducing CO2 emissions by 50% below 1991 level by 2030 and become carbon neutral in 2050.
Of the 16 initiatives in the Climate and Energy Strategy of Oslo region, there are 4 related to the heating and cooling sector:

- **Nr.9 The use of fossil fuels** for heating shall be phased out in Oslo in 2020 and replaced by renewable sources of energy for heating.
- **Nr.10 The City of Oslo** shall work to reduce energy consumption in buildings by 1.5 TWh by 2020. This reduction will be achieved through national and local measures.
  New, renewable and more robust energy systems. The use of fossil heating oil in buildings and the waste-to-energy plant at Klemetsrud are major greenhouse gas emission sources in Oslo. The plan is to completely phase out these emissions by 2020. At the same time, the conversion of Oslo's energy system will help to increase security of supply and reinforce efficient and smart use of available energy.
- **Nr.11 An overall plan** for using water as an energy carrier, comprising both heating and cooling, shall be established for Oslo within 2020.
- **Nr.15** Oslo shall work closely with citizens, businesses, knowledge institutions, organisations and other public authorities to develop and implement good climate solutions.

Gender equality

CEDAW

The Optional Protocol to the UN Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) was adopted on 6 October 1999 and ratified by Norway on 5 March 2002. CEDAW became part of Norwegian law when the former Gender Equality Act was passed. On 19 June 2009, the convention was incorporated into the Human Rights Act and has thus been given precedence over other Norwegian legislation (Gender in Norway, 2021).

The Equality and Anti-Discrimination Act

The right not to be discriminated against on the basis of gender is a human right which is enshrined in a number of conventions. The Act relating to equality and a prohibition against discrimination (the Equality and Anti-Discrimination Act) entered into force on 1 January 2018.

The Equality and Anti-Discrimination Act provides protection against discrimination on the basis of gender, pregnancy, leave in connection with birth or adoption and care responsibilities. The Act's purpose is to promote gender equality. Women and men are to be given equal opportunities in education and work, and in their cultural and professional development. The act requires employers, the social partners and public authorities to engage actively in equality efforts.

Equality and Anti-Discrimination Ombud Act

A new Act relating to the Equality and Anti-Discrimination Ombud and the Anti-Discrimination Tribunal (the Equality and Anti-Discrimination Ombud Act) entered into force on 1 January 2018. The act strengthened the Equality and Anti-Discrimination Ombud’s role as a promoter of equality and strengthened enforcement of anti-discrimination legislation through the establishment of the Anti-Discrimination Tribunal.

The Ombud for Equality and Combating Discrimination has the task of promoting equality and preventing discrimination on the basis of gender in all sectors of society. Anyone can contact the Ombud for guidance on equality and anti-discrimination legislation. The Ombud monitors compliance by the authorities with the UN conventions on fundamental human rights. The Anti-Discrimination Tribunal hears complaints against legal violations. The court is empowered to order compensation in business cases and to award compensation in certain types of cases.

The Minister of Culture and Equality makes an annual statement on the progress of efforts to promote equality and diversity in all sectors.

Integration of equality

A key policy strategy for equality is to integrate the equality perspective into all policy developments at central, regional and local level. Efforts at the central level are also influenced by the strategy of sectoral responsibility for equality, which makes each ministry responsible for equality in its own field. The Ministry of Culture is also responsible for coordinating the equality policy.

Key tools for integrating equality include the activity and reporting obligations set out in the equality and anti-discrimination legislation and the Instructions for Studies and Official Reports (Ministry of Culture, 2020).

The importance of gender sensitivity in the energy sector has been identified as one of the five priority areas within the Norwegian action plan for women's rights and gender equality. The plan also aims to take action to ensure that both women and men participate at all levels in the management of natural resources in partner countries, to contribute to the creation of jobs for women and men and to promote the active participation of women in the processes decision-making and implementation (Eige, 2021).

Two interesting networks concerning women and renewable energies have been reported:

- Kraftkvinnene network was established in March 2019 and has many members from various companies. The network is for all women in the renewable energy industry, from all disciplines and business areas in the energy companies and associated actors such as suppliers, advisory environments and authorities / administration.
- NEEN – Nordic Energy Equality Network. The network promotes gender diversity and empowerment of women. It also promotes solutions for an inclusive sustainable energy transition.

According to the interviewee, women´s employment in the STEM sector in Norway was around 14% in 2010 and after some years of systematic work of the Norwegian STEM Alliance[3] at 44% on a national average in 2020.
When it comes to the percentage of women employed in the RHC sector in Norway the level is at present 21% in 2020, however among the engineers only 11%. It is, however, important to mention that while among men 14% have four or more years of university education, 21% of the women have a university degree or min. 4 years university education. This in the long run can be a huge advantage.
She also pointed out that the increase in the number of women employed in business/public administration dealing with RHC has been small, but steady in the last 5 years.

