



**HEALTHY
HOMES**
IRELAND

**OUR PLACE:
Towards Healthier
Greener Homes**

JUNE 2023



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About Healthy Homes Ireland

Healthy Homes Ireland (HHI) is an initiative between VELUX and the Irish Green Building Council (IGBC). It aims to positively influence public policy and practice by bringing together industry stakeholders to consider how to address health problems caused by existing low-quality homes and ensure there is no compromise between health and energy efficiency in new build and renovated homes.



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Foreword



Healthy Homes Ireland (HHI) is a high-level group of industry practitioners and academics that was established in 2021 to address health issues arising from poor quality housing and to ensure there is no compromise between health and energy efficiency in new-build and renovated homes. This report and the recommendations that it contains are the culmination of work undertaken by the HHI initiative. It has been my pleasure to chair the work of the initiative and to bring together the steering group tasked with providing guidance on priorities and objectives. It is a privilege to work with some of the most respected organisations and figures in the Irish housing sector and I would like to extend special thanks to them all for their support and insights.

The steering group identified the following six priority areas when considering how we might help to advance the healthier homes agenda for Ireland: leadership; education and upskilling; occupant empowerment; knowledge; regulation; and funding.

CBRE Ireland was commissioned by HHI to conduct an in-depth investigation into these areas, leading to the recommendations presented in this report. My thanks go to Rachael McGinley and Jamie Cole who led the project research, and to all who agreed to be interviewed for the qualitative element of the research.

This report is a beginning rather than an end, aimed at spearheading the integration of health considerations into public policy and industry delivery of both new-build and retrofit homes, in their planning, design, construction as well as householder operation.

Finally, a note of special thanks to VELUX and the Irish Green Building Council, whose support and partnership have underpinned the research and made this report possible.

Kevin O'Rourke
Chair, Healthy Homes Ireland





Executive Summary

Improving the energy efficiency of our homes and making them healthier must go hand in hand. While decarbonising our homes is critical to reaching our climate targets, health risks from poor indoor air quality, insufficient light, dampness and noise pollution must also be addressed.

This report makes a series of recommendations on how to advocate for healthy homes in Ireland. They include suggestions for the creation of a leadership body for healthy homes, upskilling industry, pathways for occupant empowerment, updates to building regulations and grant funding.

We anticipate that the evidence gathered here from academics, specialists in public health medicine, consultants, local authorities, developers, builders, approved housing bodies and industry groups will form the basis for a more integrated, forward-thinking approach to healthy homes.

KEY FINDINGS

The housing industry, academics, building designers and professional bodies recognise the importance of healthy homes and the potential benefit to the public of improving indoor environmental quality (IEQ) in our homes. However, the issue of healthy housing is highly technical, and funding programmes and policies involves several government departments and agencies. A key finding of this research therefore is the **need to create a central leadership body**.

While the IEQ of new homes built to current building regulations should be very high, it can vary significantly in existing homes. The National Retrofit Plan aims to retrofit 500,000 homes to a Building Energy Rating (BER) of at least a B2 by 2030. However, there is evidence to suggest that if a significant retrofit is implemented without adequate ventilation there can be issues with indoor air quality. HHI therefore **recommends defining IEQ best practice in Irish homes and promoting the skills, funding and policy mechanisms that can deliver healthy and energy-efficient homes**.





KEY RECOMMENDATIONS



Leadership

Advocating for change and setting joint goals for healthy homes.

- Create a national cross-disciplinary body that will provide leadership and promote action for healthier housing in Ireland.



Education and Upskilling

Developing skills in the sector to build, renovate and maintain healthy homes.

- Ensure IEQ topics are fully covered in training for housing professionals, including in apprenticeships and third-level courses and CPD.
- Establish a register of approved retrofit providers that have upskilled in energy efficiency upgrades and best practice IEQ, and linked it to retrofit grants.



Occupant Empowerment

Providing occupants, including tenants with the knowledge and tools to run a healthy home, and support when IEQ standards are not delivered.

- Run a public awareness campaign on the link between housing and health, and how to run a healthy home.
- Develop easy-to-use guidance on how to run a healthy home for tenants and retrofit customers.
- Improve guidance and avenues for redress when housing causes a risk to health to tenants and occupants.



Knowledge

Building a body of knowledge to inform best practice in achieving healthy homes.

- Commission national research to quantify the link between health and housing quality.
- Define best practice for IEQ in Irish homes.



Regulation

Ensuring compliance with existing regulation, and developing more ambitious regulations to support healthy homes.

- Utilise Irish research to improve standards and legislation for healthy homes.
- Build capacity to meet government targets for the inspection of rental accommodation.
- Consider the introduction of VOC labelling for building products and materials.



Funding

Ensuring that funding mechanisms support healthy and energy-efficient homes.

- Link retrofit grant funding with the delivery of best practice IEQ.
- Fund IEQ education for the housing industry.
- Promote the take-up of retrofit grants for private and social landlords.

DEFINITIONS

Indoor Environmental Quality

Indoor Environmental Quality (IEQ) refers to a building's indoor conditions that relate to the health and wellbeing of those who occupy it. IEQ includes factors such as temperature, lighting, air quality and acoustics.

Home retrofit

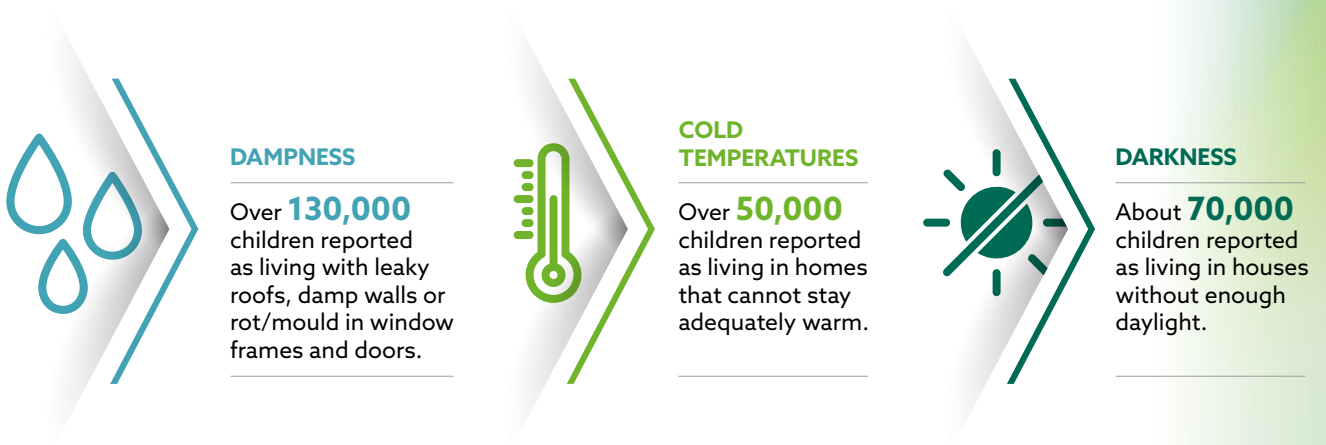
A retrofit or 'home energy upgrade' enhances the energy performance of a home. A deeper retrofit might involve multiple energy upgrade measures, including wall and attic insulation, replacement of windows and doors, addressing air tightness and ventilation and installing an efficient renewable heating system (such as a heat pump) as well as other renewable energy technologies, such as PV panels.



Introduction

Indoor environmental hazards, such as damp and mould, excessive noise, cold or lack of daylight are all-too common. In fact, **24% of households** in Ireland are negatively affected by poor indoor climate and exposed to at least one of these hazards, according to the VELUX Healthy Homes Barometer 2022.

