D3.1 – Baseline Report

Andrea Roscetti, Politecnico di Milano, andrea.roscetti@polimi.it

Eric Bush, Bush Energie, eric.bush@topten.ch

Francisco Zuloaga, Bush Energie, francisco.zuloaga@topten.ch

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About HACKS

The objective of the Heating and Cooling Knowhow and Solutions (HACKS) project is to achieve market transformation for heating and cooling (HAC) appliances and improve comfort and health of European citizens.

Across the EU almost half of all buildings have individual boilers that were installed before 1992 with efficiency of 60% or less. The expected energy savings from a speedy replacement are immense.

To achieve this goal, 17 HACKS partners in 15 countries are working together, thanks to the financial support of the European Horizon 2020 programme.

After scanning market actors, current policies and most commonly used products in each country, starting from April 2020 the HACKS partners will implement involvement campaigns to raise awareness of the economic and environmental benefits brought by good HAC products and solutions:

- HACKS will motivate households equipped with old and inefficient devices – boilers, water heaters, air conditioners, certain types of boilers and stoves, etc. – to replace them with new super efficient equipment.
- In each country, partners will set-up dedicated on-line platforms to assist consumers in their purchasing process. The platforms will propose: tools to assess households' needs and provide customised information; best product lists with technical specifications; direct links to suppliers of most efficient products; and advice on how to use and maintain equipment.
- For those households who need to improve their situation because they feel too hot, too cold, or too humid but who cannot invest in new equipment or can avoid getting equipped, HACKS will propose simple and low costs solutions. It is possible to reduce energy consumption and energy bills while improving winter and summer comfort, air quality and health conditions through the installation of shading devices, thermostats, water saving taps and showerheads, etc.

Beyond households, HACKS will target all relevant stakeholders (“multipliers”) that participate in the decision-making process of consumers by setting up strategic partnerships to facilitate the purchase of energy efficient appliances. HACKS places a strong emphasis on installers but also retailers and consumer organisations because of their proximity to consumers, their capacity to involve them and bring them guidance on energy efficient equipment.

More information on the HACKS project can be found at www.topten.eu/hacks

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Introduction to the report

The products targeted in HACKS have the potential to unlock extremely large energy savings. Space heating and water heating have an overall consumption of over 5'000 TWh per year, nearly 50% of primary energy consumption of the European Union and more than 50% of greenhouse gas emissions (CO_2 eq) in 2015. Space cooling appliances are growing in the last years, due to climate conditions and comfort requests.

The main objective of the present report is to offer an overview of the current state of the art of heating and cooling technologies, policies and markets, for the countries involved in the HACKS project. This assessment is made mainly based on a questionnaire that was completed by the national partners, and which provided information on the specific national or local regulation for HAC equipment (country-specific minimum performance standards or requirements, mandatory information), or possible national voluntary schemes or labels and support schemes such as rebates, tax incentives, replacement programmes, energy savings obligations.

The report presents an overview of the situation, based on market and existing stock research, useful to define the state of the art of existing technologies, the expected savings per units in given conditions, the expected comfort and health improvements. The responses to the questionnaire have been extremely useful in assessing the HAC practices for the different climatic regions; identifying the most appropriate technologies for each context; and to look for innovative and original solutions that can reduce or offset the use of some HAC equipment. The findings at the national level analyses also allow to identify gaps and mutual learning opportunities.

The supply market analysis aims at understanding the market characteristics for HAC goods and services. It provides a detailed insight on the market mechanisms and structures, the key actors, the market patterns. Understanding the market structure for HAC products will contribute to identifying the levers that HACKS partners must address to better reach consumers and motivate them to replace their inefficient HAC equipment.

This assessment also helps to set national priorities and identify what products should be replaced first; which products and solutions should be pushed to maximise energy savings and improve quality of life; and how to best motivate consumers (directly or indirectly).

The outcomes of this document will be completed by the product lists and selection criteria for the best available technologies and the most advanced options - useful for a more detailed identification of the saving potential per unit - and through recommendations on best practices for purchase and operation.

Executive summary

This report aims at describing the current state of technologies, policies and markets of heating and cooling products in the European Union in general, and the HACKS countries in particular.

The report is especially intended for increasing the knowledge of the HACKS project partners in the field of HAC (heating and cooling) appliances, and to support their decisions regarding: product families to cover, target groups to address, and legal and incentive frameworks to consider for the succeeding project actions.

The report builds on a mix of the authors' own knowledge, desk research, and the responses of HACKS partners to a questionnaire (see Annex 1) sent to them in October 2019.

The core of the report counts three parts, which attempts to summarise the wealth of information analysed:

1) Overview of products – assesses the contribution of the household sector to energy consumption and greenhouse gas (GHG) emissions in the European Union (EU).
2) Policy Mapping – describes the current regulatory framework, both European and national, for heating and cooling products.
3) Markets and stocks – describes the distribution of the different types of heating and cooling products, both for the European Union, and for the HACKS countries in particular.

The main conclusions of the report are:

- Heating and cooling applications are contributing for the 50% of the total EU consumption. The household sector is one of the dominant categories, responsible for 1/3 of the total final consumption.

- 2/3 of the consumption in the domestic sector for HACKS countries is for space heating. Hot water preparation is responsible for the 15% of the final energy use.

- European Union policy, and in particular Ecodesign and Energy Labelling regulations for heating and cooling products, are an essential part of the national policy framework in all of the HACKS country, including non-EU countries like Norway and Switzerland.

- While national policies on heating and cooling vary from one country to another, all countries have some type of regulation on the permits for the installation of products, the qualifications of the individual or company installing the products. The more complex and riskier the products are, the tighter the requirements.

- There tends to be a lighter regulatory framework for cooling than for heating products, for two main reasons: one is the higher complexity and diversity of heating products; the other one is climatic: while heating is needed in every HACKS country, cooling is only necessary in some of them. This might change in the future due to temperature rises, as pointed out by some of the answers to the questionnaire.

- More than half of households in the EU, 130 of 224 mio. dwellings, are heated using autonomous or small systems. Fossil sources, mainly gas, are the main energy sources for heating and hot water preparation. Dedicated sanitary hot water electric boilers are well diffused, as well as electric local space heaters.

- The installation of more efficient products/systems is growing, often without considering fuel switching towards more sustainable or renewable sources. Cooling appliances in households are installed more in southern countries, with a moderate penetration rate. In

central European countries the sales of non-efficient portable units are increasing constantly.

- The policy measures adopted in the last 25 years have had a positive impact in increasing the energy efficiency of appliances, and reducing their energy consumption and emissions. Despite these efforts, there is a margin to improve the results, in line with the long-term objectives expressed in the 2030 target and 2050 strategy. A faster transition and more effort on switching towards efficient HAC appliances could play a major role in achieving the 2030 and 2050 targets.
- The saving potential for the HAC products is estimated between 10 and 50%, depending on the product group. The highest savings - in absolute terms and considering the whole life cycle – are for space heating appliances.
- The Ecodesign policies do not allow, at national level, stricter performance criteria for limiting the less efficient appliances. The national EPBD adaptation, the national incentive schemes and regulations on emissions actually are the main measures for supporting efficient, sustainable and less energy consuming HAC appliances.
- Despite the efforts already made at EU and national level, a well-structured and stronger action involving all actors – like the HACKS project – could significantly reduce the actual impacts of HAC appliances.

For additional detail on the situation in each of the 15 different HACKS countries, the report includes as annexes (Annexes 2-16) each of the responses to the questionnaire.

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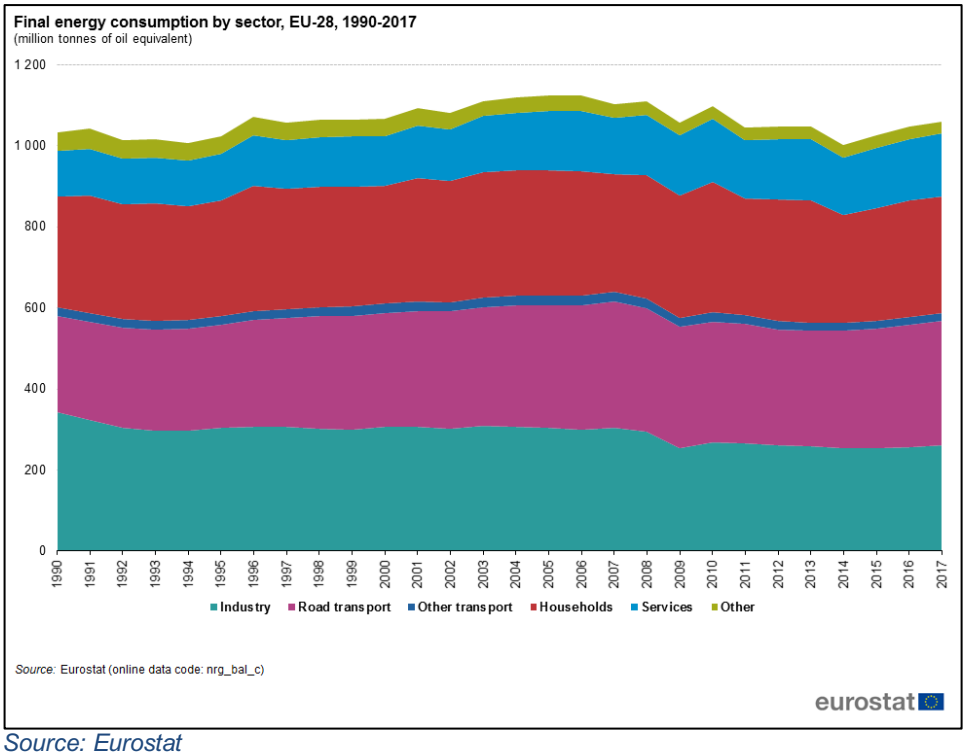
1 Overview of products

1.1 Energy and CO_2 emissions in the household sector

In 2017, EU's primary energy consumption accounted for about 1700 Mtoe/y. Heating and cooling applications are contributing for the 50% (about 800 Mtoe/y, including also industrial heat), while transport and electricity production are at 30% and 20%, 490 Mtoe/y and 310 Mtoe/y respectively[1].

The biggest share in the structure of final energy consumption in 2017 was for oil and petroleum products (37.2 %), followed by electrical energy (22.7 %) and natural gas (22.6 %). Solid fossil fuels contributed only 2.4 % to the final energy consumption at the end-use level.

Figure 1: final energy consumption by sector



Source: Eurostat

The analysis of the final end use of energy in the EU-28 in 2017 shows three dominant categories: transport (30.8 %), households (27.2 %) and industry (24.6 %).

The largest parts of energy use within the EU building stock occur for space heating, domestic hot water and space cooling (order of magnitude ~75% in total).

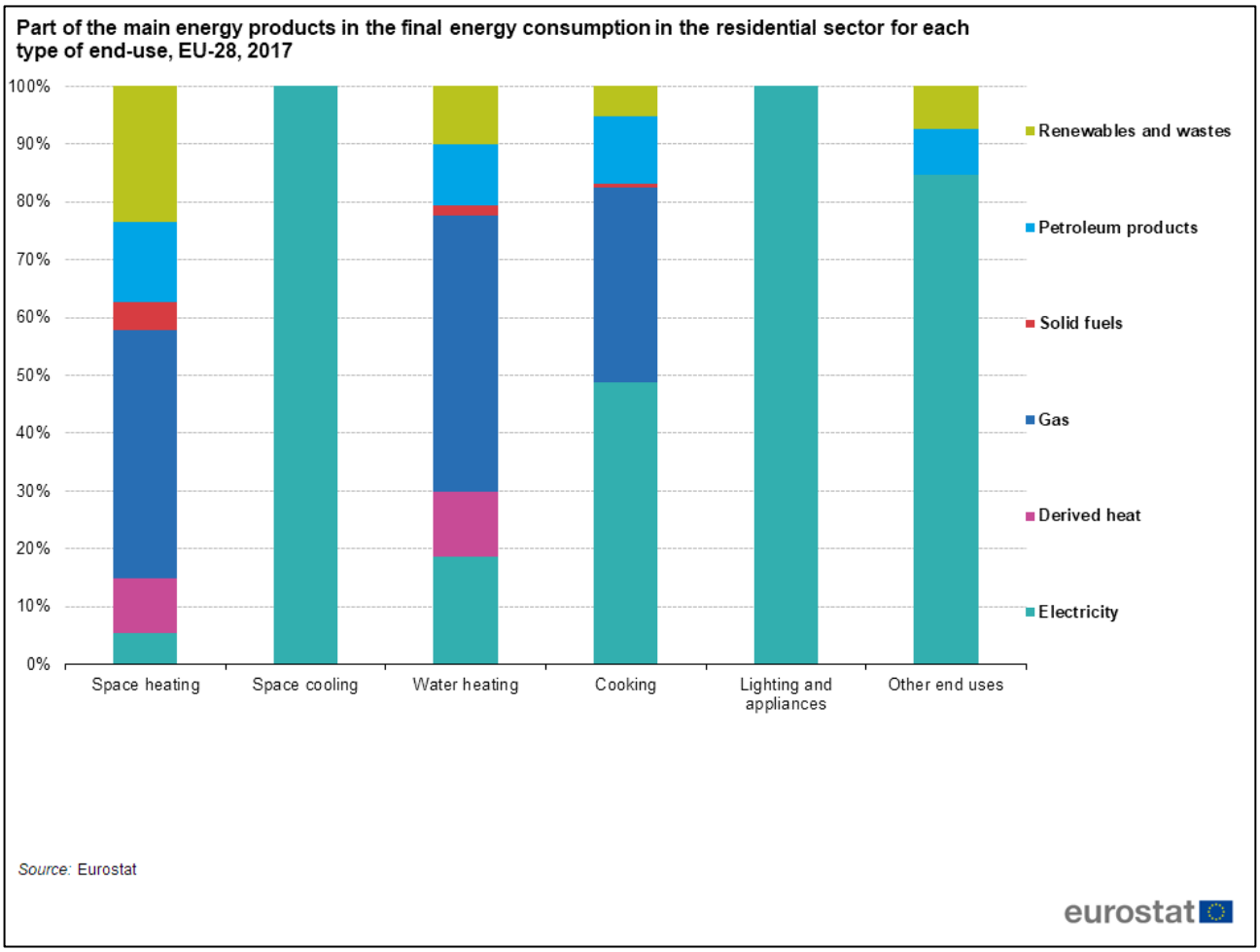
Most of the EU final energy consumption in the residential sector is covered by natural gas (36 %) and electricity (24 %). Renewables account for 17.5 %, followed by petroleum products (11 %) and derived heat[2] (7.6 %). A small proportion is still covered by coal products (solid fuels) (3.3 %).

[1] Data from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_statistics_-_an_overview&oldid=444923#Gross_inland_energy_consumption

[2] Derived heat covers the total heat production in heating plants and in combined heat and power plants (https://ec.europa.eu/eurostat/ramon/nomenclatures/index.cfm?TargetUrl=DSP_GLOSSARY_NOM_DTL_VIEW&StrNom=CODED2&StrLanguageCode=EN&IntKey=16452285&RdoSearch=&TxtSearch=&CboTheme=&IntCurrentPage=1)

In the EU, the main use of energy by households is for heating their homes (64.1 % of final energy consumption in the residential sector). Electricity used for lighting and most electrical appliances represents 14.4 % (this excludes the use of electricity for powering the main heating, cooling or cooking systems), while the proportion used for water heating is slightly higher, representing 14,8%. Space cooling and other end-uses cover 0.3 % and 0.9 % respectively. Heating of space and water consequently represents 78.9 % of the final energy consumed by households.[3]

Figure 2: energy consumption in the residential sector and source in %, by end-use



Source: Eurostat

As reported by the EEA (European Environmental Agency) in 2018[4], *nearly 80 % of total greenhouse gas emissions in the EU-27 are caused by energy production (i.e. electricity and heat, refining), energy use by the industry, services and households, and transport. Carbon dioxide emissions, while not the most potent greenhouse gas, account for a significant share of the greenhouse gas effect.*

Overall the EU emissions are 50% attributable to fuel combustion not for transport.

GHG emissions from the household sector are closely connected to the energy consumption, although their relation is not directly proportional, since this is affected by the emission factor for electricity generation, applicable at a national level.

[3] Data from https://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_consumption_in_households#Energy_consumption_in_households_by_type_of_end-use

[4] https://www.eea.europa.eu/data-and-maps/indicators/co2-intensity-of-electricity-and

Considering the direct and indirect emissions, thus including the electricity generation, the share of EU GHG attributed to the residential sector is around 30%.

The statistics presented demonstrates that the heating and cooling products in the residential sector are a major contributor to primary and final energy consumption and to the CO_2 emission at EU level. The efficiency and sustainability of the HAC appliances plays a key role in reaching the expected target of energy saving and emissions reduction.

2 Policy Mapping

2.1 European Union (EU) Policy

Most heating and cooling policies affecting HACKS products stem from European Union (EU) policy:

Ecodesign regulations are adopted and implemented as such in all EU Members States, and in the European Economic Area (EEA), without any possible adaptation to the national circumstances:

- Commission Regulation (EU) 2015/1189 with regard to ecodesign requirements for solid fuel boilers sets minimum energy efficiency requirements and maximum emission requirements for solid fuel boilers with nominal heat output of up to 500 kW.
- Commission Regulation (EU) 2015/1188 with regard to ecodesign requirements for local space heaters sets minimum energy efficiency requirements and maximum emission requirements for domestic local space heaters with a nominal heat output of up to 50 kW and for commercial local space heaters with a nominal heat output of up to 120 kW.
- Commission Regulation (EU) 2015/1185 with regard to ecodesign requirements for solid fuel local space heaters sets minimum energy efficiency requirements and maximum emission requirements for local space heaters with nominal heat output of up to 50 kW.
- Commission Regulation (EU) No 813/2013 with regard to ecodesign requirements for space heaters and combination heaters sets minimum seasonal space heating energy efficiency requirements and water heating efficiency requirements for space heaters and combination heaters with a rated heat output ≤ 400 kW. It also sets maximum air pollutants emission requirements for such products.
- Commission Regulation (EU) No 814/2013 with regard to ecodesign requirements for water heaters and hot water storage tanks sets minimum water heating efficiency requirements for water heaters with a rated heat output ≤ 400 kW and hot water storage tanks with a storage volume ≤ 2 000 litres.
- Commission Regulation (EC) No 641/2009 with regard to ecodesign requirements for glandless standalone circulators and glandless circulators integrated in products sets minimum energy efficiency requirements for circulator pumps for heating systems. It also establishes that circulators must have an off position.
- Commission Regulation (EU) No 206/2012 with regard to ecodesign requirements for air conditioners and comfort fans sets efficiency requirements for electric mains-operated air conditioners with a rated capacity of ≤ 12 kW (different requirements for split systems and single/double duct air conditioners). It also sets standby requirements and information requirements for such air conditioners, and for comfort fans with an electric fan power input ≤ 125W.

Energy Labels are also adopted and implemented “as such” across all EU countries (and EEA countries):

- Commission Delegated Regulation (EU) 2015/1187 with regard to energy labelling of solid fuel boilers and packages of a solid fuel boiler, supplementary heaters, temperature controls and solar devices rates from A+++ to D solid fuel boilers (or their packages with temperature controls and solar devices) of up 70 kW.

- Commission Delegated Regulation (EU) 2015/1186 with regard to the energy labelling of local space heaters rates local space heaters of up to 50kW from A++ to G.

- Commission Delegated Regulation (EU) No 811/2013 with regard to the energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device rates from A++ to G space heaters and combination heaters (or their packages with temperature controls and solar devices) with a rated heat output ≤ 70 kW. For combination heaters, space heating performance and water heating and rated separately.

- Commission Delegated Regulation (EU) No 812/2013 with regard to the energy labelling of water heaters, hot water storage tanks and packages of water heater and solar device rates space heaters from A+++ to G water heaters with a rated heat output ≤ 70 kW, hot water storage tanks with a storage volume ≤ 500 litres and packages of water heater ≤ 70 kW and solar device.

- Commission Delegated Regulation (EU) No 626/2011 with regard to energy labelling of air conditioners rates from A++ to D electric mains-operated air conditioners with a rated capacity of ≤ 12 kW.

The Energy Performance of Buildings Directive (EPBD) is also an important piece of legislation influencing national policies on heating and cooling. The EPBD defines the overall terminology regarding the cooling and heating systems, the concept of systems, the maintenance, verification, inspection, etc. Unlike the Ecodesign and Energy Labelling regulations, the EPBD is transposed into national legislation via national laws/decrees, so some differences could be found between countries. Each country also refers to its specific technical standardisation framework.

Directive 2012/27/EU on energy efficiency (known as the "Energy Efficiency Directive, EED) "establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union's 2020 20 % headline target on energy efficiency and to pave the way for further energy efficiency improvements beyond that date". The EED influences directly and indirectly the actions at national level in many ways. It requires among others:

- The setting of national energy-efficiency targets.
- The establishment of long-term national renovation strategies.
- Public authorities to purchase energy-efficient products, services and buildings.
- The setting of national energy efficiency obligation schemes.
- The availability of qualification, accreditation and certification schemes related to energy efficiency
- The availability and transparency of information on energy efficiency mechanisms and financial and legal frameworks.
- The facilitation of the use of financing funds and other funding streams for energy efficiency purposes.

2.2 National Policies

The national policies analysed in this document are covering a wide range of themes: energy efficiency, safety, building regulation codes, etc. The answers reported in national questionnaires (see annexes 2-16) are indicative and non-exhaustive.

The two main sections devoted to heating and cooling, highlight different policies in order to identify common legislative measures.

2.2.1 Heating

The following section on national policies summarises the responses of HACKS partners to a questionnaire on national heating and cooling regulations. We have left the questions in the text to ease the reading. A complete version of the questionnaire is available in Annex I. The country codes for which a particular policy measure applies are indicated in brackets. For each of them, more detailed information can be found in their respective annex. Country codes are quoted as illustrations, i.e. given measures may exist in other countries as well but answers to the questionnaire did not mention it specifically.

The analysis of responses to the questionnaire shows that the regulatory framework for heating is much more developed than that of cooling. This is, unsurprisingly, particularly true in colder climates, where cooling is virtually non-existent. This is starting to change however with temperature rises associated with climate change.

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)?

Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed?

For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

Small heating products/systems do not typically require any permits for their installation in the HACKS countries. Any product complying with EU regulations can therefore be installed. The threshold for such exemptions varies per country but is typically somewhere between 5 and 70kW.

Where permits are required, these are the most common:

- Geothermal and ground water heat pumps (AT, BE, SE).
- Gas boilers for their installation and access the gas network (CZ, FR, PL, PT).
- Municipalities might require a town-planning authorisation to ensure that the architectural homogeneity of the city is respected. This is particularly the case for dense and classified areas (ES, FR, SE).
- Authorisation might be required from gas authorities, municipalities or co-ownership associations regarding the placement of the exhausts to avoid visual/noise/vapour nuisances.
- Mandatory, periodic checks (every 12 to 48 months typically) of gas boilers, chimneys and central heating systems exist in many countries (AT, BE, CZ, FR, PL, SE). And of heat pumps with large amounts of refrigerant (FR, BE, PL).
- Construction permits from the municipality for new or expanded heating systems (CH, IT, PL) and for boiler rooms (SE, LT) might be required.

In some instances, a permit might not be required but there is nonetheless an obligation to report to the local authorities the installation of certain systems (BE, CZ, IT, NO, SE).

In addition to these permits and information requirements, there might be other, additional prerequisites in order to install heating products/systems:

- Building codes exist in all HACKS countries. They do not only impose an overall energy performance for buildings, but they also dictate -or at least strongly drive- what can and cannot be installed in new and refurbished buildings. These may set requirements on the efficiency of heat pumps, water and space heaters, circulators, etc. (SE, UK); or a minimum share of renewable energy in the heating systems (DE); or on the total energy consumption per m^2 excluding specific electricity, but including end-uses such as heating, sanitary hot water and cooling (FR).
- Other national or regional regulations might set additional requirements beyond EU requirements for efficiency and emissions (CH, IT, NO, SE).
- An energy certificate (including information on the heating system) is typically needed as part of the construction permit for new and refurbished buildings (LU).
- Sweden counts on special regulations regarding sea heating (heat pumps collecting heat from sea water).
- Also insurance companies might impose a professional installation– as a pre-condition to cover eventual damages caused by the installed heating product.

Finally, voluntary labels exist that guide consumers towards products and companies recognised for their quality and professionalism (FR, NO).

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Small, plug-in electric heating products can typically be installed by any person, without the help or supervision of a professional.

However qualified companies or individuals are usually required for the installation of most heating products and systems. The procedures to be qualified/certified for certain activities varies very much between countries, from self-declaration (e.g. UK's Competent Person Schemes), to specific training and exams (LT).

The most common requirements regarding technical staff are:

- A qualified/certified gas expert for the installation of gas heating systems and welding of gas pipes (CH, CZ, FR, LT, PL, SE).
- A qualified/certified electrician for the installation of electrical systems (CH, PL, SE).
- A qualified/certified refrigeration technician for the installation of heat pumps, in particular if the refrigerant is in an open circuit (CH, BE, FR, LT, NO, PT, PL).
- A qualified technical expert (e.g. an engineer) for the installation of large/complex systems (PT, IT).
- A qualified/certified expert for the mandatory periodical checks of gas boilers, chimneys and central heating systems (AT, BE, PL).

Certificates are usually produced by the qualified/certified experts at the end of the works or of the maintenance checks, in the forms of reports (BE, FR), "technical passports" (FR), or other documents. These documents must be kept for several years.

Aside from these official requirements, product manufacturers of some heating products (e.g. space and water heaters, circulators and heat pumps) provide in some countries specific training to trade persons on the specific installation instructions of their products and many have installer

networks whereby only installers that have undergone their training are approved to install their products (UK).

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

All HACKS countries count on some sort of financial support for the purchase of heating appliances/systems. These schemes exist at the national (CZ, DE, FR, IT, LT, LU, PL, PT, UK), regional (AT, BE, CH, DE, ES, PL), and the local level (CH, DE, LU, FR, NO, PL, SE). The most frequent are:

- Rebates and subsidies (virtually all countries).
- Reduced VAT for renovation (BE, FR, IT).
- Zero- or low-interest loans for renovation works, including heating systems (FR, PL).

The rebates typically support the substitution of an inefficient product/system by an efficient one. The replacing product must have certain characteristics regarding its type (e.g. only condensing boilers; only certain types of heat pumps; only products that use renewable energy); its performance (energy label class, NOx emission levels). In some instances, the rebates are directly linked to the savings achieved (e.g. FR's new support system) or to the installed power (CH). Reduced VAT (FR) or tax rebates (e.g. 50% in IT) on the other hand, are measures to support the building/appliances sectors and are not necessarily linked to energy performance.

In addition, financial incentives which are linked to a certain overall energy efficiency level for new or renovated buildings (e.g. LT) indirectly support more efficient technologies.

In most countries financial support is granted/adjusted depending on the income level of the receiving party. In some countries however (CZ, LT, LU, NO and PT), the rebates are independent of income levels.

Financial support is in most cases provided in the case of renovations rather than new buildings. The support can be conditional or adjusted according to certain requirements. Some examples are:

- Proper disposing of the old equipment (CZ).
- Renovation needs be carried out in buildings older than a certain date (BE)
- Carrying out complementary heating optimisation measures like balancing of the hydraulic system (DE).
- Carrying out a comprehensive/deep renovation (PT), or at least including insulation in the works (BE, CZ). Sometimes a final energy performance class is required in order to receive funding (LT).
- Have an energy assessment done by an energy auditor.

In most HACKS countries it is not possible to devolve the incentive to a third party. The exceptions are CH, FR, IT and PL (with some caveats for this last one).

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)?

Customers can benefit from many different sources of information. National, regional and municipal governments and energy agencies all provide advice. Given the complexity of the heating installation process (from initial planning over to the installation phase to monitoring), these authorities aim at providing one-stop-shops that can help the consumer make the best choice (e.g. AT).

In addition to advice from public authorities, a number of other actors provide advice on heating: manufacturers (and their trade associations), installers, consultants, NGOs, etc. Often these entities are better positioned than the public authorities to provide advice, as they are in direct contact with their customers. For example, a manufacturer/installer can take advantage of a periodical boiler check to provide overall larger heating advice (e.g. PL).

The information is communicated via different channels: websites, hotlines and in-person (most countries do these), but sometimes also TV advertising (e.g. ES, IT, PT).

The advice is not limited to individuals: there is often advice for municipalities and companies. Training for professionals is also sometimes provided (AT, BE, SE).

Finally, a number of product certification schemes exist, both run by public bodies (AT, CZ) and non-for profits (UK).

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, …) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, …). For which product(s)?

In most of the HACKS countries, this is not possible. The exceptions are AT, FR, IT, PL and UK. Where these systems exist, the savings are quantified based on standardised guidelines, and are sometimes subject to checks by monitoring bodies (e.g. AT, PL).

2.2.2 Cooling

Residential cooling is not very relevant in most of the HACKS countries, although this might change in the future due to temperature rise associated with climate change.

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)?

Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

Smaller cooling products (e.g. fans, portable air conditioners) can be installed by the consumer without the need for any permits in most HACKS countries. National, regional (CH, DE, ES) and municipal authorities (CH, DE, ES, LU, PT) might however require some permits. These are the most common:

- Municipalities might require a town-planning authorisation to ensure that the homogeneity of façades is respected. This is particularly relevant for split systems, and in dense or classified areas (CH, ES, FR, SE). Co-ownership associations might also set rules regarding split systems (CZ, FR, PT, PL).
- Cooling systems linked to a (reverse) heat pump. In this case, the same requirements apply as those described for heat pumps in the heating section above (AT, BE, SE).
- Mandatory, periodical checks of heat pumps and other cooling systems with large amounts of refrigerant (FR, BE, PL).

In some instances, a permit might not be required but there is nonetheless an obligation to report to the local authorities the installation of certain systems (BE, NO, SE).

In addition to these permits and information requirements, there might be other, additional requirements:

- Building codes exist in most European countries. They do not only impose an overall energy performance for buildings, but they also dictate -or at least strongly drive- what cooling systems can and cannot be installed in new and refurbished buildings (CZ, FR).
- Other national or regional regulations might set additional requirements (beyond EU requirements) for efficiency (NO).
- An energy certificate (including information on the cooling system) is typically needed as part of the construction permit for new and refurbished buildings.
- Sweden counts on special regulations regarding sea heating (heat pumps collecting heat from sea water).

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Smaller cooling products (e.g. fans, portable air conditioners) can typically be installed by any person, without the help or supervision of a technical person.

However qualified companies or individuals are usually required for the installation of some cooling products and systems, chiefly heat pumps and split air conditioners. The most relevant requirements are:

- A qualified/certified refrigeration technician for the installation and periodical revisions of heat pumps and split air conditioners (for all countries as this stems from the F-gas regulation).
- A qualified/certified electrician for the installation of electrical systems (CH, SE).
- A qualified technical expert (e.g. an engineer) for the installation of large systems (PT)

Certificates are produced by the qualified/certified experts at the end of the works or of the maintenance checks. These documents must be kept for several years. The F-gas regulation (and its transposition into national law) require that installers dedicate time and resources for training.

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

In most HACKS countries there are no financial incentives for the purchase of cooling products or systems. There are however some exceptions:

- Financial incentives for efficient heat pumps that can be used for cooling (see answers to question H.A.3 above).
- Direct rebates for efficient cooling systems (ES).
- A+++ class air conditioners can benefit from Energy Saving Certificates in France's overseas territories (FR).
- Reduced VAT for cooling in renovation works, except for air-to-air heat pumps (FR).
- Upgrade of cooling systems qualifies for white certificates in Poland, with some restrictions (PL).
- Subsidies for shading systems in the city of Vienna (AT)

The rebates typically support the substitution of an inefficient product/system by an efficient one. The replacing product must have certain characteristics regarding its type (e.g. liquid-to-water heat pump); or its performance (energy label class).

In addition, financial incentives which are linked to a certain overall energy efficiency level for a building (e.g. LT) indirectly support more efficient cooling technologies.

Similarly to heating incentives, it is generally not possible to devolve the incentive to a third party. The exceptions are FR and PL (with some caveats for this last one).

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

Generally speaking, the same type of public and private actors and networks that provide advice on heating (see answer to question H.A.4 above) also provide advice on cooling. The expertise and the amount of information to be shared is however much smaller than for heating. In many cases the advice aims at reducing overheating in order to avoid active cooling appliances.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, …) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, …). For which product(s)?

In most of the HACKS countries, this is not possible. The exceptions are FR (some products only) and PL. Where these systems exist, the savings are quantified based on standardised guidelines.

3 Market and Stock of installed HAC appliances

The Horizon 2020 HARP project published in November 2019 an extensive report (D8.1[5]) covering the characteristics of the building stock and the **installed stock of heating appliances** in France, Germany, Italy, Spain, Portugal and EU28 aggregated. At the end of the report, the building stock and the heating appliances were combined to compose a matrix that matches the most common solutions/technologies to the building stock divided into Single-Family House (SFH) and Multi-Family House (MFH).

According to table 13 in the cited report, at EU level there are around 160 mio heating appliances installed, of which 26,7 mio are centralised. The main systems installed as autonomous systems (for SFH and MFH) are condensing gas boilers (30%), non-condensing gas boilers (29%), followed by electric direct systems (18%) and non-condensing oil boilers (10%). Systems using renewables sources such as heat pumps are installed in 6%, while biomass covers 3%.

Other sources of information regarding the market and the stock of the installed appliances are available: mainly the data provided by the manufacturers' associations and the Ecodesign and labelling studies ordered by the EU Commission for improving the legislative framework for the different appliances/products.

