



Healthy Homes Barometer 2017

Buildings and Their Impact on the Health of Europeans



RENOVATION: A VITAL STRATEGY TO BOOST GROWTH, IMPROVE HEALTH AND DELIVER ON OUR CLIMATE COMMITMENTS

The Healthy Homes Barometer 2017 reminds us that buildings are intended to create a healthy home for citizens. But it is alarming to read that one out of six Europeans reports living in an unhealthy building.

The Barometer also shows that improvement of the building stock through renovation can have a major impact on our health and well-being, and it offers solutions to some of our most important societal and climate issues.

Renovation is the key

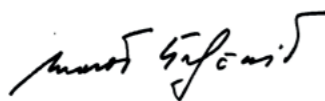
Renovation of the existing building stock is key if the EU is to succeed in its climate and energy objectives. Here, the 'Energy Efficiency First' principle is an important means to success.

Increasing the renovation rate will also bring other benefits, by bolstering the construction sector and thereby creating growth and local jobs. Buildings with a good indoor environment can reduce healthcare costs and are a way to tackle energy poverty. This is also recognised in the European Commission's proposal for a revision of the Energy Performance of Buildings Directive. It is striking, yet perhaps not unexpected, that twice as many people have poor health when living

in energy poverty compared to those who enjoy proper conditions. This further reaffirms the importance of tackling energy poverty through building renovations.

Boost private investments

Barriers to renovation do exist, as is highlighted in this report. For example, homeowners often do not undertake renovations, either because they lack awareness or because they have financial constraints. This implies that although there is a large amount of public funds available for energy efficiency, there is also a need to boost the incentives for private investments in order to reach our climate objectives and improve the quality of citizens' lives across Europe.



Maroš Šefčovič
Vice-President, Energy Union
European Commission



TOMORROW'S BUILDINGS: HEALTHY AND ENERGY EFFICIENT

This report gives, for the first time, an idea of just how much a building's condition affects its inhabitants. In order to create a healthier indoor climate and reduce CO₂ emissions in accordance with the 2016 Paris Agreement, governments will need to boost large-scale building renovations.

We have not yet had a full understanding of the actual status of European homes and their impact on our well-being, though the World Health Organisation and the European Union have supported research on indoor climate and health. But the Healthy Homes Barometer 2017 is the first report to use detailed statistical data from Eurostat SILC to show the correlation between the health of an inhabitant and the building's state.

The cost of unhealthy buildings

So what is the takeaway? Most importantly, that the likelihood of experiencing poor health increases substantially if you live in an 'unhealthy' building – that is, one which is damp, does not have enough daylight, or is uncomfortably hot or cold. Today, one in six Europeans lives in buildings with at least one of these problems. We know that buildings and their inhabitants are symbiotic, but it's still concerning to see that people are 40% more likely to have asthma simply due to living in a home with damp or mould.

These unhealthy buildings do not only affect their inhabitants physically, but also society economically. Every year the cost to European societies of just a handful of the illnesses caused by unhealthy buildings is €82 billion. But in fact, if just 2% of European homes were renovated with an emphasis on health every year, by 2050 we could halve the number of Europeans who live in a damp and unhealthy home.

Building and renovating for health

Action is needed to address both health and climate. Increasing the renovation rate would result in more healthy buildings, while also creating jobs and boosting the European economy. The European Commission's *Clean Energy for All Europeans* legislative package (which includes a framework to deliver greater energy efficiency in buildings) is a great start. Buildings matter and can make a difference – to the climate, health, societal productivity and quality of life.



