

Housing sustainability and indoor environmental quality: Policy gaps and maintenance challenges in Irish social housing

Valesca Lima^{*}, Tracy Mae Ildefonso, Stephen Daniels, Joseph Mullally

Dublin City University, Ireland

ARTICLE INFO

Keywords:

Housing sustainability
Indoor environmental quality
Maintenance policies
Social housing
Policy barriers

ABSTRACT

This study investigates the challenges of housing sustainability in Ireland's social housing sector, with a specific focus on Indoor Environmental Quality (IEQ) and maintenance policies. Drawing on qualitative interviews with key stakeholders, including Approved Housing Bodies (AHBs), Local Authorities (LAs), government representatives, private entities, advocacy groups, and social housing tenants, the research identifies critical barriers to achieving sustainability in social housing. Using the analytical lenses of the Multiple Streams Framework (MSF) and Sustainability Theory, the analysis demonstrates that IEQ remains a low policy priority despite growing health concerns, with both policy and economic barriers impeding progress. The findings argue for a substantial shift towards evidence-based housing policies that integrate sustainability and health considerations into social housing maintenance strategies. Findings indicate that the prioritisation of housing supply over other systemic needs, such as indoor environmental quality, has institutionalised health risks, requiring a transition from reactive maintenance to proactive, technology-integrated policies that align tenant well-being with sustainability goals. The application of MSF and Sustainability Theory in the Irish context shows that addressing the intersection of environmental, social, and economic dimensions of housing sustainability contributes to the broader literature and provides insights for countries facing similar challenges in developing sustainable cities and resilient communities.

1. Introduction

Housing is a basic human need, and adequate access to it has the power to determine the quality of life and welfare of individuals and their families. The location of a home, design, building quality and integration with the environment shape people's life, health, security, and well-being. Given the long lifespan of houses as physical structures, these factors not only impact the current generation but also have lasting consequences for future ones. Housing is therefore central to sustainability (Golubchikov & Badyina, 2012).

Previous research indicates that inadequate maintenance in social housing is linked to adverse health outcomes and worsens inequalities in access to safe and affordable housing (Haidar & Bahammam, 2021). Living in social housing is consistently associated with poor health, as studies show that social housing residents experience poorer health, largely due to substandard living conditions, frequently resulting from higher exposure to indoor pollutants that increase the risk of negative health effects (Holden et al., 2023).

Ireland's social housing sector faces significant sustainability

challenges, particularly regarding Indoor Environmental Quality (IEQ) and maintenance. Affecting approximately 24% of Irish households (Healthy Homes Ireland, 2023), poor IEQ has profound health implications, especially for older adults and children. Dampness and mould, for instance, can increase a child's risk of respiratory conditions like asthma by up to 50% (Holden et al., 2023) and also in adults (Moses et al., 2019). Approximately 1,700 premature deaths in Ireland annually are expected due to pollutants from indoor solid fuel, such as open fires and stoves, which burn wood and coal (EPA, 2025). This is also related to rising energy costs that push households to rely on less efficient and more polluting heating methods (SEAI, 2023). This is particularly concerning in social housing, where older, poorly insulated homes are more likely to rely on these fuels since not all households have access to fuel allowances, especially in winter months.

In Ireland, LAs and AHBs manage social housing for low-income households, older adults, and people with disabilities. While national policy prioritizes housing supply, affordability, and sustainability (Government of Ireland, 2021; Government of Ireland, 2025), IEQ remains a secondary concern. Furthermore, maintenance policies often

^{*} Corresponding author at: Henry Grattan building, Glasnevin campus, Dublin City University, Glasnevin, Ireland.

E-mail address: valesca.lima@dcu.ie (V. Lima).

lack the resources and frameworks to address systemic issues, such as poor ventilation, thermal inefficiency, and mould, common in older housing stock.

In countries with cool-temperate, high-humidity climates and a high proportion of older housing stock, such as Ireland, the combination of outdated construction methods, poor ventilation, and inadequate heating systems exacerbates mould growth and diminishes IEQ. This is because older homes, often lacking central air conditioning or modern climate control, struggle to regulate indoor humidity and temperature, creating ideal conditions for mould proliferation. This problem is further compounded by socioeconomic factors, as lower-income households are more likely to reside in these older, less-maintained properties (see Reponen et al., 2013). For example, cases like the Oliver Bond and Dolphin Housing, which are old and poorly maintained social housing complexes in Dublin, illustrate how structural deficiencies and inadequate maintenance have led to severe health risks for residents, including respiratory illnesses and mental health challenges (Creane et al., 2024).

Despite clear links to adverse health outcomes, IEQ remains a low priority in Irish housing policy, as maintenance challenges are often overlooked to favour supply shortages. This neglect is critical given the aging housing stock (Hunt, 2024), slow retrofitting (DCC, 2021), and reliance on inefficient heating (CAN, 2017; Oswald et al., 2007), which exacerbate mould and pollution (RRIAG, 2010). While policies like Housing for All and Delivering Homes, Building Communities aim to increase supply, they fail to integrate long-term sustainability and health into design and maintenance. This is important because there is a significant research gap in understanding how to effectively integrate sustainable housing practices into Ireland's social housing sector due to lack of current data (O'Hegarty et al., 2022; Watson & Williams, 2003). While the health risks associated with poor IEQ and mould are well-documented, there is limited research on how to implement proactive maintenance strategies while keeping engagement with citizens, tenants, and stakeholders, and using technological innovations to address these challenges (HHI, 2023). Bridging this gap is essential to developing evidence-based policies and practices that prioritise long-term housing sustainability and public health.

To help bridge this gap, this study identifies shortfalls in the Irish social housing sector that hinder policies prioritising IEQ and sustainability in social housing. This paper analyses the issues of IEQ and maintenance in Ireland's social housing sector through the lens of Sustainability Theory and Multiple Streams Framework (MSF). In this study, IEQ refers to the overall environmental quality of all social homes in Ireland, including clean air, absence of mould, adequate warmth, and homes that do not pose health or wellness risks to occupants. Additionally, housing sustainability is characterised by social housing that withstands climate change without sacrificing IEQ or residents' health and wellness. In turn, Maintenance focuses on the IEQ-related regulations of AHBs and LAs, ranging from day-to-day repairs to broader strategic reforms. The policy reforms and recommendations discussed in this article are intended to enhance housing sustainability in Irish social housing to support the development of resilient social homes that meet both current and future needs. By examining these with the interplay of problem, policy, and political streams, this study identifies barriers to policy change and explores potential opportunities for reform. Hence, this literature is a significant and timely contribution to the growing interest in social housing sustainability and policy reforms in Ireland and beyond.

Two central research questions guide the analysis in this paper: (1) What are the key challenges affecting the sustainability of social housing in Ireland, particularly in relation to mould, IEQ, and long-term maintenance? (2) How do systemic factors, including housing policies, economic constraints, and maintenance strategies, impact IEQ, and what solutions do stakeholders propose to improve sustainability in the sector? To answer those questions, we combine the MSF and Sustainability Theory to understand the challenges in housing policy, especially

when considering the gaps between policy intentions, actual implementation and challenges ahead in the context of social housing policy. This paper argues for a shift towards evidence-based, sustainable housing practices that integrate proactive maintenance, stakeholder engagement, and technological innovations to address systemic challenges and improve long-term public health outcomes.

The subsequent sections of this paper review the literature, detail the theoretical and methodological approach, present and discuss the findings regarding IEQ and maintenance challenges, and ultimately propose pathways towards greater sustainability in Irish social housing.

2. The Irish social housing landscape

This section describes the social housing sector in Ireland, particularly the housing bodies that govern it, the policies they follow, and the challenges within it.

In Ireland, social housing is mainly overseen by 31 Local Authorities (LAs), which manage about 155,000 homes across 5785 estates (NOAC, 2017; NOAC, 2024). Social housing funding is distributed through three main areas: LAs, Approved Housing Bodies (AHBs) and individual funding support (i.e. Housing Assistance Payment). Over 500 AHBs operate as independent, not-for-profit organisations regulated by the Approved Housing Bodies Regulatory Authority (AHBRA) and the Residential Tenancies Board (RTB) (*Housing Regulation Act, 2019*; RTB, 2021). AHBs significantly contribute to the diversification of housing options beyond conventional LA provisions by offering services tailored to tenants' needs. These needs include accommodations for older people, wheelchair users, low-income families, the homeless population, etc.

Social housing maintenance remains a significant challenge, with the government allocating substantial annual budgets. The National Oversight and Audit Commission reported a total 2023 maintenance expenditure of €223 million, with 27 out of 31 LAs seeing cost increases (NOAC, 2024). Per-unit expenses varied widely, ranging from €521.19 in Carlow to €2531.65 in Dublin City. Notably, South Dublin's maintenance costs surged by 80.65%, rising from €816.69 in 2022 to €1475.32 in 2023 (NOAC, 2024).

A possible reason for these observed increases is the aging housing infrastructure, with 61% of LA properties over 20 years old (Clarke et al., 2021). Hence, as these properties age, the demand for maintenance also rises each year, leading to increased expenses. This strengthens the call for updated data and strategies to address evolving housing challenges in the country, as discussed in the results section.

Social housing has transformed significantly over the past three decades. The traditional model of providing social housing tenancies has been increasingly replaced by individual social housing supports (Lima & Xerez, 2023; O'Sullivan, 2020). These including monthly payments to private landlords and the leasing of properties from institutional developers, an expensive attempt to deliver housing at scale (Hearne & Lima, 2024). Housing supports have expanded access to who do not meet the income threshold for social housing but unable to buy via a cost-rental model. While social housing estates have fallen out of favour due to perceptions of failure and associated social problems and stigmatisation, empirical evidence suggests that most social housing succeeds in providing adequate living environments, even if some instances of failure exist (Norris & Fahey, 2014, p. 219). However, the reliance on housing supports rather than stable tenancies highlights ongoing challenges in addressing housing affordability and accessibility for vulnerable populations (Russell et al., 2022).

Building on the institutional context, this section reviews scholarly evidence regarding Indoor Environmental Quality (IEQ) and maintenance failures. Building on this institutional foundation, the following section reviews scholarly evidence regarding IEQ and maintenance failures. By applying Sustainability Theory and MSF, we analyse how infrastructural defects, such as poor ventilation and thermal inefficiency, impact tenant health and explain why these issues remain marginalised within current policy streams.

3. Literature review - Multiple Streams Framework (MSF) and sustainability theory

The MSF provides a key lens for understanding the policy process (Kingdon, 2011). It has become a major tool in policy analysis, continuously refined by a surge of MSF literature to include technological innovations and new empirical applications (Herweg et al., 2015; Herweg & Zohlnhöfer, 2024; Ruvalcaba-Gomez et al., 2023). According to the MSF, three independent but interconnected streams flow through the political system: problems, policies, and politics.