According to the *Review study of ecodesign and energy labelling for space heating boilers and combination heaters*[6], published in June 2019, within the stock of individual products in the scope, 83% are gas-fired (71% in 2004) with a growing share of condensing boilers (30% of the total in 2014, 7% in 2004). Around 14% of boilers are oil-fired (20% in 2004). Electric systems: heat pumps (2.5%) and resistance heating (0.9%). It is important to highlight that the percentages reported relate only to water based heating systems, in the scope of the above-mentioned study.

The market data reported in the Ecodesign study show that the condensing boilers are the 80% of the market of the gas fired appliances, oil-boiler share is around 4%, solid fuel boiler 6%, electric boilers around 1%, while the share of heat pumps boilers is 6%.

The Review study of ecodesign and energy labelling for space heating boilers and combination heaters reports that the most common source for **sanitary hot water** is the space heating boiler (defined as combi units, 110 mio). Dedicated sanitary hot water heaters are installed in more than 90 mio. households[7] all over the EU. The electric storage and gas instantaneous models are the most common installed in case of dedicated systems, 57 and 17 mio. of units respectively. Instant water heaters and oil dedicated are less common. The sales data are, for 2016, around 6 mio. units for electric storage units, 1 mio. for gas instantaneous, electric showers + other instantaneous.

The total 2015 residential energy consumption for all water heating, including combi-heaters and excluding water heating from solid fuel boilers, is around 47.2 Mtoe in primary energy.

The market for **local space heaters** is around 16 mio. units per year, dominated by the electric units, with an estimated primary energy consumption of about 416 TWh for all building types.

In terms of stock, estimates are of 220 million electric local space heaters, approximately 9 million gaseous space heaters and approximately 1,1 million liquid heaters, as reported in the Review study on Local Space Heaters[8]. The sales of the electrical local space heaters are mostly direct to consumers.

[5] https://heating-retrofit.eu/wp-content/uploads/2020/02/20191107_HARP_D2.2_Building-vs-heating-stock-matrix.pdf
[6] https://www.ecoboiler-review.eu/Boilers2017-2019/documents-boilers-2017-2019.htm
[7] See http://www.ecohotwater-review.eu
[8] https://www.eco-localspaceheaters.eu

In the EU, the main types of **air conditioners** in use are single duct (and double duct) air conditioners and split systems. Around 4.5 mio. units are sold annually, the total stock installed is estimated around 50 mio. units. The sales are in constant increase annually, the share of fixed/portable appliances sold and installed varies significantly, depending on the country and region.

Portable units are typically sold directly to the final user, while fixed units are sold through different routes, depending on the country's specific market conditions.

Market and stock for HAC appliances in HACKS countries

At country level, for the 15 countries participating in the action, it is possible to group the market and stock situation for each of the systems. The analysis presented here covers the stock of appliances, not the final energy consumption related to the different solutions.

For the **space heaters & combination** with the production of hot water, gas boilers are the most common option in many countries like AT, CZ, DE, FR, IT. PT and FR still have a high share of electric heating. Oil is still an important heating source in many countries (DE, FR).

Other countries, thanks to the legislative and incentive frameworks, are switching rapidly to more efficient systems like condensing gas boilers or renewable systems like heat pumps (CH, NO).

For **local space heaters** only poor data is available at country level for defining the installed stock. FR, NO, UK, SE and ES are the biggest markets at continental level, PL and CZ are anyway important markets for such appliances.

Dedicated sanitary hot water heaters are mainly electric storage in FR, DE, LT, SP, PL, PT. IT, FR and SP have an increasing share of gas fired combi boilers.

Air conditioners are installed mostly in IT, PT and ES. Countries like BE, FR, PL have increased the stock in the last years, especially in portable units.

Though there are differences related to the type of appliance, the prevalent form of distribution seems to be: manufacturer/importer -> wholesaler ->installer/contractor. The DIY market is very limited.

The role of the client in the choice is often very limited, especially for appliances with more stringent safety regulation (combustion boilers and products with refrigerant gas piping): in those cases the choice of product (size, characteristics, brand and model) is made directly by the designer or the installer.

Appropriate technologies, comfort and savings

Providing a comprehensive definition of what is an appropriate technology is rather challenging and should consider different aspects related to the location, use of products and its impacts. The main issue concerning the appropriateness of HAC appliances is the ability to provide the service when requested, but using less energy as possible, maximizing the comfort for the user and with the lowest impact on the environment, all at a reasonable and affordable cost – or better minimizing the total costs and impacts.
The main driver for providing a good service at a reasonable cost is the reduction of energy needs, that in the HAC field is often not only related to the quality and features of the appliances, but on the needs or requests from the user.
Needs and requests can be minimized or optimized at system level, e.g. by providing a proper level of insulation for the building envelope and reducing the energy needs, or through

behavioural measures, optimizing the comfort level or managing the resources such as setting correctly the thermostats or reducing the excess use of sanitary hot water.

Comfort issues are influenced significantly by both the envelope characteristics (insulation, air tightness, shading systems and thermal mass) and the service provided by the active systems (heating and cooling terminals).

Thanks to the technical development, pushed by the worldwide and EU efficiency policies, HAC and related products/appliances made significant improvements in the last 20 years. Detailed stock analysis, like e.g. the data reported in the Ecodesign preparatory studies, show improvements in the average technology installed in the residential sector, for each end-use and energy source. The "Ecodesign Impacts Accounting"[9] estimates, for those policy measures, a saving of 15% versus the Business-As-Usual scenario, in 2020.

In the last years, due to the fast and increasing development of low carbon emission in the electrical generation systems in all countries, electricity is becoming the most sustainable source of energy.
The description of the best solutions for HAC appliances, and especially the identification of the best available technologies – depending also on the energy sources, will be addressed in detail in the D3.2.

The HACKS projects aims at convincing consumers and installers to implement a set of measures to **save energy** and improve their living conditions. The measures considered for the calculations below are:

- For cooling devices: the purchase of more energy efficient split model, the non-purchase of a AC (mobile or fixed, if possible), the installation and use of highly efficient comfort fans, of shading and blinds, the use of passive ventilation.
- For space heating devices: the installation of condensing space heaters, of efficient heat pumps instead of electric heaters, correct use of thermostat, improvement of ventilation control.
- For hot water consumption: the installation of efficient heat pump boilers instead of electric boilers, the purchase of highly efficient boilers, the use of low temperature storage and hence the reduction of standby consumption, the use of efficient water taps and shower heads.
- For circulators: replacement of old circulators by new efficient ones, preventing over-dimensioning of pumps.

Due to the several different appliance types and category, with different features and size, the calculation of the average saving potential is extremely complex, since does not depend only on technical improvements, but also on needs reduction and behavioral changes.

The **estimated potential savings** are based on data reported from different sources: research from the EU Ecodesign preparatory studies, knowledge on technologies and the partners' experience with HAC equipment.

Table 1: Estimated savings (average) per product group

Product Group	Product Lifetime	Energy per unit per year	Energy per unit over product lifetime	Projected product improvement	Projected potential savings over product lifetime
	years	kWh/a	kWh	%	kWh
Fixed ACs	12	1'000	12'000	30%	3'600
Portable ACs	12	300	3'600	50%	1'800

[9] https://ec.europa.eu/energy/sites/ener/files/documents/eia_overview_report_2017_-_v20171222.pdf

Comfort Fans	6	50	300	30%	90
Heating (condensing, heat pump…)	20	10’000	200’000	10%	20’000
Water heaters	15	1’000	15’000	20%	3’000
Circulators	25	200	5’000	50%	2’500

The results of this first estimation will be completed by the product lists and selection criteria for the best available technologies and the most advanced options. A more detailed identification of the saving potential per unit will be possible, considering also the recommendation on best practices for purchase and operation developed during the HACKS activities.

Annex 1 – Questionnaire sent to HACKS partners

Overview of the questionnaire[10]

This questionnaire will help develop "Deliverable 3.1. Baseline Report" of the HACKS project. It will provide useful information about HAC products in each of the HACKS countries. It is structured along the following lines:

- Heating (H)
  - A. Policy
  - B. Market Structures
  - C. Measures for comfort
- Cooling (C)
  - A. Policy
  - B. Market Structures
  - C. Measures for comfort

The collected answers will feed directly into D3.1. Baseline Report.

This questionnaire, compiled by the national partners, is useful for discover also specific national or local regulation for HAC equipment (country-specific minimum performance standards or requirements, mandatory information), or possible national voluntary schemes or labels and support schemes such as rebates, tax incentives, replacement programmes, energy savings obligations.
The questionnaire will contribute also to the knowledge of the HACKS project partners in the field of HAC (heating and cooling) appliances, in order to support the decision process at national level regarding the definition of the product families to include, the target groups to address, the legal and incentives framework to consider for the subsequent project tasks.

Detailed instructions on how to fill in the questionnaire:

- *Please go to section Annex X below.*
- *Answer the questions to the best of your knowledge, Where you do not have answers, please contact relevant experts who can help you.*
- *Please write in clear, concise and good English. Bear in mind that part or all of your responses will be included in an official deliverable (D3.1.) for the European Commission.*
- *Feel free to use charts, diagrams, etc. if they help make your point.*
- *Please provide links, references where possible.*
- *You can use the examples of Switzerland (Annex Y) and Italy (Annex Z) if that helps you. We have not provided answers to all questions, but it is a start.*

[10] Please note that this questionnaire has been modified (editorial changes only) after being sent to partners. It is therefore slightly different to which the reader will find in Annexes 2-16.

Country Introduction

General introduction at country level, describing the national framework about products (energy requirements, safety, permits, …).

Heating

Part A: Mapping of policy framework (such as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

H.A.2. Is there a requirement for technical staff, with specific competences for the installation (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to the individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific type of intervention (new installation, just in combination with home refurbishment, etc.)?**
- **Is it possible to "devolve" the financial incentive to a third party (in Italy it is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

H.A.4. Are there active national/regional programmes advising consumers about rebates/incentives/certification programmes on heating (for informational purposes, addressed to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

H.A.5. Are the savings offered by a third party (ESCo, Energy company, ...) for the installation of heating products accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom do you buy this product, who will install it, is there a need for a specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

H.B.2. Are there any networks or informational services aiming to install more efficient systems/products at national/local level?

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

H.B.4. Is the product or the installation service available online? (this could be useful in the next phases)

H.B.5. Add the questions related to the other work packages (requirements on tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel more comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

C.A.2. Is there a requirement for technical staff with specific competences for the installation (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to the individual or household receiving the rebate (e.g. income levels)?**

- **Are they conditional to a specific type of intervention (new installation, just in combination with home refurbishment)?**
- **Is it possible to "devolve" the financial incentive to a third party (in Italy it is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

C.A.4. Are there active national/regional programmes advising consumer about rebates/incentives/certification programmes on cooling (for informational purposes, addressed to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

C.A.5. Are the savings offered by by a third party (ESCo, Energy company, ...) for the installation of cooling products accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom do you buy this product, who will install it, is there a need for a specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

C.B.2. Are there any networks or informational services aiming to install more efficient systems/products at national/local level?

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

C.B.4. Is the product or the installation service available online? (this could be useful in the next phases)

C.B.5. Add the questions related to the other work packages (requirements on tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel more comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

Annex 2 – Contribution to Baseline Report - Austria

Country Introduction

As Austria is an EU member state, minimum requirements according to the EU regulations apply (for gas, oil and heat pump heating systems 813/2013, for biomass and other solid fuel heating systems 1189/2015 and for local space heaters 1188/2015). The EPBD is implemented at national level. The national OIB6 guideline sets requirements for buildings' quality which can be adopted by the regional governments. The regional governments can set stricter minimum requirements in their federal building laws.

The regional legislation sets limits for emissions like NO_x or CO also for products already installed, while efficiency is only subject to new products (in line with the ecodesign regulation). Gas (in all parts), oil (more in old buildings), biomass (more rural), district heating (more urban) and heat pumps (more in new buildings) are the most common systems for residential heating.

Cooling in the residential sector is still not very common although in urban regions temperatures increase. While in the service sector split AC systems are common, mobile ducted ACs are predominant in households which are only in operation on the hottest days of the year. The only market data available for cooling systems are the units of split systems sales without distinction between installation site (residential or tertiary): 32.860 units in 2019 with an increase by 16 % compared to 2018.

Table 2: Heating systems in Austria (stock data 2017/2018). Source: Statistik Austria (2019)

Primary heating system according to predominantly used energy source and type of heating 2017/2018						
Energy source	**Dwellings ("Main residences") total**	**Type of heating**				
		Single furnace	**Gas convector**	**Electric heating**	**Central heating (and equivalent heating)**	**District heating**
Wood, wood chips, pellets, wood briquettes	724.754	99.713	-	-	625.041	-
Coal, coke, briquettes	7.640	1.639	-	-	6.001	-
Heating oil, liquid gas	626.109	11.239	-	-	614.870	-
Electricity	210.648	-	-	210.648	-	-
Natural gas	913.448	-	69.104	-	844.344	-
Solar, heat pumps	294.761	-	-	-	294.761	-
District heating	1.112.734	-	-	-	-	1.112.734
Total	**3.890.094**	**112.591**	**69.104**	**210.648**	**2.385.017**	**1.112.734**

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

Apart from national implementation of the EU regulations there are no further restrictions for installing a heating product. Only for geothermal and ground water heat pumps there are zones where usage is restricted or prohibited. Before and after installation of a heating system producing exhaust gases, the chimney sweep has to check the situation. Only after this check the system can be put to operation.

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

There are requirements for staff installing heating systems. This is regulated by national law. Standards describe what the staff has to know respectively which certificates are needed. This applies to all products except those which are only to plug in to the electric grid (e.g. mobile electric heaters). There are also periodic inspections (depending on regional law and energy carrier) obligatory which have to be performed by certified staff.

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

Installers often give rebates from the listed prices. Investments can be deducted from tax if the building is used commercially or rented. Authorities give subsidies in certain cases (often regionally different), but there are no tax rebates for private installations.

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

There are subsidies depending on the performance of e.g. heat pumps. Several regions give advice to customers (especially for subsidized projects, often together with complete house

refurbishment including thermal insulation or new buildings) or offer services which shall in future be developed towards a One-Stop-Shop (from initial planning over installation phase to monitoring).

Also, the Austrian klimaaktiv initiative, which is the Austrian climate protection programme, promotes voluntary quality standards for buildings and products. Furthermore, the Austrian klimaaktiv initiative provides training for professionals and disseminates information to home owners and companies. Since 2004 the initiative is one of the most influential systems for implementing energy efficiency.

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

In the frame of the national implementation of the energy efficiency directive (EED) it is possible that energy saving measures are used by (sold to) a third party like an energy provider. To do so the energy saving calculation has to be checked by the national monitoring body (see www.monitoringstelle.at).

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Installer, electrician and chimney sweep (if combustion system) are the professionals typically involved in a new heating system installation. As explained, all professionals need a permission to do this work.

Only devices to plug in to the electric grid (e.g. mobile electric heaters) are sold from shops and "installed" by the user.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Subsidy schemes bring the market towards more efficient products as the schemes typically set stricter requirements or are focussed on sustainable systems. The regional authorities offer experts for consultation who are trained to find out which system is the best one in a certain case.

As already mentioned the Austrian klimaaktiv initiative promotes voluntary quality standards for buildings and products (see www.topprodukte.at and www.klimaaktiv.at).

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Installer, electrician and chimney sweep (if combustion system) are the professionals typically involved in a new heating system installation.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Depending on the company, but phone call is always possible and mail of course as well.

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

- http://www.energiesparverband.at/foerderungen/sonstiges/energiearmut.html
- https://www.umweltberatung.at/nevk-initiative-gegen-energiearmut

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

Permissions are needed from all other owners in multi-family houses for applying an outdoor unit resp. from the authority if it is visible from the street.

Products have to fulfil the minimum requirements according to EU-regulation 206/2012 and must have a label according to 626/2011 if they are in scope (up to 12 kW they are typically in scope).

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

For split systems a certified professional has to do the installation (as for heating systems). Combustion is no topic for cooling, but safety issues regarding refrigerants and electrical safety have to be met and the professionals have to be certified accordingly.

Financial Incentives

C.A..3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

Not known, recently subsidies for shading systems were introduced by the Municipality of Vienna.

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

Cooling for housing is not in focus, but might change in the future due to climate change. E.g. Municipality of Vienna launched a funding programme for shading systems in November 2019.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Not applicable

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Cooling in households is often provided by mobile ducted appliances which are bought in shops. Split systems are installed by installers. Permissions are needed from all other owners in multi-family houses for applying an outdoor unit resp. from the authority if it is visible from the street.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Cooling is not as much in the focus of authorities as heating.

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

We have no data on this.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Installation is done by installers normally. Which ways of communication they offer depends on the company.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple

measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only

Very simple recommendations for the case of summer heat waves:

- Close windows during the day and open windows for airing the apartments/house only during the night.
- Use blinds (preferably Persian blinds) to prevent overheating.

(Such tips are published on topprodukte.at during the summer period, similar tips are promoted on several websites of energy counselling organisations, consumer portals, etc.)

Annex 3 – Contribution to Baseline Report - Belgium[11]

Country Introduction

Belgium regulations covering energy issues are in line with the EU: the EU energy label and Eco design regulations are adopted for all the products. We have three regions in Belgium: The Flemish (FL), Walloon (WL) and Brussels (BR) region. Therefore regulations can differ locally, especially incentives/rebate programs. When looking at the energy use in households it is very clear that heating is the main energy consumption (74%). Heating of water is another important energy consumption in the Belgian households (12%). Cooling is very small (0.1%). *(figure 1, p.8)*

In general Belgium has large houses which are poorly insulated. Next to this we have high electricity prices compared with gas prices. Consequently the installations of heat pumps is in most cases not economically competitive compared to the current gas or liquid fuel heating systems. However, for new buildings the EPB regulations are quite difficult to achieve with gas or liquid fuel heating systems. In those cases installing heat pumps can help to achieve the EPB standards. Nevertheless for renovations there isn't any regulation or requirement to shift the market towards more heat pumps.

Cooling systems are rather limited in Belgian houses. In 2017, 92% of the households had no active (mobile or installed) cooling system.[12] Historically Belgium houses were built without a focus on cooling because of the moderate climate. The main focus of houses was to keep the warmth inside and the cold outside. However in more recent years (from the 2000s up) more and more new and renovated houses are too well isolated (more effective isolation, thicker windows,...) and have difficulties with cooling down in summer and during heatwaves. Therefore active cooling of houses is starting to grow, but it is still a very small market (only 0,1% of the energy consumption in households). For new buildings or renovations the main focus is now on building houses which do not need active cooling.

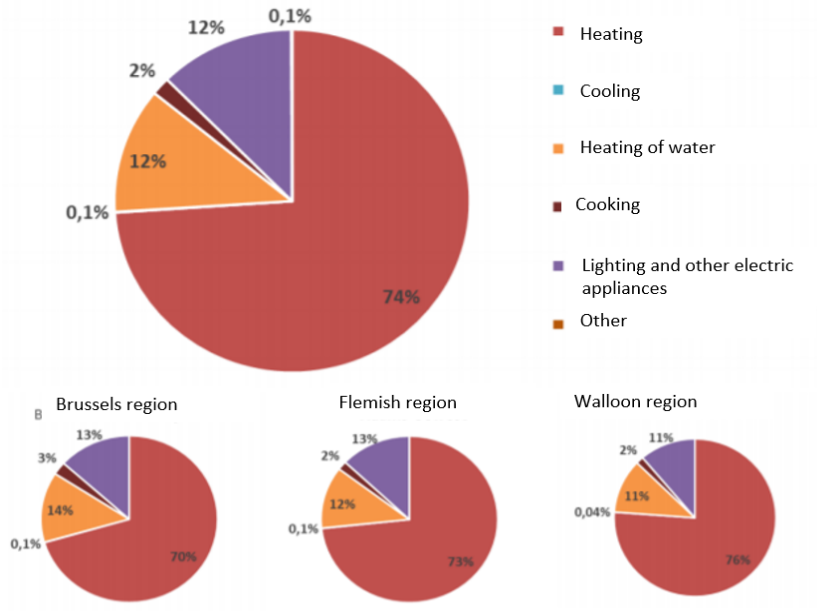


Figure 1 - Breakdown of household energy consumption by end use in 2017[13]

[11] Belgium provided eight annexes together with their questionnaire. These are available upon request.
[12] Annex 7: '*Analyse van het energieverbruik van huishoudens in België*', FOD economie, KMO, middenstand en energie, p. 8
[13] Annex 7: '*Analyse van het energieverbruik van huishoudens in België*', FOD economie, KMO, middenstand en energie, p. 12

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1
a) Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)?

Normally there is no permit needed to install heat pumps or pellet/wood stoves. European eco-design and eco-labelling regulations are in place, eliminating the most inefficient machines.

There are some exceptions:
For substantial installations (>10 kW) an environmental permit is required.[14]
On a local level there could be an "obligation to report".[15]

Next to this, in some cases a permit is required to perform a drilling for a geothermal heat pump. This is mainly dependent on the power of the heat pump, the depth of the drilling and if the system is open or closed.

b) Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed?

Besides the European eco-design and labelling requirements, there are no additional requirements.

For new buildings there is a very strict EPB legislation. New buildings must meet certain requirements on insulation, energy consumption, ventilation,... To meet these requirements, a heat pump is often necessary. This is currently the main driver to install heat pumps in buildings. But this does not account for renovation.

c) For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

n.a.

H.A.2.
A) Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)?

For the installation of heat pumps: certified refrigeration technician.[16]
For the installation wood and pellet stoves: qualified craftsman or qualified technician, no extra certificate needed.

B) Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)?

[14] https://warmtepompenadvies.be/warmtepomp-vergunning/
[15] https://warmtepompenprijs.be/vergunning-installeren-warmtepomp/*

[16] Annex *1: 'checklist keuring koeltechnisch bedrijf'*, departement omgeving Vlaamse Overheid, 23/10/2017, p. 13

There is mandatory inspection for leak proof testing of the cooling circuit of a heat pump every year by a certified refrigeration technician. Depending on the amount of CO_2-equivalent, systems with a GWM<5ton CO_2-equivalent (and below 50) officially need to do this every 12 months. They also need to have a logbook where they keep the amount of refrigerant which has been refilled every time. This needs to be performed by a qualified (FL and BR) or specialized (WL) cooling technician.[17]

Wood/Pellets stoves connected to a central heating system: There is a compulsory inspection for central heating (combustion certificate and inspection report). The inspection is an obligation for the owner or landlord and needs to be performed yearly (except for gas fired boiler this is every 2 years (In WL region every 3 years). For the inspection, you must call in the services of a qualified technician:
- At first use (regardless of capacity)
- When replacing the boiler or burner
- In case of renovation or relocation.

As for individual heating not connected to a central heating system, there are strict regulations on efficiency and emission levels (based on the EU-ecodesign regulations) before appliances can be sold on the market or installed at home. The installation has to be done by a certified technician. Maintenance is recommendation by the government, but not mandatory for individual heating appliances (stoves, gas fires, fireplaces, flow-through boilers, etc.) that are not connected to a central heating system. [18]

C) For those measures, is a certificate of the product or of the installation needed?

Heat pump
- Inspection results must be kept for at least five years. At least one copy of the records must be given to the owner or manager of the installation and, if applicable, in the installation-related logbook or register.[19]

Wood/Pellets stoves central heating
- At first use: a combustion certificate and inspection report are delivered to the owner/landlord.
- Inspection: a cleaning and combustion certificate is delivered to the user.

Financial Incentives

H.A.3.
A) Are there rebates for buying heating appliances/products?

FL: For heat pumps in renovations (max. 40% of the bill).[20] In combination with other (energy-savings) investments more rebate is possible. In some cases also wood/pellet stoves connected to central heating systems may apply for the renovation subsidy.[21] Furthermore for protected customers (households who are equitable for social tariffs on electricity and gas) the energy saving incentives are increased with 50%

WL and BR: Different incentives for heat pumps for space and for water heaters.

[17] Annex 2: '*Wetgeving koelmiddelen',* AB Coolservice bvba, 25/02/2015 , p. 9
[18] https://www.vlaanderen.be/schoorsteen-reinigen#schoorsteen-van-individuele-decentrale-stooktoestellen
[19] Annex 3: *'Het stooktoestellenbesluit en het VLAREL: aandachtspunten voor technici', Departement omgeving, Vlaamse Overheid, 24/12/2018, p 37*
[20] https://www.vlaanderen.be/premie-van-de-netbeheerder-voor-een-warmtepomp
[21] https://www.vlaanderen.be/overkoepelende-renovatiepremie

In WL max. 70% of the bill[22], in BR max. 50% of the bill.[23] Both regions also provide other renovation subsidies, more specifically the combination with other rebate programmes for energy saving measures linked to heating (isolation, glazing, solar boilers,…).[24]

On a local, municipal level, other rebate programs and financial incentives for the installation of more energy efficient heating systems can be in place.

B) Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

The rebate programs for heat pumps are calculated through a reduction in property tax (if a building meets certain energy criteria (by placing a heat pump or other energy saving investments), or through a direct premium from the grid operator.[25]

C) Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?

Rescert certificate is mandatory, ecolabel minimum A++ for geothermal heat pump and minimum A+ for other heat pumps (FL).[26]

- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**

In FL: For *protected customers* (Households who are equitable for social tariffs on electricity and gas) the energy saving incentives are increased with 50%

In BR and WL rebate programs are linked to different income categories and household compositions.[27]

- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)**

Only renovations for buildings built before 2014

- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

No

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)?

- There are campaigns on energy saving measures and to address installers, both from the different governments and from the federations of heat pump manufacturers/retailers.

[22] https://www.infopompeachaleur.be/primes-pour-pompes-a-chaleur/primes-wallonie/
[23] https://www.infowarmtepomp.be/premies-voor-warmtepompen/premies-brussel/
and https://leefmilieu.brussels/sites/default/files/user_files/list_primes2019_nl.pdf

[24] Annex 5: 'Primes énergie&rénovation' Wallonie service Publice, p. 7
[25] https://www.vlaanderen.be/premies-voor-een-warmtepomp-of-warmtepompboiler
[26] https://rescert.be/nl
[27] https://energie.wallonie.be/fr/primes-energie-si-envoi-d-un-avertissement-prealable-avant-le-31-mai-2019.html?IDC=8793

- The regional energy agencies (FL, BR, WL) also distribute information and guide people towards more ecological appliances.[28]
- The sector organization on renewable energy ODE, which is the link between government and the sector of heat pumps and other renewable technologies, also takes up this role[29]
- *Slagkracht*: a project that offers free training to installers of heat pumps.
- Additionally there are different ecological organizations, local governments, city councils, heating companies and other local businesses and organizations who provide (online) information and/or tools to guide or advise people on heating systems (rebate programs, installer lists, info on regulations,…)

Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

For renovations there is a 6% VAT instead of the normal 21% (for new buildings).

In Flanders combining different energy-savings investments (for example a heat-pump in combination with floor and roof isolation and new double or triple glazing) can increase your renovation subsidy.

Also in Brussels and Wallonia there are different rebate programmes on energy savings in houses and for the renovations of buildings.[30] [31]

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Not existing yet.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

See question H.A.2.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

See answer H.A.4

Most important:
ODE: Sectoral organization for renewable energy in FL.

[28] Vlaams Energie Agentschap (https://www.energiesparen.be/over_vea), Leefmilieu Brussel,(http://www.leefmilieubrussel.be), Service Public de Wallonie DGO4 (http://energie.wallonie.be)
[29] https://ode.be/

[30] Annex 4: Energiepremies 2019, Leefmilieu Brussel, 01/2019, p.18
[31] Annex 6: Overzichtstabel premies Brussel, Leefmilieu Brussel, 14/12/2018, p. 1

The different partners of the 'Plea for Green Heating' a project by BBL and many other partners.[32] The regional energy agencies. VEA (FL), Leefmilieu Brussel (BR), DGO4 (WL)

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available

The main part of the heat pumps are sold by the importer/manufacturer to the installer.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Yes, can be found online.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.

We have different actors on national/regional level (ODE, Slagkracht) who are building decision trees for heating appliances.[33] It would be very convenient if we could use the same system, that we work towards one system that we all use in advising them.

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

In all regions there are multiple sources:
Quick wins 1: https://www.energiesparen.be/tips
Quick wins 2: https://www.energievreters.be/HouseClosed.aspx?lang=NL
Quick wins 3: http://document.environnement.brussels/opac_css/elecfile/100tipsEnergieNL

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)?
The law and requirements differentiate between two categories of installations. Installations with a total installed power greater than or equal to 5 kW and installations with an installed power

[32] https://www.bondbeterleefmilieu.be/activiteiten/pleidooi-groene-warmte

[33] https://www.kiesjeverwarming.be/

smaller than 5kw.[34] In both cases a certified technician is needed for the installation, but the ecological, efficiency and safety requirements are stronger for the first category. They relate to:

- Maintenance
- Maximum relative leakage loss
- Periodic leak-tightness checks
- Completion of installation-related logbook
- Periodic inspection of air conditioners with a rated cooling output > 12 kW

Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed?

Before a product can be sold or installed the European eco-design and eco-labelling requirements have to be met. Furthermore there are multiple ecological and safety requirements for installing of cooling systems as formulated in Vlarem II (Annex 8, see answer C.A.1.). For mobile units and small home appliances there are no additional requirements than the European eco-design and eco-labelling requirements. No additional requirements than the European eco-design and eco-labelling requirements.

For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

See regulations heat pump in question H.A.1.
No building permit for cooling installations, except when connected with a geothermal heat pump or if the installation exceeds 3 meters on top of the building. If a building permit is needed for geothermal heat pumps, this is mainly dependent on the power of the heat pump, the depth of the drilling and if the system is open or closed.

C.A.2.
A) Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)?

All fixed air-conditioning's need to be installed by a certified cool technician and a certified refrigeration company.[35]

Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)?

See question C.A.1.

For those measures, is a certificate of the product or of the installation needed? For which product(s)?

See question C.A.1.

Financial Incentives

[34] Annex 8, *Artikel 5.16.3.3. Koelinstallaties,* Besluit van de Vlaamse regering van 1 juni 1995 houdende algemene en sectorale bepalingen inzake milieuhygiëne, VLAREM II, 31juni 1995, p. 538
[35] Annex *1: 'checklist keuring koeltechnisch bedrijf'*, departement omgeving Vlaamse Overheid, 23/10/2017, p. 13

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)?

No, on the contrary, often the cooling option needs to be switch off to be able to get the incentive for a heat pump.

For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**

N.a.

- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**

N.a.

- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**

N.a.

- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

N.a.

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

No subsidies for cooling, the main focus is to (re-) build houses in such a way that active cooling is not needed. Next to this Belgium has a moderate climate, therefor are cooling systems not really common in households and not recommended or supported by the government.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Normal fixed air conditioners have to be installed by a certified technician and certified refrigeration company. The certificate and technical approval of the installation is delivered at the owner of the installation and must be kept for future (periodic) technical maintenance and checks.[36]
The portable air conditioners are sold from normal retailers/distributors and the consumer can install it themselves. EU regulations are in place, no further requirements.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

No.

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Yes, can be found online.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

[36] Annex 8, *Artikel 5.16.3.3. Koelinstallaties,* Besluit van de Vlaamse regering van 1 juni 1995 houdende algemene en sectorale bepalingen inzake milieuhygiëne, VLAREM II, 31juni 1995, p. 538

Annex 4 – Contribution to Baseline Report – Czech Republic

Country Introduction

The most important HVAC component is heating in the Czech Republic. The heating is present at every (family) house. AC systems were not common and they are being used mainly in recent years.

There are several heating options in the Czech Republic. The old systems use coal, still present at small communities or still used by central heating plants. The modern heating plants use gas. Coal heating is still present in many parts of the Czech Republic. The general effort is to reduce coal heating especially at local level and the Boiler Funding Programme and New Green Savings Programme is quite popular funding for new types of heating (for family houses).

The district heating is quite common in the Czech Republic. The energy sources for district heating: 57% coal, 7% biomass, 25% natural gas, 5% other gases, 3% other solid fuels, 3% other. The coal combustions in the medium or large plants is much more efficient than in local coal boilers. Also, the coal plants for district heating are usually located outside the cities and in the areas of power plants so the overall emissions are not so directly dangerous like emissions of small boilers in the cities and smaller communities. So the main pressure of last decade was to limit coal sources at local levels. However, important change is expected in next decade as most coal district heating sources will transform its boilers from coal to gas.

There are also other types of boilers common in the Czech Republic: biomass boilers (wood logs, pellets etc), heat pumps (especially in last years) and gas.

The funds limit the choice of boilers to the efficient ones (Ecodesign requirements from 2022) and high emission class. Most requirements are set at state level and declared in appropriate Acts. Only the Boiler Funding programme is managed by local regions (however the limits and conditions are the same / similar).

The total statistics for heating in 2011: gas (49%), district heating (25%), coal (3%), wood (7%), electricity (10%), heat pump (5%), other (1%). Electricity sources: 34% nuclear, 47% coal, 11% RES (2% water, 5% biogas+biomass, 3% PV, 1% wind), 4% gas, 3% other gases, 1% other.

The overall heating sources: 56% gas, 27% coal, 9% wood+other biomass, 5% nuclear, 3% other.

