



# **REKORDERLIG RENOVERING**

Record-breaking Renovation

**CONSERVATIVE  
ENVIRONMENT  
NETWORK**

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## Summary

The illegal invasion of Ukraine has driven home the need to reduce reliance on Russian gas, coal and oil. Russia supplies Europe with around 40% of its gas<sup>1</sup>, 40% of its coal<sup>2</sup> and 30% of its oil<sup>3</sup>. The invasion has highlighted that the clean energy transition will provide benefits beyond decarbonisation and lead to greater security, consumer protection and new jobs. Shifting away from fossil fuels will require action across many sectors at the same time, tackling power, transport, and industry to transition from these fossil fuels.

However, the urgency of responding to the war in Ukraine has given a particular impetus to measures that can be implemented quickly. New wind farms can take years to approve and build, electric vehicle infrastructure takes time to install, and heavy industry is difficult to decarbonise at scale without advances in technology like carbon capture or zero carbon feedstocks. One measure that can be implemented relatively quickly, however, is increasing energy efficiency through insulation in buildings and housing stock. These measures are key to reducing greenhouse gas emissions - energy efficient homes are easier to heat and cool as less heat escapes from the building, meaning that less energy is wasted on heating and air conditioning systems.

One country which has managed to improve its housing stock significantly is Sweden. Sweden, being a particularly cold country, relies on heating more than most, so improving the energy efficiency of its housing stock is a key part of decarbonisation. Because Sweden has few domestic fossil fuel reserves, it was especially exposed to the price instability in oil and gas markets, and therefore transitioned towards renewable energy much earlier than other comparable countries. The Swedish energy mix in 2020 featured hydropower as its biggest source, supplying 72 TWh of energy, with nuclear energy following close behind at 47.3 TWh. The transition to renewables was incredibly successful and the share of Sweden's heating powered by fossil fuels

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<sup>1</sup> What happens if Russia shuts off gas supplies to Europe?, euronews.green, 2022

<sup>2</sup> Analysis: Russian gas prices stokes Europe's appetite for Russian coal, Saul J, Chestney N, Reuters 2022

<sup>3</sup> From where do we import energy, eurostat

is now under 5%<sup>4</sup>. Part of this has also been due to a long term tax increase on heating oil, which encouraged a shift to sustainable alternatives.

But to further reduce the carbon emissions from heating buildings, Sweden needed to not only tackle the type of fuel used to *supply* heat but also the *demand* for heat. To reduce demand for heating, Sweden has focused on increasing the energy efficiency of its housing stock.

Much of this improvement was started during the centre-right government led by Prime Minister Fredrik Reinfeldt of the Moderate Party between 2006 and 2014, which raised the ambition on EU building regulations in 2010<sup>5</sup>. The EU directive stated that new houses by the end of 2020 should achieve ambitious energy performance requirements. The Reinfeldt government brought forward the target to 1st January 2019 so that new homes were of a higher standard earlier, meaning that they would require nearly zero energy to heat due to high energy efficiency. The Reinfeldt government also asked the Swedish Energy Agency to suggest measures to achieve a 20% reduction of energy consumption in buildings by 2020. In order to achieve this, the Swedish Energy Agency developed the Rekorderlig Renovering programme which assessed profitable measures for energy efficiency. The Halvera Mera campaign was implemented which funding up to SEK 150,000, or around £12,000 to incentivise feasibility studies according to the Rekorderlig Renovering method.

### Sweden - Homes and heating pioneer

Sweden has been home to a number of innovations in the housing sector, including the Passivhaus. A Passive House or Passivhaus is a house that is designed to be so energy efficient that it makes heating and cooling systems obsolete. This is achieved with solar gain through windows, preventing any air leaks in the house, using very energy efficient appliances, and taking advantage of natural conditions such as utilising south facing windows. Though the modern Passivhaus concept originated in Germany, it was greatly influenced by a Swedish professor, Bo Adamson<sup>6</sup>. Swedish researchers were also pioneers in energy efficiency research - in 1977, for example, they developed the 'blower door test', which has helped to determine energy efficiency of a building by locating heat leakages<sup>7</sup>.