The problem stream encompasses issues arising independently of political or policy developments, such as unpredictable natural disasters. The policy stream involves generating potential solutions where actors aim to persuade others to accept specific policy proposals. In contrast, the political stream is characterised by bargaining, lobbying, and group mobilisation, reflecting the dynamics of political will and public opinion. These streams operate with distinct modes of interaction: persuasion dominates the policy stream, while bargaining and coalition-building define the political stream (Fig. 1). Policy change emerge when policy entrepreneurs capitalise on windows of opportunity to link the problem stream with the political stream (Kingdon, 2011; Kurian, 2011). A relevant implication is that solution development, policy problem evolution, and political processes are decoupled, lacking reciprocal influence (Zahariadis & Petridou, 2024).

Sustainability Theory's starting point is the integration of three dimensions: environmental, economic, and social sustainability or 3P formulation (Elkington, 2013). In a nutshell, environmental sustainability focuses on reducing environmental harm through energy-efficient housing, sustainable materials, and lower carbon footprints (Elkington, 1997). But what constitutes 'sustainable' is far from well-defined. Daly (1996) argues that current focus dwell too much on minimizing harm rather than promoting a positive vision of sustainability involving systemic changes. Housing sustainability thus encompasses not only access to affordable and good-quality homes but also a systems-thinking approach that includes a liveability, green construction, participatory regeneration, retrofitting to mitigate mould and improve public health (see Moore & Doyon, 2023; Shukla et al., 2019; Winston, 2009). Economic Sustainability involves balancing costs with long-term viability, such as funding retrofitting through green mortgages and energy efficiency upgrade without imposing excessive financial burdens on low-income households (Haidar & Bahammam, 2021; Liaw, 2024). Finally, social sustainability ensures housing policies promote equity and well-being, particularly for marginalised groups (Chan & Adabre, 2019). This dimension address health risks associated with poor IEQ (Holden et al., 2023; Moses et al., 2019), such

as respiratory illnesses, which disproportionately affect low-income tenants (Tsoulou et al., 2021).

Policy windows open when the three streams align, creating opportunities for policy change (Kingdon, 2011). Those are short-lived moments for advocates to push their solutions or problems onto the agenda, when, for example a new legislature is elected and are interested in new ideas (political stream) or when social indicators decline and affect the national mood (problem stream, e.g. employment indicators) (see Herweg et al., 2018). A public health crisis linked to poor housing conditions, for example, could serve as a catalyst for aligning these streams. A shift in political will, driven by public demand for healthier living conditions, could further align the political stream with sustainability goals. Past examples, such as stricter building codes introduced in response to energy crises, demonstrate how policy windows lead to sustainable housing practices (Colclough et al., 2018).

Despite their suitability for analysing policy processes and sustainability in housing, both the MSF and Sustainability Theory have limitations. A key critique of MSF is its retrospective nature, as it explains policy change after it has occurred but lacks predictive capacity (Zohlnhöfer & Rüb, 2016). Sustainability Theory is not without critics: it can be too broad and lacks a clear policy implementation pathway, often resulting in fragmented and uncoordinated sustainability efforts (see Purvis et al., 2019). It also frequently overlooks political and economic constraints and influences sustainability policy priorities (Griessler & Littig, 2005). However, these limitations do not prevent their application. Instead, combining MSF's insights into how policies emerge with Sustainability Theory's emphasis on promoting long-term environmentally sustainable and socially resilient housing and urban infrastructure provides a broader framework for analysing the social aspects, impacts, and opportunities for sustainable housing and the resilience of cities.

Taken together, the combination of MSF and Sustainability Theory in this paper explores how the alignment (or misalignment) of problem, policy, and political streams influences the integration of sustainability dimensions in Ireland's social housing sector. The misalignment among streams often results in the neglect of sustainability concerns, particularly regarding IEQ, tenants' health and long-term maintenance.

3.1. The policy context of IEQ in social housing: applying the framework

Applied to Irish social housing, the *problem stream* is identified through poor IEQ, mould infestation, and inadequate maintenance. These challenges are particularly acute in Ireland, where older housing stock, poor ventilation, and inefficient heating systems heighten mould proliferation and indoor air pollution (EPA, 2023; Holden et al., 2023). These issues are framed as public health and environmental concerns,

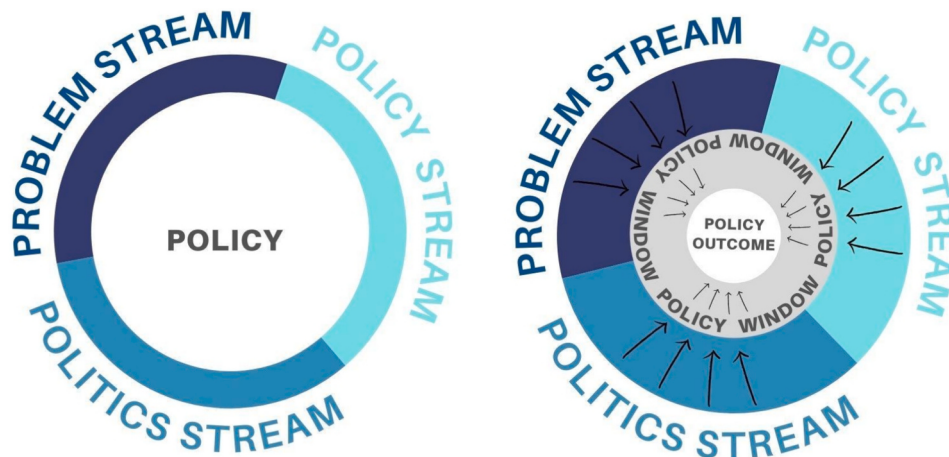


Fig. 1. Multiple Streams Framework. Streams in independent mode vs. Pressures from the streams affecting a policy.

directly affecting the social and environmental sustainability of the housing sector (Chan & Adabre, 2019). Stakeholders, including tenants, advocacy groups, and housing organisations in Ireland, have started to identify these issues as urgent problems requiring policy attention (see Creane et al., 2024; Healthy Homes Ireland, 2023).

The *policy stream* encompasses potential solutions, such as sustainable housing designs, proactive maintenance strategies, and technological interventions to improve IEQ. For example, the installation of indoor environmental sensors to monitor air quality and retrofitting older housing stock with improved insulation and ventilation systems can reduce energy consumption and mould growth, addressing both environmental and social sustainability dimensions (Haidar & Bahammam, 2021). But the lack of integration between solutions often results in fragmented policy approaches.

The *political stream* reflects the political environment, including public opinion (e.g. death of a young child in southeast London due to respiratory disease due to exposure to mould in Rochdale social housing state led to new discussions and policy). The political stream also includes political priorities that, in Ireland, often prioritise housing supply over sustainability and need. Policies like the 'Housing for All' program emphasise increasing housing supply to address shortages, often at the expense of long-term sustainability and affordability (Lima et al., 2022). From a Sustainability Theory point of view, this prioritisation of housing supply over sustainability reflects a neglect of the social sustainability dimension, particularly the health and well-being element. Public opinion, however, is increasingly recognising the importance of sustainability, particularly in light of rising energy costs and public health concerns (SEAI, 2023). This shift in public sentiment could create opportunities for aligning political will with sustainability goals (European Environment Agency, 2024).

4. Methodology

As part of the SHINE Project, this study employs qualitative inquiry methods for data collection, complemented by thematic analysis for data interpretation with a focus on IEQ and sustainability challenges in Ireland's social housing sector. The SHINE Project focused on policy-driven and technological solutions, particularly through the use of environmental sensors to monitor IEQ. The team adopted this qualitative approach to gather not only empirical data but also nuanced insights into the current and future needs and challenges in the sector related to IEQ.

4.1. Data collection

After securing ethical approval, we conducted one-on-one semi-structured Zoom interviews with 28 stakeholders between January and August 2024. These stakeholders represent a comprehensive range of sectors, including AHBs, LAs, government entities, private organisations, non-profits, advocacy groups, the surveying and construction industry, and social housing tenants.

To ensure a representative dataset, individuals selected through stratified random sampling to reflect a range of services within the social housing sector. Separate interviews were conducted to protect participant anonymity. Participants received plain-language statements, informed consent forms, and sample questions outlining their rights, including the option to withdraw at any time, and clarifying that the interviews would be unstructured. Questions were non-leading and focused on general sector challenges, environmental issues, and views on the proposed sensor.

Recruiting professional stakeholders was relatively straightforward, as public figures and professionals are generally classified as low risk under our University's ethical guidelines. In contrast, social housing residents, considered a vulnerable group, required a more careful recruitment strategy. Contact could only occur through tenant engagement officers. Some residents were also reluctant to participate due to

concerns about potential landlord-related issues. However, support from our project partner, Clúid Housing, enabled us to reach residents, achieve data saturation, and conclude the interview process. A more detailed profile of our stakeholders is provided in the table below (Table 1).

4.2. Data analysis

Interviews were transcribed, organised in NVivo, and analysed thematically to identify patterns across the dataset (Braun & Clarke, 2006). NVivo was utilised to efficiently categorize and code the data, facilitating a structured and comprehensible narrative (Bazeley, 2006). To ensure analytical rigor, we employed investigator triangulation. One researcher conducted the primary coding in NVivo, while a second systematically reviewed the codes. Any discrepancies were resolved through consensus. This systematic approach ensures that data retains its original meaning throughout multiple analytical stages while minimizing researcher bias through iterative refinement (ibid). More specifically, all transcriptions underwent four distinct coding cycles to catalogue information from macro-thematic levels down to micro-level subcodes (see Chart 1). This rigorous process generated a detailed hierarchy of subcodes, spanning organizational profiles, current IEQ challenges, and future strategic plans for the Irish social housing sector.

To systematically organise the data, all interviews were analysed and coded four times (see Chart 1). Stakeholder input was carefully categorised by topic, and, where relevant, individual responses were assigned multiple codes. For example, when maintenance challenges

Table 1
Stakeholders' profile.