Michael K. Rasmussen
SVP Brand at the VELUX Group



Europeans living in damp or dark buildings are more likely to report poor health



	Share of Europeans reporting poor health and living in:			Share of Europeans reporting poor health and living in:		
	Not damp home	Damp home	Percentage increase reporting poor health	Not dark home	Dark home	Percentage increase reporting poor health
EU	9%	16%	66%	10%	15%	52%
Austria	9%	11%	26%	9%	16%	91%
Belgium	8%	13%	65%	8%	15%	79%
Bulgaria	11%	18%	56%	11%	17%	53%
Croatia	23%	42%	81%	26%	32%	24%
Cyprus	5%	9%	81%	6%	12%	89%
Czech Republic	12%	17%	38%	13%	21%	64%
Denmark	8%	11%	39%	8%	22%	178%
Estonia	14%	24%	67%	16%	20%	22%
Finland	8%	10%	31%	7%	12%	59%
France	8%	13%	63%	8%	13%	56%
Great Britain	8%	10%	34%	8%	10%	27%
Greece	8%	18%	125%	9%	16%	77%
Hungary	14%	23%	73%	15%	21%	37%
Iceland	5%	9%	68%	6%	9%	45%
Ireland	3%	5%	95%	3%	5%	100%
Italy	11%	18%	59%	12%	17%	44%
Latvia	14%	17%	18%	15%	15%	2%
Lithuania	18%	30%	62%	19%	31%	60%
Luxembourg	7%	9%	23%	7%	9%	19%
Malta	3%	6%	91%	3%	6%	81%
Netherlands	6%	8%	41%	6%	7%	19%
Norway	6%	9%	42%	6%	17%	180%
Poland	14%	22%	60%	14%	23%	61%
Portugal	16%	27%	71%	18%	25%	40%
Romania	8%	20%	139%	10%	17%	79%
Slovakia	12%	23%	92%	12%	19%	54%
Slovenia	11%	21%	85%	14%	21%	55%
Spain	8%	11%	43%	8%	10%	25%
Sweden	4%	8%	73%	4%	9%	114%
Switzerland	3%	5%	56%	3%	5%	47%



More than 1½ times as many Europeans report poor health when living in a damp home



1½ times as many Europeans report poor health when living in a dark home

The data is based on responses to three parameters: "General Health", "Lack of daylight" and "Leaky roof, dampness or rot". Academic advice: Dr.-Ing. Andreas H. Hermelink, Dipl.-Geogr. Ashok John and team, Ecofys Germany GmbH.

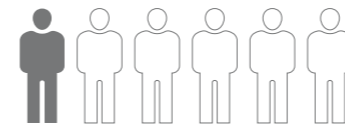
THE IMPACT OF UNHEALTHY BUILDINGS

Factors such as mould and damp in buildings can affect not only the health of the building, but especially the health of those who live within them. More than 1½ times as many Europeans have poor health when living in an unhealthy building.

Today one out of six Europeans – or the equivalent of Germany's population – reports living in unhealthy buildings, i.e. buildings that have damp (leaking roof or damp floor, walls or foundation), a lack of daylight, inadequate heating during the winter or overheating problems. In some countries, that number is as high as one out of three.

Unfortunately, it's clear that living in unhealthy buildings has negative health effects. More than 1½ times as many people who live in unhealthy buildings have poor health compared to those who live in healthy buildings (see figure at left). This demonstrates a clear correlation between unhealthy buildings and people who have rated the parameter *self-perceived health* as 'poor'.

Number of Europeans who report living in an unhealthy building



1 out of 6 Europeans, which is equivalent to the size of Germany's population



UNHEALTHY BUILDINGS AND THEIR COST TO SOCIETY

Unhealthy buildings affect not only Europeans' health, but their wallets. The cost to European societies of asthma and chronic obstructive pulmonary disease is €82 billion per year.



The shift away from outdoor work to 'desk jobs' has left Europeans spending far more time indoors. In fact, today 90% of our time is spent inside – two-thirds of that within the home¹ – so it follows that the indoor environment of the buildings we live, work and play in has a major health impact.

The entire respiratory system becomes vulnerable when exposed to poor indoor air quality, which can provoke the onset of various respiratory illnesses and even raise the risk of developing non-respiratory diseases. In fact, people are 40% more likely to have asthma when living in a damp or mouldy home, and today, 2.2 million Europeans have asthma as a result of their living conditions. Asthma isn't the only health risk, either: allergies, disabilities and premature deaths are also linked to living in damp buildings.

The health impact in Euros and cents

The economic impact of these illnesses is also significant: the cost to European societies of asthma and chronic obstructive pulmonary disease is €82 billion per year. Half of that amount goes to direct costs such as medicine and care. The other half, almost €40 billion, is calculated as indirect costs such as loss of work productivity. This should put a good indoor environment at the top of every employer's agenda, also given the fact that healthy indoor air quality at work can increase people's productivity by up to 10%².