Perhaps though, the most important development in terms of home energy efficiency in Sweden has been the development and rollout of heat pumps. Sweden has the highest number of ground source heat pumps per capita in the world<sup>8</sup>. Sweden supported the development of heat pumps through research and development programmes, training and information campaigns. Sweden also benefited from historical experience in water well drilling which was also applicable to the borehole drilling used to install ground source heat pumps. This all meant that Sweden was surprisingly well equipped to increase its housing stock

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<sup>4</sup> Sweden heat energy system - new tensions and lock ins after a successful transition, Stockholm Environment institute, 2017, Dzebo A, Nykvist B

<sup>5</sup> *Ibid*

<sup>6</sup> *Ibid*

<sup>7</sup> *Ibid*

<sup>8</sup> International Energy Agency, Heat Pumps Report, 2020

and some have suggested that Swedish consumers were less wary of these technologies because they had been 'home-grown'.

## Background

The centre-left Social Democratic Party has dominated Swedish politics for much of the post-war period. One of the key pillars of its agenda has been the provision of good quality housing. Part of this included the million homes programme between 1965 and 1974, which did successfully end a nationwide housing shortage<sup>9</sup>. This, however, meant that much of Sweden's housing stock was inefficient, leaky and outdated going into the 21st century and provided the then Swedish government with an opportunity to improve the housing stock. Interestingly though, the mass expansion of housebuilding led to a large number of houses which were very similar in terms of composition, energy efficiency and installation technology. This meant that any efforts to increase the quality of housing stock was applicable to a large number of homes.

October 2006 saw the election of Fredrik Reinfeldt as Swedish Prime Minister and the end of twelve years of the Social Democratic Government. His party, the Moderates, recognised the need for improvements in housing. In order to assess the housing stock in Sweden, the Swedish Government commissioned a survey from the National Board of Housing Building and Planning in 2008, shortly after the centre-right Moderate Party came into government. The results were damning. The survey concluded that roughly 70% of all housing in Sweden had some sort of damage, with approximately 45% of this damage arising from damp. Around 30% of the buildings had mould, mould odour or high moisture levels which could impact on the indoor environment<sup>10</sup>. The survey also found that a high proportion of housing stock was under-ventilated.

In the previous 30 years, there had been a large shift from mostly oil-fired heating to heat pumps, district heating and biofuels, but the corresponding energy use per m<sup>2</sup> for new buildings and dwellings remained constant from 1993 to 2005. One explanation for this was the lack of a requirement for improvements in energy efficiency<sup>11</sup>. The energy used in the built environment constituted 40% of the total energy use in Sweden at the beginning of the Reinfeldt Government in 2006<sup>12</sup>. Buildings in particular made up 18% of Sweden's greenhouse gas emissions, a similar proportion to that of the transport sector<sup>13</sup>.

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<sup>9</sup> Mainstreaming Passive Houses: A study of energy efficient residential buildings in Sweden Niskanen J, Linköping 2018, p19

<sup>10</sup> Sweden's Third National Strategy for Energy Efficient Renovation, Report pursuant to Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings., Ministry of infrastructure p22

<sup>11</sup> Ibid

<sup>12</sup> Perman. K, Swedish building policy and the manufacturers of single-family houses in the county of Dalarna. A collaboration for the future goal of the improvement of energy efficiency? World renewable energy congress 2011.

<sup>13</sup> Mainstreaming Passive Houses: A study of energy efficient residential buildings in Sweden Niskanen J, Linköping 2018, p1

## Rekorderlig Renovering

The results of the national housing survey showed that buildings needed urgent updating. To find a way to help consumers work out what renovations were effective and profitable for people the Swedish energy agency introduced the method of 'Rekorderlig Renovering' which can be translated to Record Breaking Renovation. This was a programme which was designed to assess the potential improvement of individual buildings for property owners and took into account their financial resources<sup>14</sup>. It intended to provide property owners with a basis for decisions on improving energy efficiency by suggesting measures that will improve energy efficiency by at least 50%<sup>15</sup>. The buildings go through three stages: preparation, where a feasibility study is undertaken, implementation, and the conclusion phase, where feedback is given. The Swedish Energy Agency's collaboration with prominent property owners led to the creation of 'Bebo' which is the body that oversees the 'Rekorderlig Renovering' method. Its website features examples and detailed information on how to go about renovation, as well as a calculator for property owners to work out whether the renovation would be profitable through lower energy bills over a period of twenty years.

