



REPLACE conclusions for policy makers – heating system replacements in times of multiple crises

Report D6.4

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Preface/Abstract

Half of Europe's energy consumption is used for heating or cooling. In 2019, 58 % (61 million) space heaters installed in EU-27 have been inefficient non-condensing oil and gas boilers.

In order to achieve the climate targets and make Europe independent of oil, coal and natural gas, changes in this sector are essential.

The aim of REPLACE is to motivate and support people in nine different countries to replace their old heating systems with more environmentally friendly alternatives. Simple renovation measures that reduce overall energy consumption are also part of the program.

To reach that goal, the REPLACE project brings together installers, chimney sweeps, politicians, and other key players at one table, regionally.

The core activity of REPLACE is to develop, embed (by facilitating policy programmes/measures) and implement ten (R)HC equipment replacement campaigns adjusted for local conditions and structures by a strong involvement of the LWG and further local key stakeholders in their design and implementation.

During the REPLACE project, measures and policies were created and implemented during developing, implementing and steering adequate phase-out campaigns and activities, tailored to the situation of nine different pilot regions in eight countries.

The campaigns and activities and the embedment by adequate policy measures/programmes were jointly developed with regional/local public and market actors, forming so called local working groups that steered and facilitated the measures taken to phase-out a range of energy carriers, like oil, natural gas, coal, direct electricity and inefficient log wood usage from the residential heat market. The REPLACE project has shown that such "base approach" can be an adequate measure to foster the heat transition in Europe.

Executive Summary

REPLACE supports households to replace their old, inefficient heating equipment by modern, clean and climate-friendly heating systems being more comfortable and resilient. In the light of energy and climate crises facilitating energy systems based on nearby, renewable sources energy – instead of fossil energy sources imported from non-democratic states – becomes of high relevance to free societies.

Given the different legal, regulatory and supporting (e.g. financial) framework conditions, market structures and circumstances, purchasing power and market development statuses in the (eight) REPLACE target countries, there is no one-fits-all solution to the challenge of phasing out oil, natural gas, coal, inefficient log wood and electricity only heating equipment from within European residential heat markets.

REPLACE shows, however that due to efforts jointly undertaken with public and market stakeholders to establish an enabling environment (by adequate policy measures and programmes) that many tailor made activities and approaches are already existing now that can facilitate this phase-out. Some measures and activities, because of changing framework conditions (especially due to the emerging pandemic situation), were discarded and re-designed. Nevertheless, many of them were successfully implemented, tested and fine-tuned, accordingly.

This report summarises observations and twelve concrete queries (or action fields) which, according to the opinion of the REPLACE consortium, should be addressed by European politicians the sooner the better. Some policy measures will even remain beyond project life.

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1 | Scope of the report

Report D6.4, REPLACE conclusions for policy makers – heating system replacements in times of multiple crises, is an outcome of the REPLACE project and reflects the opinions of many European experts in the field of Renewable Energies and Renewable Heating & Cooling.

Experiences of nine different markets (two of them outside the European Union) were considered and consequent recommendations are presented in this report.

It is clear that action must be taken now and that there are existing and mature technologies to decarbonize the sector.

Following, twelve urgent queries are presented, where political action would be needed to better foster and accelerate the heat transition in Europe. In addition, innovative ideas which were developed during REPLACE to support the heat transition are shown in this report

2 | General observations & recommendations in and for Europe

Before demanding any political decision, it is of utmost importance to be aware of the past, current, and future situation of the heating sector. The heating and cooling sector is in the midst of political and societal discussions, as well as affected by the climate change. If handled in the right way, the needed transition in the heating and cooling sector can be carried out in a way that does not lead to social distortions (by developing programmes that are socially well-balanced) and contributes at the same time to mitigate the climate change by emitting less CO₂ emissions when using sustainable technologies.

The current situation in the heating and cooling sector in the EU-27 (data for 2021) reveals that the majority of Member States (MS) has still a long way to go to decarbonize the sector. Only four MS (Sweden, Estonia, Latvia, and Finland) have a share of renewable energy sources (RES) used for heating and cooling of 50 % or more, while the EU-27 average is only 22.9 % (see Figure 1). Big MS like Spain and Germany have a lower share than the European average and it would mean a leverage effect on the positive impact if these two countries could become forerunners for RES heating and cooling.

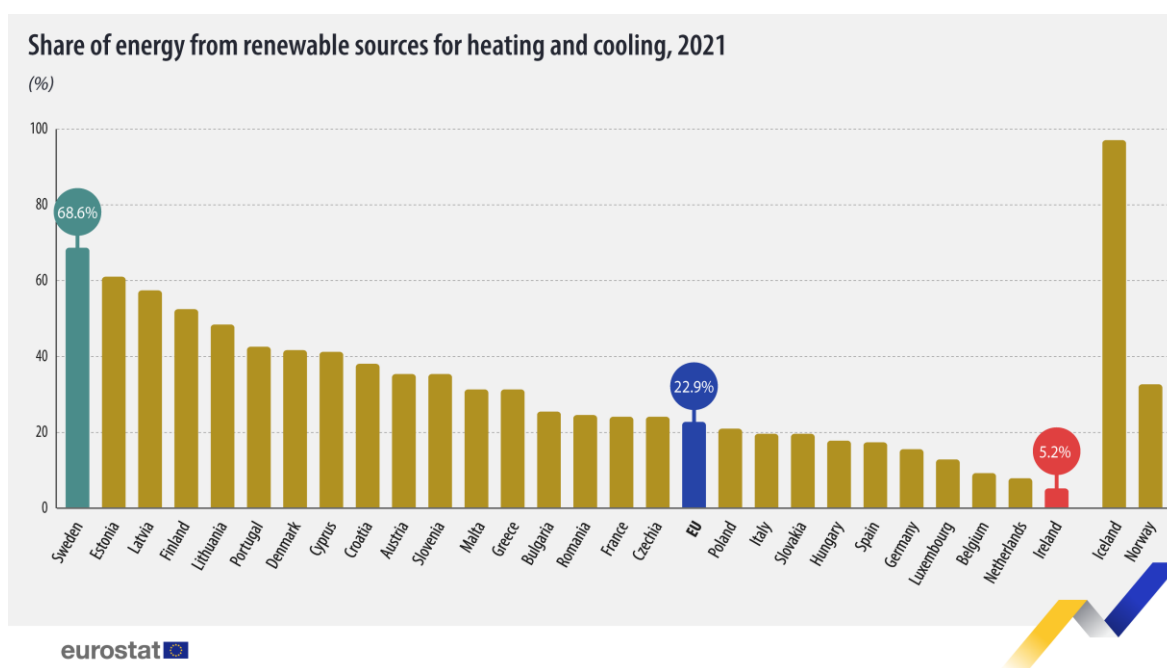


Figure 1: Share of renewable energy sources used for heating and cooling in the EU-27 (Eurostat, 2023)