The interviewee also reported that according to the Gender Responsive Public Financial Management Assessment carried out in Norway by Norwegian Agency for Development Cooperation in 2020, explicit expressions and visibility of the gender equality dimensions in management systems are also needed in Norway and to strengthen gender mainstreaming in the budget process.
This is even though public authorities have a specific statutory responsibility to ensure that legislation and policy instruments facilitate equality and Norwegian "equality policies" are integrated into the Norwegian welfare system.

In her point of view, stereotypes and biases are gradually decreasing, at the same time the self-esteem of women starting their career in the energy sector is improving. Women´s networking is also more organized and effective: in 2019 KraftKvinnene – PowerWomen was launched and among its initiative PowerWomen of the Year are annually selected to provide role models for the next generations.

Financial framework

Enova SF is a state enterprise owned by the Ministry of Climate and Environment. Established in 2001, its task is to promote a shift towards more environmentally friendly energy consumption and production, as well as the development of energy and climate technology. Enova's activities should strengthen energy security of supply as well as reducing greenhouse gas emissions. With the transport sector being added to Enova's areas of responsibility in 2015, Enova's activities now cover the majority of energy use and GHG emissions in Norway.
A series of funding schemes promoted by Enova are listed below:

Investment aid for new Passive Houses and Low Energy Buildings (2012)
Enova offers investment aid anyone who wants to build or rehabilitate buildings to a higher standard than what is required by the Technical regulation for buildings, and it is currently aimed at low-energy buildings and passive houses (IEA, 2021).

Renewable heat production
Enova offers investment aid to renewable heat production, which shall contribute to increased use of other energy carriers than electricity, natural gas and oil for heating. Enova has support programmes in place aimed at small heating plants and larger district heating plants. Enova also has a support programme directed towards industrial production of biogas.

Climate and Energy Fund/Enova (Residential buildings)
Enova offers subsidies for energy efficient and climate friendly technologies to owners of residential buildings. Enova SF is a state enterprise owned by the Norwegian government (Ministry of Climate and the Environment). It is an important energy and climate policy instrument, which contributes to lasting marked

[3] The Norwegian STEM Alliance received in 2018 the World́s Best Award for Girls and Technology in STEM, from the International Partnership Network, USA.

changes, and supports development and deployment of more energy and climate efficient technologies. Enova SF is financed through the Climate and Energy Fund.

Energy Efficient District Heating and Cooling Scheme
Enova has been providing district heating subsidy programs since 2002 which aim to create greater investments in district heating infrastructure and production based on renewable energy, waste heat and heat pumps.

Enova's subsidy programme for local heating plants
Enova has had grant programs for small heating systems since 2008. The grants affect property owners, industrial companies and suppliers of heating systems. Enova's goal is to create greater investments in local energy plants based on renewable energy, heat pumps and waste heat.

The need to use heat pumps and electric boilers has been identified in Norway as well. The electricity tax for electricity used in energy production and in district heating and cooling production is reduced from the original[4]. There is also a tax deduction 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.

In addition, there are other funding schemes provided by different other entities:

Financing Renewable Energy projects in Norway
Through the Ministry of Foreign Affairs, the Norwegian government supports the Private Financing Advisory Network (PFAN), a programme hosted by UNIDO and The Renewable Energy and Energy Efficiency Partnership (REEEP).
The Renewable Energy and Energy Efficiency Partnership (REEEP) develops innovative, efficient financing mechanisms to advance market readiness for clean energy services in low- and middle-income countries.
REEEP designs and implements tailor-made financing mechanisms, utilising targeted injections of public funding to build dynamic, sustainable markets and ultimately make clean energy and energy efficiency technology accessible and affordable to all. REEEP invests primarily in disruptive approaches led by small- and medium-sized enterprise (SME) players in low- and middle-income countries, facilitating market- and community-led energy transitions (REEEP, 2021)

United Future Lab Norway is part of the UN's smart city program United for Smart Sustainable Cities implementation program. The lab is located in the heart of the competence cluster at Sunnmøre, at NTNU Campus Ålesund, Norwegian Maritime Competence Center (NMK) (United Future Lab in Norway, 2021).

Norfund is the Norwegian Investment Fund for developing countries focusing on four areas: Clean Energy, Financial Institutions, Green Infrastructure and Scaleable Enterprises. Its mission is to create jobs and to improve lives by investing in businesses that drive sustainable development.
Norfund is owned and funded by the Norwegian Government and is the Government´s most important tool for strengthening the private sector in developing countries, and for reducing poverty. (Norfund, 2021)

Social and cultural framework

From a case study on 'prosuming' in Italy, Norway, Serbia, the UK and Ukraine, it emerges that in Norway the main reasons that led people to install Household Solar Power Plants (HSPP) are related to environmental aspects. Second, they argue that this type of solution entails greater assurance that the sources of supply are actually sustainable and controlled. Furthermore, they have been very interested in the technological aspects of producing solar electricity in their own home.