## Halvera Mera

In order to prove the value of the 'Rekorderlig Renovering' method, the Halvera Mera campaign was introduced in 2013. This was designed to carry out feasibility studies of energy efficiency measures in order to prove that the 'Rekorderlig Renovering' method worked<sup>16</sup>. The first round included 25 feasibility studies and was later expanded to include 31 due to householder interest. The campaign is aimed at property owners in both the private and municipal sectors as well as tenant-owner associations to provide a large variety of buildings for study<sup>17</sup>. A grant of SEK 150,000 (equivalent to around £12,000) was given to all of the property owners of the buildings in the Halvera Mera campaign. The property owners then carried out the feasibility study themselves, with some using Bebo, which is a collaboration between the Swedish Energy Agency and some of Sweden's most prominent property owners who run the 'Rekorderlig Renovering' method and 'Halvera Mera' campaign<sup>18</sup>. Most of the property owners used external consultants. Bebo then checked the calculations in order to maintain the standard of accuracy.

The estimated energy savings from the Halvera Mera campaign were large, with the average saving in properties being 80 kWh/m<sup>2</sup> every year, a 61% improvement in energy performance leaving the new energy performance 64 kWh/m<sup>2</sup> every year. This only reflects the savings from the feasibility study stage, but some properties which have gone through the whole 'Rekorderlig Renovering' process saw even bigger

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<sup>14</sup> Sweden's Third National Strategy for Energy Efficient Renovation, Report pursuant to Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings, Ministry of infrastructure p22

<sup>15</sup> Westerbjörk (2019), Halvera Mera 1+2+3 – Analys p3

<sup>16</sup> Ibid

<sup>17</sup> Ibid

<sup>18</sup> Beskrivning av utlysning Energieffektiv renovering i flerbostadshus,

improvements. One housing association has cut its energy consumption by 67%, from 157 kWh/m<sup>2</sup> a year to 52 kWh/m<sup>2</sup> a year, after completing all three stages of the 'Rekorderlig Renovering' process<sup>19</sup>.

The measures and potential savings from the feasibility studies are shown in the graph below, with the savings over one year and across the lifetime of the measure. It showed that the most effective measures both for one year and over the lifetime of measures are changes in heating systems like heat pumps and geothermal heat. However, when the savings are assessed over the lifetime of the measure, insulation becomes increasingly effective.

### Energy savings per measure for one year (kWh/m<sup>2</sup>)

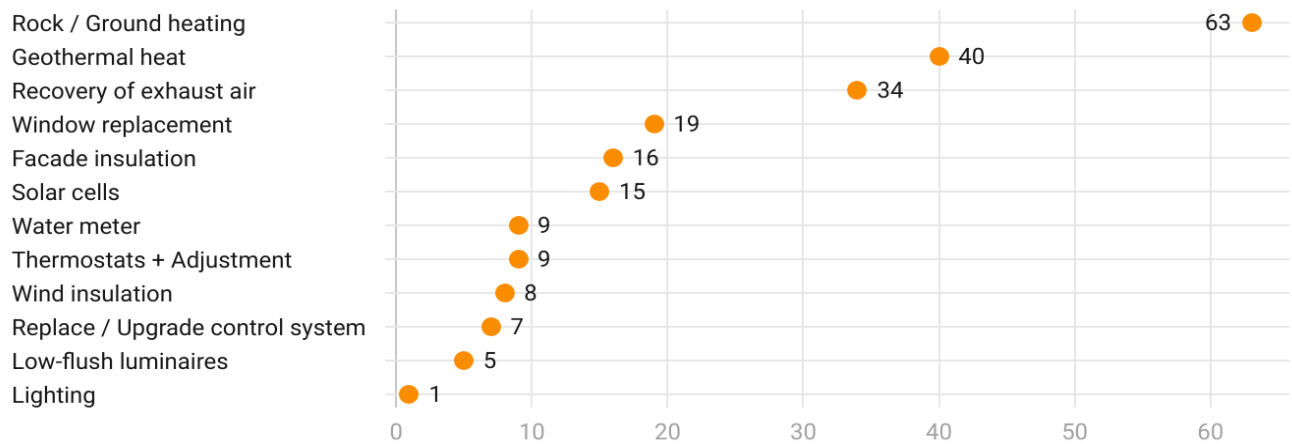


Chart: Conservative Environment Network (CEN) • Source: Bebo • Created with Datawrapper

<sup>19</sup> Sweden’s Third National Strategy for Energy Efficient Renovation, Report pursuant to Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings, Ministry of infrastructure p25