It needs to be stated of course, that any energy efficiency measure should be first considered. It is known that behavioural change is the biggest driver for efficiency measures. Thus, **behavioural change** in **combination** with a **sustainable heating and cooling** system and a **well-insulated building**, lead combined to the highest energy savings. Political measures should always be aware of the **energy efficiency first** principle and make usage of this knowledge.

Within the REPLACE project, different measures have been used to support the most efficient technologies, all with the same objective, to **phase out natural gas, fuel oil, direct electricity or other inefficient, old heating system in the residential sector** and to replace them by modern, high-comfort, clean, and climate friendly systems.

Ensuring security of energy supply

February 2022 marked an abrupt change of the market environment, not only but especially for the heating and cooling sector. Russia, which started an unacceptable war of aggression against its neighbour Ukraine, was not only the most important supplier of natural gas, but also exported large amounts of wood pellets to the EU. The critical situation of the security of supply of natural gas for heating (everything depended on the length and severity of the cold spells in the coming winter, i.e. of 2022/2023) caused fear and sometimes panic among end users. This led to many households wanting to get rid of gas and oil as soon as possible. This situation has completely changed the image of natural gas and also heating oil, as the reliability of supply (at affordable costs) for a vital purpose was for the first time really in question. The market reactions of summer 2022 have thus led to skyrocketing prices for natural gas (which had a price impact on electricity as well) and wood pellets which contributed to the concerns of many EU citizens.

While the price situation has stabilized since (on a higher level), mostly because of a mild winter, the need for **real energy independency** became obvious. To ensure reaching the independency, it will be needed to mobilize **all kinds of local/regional renewable energy sources**, and to **lower energy demand** to allow as many people as possible to get **access to RES at reasonable prices**.

More efficient, economical use of energy and the rapid **expansion of renewable energy** are the pillars in the attempt to curb the effects of climate change. The war of aggression against Ukraine has added to that urgency. It is a chilling reminder of the vulnerability of an energy system that continues to rely on high levels of imports, rather than helping the wider population to develop **locally available energy sources** that can be used as quickly as possible.

It is possible **right now** to exploit locally available energy sources by using renewable energy technologies for heating and cooling, the technologies are mature and commercially available. The availability of equipment for some products is limited, but given stable, long-term predictable framework conditions, the industry and the craft sector can cope with, it is expected that this will be overcome, and some markets are showing signals that this has already started (i.e., [increase of pellet production in Austria](#), [easing of the production bottleneck for heat pumps](#) in Germany).

In combination with all viable energy saving measures (i.e., enhancement of building envelope insulation; insulation of pipework, fittings and storage; state of the art, efficient heat distribution and dissipation; application of thermostatic valves; optimisation of flow temperature and heater settings, exploitation of behavioural energy saving potential, shading, etc.), the use of **ALL RE technologies** is important as they **complement each other**:

- solar energy,
- biomass,
- heat pumps,
- geothermal,
- waste heat (though not renewable per se, the most sustainable use compared to landfilling).

While some technologies are politically boosted, others are currently seen increasingly critical. An **open and fact-based discussion** is needed. For some technologies, a wider discussion is needed (e.g., the *opportunities and challenges of heat pumps* for its integration and the integration of renewable energies in the power grid; the *use of biomass* in connection with sustainable forest management and forest adaptation to climate change);

District heating (all scales) is a key enabler to facilitate a fast heat transition with a high impact for areas where district heat is applicable and viable.

All mentioned technologies should be supported in the best way.

3 | Twelve urgent queries to policy makers

1. **Establish a national level playing field** that takes into account the external costs of using different energy sources through a bundle of appropriate financial measures (e.g. CO2 price, VAT, one-off investment subsidies to reduce the barrier of high up-front costs, tax breaks, etc.).
2. **Set clear and binding national** (and regional) **long-term clean heat transition targets**, which are coordinated with industry and trade, with clear and achievable milestones that provide investment certainty and strengthen long-term political commitment.
3. **Support industry development: Heating manufacturers optimise their products** and work more closely with installers to **improve their services** and create a more dynamic impact on the market.
4. **Public authorities** should **support R&D activities** that help to promote the clean heat transition in the direction described in the recommendations above.
5. Ensure a **just transition** by mitigating the socio-economic impacts of the clean heat transition.
6. Develop **stable** and **comprehensive Policy Programmes** and follow a **Long Term Approach**: Establish long-term heat transition policy programmes with a comprehensive approach and sufficient resources. Comprehensiveness is a prerequisite for successful policies and can best be achieved by involving all potentially relevant stakeholders in the definition and implementation of the policy. Appropriate programme management has a key role to play in this respect.
7. **Train sufficient professionals and tradespeople** to provide the workforce needed to support suppliers and end users in the clean heat transition. The lack of trained manufacturers, service technicians and installers is a key bottleneck for RES-H market development throughout Europe.
8. Establish and ensure a **high quality of products and services**. That is a fundamental issue that needs to be addressed to enable a successful clean heat transition and will strengthen end-user confidence.
9. Ensure **long-term price stability** of locally available renewable energy sources for the clean heat transition, to make them future-proof and price resilient for end-users.
10. Facilitate a **regionally focused, hands-on approach** in order to support the clean heat transition. The diffusion of RES-H technologies depends to a large extent on local availability of information, local development of projects based on a detailed knowledge of local circumstances, communication flows, influential persons etc.
11. **Consider your regulations**. Regulations can be an effective and inexpensive measure for public budgets to ensure the widespread introduction of clean heating systems.
12. **Information and promotion**. Dissemination and marketing is a key activity in developing clean heat markets. Both information and promotion independent from direct commercial interests and commercial promotion are essential.