CHILDREN IN POOR HOUSING IN IRELAND



Source: RAND Europe/VELUX Healthy Homes Barometer Ireland 2019

Health in homes is a complex topic that spans several sectors. The issues are being compounded by challenges such as skills and labour shortages, insufficient rental accommodation and the recent increase in fuel prices. The Government's commitment to improving homes in Ireland provides an opportunity to improve public health, alongside meeting targets for new homes and energy retrofits.

A position paper published in 2021 by the HSE's Public Health Medicine, Environment and Health Group states that adequate housing is a basic human right and that housing is a key socio-economic determinant

of health. Improved housing conditions can save lives, prevent disease, increase quality of life, reduce poverty and help mitigate climate change.

The recommendations contained in this report were developed following engagement with stakeholders. They provide focused and achievable solutions that aim to deliver clear benefits to occupants; for instance, in areas of Indoor Environmental Quality and 'occupant empowerment' the recommendations address a widespread need and have the potential to deliver considerable public health benefits.



ABOUT THE HHI INITIATIVE

Healthy Homes Ireland (HHI) is an initiative between VELUX and the Irish Green Building Council (IGBC). It aims to positively influence public policy and practice by bringing together stakeholders to consider how to address the health problems caused by existing low-quality homes and ensure there is no compromise between health and energy efficiency in new build and renovated homes.

The initiative is led by a Steering Group of built environment experts from the housing industry and academia who provide support and guidance and oversee progress on the aims of HHI. In addition, an open forum meets twice a year to allow wider participation in the discussions.

ABOUT THE PROJECT

HHI commissioned CBRE Ireland to review relevant existing policies and lead a programme of industry engagement to develop a series of policy recommendations. The research had two purposes:

1. To understand at a macro level the extent to which current public policy and regulation reflect or contribute to a healthy home and to identify if and where gaps exist.
2. To inform a report that makes a series of policy recommendations to the Government, prioritising those likely to have the highest impact and those that are easiest to implement.

The project brought together a wide range of industry experts and stakeholders from the housing sector, government departments, state agencies, approved housing bodies, building designers, industry associations and academia.

The recommendations were developed in 2022 and 2023 in the stages set out in Table 1.

TABLE 1. DEVELOPMENT OF POLICY RECOMMENDATIONS

Desktop review, 2022	Policy review	Analysis of Ireland's policies and how they address healthy homes.
	Literature review	Analysis of local and international literature and best practice.
	Housing sector review	Analysis of housing data, including volumes, demographics, tenure, ages and performance.
Stakeholder engagement, 2022 and 2023	Workshop 1 8th July 2022	The objective of the workshop was to refine the scope of the recommendations. A post-workshop survey was conducted to provide further direction.
	Workshop 2 15th December 2022	The second workshop took the form of a strategic forum on IEQ.
	Steering Group engagement	The HHI Steering Group provided feedback through the project.
	Virtual roundtables	In early 2023, a more focused engagement with key industry groups was used to refine the policy recommendations.
	Steering Group feedback	In April 2023, a draft of the recommendations was provided to the Steering Group for comment.
	Stakeholder survey	In May 2023, stakeholders were surveyed for final feedback on the policy recommendations.



What is a Healthy Home?



"A healthy home is a user-friendly home, sustainably designed, constructed and maintained to support its occupants' complete physical, mental and social wellbeing. It is well-ventilated, has good indoor environment quality, is free from harmful pollutants, is bright, and facilitates comfortable temperatures. It has adequate sanitation and protects from excessive noise. In addition, a healthy home is well connected to the local community, green space and sustainable transport options."

The HHI Steering Group agreed on this definition of a healthy home, which was subsequently used as a starting point for the research and engagement undertaken for this report.

In essence, a healthy home is one that is in a well-planned setting, designed and built for healthy living and properly maintained and operated.

HOW HOUSING CAN IMPACT HEALTH

The COVID-19 pandemic forced us to spend more time at home and thereby increased public awareness of our indoor environment. The population of developed countries spends an average of 92% of their time indoors, according to the World Health Organisation and the U.S. Environmental Protection Agency, with approximately 60% of this spent in their homes (Klepeis et al, 2021).

Although HHI embrace a holistic view of a healthy home, this report focuses specifically on IEQ as the most pressing issue in light of current retrofit targets, increasing fuel prices and supply shortages in the rental market. We also note that while Building Regulations set the standard for IEQ in new buildings, the majority of homes have been constructed under older versions of the Regulations, or no longer comply with regulations due to alterations or are operated in a way that compromises a healthy environment.

There are many ways in which the quality of homes and how they are operated can affect the occupant's health. This not only has an immediate effect on the householder but can also have an impact on public and health services. Studies in other

jurisdictions, such as the UK, Spain and France, show that significant savings can be made on public health spending by investing in improvements to housing quality.

For example, research by the Catalonia Institute of Energy estimates that renovating 1.5 million dwellings considered to be at risk of energy poverty would save the public administration €370 per household per year – composed of €150 in savings per household in health services costs and €220 per household in labour costs – leading to a total annual saving of €555 million to the public sector (Ortiz, 2016).

A study on the costs and benefits of renovating 7.4 million energy-inefficient dwellings (class F-G) by 2025 in France estimated annual savings of €758 million for the healthcare system. The same study reported that direct medical costs linked to poor housing amount to some €930 million per year in France, while indirect costs, including from absenteeism at work and school and associated productivity losses are up to €20 billion per year – almost 22 times more than direct costs (Renovons, 2017).






TABLE 2. IMPACT OF IEQ ON HEALTH

IEQ hazard	Impact on health
Low temperature 	<p>Scientific research clarifies that cold homes are harmful to their occupants and sometimes even deadly. There's a higher risk of stroke, respiratory infection, falls or other injuries due to people's reduced strength and dexterity in low temperatures.</p> <p>A 2014 study focusing on the island of Ireland shows a cumulative mortality increase of 6.4% in relation to every 1°C drop in daily maximum temperature. It showed similar increases in cardiovascular disease and stroke, and disproportionately higher rates of respiratory illnesses (Zeka, 2014).</p>
High temperature 	<p>The frequency and severity of climate and weather extremes is increasing in Ireland. Factors such as climate change, increased urbanisation, high rise apartments and winter energy efficiency measures increase the overheating risk. Exposure to extended periods of high temperature can cause direct and indirect health impacts in addition to discomfort, especially if sleep is degraded.</p> <p>Heat stress: The UK's Health and Safety Executive defines heat stress as occurring "when the body's means of controlling its internal temperature starts to fail". Heat stress raises core body temperature and increases heart rate, leading to heat exhaustion or heat stroke. The temperatures above which heat stress occurs vary. However, studies suggest it can occur from a wet-bulb globe temperature (a measure of heat stress in direct sunlight) of 26°C and upwards (Andrews et al, 2018).</p> <p>Unintentional injury and accidents: There is clear evidence that high temperatures can increase the risk of injury, particularly in children. A literature review found that on days with moderate temperatures, the increased injury risk varied between 0.4% and 5.3% for every 1°C increase in temperature (Otte im Kampe, E., Kovats, S., & Hajat, S., 2016).</p>
Lack of fresh air 	<p>Ventilation is key to providing good levels of fresh air and reducing risks to health from indoor pollutants. A lack of adequate ventilation can lead to dampness, mould and increased levels of indoor air pollutants.</p> <p>Ventilation in homes varies greatly. Older homes may typically be ventilated through windows and permeable building fabric. Newer homes may include wall vents and mechanical ventilation.</p> <p>The contaminants that determine/define indoor air quality are numerous, but include priority pollutants such as carbon monoxide, particulate matter and volatile organic compounds (VOCs). Most indoor air pollution comes from sources inside the building. Therefore, it is key to control the sources of these contaminants and to ensure their removal through proper ventilation.</p>
Dampness and mould 	<p>Normal household activities such as showering and cooking generate moisture, which can become trapped within a building. Damp can be caused by poor building fabric, leaks and poor ventilation and it can be exacerbated if an occupant does not keep their home adequately heated, which is often an issue for those in fuel poverty.</p> <p>People living with mould are more likely to suffer from respiratory illnesses, infections, allergies or asthma. Mould can emit spores, cells, fragments and VOCs into the air. Inhaling or touching these spores can cause an allergic reaction, trigger asthma attacks and cause coughing, wheezing and breathlessness.</p>