Stakeholder	Sector	Nature of organisation	Focus of expertise
1	Government	AHB Association	Policy
2	AHB	Housing & Service Provider	Senior Management
3	AHB	Housing & Service Provider for residents with specific needs	Senior Management
4	AHB	Housing & Service Provider for residents with specific needs	Management
5	Government	Homeless Health	Team/Project Management
6	AHB	Housing & Service Provider	Policy
7	AHB	Housing & Service Provider	Diversity, Equity, Inclusion
8	AHB	Housing & Service Provider for residents with specific needs	Senior Management
9	AHB	AHB Association	Environmental Sustainability
10	Government	Housing Organisation	Senior Management
11	AHB	Housing & Service Provider	Policy
12	Non-Profit	Advocacy Group	Social Worker
13	AHB	Housing Provider	Senior Management
14	AHB	Housing & Service Provider	Senior Management
15	AHB	Housing & Service Provider	Senior Management
16	AHB	Housing & Service Provider	Senior Management
17	AHB	Housing & Service Provider for residents with specific needs	Senior Management
18	Tenant	AHB Tenant	Lived experience
19	Government	Local Housing Authority	Senior Management
20	Government	Policy Organisation	Policy
21	Private	Environment and IAQ	Consultant
22	Non-Profit	Building Association	Home Performance Index
23	Tenant	AHB Tenant	Lived experience
24	Tenant	AHB Tenant	Lived experience
25	Private	Surveyor, Construction & Property Sector	Senior Management
26	Non-Profit	Environment and IAQ	Senior Management
27	Tenant	AHB Tenant	Lived experience
28	Tenant	LA Tenant	Lived experience

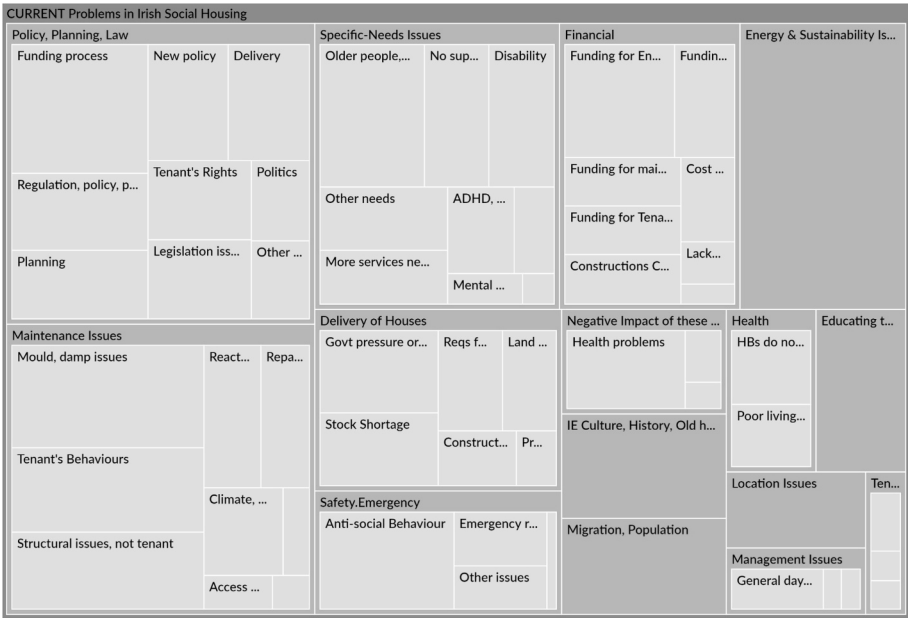


Chart 1. NVivo-Generated Coding Hierarchy for the subcode “sector” under the main code “Current Problems in Irish Social Housing”.

were linked to budget constraints, these were coded under both financial and maintenance subcategories. Main themes were identified based on the frequency of coding references, indicating how often and by how many stakeholders a topic was discussed.

Kingdon states that when the MSF lens is applied using three streams,

“a problem is recognised, a solution is developed and available in the policy community, a political change makes it the right time for policy change, and potential constraints are not severe” (2011, pp. 165). Hence, since identifying the problem in the sector is one of our main goals, this article presents an analysis of the codes related to these topics.

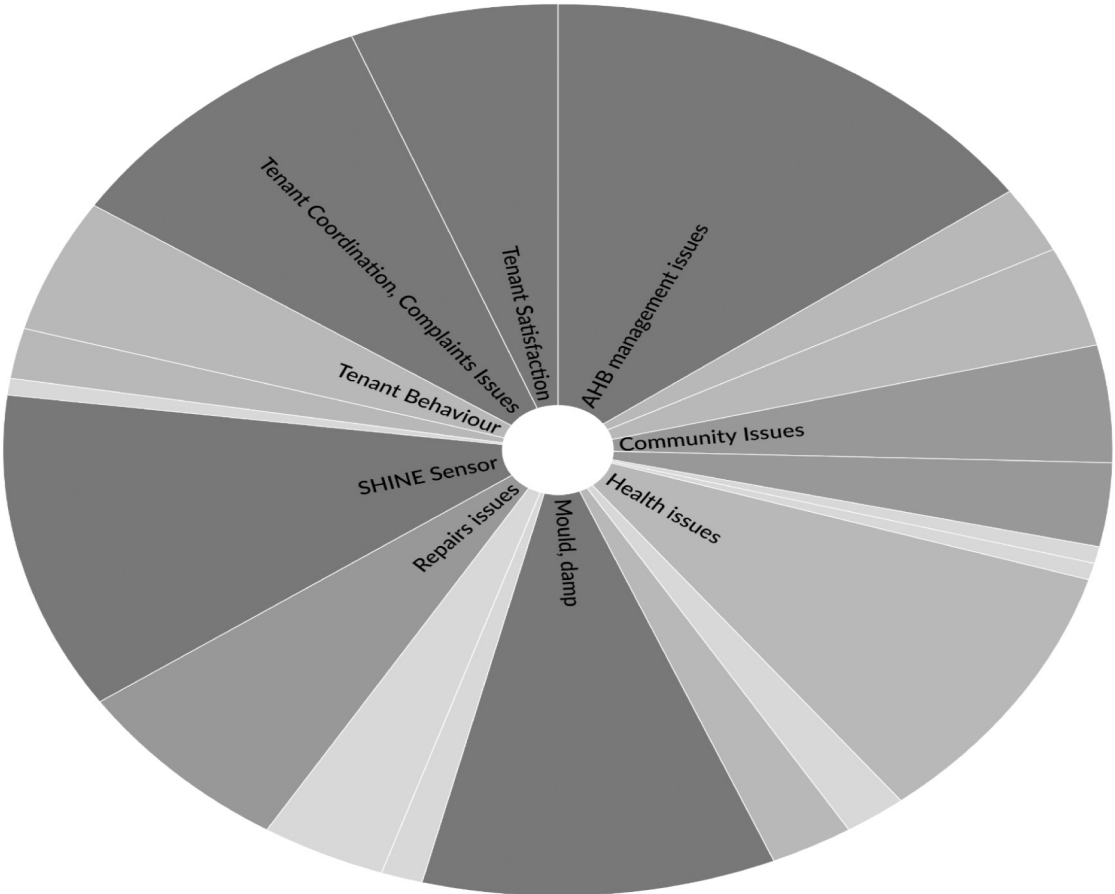


Chart 2. NVivo-Generated Coding Hierarchy for the subcode “residents” under the main code “Current Problems in Irish Social Housing”.

More specifically, the data generated under the main code “current problems in social housing,” which branches into several subcodes reflecting perspectives from both the sector (Chart 1) and residents (Chart 2). The subcodes most relevant to this framework, and which generated the highest number of references, include “energy and sustainability issues,” “Irish culture, weather, and history of housing,” “migration and population,” “mould and damp issues,” “management issues,” and “tenant behaviours,” among others. These data enabled us to analyse our findings effectively through both MSF and Sustainability Theory lenses. Please note that in Charts 1 and 2, a darker shade of grey in a box or circle segment representing interview topics indicates a higher number of coding references.

These codes identified are organised around two key topics in this article: the lack of IEQ prioritisation in Ireland and proposed solutions to social housing challenges. The following section provides a detailed explanation of the research findings.

5. Results

In this section, we unravel an analysis of the two primary themes emerging from the qualitative data: (1) the insufficient prioritisation of IEQ in Ireland's social housing, and (2) stakeholder-proposed solutions for IEQ and sustainability challenges. Based on these themes, the findings are organised into two key areas: first, the persistent challenges in prioritising IEQ and sustainability within Irish social housing policies; and second, the stakeholder-suggested solutions, ranging from a new maintenance policy strategy to engaging the ‘three agents of change’: policy, technology, and community engagement, to advance housing sustainability, resilience, and public health improvements.

5.1. IEQ in social homes is not a priority

The persistent neglect of IEQ in Ireland's social housing sector reflects a misalignment political and economic goals often overshadow long-term health and environmental needs. Furthermore, neglecting IEQ undermines environmental sustainability through inefficient energy use (Elkington, 1997), social sustainability by disproportionately harming vulnerable populations (Chan & Adabre, 2019), and economic sustainability by escalating long-term healthcare and maintenance costs (Haidar & Bahammam, 2021).

In 2021, the WHO updated its Air Quality Guidelines (AQG) for PM_{2.5}, PM₁₀, ozone (O₃), nitrogen dioxide (NO₂), carbon monoxide (CO), and sulphur dioxide (SO₂) (World Health Organization, 2021). The EU subsequently revised the Ambient Air Quality Directive in 2024, aligning with WHO standards but imposing stricter limits, such as halving the annual PM_{2.5} value and regulating pollutants like benzene, arsenic, and lead (European Commission, 2024). Although the WHO recommends local adjustments to these values, Ireland struggles to meet current benchmarks, and the revised EU directive has yet to be incorporated into Irish legislation (EPA, 2025). *Healthy Homes Ireland (2023)* expresses concern that the absence of clear, accepted IEQ standards remains a significant barrier to progress. Consequently, these policy delays hinder the rapid implementation of targeted actions required for healthier social homes. Consequently, slow progress and delays in implementing effective policies and targeted actions cause concern among stakeholders advocating for healthier homes.

Housing and health in old age are inherently interlinked (Oswald et al., 2007), a reality underscored by Stakeholder 8, who manages an AHB for the elderly. They reported recurring respiratory issues among tenants, attributing these illnesses directly to mould, damp, and the failures of aging housing infrastructure. Stakeholder 8 emphasized that for this vulnerable demographic, exposure to pollutants in cold, poorly insulated homes results in severe health complications—and in extreme cases, death, necessitating that the sector reframe housing conditions as a critical public health concern.

For instance, a task force involving Stakeholder 12 (a social worker

in a local advocacy group championing Dublin's Dolphins House regeneration) found the building hazardous due to damp, mould, and condensation since at least 2002. The task group report revealed 90% of residents had mould in their homes, impacting infant and child respiratory health (RRIAG, 2010). A similar report by building science experts identified harmful spores, including *Aspergillus fumigatus*, posing risks to immunocompromised individuals (see Thomas, 2011). A Dublin City Council building analysis on the building attributed condensation to structural issues like poor thermal bridging, insulation deficits, and inadequate ventilation, exposing residents to temperature extremes (CAN, 2017). Built in the 1950s and unupgraded, the complex suffers from poor air circulation up to 2024 (Hunt, 2024). Despite 20 years of advocacy, 50% of residents still endure these conditions, with full regeneration not expected until 2030 via a phased plan initiated in mid-2021, according to its master plan consultation (DCC, 2021).