4 | Queries explained

There is a need for predictable and stable long-term frameworks and comprehensive policy programmes implemented through a regional approach to facilitate a fast, sustainable and affordable heat transition, in the EU, but also beyond. During the three years of fieldwork, the REPLACE project team found that, in an ideal world, framework conditions that effectively support clean heat transition should be based on the following key features

1. **Establish a national level playing field** that takes into account the external costs of using different energy sources through a bundle of appropriate financial measures (e.g. CO2 price, VAT, one-off investment subsidies to reduce the barrier of high up-front costs, tax breaks, etc.).
 - **External costs** - including health, safety, security and the environment - are typically much higher for conventional, fossil-based energy than for renewables, and the limited recognition of these costs in the marketplace works strongly against renewables.
 - At the same time, **renewables offer benefits** that are often not reflected in energy policy and market conditions, including increased employment, **reduced dependence on energy imports**, increased **security of energy supply** and reduced burden on foreign exchange.
 - The **market should** be corrected to **reflect the full costs** and benefits of all energy options, a process often referred to as '**levelling the playing field**'.
 - **Sufficient resources must be available** for all essential activities necessary to make the clean heat transition expand, including program management, direct financial incentives, trainings, promotion etc. *In none of the eight REPLACE partner countries successful market development has been possible without financial incentives and sufficient resources for the required additional supporting instruments.*
2. **Set clear and binding national (and regional) long-term clean heat transition targets**, coordinated with industry and trade, with clear and achievable milestones that provide investment certainty and **strengthen long-term political commitment**.
 - In 2019, 58% (61 million) of the space heating systems installed in the EU-27 were still inefficient non-condensing oil and gas boilers. It is clear that there is an urgent need to change this.
 - The following figure gives an overview of the current status of **oil and gas phase-out strategies** in Member States' heating markets

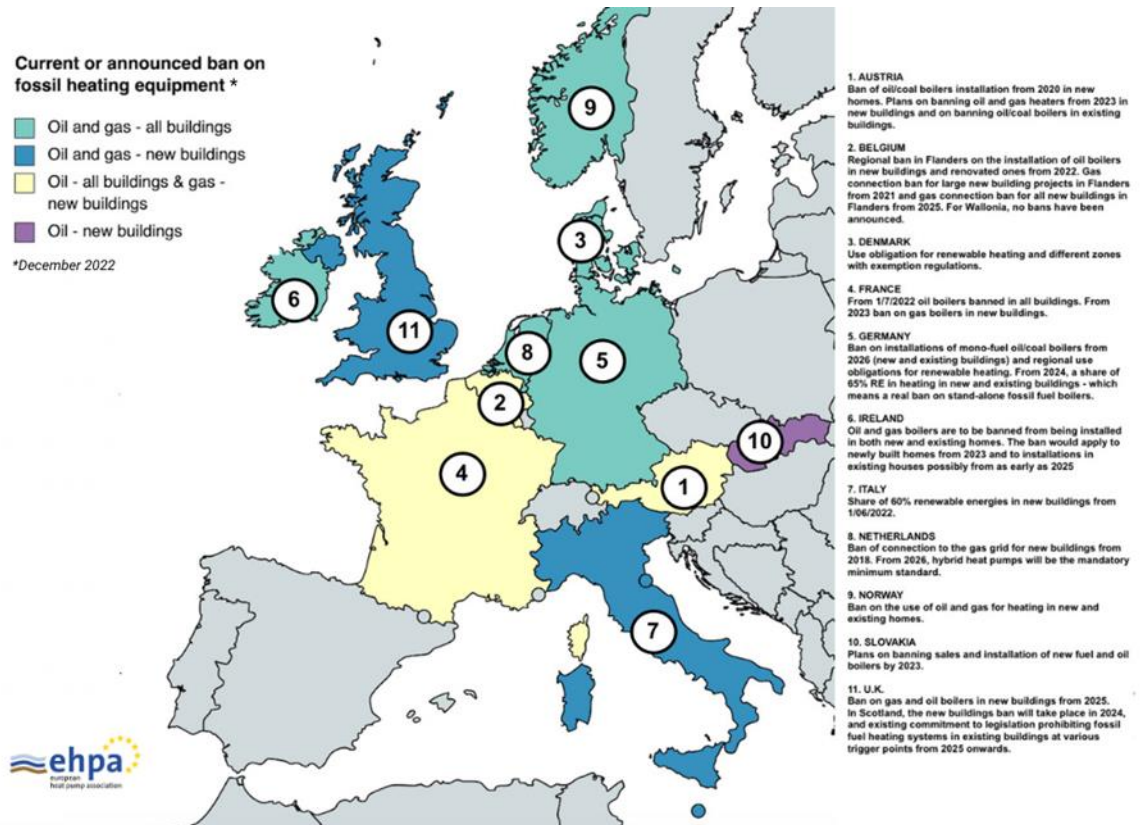


Figure 2: Overview on ban on fossil heating equipment (EHPA, 2023)

- In some regions, the necessary **political commitment is still completely lacking**. Despite many other serious problems, such as acute health problems caused by excessive coal use, fossil fuels are not seen as a problem but as part of the solution to climate change (e.g. natural gas as a bridge technology or a pretence of openness to technology).
 - Ideally, **politics and business** (manufacturers, professionals) **should agree together** on how much plant production and installations can actually be ramped up in the next years for the Clean Heat Transition and what framework conditions are needed for this (manufacture and installation).
 - It is clear that **subsidies on fossil fuel systems must be stopped or forbidden**.
- 3. Support industry development: Heating manufacturers** should **optimise their products** and work more closely with installers to **improve their services** and create a more dynamic impact on the market.
- The energy crises, especially the fear of supply disruption has led many households to want to switch quickly from fossil fuels to clean energy sources. The aftermath of the overheated market has shown, like a magnifying glass, where the **industry needs to improve**. Some manufacturers reported increased downtime and customer travel due to disrupted supply chains and missing parts that had to be replenished.
 - As a result, individual manufacturers are now analysing their supply chains. In some cases, the choice or number of suppliers is being reconsidered. This is often driven by the realisation that the portfolio of products and variants is too broad, which increases the susceptibility to failure.