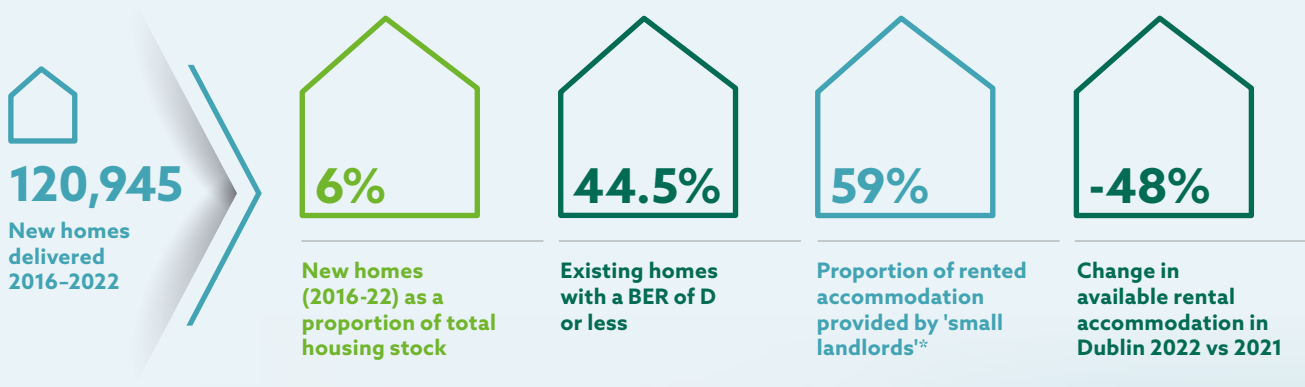
TABLE 2 CONTINUED. IMPACT OF IEQ ON HEALTH

IEQ hazard	Impact on health
Indoor air pollutants 	<p>Indoor air pollutants (IAPs) can have a significant impact on respiratory, cardiovascular, neurodevelopment and cognitive function.</p> <p>IAPs can be of concern in retrofitted homes due to the introduction of new paints, insulation and other products and the increased airtightness of the fabric and the lack of or poor operation of new ventilation systems. Particulate matter (PM2.5), radon, formaldehyde, nitrogen dioxide, benzene and carbon monoxide are among many health-relevant pollutants measured in retrofitted buildings, often at concentrations exceeding guidance values. IAPs can be managed by ensuring that a proper ventilation system is installed, that it is operated correctly and that pollutants are prevented from entering the home (Coggins et al, 2022).</p>
Daylight 	<p>Exposure to daylight helps us sleep better at night and improves our mental wellbeing. Light in the morning increases our levels of alertness, allowing increased performance at the beginning of the day. From mid-morning to early evening, high daylight levels allow us to regulate our sleep/wake timing and levels of alertness. In contrast, reduced light levels in the evening and a dark room with blackout promote sleep at night. The inability to provide building occupants with a good overall lighting environment can impact health (Lam, 1977; Boyce et al, 2003; Reinhart, 2014).</p>
Noise 	<p>One important function of the building envelope is to protect the interior from unwanted noise. Noise can significantly impact the health and performance of building occupants by causing stress and headaches, preventing sleep and even contributing to learning difficulties (National Institute of Occupational Health in Denmark, 2006). Therefore, sound insulation should be an important parameter of building components.</p>





The Irish Housing Sector



Sources: Central Statistics Office, Daft.ie

*A small landlord is defined as someone who owns one or two rental properties.

SHORTAGE OF HOUSING

The Government's Housing for All plan states that there are not enough houses to buy or rent in the private sector and not enough social housing being built. Given that the embodied carbon emissions of a deep residential retrofit are typically about a quarter of that of a new-build, these emissions must be considered. Embodied carbon emissions are those emissions associated with the manufacturing, transportation, construction, and end-of-life phases of building materials and systems). Research shows that Ireland cannot reach its 2030 targets if the requirement for homes is exclusively delivered through new-build (Kinnane et al, 2022).

Under Housing for All, the Government has pledged to build an average of 33,000 new homes annually from 2021 to 2030. However, to meet Ireland's housing needs and climate targets, it is important to also consider how additional high-quality housing can be delivered through the retrofit and renovation of derelict or underused properties¹.

Building Regulations are a set of legal requirements governing new housing and major renovations (where at least 25% of a building's fabric is affected). They set standards for ventilation, thermal comfort, lighting and other IEQ issues. As highlighted in HHI's definition of a healthy home, a dwelling also needs to be connected to the local community, green space, and sustainable transport options to be truly healthy, issues that are not currently included in the Building Regulations.

¹ The 2022 census showed that 166,000 properties were vacant in Ireland, and that more than 48,000 had been vacant for six years or more. However, recent land use surveys from the Collaborative Town Centre Health Check (CTCHC) Programme show that this is only the tip of the iceberg. They highlight that the ground floor commercial vacancy rate in towns in Ireland is 18 - 45%, many times higher than the target rate of 5% in Europe. The upper floors in Ireland's towns are around 80% vacant. Both these levels are disproportionately high in a European context.

Given that the embodied carbon emissions of a deep residential retrofit are typically about a quarter of that of a new-build, these emissions must be considered. Embodied carbon emissions are those emissions associated with the manufacturing, transportation, construction, and end-of-life phases of building materials and systems). Research by Kinnane et al. (2022) show that Ireland cannot reach its 2030 targets if the requirement for homes is exclusively delivered through new-build.



HOUSING SUPPLY ISSUES

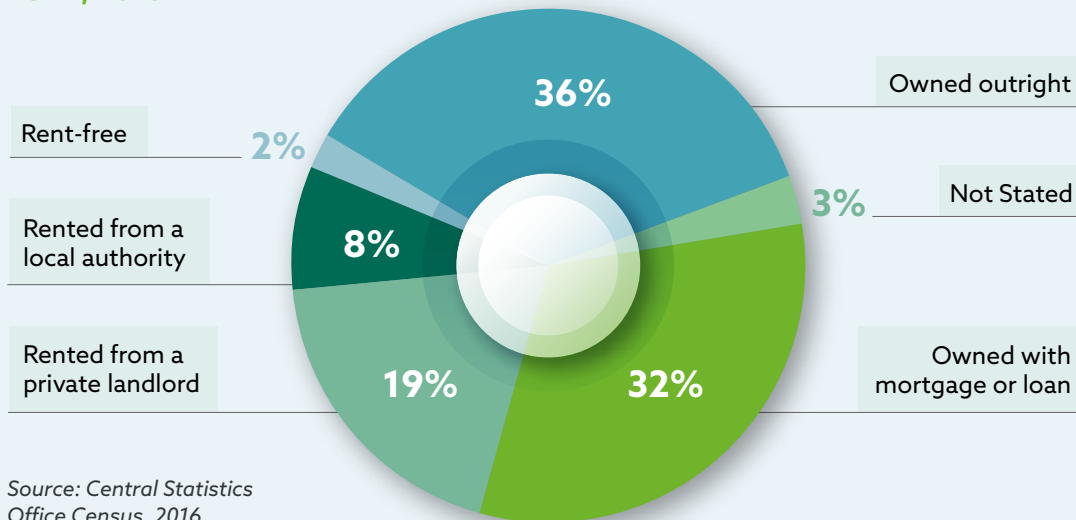
Home occupiers of different tenures require different types of support to improve the IEQ of their homes. Policies designed to support owner-occupiers are different from the mechanisms that support tenants. Owner occupiers, for instance, can avail of retrofit grants, whereas tenants rely on their landlord or housing provider to improve the quality of their home.