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

Boilers for solid fuels (renewable sources):

- must be installed by “authorized person” only, the accreditation could be obtained by Ministry of Industry and Trade

- other requirements for boilers: ecodesign requirements and national act 415/2012: (new requirements especially from 1/1/2020) maximum emission limits[37]
- the installer of boiler must have certification that the boiler meets the emission limits
- appliance inspection every two years (for every solid fuel boilers)
- protocol of commissioning (start of the operation), this is the formal document where installer confirms that the boiler (model, type) starts its operation
- chimney inspection once a year
- emission class is linked to EN 303-5:
    - 2014: prohibition to buy/sell classes 1 and 2
    - 2018: prohibition to buy/sell classes 3 and below
    - 2020: prohibition to buy/sell classes 4 and 5 so you can buy only boilers with ecodesign requirements
    - 2022: prohibition to operate classes 1 and 2 and boilers without classes

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Gas boilers installation:

- requirement of chimney inspection if the boiler has different parameters than the previous one
- the initial review of gas appliance must be done
- the installation must by carried out by person/company with appropriate "gas certification"
- the inspection of chimney must be done once a year
- according to the national Act 85/1978: gas review should be done every three years, this could be done only by person approved by appropriate state institution, the review should consist of: identified problems and given time to eliminate it, type of appliance, date of last review, used measuring equipment

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

There are two funding opportunities for heating appliances for end users (The Boiler Funding programme, New Green Savings Programme), one for public organisations (Operational Programme Environment), one for private companies (Operational Programme Enterprise and Innovations for Competitiveness 2014-2020). All these four funding streams cover the replacement of inefficient heat sources. The amount of funding is higher if the saving project covers insulation. The supported types of heat sources: pellet boiler (automatic or manual), stoves and fireplaces with heat exchange, heat pump WW/GW/AW, condensing gas boiler.

New Green Savings Programme – Administrated by State Environmental Fund of the Czech Republic (under Ministry of Environment). The purpose of the fund is mainly the change of inefficient heat sources and insulation of buildings (family houses and house block of flats). Applicant needs to have energy assessment by official energy auditor (listed and granted by Ministry of Industry and Trade).
These boiler types supported:

[37] https://vytapeni.tzb-info.cz/vytapime-tuhymi-palivy/12909-co-musi-splnit-novy-kotel-na-tuha-paliva-po-roce-2020

- biomass boiler – manual or automatic – boilers compliant with Ecodesign 1189/2015 article 1 and 2 in Annex II (requirements from 1/1/2020), stoves compliant with Ecodesign 1185/2015 article 1, 2 and 3 in Annex II (requirements from 1/1/2022)
- stoves with heat exchange system – manual
- stoves with heat exchange system – automatic
- heat pump W/W, A/W, G/W (electric or gas) – compliant with Ecodesign 813/2013 1b, 2b, 3 and 5 according Annex II (already should be in force)
- condensing gas boiler – compliant with Ecodesign 813/2013 1b, 2b, 3 and 5 according Annex II (already should be in force)
- connection to district heating system

Terms of support:

- only substitution of older boiler
- the substitution of electric boiler only for electric heat pump
- energy assessment (done by a official energy auditor listed on Ministry of Industry and Trade
- the support is higher when the project is combined with insulation

The Boiler Funding programme – Administrated by 14 autonomous regions of the Czech Republic (called "kraj") with State Environmental Fund. The programme is mainly to reduce emissions produced by local boilers. Applicant needs to have energy assessment by official energy auditor (listed and granted by Ministry of Industry and Trade). The boilers must be on official product list. There are various 14 terms according to the local regions but the most common conditions are:

- supported only boilers, not stoves
- not suitable for substitution of gas boiler, only solid fuel boiler
- biomass boilers (Ecodesign compliant 1/1/2020) without manual refueling
- condensing gas boilers are ok if the original boiler has emission class 3 or below
- heat pumps are ok
- special bonus for priority locality (lists of them differ according to the region's requests)[38]
- this funding opportunity ended with the 3rd call in autumn 2019 and it is not known if there will be another call

Operational Programme Environment and Operational Programme Enterprise and Innovations for Competitiveness 2014-2020 are not meant for end-users.

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**

  Yes, described above.

- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**

  Described above. The Boiler Funding Programme have its priority localities where people can get some more funds. There is no income level limit.

- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)**

[38] https://www.opzp.cz/dokumenty/detail/?id=1724

The funding for boilers are in both funding programmes intended only for substitution of old inefficient boiler. Beneficiaries have to sign that they have ecologically disposed the old boiler.

- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**
  No

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

Informational help:
- New Green Savings Programme website portal (infoline for the programme)
- The regions' websites (infolines for the Boiler Funding programme)
- EKIS – the consultancy network paid by Ministry of industry and trade (network of companies working at given times for public)

Both main end-users programmes offer more funding when combined with insulation. Described in detail above.

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No

Part B: Supply market analysis and market structures. Purchase procedures.Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Usually, the installer company will design the heating system and will provide the exact type of the boiler/heating source. This is the usual and most common way how the end-user obtains heating source. However, in some cases for smaller houses (family houses), the investor (user of the house) could change the type of boiler/heat pump if he/she is aware of the project details and have enough of technical knowledge.

Eventually, the user of the house has to have all the necessary papers and stamps (chimney inspection, etc.).

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

informational help:
- New Green Savings Programme website portal (infoline for the programme)

- The regions websites (infolines for the Boiler Funding programme)
- EKIS – the consultancy network paid by Ministry of industry and trade (network of companies working at given times for public)

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

1. Installers (including designers of heating systems), 2. distributers/manufacturers, 3. energy utilities and ESCOs

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

There are plenty of installation companies available through online communication.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

n/a

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

- „overheating", Czechs love warm/hot homes and sometimes are not aware of costs and its price
- appropriate setting of temperature (recommendations, different for each room)
- switching off the appliances if not used (ventilators, etc.)
- setting the right temperature of water heaters
- recommendations for operation of different types of heating systems (especially for condensing boilers)
- when it is meaningful to heat with AC unit?
- not efficient use of electric plug-in heaters
- possible savings with different heating systems (overview, infographics)
- possibilities of smart controls of heating systems, i.e. smart valves (overview, infographics)

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to

be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

No limitation for cooling products

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

The AC unit (split) could be installed only by a "certified person" according to the national Act 73/2012 and there must be a "written agreement" where the specific type of AC unit is stated. Also, there must be confirmation of "professional installation" of appliance. These requirements are based on Act 73/2012 about F-gases and appropriate handling of F gases.

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

There is no rebate programme for AC units (cooling).

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

There is no rebate/incentive programme for cooling.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

The process is similar to heating source selection process. AC units were not designed in family houses in the past. Nowadays, they becoming standard in some new houses. The most of AC units are installed in existing houses.

The AC units are designed and installed mostly by expert cooling companies.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

EKIS – the consultancy network paid by Ministry of industry and trade (network of companies working at given times for public)

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Mainly installer and expert cooling companies.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

The installer companies are usually online. And there is association of cooling installer companies.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

n/a

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

- ventilators
- enough of fluid intake
- dress appropriately
- IR reflection foils (infrared reflective coatings) on windows
- window louvers, blinds or awnings
- plant trees

Annex 5 – Contribution to Baseline Report – Switzerland

Country Introduction

In Switzerland there are more than 3.2 mio buildings, more than 2/3 in the residential sector. More than the 20% of buildings were built after 1990, and the stock is still increasing in the last 15 years[39].

One third of the overall country consumption in in space heating, decreasing year by year due to efficiency measures and climate conditions. Almost 50% of the heating in the residential sector uses oil. For hot water oil and direct electric systems are the most diffused. In new installations and in major renovation, and especially for single family buildings, heat pumps are installed in the majority of the cases. Cooling systems are not so common in the residential sector, despite the increase, especially of portable units, in the last years. Reversible heat pumps systems are used in combination with radiant cooling, especially in new buildings or major renovation.

In the building sector the legislative framework and the voluntary labelling are strongly pushing towards more efficient buildings and renewables: the reduction of the energy needs is one of the main strategies[40], followed by the substitution or minimization of fossil-based sources. The regulatory part covering the energy issues is quite in line with the EU: the EU energy label and Ecodesign regulations are adopted for all the products (additional voluntary labels or MEPS are used). The cantonal energy regulations are setting minimum requirements (based on a common set at federal level) regarding efficiency, consumption and additional requirements (based mainly on the national standards SIA, like e.g. for shading systems). The safety issues are defined at national level, the CE mark is accepted and for specific products an additional verification is needed. The federal legislation sets also limits to emissions (noise and pollutions).

The set of incentives is defined at cantonal level (based on a federal scheme), locally is possible to have additional schemes.

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

Requirements are set for all new and refurbished heating systems, as specified in the Cantonal energy regulations. The mandatory form is part of the construction permit for the municipality, for newly installed or substitutions of boilers and heat pumps. For stoves and fireplaces, a separate documentation is needed, based on cantonal regulations.

The energy label is available like in EU for heating products. The technical fiche should be attached to the documentation for the permit. Only condensing boilers are admitted for new installation/replacement of gas/oil boilers. The combustion system should have a specific approval by SVGW (society for gas and water industry) for safety, + the conformity declaration to

[39] https://www.bfs.admin.ch/bfs/de/home/statistiken/bau-wohnungswesen.html
[40]

the ordinance against air pollution, and VKF (fire policy association) for fire safety of exhaust. In general, all gas and water apparels must be approved by the SVGW | SSIGE | SSIGA.

The technical fiche of heat pumps shall report gas type and quantity. Electrical conformity for all products shall be proofed. For new/refurbished systems in holiday homes is mandatory a distance control. In new or completely refurbished buildings are mandatory controls and mid-low temperature systems. A combination with solar systems is often required (new/refurbished systems in multifamily buildings). Non-renewable heat generation systems are generally forbidden in certified buildings (Minergie), except for peak covering in special cases.

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Yes. For combustion systems is mandatory a qualified installer and a periodic maintenance. For heat pumps hardwired it involves an electrician and a thermal system professional (all with federal certificates).

Yes, see previous answer. Also the technical staff (electrician and thermal systems) must have a federal certificate. For new systems is mandatory a fire-safety certification of the installation (not only about products). The fire safety legislation is federal, the actors involved in the application are defined at cantonal level.

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- ***Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?***
- ***Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?***
- ***Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)***
- ***Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?***

The incentives are for new electric heat pumps for heating and/or hot water, with any source (water, air, ground) but only substituting a combustion or a direct electric system. The amount is defined at cantonal level (with a possible addition at municipal level or by the local utility). It's direct money, the amount is fixed + proportional to the heating power of the installation. The incentive system is managed at cantonal level. Additional incentives are possible at municipal level.

The direct credit is devolved to the beneficiary (who claim the incentives and pay the invoices). Not necessarily the home owner.

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

Cantonal offices for energy, associations or municipal utilities are giving advice.

The “heat pump system modul” website contains a list of certified products and lists the installers/designers.

The new system < 15 kW of heating power should satisfy the quality mark (selected installers and products) of the “heat pump system module”. It’s a certification of proper design and installation.

For systems with higher heating power, there is no limitation (only minimum standard, set at regulatory level based on the EU regulation).

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the “white certificate market” (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No. Such obligation system/market is not available. Local energy companies have set a voluntary scheme.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

It’s possible to buy directly from the importer or the distributor but typically is the installer or the technical designer/installer. The addition/substitution of any kind of heat generator needs a municipal permit, for the cantonal building law.
Small plug-in systems are not considered as main heating system, is possible to find them in shops. Direct electric heating is forbidden in most of the cantons (typical exception is the direct electric towel tray, only admitted in toilets as additional systems and with a timer). New electric boilers for hot water are possible only if connected with the main heating generator or fed by renewable systems.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Only providing information: federal office for energy, EnergieSchweiz, cantonal energy offices, municipal utilities and associations.

The “heat pump system module” website offers many information.

H.B.3. If it’s not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

For large or main systems mainly the installer, 90%. Rarely the distributor or producer. For stoves and fireplaces mainly distributor or retailer.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

No.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, ...
Probably are useful the savings achieved, compared with the previous system (Money, Energy and CO_2) + the incentive contribution (in %?). Comfort issues?

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

- Swiss Federal Office of Energy (SFOE) for heating products https://www.energieschweiz.ch/page/de-ch/heizen
- „Smart Heating“ best thermostats: https://www.topten.ch/private/adviser/ratgeber-smarte-heizsysteme
- Brochure about efficient heating https://www.bundespublikationen.admin.ch/cshop_mimes_bbl/8C/8CDCD4590EE41ED8A6F9D2A5CE7C7185.pdf

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

For any active cooling system, a building permit is necessary, to be submitted to the municipality. Small systems or plugin units are not covered by the building law.

For small units (<12 kW) the EU energy label is mandatory. In case of new installation, the cantonal regulation on the energy use sets limits (on power installed per m^2, otherwise is necessary to proof the cooling need – practically impossible in households). In case of high specific power, the regulation sets specific requirements (on internal thermal mass, on shading systems and its controls), accordingly to the national technical standards (SIA 382/1).

Any system installed outside or connected with the outside air (heat pump vents, external part of a split, ..) need to be approved by the cantonal authority (Federal ordinance on noise pollution).

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

For hardwired products only an electrician can do it (NIS – Ordinance on low voltage installations).

Only a technician in technical systems could manage and install appliances with refrigerating gases (Chem RRV, ordinance on risk reduction of chemical products use). For small plug-in systems no requirement is needed.

It's the state of the art, since the product must be installed by an expert (if it's hardwired and with f-gases). For small plug-in products NO.

Financial Incentives

C.A..3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- ***Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?***
- ***Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?***
- ***Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)***
- ***Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?***

No (but partly, because for reversible heat pumps the heating function is incentivised…)

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

Some advice on how to avoid overheating is given by EnergieSchweiz and local actors and agencies.

NO, since no incentive plan for cooling systems is active.

Figure 1: Energy consumption of a comfort fan compared to a mobile AC unit. Source: topten.ch

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No incentive.

Short-term local incentive programmes for comfort fans in summer exist occasionally (e.g. by utility companies).

Part B: Supply market analysis and market structures. Purchase procedures. ***Analysis of the sale and installation chain for each product (imported products, market research, ..):***

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Comfort fans are bought individually online or in retail stores and installed by the user; no documentation except for warranty and instruction manuals. AC units are predominantly installed professionally.

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, ...

The purchase procedures, actors, % of market channels, for hardwired products or other systems with a gas distribution are similar to the one described above for heating products.

Comfort fans are purchased almost exclusively directly by users either online or in retail stores. No networks for installing or advising on cooling systems. (only advising on heat protection in summer, same one ad for heating).

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

- Topten Switzerland in cooperation with the Swiss Federal Office of Energy (SFOE) has compiled a brochure in 2019 for the cooling of office rooms and buildings. It contains tips and tricks to achieve a comfortable in-room climate without cost and energy intensive measures. The brochure is available in German, Italian and French.
    - https://www.topten.ch/private/page/cool-bleiben
    - https://storage.topten.ch/source/files/Cool%20Bleiben/Cool-Bleiben.pdf?_t=1558690493

- A similar brochure for the general public could be realized in 2020 or 2021.

Annex 6 – Contribution to Baseline Report – Germany

Country Introduction

Germany has 40 million households whose main energy sources for heating are natural gas (48% of the households), oil (26%), and district heating (14%). Wood (3%), night storage heaters (3%) and heat pumps (2%) are the less common heating energy sources for German households. The main heating system in Germany is central heating which is used in 70% of the households. Statista states that there are 4.8 million oil heating systems, 7.1 million gas heating systems, 500.000 pellet heating systems and 2.36 million solar thermal systems. In 2019 there were 880.000 installed heating pumps, which become more and more popular in the German market and households. Meanwhile cooling technics like air conditioning systems or comfort fans were not wide spread in German households, but the annual sales are raising in the last years. In Germany the regulatory framework is quite wide and introduced over the years a lot of instruments and incentive programmes regarding heating and cooling systems. Some of the regulations are naturally based on the EU directives, like the EVPG ("Energieverbrauchsrelevante-Produkte-Gesetz") as an implementation of the Ecodesign directive or the national implementation of the EU energy label regulation. Additionally, important standards for heating and cooling products in buildings derive from regulations like the energy saving regulation (EnEV) or the renewable energy heat act (EEWärmeG). Furthermore, there are incentive programmes on the federal, regional (Länder) and local level for efficient and environment friendly products.

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

Depending on the building there are certain requirements for the choice of heating products. This is obligated for buildings bigger than 50 square meters.

New buildings must use renewable energy for their heating system to a certain extent. If heating technics with solar power are used, it must deliver at least 15 % of the total energy demand within the building; for bio mass (gas) it is 30 % and for bio mass (solid/liquid) and geothermal energy it is 50 %.

For refurbished buildings the amount of heating from renewable sources are also specified. If you can't follow those requirements, you must implement additional energy efficiency measures in compensation. This is based on the EEWärmeG, which stands in connection with the Renewable Energy Directive of the EU.

In existing buildings you also have to replace heating products, which are older than 30 years.

Additonal source:

dena/Frontier Studie „Energieeffizienz Verpflichtungssystem" (2012), pp. 19-20. https://www.dena.de/fileadmin/dena/Dokumente/Pdf/9099_Studie_Energieeffizienz-Verpflichtungssysteme_EnEffVSys.pdf

Tabelle 2-3: Instrumente und Maßnahmen für Energieeffizienz in der EU-27[8]

	Instrumente und Maßnahmen
Ordnungsrecht	▪ 2003 - EU-Energiesteuer 2003/96/EG (Mindeststeuern) ▪ 2006 - Richtlinie 2006/32/EG Endenergieeffizienz und Energiedienstleistungen (EDL-RL) ▪ 2009 - Verordnung (EG) Nr. 443/2009 Emissionsnormen für PKW ▪ 2009 - Ökodesign-Richtlinie (2009/125/EG) (Mindesteffizienzanforderungen) ▪ 2009 - Richtlinie 2009/33/EG (Beschaffungsrichtlinie Straßenfahrzeuge) ▪ 2010 - EU-Gebäuderichtlinie (z. B. Art. 9, Niedrigstenergiegebäude)
Förderprogramme	▪ Europäischer Energieeffizienzfonds (EEEF) ▪ 7. EU-Forschungsrahmenprogramm
Marktinstrumente	▪ 1999 - RL 1999/94/EG zur Verbrauchskennzeichnung von Neuwagen ▪ 2002 - Novelle 2010 RL 2010/31/EU Gebäude-Gesamtenergieeffizienz (Energieausweise) ▪ 2003 - EU-Energiesteuer 2003/96/EG (Steuerermäßigung) ▪ 2006 - Richtlinie 2006/32/EG Endenergieeffizienz und Energiedienstleistungen (EDL-RL) ("Weiße Zertifikate"; Art. 6 Abs. 2 der EDL-RL) ▪ 2009 - Verordnung 1222/2009 Kennzeichnung von Reifen bzgl. Kraftstoffeffizienz ▪ 2010 - Richtlinie 2010/30/EU (Energieverbrauchskennzeichnung) ▪ 2011 - Einbeziehung des Luftverkehrs in den CO2-Emissionshandel
Freiwillige Vereinbarungen	▪ freiwillige produktbezogene Label (Pumpen, Warmwasserarmaturen, Heizungs-thermostate) ▪ freiwillige Vereinbarungen für die Umsetzung der Ökodesign-Richtlinie (bildgebende Geräte, komplexe Set Top Boxen) ▪ EU-Energy Star für Bürogeräte ▪ EU-Eco-Label (Umweltblume) ▪ Normen, z. B. für Energiemanagementsysteme (DIN EN ISO 50001)

Table of energy efficiency instruments and regulations of the EU

Tabelle 2-4: Instrumente und Maßnahmen für Energieeffizienz in Deutschland

	Instrumente und Maßnahmen
Ordnungsrecht	▪ 1976 - Novelle 2009 - Energieeinsparungsgesetz (EnEG) (Gesamtenergieeffizienz von Gebäuden) ▪ 1977 - Novelle 1994 - Wärmeschutzverordnung (WärmeschutzV), abgelöst durch EnEV 2002 ▪ 1981 - Novelle 2009 - Heizkostenverordnung (HeizkostenV) (verbrauchsabhängige Abrechnung der Heizkosten) ▪ 1999 - Novelle 2012 - Stromsteuergesetz (StromStG) ▪ 2002 - Novelle 2009 - Energieeinsparverordnung (EnEV) (Gebäude) ▪ 2002 - Energieverbrauchshöchstwerteverordnung (EnVHV) ▪ 2002 - Novelle 2010 - Kraftfahrzeugsteuergesetz (KraftStG) (Besteuerung CO2) ▪ 2003 - Novelle 2012 - Vergabe-Verordnung (VgV) (Vorgabe bei Vergabe öffentlicher Aufträge, Energieeffizienz zu berücksichtigen) ▪ 2005 - Novelle 2009 - Energiewirtschaftsgesetzt (EnWG) ▪ 2006 - Novelle 2011 - Energiesteuergesetz (EnergieStG) ▪ 2008 - Novelle 2011 - Energieverbrauchsrelevante-Produkte-Gesetz (EVPG) ▪ 2008 - Novelle 2011 - Erneuerbare-Energien-Wärmegesetz (EEWärmeG) ▪ 2010 - Energiedienstleistungsgesetz (EDL-G) (vor allem Informationspflichten)
Förder-programme	▪ 2008 – BMU Nationale Klimaschutzinitiaitve ▪ 2009 - BAFA - Vor-Ort-Beratung für Wohngebäude ▪ 2009 - Förderung von "Energieeffizienz- und Klimaschutz-Netzwerken" in Unternehmen ▪ 2010 - Novelle 2011 - Gesetz zur Errichtung eines Sondervermögens „Energie- und Klimafonds" (EKFG) ▪ 2011 - Förderung von Impulsgesprächen zum Thema Energieeffizienz in KMU ▪ 2012 - Förderprogramm für effiziente Querschnittstechnologien im Mittelstand ▪ 2012 - Förderung von Energieberatungen im Mittelstand (Vorgänger 2009 – Sonderfonds Energieberatung KMU) KfW-Programme ▪ KfW-Programme Energieeffizient Bauen und Sanieren im Rahmen des CO_2-Gebäudesanierungsprogramms des Bundes ▪ Energetische Stadtsanierung (KfW, Bund) ▪ KfW und BMWi Sonderfonds Energieeffizienz in KMU („Energieeffizienzberatungen" und zinsgünstige „Investitionskredite für Energiesparmaßnahmen".) ▪ Energieeffiziente Stadtbeleuchtung (KfW) ▪ Soziale und kommunale Infrastruktur finanzieren (KfW)
Markt-instrumente	Verbraucherinformationen ▪ 1997 - Novelle 2012 - Energieverbrauchskennzeichnungs-VO (EnVKV) ▪ 2004 - Novelle 2011 - Pkw-Energieverbrauchskennzeichnungsverordnung (Pkw-EnVKV) ▪ 2007 - Novelle 2009 - Energieeinsparverordnung (EnEV) (Gebäudeenergieausweis) ▪ 2010 - Energiedienstleistungsgesetz (EDL-G) ▪ 2012 - Energieverbrauchskennzeichnungs-G (EnVKG) ▪ *Vor. ab 2013: Steueranreiz zur Einführung von Energiemanagementsystemen (EMS) als Voraussetzung zur Fortführung des Spitzenausgleichs (laut Energiesteuer-Gesetzentwurf)* ▪ *Zur Abstimmung im Bundesrat: Steueranreize zur Absetzung von energetischer Gebäudesanierung* Informations- und Beratungsangebote ▪ Green-IT Initiative des Bundes ▪ Zentrale Kompetenzstelle für nachhaltige Beschaffung ▪ Deutsche Energie-Agentur – Informations- und Motivationskampagnen zu Strom, Gebäuden, Mobilität ▪ Servicestelle kommunaler Klimaschutz (difu) – Information und Beratung für Kommunen ▪ Energieagenturen der Länder – verschiedene Informations- und Beratungsangebote ▪ Forschungsinstitute (z. B. Projektträger Jülich, Fraunhofer) usw. Ökonomische Anreize ▪ 2002 - Novelle 2011 - Kraft-Wärme-Kopplungsgesetz (KWK-G; Stromabnahme und -vergütung)

Table of energy efficiency instruments and regulations of Germany

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

There are no requirements by regulations. Qualified craftsmen who are supposed to do the installations are educated by their apprenticeship at least and they belong to a company that is operated by staff that have a master craftsman certificate.

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

There are various rebate programmes for different heating products. Some rebates are given by the BAfA – a federal office of the German Ministry for Economic Affairs and Energy. Other rebate programmes are by the state development bank KfW. The rebates are often linked to requirements for the characteristics of the building, the heating system and combined measures. It is for example mandatory to do the hydraulic balancing of the heating system when funding a replacement of a boiler.

Heating products that use renewable resources like heat pumps, pellet boilers or solar thermal systems are subsidised by a programme called MAP that is linked to the EEWärmeG, the regulation for more renewable heating. Other programmes like the heating optimization programme by the KfW subsidises with a rate of 30% a combined set of measures: change of thermostats, change of circulation pumps, hydraulic balances and optimization of heating water.

The financial incentives are normally not for third parties. Though there has been an interesting pilot project called "Einsparzähler" in 2018/2019 where companies that help saving energy at a consumers building get 50% of the funding after the measurement, when the energy saving is actually proved by continuous monitoring results. https://www.bafa.de/DE/Energie/Energieeffizienz/Einsparzaehler/einsparzaehler_node.html

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

Most of the time the craftsmen or energy consultants help with the subsidy consulting. The BAfA and KfW have hotlines for interested customers. Also online database like Förderdatenbank, foerderdata by febis or tools like the FördermittelCheck by co2online give a good overview for the consumers.

Some local or regional rebate programmes can be combined with national programmes.

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

The main market chain is a three-staged sale. The manufactures have their products sold by gross market distributors to the installers who will sell it to the consumer. The consumer receives eventually the documents regarding the technical approvals and product information.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Yes, e.g. local, regional and federal energy agencies who give advice on energy efficient products to craftsmen, energy consultants and consumers.

H.B.3. If it's not a direct sale, who are the actors involved? Gross market distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Look above, H.B.1.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

The products are available online, offered by online platforms or some gross market distributors.

Concerning the installation service, lately some new actors appeared in the market like Thermondo, Perto or DAA. They offer a quick online consultation, create a concrete offer and send installers to the customer's house for the installation.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

- Pipe insulations https://www.co2online.de/modernisieren-und-bauen/sanierung-modernisierung/heizungsrohre-isolieren-anleitung/
- Window insulation
- Bleed the Radiator
- Weather forecast for heating control

https://www.co2online.de/energie-sparen/heizenergie-sparen/heizkosten-sparen/richtig-heizen-die-10-besten-tipps/

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

Private households don't need permits for the installation of monoblock air conditioners. For split systems can only be installed by qualified installers. There are also some regional constructions specifications, so local building authorities have to be contacted before the installation of split systems. The federal entities have different specifications and processes for this. This is primarily relevant for the outside component of the split systems. They have to fulfil requirements for lighting or noise protection.

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

A portable AC can be installed by the customer. Split system need to be installed by qualified experts/companies that are certified for the work with coolant. This qualification is based on the „Chemikalien-Klimaschutzverordnung", which is an additional regulation to the EU-regulation No. 517/2014 on fluorinated greenhouse gases. The customer is obligated to check for the certification of the installer.

http://www.gesetze-im-internet.de/chemklimaschutzv/index.html

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

No rebates are available for air conditions or comfort fans. There are rebate programmes that take heat pumps with cooling functions into account (C.A.4).

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

The BAfA has subsidy programmes for cooling products over 5 kW for companies and municipalities.

https://www.bafa.de/DE/Energie/Energieeffizienz/Klima_Kaeltetechnik/klima_kaeltetechnik_node.html

For private persons there are only rebate programmes for heat pumps in new or refurbished buildings. Heat pumps may reverse their function and help to cool rooms and buildings. The volume of the subsidies depends on the type and output of the heat pump.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No.

Part B: Supply market analysis and market structures. Purchase procedures. ***Analysis of the sale and installation chain for each product (imported products, market research, ..):***

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

ACs are available in electronic stores but also sold by distributors, installers or directly by the manufacturers. As mentioned before portable ACs can be installed without permits, products which use coolants like split ACs need a certified installer.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Yes, co2online has set up a platform for the Federal Environmental Agency to inform about cooling systems and present certified installers. It is called „Kältemittelportal" https://www.kaeltemittel-info.de/informationen/anwendungen/stationaere-klimatisierung/

It is complemented by other consulting services of the Federal Environmental Agency or local consultations by regional energy agencies. https://www.kaeltemittel-info.de/beratung/

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

For heat pumps or complex cooling systems the main market chain is a three-staged sale. The manufactures have their products sold by gross market distributors to the installers who will sell it to the consumer. Also some specialised installers buy the products directly from the manufacturers.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Products are available online, installation services are not.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

1. Adjust your daily schedule to the temperatures
2. Drink tepid drinks.
3. Cold showers.
4. Use water from spray bottles to cool yourself.
5. Light food on hot days.
6. Switch off all electronic devices like routers.
7. Plants like ivy on walls help to keep the walls cooler.
8. Close window blinds during the day.

https://www.co2online.de/energie-sparen/strom-sparen/hitzeschutz-folgen-des-klimawandels/einfuehrung-was-tun-bei-hitze/

https://www.co2online.de/energie-sparen/strom-sparen/hitzeschutz-folgen-des-klimawandels/gesundheitstipps-im-sommer/

https://www.co2online.de/energie-sparen/strom-sparen/hitzeschutz-folgen-des-klimawandels/energiespartipps-im-sommer/

Annex 7 – Contribution to Baseline Report – Spain

Country Introduction

In Spain, the regulatory part covering the energy issues derives from the EU Energy Label and Eco-design regulations, Regulation (EU) 2017/1369 of 4 July establishing a framework for energy labelling. It applies to energy-related products brought to the market or put into service and determines their labelling as well as the inclusion of standardized information concerning energy efficiency and energy consumption, thus allowing customers to choose more efficient products to reduce their energy consumption.

Many programs aimed at low emission mitigation have been launched in Spain recently. They have been based upon supporting the adaptation of buildings to use renewable sources for cooling and heating systems, domestic hot water (DHW) and small-scale electricity generation. Programs, such as 'Plan Renove', for promoting the replacement to better energy efficiency labeled electric appliances, have reached 23% of households, replacing 4% of heating systems. There are also energy-saving campaigns aimed specifically at assisting in the proper use of cooling and heating systems. It is worth mentioning the Heat Map App, an application which exposes zones demanding cooling and heating and which is a useful tool to evaluate and plan the efficiency of cooling and heating systems.

Market structure and stock
In Spain, as reported in the last statistical analysis made in 2011 by the INE (National Institute of Statistics), there are more than 25 mio dwellings. The 72% of the dwellings are occupied permanently by residents. The 79% of the stock is a property of private persons. 14% of households are rented.
Regarding the energy demand and availability, in Spain the National Strategy against Energy Poverty (2019 – 2024) defines that this situation affects between 3.5 and 8.1 million citizens in 2017.

Heating appliances
Following the statistical data collected in 2011, autonomous systems for the heating generation are installed in 39% of the households, while 9% are equipped with centralized systems (larger multi-family buildings). The 38% of the households are equipped with room systems (single appliances) and the 15% have no appliances for heating.
For the sanitary hot water production, 55% is covered by gas boilers, 15% with electricity, 15% LPG, 8% by solar thermal systems, while Oil and Biomass only 5% and 2% respectively.

Cooling appliances
The cooling appliances are installed in more than the 34% of the dwellings. The estimated heat pump park reaches 11mio units. Of the total park the 5% are used only for cooling, while 95% heat pumps are used to meet heating and cooling needs. Significantly, three quarters of the heat pumps are located in the Mediterranean climate zone.

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be

installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

Only certain EU product policies are active at national level, such as the Directive 2009/125, that regulates the **ecodesign** requirements for energy-related products and provides a framework for the ecodesign in order to ensure their free movement in the internal market and, therefore, in Spain. The same applies to the EU policy related with the Energy Label. Hence, heating products should be accompanied by both, Energy Label and technical fiche.
Power installations of 70 kW or less require a technical certificate, that can be ordered by a competent installer: as a proviso, installations of up to 5 kW or devices for the sole purpose of producing sanitary hot water with up to 70 kW do not require any documentation. The content of the technical certificate is indicated in article 17 of the Regulation of Thermal Installations in Buildings (RITE). The regional government defines the requirements of the technical report, which's content is specified in the aforementioned article. In new buildings, the considered power is the sum of the powers of all the generators of the building, so even if there are installations for different users with powers of less than 70 kW, if the total sum of power exceeds that value, a plan approved by a qualified technician is required.

In new buildings, it is only possible to install condensing boilers. In case of renovations or when replacing the boiler, the installation of sealed boilers is only permitted, if a separate single-family house is concerned. However, when it comes to flats, a sealed boiler can only be installed, if a community gas outlet pipe with a deck (shunt) is available. If no shunt is available, a tube exit to the facade or inner courtyard can be realized, given that there is a high-efficiency sealed boiler, that is low in NOx or condensation. However, not all municipalities allow the tube exit to the facade.

H.A.2. Is there a requirement for technical staff with specific competences for the installation (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Installations must be carried out by qualified installers, who operate within an authorized installation company.

Once the work is finished, the corresponding certificates will be signed. In case that a technical project has been required, a competent qualified technician is needed to manage the work. For tests carried out by an authorized installer or a competent technician, the fuel supply for testing can be requested from the supplying company, if needed. Once the tests have been completed, the relevant documentation will be registered within the community (regional goverment), this documentation being:

- Technical report or plan.
- Installation certificates.
- Certificate of initial installation when determined by the Autonomous Region (Regional Government).

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to the individual or household receiving the rebate (e.g. income levels)?**

- **Are they conditional to a specific type of intervention (new installation, just in combination with home refurbishment, etc.)?**
- **Is it possible to "devolve" the financial incentive to a third party (in Italy it is called "credit cession", typically towards the ESCo or the installer) in order to receive an immediate discount on the intervention cost?**

It depends on each region. In the second semester of 2019, only the Community of Madrid and the Principality of Asturias offer support plans.