[4] 16.32 øre per kWh to 0.48 øre per kWh in 2017 (Skatteetaten, 2017).

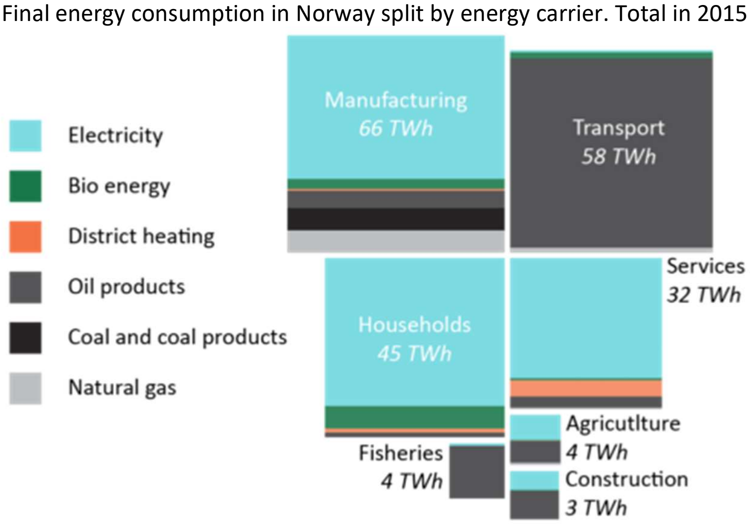
A third important factor mentioned as motivation to invest in Household Solar Power Plants (HSPP) are the economic aspects. The initial costs of installing an HSPP are high in Norway but many respondents highlighted the long-term investment perspective. They also argued that the panels last a long time and that electricity consumption and prices are likely to increase in the future. Because many of the prosumers surveyed had either purchased solar panels at discounted prices in the workplace or had the experience to install the panels themselves, they could reduce costs and the payback period. All prosumers had also benefited from subsidy schemes from Enova or the Oslo municipality (Enable.EU, 2016).
The research points out that although the decision to invest in a solar system was made jointly, it is almost exclusively men who lead the process of becoming a prosumer. With the exception of the two women who work in the energy sector, it was the men who brought investments in solar systems to the agenda, who took care of the practical and bureaucratic aspects (Enable.EU, 2016).

Market conditions

Norway, with its vast hydro power resources, utilises high share of electricity in heating and increases the electricity based on renewable hydropower.
According to the interviewee, a common factor in the Nordic countries is the rather liberal and open markets and a quite strong position of the consumer in choosing of heating and cooling systems and solutions.
The district heating market has grown rapidly due to new waste to energy plants. There is in some cases obligation to connect with regulated prices, and in some cases no obligation and no price regulation. Heat prices are generally capped based on electric heating.

Norway has a share of renewable energy that is much higher than in all EU countries and the use of fossil fuels in the buildings is extremely small. In 2011, renewable electricity production was about 124 TWh (Norwegian Ministry of Petroleum and Energy, 2019).
Electricity accounts for a large proportion of energy use in Norway. There is a large energy-intensive manufacturing sector, and electricity is widely used to heat buildings and water.
In 2017, final energy consumption in Norway totalled 213 TWh. As the figure below shows, manufacturing and transport were the sectors that used most energy in 2015, followed by services and households. Other sectors such as construction, agriculture and forestry and fisheries accounted for only a small proportion of energy use. This pattern has not changed much since 1990, although total energy use has risen in this period.

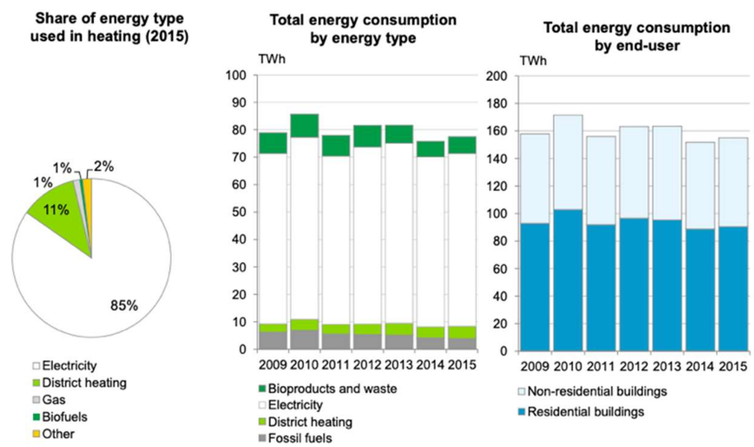
Final energy consumption in Norway split by energy carrier. Total in 2015