Tenants' lack of control of home IEQ is compounded by the shortage of rental accommodation in Ireland, which affords tenants fewer options if they wish to move and can lead to a reluctance to raise complaints with landlords. The rental shortage is particularly notable in Dublin, where there were around 15,000 homes listed for rent in Dublin in 2022, down 48%

from the total for 2021. Furthermore, the cost of renting a room in Dublin was roughly 12% higher on average in late 2022 than a year earlier, according to Daft.ie.

In 2021, small landlords (those with one or two properties) owned 58% of registered rental properties. Given the small scale it is likely they will have limited financial capacity to undertake upgrades and limited awareness of how to access support for retrofitting. Policy recommendations therefore need to support landlords, especially small-scale ones, to upgrade their properties and encourage them to stay in the market.

PROPERTY OWNERSHIP BY TENURE, 2016





IMPLEMENTATION OF STANDARDS IN THE RENTAL SECTOR

Accommodation standards in the rental sector are protected by the Minimum Standards for Rented Accommodation guidelines issued by the Department of Housing, Local Government and Heritage in 2021. They include a high-level description of the expected quality of housing in both the private and social rental sectors. They stipulate that accommodation should be warm and well-ventilated, among other things, but does not provide specific performance targets, making it difficult to enforce a specific standard of IEQ.

Local authorities are responsible for conducting inspections and enforcing housing standards under the Housing Miscellaneous Provision Act 1992. The Housing for All plan includes a target for rented accommodation to be inspected every four years; however, it is widely acknowledged that local authorities have not met targets due to the pandemic and resourcing issues.

The National Oversight and Audit Commission (NOAC) showed that approximately 5% of registered tenancies (17,594 properties) were inspected by local

authorities in 2021, well below the Government's target of 25% per year, and that some 90% of these failed to meet minimum rental standards.

To maintain rental standards, it is important that clear targets are set, and that compliance is monitored and enforced. However, as most landlords in Ireland are small-scale with one or two properties, appropriate technical and financial supports are also required to support improvement.

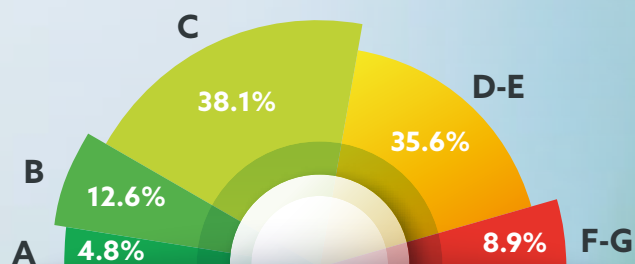
Given the current rental shortage, tenants may also be less likely to raise complaints regarding IEQ with their landlords for fear that they might terminate the tenancy or increase the rent. It is hence recommended that tenants are provided with improved information on IEQ issues, including how to operate their homes and how to seek support if a complaint needs to be raised with the landlord. This information should be communicated by methods that best suit the audience, whether as a traditional document, online app or video, and should be communicated in plain language by trusted messengers.

ENERGY PRICES AND FUEL POVERTY

The recent sharp increase in energy prices is having an impact on health and wellbeing in our homes. Domestic consumers were paying an average of 80% more for electricity and gas in November 2022 compared with November 2021, according to Central Statistics Office (CSO) data. Estimated annual electricity and gas bills in November 2021 were €1,193 and €1,015, respectively, compared with €2,167 and €1,887 a year later.

Statistics published by the Economic and Social Research Institute in 2022 also show that almost one quarter of households in Ireland are at risk of fuel poverty.

RENTAL PROPERTIES BY BER



Source: Central Statistics Office Census, 2021.



Energy poverty is a multidimensional phenomenon and can arise from a combination of factors, including low income, spending a high proportion of household income on energy and poor energy efficiency of dwellings (Article 29 of EU Directive 2019/944). In Ireland, a household is deemed to be in energy poverty if it spends more than 10% of total income on energy, according to the Energy Poverty Action Plan published by the Department of the Environment, Climate and Communications in 2022.

Maintaining a healthy temperature in a home can strain household budgets for those in energy poverty. If homes are not heated or ventilated adequately, mould can become a significant health risk. The Energy Poverty Action Plan states that living in a cold, damp home has major impacts on health, including through increased susceptibility to respiratory and cardiovascular diseases, excess winter mortality and mental stress.

CSO data from 2021 states that more than 40% of rental homes have a BER of D or lower. These lower-rated homes are much more costly to heat during winter, which leads to low temperatures and issues with dampness and mould. Many tenants living in

housing with poor energy efficiency struggle to pay inflated heating bills and have limited options to remedy the situation.

Annual exchequer expenditure exceeds €500 million to over 500,000 homes (under the National Fuel Scheme and Household Benefits Package) in support aimed at protecting against energy poverty. Within this, Fuel Allowances represent an annual payment of around €700 to long-term social welfare recipients. In terms of capital expenditure, the Better Energy Warmer Homes Scheme and its predecessor schemes operated by SEAI have invested in energy efficiency upgrading of around 150,000 owner-occupied homes. In addition, local authorities have invested in the energy efficiency upgrading of parts of their housing stock.

While the SEAI Fully Funded Energy Upgrade scheme has recently been reviewed, a recent study by the Economic and Social Research Institute shows this assistance does not necessarily reach all households who experience energy poverty. For instance, larger urban families who live in rented or mortgaged dwellings may not be considered to be in income poverty but may still experience fuel poverty.

IEQ in Home Energy Upgrades

The National Retrofit Plan sets out how the Government will deliver on Ireland's target to retrofit 500,000 homes to a BER of B2 by 2030. Under the Local Authority Retrofit Programme the Government is also committed to retrofitting approximately 36,500 local authority homes in the next decade.

Support packages have been developed to make it easier and more affordable for homeowners, landlords

and social housing providers to undertake home energy upgrades that will result in warmer, healthier and more comfortable homes.

These measures aim to improve the thermal and energy efficiency of the building envelope, while supporting decarbonisation of heating. All these actions can contribute to an improvement of the IEQ of homes.

ENERGY UPGRADES FUNDED BY THE SUSTAINABLE ENERGY AUTHORITY OF IRELAND, 2019-2022



Source: Sustainable Energy Authority of Ireland.



Ventilation

Ventilation is a key factor in determining indoor air quality and thermal comfort and therefore needs to be considered when undertaking retrofitting. While improving thermal efficiency reduces energy consumption, indoor air quality may become compromised if adequate ventilation is not provided and maintained.

Adequate ventilation should be provided to supply fresh air, exhaust any pollutants and prevent mould. This should be considered as part of the design and delivery of a home retrofit. Implementing improved ventilation could be incentivised by setting standards and targets for IEQ and providing IEQ training to retrofit providers.

Poor ventilation can arise from improper operation of ventilation systems. Recent research on indoor air quality, thermal comfort and ventilation in 'deep' energy retrofitted dwellings in Ireland found that air quality was negatively impacted by improper handover, inadequate cleaning and maintenance of ventilation systems (M. Coggins, 2022).