Community of Madrid
This is one of the few open calls for support regarding the change of individual boilers.
The conditions for the support offered by the Community of Madrid are:

- Condensing boilers: incentive of up to 350 euros per house.
- Low NOx sealed heaters (butane), incentive up to 150 euros.
- In both cases, the support is limited to 25 % of the eligible cost (VAT not included).

The application period for the subvention will be open until 31 December 2019, unless the funds are spent earlier. The prerequisite for receiving the support is to have realized the change between 11 June and 31 December 2019.

Link

H.A.4. Are there active national/regional programmes advising consumers about rebates/incentives/certification programmes on heating (for informational purposes, addressed to installers, etc.)? Is there a specific level of subvention for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

Mostly by retailers and manufacturers.
Sometimes, the IDAE (national energy agency) does some advertising in television about energy efficiency, but mostly in social media.

H.A.5. Are the savings offered by a third party (ESCo, Energy company, ...) for the installation of heating products accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No. Such a system is not available in Spain.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom do you buy this product, who will install it, is there a need for a specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?
H.B.2. Are there any networks or informational services aiming to install more efficient systems/products at national/local level?
H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?
H.B.4. Is the product or the installation service available online? (this could be useful in the next phases)
H.B.5. Add the questions related to the other work packages (requirements on tools for professionals in WP5, which kind of results they need from the calculators, etc.)

The principal sales channel is through installers.

There are no specified networks or services aiming to install more efficient products at national level.

Consumers can find heating products or installation services online. For example, here: a retailer also offering installation:
https://www.leroymerlin.es/calefaccion-y-climatizacion/calderas-y-aerotermia/calderas-de-gas

Part C: Solutions to feel comfortable/healthier during winter

Here we selected some of the recommendations we share to feel comfortable at home during winter and to reduce the energy consumption:

- **Heating to an adequate temperature**: Every degree, that you increase the temperature will consume 7% more energy. A room temperature of 19°C is more than sufficient.
- If you are renovating your house, make sure to install some type of thermal insulation in the walls or in the ceiling.
- In terms of **windows**, double glazing and blinds are recommended. Without insulation, the temperatures of two connected surfaces assimilate, meaning that the inner wall loses temperature by assimilating to the temperature of the outer wall. Thermal insulation helps to prevent this effect. The better we insulate our houses, the less heat we will lose.
- A good thermal insulation of the house can save you more than 50% of energy.
- **Flush your radiators** once per year to make sure that there are no air bubbles reducing its efficiency.
- Don't place anything in front of your radiators since doing so will block the heat flow. Especially don't leave wet clothes on your radiators in order to dry them. This will increase air humidity, which then could lead to condensation on windows, walls or in unheated zones.
- Shut the blinds at nighttime to increase thermal insulation and to reduce the amount of heat passing through the glass of the windows.
- Put up **thick curtains** and keep them closed during the night. Just like the blinds, this will work like a barrier against the cold, that could enter through the windows.
- Close doors and windows, especially the ones of unheated rooms. This way you will also avoid losing heat.

An elevated level of humidity inside the house can cause condensations in colder zones of the house, as well as in enclosures and windows. In the following, we will suggest a few methods to control and reduce the percentage of humidity in the house, also increasing comfort.

- **Dry your clothes outside**. Avoid drying inside, since the humidity from the clothes will preserve in the home environment and condensate in the coldest rooms of the house.
- **Shower with the door closed**. Every time you use hot water, close the door to make sure that the steam doesn't dissolve into other rooms and generates humidity. If possible, after finishing the shower, open the window for 5 min so that the generated steam can leave.
- **Cook with the door closed**. The kitchen is a big source of steam, so always cook with the door closed and the fume hood activated.
- **Ventilate your house every day** for 10 min to renew the air and to reduce the amount of humidity.

All these recommendations and more are included it in the following material:

- Guidebook to promote low-cost and no-cost solutions to help people be more comfortable at home:
  - https://niunhogarsinenergia.org/panel/uploads/documentos/manual_economia_energia_domestica.pdf
- Questionnaire „I want to save energy and money"
  - https://niunhogarsinenergia.org/cuestionarios/autodiagnostico.php
- Low-cost building renovation guidebook:
  - http://www.fundacionnaturgy.org/publicacion/re-habilitacion-expres-hogares-vulnerables-soluciones-coste/

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

European legislation concerning air-conditioning touches upon topics such as eco-design, labelling, energy efficiency, renewable energy and refrigerants.

When it comes to national legislation, the most noteworthy regulations regarding air-conditioning devices are: 1) the Technical Building Code (CTE) and 2) the Regulations on Thermal Installations of Buildings (RITE). Both are currently being modified. Regional and municipal legislation are also of great importance.

The CTE includes a section of energy saving (CTE-HE) that, in alignment with European regulations, has to be updated regularly. Since its publication in 2006, the CTE-HE has been updated on numerous occasions (23rd October 2007, 25th January 2008, 12th September 2013, 8th November 2013). The final version, approved in December 2019, will become effective later this year in June 2020.

The requirements regarding installations, executing installation companies and the personnel depend on the type of equipment and location, the type and quantity of refrigerants used, etc.

The new CTE-HE limits both, energy demand and consumption of the building (compulsory for new constructions and with a margin of flexibility in cases of renovation). In order to do, the CTE limits the maximum heat transmittance of thermal insulation (in walls, floors, roofs, gaps, etc.), which depends on certain design factors, like aspect, compactness of the building or solar protection of gaps like windows and doors.
The new version of the CTE does require some sun protection parameters to be met in windows, doors and similar surfaces.

Any system installed outside is regulated by the municipal authority in terms of noise and vibration.

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?
Depending on the type of installations, the installers need to meet specific requirements, also when it comes to fluorinated gases, but all the installations have to be done by a certified refrigerator installer.

With regard to equipment containing fluorinated gases and technical personnel for the installation of such, Royal Decree 552/2019 has just been published. It approves the Safety Regulations for Refrigeration Facilities (RSIF) and includes supplementary technical instructions, which is of great importance when installing equipment with fluorinated greenhouse gases.

Royal Decree 115/2017 regulates the marketing and handling of fluorinated gases and related equipment, the certification of the professionals who use them and the technical requirements for institutions with activities that emit fluorinated gases.

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**

Sometimes, as part of the Renove Plan, there is support from the state for substituting inefficient equipment with energy-efficient alternatives.

In addition, other kinds of support at regional level exist, that promote the installation of equipment with high energy efficiency, which, apart from energy and economic savings, leads to lower CO_2 emissions and, therefore, greater environmental protection.

- **Are they subject to conditions linked to the individual or household receiving the rebate (e.g. income levels)?**

In most cases no, if not to aspects related to the equipment itself or to the rehabilitation of buildings.

- **Are they conditional to a specific type of intervention (new installation, just in combination with home refurbishment)?**

In some occasions yes, especially when it comes to rehabilitation, as it is seen as very important.

- **Is it possible to "devolve" the financial incentive to a third party (in Italy it is called "credit cession", typically towards the ESCo or the installer) in order to receive an immediate discount on the intervention cost? For which product(s)?**

There are also some Renove Plans where the end-user buys the product and the subvention is directly substracted from the price, in which case the installer or the merchant receives the entire subvention.

C.A.4. Are there active national/regional programmes advising consumers about rebates/incentives/certification programmes on cooling (for informational purposes, adressed to installers, etc.)? Is there a specific level of subvention for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

The Renove Plan support systems are developed in different regions and favour energy-efficient equipment.

The support programmes by the IDAE (national energy agency) include energy efficiency actions in small and medium-sized enterprises, support programmes for the rehabilitation of existing buildings and so on.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?
Currently, we do not have any information on this.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..)

C.B.1. Where/from whom you buy this product, who will install it, is there any need of a specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

The small/medium-sized cooling products are provided by the installer or found in shops. Plug-in units are sold in shops. No document is needed for the installation.

C.B.2. Are there networks or informational services aiming to install more efficient systems/products at national/local level?

Not really, only retailers and manufacturers.

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Domestic sector:

- Installers
- Wholesalers/distributors
- Consumer goods sector: appliances shops (independent and purchasing groups), large warehouses and department stores

Commercial sector

- Installers
- Wholesalers
- Distributors
- Contractors
- Builders

Third sector / Industrial

- Installers
- Property owners
- Construction companies
- Property developers

100% of Plug-in systems are from appliances shops.

For the split systems, the distribution could be 50% by installers, 50 % direct sale.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Some household equipment can be found online, but it is a sector that does not have a lot of online presence yet.

C.B.5. Add the questions related to the other work packages (requirements on tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel comfortable/healthier during summer

Here, we present some of the recommendations we share to feel comfortable at home during summer and to reduce the energy consumption:

- **Air-conditioning to an adequate temperature:** Every degree, that you reduce the temperature will consume 8% more energy. 24°C is more than sufficient.
- **Close doors and windows** to stop hot air from entering the room and cold air from leaving it.
- **Use ventilators instead of air-conditioners**, their energy consumption is more than 10% less than the one of a conventional air-conditioning device.
- **In summer, keep windows and blinds closed during the day and open the windows at nighttime**. This way, we can isolate the flat from heat during the day and profit from fresh air at night.

All these recommendations and more are included it in these guidelines:

- Guidebook to promote low-cost and no-cost solutions to help people be more comfortable at home:
https://niunhogarsinenergia.org/panel/uploads/documentos/manual_economia_energia_domestica.pdf (pag 23)

Annex 8 – Contribution to Baseline Report – France

Note: this document was elaborated based on interviews with ADEME experts (Anne Lefranc and Florence Proharam) and bibliography mostly provided by ADEME our found during a desk research.

Country Introduction

France is a centralised country: in terms of products, in general or otherwise mentioned below, no other mandatory regulation than the European Ecodesign requirements and Energy Labelling regulations apply (this report does not mention them in particular), even if the country covers several climatic zones, including overseas territories.

Likewise, incentives and safety regulations are rather homogeneous across the country, except for additional financial support to encourage technologies making sense because of the specific geographical position where they would be used (solar installations in the Caribbean's, efficient solid fuel boilers/burners in air-polluted areas) and for safety regulations that can be reinforced at the local level[41].

French policies try to push for deep building renovation: installing energy efficient equipment (for heating) is considered as only one action part of the renovation. This reports focuses on HACKS relevant products and does not report actions and supports to other renovation actions such as insulation.

Heating

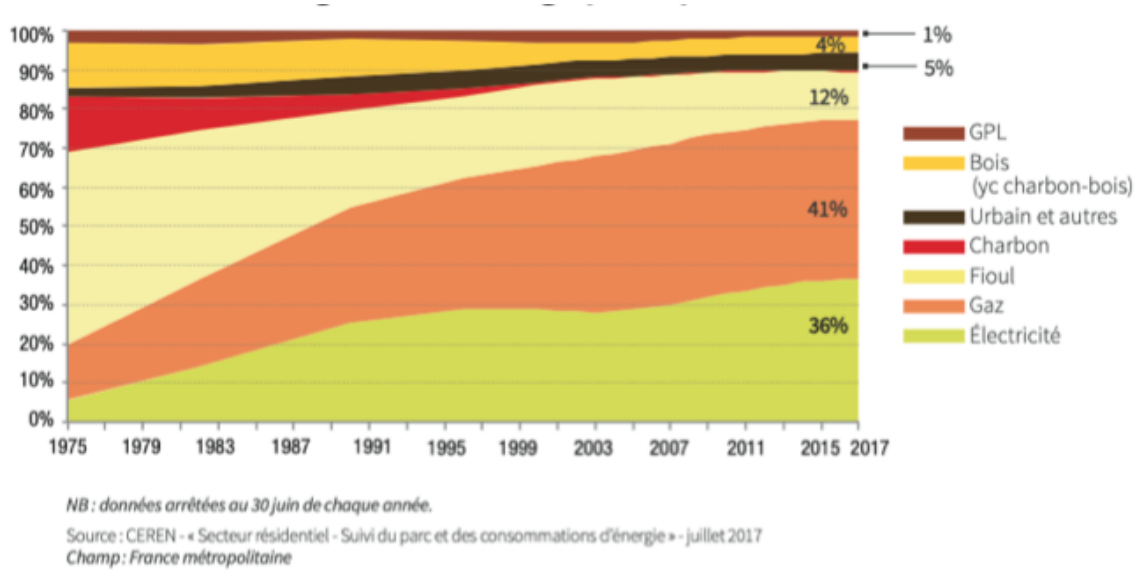
A very recent poll[42] shows that 71% of respondents declare to be ready to change heating modes for a more economical one, 53% for a more ecological one and 34% for a more secure one.
France counts 29'680'000 households (2018) including an average of 2.2 persons.

The repartition of main residences according to the source of energy used for main heating[43] is as follows: gas (41%), followed by electricity (36%), fuel (12%), district heating and others (5%), wood (4%), liquefied petroleum gas (LPG) (1%) – coal has almost disappeared.

[41] France counts 101 "Départements" and 13 Regions.

[42] Via séva / IPSOS on heating networks, 1'000 respondents between 18 and 70 years old, living in apartments in cities of more than 20'000 inhabitants, representative of the French population in terms of sex, age, regions. January 2020.

[43] Climat Air et Energie, Chiffres Clés Edition 2018, ADEME, for mainland France.

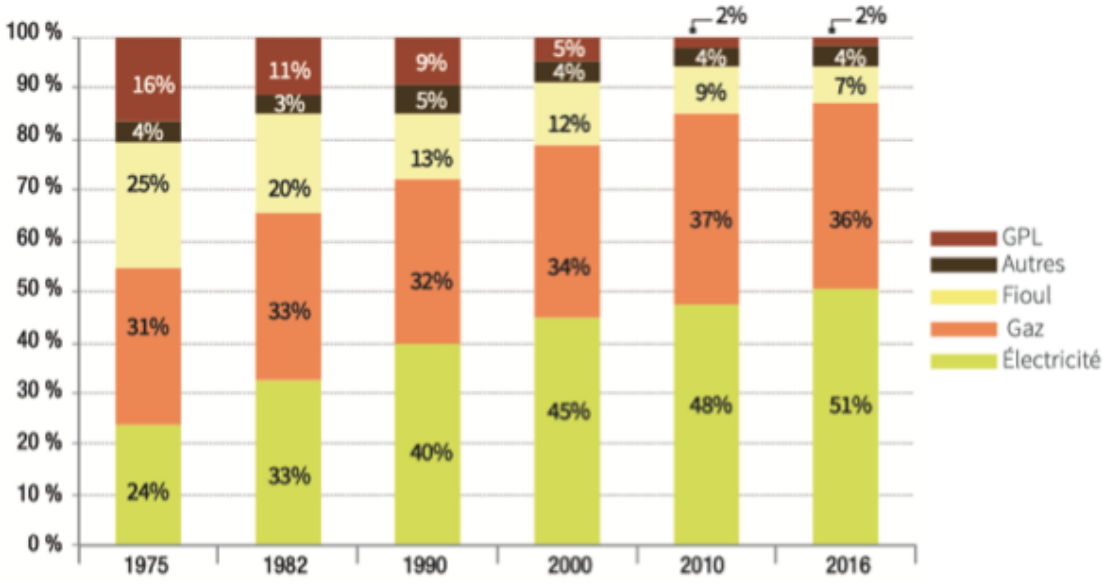


NB : données arrêtées au 30 juin de chaque année.

Source : CEREN - « Secteur résidentiel - Suivi du parc et des consommations d'énergie » - juillet 2017

Champ : France métropolitaine

Regarding sanitary hot water, repartition of main residences according to the source of energy is as follows: electricity (51%, mainly joule-effect water tanks), followed by gas (36%), fuel (7%), others (4%) and LPG (2%) – in 2016, 0.1% of main residences did not have domestic hot water (against 25.5% in 1975)



** ECS : eau chaude sanitaire*

Source : CEREN - « Secteur résidentiel - Suivi du parc et des consommations d'énergie » - juillet 2017

Champ : France métropolitaine

The daily per person domestic hot water consumption varies over the year depending on the size of the households: at 40°C from 80 ± 35 litres for a 1-person household to 45 ± 20 litres for a 5-person household[44].

[44] Guide Technique, les besoins d'eau chaude sanitaire en habitat individuel et collectif, ADEME, 2016.

On average, space heating represents 66% of a household's energy consumption, and water heating 11%. Reducing this consumption is therefore key to reduce energy bills. The average annual heating energy bill in 2016 was 1'611€[45], covering a diversity of costs, on average:

- 811€ for wood
- 1'415 € for gas
- 1'726 € for electricity
- 1'927 € for fuel oil

Wood is assessed as the most economical source of energy (4 to 6 €cent per kWh) – however this source of energy is often complemented by an extra source – followed by natural gas (7 to 9 €cent per kWh), fuel and propane gas (9 to 15 €cent per kWh) and the most expensive electricity (16 to 17 €cent per kWh).

Over 404'000 **condensation gas boilers** were sold in 2016 (first type of heating equipment sold in France). 75% of the gas and fuel boilers market is now formed by condensation models but the country is lagging behind others in Europe (e.g. UK or the Netherlands where this rate reaches 100%).
The stock of individual gas boilers (all types) is around 11 millions, with around 20% of condensation gas boilers (2.2 Millions), a low rate compared to the European average (40%).

Half of the French households are equipped with **electric water heaters** (Joule-effect, i.e. with a simple resistance). Potential energy savings would mainly come from the insulation of the appliance, changing the place where it is stored, and, more importantly, a correct dimensioning and a shift to (more expensive) heat pump water heaters. Installed joule-effect water heaters are estimated at 17 millions (in 15 millions households – 46%), with a 1.5 million/year replacement (compared to other European countries – except Belgium all things considered – these numbers are very large). On average, this type of water heaters represents 33% of the household electricity bill (1'560 kWh/ year over a total of 4'710 kWh/year). The information displayed on the energy label is most probably over estimated (because of the load profile chosen). It is therefore assessed as not very efficient in encouraging manufacturers to insulate their products or to guide buyers towards a product that would limit losses.

Sales of **solar water heaters** are going down with 4'600 units sold in 2018 (and 340 combined solar water and heating systems) In 2015, 2.5% of households were equipped with a solar hot water system (circa 740 000 households).

The market for **heat pumps** is growing with 400'910 units sold in 2017 (of which 63% air/air heat pumps); the market for heat pump water heaters is also growing with 84'420 units sold in 2017.

Nearly 25% of French households (7 millions) use at least one **wood-energy** equipment, as main or extra heating source. The government goal is to raise this number to 9.5 millions of households equipped with efficient devices by 2023. Installed equipment is composed of 46% of insert and closed fireplaces[46] and 26% of independent wood stoves (while inefficient open fireplaces represent 13% of the equipment).
In total 6.8 million households use solid fuels (in 2017), in Million:

- 0.4 boilers
- 0.10 cooker stoves
- 1.7 wood log stoves
- 0.7 pellet stoves
- 3.1 closed chimney and insert

[45] Source: online survey from Quelle Energie on 19 663 respondent (2016)
https://www.quelleenergie.fr/magazine/economies-energie/cout-chauffage-2016-51949/
[46] Closed fireplaces are popular in France and their aesthetic aspect is very important.

- 0.8 open chimney

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

Several mandatory regulations drive the installation of heating products:

- **The building code for new buildings**: The current building code ("Règlementation Thermique" RT 2012[47]) imposes a global energy performance to new buildings for so-called regulated uses, which cover: heating, hot water, cooling, lighting and auxiliaries. This strongly drives the performance of chosen heating technologies and products. It is sometimes perceived as complex to promote wood heating because it may not be considered as the primary source of heating in the RT 2012 (though it is allowed, few architects and consulting engineers in charge of making the new home compliant with the regulation are at ease when proposing wood solutions to their clients especially log-wood solutions).

- **The building code for renovated buildings** (Règlementation Thermique Existante 2008 – which is out-dated for most products and does not progress quickly), applies whether the renovation is light or deep, and imposes performance requirements on insulation works but also equipment efficiency. Requirements are often estimated as "rather low" and, whenever they exist, are actually aligned on the Ecodesign thresholds, i.e. the minimum levels to be authorised on the European market.
    - Gas and fuel boilers must be at the level of Ecodesign requirements, and circulators must have an off position.
    - Heat pumps must be at Ecodesign requirement level, with a COP between 2.7 and 3.2 depending on the type.
    - Wood boilers, stoves and fireplaces must reach a given efficiency, which will be aligned from 2020 and 2022 on Ecodesign requirements.
    - Heaters should have an automated regulation and a manual off button
    - Water heaters must to be at the Ecodesign requirement level.
    - Heat pumps must reach a minimal EER.

- **Urbanism codes**: building permits for new houses must include solar devices and the way they are intended to be used. In case of a renovation, the municipality (i.e. city level) must grant a town-planning authorisation because it may have taken dispositions on the aspect of houses that will influence the installation. In dense or classified areas, solar devices must obtain a favourable notice from the institution dealing with national monuments (Architectes des Bâtiments de France).

- **Safety regulations** impose that a professional and certified installers install the following products. Also **insurance companies** impose a professional installation– otherwise they will not cover possible damages because of the product.
    - Gas boilers cannot be granted access to the gas network without a certificate accepting the installation.

[47] A new "RT 2020" is expected next year.

- Condensation gas boilers need a minimum distance to the next home to evacuate the vapour otherwise the gas authority may not deliver the starting authorisation.
- Wood stoves, inserts and closed fireplaces are not covered by insurance companies if not installed by a professional installer (though it is not mandatory).
- Though a certified installer is not required for solar devices, some insurance companies may ask for it or apply an additional premium if it is not the case.
- Installing certain heat pumps may require an authorisation from the co-ownership association because of the noise of the external unit.

Most **heating equipments must be checked each year** for safety reasons:

- There is a yearly mandatory visit for gas boilers, leading to the delivery of a certificate that is asked by insurance companies or administrators of collective buildings. The professional carrying out this visit must have a professional qualification[48]. In theory, he checks the boilers, cleans it if necessary, tunes it, if it is not tight, he measures carbon monoxide, estimates the energy performance and the pollutant emissions (NOx, VOC – Volatile Organic Compound – and dusts) and compares these measurements with results from more efficient products of the market. If the boiler has a tight chimney, the tightness must be checked and the connecting duct must be cleaned. At the end of the visit, he should provide guidance on correct use of the boiler and release a certificate listing the activities undertaken during the visit, the measured values and the advice provided.
- There is a yearly mandatory cleaning visit of the chimney for all boilers and wood equipment connected to an exhaust duct for combustion products (the local public health regulations can impose two visits for wood heating devices using over 10 steres of wood, including one during the heating season). A certificate must be released for each visit and can be asked by the professional visiting the boiler, by insurance companies and administrators of collective buildings.
- For products with a heat pump involving more than 2 kg of refrigerant, a visit is mandatory every second year and it is highly advised to have this visit for all products to check the tightness of the refrigerant's circuit.
- There is no mandatory visit for solar installations but it is highly recommended in official documentation to have one at least every second year.

Beyond these mandatory provisions, there exist **quality labels** enabling households to choose quality products, for example:

- For solar equipment: certification "CSTBat" or "Solar Keymark" for the thermal captors, or certification "CSTBat" or the certification "NF CESI" for solar installations
- For heat pumps: the Eurovent / NF PAC certification insures the values of heating and cooling powers (compared to those announced by producers) noise emission and possibly seasonal performance and cooling performance for some models; the Promotelec label is granted according to specifications (including performance); certification NF Electricité Performance for efficient heat-pump water heaters.
- For wood heaters and boilers: the well-known Flamme verte endorsement label[49] (Green Flame") covers over 100 brands (often regional producer) and over 5'000 products, all listed on a publicly available website. The label was first launched in 2000 by public authorities but is now managed by the Union of Renewable Energy Industries (Syndicat des Energies Renouvelables). When asked during evaluation studies, professionals seem to appreciate this tool. From 2020, only 7-star products will be distinguished as the most

[48] Law from 5 July 1996.

[49] https://www.flammeverte.org

energy efficient, emitting less CO, less NOx, less particle matters – and also less VOC for boilers. Independent third party laboratories certify labelled products.

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Most installers must be certified to install heating products:
For all gas products, installers must be certified in order to deliver a gas conformity certificate. There are circa 15'000 companies with certified staff "PG installation" and/or "PG Maintenance" (PG – Professional Gas). From January 2020, releasing a "technical passport for gas installations" will be mandatory: it will be attached to the house or apartment and should be therefore passed on to new owners in case of proprietary change. The idea is to group information about the gas installation, its regular maintenance, upgrades, problems, etc. - because today this historical information is often lacking.
For products with a heat pump, an accredited body delivers a "capacity certificate" to the installer to demonstrate his ability to safely manipulate refrigerant. This certificate is mandatory for staff in charge of the installation, maintenance, repair and control of products with a heat pump.
These mandatory certifications are organised in various ways and require that the installers dedicate resources and time for the training and the (regular) certification of its staff members.
Beyond these mandatory requirements, in order to foster trust in new efficient installations, **public authorities have developed an endorsement label for installers** called "RGE – Reconnu Garant Environnement", i.e. "recognized protector of the environment". To benefit from the financial rebates and State support dedicated to energy efficient / low carbon technologies and products, employing RGE labelled installers is mandatory and the mention "RGE" must show on the invoices to be checked by the administration (see below).

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

Two types of incentives can be described: "public incentives" (related to the income tax system and direct State support under conditions) and "private incentives", even if framed by the State, in the framework of the Energy Saving Certificates (ESC, also known as white certificates) delivered by the utilities subject to energy saving obligations. As presented below, both types can be combined under specific conditions.

1) Private incentives – Energy Saving Certificates

The ESCs are intended for renovation actions (e.g. attic insulation, comparing *ex-ante* and *ex-post* situations) or for products when standardized product fiches exist, describing the value of

the certificate for installing a product of a given performance. The product fiches are evaluated every 2 or 3 years by the authorities to follow as much as possible market evolutions.

ESCs are delivered independently from households' conditions (e.g. income, energy poor, etc.), and their value can be devolved to the company implementing the works or supplying the product – be it an ESCO or directly a utility covered by the energy saving obligation.

Since 2015, if a certification exists for a given action, in order to benefit from the ESC, a RGE labelled installer or builder must be employed.
The following products relevant to HACKS are covered by standardised fiches:

- Solar water heaters
- Heat-pumps air/water or water/water, or air/air heat pumps below 12kW with a SCOP above 3.9.)
- Hybrid heat pumps coupled with extra heating equipped with a regulation system (excluding sole production of hot water and low temperature heat pumps)
- Storage heat pump water heaters (COP above 2.5 for air, above 2.4 for all others)
- Super efficient boilers (seasonal efficiency of at least 90%)
- Low temperature heaters
- External temperature probe devices linked to the heating regulation system
- Independent wood heaters (stoves, burners) compliant with the endorsement label Flamme Verte
- Individual biomass boilers compliant the endorsement label Flamme Verte
- Low temperature water heated floors
- Thermostatic valves
- Programmable thermostats
- Individual counting of heating energy
- Solar "combi" devices producing heating and hot water (only on mainland)
- Solar water heaters (only in overseas territories)
- System integrating PV and solar captors for hot water
- Efficient air conditioners with an A+++ class (only in overseas territories)
- Electric / radiant panel heater with electronic regulation and advanced functionalities detecting open windows, absence, consumption indication, weak range variations
- Energy consumption display devices, also providing information on how to interpret this consumption

Several consumer organisations and unions of small enterprises working in buildings complain that, because of lack of controls, the energy certificates (combined or not to the subsidies described below) and their publicity such as "a boiler for 1 euro" actually make the price of energy efficient devices increase. For example[50], they note an increase of prices for condensation gas boilers from maximum 5'000€ to 8'800€ and for heat pumps from 12'000€ to 20'900€ (installation included for both).

2) State subsidies

The direct public incentives are about to evolve.

Until the end of 2019, the **"C.I.T.E." - Crédit d'Impôt pour la Transition Energétique - Tax credit for the energy transition**, plans for a maximum deduction of 30% of the purchasing price of selected products according to their performance – i.e. the installation cost is not covered (except in the case of poor households getting rid of a fuel oil storage tank which opens a tax credit up to 50% on the installation work) and the support to the consumer is shifted in time. The maximum eligible expense over 5 years (on which the tax credit is calculated) is 8'000€ for a single person, 16'000 for a couple, plus 400€ additional per dependent person.

[50] Que Choisir (one of the main Consumer magazine) n°586 – December 2019

The CITE support has no condition for the beneficiary – except the employment of a RGE labelled worker – and can be combined with other types of support, whether public (e.g. programmes to improve homes and buildings, often with conditions) or the ESCs presented above.

	Ménage très modeste (revenus fiscaux annuels inférieurs à 21 001 € ou 29 171 € en Ile-de-France)	Ménage modeste (revenus fiscaux annuels de 2 personnes inférieurs à 26 923 € ou 35 510 € en Ile-de-France)	Autre ménage (au-dessus du seuil précédent)
CHAUDIÈRE FIOUL / GAZ / CHARBON (HORS CONDENSATION) VERS...			
• Chaudière biomasse classe 5 • PAC (pompe à chaleur) air/eau ou eau/eau • PAC hybride • Système solaire combiné (SSC)	4 000 € (CEE) + 50 % du coût HT du matériel et de la pose (ANAH, Habiter Mieux Agilité) + CITE 30 %	4 000 € (CEE) + 35 % du coût HT du matériel et de la pose (ANAH, Habiter Mieux Agilité) + CITE 30 %	2 500 € (CEE) + CITE 30 %
• Raccordement à un réseau de chaleur	700 € (CEE) + 50 % du coût HT du matériel et de la pose (ANAH, Habiter Mieux Agilité) + CITE 30 % (hors main-d'œuvre)	700 € (CEE) + 35 % du coût HT du matériel et de la pose (ANAH, Habiter Mieux Agilité) + CITE 30 % (hors main-d'œuvre)	450 € (CEE) + CITE 30 % (hors main-d'œuvre)
• Chaudière gaz THPE (ETAS* ≥ 92 %)	1 200 € (CEE) + 50 % du coût HT du matériel et de la pose (ANAH, Habiter Mieux Agilité) + CITE 30 %	1 200 € (CEE) + 35 % du coût HT du matériel et de la pose (ANAH, Habiter Mieux Agilité) + CITE 30 %	600 € (CEE) + CITE 30 %
POÊLE CHARBON VERS...			
• Poêle biomasse (Flamme Verte 7*)	800 € (CEE) + 50 % du coût HT du matériel et de la pose (ANAH, Habiter Mieux Agilité) + CITE 30 %	800 € (CEE) + 35 % du coût HT du matériel et de la pose (ANAH, Habiter Mieux Agilité) + CITE 30 %	500 € (CEE) + CITE 30 %

*Efficacité énergétique saisonnière = mesure du rendement saisonnier des appareils de chauffage

As households' situations can vary a lot, an on-line simulator to calculate reachable financial public support has been developed (see below section HA.4, the online simulator).

The CITE applies to the most efficient products. The ones relevant to the HACKS project are the following:

- Efficient gas boilers: efficiency at least 92%, for condensation gas boilers 87% efficiency measured at 100% of nominal thermal power and 95,5% measured at 30% of nominal thermal power.
- Wood or biomass boilers. For a boiler below thermal power 300 kW, efficiency and pollutant compliant with class 5 according to NF EU 303.5.

- Heat pumps (except air / air heat-pumps not covered by the tax credit) with a seasonal heating efficiency ≥ 126 % if low temperature, and ≥ 111 % if medium and high temperature.
- Heat pump water heaters with an efficiency ≥95 % if the load profile is class M, ≥100 % if the load profile is class L; ≥ 110 % if the load profile is class XL.
- Solar heating and solar water heaters with a certification CSTBat, Solar Keymark or equivalent, with different efficiencies required according to different load profiles.
- Wood stove and heaters with an efficiency ≥ 70 %, carbon monoxide ≤ 0,3 %, environmental performance (indicator "I") ≤ 1; particle emissions PM ≤90 mg/Nm3.
- Pipe insulation (when pipes go through non heated spaces) allowing reaching insulation class ≥ 3 according to standard NF EN 12 828.
- Regulation and programmer devices for heating and/or hot water taking into account ambient temperature, external temperature, allowing the regulation of single heaters, the power limitation according to external temperature, or selective power cuts in case it goes above the subscribed power.
- Energy performance diagnosis (in non mandatory situations, 1 diagnosis every 5 years) including: information gathering, synthesis, building simulation, list of improvements to implement, recommendations on efficient and sufficient use of products, work proposal with 2 scenarios to improve the energy performance.
- Dismantling of fuel storage tanks.

The CITE was evaluated by professionals in a qualitative study. This scheme was perceived as positive as it helped triggering the buying of an efficient solution, that became as competitive as a cheaper, less energy-efficient one. CITE also favoured considering deep renovations (compared to only changing windows for example). However, it was mainly used by well-off households living in badly insulated individual houses and was sometimes used by manufacturers and installers to raise their margins, which attenuated the impact of the scheme. Some installers assessed it as necessary to stimulate the market and mobilise households on the energy transition

From 2020, this tax credit will be transformed into a fixed bonus per selected product, paid at the installation (i.e. the beneficiary should get the money faster than before), and only in the case of renovation (not anymore in the case of new constructions). The bonus will be standardized depending on the generated savings - the more efficient, the higher the bonus, on the type of energy saving action (change of boiler, insulation) and calculated according to standardised building types (using a standardised calculating tool part of the building code).

In addition, the bonus will be merged with other types of public support – including the current programme for low income houses for renovation works called Habiter Mieux[51] -and modulated depending on the household's income, with 4 categories of income considered: precarious / modest / intermediate / well off. If a household is precarious and benefits from an ESC, the bonus could reach 90% of the newly installed equipment. On the opposite, the most well off households would not have public support anymore (since the tax credit will be supressed), though ESC could still be implemented.