Source: Norwegian Ministry of Petroleum and Energy, 2019

The figure shows that electricity is the dominant energy carrier, followed by petroleum products. Electricity dominates energy use in manufacturing, the household sector and the service industry, while petroleum products account for a large percentage of energy use in sectors that make heavy use of transport and machinery. District heating and natural gas account for only a small part of energy consumption, but it has increased in recent years. The consumption of district heating has increased, particularly in the service industries and households, while there has been an increase in the use of gas in the manufacturing industries and in the transport sector. These energy carriers have replaced fuel oil for heating and coal, coke and heavier petroleum products in industrial processes (Norwegian Ministry of Petroleum and Energy, 2019).
Electricity is the dominant source of energy for heating and hot water in the residential and services sectors, and data collection from ENOVA estimated that 85% of space heating was based on electricity in 2015, and in 2012 over 90% of residential housing have access to heating from electrical ovens and heating cables (Nordic Council of Ministries, 2017).

Total energy consumption in the Norwegian residential and service sectors (2009–2015)



Source: SSB, Enova: Byggstatistikk 2015.

Source: Nordic Council of Ministries, 2017. Data following from Enova: Byggstatistikk 2015.

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Slovakia

Legislative and policy framework

Renewable heating and cooling

National Renewable Action Plans (NREAPs)

Under the EU Directive 2009/28/EC member countries of the European Union are obliged to draft and submit to the European Commission National Renewable Action Plans (NREAPs) outlining pathway which will allow them to meet their 2020 renewable energy, energy efficiency and GHG cuts targets.

Slovakia 2020 renewable energy targets:

- **Overall target**: 10% of share of energy generated from renewable sources in gross final energy consumption;
- **Heating and cooling**: 14.6% of heat consumption met by renewable sources;
- **Electricity**: 24% of electricity demand met by electricity generated from renewable energy sources;
- **Transport**: 10% of energy demand met by renewable energy sources (IEA, 2021).

Slovakia's **final National Energy and Climate Plan (NECP)** raises the target for the renewables share by year 2030 to 19.2% compared to 18% proposed in its draft NECP. The 19.2% target share still falls short by a wide gap of 4.8%, compared to the share indicated in the Regulation. The bulk of the 19.2% renewables is to be accounted for by solid biomass and biogas/biomethane with modest contributions from wind and solar. To achieve the 19.2% target, Slovakia has enumerated a spate of existing and additional policies and measures, such as e.g. (Government of Slovakia, 2019):

- Stimulating distributed RES-E generation and self-generation for households electricity and heating needs
- Support for the renovation of district heating pipes
- Support for the introduction of low-power electricity and heat generation installations in family houses and apartment buildings
- Creation of a support mechanism to increase the RES share in the heating sector and in district heating systems, also through generation from RES in high-efficiency cogeneration. Integration of RES in the form of biomethane mainly derived from plant and animal production waste, the biodegradable part of municipal waste, biodegradable kitchen and restaurant waste, and waste water treatment plant waste. Introduction of a RES quota obligation for district heating systems
- Support for biomethane and hydrogen production
- Support for recovery of bio residues and waste heat (EurObserv'ER, 2020).

Renewable Energy Act (Act 309/2009 on Promotion of Renewable Energy Sources and High-efficiency Cogeneration and on amendments to certain acts)

The law is the main tool to support the generation of renewable electricity. Defines specific options for supporting renewable electricity, including the guaranteed purchase price period. Over the years, Slovakia has revised its feed-in tariffs for solar energy after witnessing an unexpected "solar boom" in early 2011.

Feed-in tariffs are limited to plants producing electricity from renewable energy sources or CHP with installed capacity up to 5 MW (15 MW in the case of wind energy). The feed-in tariff and other support are provided to electricity producers for 15 years from the commissioning of the plant or its renovation.

Act No 555/2005 Coll. on Energy efficiency certification of buildings

The Law is the main instrument to reduce GHG emissions from buildings up to 2020. It defines measures that lead to the improvement of energy efficiency in buildings with the aim of optimizing the internal conditions in buildings and reducing CO2 emissions emitted by maintenance of buildings. It also establishes the respective competences of public authorities.

The law regulates energy performance certificates (EPCs) for buildings. Buildings that are obliged to provide an energy performance certificate and an energy efficiency label include public buildings with a total area of more than 250 m² used by a public authority and frequently visited by the public. Energy certification is required for buildings that are sold or rented to a new tenant, as well as all new buildings or all buildings that have undergone major renovations (Climate Laws, 2021).