## Energy savings per measure during the entire life of the measure (kWh /m2)

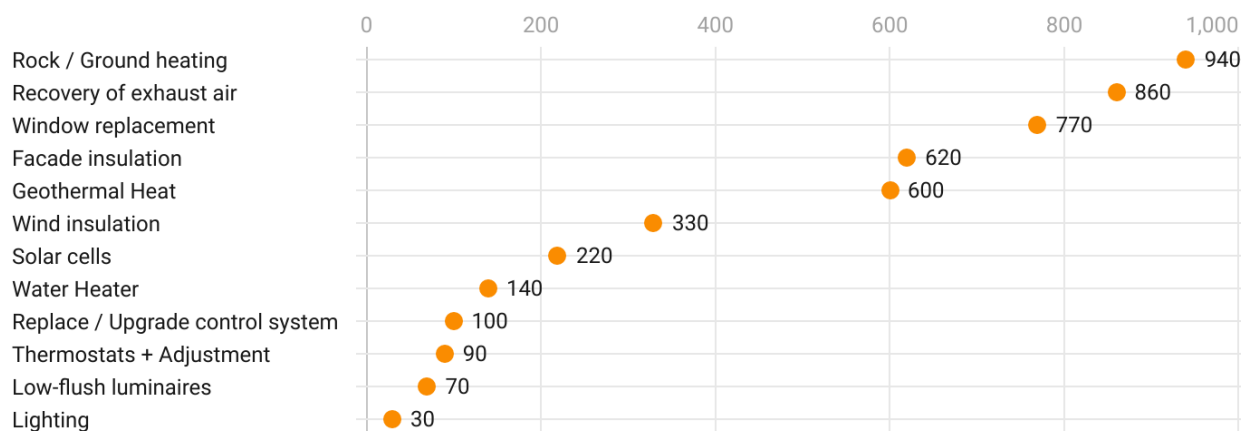


Chart: Conservative Environment Network (CEN) • Source: Bebo • Created with Datawrapper

### How to fund it?

Building owners are not paid to renovate their homes with the 'Rekorderlig Renovering' method. Instead it aims to offer people a methodical approach to working out how to reach cost effective savings given a particular building's context. Based on the context, an action package is put together which is assessed to be profitable over twenty years<sup>20</sup>. Projects covered by the Halvera Mera awareness campaign are given a grant to cover the cost of renovation but most of the projects covered by the 'Rekorderlig Renovering' method are not given any money to carry out the renovation because of the assumption that the overall renovations would be cost effective for building owners. The calculator specifically suggests to property owners a combination of measures which might not have been both profitable and increased energy efficiency by 50% alone but are when combined with other measures.

A further incentive that has made renovation a cost effective measure is the cultural norm of 'warm rent'- that is, rent which includes heating costs, incentivising the building owner to increase energy efficiency rather than the tenant reducing energy efficiency<sup>21</sup>. The 'Rekorderlig Renovering' method therefore works especially well for landlords who cannot reduce their tenant's use of electricity by not using the heating and instead can only increase the insulation.

<sup>20</sup>Bebo, Belok and Besmã - Networks for energy savings in facilities, Essner. I, Viberg. T, Uppsala University, 2015, p18

<sup>21</sup>Von Platten, J.; deFine Licht, K.; Mangold, M.; Mjörnell, K. Renovating on Unequal Premises: A Normative Framework for a Just Renovation Wave in Swedish Multifamily Housing. *Energies* 2021,

## Lessons to be learned from Sweden's energy efficiency drive

**Focus on measures that help to decarbonise quickly** - The invasion of Ukraine has led to an urgency in decarbonisation efforts in order to avoid using Russian coal, oil and gas. This urgency makes increasing energy efficiency an attractive option because, unlike some sectors which require advances in technology to decarbonise, insulation and changing of heat systems are well tested, have options to fit different budgets and can be installed relatively quickly and easily.