- On the one hand, the aim is to design individual unit types for a wider range of applications. The aim is to reduce the diversity of existing systems. The modularity of new systems must be increased. An increased number of similar (but more flexible) components can also reduce costs and increase competitiveness. At the same time, new products need to be more flexible, so that they can be used in a wider variety of existing buildings in the boiler replacement markets.
 - On the other hand, it is also about designing the systems so that they can be integrated more easily and installed more quickly in existing buildings using standardised components. Efforts are being made to develop skid-mounted systems and plug-and-play solutions. For single-, double- and terraced houses, it may make sense to have a separate small heat pump for domestic hot water (e.g. using the return flow from the heating system in winter) and a larger monobloc heat pump for space heating. The latter does not require a separate indoor unit and is located outside. Such an approach would reduce complexity and installer time. In general, **cheaper and better solutions need to be developed** and tested to increase the affordability and diffusion of new technologies for a successful phase-out of fossil systems.
 - Furthermore, the **industry needs to train installers in the use of the new systems**. A balance needs to be struck so that, for example, installers become partners in the value chain, starting at the design stage, developing, delivering and installing appropriate customer solutions, and becoming more competent in customer communication and site management. The short-term availability of well-trained professionals and their knowledge and skills in the field of hydraulics for water-bearing systems remains a challenge. However, this **situation can be alleviated if the installation times**, which are currently twice (heat pump) to 2.5 times (pellet heating) as long as for gas heating, **are reduced through new solutions and good training**.
 - Finally, **cooperation between industry and the trades** has great potential to increase the current rate of replacement of boilers and stoves. One idea is to reduce the burden on installers by having manufacturers organise the dismantling and disposal of old equipment and the marketing of any remaining fuel oil on their behalf. Depending on the manufacturer, this could include breaking through the building envelope, excavation and concrete work to create the foundations, and delivery of the new equipment to the exact location of the installation. Other ideas include hydraulic or system design support. At this stage, it is not possible to say whether, or to what extent, installers would actually be prepared to hand over tasks (up to and including competencies) or - with a view to gaining access to a larger number of contracts with the same number of staff - to enter into such collaborations. The Austrian one-stop-shop for boiler replacement supports such cooperation. However, due to the prevailing market conditions, it has not yet been possible to prove the concept (for details see "D5.3 Synthesis report on collective actions").
 - Considering this, it is obvious that **new collaboration approaches and business models** should be developed and implemented in a way to **facilitate and foster industry and trade cooperations**. The Austrian one-stop-shop for boiler replacements (see REPLACE report on "Overview of boiler & oven replacement activities and campaigns in nine pilot regions") is a model case for such model facilitating collaboration.
4. Public authorities should **support R&D activities** that help to promote the clean heat transition in the direction described in the recommendations above.
- **R&D activities** of the past have led to **several sustainable technology solutions** that are **available today** and can help us directly in the heat transition. It is important to **continue**

supporting R&D activities in the field of heating and cooling to achieve further improvements in efficiency and sustainability.

5. Ensure a **just transition** by mitigating the socio-economic impacts of the clean heat transition.
 - In 2019, over 35 million Europeans claimed to be unable to afford to keep their homes warm enough. This number has increased during Covid-19 crisis. In 2020 the figure was reported to be at 36 million (European Union, 2022). It is expected to grow even faster due to price crises that went on since mid-2021, and with the Russian Government's invasion on Ukraine in addition turned into an energy supply crises elevating energy prices even more. Reducing the number of people at risk of poverty or social exclusion by at least 15 million is one of the three headline targets of the **European Pillar of Social Rights (EPSR)** to be reached by the EU by 2030.
 - The **European Green Deal** stresses the need to tackle energy poverty and ensure a fair transition, for instance through designing measures for households unable to afford key energy services, financing renovation schemes, and reducing energy bills. The Gas and Electricity Directives call for the protection of vulnerable consumers, and the Energy Efficiency and Energy Efficiency of Buildings Directives require **measures to alleviate energy poverty alongside efficiency efforts**.
 - Moreover, the EU is committed to tackling energy poverty by its roots and protecting vulnerable consumers, and made it a policy priority in the **Clean Energy for all Europeans** package, adopted in 2019. Where EU countries identify a significant number of energy poor households, they must use their national energy and climate plans and long-term renovation strategies to set out an indicative objective for the reduction of energy poverty, a timeframe and relevant policies. The Commission has further stepped up its ambition to tackle energy poverty and support EU countries in their efforts through the **Recommendation on energy poverty (EU) 2020/1563**, issued as part of the renovation wave package.
 - **Energy poverty** can have severe implications on the health, wellbeing, social inclusion and quality of life of citizens. There should be a sufficient number of **trained authority staff to take advantage of any supranational funding available**, e.g. from European programmes such as the Just Transition Mechanism.
 - When **changing the political framework conditions**, it is of high importance to design them to increase the social acceptance of renewable energy systems. This includes also the consideration of **different consumer groups**. For example, special support must be provided to the poor, addressing also energy poverty. Thereby it must be understood that energy poverty is highly related to general poverty. It exists in all countries, but there are huge differences among countries and regions. In some REPLACE countries energy poverty has been a very important aspect.
6. Develop **stable and comprehensive Policy Programmes** and follow a **Long Term Approach**: Establish long-term heat transition policy programmes with a comprehensive approach and sufficient resources. Comprehensiveness is a prerequisite for successful policies and can best be achieved by involving all potentially relevant stakeholders in the definition and implementation of the policy. Appropriate programme management has a key role to play in this respect.
 - A **comprehensive approach** does not rely on simple individual measures as incentives, regulation R&D but on a **bundle of measures** (including socially tailor-made subsidy schemes,

training programmes, campaigns, etc.) that enable both suppliers and end-users to implement the clean heat transition path with binding targets and provide investment certainty