Moreover, living in a home with compromised IEQ is not only harmful to vulnerable groups, but it can also deteriorate the health of individuals who were previously healthy. The direct impact of these policy failures on the lived experiences of social housing tenants in Dublin is detailed in the following section.

5.1.1. The residents' experiences

From a social sustainability perspective, poor IEQ disproportionately harms vulnerable and low-income groups; and strains public resources through preventable health complications and emergency repairs. Congruent with previous research, tenants' lived experiences underscore the urgent need to address IEQ issues, yet these concerns remain sidelined in policy and political agendas.

One AHB resident, Stakeholder 18, reported years of recurring damp and ‘green, yellow, and fluffy’ mould in two bedrooms. Reports to the AHB resulted only in limited inspections and cleaning advice, failing to follow-up. This ongoing exposure, especially in their child's room, coincides with the child's persistent sore throats and tonsillitis. Frustrated by the lack of effective response, the tenant no longer seeks assistance from their AHB. Stakeholder 27, also an AHB tenant, endured more than 10 years with their previous property where mould and dampness spread into their porch, kitchen, wardrobe, appliances, furniture, carpets, and beds; eventually covering a 8-ft-tall wall. By year there, these living conditions triggered chest and lung problems, breathing issues, panic attacks, and suicidal ideations. Despite regular ventilation and house cleaning, the root cause, a poorly constructed apartment base-ment, which lacks fundamental work and is always flooded, resulting in dampness and condensation throughout the entire building. This underscores the need to move beyond tenant-blaming narratives when addressing systemic IEQ failures (Lima et al., 2026). The stakeholder also shared that they reported the issue multiple times, but without success, contrasting with a neighbour rehomed immediately by a social worker. This resident was finally moved to a mould-free property in year 13. Consequently, their mental and physical health seems to be improving, and they are thankful to leave that experience behind them.

The individual accounts of Stakeholders 18 and 27 are representative of broader, documented failures in social housing. At Oliver Bond Homes flats, which consists of 391 flats across 14 blocks, 83% of tenants report damp and mould, and 74% experience fuel poverty (Wilson, 2024). These conditions are linked to widespread physical and mental health issues (Manzo, 2024), compounded by sewage leaks (30% of properties), pest infestations (34%), and lack of bins (64%). Despite 51% of residents receiving medical confirmation of housing-related illnesses, official responses remain slow (McAuley, 2024).

From an MSF's perspective, recognising changing dynamics in policymaking create opportunities to align the problem and policy streams (Kingdon, 2011). Stakeholders noted that resident engagement in projects often turns into complaints forum, limiting the collection of useful feedback for housing organisations. Yet evidence suggests this can be mitigated by communication strategies that validate resident input (Jordan, 2022; Moore & Doyon, 2023; Winston, 2009). Successful

precedent exist: In 2022, the sector implemented a strategy that prioritised social housing tenants in decision-making processes in some LA projects. This approach shifted the dialogue among tenants from blame to constructive problem-solving. As a result, residents felt valued, engaged, and included in the process (Jordan, 2022); and recent studies demonstrate that actively co-creating sustainable innovations with Irish social housing tenants through participatory research can effectively bridge these policy gaps (Ildefonso et al., 2026). Moreover, the Department of the Environment, Climate and Communications redesigned the Energy Efficiency Obligation Scheme with public consultation in mind, successfully creating policy decisions that are fit to the needs of the people (see DECC, 2021, p. 29–32). These government-level best practices provide a strong example of how resident inclusion in policy decision-making can contribute more than it detracts, a lesson the social housing sector can apply to address the above-mentioned issues in IEQ.

5.1.2. Irish housing policy

With evidential health cases linking poor-quality homes to negative health outcomes, it is warranted to ask why Ireland is still behind in this initiative. Expert stakeholders highlight a fundamental conflict with the Housing For All plan, that political priorities emphasise meeting housing targets, leaving little room for addressing sustainability and health concerns. While the plan mandated 300,000 new homes from by 2030 supported €4 billion in funding (Government of Ireland, 2021), focus on supply targets effectively crowds out IEQ and sustainability concerns.

The general consensus among the interviewed, specially the housing providers, is that they are currently pressured to meet the deadlines set by the government while facing various challenges: high construction cost and materials, labour shortage, permit delays, policy changes, and land access issues. The latter problem may hinder efforts to reduce carbon emissions in the country because if new homes are located in areas where transport links to cities are not available or reliable, people will resort to using private cars. Moreover, one alarming disadvantage of the housing plan raised by several stakeholders is that new homes are not prioritising sufficient IEQ, sustainability, and energy efficiency in their designs and development. This is evidenced in the parliamentary debate in the Irish lower house (Houses of the Oireachtas, 2025) regarding the Housing Commission report and proposal (Government of Ireland, 2024). While this report provides a valuable roadmap for addressing these several challenges, including housing sustainability, the government appears only relatively willing to adopt a more radical and transformative approach to housing policy to address the housing challenges effectively. From the MSF lens, these pressures significantly misalign all streams (most notably the policy and political streams) because the evidential problem in the sector does not align with the government's prioritised policies. Stakeholder 22, from a non-profit organisation representing building societies, reflect this consensus:

“Unfortunately, I think sustainability, and doing what is best, are not going to take priority over getting homes built. So we're going to continue taking shortcuts on ventilation because it's not being monitored properly; we're going to continue building on green fields because that is the easiest way to build homes; and we're going to continue with the typology of semi-detached urban sprawl (promoting private car dependency). We'll be making a lot of cases against that.”

Stakeholder 6 shares that their AHB is overwhelmed by construction deadline, with yearly housing delivery goals increasing from 70% to 100%. Although their organisation has a dedicated sustainability department to promote IEQ goals, other AHBs lack similar support. Stakeholder 14 admits their AHB has yet to create its own energy and sustainability department, while Stakeholder 9 notes that there is no climate action regional office for AHBs to support them in their environmental and sustainability needs. This absence is problematic because AHBs are expected to play a critical role in delivering homes under the

current housing policy program (Houses of the Oireachtas, 2025).

As an environmental consultant, Stakeholder 23 warns that if ventilation and air quality strategies new properties are not properly planned and executed, inconsistencies in the definition of what constitutes good housing will emerge in the next five years. The possible effect of these unresolved strategies before building development is the possible occurrence of similar issues seen today in houses built in the next decade. Ultimately, this suggests the future IEQ situation in Ireland that may not differ significantly from the present if home and environmental sustainability issues are not urgently addressed.

Several research participants suggested that one reason why the non-prioritisation of IEQ persists is that it does not currently make economic sense to investors and the government. Stakeholder 10, from one of the government's housing organisations, suggests the entire social housing sector should collectively present a “proper economic argument linking better housing to better health outcomes” to gain the government's attention and prioritisation. Case studies from neighbouring EU countries demonstrates greater improvements in quality of life and wellbeing when sustainability and IEQ initiatives are supported by policymakers (BPIE, 2024). According to the 2024's Healthy Buildings Barometer report, France addressed the issue of 95% of residents being unable to keep their homes warm during cold weather through the “raise-the-roof” project, which added apartments atop existing buildings using lightweight, bio-based, non-toxic materials. This intervention improved residents' thermal comfort, enhanced mental health, and reduced the number of people suffering from inadequate warmth (ibid.). Similarly, the Netherlands, which has one of the highest rates of damp homes in the EU, is responding by constructing new social housing using sustainable materials and designs adaptable to wet-weather conditions. This initiative led to a 6% reduction in people living in damp conditions between 2015 and 2020 (ibid.).

In the next section, stakeholder suggestions for addressing policy, political, and sustainability challenges in Ireland are presented, with data playing a central role in informing potential improvements for the sector.

5.2. Getting ahead of the curve

5.2.1. Proactive maintenance and technological intervention

The fatal mould exposure incident in Rochdale (UK) has alerted Irish AHBs. To prevent a similar tragedy, Stakeholder 6 noted that their AHB is actively remedying latent defects in properties built or acquired since 1999 onwards. Moreover, they have advocated for sufficient national funding to ensure all AHBs can perform essential repairs. Additionally, this stakeholder stated that their AHB has adopted a proactive maintenance approach by engaging tenants through a recently established ‘resident policy group’. This group submitted a position paper which the top management has welcomed. Rather than relying on reactive complaints or engagement officer reports, Stakeholder 6 is confident this AHB is now exploring the formal incorporation of this group into its asset management approach.

Similarly, Stakeholder 15's AHB is responding to the issue, particularly concerning properties that have undergone several repairs in the past and were flagged during the yearly survey. However, their approach is more technology-focused. With the ultimate goal of assessing their assets' performance and implementing preventative maintenance in the near future, the organisation is conducting a pilot program where up to 1000 environmental sensor units will be installed on their properties. These sensors will measure the home's CO2 levels, humidity, and temperature. The data generated will help the AHB determine the actual causes of mould in their properties, whether related to heating, ventilation, or lifestyle issues. Thus, their approach to the scientific data gathered from the sensors will be to investigate first whether the problems are the landlord's responsibility before informing tenants of potential lifestyle issues. Additionally, this AHB is also considering revising its damp, mould, and condensation policy to

ultimately eliminate the problem.

A proactive maintenance approach focuses identifying and resolving problems before they occur. This contrast with the social housing sector's more common and current reactive model, where issues are addressed only after a report has been filed. Stakeholders 6 and 15 indicate a shifting discourse towards a more proactive strategy. Stakeholder 6's proactive approach involves gathering evidence-based data from residents through their opinions, suggestions, and policy recommendations. Meanwhile, Stakeholder 15's strategy relies on collecting scientific data on home pollutants to predict potential problems.

Gathering scientific data and evidence-based information to aid a solution-oriented strategy is beneficial, but may prove ineffective without competent translation into clear and feasible recommendations. As an environmental consultant, Stakeholder 21 argues that how an organisation translates data into an urgent case is crucial for gaining public and government attention, leading to investment and prioritisation of projects focused on a full asset proactive maintenance approach in social housing. Stakeholder 21 explains that the social housing sector has already gathered extensive data proving that poor IEQ is more hazardous than smoking, alcoholism, and road deaths, with evidence linking tenants' poor health outcomes with exposure to mould in social homes. However, the sector struggles to demonstrate how healthier social housing residents and properties could economically impact the social housing sector. This challenge likely stems from the difficulty of isolating the financial impacts of housing improvements due to the complex, interlocked factors and data limitations (Li et al., 2025). As a result, Stakeholder 21 appeals to the sector to focus more on effectively translating data into tangible insights, to insure it is fully utilised and not wasted.

One main drawback of this approach, as noted by stakeholders, is a perceived reluctance to take responsibility for the data resulting data. Stakeholder 25, from the construction sector, points out that this poses a challenge for housing organisations. Once faced with an evidence-based issue, they are legally required to address them with the same urgency as private landlords, as required in the *Landlord and Tenant (Amendment) Act 1980* (2019).