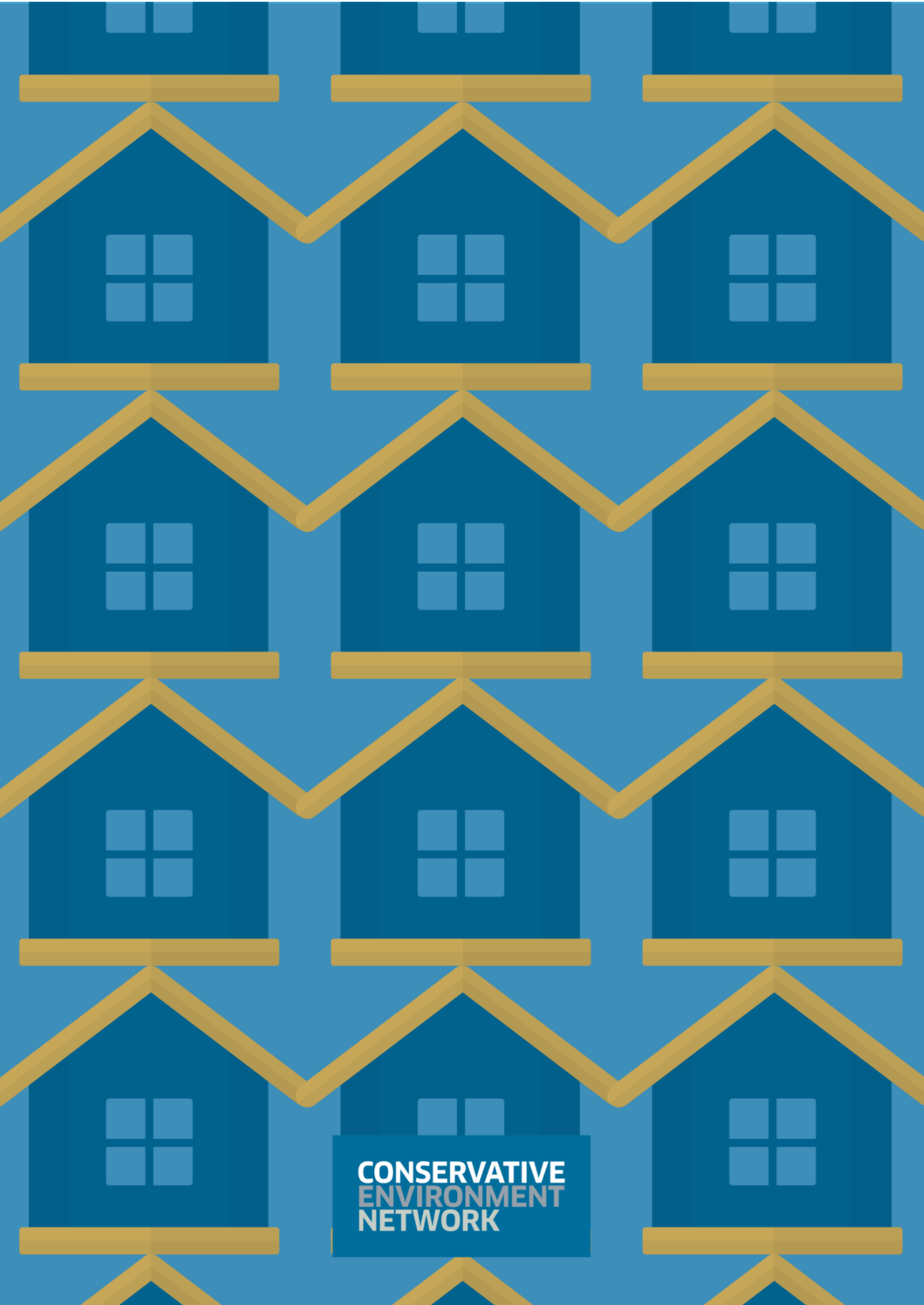
**Encourage research and development in clean technologies** - Some have suggested one of the reasons for their enthusiastic uptake of heat pumps is because Swedes feel as though they are supporting home grown industries. They are also more familiar with the technologies and so have less reluctance to install them. Encouraging research and development in clean technologies is not only an important business opportunity but also increases uptake.

**Work with cultural norms** - Sweden worked with the cultural norm of 'warm rent' to tackle emissions from heating by incentivising building owners to renovate their properties rather than incentivising tenants to use less heating. This measure would likely have less uptake in countries where this is not the cultural norm for countries with a large proportion of renters. Additionally, the near identical housing stock built during the million homes programme meant that Bebo was able to refine calculations for renovation very effectively. Tailoring approaches to work with cultural norms and the particular conditions of a country leads to more effective responses.

**Demonstrating that a measure is profitable in the long term is effective** - Bebo's calculator tool and 'Rekorderlig Renovering' method focuses on producing a collection of measures that will be both profitable over 20 years and improve energy efficiency by 50%. This leads to a mix of measures that are expensive but provide excellent returns like installing a ground source heat pump, alongside cheaper and longer term efficiency measures like window replacement. This allows homeowners to consider measures which would not have been profitable on their own but when combined with other measures result in big energy savings.

**Insulation is an important economic and environmental investment for buildings** - By installing insulation, buildings use less energy for heating and cooling and occupants experience less variability in temperature. Retrofitting buildings with further insulation is an important climate change mitigation measure, especially in geographies where energy production is carbon-intensive. Insulation can be installed quickly.





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