¹ World Health Organization Europe (2013)

² David P. Wyon and Pawel Wargocki, ASHRAE Journal, March 2013, pp. 46-50



€40 bn

Indirect annual costs of asthma and chronic obstructive pulmonary disease, eg. loss of work productivity



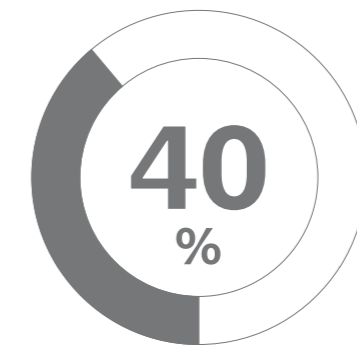
€42 bn

Direct annual costs of treating asthma and chronic obstructive pulmonary disease, eg. medicine and care



€82 bn

Total annual cost for European societies attributable to asthma and chronic obstructive pulmonary disease



Europeans are 40% more likely to have asthma when they live in a damp or mouldy home



When Europeans cannot keep their homes comfortably warm in winter:



Twice as many Europeans report poor health



Twice as many Europeans report lack of daylight



Almost three times as many Europeans report dampness

THE RISING THREAT OF ENERGY POVERTY

Eat or heat? This is the dilemma that 49 million Europeans face every time they wake up to a cold day. And the consequences are enormous; twice as many people have poor health when living in energy poverty.

In this report, energy poverty is understood as a person's inability to adequately heat the home. The main contributors to energy poverty are rising energy prices, low income and non energy-efficient buildings.

This year's Healthy Homes Barometer has found that Europeans who experience economic hardships are more likely to also experience energy poverty. Looking at the European economic landscape, one in three has difficulties making ends meet – and over half of them live in a cold dwelling. Forty-five percent actually keep their temperatures down in order to lower their energy bills³.

Health risks of living in a cold home

These people live not only in cold, but in unhealthy, buildings. Europeans who live in energy poverty are almost three times as likely to live in a damp, unhealthy building. And living in a cold home also has major impacts on health. Twice as many Europeans report poor health when they are unable to keep their dwelling at a comfortable temperature in the winter.

³ Healthy Homes Barometer (2016)

Europeans living in cold homes are more likely to report poor health



Share of Europeans reporting poor health and living in:

	Comfortably warm home	Cold home	Percentage increase reporting poor health
EU	9%	20%	113%
Austria	8%	27%	221%
Belgium	8%	24%	212%
Bulgaria	8%	15%	82%
Croatia	24%	45%	88%
Cyprus	4%	11%	149%
Czech Republic	12%	24%	99%
Denmark	8%	24%	190%
Estonia	16%	31%	97%
Finland	7%	26%	249%
France	8%	20%	158%
Great Britain	7%	20%	171%
Greece	8%	13%	61%
Hungary	14%	26%	80%
Iceland	6%	15%	155%
Ireland	3%	6%	154%
Italy	11%	18%	69%
Latvia	14%	21%	56%
Lithuania	17%	26%	49%
Luxembourg	7%	32%	344%
Malta	3%	6%	88%
Netherlands	6%	25%	323%
Norway	6%	32%	393%
Poland	13%	26%	102%
Portugal	15%	27%	83%
Romania	9%	16%	67%
Slovakia	12%	21%	76%
Slovenia	13%	31%	131%
Spain	8%	12%	61%
Sweden	4%	14%	216%
Switzerland	3%	9%	189%

The data is based on responses to two parameters: "General Health" and "Ability to keep home comfortably warm". Academic advice: Dr.-Ing. Andreas H. Hermelink, Dipl.-Geogr. Ashok John and team, Ecofys Germany GmbH.

PRIVATE HOMEOWNERS ARE KEY TO INCREASING RENOVATION

There are 110 million detached and semi-detached single-family homes throughout Europe – 84% of them are owned by private homeowners. And a great deal of them need substantial renovations.

Nearly 60% of Europeans live in detached and semi-detached houses, with an average of two adults in every family home⁴. However, up to three out of four of these homes are not energy efficient⁵. With 40% of Europe's energy being consumed by homes and buildings and 36% of CO₂ emissions being emitted by them⁶, there is a clear need for more energy-efficient homes throughout Europe. Therefore, private homeowners are key to achieving a more energy-efficient building stock.