This new support policy is heavily discussed at the time of writing because, on the one hand the most well off households do not "need" subsidies, but on the other hand they are the ones who

[51] This programme is implemented by ANAH – Agence Nationale de l'Habitat. It spent 527M€ for renovation works of over 62'300 homes in 2018.

invest the most in renovation and hence support the construction and renovation industry. In addition, though the support is presented as more efficient, the overall budget which was 1.7 billion Euro in 2019 for the C.I.T.E. has been divided by two in 2020 (for the fixed bonus policy).

A **specific package called "Coup de pouce" ("with a little help")** will be running until the end of 2020 for households shifting from their current coal, oil, or gas boilers (except condensation gas) to a new super efficient gas boiler, wood boiler, heat pump or renewable energy boiler. The objective is to end oil heating within 10 years. The more efficient the new device, the more important the bonus, but the starting condition is the old equipment to replace. The bonus is modulated according to the household's income, and more directly paid to the beneficiary (by utilities). If all the State supports are combined, it is possible to reach a "new boiler for 1 Euro". However, this scheme is accused of tempting manufacturers and installers to raise their prices and margins (see above).

Pour le remplacement d'une chaudière* par :

	Chaudière biomasse performante	Pompe à chaleur air/eau ou eau/eau	Système solaire combiné	Pompe à chaleur hybride	Raccordement à un réseau de chaleur EnR&R**	Chaudière au gaz à très haute performance énergétique
Prime pour les ménages modestes	4000 €	4000 €	4000 €	4000 €	700 €	1200 €
Prime pour les autres ménages	2500 €	2500 €	2500 €	2500 €	450 €	600 €

* individuelle (ou collective dans le cas d'un raccordement à un réseau de chaleur) au charbon, au fioul ou au gaz, autres qu'à condensation.

** Réseau de chaleur alimenté majoritairement par des énergies renouvelables ou de récupération

More details: https://www.ecologique-solidaire.gouv.fr/coup-pouce-economies-denergie-2019-2020

There are other types of public financial support:

The **VAT rate for building renovation actions** related to energy savings is reduced for works eligible to tax credits from 10%[52] to 5,5% for heating works (except air-to-air heat pumps which are not concerned by this measure). All types of households are concerned, regardless of their

[52] The most usual VAT rate is 20%, sometimes reduced to 10% for the building industry (to support the sector), or to lower rates in overseas territories.

income and inhabitant situation (landlords, renters, living in the owned apartment or not, co-ownership associations). The home must be at least 2 years old.

The builder undertaking the renovation applies the preferential VAT rate and the client certifies the type of work and the age of the home.

In some cases, **for deep renovation works, households can obtain a specific "Zero rate environmental loan" (Eco Prêt à Taux zero)** with specific efficiency requirements for heating equipment. There is no income condition to benefit from this type of loan (agreed by the bank depending on the ability to pay the credit, but partly funded by public authorities). Beneficiaries must live in a home which has at least 2 years, demonstrate their energy consumption before the renovation work (for heating, cooling and hot water) and show that the works will bring at least 35% savings. All costs can be covered by the loan – upstream professional estimates, insurance, builder's work, and equipment. The more renovation actions implemented at the same moment, the higher the loan amount, which can be granted for 3, 10 or 15 years for complete deep renovations.

MONTANT DE L'ÉCO-PRÊT À TAUX ZÉRO

	Action seule	Bouquet de travaux		Performance énergétique globale	Assainissement non collectif
		2 travaux	3 travaux ou plus		
Montant maximal d'un prêt par logement	15 000 €* (7 000 € pour les parois vitrées)	25 000 €*	30 000 €	30 000 €	10 000 €

* Depuis le 21 août 2019

The following equipment relevant to HACKS are eligible in the framework of this environmental zero rate loan:

- Super efficient gas boilers with a programmer
- Micro-cogeneration gas boiler with a programmer
- Regulation and programmer devices
- Air / Water heat-pumps with a programmer
- Geothermal heat pumps with refrigerants (water/water or glycol water/water) with programmer
- Pipe insulation
- Dismantling of fuel storage tanks
- Wood boilers
- Wood stove and heaters
- Renewable energy heating system (hydraulic, solar)
- Heat-pump water heaters

A specific "**Air Wood Fund**" is co-funded by ADEME and 11 different local authorities (mainly in the regions Rhône Alpes and Ile-de-France) willing to reduce air pollution on their territory. It is meant to incentivize households to replace their old wood device (dating before 2002) by a new Flamme Verte labelled device. The conditions to benefit from a local subsidy vary, so does the amount between 400€ and 2'000€.

For household with modest income, an "**Energy Cheque**" (or voucher) of a maximum 277€/year subsidy is supporting 5.8 million persons. It can presently be used to pay energy bills and

insulation measures covered by the energy saving certificates and credit tax system. Upon a Parliament decision, it could potentially cover part of efficient equipment's costs (but it is not the case today).

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?
In the past, there have been several networks funded by ADEME to advise the general public on energy issues as a whole.

Currently, the network of advisers all around France is called the **FAIRE network**[53] (Faciliter, Accompagner et Informer pour la Renovation – a game on words with the verb "FAIRE" = to take action, and the acronym Facilitate, Accompany and Inform for Renovation), funded by ADEME but soon by the Regional authorities on their territory (and may be by an ESC programme in the future). It targets the general public and professional operators on building renovation issues. The FAIRE free of charge website and call centre with local advisers (that can most of the time also receive the public in their offices) provide information on:

- Technical issues
- Approach and procedures to undertake a renovation project
- Labelled installers at the local level
- Existing financial support including with an on-line simulator[54] informing household about the maximum amount they can pretend to (combining the different types of incentives) given their specific situation, and proposing to connect with a free of charge adviser.

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?
Yes, standardised energy savings generate certificates that, when triggered by actions proposed and funded by a utility or an ESCO, "belong" to the utility or the ESCO - see above the part on financial incentives.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

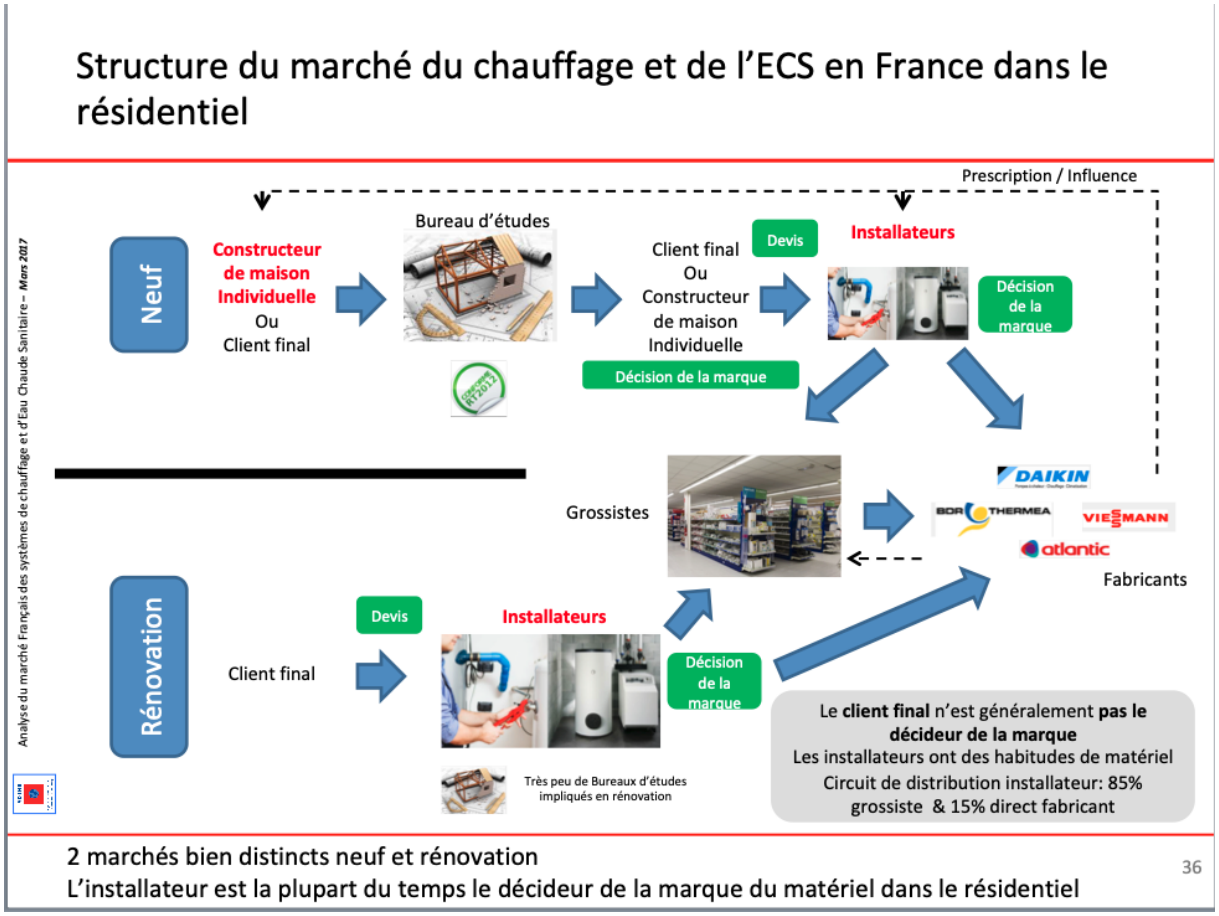
ADEME has made a study in 2017, interviewing 67 professionals on their respective markets. It pictures the market chain as follows, stating the installer is most of the time the person deciding of the brand that will be installed. Installers have habits: 85% are supplied by wholesalers and 15% directly by manufacturers. However, the availability of the product seems to be key: plumbers for example quote as selection criteria the product's quality, their habit of working with a brand,

[53] https://www.faire.fr

[54] https://simulaides.ademe.fr/front?PHPSESSID=8ca6i4uh3effe2e9m2d2isida6

and (to a lesser degree) the price, but if the product is out of stock when they need it, they do not hesitate to change brands and avoid wasting time.

The majority of installers in France are very small companies. There are over 500 000 SMEs registered in the residential building field; 98% have less than 20 employees, more than 360'000 have 1 or 0 employee. 8% of the workers have an engineering degree. This is important to keep in mind when the cost of training or the time of training is at stake and regarding the type of communication that cannot be too technical though must be practical.



Relation to the energy label

Installers do not seem to value or use the energy label because they rarely perceive the label as a selling argument. Installers choose anyway the product they are going to install, and the label makes differences between technologies (which is difficult to explain) but very little between products of a same technology. It is too complex to generate energy labels for systems, especially when installers use different suppliers (this difficulty/critique is often stated for solar water heaters).
Consulting engineers do not seem to consider the energy label either, but rather the performance and the needed capacity / dimensioning.

Smaller manufacturers feel penalised by the energy label, which may constitute a barrier to enter the market for some of them.

Finally, consumers do not understand energy units and installers think it would be better to address them with savings expressed in Euros. They view their clients as paying attention mostly

to the initial investments and to the practicality and comfort the new solution will bring. This is why clients are more sensitive to tax credits and rebates that target this first investment step.

Generally speaking (for various types of heating equipment), though most equipment is available directly at DIY stores (except wood boilers) or directly at manufacturers', a professional installer is generally the person choosing, buying (potentially at a lower tariff than a household) and installing the products.

Typically, installers work with one to three brands that train them for their specific products. Households may either look for an installer (or chose the one in charge of the yearly visit) or look for a specific brand (e.g. on-line) that publicises its own network of installers.
DIY shops may also propose the installation and manage a network of installers – in this case the number of brands covered is larger. Large DIY shops may work together with utilities and propose the installation carried out by certified RGE installers so that Energy Saving Certificates and subsidies can be used.

As presented above, a safety certificate is needed for the installation of gas boilers, wood and pellet boilers and certain heat-pump products. It is not mandatory for other products but strongly recommended for insurance purposes.

Electrical equipment can theoretically be installed directly by households, though a plumber or a heating specialist is generally hired.

Most HACKS products seems to be available on-line from specialised retail stores or directly from manufacturers, who then direct to more or less independent installers.
In documentation targeting the general public, it is most of the time advised, when hiring a worker, to check that the company is insured – the insurance company checks the capacities of the company to minimise its own risks.

Gas boilers seems to be bought:

- When the current equipment breaks down: households call their installers or technician that does the yearly safety visit to replace the broken equipment and usually, the same kind of product is proposed ("identical replacement"), or with a little improvement due to market evolution, but not affecting the house configuration (e.g. a condensation gas boiler is proposed instead of a low temperature gas boiler). The installer may propose 1 or 2 brands – that have trained him.
- When renovation works are undertaken in the home. In this case, most often the new chosen solution does not require changing the heat distribution network (to limit the works). However, it is mostly in this framework that a change of energy can be envisaged and that household may look for information. A study interviewing 30'000 households having undertaken works in their individual house between 2014 and 2016 indicated that:
    - 61% of the works were done by a professional
    - 6% by a professional and self-renovation
    - 18% were done as self-renovation with the help of one's entourage's professional competencies
    - 15% were done as self-renovation without the help of one's entourage's professional competencies

  This is a high share of self-renovation, i.e. works implemented by households that may not look for any type of information because they are not entitled to any rebate (which are conditioned by the use of an contracted RGE labelled installers/workers).

The market for boilers seems to be dominated by 6 manufacturing groups: Bosch, BDR Thermea, Vaillant, Ariston, Atlantic and Müller, each of them owning several brands (from 2 to 9 brands).

Manufacturers' discount to installers varies from 25% to 65% depending on the technology, the manufacturer and the volume bought. Installers make a margin around 30% to 35%.

Wood boilers are produced and most often sold directly by few manufacturers. Households look for information, contact a brand that recommends installers. The situation is more complex for **independent wood stoves, inserts and closed fireplaces** because there are many manufacturers in France, including two foundries, and the market is very local, even regional. The market seems to be highly competitive, attracting more and more foreign manufacturers, and pushing national manufacturers into niches (e.g. use of logs, stoves using mains gas to avoid frontal competition with wood stoves). Training new installers and craftsmen is also not easy on a market for which sales are reducing.

For first equipment, 4 questions drive the choice:

- Will it be a central equipment (i.e. a boiler – few models sold each year) or independent equipment?
- Will it use logs or pellets?
- If used inside the home, will it be an independent stove, an insert in the chimney (possibly with a buffer water tank to feed one or two radiators), or a closed fireplace?
- Where to place it (depending on the chimney, and if there should be a tight duct)?

Independent wood stoves are bought to renew an old equipment or when moving to a new home. 362'500 independent types were sold in 2018 (against 12'000 wood boilers) and the buyers have declared as main selection criteria: aesthetics (80%), power (65%) and user-friendliness (48%). There seems to be various market chains:

1) Direct sales in showrooms or near to the factory
2) At Wholesalers: manufacturers are in contact with one or more wholesalers / retailers
3) Via installers: manufacturers are in relation with one or several networks of installers who can be in contact with other brands
4) Via exclusive installers: manufacturers have their own installers or an exclusivity contract with installers working only with their brands
5) At DIY shops, which can themselves use their own network of installers

The brand is decisive for this type of products.

Types d'appareils	Ventes directes	Grossistes	Installateurs/ revendeurs	Réseaux d'installateurs exclusifs	GSB
Poêles	1%	22%	28%	23%	26%
Foyers fermés et inserts	1%	12%	40%	20%	26%
Chaudières	0%	88%	11%	2%	0%
Cuisinières	2%	36%	33%	30%	0%
Marché total	**1%**	**25%**	**29%**	**22%**	**24%**

- La part de produits vendus via la GSB a légèrement diminué, au profit des installateurs et revendeurs.
- Un nouveau réseau, encore non pris en compte dans cette étude, marque désormais le marché : les ventes par Internet.

A specificity of the wood heating is the type of wood supply: 42% of household are in auto-supply situations (e.g. they own wood parcels), 35% can benefit from only partially paid wood with short delivery supply (because they have friends or because their local authorities have organised a

specific supply with their local wood resources)[55], and 23% use a professional delivery channel (this number is raising).

Regarding **joule-effect water heaters**, 3 main manufacturing groups dominate the market: Ariston, Atlantic, Brandt – each of them covering several brands. They also manufacture retailer own brands for DIY stores.

Nearly 270 different models are offered on the market by the main brands: 90% of these are in Class C. Only few models are equipped with a SMART function (i.e. an auto learning process on the user load profile). A reinforced insulation (70 mm instead of 35 mm) would allow an average saving of 200 kWh/year/household. If equipped with a heat-pump water heater, it would be possible to manage the storage temperature and save 150 kWh/year/household.

Concerning heat pump water heaters, half of the sold ones are based on ambient air (72'000 units were sold in 2014, 58% more than in 2013). The most popular size is 300 litres: the difference in price between a model of 200 litres and a model of 300 litres is small and encourages installers to choose the larger models.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Several networks aim at informing the general public and more specifically household planning to renovate their home

The **FAIRE network**[56] is presented above. It is conceived as a platform:

- Centralising all information for different targeted audiences
- Gathering all sector's stakeholders around a Charter for builders' and real estate professional associations and federations, committing to:
    - Inform their members
    - Encourage them to get trained and labelled in order to raise the sector's capacities
    - Support partnerships
    - Communicate to clients with the FAIRE signature
    - Participate in pilot projects carried out by public authorities by sharing data (to feed the observatory on energy renovation)

To be successful, the French HACKS campaign will have to be part of the FAIRE network, referring to local advisers for upstream and customised advice and providing them downstream advice on specific products (this service is not available at the moment).

Also at the central level, **ADEME's website proposes a lot of specific guidelines** and leaflets[57] targeting the general public on different types of energy sources and equipment.

Many other public administrations or professional associations also inform their citizens at the local level. Hence there is a lot of detailed and free of charge information available but rather to households already willing to get it. Installers – who are the main prescribers – or manufacturers, do not systematically disseminate this information, which often does not reach very low income

[55] It is difficult to analyse wood heating in the light of fuel poverty because its definition implies a certain level of income spent on energy, whereas most often, wood users do not pay for wood. In addition, the majority of wood users as main heating source belong to the lower socio-professional categories, whereas the users as extra heating source or pellet users rather belong to the higher socio-professional categories.

[56] https://www.faire.fr

[57] https://www.ademe.fr/guides-fiches-pratiques

households or households undertaking self-construction or renovation (see above), hence not eligible to subsidies and not looking for them.

Several networks and federations aim at informing and training professionals

As mentioned above, **public authorities have developed an endorsement label for installers** called RGE. To benefit from the financial rebates and State support dedicated to energy efficient / low carbon technologies and products, employing RGE labelled installers is mandatory and must show on the invoices to be checked by the administration. This encourages installers to go through the RGE training, which is quite demanding. At least one worker should undergo the specific training (some craftsmen working alone have complained that they must dedicate a lot of time to the accreditation whereas large enterprises can be certified with just one staff trained even if this person is not present on all works)[58].

On the one hand, various specialised certification bodies and professional associations deliver training and grant the RGE certification (the variety of training courses and of institutions delivering these courses very important and cannot be reported here exhaustively). The two more well-known professional networks are:

- **CAPEB** – the federation of SMEs and craftsmen of the building sector, counting 12 regional offices and 95 offices at the level of Département. It has developed a specific training called "Eco Artisan" opening to the RGE label because specialising in energy efficiency[59]. The objective is that the trainee be able to evaluate the energy performance of a house, advise on consistent technical solutions improving the house's thermal efficiency, and propose efficient solution in his type of trade.
- **FFB** - French Builders' Federation- has also developed a course called "RGE Professional of energy performance".

Both these courses are accredited by the qualification body Qualibat.

Qualibat certifies many other specialised training courses related to energy efficiency (provided by the two institutions above and others):

- Chauffage
- Qualibois Air and Qualibois Eau for wood stoves and boilers
- Qualisol CESI and Combi for solar devices
- Qualipac chauffage and chauffe-eau for heat pump devices
- CERTIBAT and CEQUAMI for global deep renovation operations
- Qualit'EnR for equipment integrating renewable energy sources
- Qualifelec for electrical works
- Two specific training on water efficiency.

On the other hand, a public service is organised to promote the labelled installers and maintain a directory to inform households about their existence. The FAIRE network promotes its services for installers as ways to:

- Get specialised in energy renovation, a booming market, underlining that for a large number of actions, being an RGE certified installer is mandatory.
- Create customers' loyalty and get new clients bringing them State financial support.

[58] Several consumer organizations have criticized this label and the quality of the works delivered, and the authorities intend to reinforce training, controls and check on whether the RGE Charter is applied.

[59] As an example the generic RGE qualifications cost ca. 200€ per year, and the specialised RGE qualifications ca. 115€ each. A training course takes between 2 and 4 days.

- Be identified and recognised by households as specialised in energy renovation with adequate competencies.
- Raise the company's profile, thanks to the partnerships with public institutions, the FAIRE communication campaigns and the publicity of the RGE installer's directory.
- Get information on evolving financial mechanisms and regulations.
- Participate in events organised with companies facing similar experiences or potential clients.

Over 60'000 mainlanders companies are RGE certified (over nearly 400'000 enterprises). The RGE certification is valid for 4 years but the certificate is renewed every year: the chosen certification body checks the reliance of the company (no financial difficulty, insurance taken, enough means to ensure supply and installation of the products, past experiences, presence of a technical staff trained to energy performance / use of renewable energy sources) and controls at least one of its work sites.

If sub-contractors are employed, they should also be RGE labelled (this includes cases in which e.g. a boiler would be bought "ready-to-use" at a specialised / DIY retail shop, i.e. with the installation: In order to benefit from financial incentives, the installer must be RGE labelled).

The RGE certification can also be granted to engineering consulting companies, which have to refer to specific professional organisations that confirm the specific capacities needed for energy renovation and energy performance (OPQIBI, OPQTECC, Certivea, LNE, AFNOR certification).

To our knowledge, there is no equivalent to Topten in terms of advice on specific products – i.e. specific information that would come "downstream", after the choice of energy source and of the heat carrier has been made thanks to a professional and neutral advice from the FAIRE network[60].

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?
See above.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)
See above.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

A lot of brochures and tools (e.g. digital guides with illustrations, videos, etc.) exist for the general public and for professionals on a wide variety of issues: pros and cons of energy sources, technical points to watch for certain works, financial support, how to install a given equipment, how to dimension that equipment, how to advise clients, etc. This documentation is more or less technical, and cannot go into calculation details that would target engineering companies – whereas very often, builders work in micro-SMEs with one to three persons (98% of companies in the building sector have less than 20 employees; 79% of the apprentices are trained within the company).

Documentation is produced by a wide variety of institutions, amongst many others:

- ADEME www.ademe.fr
- AQC – Agence Qualité Construction https://qualiteconstruction.com/

[60] One website target architects proposing products and estimates from the suppliers - but there seem to be no energy performance criteria or information indicated https://www.archiexpo.fr/

- PACTE - Le Programme d'Action pour la qualité de la Construction et la Transition Energétique, which was launched in 2015 by public authorities with the goal of accompanying the builders' necessary capacity upgrade in the field of energy efficiency to reinforce building quality and reduce accident rates
- The CAPEB (see above, their journal https://www.lebatimentartisanal.com and training platform https://www.eco-artisan.net where the system of energy certificate is explained, underlining the marketing advantage of labelled companies)

Some documents however try to get into technical details – necessary to implement the works correctly – while keeping it simple. For example, amongst ADEME's guides, one covers the dimensioning of water heaters and was developed in collaboration with the industry. The possibility to calculate a correct tank dimension is included in the building code's guidelines, but they rather target engineers.
One can also quotes a very complete and standardised collection of "DTU - Document Technique Unifié"[61] which present the technical state of the art for a variety of topics and products. Using these (quite technical) documents is not mandatory, but not respecting their content may cause the loss of insurance warrantees.

Other tools exists, in which HACKS activities could fit, but we do not know about their popularity among installers, for example:

- Many MOOCS have been developed for different target groups (professionals, individuals implementing self-renovation), such as https://www.mooc-batiment-durable.fr/
- Teaching material for installers with guidelines, but also videos, photos, illustrations: https://pedagogie-rexbp.qualiteconstruction.com/ecs
- Technical quiz: https://www.programmepacte.fr/jeu-concours
- Use of Apps to visualise how to install specific products: https://apps.apple.com/fr/app/mes-calepins-de-chantier/id1489334140

Studies in the building field indicate that a lot of training courses exist but they fail to meet their target and to convince participants because they do not include tips on how to convince clients. One study concludes that, especially when trying to sell relatively more expensive solutions, client management tools are essential, but are not used by very small enterprises. They would allow to characterise clients, follow-up their decision process – which can be long e.g. when the change of a boiler depends on other renovation works, propose the good information at the right time, evaluate their satisfaction, etc. It would be good for HACKS to fit in networks proposing this kind of services.

Another strategy for HACKS would be to target the installers at the forefront of the energy transition, and for the smallest ones who often gather into so-called "clusters" of micro-enterprises interested in sustainable development, in which different types of trades are represented. Should HACKS target the very few enterprises already convinced by the topic who would be more likely to use the Topten tool and advices, or should it try to target as many enterprises as possible, with the risk of not being considered?

ADEME has evaluated a communication campaign concerning a special rebate for efficient wood stoves, that used several channels: an internet site, presence at fairs, presence in the media (in the press, on the radio) directly in small city halls with practical training for professionals, contacts with DIY shops, etc. but despite the many activities, the results where not as high as expected.

[61] List of thematic DTU: http://www.bntec.fr/sites/default/files/nfdtu_bntec_juin2016.pdf

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

We propose below a list of thematic bullet points that cannot be exhaustive at this stage (these are only examples). They can target vulnerable groups or not (actually it is the language and the type of communication channel that is different for vulnerable groups rather than the type of advice).

- Sources for general advice:

http://multimedia.ademe.fr/infographies/infographie_mieux_se_chauffer/
https://www.inc-conso.fr/content/pourquoi-t-froid-chez-soi-alors-quon-chauffe-avec-lademe-0
https://www.faire.fr/ameliorer-confort-logement
https://www.faire.fr/reduire-facture/economie-energie

- Correct dimensioning
  - This implies training for installers but also a need for education of households. For example, water heaters should not be dimensioned for peak consumption (e.g. when receiving guests) but for the daily-type of use.

- Difficulties related to the product
  - External units of heat pumps can be noisy and generate trouble with the neighbourhood
  - Where to install the product

- Correct use and settings
  - Heating
    - Setting good temperatures
    - Simple insulation measures
  - Wood
    - How to start a fire
    - How to use the boiler (not shut it down completely)
    - Use certified fuel
    - Use local fuel (to avoid transportation)
    - Where to store the pellets
  - Water and energy (a 4 to 5 minute shower consumes 30 to 40 litres and a bath 150 to 200 litres, washing dishes by hand 50 litres of hot water)
    - Install the production of hot water near the place where it is used or install several points to limit heat losses
    - Insulate the pipes
    - Reduce scale formation
    - Install water saving tapes and showerheads
    - Set the temperature at 55°C
    - Illustrate with numbers[62]: e.g. time of return for various investments (e.g. when using electricity, 0.2 year for a water saving shower head, 0.3 year for a water saving tap, 5.3 years for a thermostatic mixer tap)

[62] Etude PACTE ECS 2011

- Co-benefits
    - Air quality in relation to wood stoves (29% of particulate matters come from individual wood heating)
    - Improving health: several studies[63] underline that renovating dwellings where poor people live is an energy efficiency policy that can be financially justified by the reduction of costs for the health system, without taking into account potential rewards due to energy savings.
    - Managing mould issues

- Maintenance
    - Prolongs life-time
    - Reduces air pollution

Cooling

Though air-cooling is expected to grow in France, there is not a lot of information on the topic (type of products installed, type of products sold, etc.). However, cooling is of specific importance for overseas territories and may be treated in specific ways depending on geography.

ADEME has published very recently a call for tender to understand the current state of the art, but the results will not be available before several months.

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

The current building code ("Règlementation Thermique" RT 2012, a new RT 2020 is expected next year) imposes a global energy performance to new buildings, for the regulated uses such as: heating, hot water, cooling, lighting and auxiliaries. For cooling it actually makes it quite difficult to install cooling systems. A new indicator is in discussion for the next regulation for new buildings, in order to take into account lack of comfort in the summer. Cooling needs will raise in the future and this indicator attempts to cover them in a regulated way instead of having users install cooling equipment after the building is built.

There also exists a building code for renovation (Règlementation Thermique Existante which has not evolved since 2008), whether the renovation is light or deep, it imposes performance requirements, which are rather low. The regulation imposes to have, if an air-cooling system is installed or replaced:

- External solar shading devices (the solar factor of the window including its solar protection must be below 0.15)

[63] Energy renovation of poorly efficient French dwellings: does it help to reduce costs for the French health system? Marie Hélène Laurent, EDF R&D, et al

- An energy performance in line with the Ecodesign regulation (for models above 12 kW minimal EER are requested).

Because of the F-gas regulation, cooling equipment will soon incorporate requirements regarding refrigerants, their type and quantities (cooling is responsible for ca.12% of the demand of refrigerants).

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?
Because of the F-gas regulation, installers and maintenance staff must be trained and certified regarding the manipulation of refrigerants for products above a certain quantity.

An accredited body delivers a "capacity certificate" to the installer to demonstrate his ability to safely manipulate refrigerant. This certificate is mandatory for staff in charge of the installation, maintenance, repair and control of products with a heat pump.

These mandatory certifications are organised in various ways and require that the installers dedicate resources and time for the training and the (regular) certification of its staff members.

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

A+++ class air conditioners can benefit from Energy Saving Certificates – only in overseas territory because of their geographical position.

No other incentive for cooling other than VAT rate for building renovations related to energy savings is reduced from 20% to 5.5% for heating works, and 10% for cooling works (except air-to-air heat pumps).

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?
Cooling products are not covered by incentives in their vast majority.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Very few information is available regarding cooling in France. An estimated 5% of main homes are equipped with a cooling device – hence a low equipment rate but France expects a sharp rise in the coming years. In addition, cooling experts assess these 5% as an old number; given the sales' trend, equipped homes would rather be 10 to 15% of main homes.

ADEME has just published a call for tender to understand the current state of the art, but the results will not be available before several months.

According to the study prepared for the review of European regulations[64], France is clearly a market of first installation in existing buildings, whether for portable or fixed units.

For 2020, the estimate stock is 5.5 million of units (another figure states a distribution of 12% portable units, 29% of small split units below 5 kW and 25% of large split units above 5 kW, included duct). The estimated sales are 532'000 for units below 12 kW.

No information could be found at this stage on comfort fans.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Answers are similar to the ones in the heating part. There are guidelines and advice on cooling products and how to promote passive cooling and avoid getting equipped, but no specific network regarding efficient cooling.

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

For the 2 above questions, the study mentioned above depicts the main market chains: for portable units, the main prescriber is the retailer, and for split units, they are mainly wholesalers, then installers, and to a lesser extent retailers and contractors.

Single ducts product are often bought "in emergency" at retailers during heat waves (compulsive buying). No information could be found at this stage on comfort fans.

Cooling products are as heating products available on-line, with or without the installation service proposed.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

[64] Air conditioners and comfort fans, Review of Regulation 206/2012 and 626/2011 Final report.

Information and guidelines on the cooling topics tend to focus on how to avoid the need of cooling. Many technical brochures are also available regarding the installation of products, targeting installers. Correct dimensioning is an issue but rather to secure client's satisfaction rather than promoting energy efficiency and a possible level of sufficiency.

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

Amongst the many existing guidelines, two can be quoted for the general public (ADEME's guide) and for installers (from the Agence de la Qualité de la Construction) with as main advice:

- The external use of plants and green as solar protections to create shade
- When the mass of the walls / inertia cannot be changed, the external painting can be of clear colour
- Install louvered shutters to let the air circulate at night
- Install comfort fan to move the air
- Insure ventilation to let hot air get out of the home, including at the top of the walls
- Install soar protections
- Limit internal gains thanks to energy efficient products or buffer zones
- Setting the temperature correctly (26°C at the lowest, no more than 5 to 7 degree difference with the external temperature, including for health reasons).
- Choosing well the products (see also the advice page on Guide Topten https://www.guidetopten.fr/grand-public/recommandations/recommandations-et-conseils-sur-les-climatiseurs)
- Maintain the product (depending on products thanks to a yearly visit of a professional)

Annex 9 – Contribution to Baseline Report – Italy

Country Introduction

National / regional / local policy

In Italy the regulatory part covering the energy issues derives from the adoption of the EU directives and regulations. The Ecodesign and labelling are implemented since years in the national legislation. The EDP (Energy performance of Buildings) Directive is adopted at national level through decree. In addition, the regional energy decrees are setting further requirements for building energy use regarding efficiency, consumption and additional requirements e.g. on renewables and on the eergy performance certificate. All the calculations and evaluations are based on the national standards UNI-TS, actually in revision. The safety issues are defined at national level. The regional legislation could set also limits to emissions (pollutions).

The set of incentives is defined at national level. The white certificate market (energy saving obligation scheme) is active and includes also HAC products in the residential sector.

Market structure and stock

In Italy, as reported in the last statistical analysis made in 2011[65], there are more than 12 mio. of residential buildings, with 31 mio dwellings, with a growing trend higher than the 1% per year. The 77% of the dwellings are occupied permanently by residents. The 93% of the stock is a property of private persons. 18% of households are rented. Regarding the energy demand and availability, in Italy about 4.3 million of families live in fuel poverty (that's about 9.4 million people), according to the Istat SDGs Report 2018.

Heating appliances

Following the statistical data collected in 2011, autonomous systems for the heating generation are installed in two thirds of the residential units, 15% are equipped with centralized systems (larger multi-family buildings). The 20% of the households are equipped with room systems (single appliances), mainly in the south and the islands (15%).