Act on Energy (Act no. 656/2005)

The 2005 Act on Energy governs the conditions for conducting business in the energy sector, access to the market, rights and obligations of market participants in the energy sector etc. Those operating in the sector are bound by obligations in the general economic interest, which means ensuring, in particular:

- The security of the electricity system or gas system, including the regularity, quality, and price of electricity and gas supplies, environmental protection and energy efficiency;
- Preferential access to the system for the supply of electricity generated from renewable energy sources and electricity generated from domestic coal;
- The use of renewable energy sources, combined heat and power, and domestic coal for the generation of electricity; and
- Environmental protection (IEA, 2021).

Act No. 314 / 2012 Coll. on Regular Inspections of Boilers, Heating Systems and Air-conditioning Systems as amended

Law no. 314/2012 Coll. on periodic inspections of boilers, heating and air-conditioning systems, defines the procedures and establishes the intervals for periodic inspection of boilers, one-time inspection of heating systems and inspection of air-conditioning systems. The law also defines the professional competence for such inspections. Implements Directive 2010/31 / Eu (EPBD) aimed at improving the energy efficiency of buildings. The law establishes the inspection procedure, the duties of the building owner, the frequency of the various regular inspections, the content of the inspection report, the examination procedure of the professional appraisal, the surveillance mechanisms and sanctions (IEA, 2021) .

Training programmes for Installers

The certification of RES installers applies to installers of boilers and furnaces for biomass, PV and solar thermal installations, shallow geothermal plants and heat pumps (§ 13a par. 2 RES Act Letter a-d in conjunction with § 2 par. 1 Letter a-c Decree No. 133/2012).

The certificate can be acquired through the recognition of professional experience and the successful completion of an exam (§ 2 and § 3 Decree No. 133/2012). The professional experience is demonstrated by at least one year of work experience in the energy sector. Following the professional training, a final examination consisting of a practical and theoretical part may be completed before an examining board established by the Ministry of Economy (§ 4 Decree No. 133/2012) (Res Legal, 2019).

Gender equality

The Slovak Constitution establishes equality between human beings in dignity and rights, as well as prohibiting discrimination based on sex (Article 12).

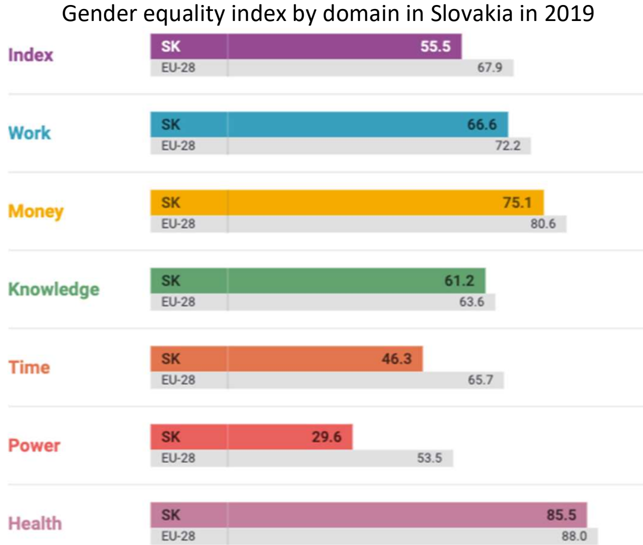
Although Slovakia made a commitment to gender equality in the early 1990s (in particular under the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW) and the Declaration and Platform of Beijing action, BPfA), gender equality policies were further developed during the EU accession negotiations and the transposition of the European directives on equality. In 2001, the concept of equal opportunities for women and men was also adopted, referring to gender mainstreaming as an approach to addressing gender inequality.

The 2007-2013 National Strategy for Gender Equality promoted a dual approach, combining positive action and gender mainstreaming. This was the first document in Slovakia to provide a definition of gender mainstreaming and to include measures that address the structural aspects of gender inequality. In 2010, the National Action Plan for Gender Equality for the years 2010-2013 was adopted by the government with the aim of translating the existing strategy into concrete measures.

Although there is no legal basis for gender mainstreaming at national level, there is a binding political commitment. The National Strategy on Gender Equality for 2014–2019 provides the only framework for gender mainstreaming and envisages it as the main policy method in the area of gender equality. The Strategy emphasizes the need for a two-pronged approach, combining a horizontal commitment to include a gender dimension (gender mainstreaming) with specific supports in areas where some disadvantages are most evident for those groups. As the Strategy was adopted by the government, it represents a binding commitment. However, the implementation infrastructure for gender mainstreaming is lacking.
The national strategy on gender equality is further developed in specific measures by the action plan on gender equality for the years 2014-2019. The Action Plan assigns responsibilities, deadlines and financial resources for each task but does not include indicators to support and measure the implementation of the objectives. Despite the fact that gender mainstreaming and affirmative actions are perceived as the core principles of policy documents, gender mainstreaming methods are stipulated on a limited level and in many cases refer to the European Structural Funds (ESF) rather than national policy making processes (Eige, 2020a)

Gender equality index in Slovakia
With a total score of 55.5 points, Slovakia ranks 25th in the EU on the Gender Equality Index, 12.4 points below the EU's score.
Concerning the domains, the highest scores can be witnessed in the domains of health (85.5 points) and money (75.1 points). Slovakia shows poor performance in the domains of power (29.6 points, 23.9 points below the EU's score), time (46.3 points, 19,4 points below the EU's score) and knowledge (61.2 points) (Eige, 2020).