AHB Stakeholder 8 shares a similar concern, particularly regarding the insufficient resources and protocols to address the tenant health problems identified by new technologies. As these technologies are relatively new to the sector, clear frameworks for response and funding are currently absent. However, studies confirm that integrating technology in social housing policies significantly benefits both tenants and providers while improved tenant experience (Oladoja et al., 2025). Smart IoT systems achieve a 20–38% reduction in energy consumption, improved air quality, increased comfort, and better tenant-landlord communication on maintenance (ibid.; Ahmad & Alshurideh, 2025). Real-time monitoring enables staff to send alerts about security breaches or air quality concerns, thereby increasing responsiveness (Ahmad & Alshurideh, 2025). At the management level, IoT devices decrease unplanned maintenance and emergency repairs by predicting structural problems, thereby lowering costs, prolonging property lifespan, and streamlining management functions (Oladoja et al., 2025).

Aligning social housing policy with technological growth is very relevant for national policymakers. But it is crucial that data management is ethically governed and regulated by government policies, particularly for vulnerable individuals. Studies show that transmitting data to public health authorities, rather than to private companies, through encryption and decryption techniques reduces the risk of exploitation and data breaches among vulnerable people (Mallinson & Shafi, 2022; Assa-Agyei & Olajide, 2022). Moreover, the carbon footprint of these technologies should also be considered to ensure that the environmental dimension of 3P is contributing to sustainability than adding further harm (Elkington, 2013).

Interviewees stressed a growing recognition of the need to move from reactive maintenance in the sector to proactive maintenance. Some AHBs are piloting environmental sensors to monitor indoor air

pollutants, adopting a data-driven approach to isolate the root causes of mould and dampness. This strategy shifting the focus from blaming tenants to addressing structural and systemic issues. Stakeholder 2 (AHB) underscores this shift, arguing that housing associations must adopt proactive partnerships with residents rather than attributing mould to lifestyle:

"No tenant wants to have mould in their house, or wants to do things which might contribute to it. So what you can't do and what you shouldn't do is blame tenants for mould... Technology could help us more in those respects in terms of... understanding room temperatures, moisture levels... the new build houses that are so well sealed that some of those can be sensitive if they're not heated correctly, (and) can be very sensitive to condensation and mould."

By utilising technology to monitor these sensitivities in airtight builds, AHBs can distinguish between structural deficiencies and heating challenges. However, for these pilots to succeed, they must be formally integrated into national housing policies.

5.2.2. Solutions: the agents of change

Research participants identified three key agents of change: policy-makers, the construction supply chain, and social housing residents noting they must collaborate to improve IEQ and sustainability in social housing and catalyse healthy housing standards in Ireland. The following solutions outline the necessary actions for these key stakeholders.

5.2.2.1. Policymakers. To create adaptable policy recommendations for the diverse needs of the social housing sector, policymakers must integrate scientific evidence into the decision-making process. Stakeholder 20, from a policy government agency, highlights existing data showing how mould infestation in elderly housing significantly impacts health. Similarly, Stakeholder 8 (AHB) notes that an increase winter mortality due to inadequate heating in social housing disproportionately affects among older individuals, which they argued should be recognised as a public health issue. Despite evidence linking poor social living conditions to illness and death, decisive policy action remains absent.

Stakeholder 10, from the government sector, identifies the structural barriers sustaining this inaction. They explain that an asset management approach is deprioritised in LAs because of the urgent need to provide housing. This focus leads to neglect of regular assessments, such as the national social housing stock condition, which has not taken place in the past years. Additionally, available funding for repurposing vacant properties often outweighs the perceived manageability of proactive maintenance. More importantly, the government's funding model remains the roots cause. Rental income under the differential rent scheme – based on tenant's income – insufficient to support proactive asset management. While AHBs can access private finance, they remain depend on government funding as rent payments alone cannot cover their operational debts.

To transition to a more health-oriented social housing sector pointed to relevant solutions. Firstly, stakeholders advocated for proactive asset maintenance policy supported by ring-fenced government funding. When income and funding are combined in the same financial pool, they can be easily redirected to other purposes, such as building parks. Ring-fenced funding can promote regular proactive asset management practices, particularly within the LA sector. For example, the European Public Health Alliance's position paper on enhancing IAQ in European residences, recommends that legislation and policies for the initiative include a provision for a sufficiently ring-fenced fund. This fund should be readily available for use, particularly for projects addressing negative social impacts (with priority given to targeting emission sources) and for retrofitting homes of people living in compromised infrastructure (EPHA, 2024). Successful implementation of such a policy can help stabilise the policy stream, thereby stabilising the political stream, since

the financial constraints will no longer hinder the implementation of IEQ-related changes in the sector. To illustrate this in the Irish context, stakeholder 10 (the government's housing sector) explained:

"If we, as a sector, are to move in a fluid kind of movement towards an asset management approach, then local authorities are simply going to have to: a) be better funded in terms of the rent. And if tenants can't pay that, then there's an argument to make. The central government is going to have to come up with some kind of supplementary payment to allow all of that to occur. But if that's to happen, then local authority rents and any supplementary funding that comes from the central government needs to be ring-fenced for properties and reported on."

Secondly, AHBs can spearhead these transitions due to their greater management experience. With dedicated maintenance staff and established practices, AHBs offer valuable insights into effective asset management and policy development. Stakeholders also advocated for a cross-government approach to tap into inter-departmental resources to support continuous maintenance and implement necessary reforms.

Ultimately, when discussing solutions, nearly all stakeholders public health is explicitly contingent upon the government's approach to social housing standards. The State must acknowledge that sustainability goals directly impact public wellbeing; while well-maintained homes enhance quality of life, neglect increases health expenditures and public health risks.

5.2.2.2. Construction supply chain. This second agent of change comprises the technical expertise and key players involved social housing delivery, includes architects, engineers, surveyors, installers, and others. This group must address several critical areas to implement changes towards a more sustainable living environment in the sector.

The Irish housing sector faces escalating material costs of materials driven by inflation and global geopolitical instability. A problem highlighted by AHB Stakeholder 6 is the observed lack of construction workers. While they argue construction jobs are available, several positions remain unfilled. A possible reason for this is the increasing number of young people emigrating from Ireland due to poor life prospects, and the high cost of living in Ireland, including housing. Stakeholder 6 also identifies precarious employment contracts lacking holiday and sick pay as a primary deterrent for recruits. Sustainability Theory posits that social justice and fair labour are important factors in cementing meaningful environmental and sector-wide sustainability (Elkington, 2013). Hence Stakeholder 6 advocates for employment packages that are attractive and legally compliant to retain the job seekers' interest in this sector.

Technological innovations can also promote enhanced IEQ and sustainability in social homes. The Irish government offers grants to private homeowners and the social housing sector to eliminate fossil fuels and upgrade homes to be more energy-efficient. Through the National Home Energy Upgrade Scheme, grants are available for materials such as solar panels, floor insulation, central heating systems, heat pumps, mechanical ventilation, and air-tightness improvement (Citizens Information, 2025). While this is welcomed by the AHB sector, Stakeholder 9 believes that more technological equipment should be included in the grants, such as thermodynamic systems. This opinion arises from the stakeholder's observation that there is not enough comprehensive knowledge of other technologies that could be beneficial in retrofitting and building energy-efficient homes in Ireland. For example, in China, technological innovations are not only subsidised for more than 50%, but their policies advocate for continuous investigation to keep up with rapid urbanisation, such as investments, a sustainable investment and financing system in place for urban infrastructures, and inclusion of private capital (Chang et al., 2016).

Additionally, Stakeholder 26 (non-profit) sees that upskilling within the supply chain is also crucial for attaining long-lasting changes in the sector. This aligns with Stakeholder 22's observation, from the building

sector, that Ireland seems lax regarding the technical standards of homes and buildings being constructed. Stakeholder 25 has noted that the current infrastructure does not adhere closely to the Home Performance Index (HPI) requirements and continues to follow outdated models. Developed by the Irish Green Building Council, the HPI is a national certification for residential homes and infrastructure that aligns with building standards and environmental sustainability requirements. From construction to location, an HPI-certified property is guaranteed to have green features, such as improved IAQ, energy and water efficiency, energy savings, and enhanced biodiversity (IGBC, 2025). The requirements set forth by HPI also address issues, such as air tightness, adequate ventilation, and thermal bridging. However, as noted by interviewees, more effort is needed for these changes to be implemented and become a standard practice in the country's construction industry. EU best practices prioritising green construction, energy efficiency, and cost-effectiveness offer a vital framework for tailoring Irish housing policy. Adopting successful policy and legislative from across the EU provides an evidence-based pathway to address Ireland's infrastructure and environmental challenges (see Kylvili & Fokaides, 2017). Moreover, the policy should include a clear definition of roles and their allocation in the supply chain to ensure that sustainability in construction is upheld. For example, the Chinese government's construction policies clearly specify the unique obligations of key players, such as developers' role in solid waste management and environmental impact assessment, and designers' adherence to the compulsory energy standard set by the country's Energy Conservation Law (Chang et al., 2016).

5.2.2.3. Social housing residents. Household behaviour is a critical agent of change. Even the most recent upgraded or newly built energy-efficient home will suffer from poor IEQ if tenants are not supported in adapting to new technologies. Many Irish social housing tenants remain unfamiliar with sustainable innovations, such as heat pumps and Mechanical Ventilation Heat Recovery (MVHR) systems. For example, Stakeholder 13 highlights a relevant disconnect. While traditional oil or gas boilers require manual switching, heat pumps are designed for continuous, low-background operation. When tenants apply old habits to new systems, the results are often counterproductive:

Stakeholder 13 (AHB): "We see issues around people not heating their properties appropriately, people incurring large bills because they're trying to use a heat pump in a way that it's not designed for. We're seeing subsequent damp, mould, and condensation issues around that because what we have is highly insulated, high-airtight houses and people are turning off mechanical ventilation heat recovery systems. They're turning off heat pumps, and then they have a build-up of carbon dioxide in the property."

Misunderstanding these systems does more than increase costs; it compromises the building's structural integrity and the resident's health. This underscores the need for clear communication and user-friendly education to ensure that technological upgrades translate into actual improved living standards.

Stakeholders 23 and 24 (residents) share that while they are interested in new technology and information, the data and results are not being provided to them. For instance, a water quality study was conducted by an Irish organisation in their area. The residents were aware that the study would inform them about whether their water was safe to drink. However, they claim they were not provided with the results. When they asked the organisation for results, they received a technical report filled with data that was only comprehensible to an expert.