The main source for heating in Italy is natural gas (70%), followed by biomass (15%), LPG, electricity at 5%, oil for the 3%.

For the sanitary hot water production, 70% is covered by gas boilers, 15% with electricity, 7% LPG, Oil and Biomass only 3%.

Cooling appliances

The cooling appliances are installed in more than the 30% of the dwellings. Market for cooling appliances had a peak during the summer of 2003 and increases constantly, depending on the summer conditions. Since early 2000 the cooling appliances in the residential sector were limited to specific situation (city centres or southern regions). Is estimated that more than 18 mio. units are installed in Italy. Every year Assoclima (Association of manufacturers of climatization systems) publishes a market report for this sector. In 2018 the market for smaller appliances consisted in 1.5 mio units for a total of 900 Mio € for portable units, mono- and multi- split. In detail were sold 100000 portable units, 1 mio. monosplit, and 300000 multisplit.
More than half a million units were exported, mainly portable[66]. The market for portable units is quite stable, while the trend for mono and multi split is growing +10%, in 2018 and 2019.

[65] Statistical data from http://dati.istat.it
[66] Assoclima report 2018, available at https://www.anima.it/kdocs/1960392/Rilevazione_Annuale_Assoclima_2018.pdf

Shading systems: the market is growing slightly every year, no data are available publicly. The only data available are published by ENEA in the framework of the incentive system: 70'000 new shading systems were incentivised in 2017, with a covered surface of 576'000 sq.m.

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

No document is required for simple replacement of systems under 50 kW without changing energy source. For complete refurbishment of a heating system in mandatory a communication to the municipality (CILA – communication of works) and the Law 10 report (energy report). For new systems / expansions is mandatory a construction permit (SCIA).

See figure:

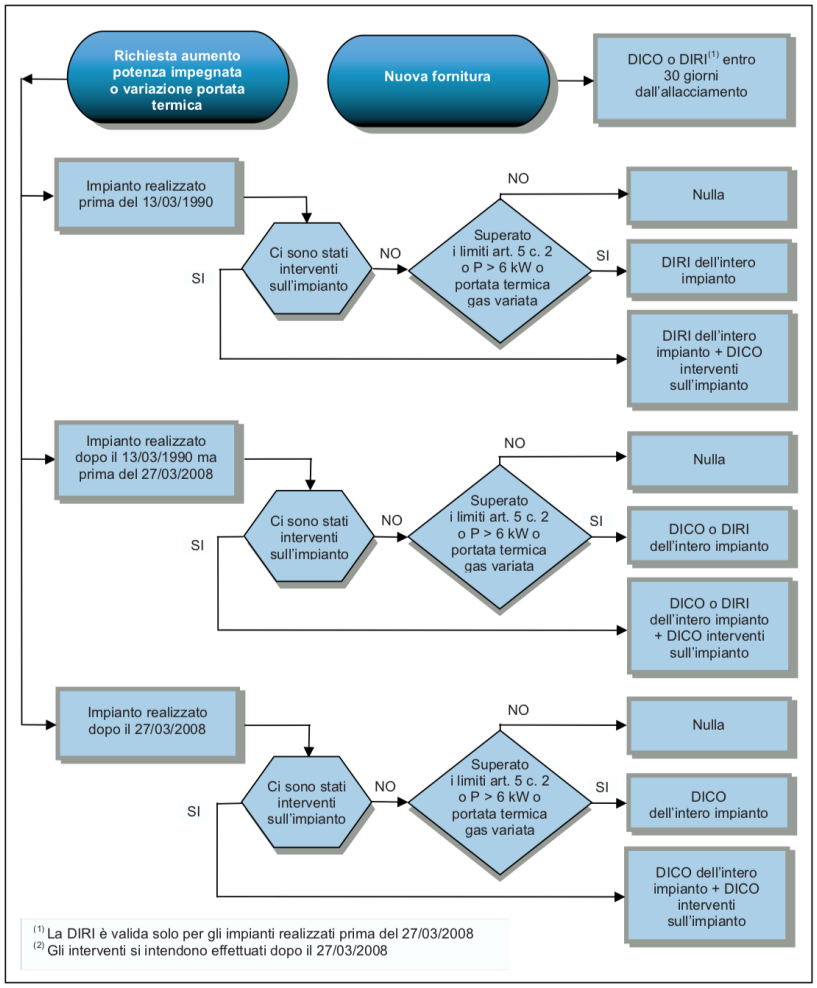


Figure 1: procedure and authorization for installing heat generators, Source: http://www.regione.toscana.it/documents/10180/70872/Linee%20guida%20per%20applicazione

%20del%20DM%2022%20gennaio%202008%20n%2037/717c0cfd-5659-412c-8e8d-4f5e57a4212e

For efficiency level, just the EU regulations are active at national level. At regional level there are possible additional requests on efficiency. The non-condensing units are permitted only in special cases (one exhaust pipe for more boilers)

Other minimum criteria are depending on the region (energy issues are legally co-managed at national and regional level). E.g. in Lombardy, only selected biomass stoves and boilers are permitted (biomass from wood and wood-products, valid for existing and new installation).

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Yes, only a qualified company/individual could design and install it (legally binding is the Ministerial Decree 22 January 2008 n. 37, for all the works in buildings and systems). A technical systems designer (engineer, ..) is necessary in case of: heating power > 50 kW, electrical power > 6 kW, > 400 sqm. (200 for tertiary activities), exhaust pipe is common with other systems. In all other case the installer's technician could do it.

At the end of the works is necessary to provide (by the installer technical staff + their legal responsible) a certificate of compliance (declaration about respect of the project, compliance with the actual standards, proper materials and products installed, safety and functionality controlled).

The compliance and safety requirements must be checked regularly: depending on the product capacity and power source, the maintenance must be done every 12 to 48 months.

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- ***Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?***
- ***Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?***
- ***Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)***
- ***Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?***

Two main systems of incentive are active in Italy: Tax rebates and direct incentives (Conto termico).

For private owners are active national **tax rebates** (max expenses 30k€ - deductible in 10 years, 5 years for people > 70 years of age). It's the 65% or 50% of the cost for the works (appliance/products + installation + design)[67]. For larger buildings like multifamily are applied different rules and in this case the percentage can reach up to the 85% of the costs.

[67] See the national guidelines published by the national tax agency: https://www.agenziaentrate.gov.it/wps/file/Nsilib/Nsi/Agenzia/Agenzia+comunica/Prodotti+editoriali/Guide+Fiscali/Agenzia+informa/AI+guide+italiano/Agevolazioni+fiscali+per+risparmio+energetico+it/Guida_Agevolazioni_Risparmio_Energetico.pdf

For refurbishment works (of any kind) is available a 50% tax rebates (max 96k€ of expenses) or 36% after 1.1.2021 (max 48k€).

VAT is reduced at 10% for materials and products related to the refurbishment intervention.
For the subjects with higher income is not possible to devolve the tax rebates incentives to banks, or financial companies.

Interventi su parti comuni dei condomini o sulle singole unità immobiliari

INTERVENTO	% detraz.	A CHI SI PUÒ CEDERE
serramenti e infissi	50%	I CONTRIBUENTI CHE RIENTRANO NELLA "*NO TAX AREA*" possono cedere il credito a: • fornitori • altri soggetti privati, compresi banche e intermediari finanziari I CONTRIBUENTI CHE **NON RIENTRANO** NELLA "*NO TAX AREA*" possono cedere il credito a fornitori o altri soggetti privati, ma non a banche e intermediari finanziari
schermature solari		
caldaie a biomassa		
caldaie a condensazione in classe A		
caldaie a condensazione in classe A e sistema di termoregolazione evoluto	65%	
pompe di calore		
scaldacqua a pompa di calore		
coibentazione involucro		
pannelli solari		
generatori ibridi		
sistemi *building automation*		
micro-cogeneratori		

Figure 2: incentive percentage, in terms of tax rebates, for each intervention.

There is also **Conto Termico**, a state incentive developed to increase the energy efficiency and the production of thermal energy from renewable sources for small-scale systems. The annual amount for the incentive is 900 million euros, of which 200 intended for public administrations.
Conto Termico cannot be combined with the tax deductions previously described.

For the citizens, Conto Termico incentives:
1) Replacement of existing systems with renewable energy heating systems (heat pumps; biomass heating systems; hybrid heat pump systems).
2) Installation of solar thermal systems also combined with solar cooling technology.
The amount of the incentive varies according to many characteristics (technical characteristics of the product, climate zone, etc.) and is in the form of direct money.

Also rebates from private utilities are active (e.g. ENI through credit transfer, A2A thorough instalments included in bills, etc.)

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

ENEA (national energy agency) and the National tax agency are advising about the tax rebates – few information on efficiency levels.

https://www.agenziaentrate.gov.it/wps/file/Nsilib/Nsi/Agenzia/Agenzia+comunica/Prodotti+editoriali/Guide+Fiscali/Agenzia+informa/AI+guide+italiano/Ristrutturazioni+edilizie+it/Guida_Ristrutturazioni_edilizie.pdf

Utilities usually advertise through national media about their offers to substitute products, in particular condensation boilers.

Yes, A class condensing or biomass boilers for space heating receives 50%, with advanced controls (class > V as in EU 2014/C 207/02) is 65%. For hot water only heat pumps boilers with COP > 2,6.

For appliances substitution is min A+ class (A for ovens) for receiving the 50%.

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Is possible to account the savings for any documented intervention. The limit is the minimum saving to achieve for reaching a certificate (1 MToe). For the calculation is possible to apply a standardized calculation methodology or report the effective metered savings.

Part B: Supply market analysis and market structures. Purchase procedures.Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?
H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?
H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?
H.B.4. Is the product or installation service available online? (this could be useful in the next phases)
H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

The main market chain is through installers, secondary options are the direct sale, the telephone contact by ESCos or energy companies. Rarely for small installation is involved a systems designer. Despite reasons for installing or substituting products are usually "green", sometimes it looks like marketing, very rarely installers or utilities propose super-efficient products. The focus is often on technology, not on products (e.g. condensation boilers). Sometimes, offers from utilities are accessible online (e.g. ENI).

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

- Thermostatic valves and thermostats (already mandatory in multifamily buildings without dwelling/unit accounting system, since 2016)
- Use blinds at night

- Use heavy curtains to protect windows and prevent heat losses.

Sources:

- https://www.enea.it/it/Stampa/news/energia-riscaldamento-online-la-guida-enea-per-aumentare-lefficienza-e-risparmiare-in-bolletta

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc)? Are there other requirements (e.g. energy label, electrical safety label, shading cooling product(s)?

No, for small units there are no special requirements, except in city centres or historical areas/facades, for which a special approval by the municipality is needed (for visual disturbance).

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

No, for small units (non-industrial) the rules are the same as for heating products.

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- ***Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?***
- ***Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?***
- ***Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)***
- ***Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?***

See answer below

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

The incentives framework is exactly the same as for heating systems. 65% or 50% tax rebate is available. There are rebates also for shading systems (50%). Utilities promote the purchase of ACs during summertime (e.g. through credit transfer and the possibility to pay the product in the bills), but not propose super-efficient products.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?
Yes, see the text below in C.B.2. Utilities are offering high efficiency A++ cooling systems. Not known if white certificates can be claimed in this case.

Part B: Supply market analysis and market structures. Purchase procedures.Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Typically the small-mid cooling products are provided by the installer or found in shops. Plug-in units are sold in shops. No document is needed for the installation (likewise for heating is there a specific limit in power).

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Local and national utilities started to distribute split systems (http://clima2a.a2aenergia.eu). Very often utilities propose ACs from a given brand (co-marketing). No advice from other apart from retailers/manufacturers.

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?
Guess for split systems: 50% by installers, 50% direct sale + installation service provided by the retailer. Plug-in 100% direct sale.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

No, except for products sold by the utilities and some retailers.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

In Italy we're planning to open a table with installers to understand which are their actual needs and deliver meaningful help to them.

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

- Shading systems
- Ceiling fans
- Blinds during daytime

- Measures for offices (e.g. clothing)
- Control/regulation, maintenance and installation tips (see below the links)

Sources:

- https://www.enea.it/it/Stampa/documenti/guidacondizionatori.pdf
- https://www.enea.it/it/Stampa/news/energia-10-consigli-enea-per-ridurre-i-consumi-e-i-costi-dei-condizionatori
- https://energy.lifegate.it/blog-gas-e-luce/guida-climatizzatore-risparmio/
- https://www.qualenergia.it/articoli/20150628-come-scegliere-il-climatizzatore-giusto-detrazioni-efficienza-costi-e-controlli/
- https://www.qualenergia.it/sites/default/files/articolo-doc/AiCARR_BuonePratiche.pdf

Annex 10 – Contribution to Baseline Report – Lithuania

Country Introduction

Climate. Demand for heating and cooling is defined by the country climate conditions, first of all by outdoor temperatures. Lithuania is located in a semi-continental climate zone. In the coastal area, winters are relatively mild with average temperature in January being just below the freezing point while average summer temperature in July-August is 18 C. In inland areas, temperatures are a bit lower in winter and a bit higher in summer. Buildings need to be heated approximately from mid-October to mid-April, the average heating season lasting for 180-185 days/year. In winter, there are a few days of very severe cold with temperatures dropping to minus 15-20. In recent years, due to climate change outdoor temperatures become more unpredictable and subjected to frequent and unexpected swings.

Residential building stock embraces about 1400 thousand households, which are distributed by types as follows:

(1'000)

	Total	1 apartment house	2 apartment house	Multifamily house	Other
Total number of households	1'389	497	55	820	17
of which:					
in cities	930	139	34	743	14
in countryside	459	358	21	77	3

Source: country census, 2011.

About 60% of population live in multifamily houses, of which total number counts to 35'000 across the country. This type of houses dominates in cities, while, in the countryside individual homes prevail.

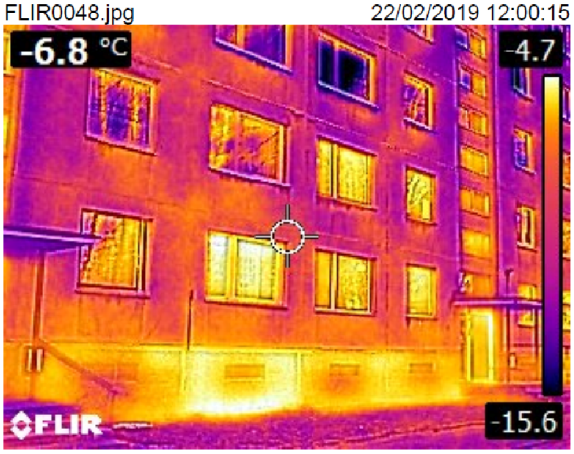
61% of all houses were built in the 1961-1990 period when the main focus was to satisfy acute need for dwellings and paying less attention to living comfort and energy efficiency issues. For this reason, construction of this period is characterised by bad thermal insulation of the building envelope, outdated heating system and poor energy efficiency.

Table 1: Fuel & Energy used in households for heating & preparation of hot sanitary water

Fuel / Energy	Unit	Quantity
Heat from district heating systems	GWh	5521.9
Electricity	GWh	298.0
Natural gas	GWh	1518.1
Diesel	1'000 ton	18.6
Liquefied gas	1'000 ton	1.2
Wood logs, briquettes, pellets	1'000 m^3	2352.4
Peat briquettes	1'000 ton	48.6
Coal	1'000 ton	69.3

The prevailing energy sources and fuels are: district heating (75%), natural gas (21%), electricity (4%) in cities, wood in rural area. District heat is produced mainly by using wood chips.


Typical construction of 1961 – 1980 period in Vilnius. There are 40-100 flats in one building.



Poor thermal insulation of the basement walls and heating piping lead to high heat losses.


8-flat multifamily houses in a small village. After the houses had been disconnected from a closed down district heating system, the flat owners implemented “do-it-yourself” solutions of how to heat their flats by installing primitive wood-fired stoves in the flats. The houses are in poor shape and it is doubtful whether they will last long.

In 2004 government embarked on an ambitious renovation programme intended for refurbishment and modernisation of residential multifamily houses. So far, the programme has been successful and produced good results. Since the beginning about 2’500 multifamily houses have been modernised, mainly by covering building envelope with thermal insulation, replacing old and worn out piping of heating, hot water, cold water and sewage systems.

Renovated multifamily house.

The building stock also improves by new construction, which meets all contemporary requirements including energy efficiency. The latest government regulation stipulates energy efficiency class not less than A to be achieved for newly constructed buildings.

New construction (2012). 68 flats, energy efficiency class B.

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

All the information about requirement, permits, regulations, etc. were collected by visiting a number of retailers and installers (nearly 10 small companies) and taking interviews. This information reflects existing practices. Rules & Instructions of this kind are fragmentary and mostly stem from regulations by State Energy Inspectorate under the Ministry of Energy (https://vei.lrv.lt/, accessible in English).

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

There are government regulations on installation of natural gas boilers and heating equipment in residential houses. They prescribe requirements and rules for installation of such devices with particular focus on safety, e.g., they lay down requirements for installation of natural gas boilers in basements of multifamily houses. An example of such requirement is that the boiler room must have windows of sufficient area to serve as a safety valve in case of gas explosion thus preventing the building envelope from destruction. All installation firms must stick to these requirements.

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

There are requirements for specific works: on gas pipes, boilers, electrical devices. A company engaged in specific works must possess a certificate for this kind of works. Examples are: a certificate for construction and welding natural gas pipes inside a building; installation of gas boilers, installation of heat pumps (in the last case a special certificate is needed for working with refrigerants).

In order to get a certificate for a specific technical area, a company or a natural person must attend a corresponding training course and pass the exam. These courses are provided by Energy Training Centres

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)**

- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

There are a few government programmes or incentives, which provide rebates to households. Examples are:

1) Replacement of old and inefficient heat boilers with new and energy-efficient equipment. The programme targets individual households (1-2 flat houses). Natural persons, who have installed a new, energy efficient heat generator such as: a biomass boiler of not less than 5-th class, a ground-water or water-water heat pump with SCOP => 3.5; air-water heat pump with SCOP =>3 are eligible for 50% rebate of the sum, which is calculated by multiplying nominal heat output (kW) by a fixed price per 1 kW[68].

2) Programme of modernisation of multifamily houses. Flat owners, who participate in the programme and modernise their buildings, are eligible for 30-40% rebate of total renovation costs, concrete percentages depending on a set of implemented improvements. Recently new legislation in this area have broadened scope of renovation – from the so called engineering or small renovation, which includes heat substation, hot water piping, sewage system, thermostatic valves on radiators, heat cost allocators on radiators to a full package of measures including thermal insulation of the building envelope, windows replacement and others. These changes made the programme more flexible and better tailored to concrete customers because flat owners substantially differ in well-being and understanding engineering matters[69].

3) Rebates for installers of small-scale PV-panels. This programme targets individual households or villas (6 a land plots for gardening usually in suburbs). Installers of PV-stations up to 10 kW capacity are eligible for a fixed rebate 322.91 €/kWp. PV panels can be installed on a roof or ground (roof installation gives a better score as does installation of up to 5kW capacity). A few requirements are set for PV panels: EU production. CE sign, sufficient protection against dust and humidity (at least IP 65)[70].

All these rebates do not depend on household income. There is differentiation of modernisation costs for a consumer in the "Programme of modernisation of multifamily houses". But this is a threshold differentiation – flat owners who experience energy poverty and this is proved by receiving state compensation for energy, pay NOTHING for modernisation of their multifamily house. Those who do not fall under this category of energy poverty pay uniform renovation costs proportionally their floor area.

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

Government programme for modernisation of multifamily houses sets requirements for some energy-efficiency indicators. For example, if flat owners implement a measure of thermal insulation of the building envelope, then they are eligible for 40% rebate on insulation cost, only

[68] *https://www.apva.lt/paskelbtas-kvietimas-senu-ir-neefektyviu-sildymo-katilu-keitimui-2/*

[69] *http://www.betalt.lt/veiklos-sritys/programos/daugiabuciu-namu-atnaujinimo-modernizavimo-programa/102*

[70] https://www.apva.lt/norite-isirengti-saules-elektrine

if heat saving is => 40% and the building achieves at least C energy-efficiency class. However, heat consumption after insulation works is calculated and not measured.

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Neither ESCO nor Energy Performance Contracting (EPC) models are used except maybe a few pilots.

Part B: Supply market analysis and market structures. Purchase procedures. ***Analysis of the sale and installation chain for each product (imported products, market research, ..):***

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

It was already said that installation companies must have certificates depending on the scope of work they are engaged in. Some works like installation of a wood boiler do not require certificates at all but some may need a set of certificates: e.g., for gas works, electricity works, permission to work with refrigerants as in a heat pump case.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Such advice can be obtained within government programmes. Typically, each programme is supervised by a specific government institution. For example, advice on modernisation of multifamily houses is provided by Housing Energy Saving Agency, which periodically organises educational trainings across the country. For this agency, there is a shortened English version of its site www.betalt.lt .

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Typically, energy equipment market operates in direct sale mode.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

A product – yes. Installation service – no. Retailers have formal or informal bilateral agreements with installers.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

It would be useful to have 2 instruments (I do not know if this is feasible):

1) When calculating energy consumption, efficiency, savings, etc., to distinguish between conventional (large CO_2 footprint) and green energy (no or small CO_2). Then you can move toward progress by simply replacing conventional energy by greener or green energy. Such evaluation would enrich the picture a lot.

2) For some items of energy equipment it would be quite useful to have a “reciprocal“ calculator. This means deriving a break-even price based on the energy characteristics of the unit under question and the current consumer situation. You enter a few parameters of the current situation at the customer who is considering purchase of the unit. Then you enter energy data of the unit and get a break-even price, i.e., at what price it is worth purchasing and installing the unit. After what the customer may compare the calculated break-even price with that in the shop. This would be very useful and attractive for many players. Moreover, it allows to avoid exhibition of a retailer‘s price, which as far as I understood in Nice, causes problems. However, it is probably not easy to do. If you decided positively, I could try to help in this aspect. Maybe we could do this for Lithuania case at least for a few larger items?

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

There are 3 simple and cheap measures, which could considerably improve life in multifamily houses where 60% of Lithuanian population lives.

1) Balancing heat risers. These are a pair of ¾“ - 1“ heating pipes, which vertically cross all storeys. One radiator is connected to a riser in each storey, so one riser provides heat for as many flats as there are storeys.

Sad pictures of risers in ordinary multifamily houses. These pipes are located in the basement, space around them is used by flat owners for keeping sundry rubbish. Access to the risers is constrained while repairs are in high need. Normally, in these places there should be balancing valves to even heating across the building.

2) Installation of thermostatic valves on radiators.

Actual situation. No thermostatic valve, no heat meter (heat cost allocator) on the radiator. It is connected to one pipe, which makes balancing more difficult because adjusting one radiator influences other radiators on the same riser in different storeys.

3) Installation of heat cost allocators on each radiator. A pair „thermostatic valve + heat cost allocator“ provides incentives for adjusting heating to individual needs and results in around 15-20% energy saving.

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Cooling on a bigger scale in residential sector is non-existent except small air conditioners installed individually and used in summer time. There are big cooling systems in modern office buildings, big shopping centres and the like.

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Financial Incentives

Cooling appliances play much less significant role compared with heating devices and are limited by air conditioners and comfort fans only. Neither market of cooling appliances is big, nor authorities consider them of great importance for customers. None of them are supported by any financial incentives.

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

Annex 11 – Contribution to Baseline Report – Luxembourg

Country Introduction

In Luxembourg, the energy requirements are defined by national regulations transposed from the EU directive on the energy performance of buildings. The national regulation sets limits to emissions. Safety requirements are included in the same text. Municipalities deliver a permit for the installation of a heating system in compliance with national regulations.

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

Requirements are set in a national regulation which is transposed from the EU directive on the energy performance of buildings. For a new construction or the renovation of an existing building, the building owner has to deliver an energy certificate. The energy certificate includes information about the energy efficiency of the heating installation. The energy certificate is a mandatory part of the construction permit.

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Yes. Only qualified heating installers are allowed to install and repair heating systems. Heating systems have to be checked every 2 years by a qualified heating installer. National regulations transposed by an EU directive define the safety measures.

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

The Ministry for Environment gives a financial support for the acquisition of pellet and woodchip heating systems and wood-fired boilers up to 5000 € per living unit.

Some municipalities have rebate programs and add a predefined amount to the financial support of the Ministry.

The following conditions must be fulfilled: Efficiency ≥ 90%; Firewood boiler and combination firewood / pellets: buffer memory ≥ 55l / kW; Pellet stove: at least 50% heat extraction to the central heating system

There are no conditions linked to income levels.

An immediate discount on the intervention cost is not foreseen in the national rebate program.

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

MyEnergy is a semi-national agency and gives advice to municipalities and individuals on energy saving measures and energy efficiency. The Ministry of Environment has introduced a communication campaign called Heating Check with the aim to sensitize people to do a regular maintenance of the heating installation,

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No, this is not the case for heating systems.

Part B: Supply market analysis and market structures. Purchase procedures. ***Analysis of the sale and installation chain for each product (imported products, market research, ..):***

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Sanitary and heating installers sell these products. It is possible to buy a heating system directly from the importer or distributor. But this is quite an exception. For the installation or replacement of a heating system a new energy certificate is needed. If the installation or replacement of the heating system is done over the course of a new construction or renovation of a building, information about the system needs to be transmitted to the municipality for the construction permit.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Yes, the Ministry of Environment, MyEnergy and some local initiatives.

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

The installer is the main actor in selling heating systems. The percentage of market channels are not known.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Online commerce is not a big issue in Luxembourg. It exists only one national online shop: letzshop.lu. Unfortunately, you don't find heating or cooling devices on this online shop portal. For the rest, we depend on online shops from other countries.

Retailer and installers all have a website. But it is only used to promote their service and the products that they sell in their shop.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

How much money or CO_2 can you save in investing in an energy efficient heating system?

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

- Oekotopten.lu – our own website with recommendations on how you can reduce your heating costs without any invest: https://www.oekotopten.lu/private/article/art2018120101f
- MyEnergy: general information about energy saving measures https://www.myenergy.lu/
- Energieatelier: general information about energy saving measures http://energieatelier.lu/
- Energieagence: general information about energy saving measures https://www.energieagence.lu/

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

There are requirements for permits for the installation of cooling products. For active cooling systems, the national regulations are the same as for heating systems. A construction permit is needed by the municipality. For air conditioners with a rated capacity of ≤ 12 kW for cooling, the EU energy label is mandatory. The products have to comply with the ecodesign requirements for cooling products up to 2 MW.

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Only qualified staff can install professional cooling devices. There are no additional national safety measures beside the EU requirements.

For small plug-in systems there are no requirements.

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

No

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

No. MyEnergy and other local initiatives give advice on how to avoid overheating in buildings.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?
No

Part B: Supply market analysis and market structures. Purchase procedures. *Analysis of the sale and installation chain for each product (imported products, market research, ..):*

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

The market situation of cooling products is similar to heating devices.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

No

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Unfortunately, reliable figures for the different market channels are not available.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

For cooling appliances, we have the same situation as for heating appliances. We don't have a national online shop where you could buy these appliances. Except for small fans. Some retailers have an online shop where you can find this type of devices: (https://www.hifi.lu/fr/search?q=ventilateur)

We don't have a national website where you could find a support for DIY. As for the heating products, installers offer their services on their website. But you don't find any recommendations how you can fix your appliance yourself.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

An overview about the current market situation for cooling devices would be interesting for consumers. Furthermore, it would be interesting to calculate the saving potential for different professional cooling devices for office buildings.

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

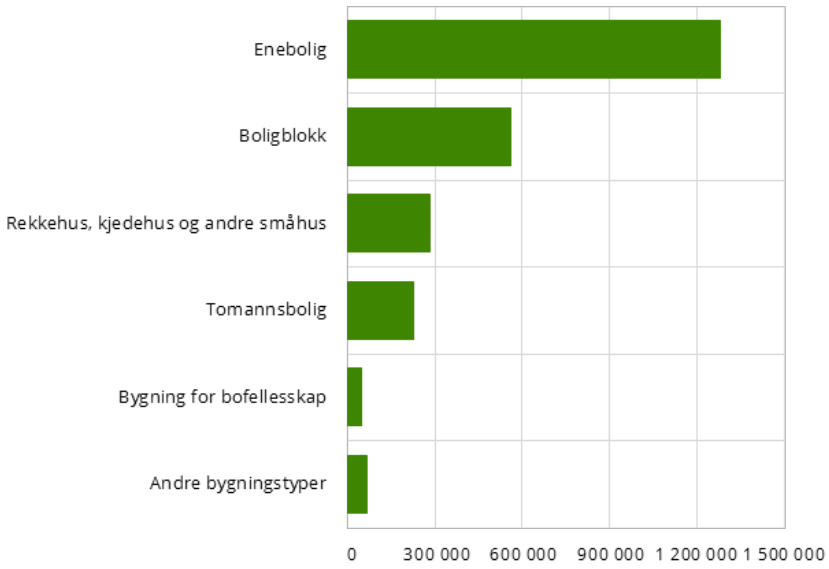
- https://www.myenergy.lu/fr/particuliers/electricite/climatiseur
- https://www.oekotopten.lu/private/article/art20190620f

Annex 12 – Contribution to Baseline Report – Norway

Country Introduction

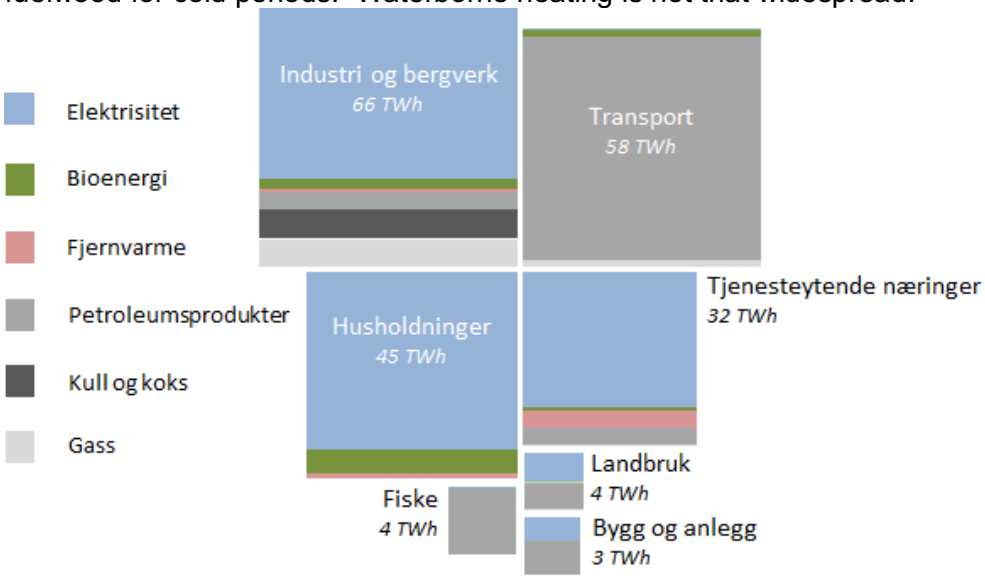
Norwegians are home owners. This means that both apartments and single house homes typically are owned by its inhabitants. Even though Norwegian authorities talk a lot about densification, still most Norwegians live in single house homes and townhouses. And these building types constitutes about 70% of the Norwegian building mass, even though this is slowly changing.

Figur 1. Boliger etter bygningstype. 1. januar 2014



Kilde: Statistisk sentralbyrå.
(https://www.ssb.no/bygg-bolig-og-eiendom/statistikker/boligstat/aar/2015-04-22#content)

The preferred building material in Norwegian buildings has historically been wood materials, with wooden studs and wood panelling, and it still is. To withstand the cold winters the building standard is generally good. The houses are generally well insulated, but as a hydropowered country – most of the heating appliances and equipment is based on direct electricity and fuelwood for cold periods. Waterborne heating is not that widespread.



(https://energifaktanorge.no/norsk-energibruk/energibruken-i-ulike-sektorer/)

Norwegians are the world champions of home refurbishment, Norwegians spend NOK 94 billion every year on renovation of cabins and houses, and about 40% of home owners refurbish every year. Still the main focus is not always on necessary maintenance or the smart and energy saving solutions and measures. (https://prognosesenteret.no/oppussing-folkehobby-nr-1/)

In Norway most of the regulatory parts concerning energy issues, like heating and cooling in buildings are in line with the EU. One of the most distinct regulations in Norway is the prohibition on use of fossil fuel for heating. This was first mentioned by the Norwegian parliament as part of the Climate report of 2012 as a potential prohibition in 2020. This was later approved in 2018 and the prohibition is valid from 2020. (https://www.regjeringen.no/no/aktuelt/forbud-mot-oljefyr--til-oppvarming/id2678986/)

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)?

In Norway the installation of heating systems typically does not require application.

There is a voluntary national quality scheme called “Central Approval” that is run by the Directorate of Construction Quality. Central approval is a quality scheme which documents the company's professionalism and expertise. Foreign companies can achieve central approval on the same terms as Norwegian companies. The purpose of the regulations is to ensure that buildings of good quality are constructed.

Many of these heating products can be mounted / installed by the consumer. The main rule is that if they have “plugs", then the common man is "good to go". If there are heat pumps, cooling systems (air conditioning, cooling rooms in the house etc) it must be done by "professionals". Here, the FSE rules set the requirements (FSE = regulations for electricians). Simply put, one must then have a professional certificate as an electrician or "electrical repairer". If the heating system contains F-gases in open circuits, the installer of the heating or cooling system has to be F-gas certified.

“Electrical repairer” is a professional letter for what we call "home appliance techniques". Anyone can buy the products, but not necessarily install them.