Unlocking private investments in renovation

Carrying out the type of renovation that would transform a house into an energy-efficient and healthy home depends on the private homeowner's means. Research con-

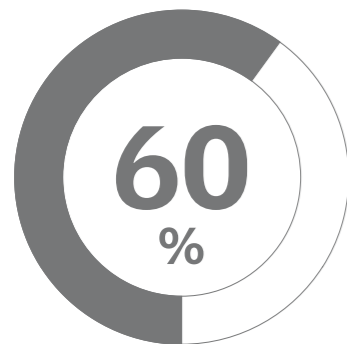
ducted by Copenhagen Economics reveals that the available capital of an average European household is €139,000. Taking the national distributions of wealth into account, this means that 70% of European households would be able to afford a staged renovation. The available capital is in this analysis defined as financial assets, such as savings, shares etc., while non-financial assets are defined as equity available.

⁴ "The relation between quality of dwelling, socio-economic status and health in EU28 and its Member States", Ecofys 2016.

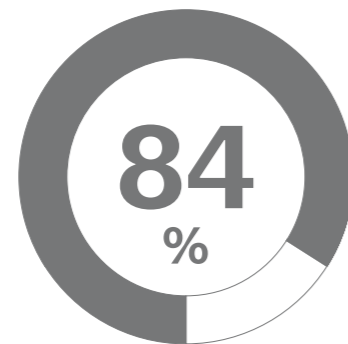
⁵ COM (2016) 860 final Annex

⁶ European Commission, Buildings (2017), available here: <https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings>