This situation exemplifies the earlier cited insight of Stakeholder 21 (environmental consultant) regarding the need to translate data effectively to ensure that messages are delivered clearly. According to our data, there is a rising interest among our social housing resident stakeholders in learning how to make their homes more sustainable, as 80% agree with the installation and usage of technological devices to address dampness, mould, and condensation issues in their residences. However,

the key feature they would like to see to ensure continued usage is that information is easily accessible and understandable. Residents, Stakeholders 23 and 24, suggest this could involve informing them about what home factors are monitored by the equipment, the accessibility of any collected data (if there is any), and recommending ways they can adopt more sustainable household behaviours.

In the social housing sector, some AHBs are working to ensure that communication, information dissemination, and messaging from organisations to tenants are effectively circulated. This is being done through monthly newsletters, online communication portal, engagement with tenants through visits by engagement officers, and programs such as webinars and in-person meetings or training. However, as cited earlier, tenants are often not keen on participating in these information dissemination programs, as evidenced by low participant turnout. Stakeholder 26 shares a successful approach recently implemented in Ireland to disseminate information regarding carbon monoxide that they believe should also be applied to promote home sustainability and enhanced IEQ among social housing tenants.

Stakeholder 26 (a non-profit focusing on IAQ and IEQ issues in Ireland):

"It's a really important point around the whole area of having an awareness campaign, which is again really important from the point of view of creating general public awareness in the way that we hope... There needs to be a campaign that is multi-channel. So it needs to be on TV, in the newspapers, in literature of that kind, and talking about it... online, of course, in general, because so much communication is now online."

Stakeholder 26 adds that pamphlets should be available in GP clinics, hospitals, and other areas frequented by those who may be ill, as these can be effective places to disseminate such information, especially since IEQ is a health-related matter.

Nevertheless, stakeholders generally agree that while communication is available, more effort is needed to deliver messages effectively, especially if the goal is to encourage new lifestyle habits that align with home sustainability and technological advancements. The tone of the information delivery is also crucial, as tenants do not want to feel patronised or blamed for problems. Concerns about security and privacy in using technologies must also be addressed. As Stakeholder 2 suggested, the more tenants are informed about the safety of their privacy and homes, the more they would be willing to cooperate.

From a sustainability theory perspective, a comprehensive approach that includes a 3P formulation will help achieve a significant sustainability impact. In this context, including social housing residents in policy design supports social justice values resulting in enhanced community well-being (Elkington, 2013). Stakeholder 12 (advocacy group) advocates for a national voice for tenants to empower social housing residents and ensure that their perspectives and needs are prioritised in decision-making processes. This collaborative model mirrors a successful 2013 LAs initiative, where public discussions during the planning and management stages created a strong sense of community ownership and collaboration (Siddall et al., 2013). Their suggestions were incorporated into Dublin City Council's 2013 Sustainability Report. By motivating this sense of agency, tenants would be encouraged to take an active role in promoting sustainability and IEQ practices, seeing themselves as essential partners in collaboration with the government.

6. Discussion

The integration of MSF and Sustainability theory provided a robust framework for understanding how the alignment - or misalignment - of problem, policy, and political streams influences the integration of sustainability dimensions in Ireland's social housing sector. This dual-theoretical approach offers critical insights into the challenges of balancing environmental, economic, and sustainability strategies in housing policy.

As visualised in Fig. 2, the *problem stream* is well-documented, with

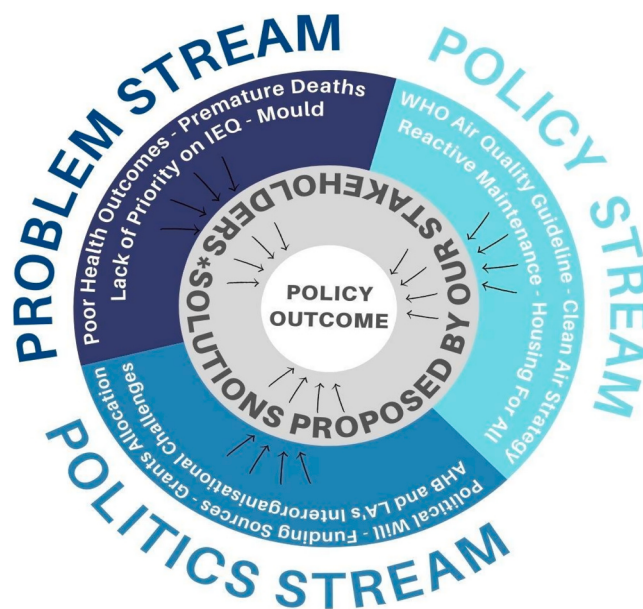


Fig. 2. MSF Framework applied to research findings.

evidence linking poor IEQ to severe health risks, such as respiratory illnesses, mental health challenges, and premature deaths (EPA, 2023; WHO, 2021). Tragic incidents like the Rochdale mould-related death have further highlighted the urgency of addressing these issues (Stakeholders 6, 10, 12, 15). However, despite the availability of solutions such as proactive maintenance, technological interventions, and retrofitting, these remain under-prioritised in the *policy stream*. National policies like Housing for All focus overwhelmingly on increasing housing supply, often at the expense of sustainability and IEQ improvements. This misalignment reflects a critical gap in the *political stream*, where short-term housing delivery targets seem to be overshadowing long-term health and environmental concerns.

From a Sustainability Theory lens, the neglect of IEQ undermines all three pillars of sustainability. Environmental sustainability is compromised through inefficient energy use and indoor air pollution (Moore & Doyon, 2023), while social sustainability is eroded as vulnerable populations, such as older adults and children, bear the brunt of poor living conditions (Chan & Adabre, 2019). Economic sustainability is also at risk, as the long-term costs of healthcare and emergency repairs far outweigh the upfront investments needed for IEQ improvements (Haidar & Bahammam, 2021). Stakeholders emphasized the need for evidence-based policies, ring-fenced funding, and cross-government collaboration to address these gaps, but political will remains a significant barrier.

Aside from the lack of political will, Elkington's (2013) 3P formulation also explains the misalignment of streams that hinder change in the Irish social housing sector. These three dimensions should be considered and measurable to ensure that projects and businesses have a meaningful environmental, social, and economic impact. Our findings in the previous section, and as visualised in Fig. 2, show that the sector cannot sufficiently represent each dimension to balance the misalignment. For example, regarding social impact (people), our research participants highlight the absence of social justice in the construction supply chain, including low wages, the absence of benefits, and limited job security. The environmental (planet) impact is established in the policy stream despite imperfections, as it is supported by the Irish government, the EU, and WHO directives that set forth ecological footprint measurements to ensure the country is fully guided in air quality matters. However, the policy stream does not adequately support the economic (profit) dimension or the benefits the country will gather from policy changes in the social housing sector. Stakeholders highlight a significant financial gap in sustainability matters within the sector, which is why IEQ

remains unprioritised. Insufficient funding and political resolve to shift from reactive to proactive maintenance strategies currently hinder the political stream. The alignment across all three streams requires policy recommendations based on adequate 3P formulations. The timing to advance this agenda is optimal when a policy window opens.

Kingdon (2011) states that combining the three policy streams is most effective when a policy window is open to push for agendas or projects. This policy window may open in the presence of compelling problems or amid significant changes or activities within the government. However, policy windows can close very quickly. Hence, it is in the policymaker's best interest to act while it is open. This study's contribution is a readily available document that offers a timely analysis of the current state of sustainability in the social housing sector and policy gaps. Using MSF and Sustainability Theory lenses, we were able to provide Ireland-specific needs, realistic, factual, and useful information to support policy recommendations. Given the issues presented throughout this article and the Ireland's recent changes in housing policy after the general election in 2025, we argue that policy windows were open once the government signalled the elaboration of a new housing plan (Delivering Homes, Building Communities 2025–2030) and that the sector is well-positioned to start challenging the status quo despite the dominant focus on housing supply. This research provides ready-to-evidence that enable policymakers to allocate more time to maximising the opening of a policy window rather than researching from scratch, thereby ensuring they can capitalise on this elusive opening before it closes.

However, for this window to lead to meaningful change, policymakers and stakeholders need to effectively translate data into action for policy change in order to present a compelling economic case for IEQ improvements. This requires a collaborative effort among policymakers, the construction supply chain, and social housing residents – the three key agents of change.

Cross-sectoral alliances remain underdeveloped in Ireland, overshadowed by the current focus on expand housing supply. When policy windows closes and the sector loses its opportunity for policy change, one pragmatic approach is to lay the groundwork in anticipation of future policy windows, in the next housing plan when it reaches its 2030 deadline. Central to this preparation is the requirement for the government to consult social housing providers and co-design the future housing plan. By involving these providers in the design process, the state can ensure that future policy windows are met with collaborative, evidence-based strategies that prioritise long-term sustainability alongside supply. This preparation can involve building networks and strategies within and between organisations, developing evidence-based proposals, and engaging in public awareness campaigns. Another relevant strategy is to conduct a cost-benefit analysis of how technological interventions can address IEQ issues, such as installing environmental sensors in social housing. Real-world examples from other countries, such as annual savings of €555 million in Catalonia, €758 to €930 million in France on maintenance and healthcare costs (HHI, 2023), and a 30% reduction in anomalies when analysing building infrastructure with technology compared to manual inspection in Bangladesh (Farce et al., 2025), demonstrate the economic advantages of policy changes in this sector. While best practices from other countries can inform this process (see BPIE, 2024; Vázquez-Torres et al., 2025), the involvement of Housing Alliance (a network representing major AHBs in Ireland) is well-positioned to catalyse changes and partnerships to ensure policy reforms are effectively adapted to the Irish context.

7. Conclusion

The persistent health and environmental failures in Irish social housing are symptoms of deeper systemic flaws in policy planning and funding. Stakeholder testimony confirms that critical issues, such as mould and poor IEQ, are not isolated incidents, but the direct result of deprioritized maintenance and chronic underfunding. Evidence suggests

that the sector is not passive in the face of these challenges; indeed, stakeholders with sufficient resources have already begun pioneering technological interventions and proactive maintenance models. However, for the majority of social housing providers, the path to sustainability is blocked by external constraints, specifically rigid government mandates and shifting political priorities. These findings underscore a growing urgency: to achieve lasting change, Ireland must move beyond reactive symptom management and address the structural barriers that prevent stakeholders from scaling successful, evidence-based solutions.