- With the right policies in place, the market can take off quickly and deliver multiple benefits, including the sustainable growth of renewable energy industries. There is **not a single case where the market itself has been able to deliver significant clean heat use**, with the exception of the traditional use of wood logs for heating.
- The **need for implementing long-term, continued policy programmes** stems from the **slow pace of change in the building sector**, which involves significant capital investment. Furthermore, the clean heat transition in the residential heating market means that appropriate technology solutions need to be disseminated to a large number of consumers, involving a wide range of educational, technical, administrative and political actors over a longer period.
- Therefore, making the transition work means that all these actors act in a coordinated and meaningful way over a longer period of more than five years in order to support the transition. Last but not least, strong competing forces, massive persistence and inertia, etc. are still working against this transition.
- Due to the complexity of implementing a comprehensive approach, dedicated public programme managers (change agents) need to be put in place, with a wide scope of action and sufficient resources to involve all relevant stakeholders in the design and implementation of programmes. The following figure provides an overview of the elements that such an independent programme manager needs to address.

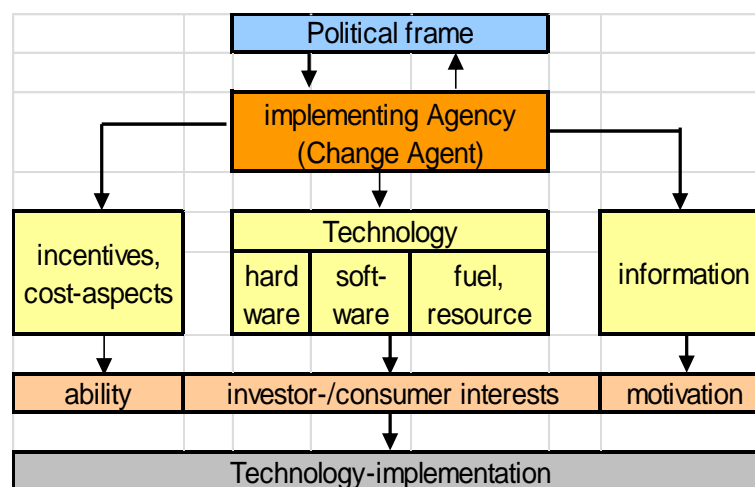


Figure 3: Overview of change agent's scope of action (AEA, 2023)

- **Establishing committed public program managers**, that ensure smooth market development by addressing all issues that need to be dealt with is not only a precondition for success, but it is also particularly an (also cost) effective measure.
- **Avoid like-for-like replacements** of fossil fuel based heating systems by collaborating with manufacturers and installers to **introduce mobile heaters**.

The provision of mobile heaters avoids the need for emergency like-for-like replacements in the event of a breakdown and therefore avoids lock-in to fossil fuel or inefficient heating

systems by avoiding 1:1 replacements. In addition, mobile heaters help to bridge a few weeks for an informed decision on a fuel switch.

- **Keep people who heat green in line.** It is often the case that grants for clean heating systems are only given for switching from heating oil and natural gas.

However, there is a huge stock of old and inefficient firewood boilers that need to be replaced in the years to come too. The **authorities should not forget to provide adequate subsidies for the renewal of such old renewable heating systems**. Otherwise there is a risk that the share of renewable energy will decrease. Their efforts to mitigate climate change should be rewarded as a matter of fairness.

- Enable **informed decisions** for end-users as well as building investors and owners

REPLACE aimed to boost the phase-out of inefficient and old heating systems in the residential sector by targeting consumers, investors & owners as well as intermediaries and helping them to make informed decisions.

In order to allow actors to make informed decisions, **REPLACE** developed a number of **tools** (REPLACE heating [matrices](#), REPLACE Your Heating System [Calculator](#)) and information products (REPLACE [Handbook](#) for end consumers and [Handbook](#) for professionals, REPLACE Collection of Best Practice [examples](#)). Each of the mentioned tools and more information are explained further in chapter 5.

Provide sufficient resources and training facilities to employ a sufficient number of trained, **product-neutral, locally available public energy advisors**.

- Ensure a **just transition**, alleviating the socio-economic impacts of the clean heat transition

Older heating system owners, who are predominantly women due to life expectancy, often have problems getting loans just because of their age. This is discriminatory and should be legally avoided (this has recently been done in Austria).

Manufacturers, installers, utilities or banks can offer instalment payment models instead of large upfront investments, easing financing and affordability issues. Energy or plant contracting could also be a viable option, reducing the upfront investment pressure on households.

7. **Train sufficient professionals and tradespeople** to provide the workforce needed to support suppliers and end users in the clean heat transition. The lack of trained manufacturers, service technicians and installers is a **key bottleneck for RES-H market development throughout Europe**.

- In many European countries, there is currently a lack of trained craftsmen and installers. Those who are working in the sector are overloaded with work. To foster the transition of the heating and cooling sector **towards a Net Zero target**, it is important that existing installers need to be trained and skilled to install RES heating and cooling technologies. In vocational education and training, RES must play a more important role. The **training of young trainees on fossil fuel systems must be stopped**. Existing installers, who are predominantly focused on fossil fuels, should be given access to retraining in the implementation of clean energy technologies. Within REPLACE materials for installers and middlemen have been elaborated and are ready to be used.
- It is known today that **industry** can **train installers**. This is crucial in less mature heating markets.