Gender equality index by domain in Slovakia in 2019



Source: European Institute for Gender Equality, 2020

Results of the interviews
According to the interviewee there are fewer women in the energy sector especially in the academic world and in the decision-making process, but mainly due to the lack of interest in this sector. While a second interviewee reports that in both the state and public sector, female representation is high even though she

perceives a lower presence in high decision-making positions, both at the state and public administration level, and in the private sector.
The interviewee does not perceive problems of acceptance of women in terms of equality in business or in representation in the public administration. From her point of view, women's lack of interest in participating in complex decision-making, rather than gender equality, is a cause of less representation of women in top and decision-making positions.
The interviewee also pointed out that she is not aware of many women interested in this sector and expressed doubts about the interest in greater involvement. Women seem to focus on environmental protection or are represented in sectors such as architecture and help ensure RES implementation through this sector.
Despite the progress, according to the interviewee, women are at a disadvantage compared to men, especially during maternity leave.

One of the interviewees reported the preparation of the Recovery Plan among the initiatives of interest. Where the State Secretary of State of the Ministry of Transport and Construction actively participated in the discussions on the subject of heating and cooling from RES and is also constantly engaged on this issue.

Financial framework

For the promotion of renewable heat successfully applying developers of renewable heat producing projects an investment subsidy instrument is available from the Operational Programme Quality of Environment, 85% co-funded by the ERDF. RES-H building obligations foster renewable heat and roof-top PV. A professional training programme is available to RES-installers (EurObserv'ER, 2020).

In the following tables, the financial instruments provided by the state of the regions are summarised:

PROGRAMME	Operational Program Environmental Quality
TARGET AREA	Slovakia
OBJECTIVE AND SUPPORTED ACTIONS	The role of the Slovak Innovation and Energy Agency is to implement measures aimed at the transition to a low-carbon economy by using renewable energy sources and improving energy efficiency within the Operational Program Environmental Quality managed by the Ministry of the Environment of the Slovak Republic in 2014-2020. In total, almost € 940 million is earmarked for this purpose. The measures are divided into five investment priorities: • Support for the production and distribution of energy from renewable sources. (RES) Promoting energy efficiency and the use of energy from renewable sources in businesses. (ENTERPRISES) • Promoting energy efficiency and the use of energy from renewable sources in public infrastructures, including use in public buildings. (BUILDINGS) • Promoting low-carbon strategies for all types of territory, especially urban areas, including the promotion of sustainable urban mobility and the mitigation of relevant adaptation measures. (STRATEGY) • Promoting the use of high-efficiency cogeneration based on usable heat demand. (FLOWER)
WEBSITE	https://www.siea.sk/strukturalne-fondy-eu/operacny-program-kvalita-zivotneho-prostredia/

PROGRAMME	OP Kvalita životného prostredia (Quality of environment)
TARGET AREA	Slovakia
TYPE OF INSTRUMENT	Subsidy

OBJECTIVE AND SUPPORTED ACTIONS	The aim is to increase the share of RES utilization in households and related reduction of greenhouse gas emissions. Owners of family houses and apartment buildings apply for financial support in the form of a voucher for the installation of small renewable energy facilities (RES). Financial support is available for households to install the following equipment: • Small electricity generating installations (with an output of less than 10 kW): photovoltaic panels and wind turbines; • Heat generating installations that cover energy consumption in a family or apartment house: solar collectors, biomass boilers and heat pumps. The amount of support depends on the performance of the installed device. Solar thermal – €1,500 Biomass – €1,500 Heat pump – €3,400
TECHNOLOGIES COVERED	Solar, biomass and heat pump
BENEFICIARIES	Home owners
RESOURCES	Eur 48 million
TIMEFRAME	2019 - 2023
WEBSITE	https://zelenadomacnostiam.sk/sk/

PROGRAMME	Environmentálny fond (Environmental fund)
TARGET AREA	Slovakia
TYPE OF INSTRUMENT	Loan and grant
OBJECTIVE AND SUPPORTED ACTIONS	Promoting the production of heat, hot water and electricity through exploitation of RES Building / upgrading / replacing a heat source using renewable energy sources (in case of biomass, only outside areas with deteriorated air quality caused with increased concentration of dust particles) and associated heat and / or warm water distributions. 0.1% interest rate for loan Up to 95% co-financing for grant
TECHNOLOGIES COVERED	Geothermal, solar thermal, biomass, heat pump and thermal energy storage
BENEFICIARIES	Public authorities and NGO
RESOURCES	Eur 200 million
TIMEFRAME	N/A
WEBSITE	https://zelenadomacnostiam.sk/sk/

Social and cultural framework

According to one of the interviewees, even though the use of biomass is widespread, citizens' familiarity with the correct heating techniques is often poor.