It is therefore recommended that improved, plain language guidance is provided to occupants on how to run a healthy home. This is particularly important for retrofits and rental properties where the occupants may be unfamiliar with the building's systems.

Indoor Pollutants

Insulation, paints, furniture, and other products can introduce pollutants such as volatile organic compounds and formaldehyde that can have a detrimental effect on human health. A better insulated and tightly sealed home can worsen the effects of such pollutants in the home. The incidence of VOC emissions from construction materials or new furniture can be short term but may still be long-term in their health impact.

Radon

Radon is a radioactive gas that can cause lung cancer. It is formed in the ground by the radioactive decay of uranium in all rocks and soils. It cannot be seen or smelt and can only be measured with special detectors. Radon causes about 350 cases of lung cancer per year, making it the second biggest cause of lung cancer after smoking.

Radon is addressed in Technical Guidance Document (TGD) C of the Building Regulations for new homes. However, there is no guidance on the management of radon as part of a retrofit project. Research has indicated that predicted radon concentrations have the potential to increase by up to 107% following an energy retrofit due to inadequate ventilation (A. McGrath et al, 2021). However, radon levels can increase or decrease based on different ventilation guidelines. Pre- and post-renovation radon testing is encouraged in the Build Upon - Energy Renovation Framework Methodology developed by the Irish Green Building Council.

Operation of new technologies

In some cases, the retrofit of a home could involve new technologies, such as heat pumps, or require operation that is different to an occupant's previous experience. It is proposed that all retrofit providers issue clear, user-friendly guidance to the occupant on the operation of new technologies and how to manage their home for a healthy environment, for example by maintaining an adequate temperature and ventilation. This could be provided in a variety of formats and be supplementary to the documentation supplied with the newly installed equipment.





CONSTRUCTION INDUSTRY SKILLS SHORTAGE

A significant obstacle to achieving the Government's 2030 target to retrofit 500,000 homes to a B2 BER is the shortage of appropriately skilled workers². In addition, inflation across the construction sector and material supply chain constraints are significant barriers to delivery and are likely to remain so in the medium term.

The Department of Further and Higher Education, Research, Innovation and Science (DFHERIS) estimates there will need to be around 18,000 new entrants to the housing sector to meet retrofitting targets. The Department's Report on the Analysis of Skills for Residential Construction & Retrofitting, 2023 to 2030, says that training of these new entrants will also provide an opportunity to upskill the housing industry on delivering IEQ best practices alongside energy upgrades.

The following actions should be considered to address current skill and labour shortages:

- Develop a strategy to attract new entrants,
- Ensure that new entrants have appropriate skills, gained either through apprenticeships or third level courses, and
- Encourage those tradespersons and professionals already in the housing industry to upskill in energy efficiency and IEQ.

NATIONAL STUDY

The HHI working groups found that the research into relationships between healthy housing and public health expenditure was compelling and recommend that a national study be undertaken. This would help garner support for healthy homes from key Government Departments, including the Department of Health and the Department of Social Protection.

CALCULATING THE COST OF POOR HOUSING IN IRELAND

The Building Research Establishment (BRE) has authored a report that examines the impact of poor housing in Ireland. Its findings are derived from a model developed by BRE to extrapolate survey results from the 2016 Northern Ireland House Condition Survey, which suggests around 160,000 (8%) of Irish homes are likely to present a serious health and safety risk to their occupants (and visitors). This compares with 9% in Northern Ireland, 11% in England and 18% in Wales. Ireland's apparent better conditions are largely driven by the low age of its housing stock, among the lowest in Europe.

Hazards related to cold in the home include accidents, particularly falls. The report found that these issues are not expensive to rectify, but if ignored could cost the country €1.25 billion a year in health and care services, plus the distress and lost opportunities to the victims and their families. This figure is similar to an estimate from a pan-European study undertaken in 2016, using self-reported data on housing conditions from Irish households.

THE COST OF POOR HOUSING IN ENGLAND

In another recent BRE paper, The Cost of Poor Housing in England – 2021 Briefing Paper, the authors estimated that it costs the National Health Service some £1.4 billion (€1.6 billion) per year to treat people affected by poor housing.

When societal costs are included, they estimate that the full cost to society of leaving people living in poor housing amounts to £18.5 billion (€21.3 billion) per annum.

² While the target is to retrofit 500,000 homes by 2030 some have already been completed.



WARMTH AND WELLBEING PILOT SCHEME

The Warmth and Wellbeing Pilot Scheme was aimed at improving the living conditions of vulnerable people living with chronic respiratory conditions. Launched in 2016, it aimed to validate, in an Irish context, the strong international evidence that making homes warmer and more energy efficient can have a positive impact on the health and wellbeing of people living with chronic respiratory conditions.

It was a joint policy initiative between the Department of Communications, Climate Action and Environment and the Department of Health and was delivered by a team comprised of officials from the Sustainable Energy Authority of Ireland (SEAI) and the Health Service Executive (HSE). An independent analysis validating and objectively measuring the health and wellbeing impacts was carried out by the London School of Hygiene and Tropical Medicine, in collaboration with the HSE.

The scheme was open to people aged 55 and over or aged 12 and under living with chronic respiratory conditions in households that were in receipt of certain welfare payments. The scheme worked on a referral basis and an approved surveyor identified which upgrades were most suitable for the home. Improvements included attic and wall insulation, boiler replacement and window and door replacement where necessary. Appropriate ventilation was also provided in line with retrofitting standards.

Initial reports indicate that the upgrades delivered benefits to the health and wellbeing of participants and if the research confirms this empirically then it will be used to inform future Government decisions about approaches to retrofitting.

The London School of Hygiene and Tropical Medicine was commissioned to assess the impact of the scheme. The impact indicators being tracked include changes in hospitalisation rates, medication usage, general wellbeing and mental health, social and school absenteeism and overall improvements in quality of life.

The research analysed these changes using questionnaires and other data gathered from the households. The analysis also examined the potential to adapt existing modelling methods to assess the impact of home energy efficiency measures on outcomes that arise over longer time scales than the Warmth and Wellbeing Scheme evaluation. It also sought to assess how the interventions contribute to reduction in inequalities in outcomes with regard to age, gender and socio-economic status. Researchers derived an inventory of the health- and environment-related costs and benefits of home energy efficiency interventions as inputs for subsequent cost-benefit analyses.

TABLE 3. STAKEHOLDER PERSPECTIVES FROM THE WARMTH AND WELLBEING PILOT SCHEME



Mr and Mrs Smyth, participants in the scheme, have already seen an improvement in their living environment. Rooms are no longer damp with condensation, the house retains more heat leading to reduced fuel bills, and replacement of windows and doors has led to an increased sense of personal security.



Since the works were carried out, the child has shown an improvement in their respiratory illness. The child who previously had difficulty playing sports is now able to train and compete on a soccer team three times a week.



The mother of a 10-year-old child who suffers from asthma (that requires treatment with inhalers twice daily and led to an average of two chest infections per year) has expressed delight and satisfaction with the scheme.



Mr Smyth who suffers from Chronic Obstructive Pulmonary Disease (COPD) and is on daily medications with frequent hospital admissions, has stated that early signs indicate the symptoms of his COPD appear less severe than previous years.



Healthy Homes-Related Policies

A review of government policies related to healthy homes was undertaken to help HHI shape its series of recommendations (see appendix for full review of housing policy). At a high level, it was found that there is a strong policy platform for increasing

housing stock and energy efficiency, as linked to the government's housing and climate targets. However, it also found less policy support for healthy IEQ standards in existing homes.