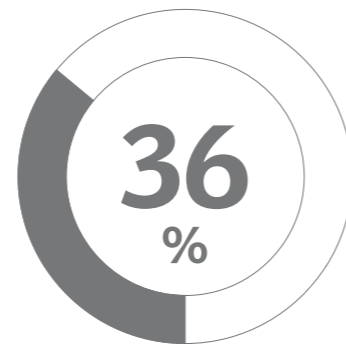
The landscape of European homes



of Europeans live in single-family homes



of single-family homes are privately owned



of Europe's total CO₂ emissions are emitted by homes and buildings



110 million

is the number of single-family homes in Europe





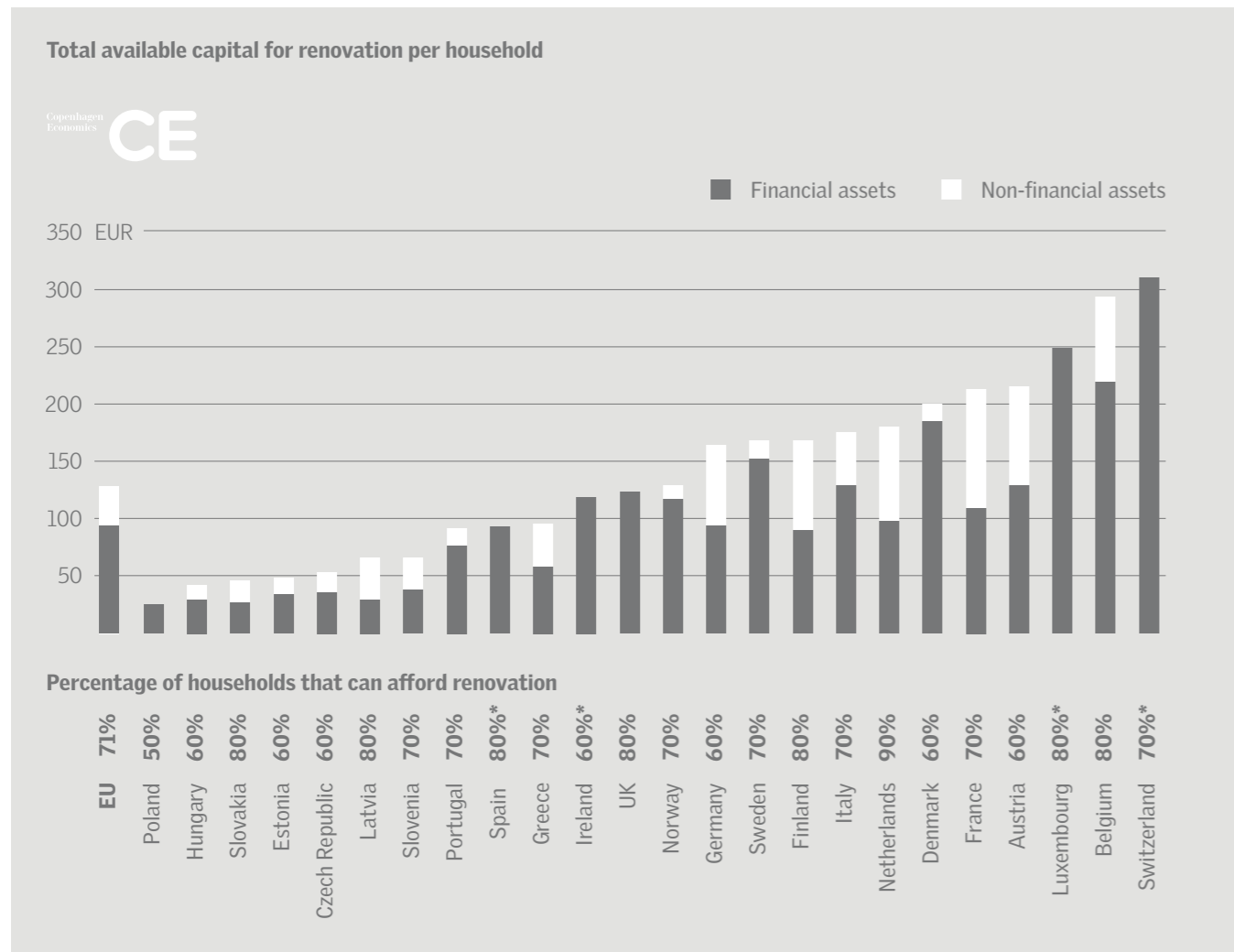
€30 trillion

Total private capital available for renovation across the EU

Money in the kitty for renovation

Total available capital in households across Europe reaches more than EUR 30 trillion. This figure takes into account both financial capital such as savings and shares, as well as non-financial capital such as real estate/equity. The figure below shows available financial and non-financial capital per country, as well as the share of households in each country that would be able

to afford a staged renovation. There are significant differences in levels of available capital across countries, but overall more than half of European households would be able to afford a staged renovation. Renovations not only deliver long-term savings through improved energy efficiency, but also offer improved living conditions, as well as making a significant contribution to the future value of a property.



Each column shows the total capital available for an average household as the sum of non-financial and financial assets in € (thousands, 2016 prices). For Spain, Ireland, Luxembourg and Switzerland, data on non-financial capital was not available. The total therefore shows the available financial assets only. The average takes into account all shown countries, including those with a "*". The number for each country is the percentage of households that can afford a staged renovation at 75.000€, adjusted for differences in the purchasing power parities (PPPs) for each country. Source: Copenhagen Economics based on OECD data (financial and non-financial assets) as well the European Commission (2015) 'Wealth distribution and taxation in the EU'.

COMFORT AND WELL-BEING DRIVE RENOVATION

Improving energy efficiency isn't the only reason to renovate a house; almost three out of four Europeans would renovate if it increased the comfort and well-being of their family.

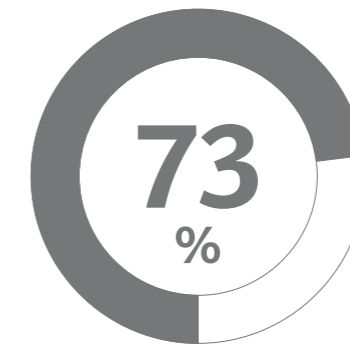
Most private homeowners today would be willing to undergo a renovation if it made their home more energy efficient⁷. But energy efficiency isn't the only incentive that drives renovation among Europeans. Almost three out of four would renovate to boost the comfort and health of their families. From last year's Healthy Homes Barometer (2016), we know that most Europeans rate energy efficiency and comfort/well-being equally high when asked about their renovation reasons.

The current renovation rate of existing buildings is low, with only about 1-2% of the building stock renovated each year⁸. This shows that there is a need to boost incentives that will encourage private investment. Therefore, health and well-being benefits should be included alongside better energy efficiency and resulting cost savings in renovation policies and end-user information. This would help to increase renovation rate.