These are Norwegian rules, in Sweden and Denmark there is no «electrical repairer».

To install stoves, the consumer must give notice to the municipality.

When installing boilers and some water based heat pump systems, the installer should notify the municipality and NGU (the Norwegian geological investigation) if drilling an energy well.

Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed?

Non-renewable heat generation systems are generally forbidden in heating products, with some exceptions.

There are also requirements concerning emissions of air pollute (particles) from stoves in Norway, this is regulated by NS1358/59, which describes both the test method and maximum particle emissions. The requirements are (or at least has been) stricter than the EU regulations with the maximal amount of 10g particles/kg fuel.

All heating products follow the EU requirements and should be both energy labelled and meet the electrical safety requirements stated in “forskrift om elektriske utstyr” (regulations for electrical equipment) e.g. CE- marking or other safety documentation.

For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

For installation of stoves and fireplaces, a documentation is needed, based on Norwegian regulations. For all heating products, like in the EU, both energy label and the products technical fiche should be attached.

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)?

If the heating system (heat pumps) contains F-gases in an open circuit, the installer has to be F-gas certified.

For the installation of heating systems with electrical components you will need an electrician.

For the installation of gas boilers the planner and installer need to have both practical and theoretical knowledge. This knowledge must be documented via a certificate.

Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)?

There are several measures to be met for the installation of heating products for safety reasons in Norway. For installation of boilers there are measures – such as the fuel storage and the amount of fuel you can store, and the design of the boiler room (materials, chimney, air supply), but also the design of the boiler and the fuel feeding mechanisms of the heating system.

For stoves there are requirements concerning the distance between the flue and flammable materials/the wall.

For heat pumps there are measures concerning the electric installation, and depending on the refrigerant used.

For those measures, is a certificate of the product or of the installation needed? For which product(s)?

There is no such certificate needed to our knowledge. But the installation must in most cases be documented to the municipality.

Financial Incentives

H.A.3. OBJOBJ Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

Yes, in Norway we have a rebate programme for installation/buying energy efficient solutions in households. The programme is run by Enova SF. The programme lets the inhabitants choose

them self if the money should be paid out directly as a direct money transfer, or as a future tax rebate. The tax rebate part of the rebate programme was due to a political compromise, and will probably vanish.

Enova SF is owned by the Ministry of Climate and Environment and their mandate is to contribute to reducing greenhouse gas emissions, development of energy and climate technology and strengthening the security of supply. The rebates include various products within heating, but also supports the removal of oil heating, energy advice and energy upgrades to the building body (you need to upgrade to existing energy standards or better). The heating products that are supported as of 2019 are: water heating heat pumps (air to water, liquid to water, exhaust air), various bio fuelled boilers and ovens (water heaters), installing water based heating system, solar collectors and heat recovery from grey water.

Some local municipalities have their own rebate programs for households.

There are other rebate programmes for other types of buildings.

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**

The only features necessary is that the products must be in line with the Norwegian and EU standards. The goal of the rebate programmes is mainly to introduce the technology and the over all solutions to the market, and not necessarily to make the producers into develop more energy efficient products. Even the installation of the least efficient products on the market (in the relevant/financially supported categories) gets a rebate.

- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**

No, the rebate programme is a universal programme for all Norwegian home owners.

- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)**

Some of the programmes requires this type of conditions. Mainly to prevent households for getting paid to do statutory installations.

- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

No, not for households. But EPC (Energy Performance Contracting) is a similar concept some municipalities and corporate building owners have experience in using, and larger contractors have experience in providing.

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)?

There used to be several regional offices called ENØK-sentre in Norway. Today there is only one institution, Enova SF. They have a direct energy advice phone.

With the project Oljefri (oil free), Naturvernforbundet have had a role as a national consumer advisor with several information campaigns and installer network in the process of banning fossil oil heating in Norwegian buildings.

Some municipalities also have their own energy advisors.

Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

There is a possibility of gaining better financial terms for building refurbishment from some private banks in Norway.

It is also possible to get better conditions, like interest reduction from Husbanken – Norwegian State Housing Bank for ambitious energy efficiency projects. Husbanken also have a social lending profile.

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Norway has yet to implement a white certificate market. This might change.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Wood stove:
Purchase: in store (water mantled stoves mainly online or through dealership)
Installation: the consumer can do the work, but the installation has to be approved by a professional before usage. Most Norwegians use a professional installer this might be a bricklayer or similar.
Notification/documentation: A notice must be sent to the fire department.

Air to air heat pumps:
Purchase: online (or in a store)
Installation: By a professional F-gas certified installer and connected by an electrician.
Notification/documentation: not necessary to our knowledge.

Boilers (wood logs/pellets/chips):
Purchase: via the plumber/installer or via dealership.
Installation: By a plumber (for households)– there might be an installer e.g. a boiler technician as well.
Documentation: When installing a new boiler, you have to apply to the municipality. When replacing an existing boiler a notification will be sufficient.

Air to water/liquid to water heat pumps:
Purchase: plumber/installer - or via dealership

Installation: by a plumber - the installer should also be f-gas certified – depending on the product installed.
Documentation/notification: You have to apply to/notice the municipality. If you install a ground source heat pump, the energy well should be registered/mapped.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

There are some networks and stakeholders aiming for the installation of more efficient products at a national level. Organizations like Enova, the consumer Council, home owner associations and industry organizations, and us through energismart.no.

With some exceptions, the main focus has been on promoting different product groups, and not so much the individual products. The initiatives have mainly been on a national level.

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

In a Norwegian context the actors involved in are the manufacturers and importers – most installers purchase HAC equipment directly from them. Some installers purchases based on chain agreements, and some are independent but loyal to different importers e.g. they purchase heat pumps from a specific brand. Other HAC products are based on distributors and gross market channels. The actors involved depends on the HAC equipment and the installers connections.
It is hard to find data on percentage of market channels in a Norwegian context.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

There are both product and installation services online for HAC-equipment. In Norway we have several online services like: tjenestetorget.no, mittanbud.no, varmepumpeinfor.no etc. Naturvernforbundet also have an online installation service via Oljefri.no.
They do not provide an online store, but function more like a platform for contact between installer and consumer.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

www.energismart.no
1. Change the windows gaskets
2. Stop air leaking
3. Right usage of stoves and fuel eg. www.riktigvedfyring.no
4. Reduce the over all temperature.
5. New thermostats
6. Invest in energy management tools, and reduce the temperature for periods.
7. Insulate hot water pipes

8. Rinse radiators and water based heating systems
9. Balancing of water based heating systems
10. Reduce the temperature on the water heater – but avoid legionella levels

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)?

In a Norwegian context cooling in buildings for the most part has been a “office building” phenomenon. Because about 70% of single house homes already have Heat pumps like split-systems they might use the equipment for cooling as well. In Norway cooling systems will have many if not the same requirements and permits as heating.

This might change over time with more efficient buildings and rapid climate change. In new buildings the energy system as a whole is regulated in building regulations, and require use of renewable energy for both cooling and heating.

Many of the cooling products can be mounted/installed by the consumer. The main rule is that if they have “plugs", then the common man is "good to go". Products follow the EU regulations.
If there are heat pumps, cooling systems (air conditioning, cooling rooms in the house etc) it must be done by "professionals". Here, the FSE rules set the requirements (FSE = regulations for electricians). Simply put, one must then have a professional certificate as an electrician or "electrical repairer".

“Electrical repairer” is a professional letter for what we call "home appliance techniques". Anyone can buy the products, but not install them. These are Norwegian rules, in Sweden and Denmark there is no «electrical repairer».

When installing liquid to water based heat pumps for cooling that are connected to the sea, or drilling, installer must apply to the municipality.

Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed?

The Norwegian requirements are in line with EU regulations on cooling appliances.

For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

The energy label is available like in the EU for cooling products. The technical fiche should be attached to the documentation of the product.

The technical fiche of heat pumps shall report gas type and quantity. Electrical conformity for all products shall be proofed.

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those

measures, is a certificate of the product or of the installation needed? For which product(s)?

The requirements for technical staff for installing split systems and other heat pumps for cooling is the same as for installing other heat pumps. Please find the information in the heating section of the questionnaire.

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

There are not rebates for buying cooling appliances in Norway. But because heating and cooling systems based on heat pumps do both, you will get a rebate if you invest in a liquid to water heat pump – which might be used for cooling as well.

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**

The rebate programme is the same as with heating. Please find the information in the heating section of the questionnaire.

- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**

The rebate programme is the same as with heating systems. Please find the information in the heating section of the questionnaire.

- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**

The rebate programme is the same as with heating systems. Read more about this in the heating section.

- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

The rebate programme is the same as with heating systems. Please find the information in the heating section of the questionnaire.

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

The answer to this question is the same as with heating systems. Read more about this in the heating section.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white

certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

The rebate programme is the same as with heating systems. Please find the information in the heating section of the questionnaire.

Part B: Supply market analysis and market structures. Purchase procedures.Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Fans and other plug in cooling products:
Purchase: store (or online)

Air to air heat pumps:
Purchase: online (or in a store)
Installation: By a professional F-gas certified installer and connected by an electrician.
Notification/documentation: not necessary to our knowledge.

Air to water/liquid to water heat pumps:
Purchase: plumber/installer - or via dealership
Installation: by a plumber - the installer should also be f-gas certified – depending on the product installed.
Documentation/notification: You have to apply to/notice the municipality. If you install a ground source heat pump, the energy well should be registered/mapped.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Same as in the heating section.

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

For most of the products the Importer sell products either directly to the chains based on chain agreements –or directly to independent installers. Some installers also import their products directly form manufacturer.

It is hard to find data on percentage of market channels in a Norwegian context.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Yes some! Same as with heating.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

- Shading systems

Annex 13 – Contribution to Baseline Report – Poland

Country Introduction

Poland is transposing successively EU law into the state's legal system. The Energy Law, the Act on Renewable Energy, the Act on Energy Efficiency, the Act on the Energy Labelling of Energy-Using products, the Act on Construction Law, the Act on the Energy Performance of Buildings and the regulation on the technical conditions to be met by buildings and their location – implement EU regulations on energy efficiency, renewable energy and market for energy using products.

However the ambition level of real implementation of the above mentioned laws seems to be limited. Especially information on best practices and promotions of best available technologies on the market are neglected. In relation to buildings energy quality (characteristic), the energy performance certificates (EPC) have been introduced, however with some limitation regarding cooling systems in residential buildings. The quality and recognition of the energy label for buildings in Poland are not satisfactory.
The national energy labelling framework is defined in the Act of the energy labelling of energy-using products (14 September 2012) which is compliant with EU energy labelling regulations.

There are several institutions in Poland responsible for market surveillance (MSA) for energy using products - the Office of Competition and Consumer Protection (UOKIK), the Construction Supervisory and the Office of Electronic Communications (UKE). For the HACKS's products mainly UOKIK and the Construction Supervisory are in the area of interest.

Polish MSAs have qualifications in the field of quality control of devices and compliance of their marking with legal requirements. The Building Supervision Inspector controls the technical condition of the building, including the heating system. Once a year, chimney sweep checks are also recommended in buildings.

According to the Act on the energy performance of the building, the heating and cooling systems are subject to periodic inspection, among others, in terms of their energy efficiency. In case of heating systems inspection intervals are as follows:

Boilers' rated power	Type of fuel			
	solid	liquid	gas	other
from 20 kW to 100 kW	5 years	5 years	5 years	5 years
over 100 kW	2 years	2 years	4 years	-

In the case of a cooling system, checks shall be carried out at least once every 5 years and applies to the cooling installations over 12 kW.

Inspection of the heating and cooling systems in the building can be done by a person who has the appropriate qualifications and is registered in the central register.

There aren't specific regulations on local or regional level dedicated to energy using products and their usage. The only exceptions are local anti-smog resolutions which are applied in many regions and cities (restrictions on the use of poor quality solid fuel boilers and fuels).

Until now, in case of residential buildings (both existing and newly constructed) the attention was being paid on heating. But now also cooling becomes an important issue.

Air conditioning, which was once the domain of office buildings, has been increasingly, purchased by households and small businesses in recent years. As a result the cooling market in Poland seems to be very promising, along with the enrichment of the Polish society, expectations

regarding the quality of life are also increasing. This also applies to the heat pumps for which the market is booming.

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

In case of heating systems in existing buildings permissions for the installation of heating products generally are not required. All products legally available on the market can be used. There may be restrictions on installation of heating devices due to type of fuel, location of heating source, fuel storage and exhaust gases, set out in a regulation on the technical conditions to be met by buildings and their location. Also due to the emissivity of high power boilers, a permit may be required. When installing gas and electrical equipment, it is necessary for the installer to be authorized. In the absence of a gas installation, it is also necessary to apply to the distribution gas network operator for connection to the gas network. The architectural and construction design requires a permit from the local Construction Supervisory Office. The law is made at the national level.

In case of newly constructed buildings and larger thermo-renovations the technical project must be done and approved by the construction supervisory. In such a case proposed devices and their technical specification should be described. However such details usually are not of interest to the supervisory office.

Due to the air quality problems in Poland the solid fuel boilers responsible for low emission are under special control (mainly in sales points) and the entitlements of MSAs have been strengthened.

Actually boilers class 5 (according to the PN-EN303-5: 2012 standard) are approved, and from 2020 Ecodesign standard will be mandatory.

Labelling of energy equipment is mandatory in accordance with EU energy labelling. In case of solid fuel boilers also technical fiches are required.

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Permits are required for electricity and gas installers. The installer issues the installation certificate in accordance with the regulations (including fire protection). The law is enacted at the national level.

In addition, in the case of heat sources related to flue gas discharge, chimney sweep entitlements are required and, in the case of checking the technical condition of electrical and gas installations, supervision rights over the operation of equipment, installations and energy and gas networks are

required. For other works in the field of renewable energy installations, central heating installations, hot water and others are not required unless they involve connecting them to an electrical or gas installation.

All products sold in Poland require CE certification.

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- ***Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?***
- ***Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?***
- ***Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)***
- ***Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?***

There are several incentives (e.g. grants, low interest rate loans, tax relief) for new, ecological heating sources and for thermo-renovation of building's envelopes.
Some of incentives especially dedicated to mitigation of energy poverty and pollutant emissions depended on the beneficiary's income (Clean Air and Stop Smog programmes).

At the national level, funding is provided through governmental bodies – National Economy Bank (BGK), National Fund for Environment Protection and Water Management (NFOSiGW) as well as tax rebates.

At local level incentives are provided by regional environmental funds and local governments.

Only a few incentives are available for clean heat sources dedicated to new constructions. A few support mechanisms allow financing the purchase of heat sources for heating in newly constructed buildings. Most programs are dedicated to existing buildings. The vast majority focus on thermo-modernization or replacement of heat sources (or heating systems) and the use of renewable energy sources in existing buildings. For some programs it is necessary to conduct a comprehensive investment - e.g. replacement of a heating device combined with deep thermal modernisation of the building.

Energy efficiency improvement due to upgrade of heating systems qualify also for White Certificates however the threshold of 10 toe savings is an important limitation in case of small investment. The service provider or an ESCO can play a role of third party or/and projects integrator.

H.A.4. Are there active national/regional programmes advising or helping consumers for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

At the national level mandatory inspection of heating and cooling systems (described above) and building characteristics (energy label) are designed to provide also information and advice to building owners on quality and effectiveness of existing heating systems and on possible improvements.

There is also an ongoing national advisory program. Energy advisors are available in regional environmental funds, however due to limited resources activities of advisors are focused on municipalities rather than on individual consumers.

There are also independent initiatives in Poland undertaken by non-governmental organizations and local governments:

- Eco-consultants in Lesser Poland Region (supported by EU LIFE program),
- Topten Poland and Euro Topten initiatives,
- Manufacturers' initiatives (PORT PC - Polish Organization for the Development of Heat Pump Technology for heat pumps, SPIUG - Association of Manufacturers and Importers of Heating Equipment for heating devices, Boiler Cluster Association for solid fuel boilers, Pol-Lighting for lighting equipment),
- Technology parks' consulting services (for example EuroCentrum, GPP),
- Catalogue of heating devices that meet the requirements of the Clean Air program (https://czyste-urzadzenia.ios.edu.pl/) develop by the Institute of Environmental Protection - National Research Institute.
- The Polish Residential Energy Efficiency Financing Facility (PolREFF, www.polreff.org) with Technology Selector, which is a search engine to find highly energy efficient materials and equipment approved by independent experts' support.

Usually the level of support doesn't depend directly on the quality (energy efficiency) of products used, all legally available products on the market are accepted, but in case the exact level of savings must be reached (which is a common case), the better products are promoted. On the other hand with maximum unit costs criterium the better but more expensive products are discriminated.

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Energy utilities theoretically could play an important role in the energy efficient product market, legally it is possible and could be profitable, however in practice only a few initiatives exist mostly as part of CSR campaigns.

Energy efficiency improvement due to upgrade of heating systems qualify for White Certificates (WC) however the threshold of 10 toe savings is an important limitation in case of small investment. The service provider or an ESCO can play a role of projects integrator.

A wide range of energy efficiency investments can be made with support of WC, excluded are generally new investments and in case of retrofit some product categories are excluded like white goods.

Part B: Supply market analysis and market structures. Purchase procedures.Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

There are 4 main purchase channels for cooling devices in Poland:

- Building stores (like Castorama),
- Internet stores,

- Branch stores (specializing in the sale of boilers),
- Manufacturer's / importer's direct selling.

In all the above cases, a service is available for the assembly of equipment purchased by authorized persons (store employees or external installers). This is necessary due to the provisions of the construction law and the terms of the manufacturer's warranty.
Most heating appliances in Poland (apart from those installed independently by connecting them to an electrical outlet) are bought in package with device assembly service.

There are several initiatives to collect and store documents confirming energy characteristic of products qualifying for support from incentives programmes, like for example the PolREF's Technology Selector or catalogue of heating devices done by Institute of Environmental Protection for governmental Clean Air programme.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

There are websites where information about effective heating devices are available (e.g. TOPTEN, heating devices catalogue that fulfils Clean Air Programme requirements - https://czyste-urzadzenia.ios.edu.pl/).

As part of the National (NFOSiGW) / Regional (WFOŚiGW) Fund for Environment Protection and Water Management, energy advisors provide support, among others, in obtaining funding for the purchase of heating products (e.g. as part of the Clean Air program).

In addition, consultancy is offered in framework of the PolREFF program (http://www.polreff.org/) - targeted at people planning thermal modernization of buildings, including the modernization of heating sources and the installation of renewable energy sources.

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Small heating devices (e.g. electric heaters) are available in home appliances and consumer electronics stores. Larger devices (e.g. boilers, heat pumps) are sold by producers and their distributors.

There is no detailed information available (wasn't identified) on the scale of the market and the balance of distribution channels for heating products.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Small devices are available online in home appliances stores, sometimes with a connection service. Online offers are available for installation when purchasing equipment.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, ...

Consumers need and seek knowledge about replacing heating in their own home. Such information is not always reliable (for example in internet). Support tools such as a calculator would help them understand difficult technical topics. Most often, people ask about (from our experience - conversations with people):

- how to choose a boiler for the home, how to determine its power so that it is sufficient for maintaining thermal comfort,
- how to check if it is profitable to replace the heating system,

- what type of boiler to choose, for what fuel,
- which equipment for domestic hot water choose - flow or with a storage tank,
- what funding are available on replacing the boiler,
- which technology choose,
- which heat pumps is more profitable (ground or air heat pumps)
- is it necessary to carry out thermo-modernization when planning to replace the source.

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

Such recommendations are not widely available in Poland especially on trusted web sites. In Poland, energy poverty has been studied by experts from the Institute for Structural Research (IBS) since 2015. A lot of analyses is available on https://ibs.org.pl/en/research/energy-poverty/. Also FEWE and INE issued a report on energy poverty (http://fewe.pl/wp-content/uploads/2018/08/Raport_ubostwo_energetyczne_broszura-drukowana.pdf).
Importance of availability of information and assistance in improving overall efficiency of houses especially occupied by power people have been pointed out in those studies.

Some heating branch portals offer general advices or guides on heating:

- https://www.ogrzewanie.pl/artykuly/
- http://www.rynekinstalacyjny.pl/ogrzewanie
- http://www.e-instalacje.pl/porady-budowlane
- https://www.instalator.pl/category/ogrzewanie/

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

Based on the Construction law the construction project (which is mandatory for new construction, and some major renovation works) should contain all information on planned building's technical systems including cooling system. Before obtaining a building permit the construction project is verified by the authority (building inspection). The main legal act dealing with air conditioning and ventilation installations is construction law, and in particular the Regulation of the Minister of Infrastructure on the technical conditions to be met by buildings and their location and Act of 12 July 2017 amending the act on substances that deplete the ozone layer and on certain fluorinated greenhouse gases and certain other acts (thereafter named: the f-gas act).

According to the EU and Polish legislation, all air conditioners and heat pumps sold in Poland must be provided with an energy label. At national level, there are no provisions imposing the choice of a minimum energy class and no specific requirements above standards Minimum energy performance standard (MEPS).

The f-gas act regulates the obligation to register devices containing f-gas. This obligation applies to refrigeration, air conditioning and heat pump equipment.

The operator (a physical or legal person having actual control over the operation of the device containing f-gases) is required to set up a card in the Central Register of Operators (CRO) within 15 days from the date of delivery or start-up of the device. The Device Card and Fire Protection System Card is placed in the CRO at www.cro.ichp.pl/.
Installation of air conditioners in existing buildings doesn't require a building permission.

Only in multi-family buildings is the acceptance of the administrator required for the installation of air conditioning on the facade of the building.

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

All devices approved for sale must be CE sign marked.

Permissions are required for electricity and devices with f-gases installers. The installer issues the installation certificate in accordance with the regulations (including fire protection). The law is enacted at the national level.

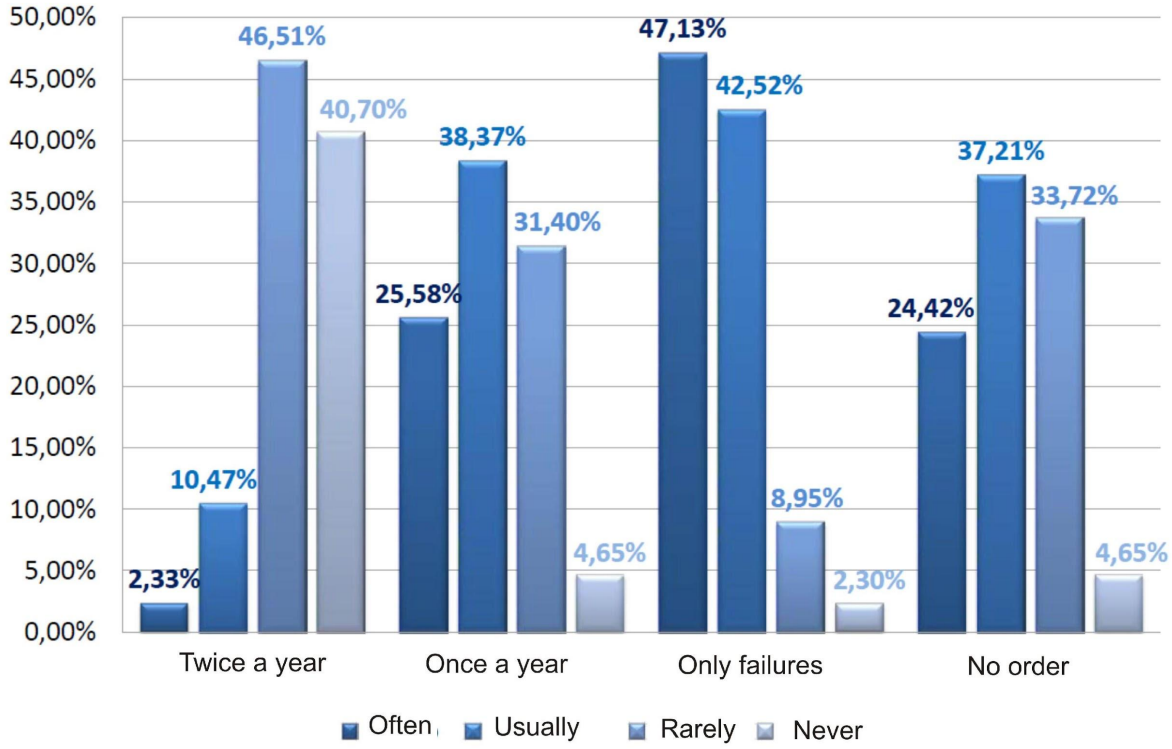
For the installation of hermetically sealed devices, it is sufficient to have the assembly and start-up authorization issued by the manufacturer of the given device.

In the case of installation of a non-hermetically sealed device (split type), start-up, i.e. making the final connection of the refrigeration system, can only be done by a person holding a certificate for personnel (f-gas permissions), issued by the Office of Technical Inspection. The installation of the device can be made by the installer without a certificate, however, for final connection and running the installer must have f-gas permissions.

This f-gas act also imposes an obligation to control the applies to refrigeration, air conditioning and heat pump equipment (according to EU Regulation No 517/2014):

CO_2 equivalent	**For equipment where a leakage detection system is installed**	**For equipment where a leakage detection system is NOT installed**
5 tonnes of CO_2 equivalent or more	at least every 24 months	at least every 12 months
From 50 to 500 tonnes of CO_2 equivalent	at least every 12 months	at least every 6 months
500 tonnes of CO_2 equivalent or more	at least every 3 months	at least every 6 months

On the other hand, we present a graph on how customers approach ordering service inspections:



[Source: Chłodnictwo&Klimatyzacja. Report „Split air conditioners", 2019]

Private users rarely remember and want to perform air conditioning equipment maintenance. Customers in companies do it much more often.

According to the Act on the energy performance of the building, the heating and cooling systems are subject to periodic inspection, among others, in terms of their energy efficiency. Cooling systems larger than 12 kW are subject to the procedure. Checks shall be carried out at least once every 5 years.

Financial Incentives

C.A..3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- ***Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?***
- ***Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?***
- ***Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)***
- ***Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?***

In Poland, incentives are generally provided for thermo-modernization of building in such a case support mechanisms for the following heating/cooling products are available:

- dual modes heat pumps (heating/cooling) ,
- mechanical ventilation systems with heat recovery,
- ground heat exchangers.

As in the case of above mentioned devices, financial support is provided by:

- municipalities usually in cooperation with regional environmental funds (regional funds for environmental protection and water management - WFOŚiGW) in the form of subsidies or low interest rate loans,
- government in cooperation with regional environmental funds and National Economy Bank (BGK) in frame of the Stop Smog and Clean Air programme,
- government in form of tax relief,
- government through National Economy Bank (BGK)in the framework of the Act on thermo-modernization and renovation in form of grants,
- commercial banks (e.g. under the POLREFF programme, www.polreff.org).

Energy efficiency improvement due to upgrade of cooling systems qualify also for White Certificates however the threshold of 10 toe savings is an important limitation in case of small investment. The service provider or an ESCO can play a role of projects integrator.

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

At the moment there is no government program for direct support for investments in air conditioning and ventilation systems (including advising or information campaigns).
At the national level mandatory inspection of heating and cooling systems (described above) and building characteristics (unfortunately cooling systems are excluded from energy labels for residential buildings) are designed to provide also information and advice to building owners on the quality and effectiveness of existing air conditioning systems and on possible improvements.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

In general, as mentioned above, energy efficiency improvement due to upgrade of cooling systems qualify also for White Certificates however the threshold of 10 toe savings is an important limitation in case of small investment. The service provider or an ESCO can play a role of projects integrator.

Actually there is no market offer (or is very limited) of energy services companies (ESCO) dedicated to residential sector especially for cooling projects. White certificates are obtained mainly by enterprises where inefficient cooling and / or ventilation systems are replaced with new efficient ones.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

There are 4 main purchase channels for cooling devices in Poland:
- Building stores (like Castorama),
- Internet stores,
- Branch stores (specializing in the sale of air conditioning and ventilation equipment),
- Manufacturer's / importer's stores.

In all the above cases, a service is available for the assembly of equipment purchased by authorized persons (store employees or external installers). This is necessary due to the provisions of the construction law and the terms of the manufacturer's warranty. For f-gas appliances, the seller delegates an authorized installer who confirms the technical approval for use and in case of a guarantee.
Most cooling appliances in Poland (apart from those installed independently by connecting them to an electrical outlet) are bought in package with device assembly service.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

- Stowarzyszenie Chłodnictwa Klimatyzacji i Pomp Ciepła [eng. Air Conditioning and Heat Pump Refrigeration Association], http://www.schik.pl/
- Krajowa Izba Gospodarcza Chłodnictwa i Klimatyzacji [eng. Polish Chamber of Commerce for Refrigeration and Air Conditioning], http://sntchik.pl/
- Krajowe Centrum Innowacji Chłodnictwa I Klimatyzacji [eng. National Center for Refrigeration and Air Conditioning Innovation], http://www.kcichik.pl/
- Polska Organizacja Rozwoju Technologii Pomp Ciepła [eng. Polish Organization for the Development of Heat Pump Technology] PORT PC, http://portpc.pl/

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Small cooling devices (e.g. fans) are available in home appliances and consumer electronics stores. Larger devices (e.g. air-conditioners) are sold by manufacturers and their distributors.

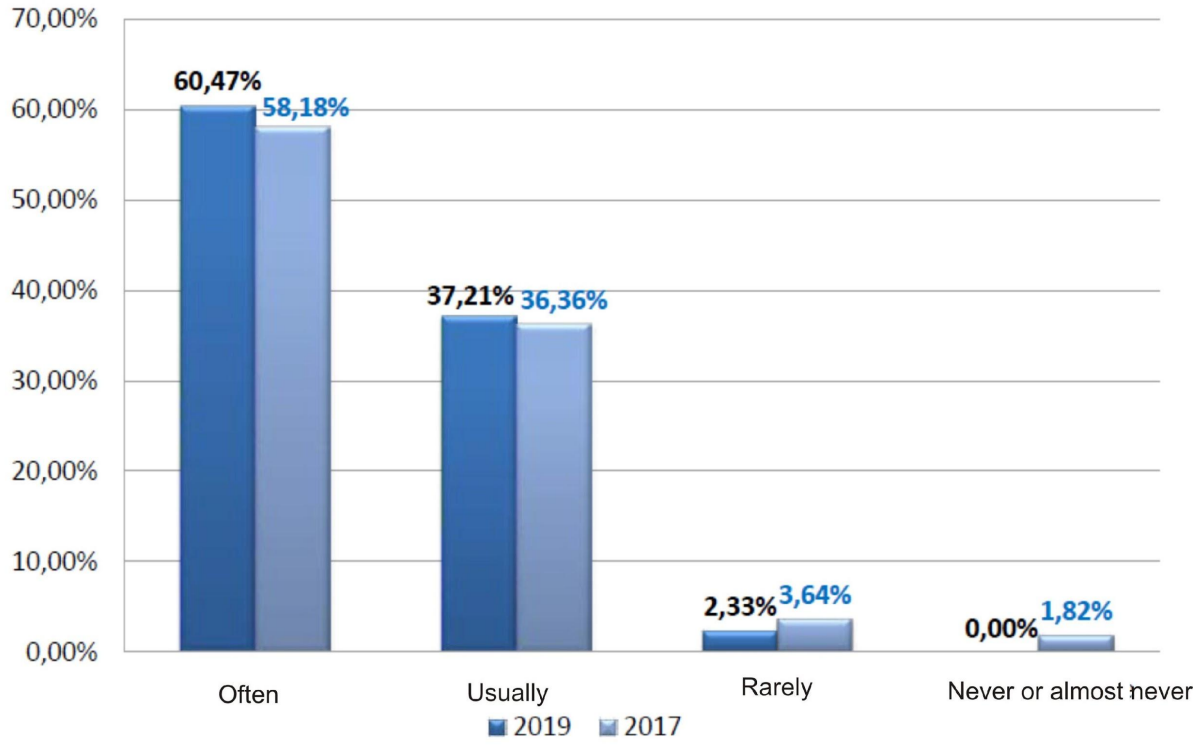
Often, designers and design offices (commission on the sales of the product) also play the role of an middleman in sales.

There is no detailed information available (wasn't identified) on the scale of the market and the balance of distribution channels for heating products.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Small devices are available online in home appliances stores, sometimes with a connection service. Online offers are available for installation when purchasing equipment.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, ...
According to the report "Chłodnictwo&Klimatyzacja. Report „Split air conditioners" (2019), the customer counts mainly on the installer to indicate the best solution for his needs:



This indicates that advice is needed, particularly in the field of dimensioning of installations, proper location of devices etc.

The calculator will somehow fulfil this role and need to focus on providing the greatest knowledge to potential buyers.

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

Such recommendations are not widely available in Poland especially on trusted web sites. In Poland, energy poverty has been studied by experts from the Institute for Structural Research (IBS) since 2015. A lot of analyses is available on https://ibs.org.pl/en/research/energy-poverty/. Also FEWE in cooperation with INE issued a report on energy poverty (http://fewe.pl/wp-content/uploads/2018/08/Raport_ubostwo_energetyczne_broszura-drukowana.pdf).
Importance of availability of information and assistance in improving overall efficiency of houses especially occupied by power people have been pointed out in those studies.
Some cooling branch portals offer general advices or guides:

- https://www.klimatyzacja.pl/wentylacja/poradniki
- http://www.rynekinstalacyjny.pl/wentylacja-klimatyzacja
- http://www.klimatyzacjewpolsce.pl/poradnik,s.html
- http://www.e-instalacje.pl/porady-budowlane
- https://www.instalator.pl/category/wentylacja/
- http://brasner.pl

Annex 14 – Contribution to Baseline Report – Portugal

Country Introduction

In Portugal the regulatory part covering these issues is based on the adoption of the EU directives, both for products - Energy label and Ecodesign regulations and buildings - EPBD.