In addition, the price of high-quality equipment is the main obstacle to installing such solutions for ordinary people (for example, the heat pump). In the case of solar and photovoltaic, the use depends on the possibility of consuming the energy obtained. it is therefore difficult to compete with the availability of gas and with today's gas prices.

In fact, low-income families cannot afford to invest in RES and for older people, the return to the system without support is not interesting.

Regarding public awareness, the amount of information is sufficient, but it would be useful to present it via a single information channel. It would also be important to increase the possibility of providing specific information in this regard.

Market conditions

In general, Slovakia does not produce much energy from renewable sources compared to other Eu countries. This is because Slovakia is quite new to RES technologies. In 2012, most of the renewable energy generated in this country came from solid biomass (554 ktoe), which accounted for 0.7% contribution to the EU-27.

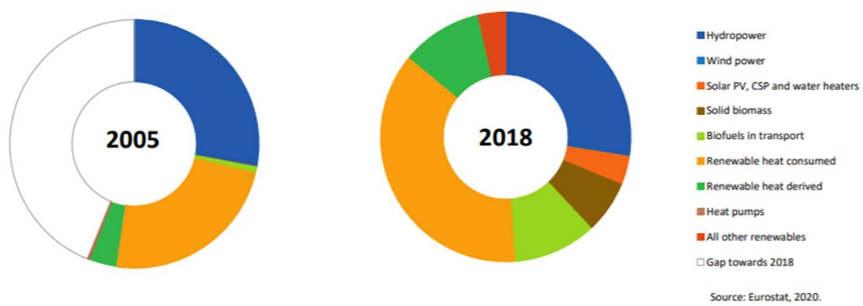
Slovakia also produced hydro energy in the amount of 391 ktoe, which was 1.3% contribution to the EU-27. The country utilized also solar PV and geothermal energy as well as biofuels however the amount of energy produced in the process was much smaller than in case of the aforementioned renewable energy sources.

Abbreviations used:

RES: renewable energy sources
RES-E: renewable electricity
RES-H/C: renewable heating/cooling
RES-T: renewable transport fuels

Data for 2018

Overall RES share:	11.9%	Avoided fossil fuels:	2.2 [Mtoe]
Overall RES 2020 target:	14.0%	Avoided fuel expenses:	0.7 [billion euro]
Share RES-E in electricity:	21.5%	RES Turnover:	1170 [MEUR]
Share RES-T in transport:	7.0%	RES Employment:	20900 [jobs]
Share RES-H/C in heating:	10.6%		



	2005	2018		
	Energy	Energy	Employment	Turnover
Hydropower	376.7 ktoe	370.7 ktoe	1200 Jobs	100 MEUR
Wind power	0.6 ktoe	0.5 ktoe	<100 Jobs	<10 MEUR
Solar PV, CSP and water heaters	0.0 ktoe	50.3 ktoe	300 Jobs	20 MEUR
Solid biomass	0.3 ktoe	92.0 ktoe	11300 Jobs	430 MEUR
Biofuels in transport	11.2 ktoe	145.4 ktoe	4000 Jobs	310 MEUR
Renewable heat consumed	317.3 ktoe	501.5 ktoe		
Renewable heat derived	49.1 ktoe	141.0 ktoe		
Heat pumps	0.0 ktoe	0.0 ktoe	2400 Jobs	180 MEUR
All other renewables	2.4 ktoe	47.7 ktoe	1600 Jobs	120 MEUR
Gap towards 2018	591.6 ktoe			

Source: Eurostat, EurObserv'ER, 2020.

Source: Eurostat, EurObserv'ER, 2020.

The renewable energy market in Slovakia is expected to experience a compound annual growth rate of more than 1% over the forecast period of 2020-2025. Factors, such as government support policies and efforts to meet growing energy demand using renewable energy sources, are expected to contribute significantly to market growth. With the government's commitment to obtain maximum energy from renewable sources and reduce carbon emissions, the share of renewable energy is expected to grow significantly in the coming years. However, the limiting factors of this expansion must also be considered: a booming market for natural gas and limited energy supply from variable renewable energy sources.

In general, the most important trends for the Slovak market are the following:

- Solar energy in Slovakia is expected to see significant market growth, holding 585 GWh in total electricity generation in 2018;
- The future development of the renewable energy sector with the growth of energy consumption and the replacement of fossil fuels with renewable sources will promote the renewable energy market. Furthermore, the growth of renewable energy technology that replaces fossil fuels is expected to provide further growth opportunities in the near future;
- It is estimated that the consumption of energy produced from renewable energy sources will reach 8,827 GWh in 2030. In particular, solar energy provides an important contribution to meet the energy needs in the electricity sector.