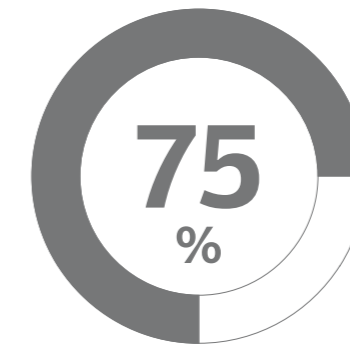
Renovating to a healthy building would lead to fewer Europeans with respiratory diseases and lowered costs to society. If just 2% of European homes were appropriately renovated every year, the number of homes with dampness would be halved by 2050. Likewise, the number of Europeans with respiratory illnesses caused by living in damp homes would be reduced by 25% by 2050⁹.

⁷ Healthy Homes Barometer (2016)
⁸ European Commission (2016)
⁹ Fraunhofer IBP (2016)

What motivates Europeans to renovate their homes



Improve well-being



Save energy costs



HOME RENOVATIONS: A GAME CHANGER IN ACHIEVING OUR CLIMATE GOALS

If we are to take actions that make significant contributions to positively affecting climate change and health, Europe's existing buildings are key. Renovating the non energy-efficient homes is a logical and meaningful start.

With so many non energy-efficient homes consuming so much of Europe's energy, it's clear that renovation will be key if nations are to achieve the climate targets laid out in the 2016 Paris Climate Agreement, which aims to limit the effects of climate change. But it is vital to understand what drives homeowners to invest in renovation.

The prospect of energy savings is appealing, but people also want to feel healthier and more comfortable in their homes. Addressing both these considerations will ultimately help encourage a higher renovation rate that will bring large-scale benefits to individuals and society alike.

About the Healthy Homes Barometer 2017

The Healthy Homes Barometer is a series of Pan-European surveys designed to investigate the link between homes and health. This is the third edition of the Healthy Homes Barometer published by the VELUX Group. The first was presented in 2015. In the 2015 and 2016 editions, we looked into how Europeans experience the difference a healthy home makes. The 2017 Barometer takes the 2016 findings one step further by analysing the impact buildings have on Europeans' health.

This year's Healthy Homes Barometer includes data from different sources; the consulting agency Ecofys based in Berlin, the German research institute Fraunhofer IBP, the Danish economic consultancy Copenhagen Economics and the two previous years' Healthy Homes Barometer.

Researchers from **Ecofys** have analysed the correlation between health and buildings in 27 EU Member States (except Germany) using the Eurostat database EU-SILC (Survey on Income and Living Conditions, a survey conducted to

assess the status and development of income and living conditions in Europe). EU-SILC data is collected by Member States' statistical offices. The research presented here is based on so-called EU-SILC raw data, i.e. a survey based on self-reported observations. Eurostat provides these data for approved research proposals handed in by accredited research institutions. This research used anonymised results for each EU-SILC variable for more than 100,000 individual households and more than 250,000 adults (16+) across all EU Member States except Germany.

Fraunhofer IBP analysed more than 200 scientific publications covering the impact of damp and mould on respiratory illnesses. The publications were analysed in a meta-analysis to determine the odds ratio of having asthma when living in a damp or mouldy home. Fraunhofer IBP combined results from the meta-analysis with data from Eurostat and other research to determine the number of Europeans affected by dampness and mould and the effects on society in economic terms.

Copenhagen Economics analysed households' available capital for renovation based on data from OECD (Organisation for Economic Co-operation and Development). The analysis included savings and non-financial capital. To estimate the available non-financial capital, Copenhagen Economics used households' net wealth as a starting point. Household net wealth is defined as the sum of financial assets and the value of dwellings, minus any outstanding liabilities.

Results and numbers in this Healthy Homes Barometer is based on the analyses by Ecofys, Fraunhofer IBP and Copenhagen Economics unless otherwise stated.

You can read more about the studies and their methods at velux.com/health



» Homeowners often do not undertake renovations, either because they lack awareness or because they have financial constraints. This implies that although there is a large amount of public funds available for energy efficiency, there is also a need to boost the incentives for private investments in order to reach our climate objectives and improve the quality of citizens' lives across Europe.

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