SUMMARY OF HOUSING POLICIES THAT ADDRESS IEQ

Seventeen policies relating to housing in Ireland were reviewed to identify those directly setting standards for IEQ in homes or the delivery, retrofitting and occupancy of healthy homes. The policies that were identified as having the most potential for improving health in homes were identified as:

- The Building Regulations (Department of Housing, Local Government and Heritage)
- National Retrofit Plan (Department of Environment, Climate and Communications, and Department of the Taoiseach)
- Housing for All (Department of Housing, Local Government and Heritage)
- Minimum Standards in Rented Accommodation (Department of Housing, Local Government and Heritage)
- Climate Action Plan (Department of Environment, Climate and Communications, and Department of the Taoiseach).

The Government's focus on energy efficiency has improved the approach to thermal comfort and fresh air. However, other elements of IEQ, such as acoustics and lighting, are less well supported by the policies reviewed.

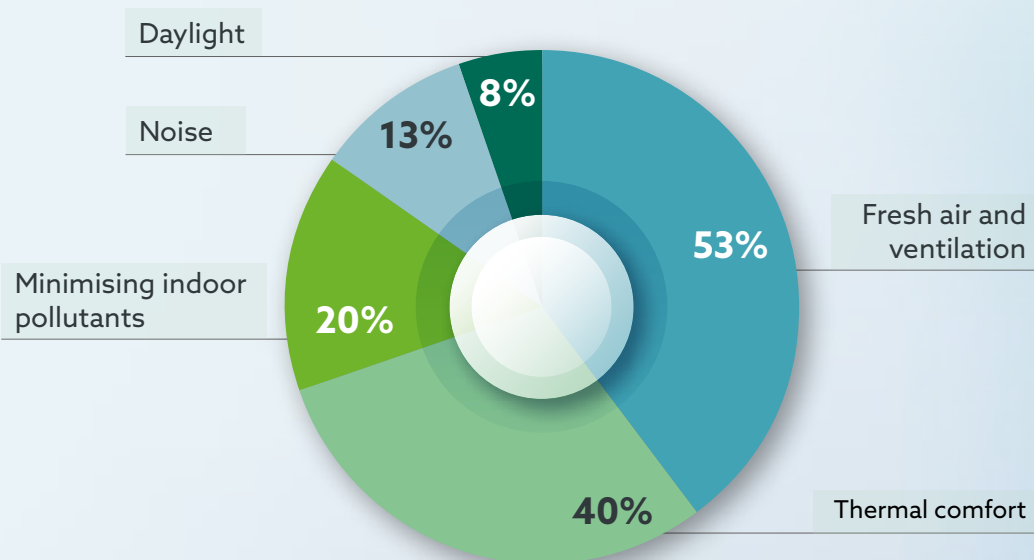
In addition, it would be beneficial to have collaboration between those departments charged with delivering housing targets and climate change goals and those responsible for improving public health and wellbeing. It is therefore recommended to create a leadership body to improve cross-department cooperation and to commission national research to demonstrate the benefit of healthy homes to public health services.





TABLE 4. PROPORTION OF POLICIES THAT ADDRESS IEQ

Issue	% of housing policies reviewed that address IEQ or set performance standards
Fresh air and ventilation	53%
Thermal comfort	40%
Minimising indoor pollutants	20%
Noise	13%
Daylight	7%





Policy Recommendations

This section makes policy recommendations for healthy homes, prioritising those likely to have the highest impact and those that are easiest to implement. In many cases, they support existing government policies, such as increasing energy efficiency through retrofitting, addressing energy poverty and upskilling the construction industry.

Indeed, the Government target to retrofit 500,000 homes by the end of the decade provides a unique opportunity to improve IEQ in existing homes. HHI believes that incentives and programmes that support healthy homes need to be underpinned by increased knowledge of their impact on health in the Irish context and the development of clear best-practice guidance for IEQ standards in homes.

A timeframe is associated with each of the recommendations. Short-term indicates implementation within one to two years, while medium-term signifies two to five years and anything beyond that is described as long-term.

KEY RECCOMENDATIONS



Leadership



Education and Upskilling



Occupant Empowerment



Knowledge

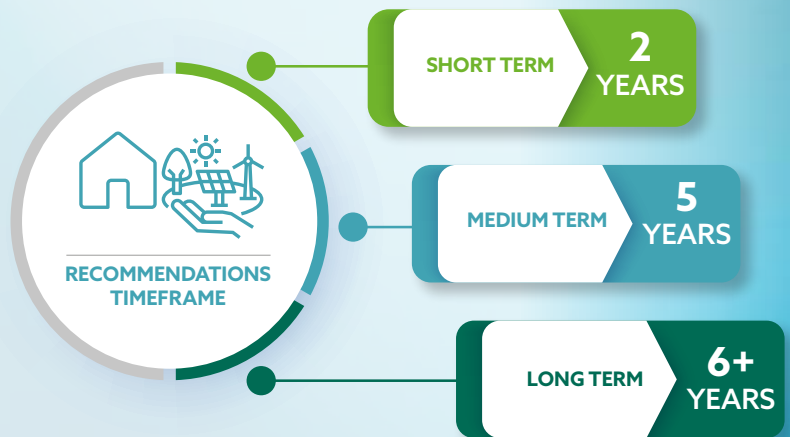


Regulation



Funding

RECCOMENDATIONS TIMEFRAME





Leadership

Creating long-lasting, impactful changes will require collaboration across the housing, construction, energy efficiency and public health sectors. There was consensus amongst workshop participants on the need for a central leadership body to advocate for change and set joint goals.

Participants recognised that leadership would also be required from several key government departments, including the Department of Health, Department of Housing, Local Government and Heritage and the Department of Environment, Climate and Communications. It is envisioned that this leadership group could coordinate the implementation of the recommendations contained within this report and act as a hub for knowledge and expertise on healthy housing. There is a need for a leadership body to act as a trusted voice on the impact of the home on health and how a healthy home can be achieved.

TABLE 5. LEADERSHIP

Recommendation	Owner	Timeline
<p>1: Create a national cross-disciplinary body that will provide leadership and promote action for healthier housing in Ireland. It should include representatives from the following organisations:</p> <ul style="list-style-type: none">• Department of Health• Health Service Executive• Department of Environment, Climate and Communications• Sustainable Energy Authority of Ireland• Department of Housing, Local Government and Heritage• The Housing Agency• Department of Further & Higher Education, Research, Innovation & Science• Local authorities• Approved housing bodies• Building trade and professional bodies• Training bodies• Occupant and consumer representatives• Building owner representatives• Leading research centres in universities	Government	Short-term



Education and Upskilling

While the general public and housing industry are becoming more aware of energy efficiency, there is less knowledge on how homes can impact health and how a home can be renovated and operated to improve wellbeing.

The Government recognises the importance of upskilling to achieve energy retrofit targets, as evidenced by its inclusion in Pillar 3 of the National Retrofit Plan. To achieve healthy, as well as energy-efficient homes, it is recommended that education on best practice IEQ is delivered as part of the Government's targets for upskilling in the housing industry. Workshop participants also identified the need for the inclusion of IEQ issues in the education of industry professionals, such as architects, tradespeople, builders, and project managers.