- Slovakia uses woody biomass for heat production and the ministry wants to accelerate the use of second generation biofuels produced from non-food crops, such as wood, organic waste, food crop waste and specific biomass crops.
- In 2019, Slovakia had a total installed bioenergy capacity of 243 MW and the total primary energy supply from biofuels and waste was 1369 ktoe (Mordor Intelligence, 2021).

Heat sector

Production, supply, and consumption of heat form an important part of Slovak energy. Natural gas lignite and hard coal were used most of the fuels for heat production in Slovakia. Wood and wood waste (heat factories, heating plants) were widely used from renewable sources. Slovakia is characterised by a developed district heating system that covers more than 54 % of total heat demand.

The development of thermal energy in Slovakia will be orientated towards greater use of renewable resources mainly biomass and geothermal energy in the medium and long term, it is also expected to make significant use of solar collectors (Slovak Environment Agency, 2021).

In areas where natural gas networks are developed, the installation of a gas boiler is still more attractive for investment than the installation of equipment using RES.

In the case of the central heating sector, according to national legislation, it is not possible to arbitrarily disconnect from DH until 2025. If this obstacle were removed, an increase in the use of RES-based heating equipment could be observed.

Geothermal energy has high potential, but the price of such solutions is the main obstacle to a wider use of this source.

The use of biomass boilers is very popular. According to the statistics of the Slovak Hydro-meteorology Institute, up to 91 % of households purchase wood from domestic sources, 1.5 % from Poland, 5.9 % from the Czech Republic, 0.7 % from Ukraine and other sources 0.9 %.

However, their knowledge of wood quality is questionable. Households are not interested whether the wood is sufficiently dried and thus technologically suitable for use in these devices. Waste wood of poor and unsatisfactory quality is often used for heating, which causes deterioration of air quality. Therefore, support boosting uptake of these boilers loses its justification.

It is always advisable to use a combination of this energy source with the installation of RHC equipment, at least during construction or renovation with the use of these sources.

Currently, application of RHC solutions in households is financially supported by the green programme "Zelená domácnostiam" (subsidy programme implemented and funded under the Operational Programme Quality of Environment). Thanks to the programme, increased demand has been seen mainly in the case of heat pumps (the highest amount of funds is allocated to the support of use of this technology), solar collectors are sufficiently supported, as well as biomass boilers.

The subsidy is not available in the Bratislava self-governing region, where natural gas is not introduced during the construction of new satellite sites in the vicinity of Bratislava and the interest in RHC solutions from builders is great, especially with regard to heat pumps. This situation is likely to be resolved. The Bratislava self-governing region is not supported because part of the funding is provided by the EU, part from state funds. As the GDP of the region is higher than in the rest of the country, the state support would have to be higher, which has not been supported by the state so far.

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Conclusions

The heating and cooling sector represents one of the areas of greatest interest as regards the reduction of CO2 emissions and the penetration of renewable energies. Heating and cooling in the EU still depend heavily on fossil fuels (75%), with a smaller but growing share of renewable energy (18%).

Their penetration compared to other sectors is therefore significantly lacking. This situation also derives from the uncompetitive prices of RES and the fact that related technologies that are not very accessible.

In the current scenario, about 20% of RES is used for heating and cooling and of this 20% about 8% is represented by biomass. Biomass is the most important source in all Member States, followed by solar / photovoltaic, wind and geothermal. Most of the biomass energy is used in residential applications, but an increasing part is destined for district heating applications, making bioenergy currently the most competitive solution in terms of costs and prices.

The first steps towards decarbonisation of the sector have only recently been taken by the European Union. As a result, different situations can be observed between countries. Denmark is among the countries that have made the most progress with regard to the penetration of RES, while countries such as Bulgaria are still solving the major problems associated with widespread energy poverty. There are also countries where the renewable energy potential is low due to territorial and weather characteristics, such as Belgium.

For all countries, however, the most important challenge is linked to the problems of insulation and energy efficiency of buildings.

Incentives and financial instruments are widespread in all states. In some cases, they mainly derive from funds allocated by the EU.

Concerning gender equality, substantial differences persist between states. Despite the progress made by the European Union with directives and strategies, the results are extremely weak.

The following trends emerge from the Gender Equality Index:

- The domain of health and money tend to score well for all states;
- The domain of power is the absolute worst, followed by time;
- Denmark is in second place, with an index of 77.4 out of 100 points;
- There are some states, such as Bulgaria and Greece, which are positioned at the bottom of the ranking.

Furthermore, in almost all countries, the interviews reveal situations of discrimination against women and requests for more solutions in order to improve the work-life balance.