

Decarbonising Buildings

Strong governance structures and policies will be required to decarbonise European homes



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Key Messages

- Decarbonising European homes will require governments to ensure clear and supportive governance structures to establish, monitor and enforce effective energy efficiency building regulations.
- Energy efficiency, along with the reduction in the carbon content of the energy consumed, is an essential enabler of decarbonisation of buildings.
- Heat pumps are likely to be key for decarbonising homes, but their rapid deployment will need governments to put in place stable and long-term economic incentives.
- Successful decarbonisation of buildings will require governments to engage with the construction industries and associated supply chains, and provide help to build the necessary knowledge, skills and support for ambitious policy.



Background and Context

Heating, cooling, lighting and using appliances in buildings account for around 40% of energy consumption in the EU, and a similar level of CO₂ emissions. The greatest single contribution to these emissions is from heating residential properties. Reducing energy consumption required to heat homes, and decarbonising the energy that remains, is vital to achieve net-zero emissions by mid-century. But, in many European countries, with the exception of decarbonising electricity, relatively little progress has been made towards these ends. This Policy Brief presents some of the key lessons from the INNOPATHS project to accelerate energy efficiency and decarbonise heating across both new and existing homes.



Decarbonising European homes will require governments to ensure clear and supportive governance structures to establish, monitor and enforce effective energy efficiency building regulations.

Around half of residential floor space in 2050 is yet to be constructed. To avoid further 'lock-in' to an inefficient, high-carbon pathway, the construction of new energy-inefficient homes relying on fossil fuels for heating must be prevented. Despite sharing a common policy framework and set of minimum requirements, the stringency of building regulations across European countries – and the degree to which they are effectively monitored and enforced – varies substantially. It is likely that this is in part due to variations in governance priorities and structures, as evidenced by Germany and the UK, where the energy efficiency of new domestic building envelopes is high and low, respectively.

In Germany, national climate action targets are supported by sub-targets and detailed sectoral roadmaps, around which the various actors in the sector may set their expectations and take decisions. Such strategies and targets are embedded within the objectives, responsibilities and functioning of the organs of the federal government, with the prominent Federal Ministry of the Interior (BMI) holding explicit responsibility for energy-efficient construction and associated portfolios. Regional (Länder) governments are empowered to go beyond Federal standards, and many do so, alongside the provision of incentives (such as subsidies) that build upon well-designed subsidies provided by Germany's national development bank, KfW, to exceed these standards (see [Finance Policy Brief](#) on the role of public finance institutions). Details of regulatory

compliance must be registered in a central database, from which a federal agency carries out regular monitoring on behalf of the Länder, to which any anomalies are then passed for further checking and the issuing of fines for non-compliance if necessary.

In the UK, an ambitious net-zero target for 2050 is enshrined by law. Although there are some sub-targets for residential energy efficiency and decarbonisation, these are not supported by clear roadmaps, and the policy landscape has been subject to repeated alteration and weakening, often in an effort to reduce regulation to encourage housebuilding. This is reflected in governance structures in England, with the ministry responsible for housing holding a primary objective to encourage housebuilding, with limited responsibility for energy efficiency policy. Local authorities in England are able to set more stringent regulations to some degree, although in recent years there was a lack of clarity as to whether this was the case, meaning that in practice very few do so. While Local authorities have nominal responsibility for enforcing the regulations, in practice this is often outsourced to the private sector, and no central record is kept of compliance activities, which are generally thought to be minimal due in large part to a lack of capacity.

Energy efficiency, along with the reduction in the carbon content of the energy consumed, is an essential enabler of decarbonisation of buildings.

Although reducing energy demand is vital, both for enabling decarbonisation and tackling issues such as energy poverty, it is critical that this is accompanied by a reduction in the carbon content of the energy consumption that remains. In our European scenarios for 1.5°C, CO₂ emissions from buildings reduce by nearly 90% by 2050, compared to emissions today. Around three-quarters of this reduction is through reducing the carbon content of energy through replacing natural gas or heating oil, for example, with electrically-powered heat pumps and non-fossil-district heating in particular.

Low-carbon technologies are also often more efficient than fossil fuel energy for heating, which, coupled with energy efficiency measures such as improved insulation, in our scenarios leads to a reduction in energy demand in European homes of 35% by 2050 compared to present levels. This accounts for the remaining quarter of CO₂ emission reductions.



To avoid further 'lock-in' to an inefficient, high-carbon pathway, the construction of new energy-inefficient homes relying on fossil fuels for heating must be prevented