- Enable **knowledge transfer between professionals from previous projects**, e.g. phasing out single flat or storey gas heaters in large urban large-volume buildings.
 - **Educational pathways** in the skilled trades should be made more attractive (image change) through positive, broad-based public marketing (e.g. we young people are realising the clean energy transition).
8. Establish and ensure a **high quality of products and services**. That is a fundamental issue that needs to be addressed to enable a successful clean heat transition, strengthening end-user confidence
- **Product testing and certification bodies** accompanied with emission regulation can **significantly improve the quality of products** by regularly publishing the best performing technology products. Heating systems are tested for efficiency, emissions and safety according to international standards. **Publication of test results** can encourage industry to continuously improve its products. For example, the Austrian biomass boiler industry has succeeded in [reducing emissions from wood-fired heating systems](#) to a minimum and significantly improving efficiency through technical innovation.
 - Funding schemes should **incentivise** the implementation of **high quality, energy efficient and high performance products** (e.g. by means of product databases like [topten.eu](#) tailor-made for end-users or the [Austrian GET-database](#) tailor-made for professionals and funding offices)
 - **Installers and service technicians** play a **key role in all RES-H technologies**. If these professionals are not properly trained in how to install solar collectors, pellet boilers or heat pumps, they will either not install these systems at all or will make mistakes resulting in poor performance.
- Retraining experienced installers** who previously specialised in oil and gas heating is a significant short to medium term opportunity to accelerate the clean heat transition.
- It would be useful to **learn from leading countries** and work towards **harmonised training and education curricula**. A **European project to identify best practice in the training and certification of installers** could be of interest.
9. Ensure **long-term price stability** of locally available renewable energy sources for the clean heat transition, making them future-proof and price resilient for end-users.
- High quality **implementation** of high quality green heat products is an important element in making end users less vulnerable to price fluctuations. More energy efficient and therefore less energy consuming technologies are advantageous.
 - However, the biggest effect in making heating systems more cost and price resilient is the **energy efficiency first principle**. Reducing the annual energy consumption for space and domestic hot water heating not only saves the annual heating bill, but also the initial investment.
 - Enable end users to make **informed decisions** that make the individual clean heat transition future-proof and price resilient. Public authorities should therefore ensure that there is a sufficient number of independent energy advisors available to advise end-users on individual and long-term cost-optimised renovation strategies.
- Fake news** about the benefits and cleanliness of fossil fuels **is a serious impediment to the pace of the necessary transformation**. Energy advisers often report how much time they

spend on tedious education. Unfortunately, this leaves them little time to give concrete advice on serious, realistic individual solutions.

- **Recommendations for solid biomass fuels**

Establish strategic emergency and long-term reserves for industrially standardized green fuels like wood pellets, as it was proposed for Austria (see below).

Establish rural solid biomass logistic hubs (for logwood, wood-chips, wood pellets) that ensure a uniformly high quality of fuel products, avoiding failures with automatically fuelled heating systems and increase their availability. Within REPLACE this has been realised in the Spanish pilot region (see REPLACE report on “Overview of boiler & oven replacement activities and campaigns in nine pilot regions”).

Introduce standards that ensure high fuel quality (such as [ENplus](#) for wood pellets) and thus high reliability of automatic heating systems, such as pellet stoves and boilers. Such standards also make it easier to prevent the illegal use of timber.

- **Tackling the problem of avidity**

Short-term profit-maximising wood fuel (especially pellet) **traders** who seek to take advantage of oil and gas price movements by demanding extreme high prices that are not justified by corresponding developments in the biomass feedstock markets and manufacturing costs **are damaging the entire sector**, especially end users and heating system manufacturers. In the end, such behaviour causes damage to these themselves.

Experience (i.e., the first pellet market crisis in Austria in 2007) shows that it can take years to overcome consumer mistrust caused by rising biomass fuel prices, disrupting market development and destroying jobs and investments in the industry. Supply actors in the sector should **act with more foresight and strengthen long-term relationships with end users**, which will be more beneficial for all market actors. In Spain, when a new pellet boiler is installed, end users are offered contracts for the long-term supply of wood pellets, for example.

Industry agreements, e.g., on the establishment of **strategic wood pellet stocks** and pellet mobilisation to mitigate escalating prices, should **help to counteract such negative developments in a timely manner**. According to Austrian industry experts, an amount of around 10 % of the previous years’ supply, e.g. via a legal stockholding obligation for both manufacturers and traders, would be sufficient (see [proposal](#) of the Austrian Pellets Association proPellets Austria). The costs of stockpiling - depending on market price - would amount to 1 to 2 % of the sales price and should be borne by the pellet industry.

Tackling the problem of **end-user stock-piling**

Fear is a bad adviser. As in the case of the Corona crisis, the last heating season (i.e. of 2022/2023) was preceded by the phenomenon of households stocking up on more goods than they needed for the winter. Such behaviour is doubly unwise when it comes to goods that are sufficient in themselves but are becoming more expensive; it reinforces the negative price trend and forces customers with short-term needs to make overpriced purchases.

Stakeholders in the sector should raise end-users' awareness of this problem and encourage them (e.g. by offering price premiums for wood pellets delivered after the heating season) to have a **constant supply of fuel** throughout the year, which would also make it possible to optimise logistics costs (fleet, storage, etc.).

10. Facilitate a **regionally focused, hands-on approach** in order to support the clean heat transition. The diffusion of RES-H technologies depends to a much greater extent on **local availability of**

information, local development of projects based on a detailed knowledge of local circumstances, communication flows, influential persons etc..

- Focus on local and (supra-)regional **energy-related spatial planning**. Energy-related spatial planning (ESP) is the integral part of spatial planning that deals comprehensively with the spatial dimensions of energy use and supply.

Promoting sustainable spatial development, creating efficient infrastructure and making the best use of locally available resources are essential pillars of effective ESP. Without spatial co-ordination, which ensures that the **most appropriate technology is used in each location**, including the electricity sector, the heat transition will not succeed.