TABLE 6. EDUCATION AND UPSKILLING

Recommendation	Owner	Timeline
2: Improve IEQ skills of professionals entering the housing industry by including relevant modules in apprenticeships and third-level education.	Universities, solas, education and training boards and professional bodies such as the RIAI, SCSl, Engineers Ireland and CIBSE	Long-term
3: Promote and incentivise the upskilling of building professionals and construction trades to provide best-practice IEQ when delivering housing upgrades.	Training providers, universities, education and training boards, professional bodies and government	Medium-term
4: Establish a register of approved retrofit providers that have been trained in energy upgrades and best practice IEQ.	Government	Medium-term
5: Link SEAI grants for AHBs to the use of approved retrofit providers. (4)	Government	Medium-term
6: Link Department of Housing, Local Government and Heritage funding for local authorities (under the Energy Efficiency Retrofitting Programme for Social Housing) to providers who have undertaken IEQ training. (4)	Government, local authorities	Medium-term
7: Train AHBs and local authorities to maintain homes for better occupant health outcomes and communicate with tenants on how to improve IEQ in homes.	Government	Medium-term



Occupant Empowerment

One of the major factors determining the health of a home is the operation of that home and its systems. Improving the information available to the occupants and the clarity with which this information is communicated should help the inhabitants operate a healthy home.

During the project workshops there was considerable discussion about the impact of occupants on the operation of a home. Numerous examples were given, including cases where vents were covered or blocked, rooms were kept at inadequate temperatures and occupants did not understand how to operate retrofitted systems. In the rental sector, the

Minimum Standards in Rented Accommodation require that information must be provided to tenants on the property, building services, appliances and their maintenance requirements. For retrofits, system documentation is handed over on project completion as part of the SEAI grant requirements.

However, during the roundtable discussions participants heard that this information can be technical and not always user-friendly, particularly to people with English as a second language. Good examples of tenant information and guidance have been developed in the social housing sectors. The private rental and retrofit sector should develop their own approach to effective communications and handover.

TABLE 7. OCCUPANT EMPOWERMENT

Recommendation	Owner	Timeline
8: Conduct a public awareness campaign on the impact of housing on health and how to run an energy-efficient and healthy home.	Government	Medium-term
9: Develop best-practice guidance on how to deliver building user guides for operating new and retrofitted homes to occupants.	SEAI	Short-term
10: Develop best-practice guidance and templates that help tenants to implement healthy and energy-efficient home operations.	IPOA, SCSi, Threshold, RTB	Short-term
11: Provide additional funding and support to improve tenant representation and action when a rental property causes a health risk or does not meet the Minimum Standards in Rented Accommodation.	Government	Medium-term
12: Develop a process for swift interventions for occupants when unhealthy housing poses an immediate and serious health risk, for example, provision of alternative accommodation where there is an immediate health risk from mould.	Government	Medium-term
13: Create an ombudsperson for local authority and AHB tenant redress where a home does not provide a healthy environment.	Government	Medium-term



Knowledge

While international and localised Irish studies have made the link between homes and health, there has been no national survey of housing condition for more than 20 years. Nor has there been any published study on the link between housing condition and health impacts and social costs.

To help deliver healthy homes, more data is required on the scale of the issue and the potential benefits of improving housing. It will also stimulate engagement among required stakeholders.

In its consultation of the evidence, HHI recognised the benefits of a study such as

that undertaken in England by BRE on the link between housing condition and NHS spend. It is recommended that a similar study be undertaken for Ireland.

During workshops and stakeholder discussions it was highlighted that there is no clear, widely adopted definition of what constitutes IEQ best practice in Irish homes. It is recommended that an evidence-based definition of best practice is developed by the housing industry, which can provide the basis for future housing standards and policy recommendations. Leading the development of the standards could be a role for the HHI or the national cross-disciplinary body included in recommendation 1.

TABLE 8. KNOWLEDGE

Recommendation	Owner	Timeline
14: Commission a comprehensive national study on the impact of housing conditions on health in Ireland. It should investigate the link between poor housing and public health expenditure and social impact.	Government, industry	Medium-term
15: Undertake pilot schemes where the medium- to long-term health impacts of IEQ conditions are quantified through monitoring of IEQ in housing.	Government	Short-term
16: Adopt building regulations (technical guidance documents D, E, F, L and K) as IEQ best-practice in existing homes and for development of policy and guidance in the short term.	Industry	Short-term
17: Create an evidence-based definition of best-practice IEQ standards for housing in Ireland. This definition can be included in guidance and policy as it is developed.	Government, industry, NSAI	Long-term



Regulation

Standards for new homes, including aspects of IEQ, are defined by Building Regulations. However, existing housing may have been constructed under the previous versions of the Building Regulations or need to be adequately maintained to provide healthy accommodation.

The main regulatory mechanism for management of the quality of IEQ in rental accommodation is Minimum standards in

Rented Accommodation. It was recognised by HHI, both in the research and in the stakeholder engagement phases, that improving the enforcement of these standards would be beneficial for the health of tenants.

In addition, following the development of best-practice IEQ standards for healthy homes (see above), the Minimum Standards regulation should be updated to include more specific requirements such as temperature ranges, amongst other parameters.

TABLE 9. REGULATION

Recommendation	Owner	Timeline
18: Update the Minimum Standards in Rented Accommodation regulations to include specific performance requirements based on IEQ best-practice standards.	Government	Medium-term
19: Improve enforcement of the Minimum Standards in Rented Accommodation and achieve the Government's Housing for All target to inspect rental properties every four years.	Government, local authorities	Short-term
20: Support local councils in enforcement of the Standards or find an alternative mechanism for inspections, such as estate agents.	Government, local authorities	Medium-term
21: Introduce VOC labelling on construction products (as in other European countries) to increase transparency and raise awareness about the issue.	Government, industry	Long-term



Funding

The main sources of funding for improvements to existing, privately-owned homes are the SEAI grant schemes. In the social housing sector, the Department of Housing, Local Government and Heritage provides funding to local authorities under the Energy Efficiency Retrofitting Programme for Social Housing.

To date, the focus of the grants has been on energy efficiency, however energy efficiency and IEQ should be considered together as a part of a retrofit to provide the best outcome for the occupant. The focus on energy often results in a warmer home but can sometimes lead to poor indoor air quality if the building is poorly ventilated, or the ventilation is poorly operated.

TABLE 10. FUNDING

Recommendation	Owner	Timeline
22: Link energy retrofit grants to IEQ outcomes and energy use reduction targets. The project should be delivered by approved providers (who have been trained in IEQ best practice) and a user manual should be supplied to the occupants. Ideally, this would be linked to the Building Renovation Passport to be introduced through the proposed revision of the Energy Performance of Buildings Directive (EPBD), to facilitate access to the information and transparency.	Government	Medium-term
23: Require that projects funded by energy retrofit grants use low VOC construction products based on European best practice and Recommendation 21.	Government	Medium-term
24: Allocate funds for upskilling within the industry to achieve best practice IEQ	Government	Short-term
25: Allocate funds for the development of more user-friendly information for the occupant post-retrofit.	Government	Short-term
26: Review SEAI Fully Funded Energy Upgrade criteria to better support households experiencing fuel poverty.	Government	Medium-term
27: Improve access to and awareness of retrofit funding and support mechanisms to encourage more social and private landlords to improve energy efficiency and health standards.	Government	Medium-term



Appendix 1

HEALTHY HOMES-RELATED POLICIES REVIEWED

- Building Regulations 2022 (*page 30*)
- National Retrofit Plan 2022 (*page 31*)
- Housing for All – A New Housing Plan for Ireland 2021 (*page 31*)
- Minimum Standards in Rented Accommodation 2021 (*page 32*)
- Climate Action Plan 2023 (*page 32*)