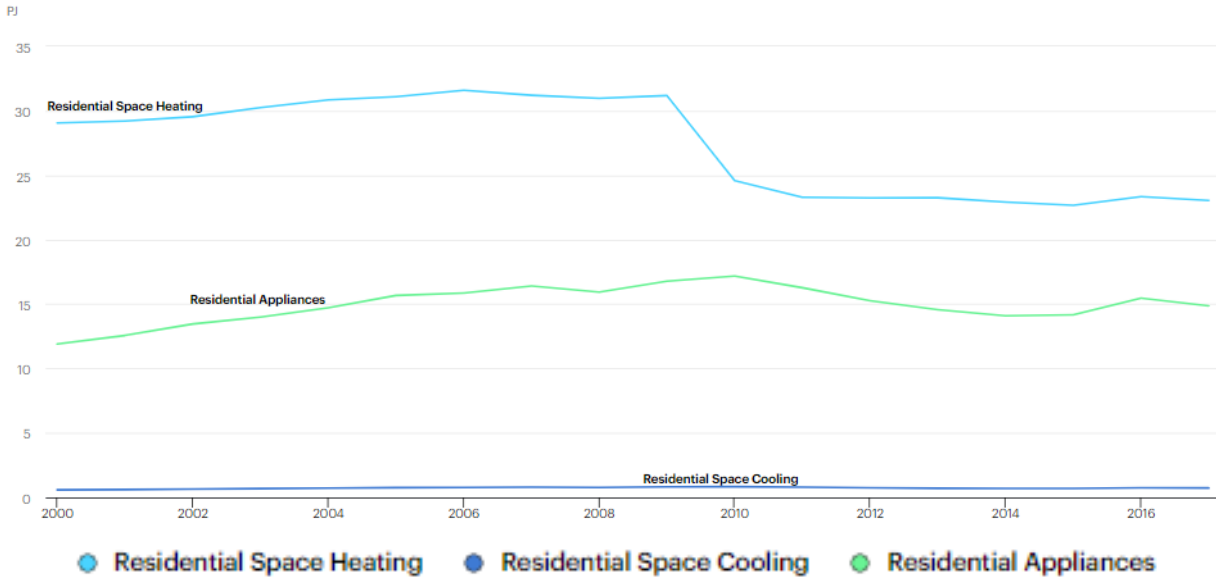
One of the goals of PNEC 2030 (Energy and Climate Energy Plan) recently published is to favour the building rehabilitation and renovation and to promote zero emission buildings. Building energy certification (SCE) is managed at a national level.

The country is strongly committed to increase the use of renewables above EU average by 2020 and 2030 and several funding programmes have been implemented though focusing only on water heating.

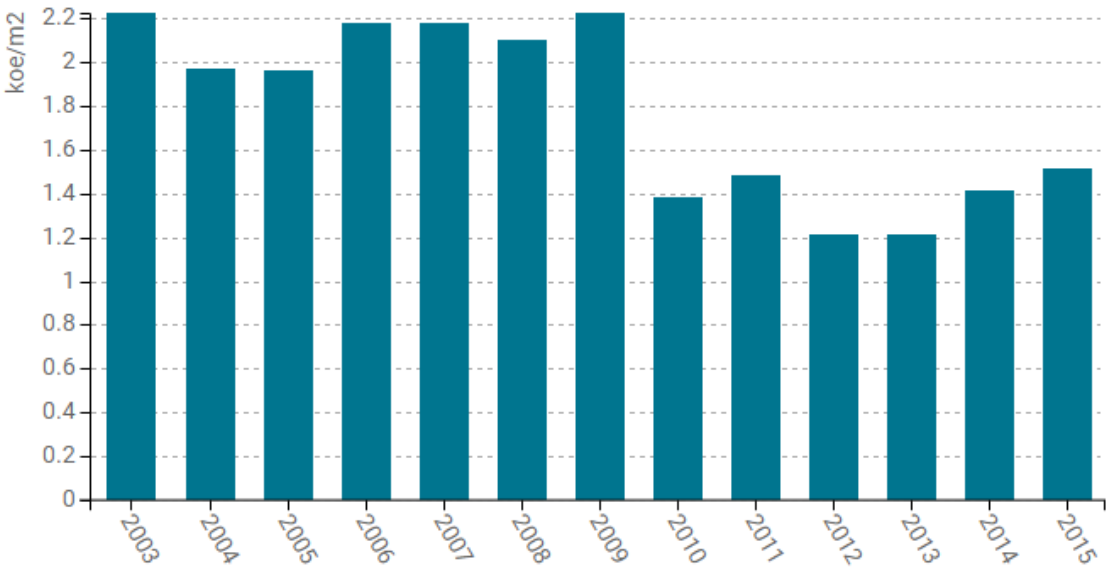
Safety issues and emission limits (noise and pollution) are defined at national level.

Heating

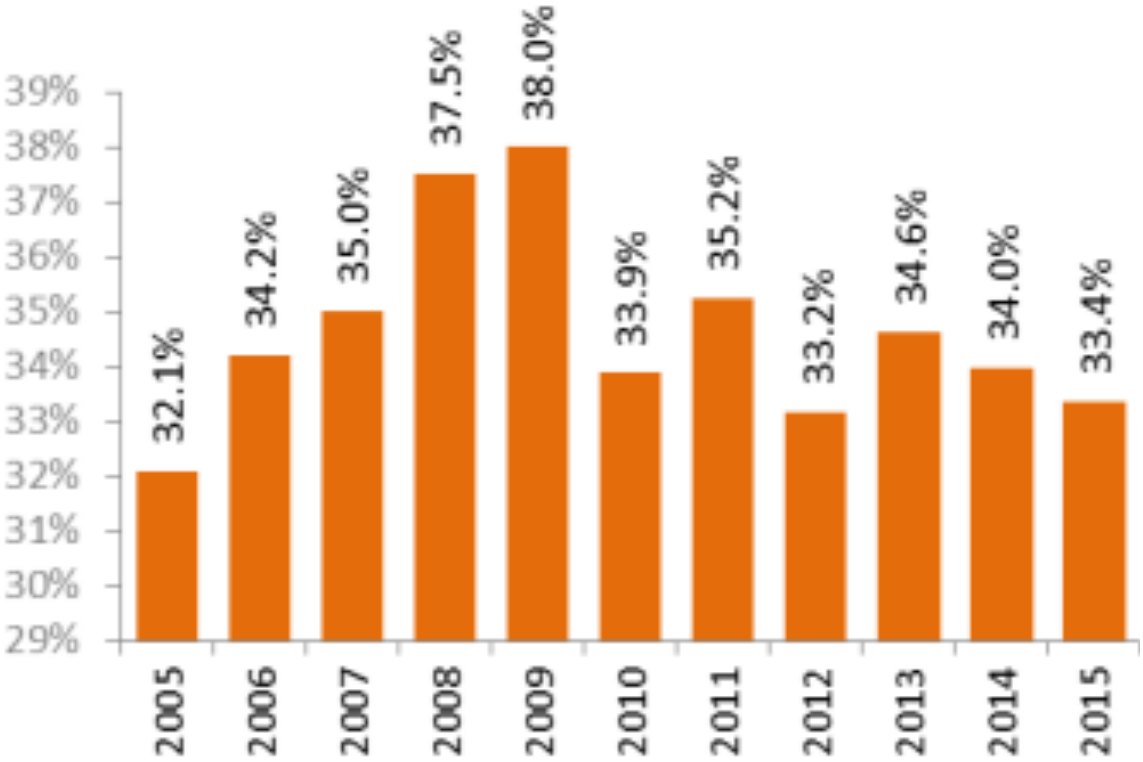
In Portugal 23.5% of households energy consumption is for water heating production, 22% is for room heating and only 0,5% for room cooling (ICESO 2010, DGEG, INE). According to CENSOS 2011 (for the whole population) the majority of national households (53%) heat their water using butane heaters, 19% use electric heater, 19% use propane heater and 9% natural gas heater. For these purpose natural gas, butane and propane boilers represent only 0,7%. For room heating electric resistance appliances are the most used by the population (39,7%), followed by fireplaces (25%) and stoves (13,3%). An important figure is the number of households without heating, which doesn't necessarily mean those houses are comfortable during the Winter. For room cooling 68% of households use fans, 25% use heat pumps and 7% air conditioners. Generally these equipments are bought and managed individually by each household.



Total consumption by end use - Residential, Portugal 2000-2017 (Source: IEA)



Energy consumption of space heating per m2 (Source: ODYSSEE)



RES Share in heating and cooling (Source: Eurostat-SHARES)

Renewables share in heating and cooling has been falling since 2009 and the reasons can be explained by the lack of a long term RES-H&C strategy, lack of certification schemes for installers and equipment in case of biomass technologies. Specifically for heating, there has also been a trend that consisted of replacing the usage of traditional biomass (wood) by air conditioning systems. (Energy Union Factsheet Portugal, EC 2017).

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

No document is required for systems under 25kW (Portaria n.º 379-A/2015), unless it's gas, in this case a certification must be issued and the installation must be reported to Directorate-General for Energy and Geology (except for gas cylinders). However, an authorization from the Municipality (in classified heritage areas) or the condominium might be required if external units must be installed.

EU regulations are active at national level.

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Yes, only a qualified company/individual could install such systems. And for systems above 25 kW there must be a project designed by a certified expert according to the specifications of 44.º Portaria n.º 701-H/2008, 29/07/2008).

Installers and companies that handle refrigerant gas must be certified for that purpose and must register the operation on a specific form.

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

Yes, occasionally for private owners (A) and legal persons (B). But only the renovation of water heating systems has been subject to rebate. Thermal solar systems; condensing boilers and heaters and heat pumps with thermal solar systems or not.

The reimbursement to each beneficiary A is limited to a maximum of € 15.000, with a threshold of € 7.500 by building or building unit. The incentive to each beneficiary B is limited to a maximum of € 47.500.

Each measure are financed at 60%, up to a maximum limit, depending on the measure and beneficiary (from € 1.000 to € 3000).

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**

Energy label must be A or A+ depending on the measure. Some measures include the replacement of an inefficient product.

- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**

No.

Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)

New installations of thermal solar systems or its combination with existing or new water heating systems.

- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

No.

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

The national energy agency (ADENE) has some publications with advice. When the national incentives are open Quercus disseminates them on our TV programme Green Minute. Quercus provides these advices in its projects with households

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Not these incentives.

Part B: Supply market analysis and market structures. Purchase procedures.Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Except for water heaters replacement, generally these products market chain is through installers. Direct sale is a growing channel before contacting the installer/company.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Just from retailers and manufacturers.

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Mainly the installer.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

No.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Possibility to compare 2 or more models at the same time, with different technologies, showing the payback time.

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

In Winter enhance the solar input and decrease heat losses, reduce air infiltrations and the wind effect by keeping blinds open during the day, closed during the night and by maintaining windows closed but ensure air renovation. Windows turning North: drop down or close the blinds (or other shadow system) in the afternoon to avoid thermal losses; Windows turning East: rise up the blinds (or other shadow system) during the morning, it's possible to open the windows for air ventilation; Windows turning South: keep the blinds (or other shadow system) opened as long as there is sun and closed them after; windows turning West: open the blinds (or other shadow system) during the afternoon, it's possible to open the windows for air ventilation.

Green spaces near the house influence it's thermal balance. Chose autochthones species and deciduous trees.

Cooling

According to Informa study, demand for air conditioners is increasing since 2014, and in the last 4 years sales have raised 50%. Portuguese market turnover rose 13,8%.
See graphs in Heating Section.

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

No document is required for systems under 25kW. However an authorization from the Municipality (in classified heritage areas) or the condominium might be required if external units must be installed.

EU regulations are active at national level.

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Yes, only a qualified company/individual could install such systems. And for systems above 25 kW there must be a project designed by a certified expert according to the specifications of 44.º Portaria n.º 701-H/2008, 29/07/2008).

Installers and companies that handle refrigerant gas must be certified for that purpose and must register the operation on a specific form.

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

No

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

The national energy agency (ADENE) has some publications with advice. Quercus provides advice in its projects with households.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Generally to installers or manufacturers, though there are some sales in stores, in particular plug-in products.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

No.

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Mainly the installer.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

No.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

The same of HB5.

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

In Summer avoid indoor heating, decrease heat losses, enhancing indoor cooling and promoting air ventilation by keeping blinds closed whenever solar radiation is direct on the windows and open windows for air circulation whenever outdoor temperature allows it. Windows turning North: open windows to promote natural ventilation and good indoor air quality; Windows turning East: drop down the blinds (or other shadow system) during the morning and open windows for air ventilation; Windows turning South: keep the blinds (or other shadow system) down especially between 12h and sunset and open the windows for air ventilation; windows turning West: drop down the blinds (or other shadow system) during the afternoon, it's possible to open the windows for air ventilation.
Green spaces near the house influence it's thermal balance. Chose autochthones species and deciduous trees.

Annex 15 – Contribution to Baseline Report – Sweden

Country Introduction

In Sweden most of the regulatory parts concerning heating and cooling in buildings are in line with the EU legislation. The country covers only one climatic zone regarding regulation in Energy labeling but it can be misleading as the distance from north to south is long. Many households are connected to district heating, but electric heating, both direct and water based, is common. Using a biofuel boiler to complement electric heating is also frequent while fossil fuel boilers are becoming rare. Cooling equipment is quite uncommon in households.

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

Installing geothermal heat pumps requires notifying your municipality. In densely populated areas, a permit might also be required (varies between municipalities). Also, in densely populated areas, you need a permit to install combustion boilers (both for central heating and traditional stoves and fireplaces). In larger cities these are often prohibited. Building a new boiler room requires planning permission issued by the municipality. The state agency Boverket introduced new laws concerning installation of combustion boilers in 2019, stating maximum levels of certain emissions.

Installing air-to-air or air-to-water heat pumps requires notification of the municipality. In some cases, you might be prohibited from installing outdoor units in certain ways and places due to noise and visual interference.

Solar heating requires planning permission in some areas. Utilization of sea heating (collecting heat from bodies of water using heat pumps) has special regulation.

Installation of smaller heating appliances like heat fans and electric radiators requires no permits or notifications. Although these products, like more advanced appliances, cannot be sold unless bearing the CE label.

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

You are allowed to install almost all appliances yourself. However, the installation of any in-place electrical installation needs to be verified by an authorized electrician. This also applies to installations done by professional installers, unless they're authorized electricians themselves.

When it comes to combustion boilers, you can install even those yourself, but they have to be verified by an authorized chimney sweeper before put into use. Same thing applies to traditional stoves and fireplaces.

Smaller heating appliances like heat fans and electric radiators require no technical staff.

Financial Incentives

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment, etc.)**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)?**

There are some local and temporary rebate systems for certain types of appliances, but nothing national. Although there is a system called ROT-avdrag (roughly "Reduction for Renovation, Remodeling and Extension) which allows tax reduction based on the work carried out by professional installers. This only applies to the working costs, however, and not to the cost of the appliances.

In some municipalities you can get grants for solar heating, but that is not as common as it was 15 years ago.

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

Almost all municipalities have energy advisors whose work is to help citizens identify how they can reduce their energy requirements and improve energy and climate standards in their homes. This includes visiting people at home, doing energy assessments in situ and lending out measuring equipment. All of this is free of charge.

Regionally, the county administration provides guidance and assistance to companies, professional installers, large-scale purchasers etc.

Energimyndigheten (the state energy department) runs regular campaigns to inform people of energy and efficiency issues in general.

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

There are some local/regional projects experimenting with different ways of handling white certificates, but no main national systems.

SSNC is part of the "Casablanca project", collaborating with energy companies to provide physical energy consumption reducing measures in residential buildings. Funding is provided in part by Bra Miljöval, the environmental label run by SSNC, stating that energy companies must set aside a certain amount of money for each sold kWh of labelled electricity.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

All products in question must be CE-labelled to be sold in Sweden. Simpler products such as electrical radiators and heat fans can be bought in regular stores. Larger and more advanced products such as heat pumps can be bought in a similar manner, although the most common practice is to hire a professional installer who in turn supplies the products. Installers are usually associated with one or a few certain brands. However, legally, anyone is allowed to buy all types of heating products intended for residential use.

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

The services are similar and often the same as in H.A.4. There are also regional energy offices, often collaborating with other types of organizations (such as agricultural or economical) who provides this kind of help and service, but it differs between different regions and areas of business.

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

In the vast majority of cases, professional installers do the purchases on behalf of the consumers. They in turn are often experts in certain brands, with whom they might have special contracts. They are usually the ones who decide on models and specifications of the products, unless the consumers have specific professional knowledge and requests.

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

There is no such thing available that we are aware of, except for regular websites and e-mail addresses (If we interpret the question right).

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

Installing cooling products requires notification of the municipality only if they require bulky outdoor units and you live in a densely populated area. No permit is required. Local laws about noise and visual interference apply. Also, there is the "F-gasförordningen", based on Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006 which applies to all installations of cooling devices using liquid coolants.

Geothermal heat pumps running “backwards” (storing heat geothermally instead of extracting it) requires notifying the municipality as any other geothermal heat pump.

Utilization of sea cooling (getting rid of heat using bodies of water) has special regulation.

Installation of smaller cooling appliances like fans requires no permits or notifications. Although these products, like more advanced appliances, cannot be sold unless bearing the CE label.

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Devices containing liquid coolants that need to be engineered in some way (e.g. constructing pipe or hose systems) needs to be installed by an authorized installer for that kind of systems.

Apart from that, you are allowed to install cooling products yourself. However, the installation of any in-place electrical installation needs to be verified by an authorized electrician before putting into use. This also applies to installations done by professional installers, unless they’re authorized electricians themselves.

Smaller cooling devices like fans and vents require no technical staff.

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**
- **Is it possible to “devolve” the financial incentive to the third party (in Italy is called “credit cession”, typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

To our knowledge, there are no such rebates. Cooling products are not very common in Sweden because of the climate, although the last couple of summers have caused demands and discussions about future adaptation.

The “ROT-avdrag” mentioned in H.A.3 might be considered a kind of rebate the same way as with heating.

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

As with heating, almost all municipalities have energy advisors whose work it is to help citizens identify how they can reduce their energy requirements and improve energy and climate standards in their homes. This includes visiting people at home, doing energy assessments in

situ and lending out measuring equipment. All of this is free of charge. However, cooling is rarely an issue in Swedish homes.

Regionally, the county administration provides guidance and assistance to companies, professional installers, large-scale purchasers etc.

Energimyndigheten (the state energy department) runs regular campaigns to inform people of energy and efficiency issues in general.

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

There are some local/regional projects experimenting with different ways of handling white certificates, but no main national systems.

SSNC is part of the "Casablanca project", collaborating with energy companies to provide physical energy consumption reducing measures in residential buildings. Funding is provided in part by Bra Miljöval, the environmental label run by SSNC, stating that energy companies must set aside a certain amount of money for each sold kWh of labelled electricity.

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

All products in question must be CE-labelled to be sold in Sweden. Simpler products such as fans and vent kits can be bought in regular stores. Larger and more advanced products such AC units can be bought in a similar manner, although the most common practice is to hire a professional installer who in turn supplies the products.

However, legally, anyone is allowed to by all types of cooling products intended for residential use.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

The services are similar and often the same as in C.A.4. There are also regional energy offices, often collaborating with other types of organisations (such as agricultural or economical) who provides this kind of help and service, but it differs between different regions and areas of business.

There is also organizations like EEF, a collaboration between energy companies, aiming to inform consumers of the most energy efficient solutions and connecting them to companies willing to help them.

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

In the majority of cases, professional installers do the purchases on behalf of the consumers. They in turn are often experts in certain brands, with whom they might have special contracts.

They are usually the ones who decide on models and specifications of the products, unless the consumers have specific professional knowledge and requests.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

There is no such thing available that we are aware of, except for regular websites and e-mail addresses (If we interpret the question right).

Annex 16 – Contribution to Baseline Report – UK

Country Introduction

In the UK all relevant EU Energy Labelling requirements are in force as well as CE marking requirements. In terms of installed measures there are legislated competency/qualification requirements for installers and also many measures are referenced in the Building Regulation Part L (Conservation of Fuel & Power) which stipulates in some cases the performance requirements of products being replaced in existing homes and installed in new build.

A number of government subsidy schemes and obligations placed on utilities providers are in place which enable consumers within set eligibility criteria to access these types of products either for free or at a subsidised rate.

The current energy supplier scheme is call ECO, it is in the 3rd phase which applies to installations completed since October 2018 and runs until March 2022. The current scheme focuses on home heating with the Home Heating Cost Reduction Obligation (HHCRO). *'Under HHCRO, obligated suppliers must mainly promote measures which improve the ability of low income, fuel poor and vulnerable households to heat their homes. This includes actions that result in heating savings, such as the replacement of a broken heating system or the upgrade of an inefficient heating system'*. more information can be found here https://www.ofgem.gov.uk/environmental-programmes/eco. The total number of different measures installed under the current programme can be found here https://www.ofgem.gov.uk/environmental-programmes/eco/contacts-guidance-and-resources/eco-public-reports-and-data/measures

Heating

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

H.A.1. Is there a requirement for permits for the installation of heating products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, emissions limits, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which heating product(s)?

All heating products sold and installed in the UK must meet the relevant EU standards for safety and CE marking etc. Also where ErP and Energy Labelling legislations apply these are in force.

Other requirements for products are noted as follows:

- Space and water heaters (boilers) (all types) are noted in the Building Regulation Part L (Conservation of Fuel and Power) with set efficiency requirements for each product type. Where ErP does not apply in most cases the regulation refers to SEDBUK (Seasonal Efficiency of Domestic Boilers in the UK) efficiency ratings. Compliant products within this scope are located on the Building Energy Performance Assessment website which looks at the relevant UK regulations which have been put in place to satisfy the EPBD legislation.

- Heating Controls are noted in the Building Regulation Part L (Conservation of Fuel and Power) with minimum requirements for the types required to be included with the installation of a new space and/or water heater.

- Heat pumps are noted in the Building Regulation Part L (Conservation of Fuel and Power) where a minimum standard based on the 'Coefficient of Performance' (measure of the efficiency of a heat pump at specified source and sink temperatures) as calculated and tested against BS EN 14825 or BS EN 14511. In the majority of products are certified by accredited certification bodies to the Microgeneration Certification Scheme. Whilst certification is not mandatory this product register is widely cited in incentive schemes and procurement guides.

- Glandless circulators are noted in the Building Regulation Part L (Conservation of Fuel and Power) where a minimum standard EEI is recommended to aid compliance with the regulations.

- The Building Regulations Part G gives a maximum potential water consumption per person per day and states that 'Reasonable provision must be made by the installation of fittings (i.e. taps and shower heads) and fixed appliances that use water efficiently for the prevention of undue consumption of water. The regulations go further to specify a maximum water consumption of common fittings including showers, baths, basin taps and sink taps. The European Water Label is in use in the UK being managed by the UK Bathroom Manufacturers Association. Whilst the scheme is industry led and voluntary there is appetite within the industry (amongst forward thinking manufacturers and the water utilities organisations) for this to become government mandated in the UK.

Summary of requirements taken from the Building Compliance Guide are provided as a supporting document which could be included as an annex

H.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. gas fired boiler)? Are there safety measures to be met for the installation of heating products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Competent Person Schemes (CPS) were introduced by the UK Government to allow individuals and enterprises to self-certify that their work complies with the Building Regulations as an alternative to submitting a building notice or using an approved inspector.

A Competent Person must be registered with a scheme that has been approved by the relevant Government Department, installation of the following required an installer registered with a CPS:

- Space & Water heaters & Circulators
- Renewables technologies (including heat pumps)
- Electrical works (including heating controls)

Taps and shower heads are able to be installed as a DIY measure

In rented properties and social housing Landlords are required to provide an annual Gas Safety check for all gas fired appliances (i.e. space and water heaters) conducted by a competent trades person and also provide a working Carbon Monoxide alarm.

Many product manufacturers of more technical products i.e. space and water heaters, circulators and heat pumps provide specific training to trade persons regarding the specific installation instructions of their products and many have installer networks whereby only installers that have undergone their training are approved to install their products.

3rd party trades person 'finders' are common in the UK – whilst not legislated many consumers will seek reviews and recommendations from 3rd party sites such CheckATrade and TrustATrader.

H.A.3. Are there rebates for buying heating appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?
The main domestic rebate schemes in the UK are:

ECO (Energy Companies Obligation): A number of financial schemes have been set up through which the energy utilities are required to fund energy efficiency home improvements for their customers. The current scheme (ECO3) *'obligated suppliers must mainly promote measures which improve the ability of low income, fuel poor and vulnerable households to heat their homes. This includes actions that result in heating savings, such as the replacement of a broken heating system or the upgrade of an inefficient heating system.' OFGEM.* There are no direct product requirements for eligible installations under ECO, the scheme focuses on the eligibility of householders which focuses on those claiming certain social benefits. There are also basic requirements for installers – I.e. that they should meet all legislative and competency requirements.

RHI (Renewables Heat Incentive): Customers who install qualifying systems can join the scheme and receive quarterly payments for the energy produced by their system. Heat Pumps are an eligible measure under this scheme and must meet the requirements of the Microgeneration Certification Scheme (MCS), in addition they must be installed by an installer certified under the same MCS scheme.

ECA (Enhanced Capital Allowance): Allows business to claim 100 per cent first-year tax relief on investments in qualifying efficient technologies and products i.e. businesses can write off cost of buying the eligible products taxable profits in the year of purchase. Eligible products are those that are registered either on the Energy Technology List (including HVAC equipment, boiler equipment and heat pumps); or the Water Technology List (including taps and showers).

Energy Redress Scheme: Managed by the energy utilities regulation body, utilities organisations are fined for breaches to their legislated obligations. This money is set aside for projects which will seek to address the breach (indirectly). For example, if an energy company is fined for provided poor advice to consumers the fines would be used to fund projects which proactively promote energy efficiency advice to consumers. The funding pot is managed by the Energy Saving Trust where only charity organisation can apply to receive funding for projects from the pot, projects cannot have any affiliation with the energy companies to ensure the funds are not returned to them. Each round of funding will set minimum eligibility criteria and 'best practice' criteria relevant to the types of projects being funded and all applications will be assessed and measured against these.

H.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on heating (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing heating products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

A number of national and regional organisations charities and community groups are in operation which offer advice to consumers. The main national consumer organisations are Citizens Advice Bureau, Energy Saving Trust, Money Saving Expert, Help the Aged and Which.
A number of independent certification schemes for products are in operation (i.e. not linked to legislation)

BREEAM: An international certification scheme for the sustainability performance of buildings & building projects. The energy category of the scheme encourages the specification of energy efficient products, systems and services which will conserve the buildings energy.

Energy Saving Trust Endorsed Product: An independent product certification scheme setting eligibility standards for set product categories including boilers, chemical inhibitors and heating controls.

Energy Saving Trust verified: An independent product performance assessment scheme which assesses and verified specific performance of efficient products.
Microgeneration Certification Scheme: the UK's largest renewables certification scheme including requirement for heat pumps

H.A.5. Are the savings achieved by the installation of heating products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

No

Part B: Supply market analysis and market structures. Purchase procedures. Analysis of the sale and installation chain for each product (imported products, market research, ..):

H.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

Boilers, Heat pumps & Heating Controls: Would usually be specified by the installer completing the work all document would be left with the householder

Taps & Showers: DIY retrofit would be purchased from DIY or specialist plumbing retailer. If installed as part of a bathroom fitting or renovation the customer would still often choose the project from a range offered by the installer

H.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

Installers can refer to products performance by the energy/water label (where relevant) or to any certification scheme/product register. Certain projects may specify minimum requirements within the procurement conditions.

Installer Trading Associations provide advice guidance and training to installers on a number of areas which could include for example installation, new technologies, customer service, energy advice etc.

H.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Consumer – chooses and installer

Installer – may be affiliated with one or more manufacturers/only be approved/trained for the install of certain products

Manufacturer – provides installer training and product warranties

3rd party warranty schemes – some manufacturers and installers will utilise a 3rd party scheme rather than make a direct warranty provision

H.B.4. Is the product or installation service available online? (this could be useful in the next phases)

DIY products such as taps and shower heads can be purchased online as can smaller products such as heating controls.

Customers can request quotes and in some cases book installations or pre-surveys online either through 3rd party sites such as CheckATrade and TrustATrader or directly through the installers website.

H.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel comfortable/healthier during winter

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

https://www.energysavingtrust.org.uk/home-energy-efficiency/energy-saving-quick-wins
https://www.moneysavingexpert.com/utilities/energy-saving-myths/
https://www.ageuk.org.uk/information-advice/health-wellbeing/keep-well-this-winter/
https://www.citizensadvice.org.uk/consumer/energy/energy-supply/get-help-paying-your-bills/make-sure-your-home-is-energy-efficient/

Cooling

Part A: Mapping of policy framework (as minimum performance standards, labels, rebate programs, tax incentives, energy saving obligations, etc.)

Regulations

C.A.1. Is there a requirement for permits for the installation of cooling products (e.g. from a specific authority like municipality, region, etc.)? Are there other requirements (e.g. energy label, electrical safety label, shading coefficients, etc.) in order for the product to be installed? For such requirements, is a certificate, a test report of the product or of the installation needed? For which cooling product(s)?

For fixed air conditioning, householders are required to notify their local planning office about the installation of fixed air conditioning systems – in most cases this will be done by the installer (see below). The installation must be compliant with UK Building regulations (implementation of EPBD)

Plug in 'local' air conditioning units are available to purchase without permits

C.A.2. Is there a requirement for technical staff for the installation, with specific competences (e.g. refrigeration gas for split systems)? Are there safety measures to be met for the installation of cooling products (electrical safety, fire, combustion)? For those measures, is a certificate of the product or of the installation needed? For which product(s)?

Installers of fixed air conditioning systems must be part of a Competent Person Scheme. This allows them to notify the planning office of the installation (self-declaration of compliance with building regulations)

Financial Incentives

C.A.3. Are there rebates for buying cooling appliances/products? Offered by whom and in which form (direct money, tax rebates, etc.)? For which product(s)?

Not for domestic air conditioning

- **Are the rebates subject to any specific feature/characteristic of the appliance (energy label, emissions, substitution of inefficient one, etc.)?**
- **Are they subject to conditions linked to individual or household receiving the rebate (e.g. income levels)?**
- **Are they conditional to a specific intervention (new installation, just in combination with home refurbishment)?**
- **Is it possible to "devolve" the financial incentive to the third party (in Italy is called "credit cession", typically towards the ESCo or the installer, in order to receive an immediate discount on the intervention cost)? For which product(s)?**

C.A.4. Are there active national/regional programmes advising or helping consumer for rebates/incentive/advice/certification programmes on cooling (for information, for addressing to installers, etc.)? Is there a specific level of financing for better performing cooling products OR in combination with other measures (like building refurbishment or general energy improvement)? For which product(s)?

Not for domestic installations

C.A.5. Are the savings achieved by the installation of cooling products offered or could be used by a third party (ESCo, Energy company, ...) and accounted as savings in the "white certificate market" (the market for exchanging energy saving certificates, mandatory for energy distributors or vendors in some countries, ...). For which product(s)?

Not applicable

Part B: Supply market analysis and market structures. Purchase procedures. ***Analysis of the sale and installation chain for each product (imported products, market research, ..):***

C.B.1. Where/from whom you buy this product, who will install it, needs of specific additional document (official permission / certificate / technical approval). Who receives or collects the additional documents (eventually)?

For fixed systems this would be an installed product and in most cases the installer would 'choose' the specific product and system based on the consumer's needs. The installer would leave the consumer with a certificate which states compliance with Building regulations, also the details of the product warranty (minimum 10 years). The manufacturers user guide would also be provided by the installer.

For local plug in products this is just plugged in by the householder in the room of their choice. The product would be provided with the EU related documents (energy label, product fiche) and any details of warranty provided by the manufacturer, also the manufacturers user guide would be included.

C.B.2. Are there networks or advice services aiming to installing more efficient systems/products at national/local level?

No

C.B.3. If it's not a direct sale, who are the actors involved? Gross market, distributor, directly from importer/manufacturer? Percentage of market channels used are available?

Always would be the consumer liaising directly with an installer for fixed systems or with the shop for local plug in products.

C.B.4. Is the product or installation service available online? (this could be useful in the next phases)

Local plug in products can be purchased from electrical stores online for delivery.
Many installers have websites where it is possible to arrange a call back or quote or make an initial enquiry online.

Manufacturers have their own websites.

C.B.5. Add the questions related to the other work packages (needs about tools for professionals in WP5, which kind of results they need from the calculators, etc.)

Part C: Solutions to feel comfortable/healthier during summer

HACKS will also promote low cost and no cost solutions to help people be more comfortable in their apartment/individual house when they do not wish to or cannot invest in new equipment. We will not advise on building envelope's insulation but on simple measures that can be implemented but each country has well known recommendations for (each of) its climate(s): please list them below in the form of bullet list, and indicate URL of websites providing this type of advice that can be related to energy poverty policies but not only.

From the NHS website regarding heat waves:

- keep windows that are exposed to the sun closed during the day, and open windows at night when the temperature has dropped
- avoid the heat: stay out of the sun between 11am and 3pm
- wear light, loose-fitting cotton clothes
- keep rooms cool by using shades or reflective material outside the windows. If this is not possible, use light-coloured curtains and keep them closed (metallic blinds and dark curtains can make the room hotter)
- if possible, move into a cooler room, especially for sleeping
- have cool baths or showers, and splash yourself with cool water
- drink plenty of fluids and avoid excess alcohol. Water, lower-fat milks and tea and coffee are good options
- if you have to go out in the heat, walk in the shade, apply sunscreen and wear a hat and light scarf
- check up on friends, relatives and neighbours who may be less able to look after themselves