District heating is a key to sustainable heat supply due to its ability to integrate a wide range of renewable energy sources and is a particularly advantageous system for replacing heating in existing buildings. Therefore it is **in many regions recommended to give priority to local district heating systems**, where possible, locally. The main advantage is that the only heating installation in the consumers buildings usually are the heat transfer stations. Consumers do not have to worry about anything except paying the bills. Care must be taken about **reasonable and transparent price policies**, fair contracts and security of heat supply. District heating can have a very high impact, as many consumers will be supplied with sustainable heat. Challenges are that the planning and installation of district heating systems can take time and that it must be offered by some organisations (municipality, energy community, private operator, etc.). **District heating** can be implemented at any scale, connecting only a few buildings to the supply of a whole city. In the case of biomass microgrids, standardised and **cost-effective plug-and-play heating and fuel storage containers** are available in developed heat markets, based on woodchips or wood pellets and supported by solar thermal in summer, which can be installed very easily and quickly. In any case, **support measures should focus only supplying district heating systems only with renewable energies** and to steadily phase out fossil energy use of existing district heating systems. Finally, it must be considered that the financial feasibility of district heating systems increase with the density of heat demand (e.g. if many buildings with high heat demands are very close together) and for scattered settlements and villages, DH may not be feasible (except where micro-grids are viable). In the case that the buildings are too scattered, individual heating solutions must be applied.

Furthermore, in times of limited availability of equipment and installers, the strategy of prioritising **renewable heat-based heating networks** enables a **faster pace of clean energy transition**. Individual solutions are more time and upfront investment intensive. Cooperative or public sector approaches potentially offer further benefits to end users. Often a **regional manager** or “**caretaker**” is needed, who pushes things forward. This can be a mayor or a person with professional knowledge (e.g. a farmer etc.).

The **use of heat pumps** also places **higher demands on the flexibility and controllability** (load management) of the heat pump systems **to relieve the pressure on the electricity grids** and **to maintain the security of supply**. A sufficient supply of renewable energy sources, especially in winter, and appropriate (also seasonal) electricity storage facilities must be ensured. In the future, especially sufficient wind capacity (as most of the annual production is harvested during the winter, typically) combined with long duration energy storage solutions will be essential to ensure a reliable supply of electricity during the heating season.

In some European urban areas (in EU candidate countries) there is also the **problem of illegal settlements**. For these areas it is difficult to manage participation in the clean energy transition. In addition, many households suffer from low income and energy poverty. **Solutions are needed to ensure that they are not left behind.**

- The **role of local organisations** (as represented by the REPLACE project partners) **shall be strengthened**. They are an essential resource of regional development of RES-H projects and even for programme and campaign management at the regional level.
- Strengthen supra-regional and national **programme management and networking**, learn from initiatives such as REPLACE, and pick up on what supports the clean heat transition in your region.

The **REPLACE** project has developed a number of successful activities that can become important elements in supporting policy programmes to replace fossil fuel and old heating systems with a comprehensive approach (see REPLACE report “Overview of boiler & oven replacement activities and campaigns in nine pilot regions”). The following figure provides an overview of the theoretical structure of how REPLACE has supported local policy programmes based on a comprehensive approach.

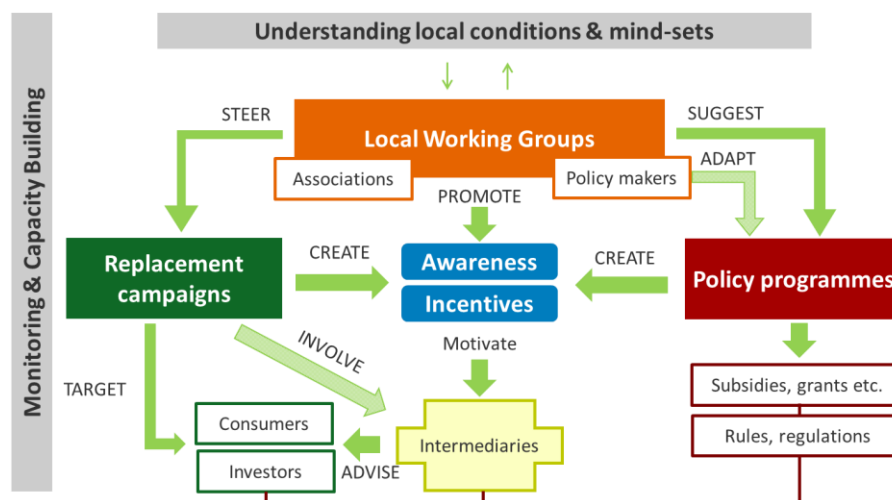


Figure 4: Overview of the REPLACE policy programme support (AEA, 2023_a)

The core activity of REPLACE was to develop, embed (by adapting/strengthening existing policy programmes/measures) and implement nine (R)HC equipment replacement campaigns adjusted for local conditions and structures by a strong involvement of the Local Working Group (LWG) and further local key stakeholders in their design and implementation as depicted in Figure 4. Rather than focusing on policy makers and consumers only, the REPLACE concept uniquely foresees new types of **collaboration of the key actors and intermediaries** in terms of the replacement campaigns and marketing activities.

Out of the experience within REPLACE it is advised to establish **local working groups** bringing together all relevant actors for the clean heat transition (e.g. local and regional authorities, local organisations, trades, manufacturers, etc.), both for planning and implementation at local level, and for providing feedback to optimise the regional and national framework conditions towards an enabling environment. The following figures show activities that were planned together with local working groups.