Using both MSF and Sustainability Theory offers insights beyond what either framework could provide on its own. MSF alone would highlight the misalignment between the three streams, but it would not explain why this fragmentation persists. Similarly, Sustainability Theory would expose gaps across 3P, yet it lacks the analytical tools to address the political timing and institutional barriers that prevent reform. Our combined framework reveals a critical finding: the misalignment of MSF streams stems from imbalances across 3P dimensions. The policy stream provides weak economic justification for IEQ improvements. This creates a sustainability trade-off that undermines the political stream, as stakeholders are reluctant to support reforms without clear financial benefits. This helps explain why IEQ improvements have stalled despite well-documented health crises and available technological solutions. The integrated approach also points to practical implications: achieving policy change requires both the alignment of the three MSF streams and a balanced representation of the 3P. Policy windows, therefore, offer a crucial opportunity to address both requirements simultaneously. Our analysis suggests that for IEQ reforms to succeed, policymakers must strengthen the economic case (the profit dimension) to stabilise the political stream and create the conditions for stream convergence when policy windows open.

Those problems persist due to gaps in policy and political streams. As the MSF suggests misaligned priorities fragment implementation and so intensifying existing problems. Sustainability Theory further explains how these systemic gaps leads marginalization of IEQ improvements in Ireland. Drawing on our empirical findings we propose a strategic policy shift centred on the following elements: (1) Policy changes prioritising IEQ in all building and retrofitting projects through integrated technological interventions; (2) a transitioned asset management approach that replaces reactive repairs with proactive strategies and regular national stock surveys; (3) ring-fenced government funding specifically dedicated to IEQ and preventative maintenance; (4) mandated LA maintenance services to ensure consistent standards across the public sector; (5) a transition towards proactive maintenance models; (6) activation of cross-sectoral alliances to unify industry efforts; and (7) proactive resident involvement fostered through consistent communication, knowledge sharing, and mass media campaigns.

A limitation of this study was the restricted access to the lived experiences of Local Authority LA. Consequently, one of this study's recommendations for future research is to explore the current conditions in LA properties, since evidence from the Oliver Bond and Dolphin House (and other similar cases frequently featured on Irish News media reports) suggests that their condition may be worse than that of tenants living in AHB properties. Another area that deserves further attention is the tendency to blame social housing tenants for home IEQ issues, such as damp, mould, and poor ventilation, even when the root causes often stem from structural deficiencies or inadequate maintenance. Other research recommendations include focusing on tenant participation in housing management and decision-making processes to improve IEQ and overall housing conditions, as well as analysing the effectiveness of tenant involvement in AHBs that have already implemented this practice to address policy gaps, particularly in repairs and maintenance.

CRedit authorship contribution statement

Valesca Lima: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Resources, Methodology,

Investigation, Funding acquisition, Formal analysis, Conceptualization. **Tracy Mae Ildelfonso:** Writing – original draft, Validation, Resources, Project administration, Methodology, Formal analysis, Data curation. **Stephen Daniels:** Validation, Software, Funding acquisition, Conceptualization. **Joseph Mullally:** Investigation.

Declaration of Generative AI and AI-assisted technologies in the writing process

The authors utilised Grammarly for proofreading the final version of the text. And Canva's free stock library for figure illustrations but no images were AI-generated. Following the use of these tools, the authors carefully reviewed and edited all content and take full responsibility for the published article.

Funding sources

The SHINE Research Project is a recipient of the National Challenge Fund, where funding is coordinated and administered by Taighde Éireann – Research Ireland, established under the government's National Recovery and Resilience Plan (NRRP) and funded by the EU's Recovery and Resilience Facility.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We owe a big thank you to all research participants in this study; your honesty and willingness to share your experiences are the true foundation of this paper. We are also deeply grateful to our partner Clúid Housing for championing this work and opening doors for us along the way. Finally, a thank you to the organisers and participants of the PSAI Standing Group on Public Policy Workshop 2025 for their feedback and insightful discussions significantly strengthened our paper.

Data availability

Anonymised and pseudonymised data may be provided upon request, but is subject to the GDPR framework and authors' discretion.

References

- Ahmad, A., & Alshurideh, M. (2025). Digitization and IoT-driven transformation of smart buildings. *International Journal of Management and Marketing Intelligence*, 2(1), 26–38.
- Assa-Agyei, K., Olajide, F., & Lotfi, A. (2022). Security and privacy issues in IoT healthcare application for disabled users in developing economies. *Journal of Internet Technology and Secured Transactions (JITST)*, 10(1), 770–779.
- Bazeley, P. (2006). The contribution of computer software to integrating qualitative and quantitative data and analyses. *Research in the Schools*, 13(1), 64–74.
- BPIE, Buildings Performance Institute Europe. (2024). Healthy Buildings Barometer 2024. How to deliver healthy, sustainable, and resilient buildings for people. Retrieved from: <https://www.bpie.eu/publication/healthy-buildings-barometer-2024-how-to-deliver-healthy-sustainable-and-resilient-buildings-for-people/> Accessed January 09, 2026.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.
- CAN, Community Action Network. (2017). A place called home: The story of a campaign for housing human rights. Dublin, Ireland. Retrieved from https://www.canaction.ie/wp-content/uploads/2023/03/a_place_called_home_case_study.pdf.
- Chan, A. P., & Adabre, M. A. (2019). Bridging the gap between sustainable housing and affordable housing: The required critical success criteria. *Building and Environment*, 151, 112–125.
- Chang, R. D., Soebarto, V., Zhao, Z. Y., & Zillante, G. (2016). Facilitating the transition to sustainable construction: China's policies. *Journal of Cleaner Production*, 131, 534–544.
- Citizens Information. (2025, January 14). Grants for a home energy upgrade. Retrieved from <https://www.citizensinformation.ie/en/housing/housing-grants-and-schemes/grants-for-home-renovations-and-improvements/grants-for-a-home-energy-upgrade/> Accessed February 12, 2025.
- Clarke, D., O'Donoghue Hynes, B., Malone, P., & Dieli, C. (2021). Local authority national performance indicator trend report 2014–2019. <https://www.localgov.ie/sites/default/files/2024-04/national-performance-indicator-trend-report-2014-2019.pdf>.
- Colclough, S., Kinnane, O., Hewitt, N. J., & Griffiths, P. (2018). Investigation of ZEB social housing built to the Passive House standard. *Energy and Buildings*, 179, 344–359.
- Creane, D., Hayes, C., O Ciardha, D., Smith, S. M., Campbell, A., & Mc Carthy, N. (2024). *Health data to support local communities*. 1 pp. 1–12. Retrieved from <https://www.tara.tcd.ie/handle/2262/104420> Accessed February 02, 2025..
- Daly, H. E. (1996). *Beyond growth: The economics of sustainable development*. Beacon Press.
- DCC, Dublin City Council. (2021). Dolphin House regeneration master plan framework 2021. https://www.dolphinhouse.ie/assets/files/pdf/dh_master_plan_framework_for_consultation_250321.pdf Accessed February 09, 2025.
- DECC, Department of the Environment, Climate & Communications. (2021). Ireland's Energy Efficiency Obligation Scheme: Summary of responses to public consultation and policy decisions on scheme design. Retrieved from: <https://assets.gov.ie/statistics/documents/eeos-consultation-summary-and-design-decisions.pdf>.
- EEA, European Environment Agency. (2024). The case for public participation in sustainability transitions. Retrieved from <https://www.eea.europa.eu/publications/the-case-for-public-participation>.
- Elkington, J. (1997). *Cannibals with forks: The triple bottom line of 21st century business*. Oxford: Capstone.
- Elkington, J. (2013). Enter the triple bottom line. In *The triple bottom line*. Routledge.
- Environmental Protection Agency. (2025). *Air Quality in Ireland 2024: Ambient Air Annual Report 2024*. Wexford: Environmental Protection Agency. Available at: EPA publication page (Accessed: 25 May 2026).
- EPA, Environmental Protection Agency. (2023). Air quality in Ireland 2022. Retrieved from <https://www.epa.ie/publications/monitoring-assessment/air/air-quality-in-ireland-2022.php> Accessed January 13, 2025.
- EPA, Environmental Protection Agency. (2025). Air quality in Ireland 2024. Retrieved from <https://www.epa.ie/publications/monitoring-assessment/air/air-quality-in-ireland-2024.php> Accessed January 08, 2026.
- EPHA, European Public Health Alliance. (2024). Towards better indoor air quality in the European residential context. Retrieved from: <https://epha.org/wp-content/uploads/2024/04/epha-towards-better-indoor-air-quality-in-the-european-residential-context-final.pdf> Accessed January 14, 2026.
- European Commission. (2024). Zero pollution: New EU rules enter into force for cleaner air by 2030. Directorate-General for Environment <https://environment.ec.europa.eu/>. December 10.
- Farce, M. S., Nishat, M. N. P., Harun, N. B. M., Dola, M. N. J., Islam, M. E., & Zaman, M. T. U. (2025). Integration of AI-Driven Predictive Maintenance in Smart Concrete Structures to Enhance Sustainability and Lifecycle Efficiency. *North American Academic Research*, 8(1), 77–94.
- Golubchikov, O., & Badyina, A. (2012). *Sustainable housing for sustainable cities: A policy framework for developing countries*. Nairobi, Kenya: UN-HABITAT. Retrieved from <https://unhabitat.org/sites/default/files/download-manager-files/Sustainable%20Housing%20for%20Sustainable%20Cities.pdf> Accessed January 01, 2025.
- Government of Ireland. (2021). Housing for all: A new housing plan for Ireland. Retrieved from <https://www.gov.ie/en/publication/ef5ec-housing-for-all-a-new-housing-plan-for-ireland/> Accessed February 06, 2025.
- Government of Ireland. (2024). Report of The Housing Commission. Retrieved from <http://www.gov.ie/en/publication/f3551-report-of-the-housing-commission/> Accessed January 11, 2025.
- Government of Ireland. (2025). *Delivering Homes, Building Communities 2025–2030: An action plan on housing supply and targeting homelessness*. Government of Ireland. <https://www.gov.ie/>. Department of Housing, Local Government and Heritage. (2025, November 13; updated May 8, 2026).
- Griessler, E., & Littig, B. (2005). Social sustainability: A catchword between political pragmatism and social theory. *International Journal for Sustainable Development*, 8(1/2), 65–79.
- Haidar, E. A., & Bahammam, A. S. (2021). An optimal model for housing projects according to the relative importance of affordability and sustainability criteria and their implementation impact on initial cost. *Sustainable Cities and Society*, 64, Article 102535.
- Hearne, R., & Lima, V. (2024). *Social housing as financialised real estate investment or a right to housing: Investigating new social housing leasing schemes in Ireland*. Workshop at The Financialization of Social Housing. Brussels: KU Leuven.
- Herweg, N., Huß, C., & Zohnhöfer, R. (2015). Straightening the three streams: Theorising extensions of the multiple streams framework. *European Journal of Political Research*, 54(3), 435–449.
- Herweg, N., Zahariadis, N., & Zohnhöfer, R. (2018). *The multiple streams framework: Foundations, refinements, and empirical applications in theories of the policy process*. Routledge.
- Herweg, N., & Zohnhöfer, R. (2024). Multiple streams in policy implementation. In F. Sager, C. Mavrot, & L. R. Keiser (Eds.), *Handbook of public policy implementation*. Edward Elgar Publishing.
- HHI, Healthy Homes Ireland. (2023). OUR PLACE: Towards healthier greener homes. Retrieved from <https://www.igbc.ie/wp-content/uploads/2023/05/2.-HHI-Report-Final-Digital.pdf> Accessed February 05, 2025.
- Holden, K. A., Lee, A. R., Hawcutt, D. B., & Sinha, I. P. (2023). The impact of poor housing and indoor air quality on respiratory health in children. *Breathe*, 19(2).
- Houses of the Oireachtas. (2025). Dáil Éireann debate - Thursday, 27 Feb 2025 Vol. 1063 No. 6. Retrieved from <https://www.oireachtas.ie/en/debates/debate/dail/2025-02-27/34/> Accessed March 11, 2025.