OTHER POLICIES AND GUIDANCE REVIEWED

- Design Manual for Quality Housing
(replaced the Quality Housing for Sustainable Communities, 2007)
- Ireland's Long-Term Renovation Strategy 2020
- Ireland's National Skills Strategy 2025
- National Planning Framework: Ireland 2040 Our Plan
- National Development Plan 2021–2030
- Roadmap for Social Inclusion 2020–2025
- Strategy to Combat Energy Poverty 2016–2019
- Draft Clean Air Strategy Public Consultation March 2022
- Energy Poverty Action Plan 2022
- Employer's Requirements for Detail Design of Quality Housing 2020
- NSAI Code of Practice for the Energy Efficient Retrofit of Dwellings (S.R. 54:2014 Code of Practice)
- Energy Poverty Action Plan 2022



Appendix 2

REVIEW OF HEALTHY HOMES-RELATED POLICIES







BUILDING REGULATIONS						
Latest Release: 2006-2022			Government Department: Department of Housing, Local Government and Heritage			
Purpose	<p>The Building Regulations aim to provide for the safety and welfare of people in and around buildings. They apply to the design and construction of a new building (including a dwelling) or an extension to an existing building.</p> <p>Under Housing for All, the Government's housing plan for 2030, a Building Regulations Advisory Body consisting of key construction industry stakeholders across private and public sectors will be re-established to advise the minister on matters relating to the Building Regulations. In addition, existing Building Regulations will be reviewed on an ongoing basis.</p> <p>The minimum performance requirements a building must achieve are specified in the second schedule to the Building Regulations. These requirements are set out in 12 parts (classified as Parts A to M):</p>					
Coverage of health in housing	<p>The Building Regulations comprise several 'Parts', some related to IEQ and home health. These include:</p> <ul style="list-style-type: none"> Part C - Site Preparation and Resistance to Moisture Part E - Sound Part F - Ventilation Part J - Heat Producing Appliances Part L - Conservation of Fuel and Energy 					
Opportunities	<p>Part L is linked to the EU Energy Performance of Buildings Directive (EPBD) and focuses on providing minimum insulation, thermal comfort standards and indoor air quality. Under the proposed revision of the EPBD, minimum energy performance standards (MEPS) may be introduced, which could provide an opportunity to introduce minimum IEQ standards.</p>					
Challenges	<p>The Building Regulations apply to new buildings and major renovations where more than 25% of the surface area of a building is renovated. With around 90% of existing homes constructed before 2000, the majority of Irish housing will have been constructed to meet previous versions of the Building Regulations.</p> <p>The building code typically takes a prescriptive approach to performance, rather than actual operational performance. For instance, it specifies what insulation is required rather than an internal home temperature range.</p>					
Topics covered	<p>Thermal comfort</p>	<p>Ventilation</p>	<p>Indoor pollutants</p>	<p>Daylight</p>	<p>Artificial lighting</p>	<p>Noise</p>









NATIONAL RETROFIT PLAN						
Latest Release: 2022			Government Department: Department of the Environment, Climate and Communications; Department of the Taoiseach			
Purpose	The National Retrofit Plan was published as part of the Climate Action Plan and aims to outline how to deliver on Ireland's retrofit targets. The Plan is designed to address barriers to retrofit across four key pillars: driving demand and activity; financing and funding; supply chain, skills and standards; and governance.					
Coverage of health in housing	Mentions the co-benefits of retrofitting as better insulated and more efficient homes that are expected to improve dwelling temperatures and air quality.					
Opportunities	Plan for higher annual targets for both volumes of retrofits and standards. There are opportunities to improve not just BER but overall IEQ. The National Retrofit Plan includes a pillar on supply chain, skills and standards, which is aligned with the recommendations of this report.					
Challenges	Grants mainly target homeowners for retrofitting. Annual retrofits completed to date are not on track to meet the 500,000 retrofits target by 2030.					
Topics covered	 Thermal comfort	 Ventilation	 Indoor pollutants	 Daylight	 Artificial lighting	 Noise

HOUSING FOR ALL						
Latest Release: 2021			Government Department: Department of Housing, Local Government and Heritage			
Purpose	To deliver more affordable and efficient housing where needed.					
Coverage of health in housing	The only health focus of this policy is to address the homelessness problem in Ireland. It suggests creation of a new National Homeless Action Committee to examine individual health and family circumstances that contribute to homelessness. It includes targets for implementation of the Minimum Standards in Rented Accommodation regulations.					
Opportunities	There is an opportunity to factor IEQ into new homes. There is also an opportunity to enforce and improve the inspections required for rented accommodation standards.					
Challenges	The policy focuses on delivering new-build homes for purchase, rent and social housing. There is reference to implementation of the Minimum Standards in Rented Accommodation regulations, but the plan notes that targets for inspections have not been met due to the pandemic.					
Topics covered	 Thermal comfort Via reference to the Building Regulations	 Ventilation Via reference to the Building Regulations	 Indoor pollutants	 Daylight	 Artificial lighting	 Noise



MINIMUM STANDARDS IN RENTED ACCOMMODATION						
Latest Release: 2021			Government Department: Department of Housing, Local Government and Heritage			
Purpose	The Standards require landlords to ensure their rented properties provide tenants with a safe and healthy environment. Local authorities are responsible for the enforcement of the regulations.					
Coverage of health in housing	The Standards state that all rooms in a dwelling should have adequate and controllable ventilation, heat and natural and artificial lighting. However, 'adequate' is not quantified.					
Opportunities	Local authorities need to ensure they provide adequate resources so that routine inspections can be carried out to identify dwellings not complying with these standards and enforce remedial action. The Standards are due to be revised in 2023/2024 to include higher IEQ standards, such as specific temperature bands or the exclusion of mould.					
Challenges	The current standards lack specific performance benchmarks for minimum heating, ventilation, noise and lighting, which makes them harder to enforce.					
Topics covered	Thermal comfort 	Ventilation 	Indoor pollutants 	Daylight 	Artificial lighting 	Noise 

CLIMATE ACTION PLAN						
Latest Release: 2023			Government Department: Department of the Environment, Climate and Communications; Department of the Taoiseach			
Purpose	The Climate Action Plan 2023 sets out a series of actions designed to achieve a 51% reduction in overall greenhouse gas emissions by 2030 and on a path to net-zero emissions no later than 2050, as committed to in the Programme for Government and as set out in the Climate Act 2021.					
Coverage of health in housing	It seeks to bring about "reduced energy costs and more comfortable, healthier, safer, and less costly to heat and cool homes [thereby] enhancing our living standards, improving our air quality and helping to address energy poverty." However, no IEQ metrics were set in the plan.					
Opportunities	The Climate Action Plan provides a high-level framework for climate action, including on housing. The National Retrofitting Plan could provide an opportunity to improve both energy efficiency and IEQ, through building standards, upskilling and capacity building in the housing industry, and additional grant criteria.					
Challenges	The primary focus of the Climate Action plan is to reduce carbon emissions, and it may be difficult to include IEQ targets as part of the main actions. More opportunity may be found in supporting polices and plans, such as those providing for retrofitting and grants.					
Topics covered	Thermal comfort 	Ventilation 	Indoor pollutants 	Daylight 	Artificial lighting 	Noise 



Appendix 3

ACRONYMS

AHB	Approved Housing Body
BRE	Building Research Establishment
BER	Building Energy Rating
DECC	Department of the Environment, Climate and Communications
DFHERIS	Department of Further and Higher Education, Research, Innovation and Science
DHLGH	Department of Housing, Local Government and Heritage
HSE	Health Service Executive
IAP	Indoor air pollutants
IEQ	Indoor environment quality
IGBC	Irish Green Building Council
IPOA	Irish Property Owners Association
RTB	Residential Tenancies Board
SCSI	Society of Chartered Surveyors Ireland
SEAI	Sustainable Energy Authority of Ireland

Appendix 4

SOURCES CONSULTED

VELUX Healthy Homes Barometer, 2022

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