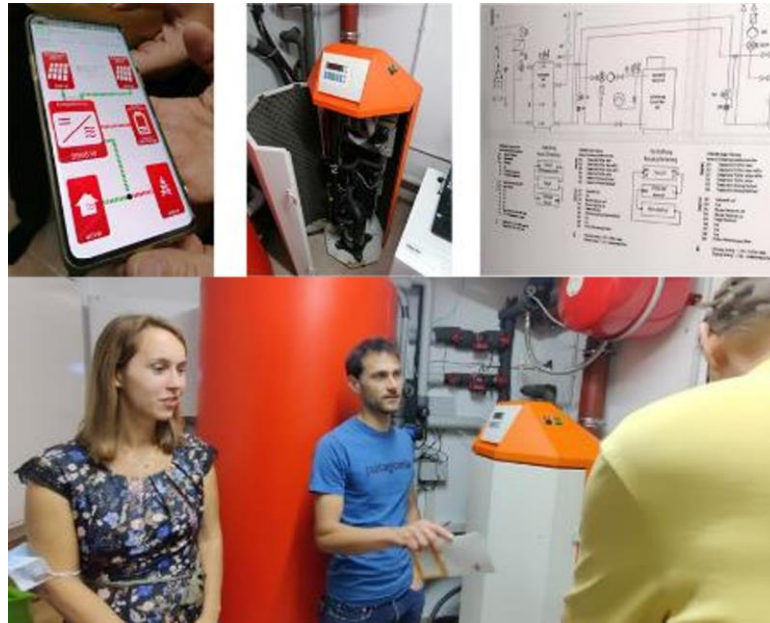


Figure 5: Open house (or cellar) day (source: EWO, 2022)



Figure 6: Realisation of a collective action - local district heating (source: EWO, 2022)

- 11. Reconsider your regulations.** Regulations can be an effective and inexpensive measure for public budgets to ensure the widespread introduction of clean heating systems.

This is demonstrated in **building regulations** that require a certain proportion of renewable energy to be used for heating, e.g., of completely renovated buildings, in the **obligation to use a certain amount of solar energy**, or in the **obligation to install clean heating systems** only when a fossil fuel system fails or to be eligible for subsidies in such a case only, if clean heating systems are installed.

12. Information and promotion

In 2019, 58 % (61 million) of the space heating systems installed in the EU-27 were still inefficient non-condensing oil and gas boilers. It is necessary to reach those households.

Dissemination and marketing is a key activity in developing clean heat markets. Both **information and promotion independent** from direct commercial interests and commercial promotion are **essential**. During the project, in an increasing number of countries, comprehensive commercial marketing campaigns have been developed by the industry. In some countries, public authorities have run independent campaigns. However, it has been reported that **independent, public campaigns should be better coordinated with industry**, as there have been cases where promotion has added to the overheating of the market.

The **REPLACE Boiler and Oven Replacement Campaigns** show further, locally based ways of information and promotion, tailored to the needs of nine pilot regions in Europe (see the report "*Overview of boiler & oven replacement activities and campaigns in nine pilot regions*" for more information).

Concluding with a concrete example the need for information and promotion is shown: A key problem of replacements of heating systems is related to the fact that many heating systems are spontaneously replaced when they suddenly break down (emergency situation). Therefore, a proper planning is needed before systems are too old and break down. Emergency situations can be overcome with **mobile heating devices**, that supply the heat during the consumers decision and planning phase. While this concept is known already in Austria and Germany, during the Final Event in Brussels in March 2022, it turned out that mobile heating devices are unknown in several EU Member States. Promoting this concept will surely foster the heat transition in Europe.

An **enhanced use of the potential** of the **local and regional networks** of actors, as described above, would need to come along with adequate financing and targeted training activities.

5 | Innovative ideas to support the energy transition

The REPLACE project identified many excellent innovative ideas, measures and tools which could support the energy transition. This is the outcome of many REPLACE activities in the different target countries, where market and framework situations are very different. This broad portfolio of ideas and measures presented by the REPLACE project should serve as a **hub for inspiration** to improve the framework conditions in all European countries. These ideas and measures are accessible in various documents on the [REPLACE website](https://replace-project.eu/). Examples of these ideas, measures and tools collected and provided by the REPLACE project are:

- **REPLACE Heating System Calculator:** The calculator enables to compare and calculate economics of different heating solutions
<https://replace-project.eu/decision-support-tool/>
- **REPLACE Heating Matrices:** They show which type of heating system based on renewable energy sources or a connection to district heat is most suitable for your single or double family houses or for your larger volume building.
<https://replace-project.eu/replace-heating-matrix/>
- **REPLACE Collection of Best Practice examples:** showing best practice examples of replacements by people who use these systems themselves
<https://replace-project.eu/best-practice/>
- **REPLACE Replacement Handbooks:** They specifically address end consumers, intermediaries and investors and are available in 9 languages
<https://replace-project.eu/technology-guides/>
- **Joint equipment purchase:** There exist some initiatives where consumers joined forces to jointly purchase equipment (e.g. heat pumps) or energy carriers (e.g. pellets) in order to leverage the impact, to reduce costs and to increase the services provided by suppliers.
<https://replace-project.eu/how-a-group-of-apartments-can-buy-heat-pumps-together-and-act-as-an-energy-community-replace-case-study-and-event-in-north-macedonia/>
- **Consumer awareness labelling:** In some initiatives, labels were designed and distributed to households who have replaced their heating systems. The labels can be displayed on the outside building wall to show other persons that the household is heated with 100% renewables. It gives a good feeling to the households using the label and some of them offer interested other persons to show them their heating system.
- **Heating system labelling:** The efficiency labelling of boilers is regulated by national legislation which needs to consider EU legislation (Energy labelling and ecodesign requirements). Heating system labelling should acknowledge the benefits of renewable energies.
<https://replace-project.eu/getting-to-know-the-most-appropriate-heating-system-replace-boiler-labelling-campaign-in-north-macedonia/>

- **One-stop-shops:** A web-based one-stop-shop for residential boiler replacements could serve as a very good measure to facilitate choices and decisions of consumers related to the replacement of heating systems. Such a one-stop-shop was developed in Austria.
<https://replace-project.eu/replace-highlight-austria-web-based-one-stop-shop-for-fuel-oil-gas-boiler-replacements-launched-mid-july-2022/>
- **Open house events:** In order to promote replacement of heating systems, “opening the door” events can be organized to show other citizens how replacements were practically done.
<https://replace-project.eu/replacing-the-heating-systems-in-households-saves-money-and-reduces-harmful-emissions-into-the-air/#more-5295>
- **Provision of emergency heating equipment:** Emergency situations caused by a sudden break down of a heating system can be overcome with the provision of mobile heating devices, that supply the heat during the consumers decision and planning phase. This enables consumers to make informed decisions.

6 | References

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