- Housing (Regulation of Approved Housing Bodies) Act 2019, Number 47 of 2019. Retrieved from <https://www.irishstatutebook.ie/eli/2019/act/47/>, (2019).
- Hunt, C. (2024). *Dolphin House residents say conditions violate human rights*. RTE News. Retrieved from <https://www.rte.ie/news/regional/2024/0613/1454575-flats-dublin-regeneration/> Accessed April 9, 2025.
- IGBC. (2025). What is Home Performance Index?. Retrieved from: <https://homeperformanceindex.ie/what-is-home-performance-index/> Accessed February 12, 2025.
- Ildefonso, T., Lima, V., Daniels, S., & Mullally, J. (2026). Co-creating sustainable innovations in Irish Social Housing Through Participatory Research. *Sustainable Futures*, 11(1).
- Jordan, M. (2022). Empowering tenants: Protecting human rights: effective tenant participation in the management of local authority housing. Retrieved from: https://eprints.soton.ac.uk/472880/1/Building_Effective_Tenant_Participation_final_200422_1_.pdf Accessed October 01, 2025.
- Kingdon, J. W. (2011). *Agendas, alternatives, and public policies*. Longman.
- Kurian, G. T. (2011). Multiple streams theory. In G. T. Kurian (Ed.), *The encyclopedia of political science* (pp. 1067–1068). CQ Press.
- Kylili, A., & Fokaides, P. A. (2017). Policy trends for the sustainability assessment of construction materials: A review. *Sustainable Cities and Society*, 35, 280–288.
- Landlord and Tenant (Amendment) Act 1980 (2019), cf.1931, s. 12. Retrieved from <https://revisedacts.lawreform.ie/eli/1980/act/10/section/48/revised/en/html>, (2019) Accessed April 16, 2025.
- Li, A., Mason, K., Li, Y., & Bentley, R. (2025). The challenges of quantifying the effects of housing on health using observational data. *Annals of Epidemiology*, 102, 23–27.
- Liaw, K. T. (2024). Benefits of property assessed clean energy programs and securitization of property assessed clean energy loans. *Commodities*, 3(4), 421–430.
- Lima, V., Hearne, R., & Murphy, M. (2022). Housing financialisation and the creation of homelessness in Ireland. *Housing Studies*, 38(9), 1695–1718.
- Lima, V., Ildefonso, T., Daniels, S., & Mullally, J. (2026). Transforming social housing: Moving beyond tenant blame to address systemic Indoor Environmental Quality (IEQ) challenges. *Housing Studies*, 42(1).
- Lima, V., & Xerez, R. (2023). Social housing systems and welfare in Ireland and Portugal: A comparative analysis. *International Journal of Housing Policy*, 23(1), 179–189.
- Mallinson, D. J., & Shafi, S. (2022). Smart home technology: Challenges and opportunities for collaborative governance and policy research. *Review of Policy Research*, 39(3), 330–352.
- Manzo, L. K. C. (2024, January 12). *What are the health implications of poor social housing in Dublin?* RTE Brainstorm. Retrieved from <https://www.rte.ie/brainstorm/2024/0112/1426051-oliver-bond-flats-dublin-city-of-care-social-housing-regeneration/> Accessed March 21, 2025.
- McAuley, E. (2024). 'Five of us are in a two bed flat full of mould': Oliver Bond residents speak out. *The Journal*. Retrieved from <https://www.thejournal.ie/oliver-bond-flats-dublin-6279136-Jan2024/> Accessed March 21, 2025.
- Moore, T., & Doyon, A. (2023). *A transition to sustainable housing: Progress and prospects for a low carbon housing future*. Springer Nature.
- Moses, L., Morrissey, K., Sharpe, R. A., & Taylor, T. (2019). Exposure to indoor mouldy odour increases the risk of asthma in older adults living in social housing. *International Journal of Environmental Research and Public Health*, 16(14), 2600.
- NOAC, National Oversight and Audit Commission. (2017). A review of the management and maintenance of local authority housing. Retrieved from <https://www.housingagency.ie/sites/default/files/publications/37.%20NOAC-Management-and-Maintenance.pdf> Accessed March 19, 2025.
- NOAC, National Oversight and Audit Commission. (2024). Local authority performance indicator report 2023. Retrieved from <https://cdn.noac.ie/wp-content/uploads/2024/10/NOAC-PI-Report-2023-FINAL.pdf> Accessed March 19, 2025.
- Norris, M., & Fahey, T. (2014). Conclusions. In M. Norris (Ed.), *Social housing, disadvantage, and neighbourhood liveability ten years of change in social housing neighbourhoods*. Routledge.
- O'Hegarty, R., Wall, S., & Kinnane, O. (2022). Whole life carbon in construction and the built environment in Ireland: Today, 2030, 2050. Retrieved from <https://www.igbc.ie/wp-content/uploads/2022/05/22-WLC-IGBC-Build-Green-Now-P1-and-P2.pdf>.
- Oladoja, I., Akanbi, M., Adedotun, K., & Raji, A. (2025). IoT-enabled smart property management systems: Challenges and future prospects. *Journal of Biodiversity and Environmental Research*, 8, 75–89.
- O'Sullivan, E. (2020). *Reimagining homelessness: For policy and practice*. Bristol: Bristol University Press.
- Oswald, F., Wahl, H. W., Schilling, O., Nygren, C., Fänge, A., Sixsmith, A., Sixsmith, J., Széman, Z., Tomsone, S., & Iwarsson, S. (2007). Relationships between housing and healthy aging in very old age. *The Gerontologist*, 47(1), 96–107.
- Purvis, B., Mao, Y., & Robinson, D. (2019). Three pillars of sustainability: In search of conceptual origins. *Sustainability Science*, 14, 681–695.
- Reponen, T., Levin, L., Zheng, S., Vesper, S., Ryan, P., Grinshpun, S. A., & LeMasters, G. (2013). Family and home characteristics correlate with mold in homes. *Environmental Research*, 124, 67–70.
- RRIAG, Rialto Rights in Action Group. (2010). Report on the first monitoring of housing conditions in Dolphin House. Retrieved from https://www.canaction.ie/wp-content/uploads/2023/03/first_monitoring_report_september_2010.pdf Accessed March 18, 2025.
- RTB, Residential Tenancies Board. (2021). Guide to making a complaint. Retrieved from https://www.rtb.ie/images/uploads/general/Guide_to_Making_a_Complaint_%28Revised_Aug_2021%29.pdf Accessed March 19, 2025.
- Russell, H., et al. (2022). *Monitoring adequate housing in Ireland*. Ireland: Irish Human Rights and Equality Commission and Economic and Social Research Institute, Ireland. <https://www.ihrec.ie/app/uploads/2021/09/Monitoring-Adequate-Housing-In-Ireland-Sept-2021.pdf> Accessed March 03, 2023.
- Ruvalcaba-Gomez, E. A., Criado, J. I., & Gil-Garcia, J. R. (2023). Analysing open government policy adoption through the multiple streams framework: The roles of policy entrepreneurs in the case of Madrid. *Public Policy and Administration*, 38(2), 233–264.
- SEAI, Sustainable Energy Authority of Ireland. (2023). Energy in Ireland 2023 report. Retrieved from <https://www.seai.ie/sites/default/files/publications/Energy-in-Ireland-2023.pdf> Accessed January 11, 2025.
- Shukla, A., Liu, S., Gaterell, M., Wood, G., Day, R., Iweka, O., Hussain, A., Van der Horst, D., & Petridis, P. (2019). Implementing an integrated meter and sensor system (IMSS) in existing social housing stock. *Energy & Buildings*, 182, 274–286.
- Siddall, E., Grey, T., & Dyer, M. (2013). Indicators and stakeholder engagement: A Dublin case study. *Proceedings of the Institution of Civil Engineers-Engineering Sustainability*, 166(2), 85–97. <https://doi.org/10.1680/ensu.12.00004>
- Thomas, E. (2011). Mould analysis report. Retrieved from https://www.canaction.ie/wp-content/uploads/2023/03/mould_analysis_march_2011.pdf Accessed January 31, 2025.
- Tsoulou, I., Senick, J., Mainelis, G., & Kim, S. (2021). Residential indoor air quality interventions through a social-ecological systems lens: A systematic review. *Indoor Air*, 31(4), 958–976.
- Vázquez-Torres, C. E., Ozawa-Meida, L., Bienvenido-Huertas, D., & Bassam, A. (2025). Advancing sustainable housing in Latin America: A critical review of energy efficiency, indoor environmental quality, and policy. *Sustainability*, 17(13), 6139.
- Watson, D., & Williams, J. (2003). *Irish National Survey of Housing Quality 2001–2002*. Dublin: ESRI in association with Department of Environment, Heritage & Local Government. Retrieved from <https://www.esri.ie/publications/irish-national-survey-of-housing-quality-2001-2002> Accessed January 31, 2025.
- WHO, World Health Organization. (2021). What are the WHO Air quality guidelines? Improving health by reducing air pollution. Retrieved from <https://www.who.int/news-room/feature-stories/detail/what-are-the-who-air-quality-guidelines> Accessed February 06, 2025.
- Wilson, J. (2024, January 23). *Oliver Bond House residents more than twice as likely to have asthma*. The Irish Times. Retrieved from <https://www.irishtimes.com/ireland/social-affairs/2024/01/23/oliver-bond-house-residents-more-than-twice-as-likely-to-have-asthma/> Accessed March 21, 2025.
- Winston, N. (2009). Urban regeneration for sustainable development: The role of sustainable housing? *European Planning Studies*, 17(12), 1781–1796.
- Zahariadis, N., & Petridou, E. (2024). A 40-year retrospective of John Kingdon's agendas, alternatives and public policies. *International Review of Public Policy*, 6(6:3).
- Zohnhöfer, R., & Rüb, F. W. (Eds.). (2016). *Decision-making under ambiguity and time constraints: Assessing the multiple-streams framework*. ECPR Press.