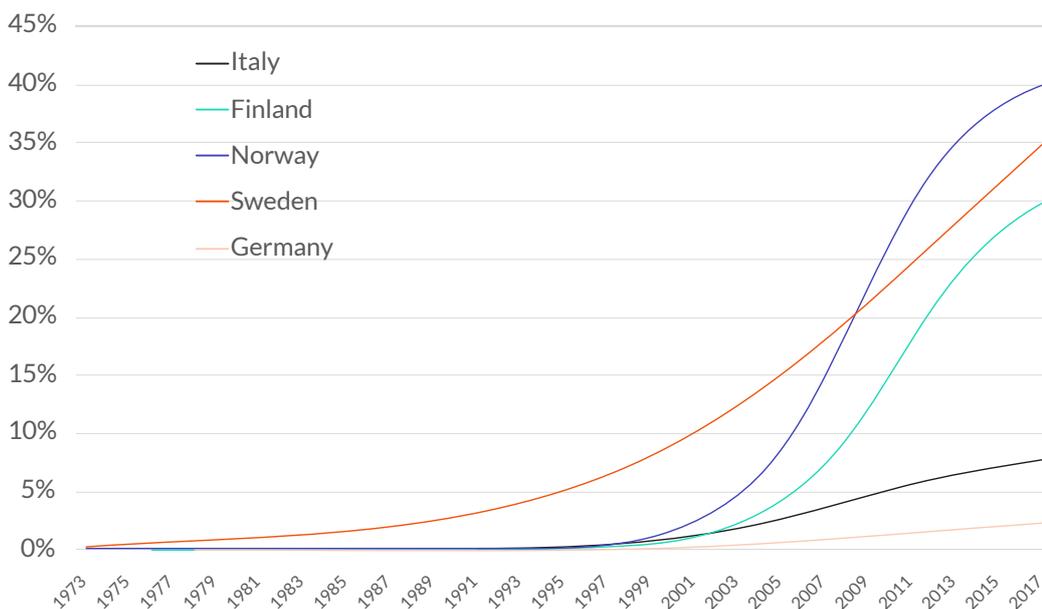
Heat pumps are likely to be key for decarbonising homes, but their rapid deployment will need governments to put in place stable and long-term economic incentives.

Countries with the greatest deployment of heat pumps in Europe, including Sweden, Germany, Austria, Norway, Finland and France, began to establish markets in the wake of the oil crises of the 1970s, as the result of public policy to reduce oil import dependence. A key component of their success was the provision of economic incentives through capital subsidies for the installation of heat pumps, low electricity prices through the dominance of nuclear or renewable energy, or robust carbon pricing on fossil fuel heating alternatives – and in the most successful cases of Sweden, Norway and Finland, all three (Figure 1).

Countries in which heat pumps remain a niche technology, such as the UK, should learn this lesson to accelerate their deployment, which may be achieved more quickly at lower cost by building on the experience of these pioneer countries. In addition, lessons may be learned from how subsidy and carbon pricing instruments have been designed in these countries, and thus how they may be replicated most effectively and cost-efficiently. It is equally important that they remain stable and predictable over time, to grow and maintain business and consumer confidence to adopt the technology and invest in the supply chain.

But, although economic incentives are crucial, they are not a sufficient condition for driving widespread adoption of a new technology.

Share of Households with a Heat Pump



Successful decarbonisation of buildings will require governments to engage with the construction industries and associated supply chains, and provide help to build the necessary knowledge, skills and support for ambitious policy.

Where such engagement is lacking, new technologies and techniques are less likely to achieve widespread adoption, and policy measures to encourage them are more likely to fail or be actively resisted. In the UK for example, evidence suggests a high rate of non-compliance with building energy efficiency regulations due to poor understanding of their requirements, a lack of appropriate skills, inadequate enforcement, narrow technical specialisations and a sector structure un conducive to knowledge exchange and the adoption of more holistic approaches. This has led to a view that building energy efficiency regulations are a ceiling for ambition rather than a floor, with resistance to increasing ambition (exemplified by the removal of an ambitious 'Zero Carbon Homes' regulation announced in 2006, which was scrapped months before it was due to take effect in 2016, justified as a step to encourage greater rates of housebuilding).

By contrast, in Germany, there are numerous joint fora and platforms for research, knowledge exchange and collaboration between different public sector bodies (from government ministries and agencies, to universities and other public research institutions) and the construction industry, including publicly-funded information and training institutions, programmes, and certification mechanisms. This has helped to reduce barriers to, and even engender support for, increasingly ambitious regulation among the range of actors in the industry.

A similar picture emerges from European countries in which heat pumps are the most widely deployed. Governments in these countries collaborated with research institutions, industry and other stakeholders (such as utilities) to develop the technology, and following slumps in sales resulting from poor quality installations, to develop the skills and provide the training required to properly install them. Certification and labelling schemes were then jointly developed to provide consumers with confidence in both the quality of the technology and the skills of installers, alongside collaborative awareness campaigns.

Investing in the development of appropriate skills for energy efficiency and decarbonisation should be at the heart of Covid-19 recovery packages ([see Labour Markets Brief](#)).



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Further Information

For further information, please consult the following publications:

- INNOPATHS Deliverable D1.3: Sectoral analysis report, Available at: <https://innopaths.eu/publications/#project-deliverables>
- INNOPATHS Deliverable: D2.4: Report on the sectoral and national (plus EU) innovation system case studies, Available at: <https://innopaths.eu/publications/#project-deliverables>
- Levesque, A., Pietzcker, R., Baumstark, L. and Luderer, G. 2020 Deep decarbonisation of buildings energy services through demand and supply transformations in a 1.5°C scenario, Environmental Research Letters, <https://doi.org/10.1088/1748-9326/abdf07>

This Policy Brief was written by:

Paul Drummond, p.drummond@ucl.ac.uk,
UCL Institute for Sustainable Resources

Antoine Levesque, levesque@pik-potsdam.de,
Potsdam Institute for Climate Impact Research



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