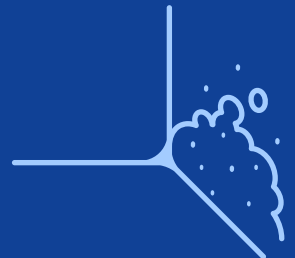
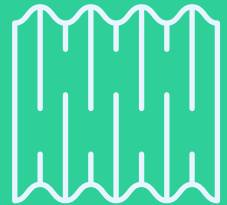




POLICIES, REGULATIONS & LEGISLATION PROMOTING HEALTHY HOUSING: A REVIEW



World Health
Organization



POLICIES,
REGULATIONS
& LEGISLATION
PROMOTING
HEALTHY HOUSING:
A REVIEW

Policies, regulations and legislation promoting healthy housing: a review

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ABBREVIATIONS

BREEAM	Building Research Establishment Environmental Assessment Method
BTH	Beijing-Tianjin-Hebei
EED	Energy Efficiency Directive (European Union)
EPA	Environmental Protection Agency (USA)
HFH	Housing for Health (Australia)
HHGL	Housing and health guidelines (WHO)
HHSRS	Housing Health and Safety Rating System (United Kingdom)
ICAP	India Cooling Action Plan
LEED	Leadership in Energy and Environmental Design
LSHTM	London School of Hygiene and Tropical Medicine
NHS	National Health System (United Kingdom)
NICE	National Institute for Health and Care Excellence (United Kingdom)
NSW	New South Wales
POE	post-occupancy evaluation
RICS	Royal Institution of Chartered Surveyors (United Kingdom)
SHS	second-hand smoke
UCL	University College London
WHO	World Health Organization





EXECUTIVE SUMMARY



The potential to improve health and equity through better housing is well established. [The WHO Housing and health guidelines](#) (HHGL) provide evidence-based recommendations for housing that support health, quality of life, sustainability and poverty alleviation. These guidelines have ever greater relevance because of global trends of increasing urbanization, climate change and ageing populations.

View the WHO Housing and health guidelines (HHGL)

for more information.



As part of efforts to support the wider implementation of the HHGL, we undertook a review of health-promoting housing policies, regulations and legislation that have been adopted at national, regional and local levels in countries of the six WHO regions. Relevant examples with the potential to produce health benefits for residents are set out in a repository and discussed in this report. This overview of existing policies, regulations and legislation is intended to serve as an aid for policy-makers and stakeholders seeking to plan, formulate and implement similar policies aimed at promoting healthy and safe housing for all.

The policies were identified through searches of academic bibliographic databases and grey literature and through expert input. The contexts in which policies were adopted and implemented were documented, as were specific barriers, enablers and benefits for health. In view of the limited timescale of the project, it was not possible to undertake a fully comprehensive, systematic review and analysis. The review and repository were supplemented with knowledge gathered during a WHO expert consultation in January 2020 and provide a series of examples that can inform discussion among policy-makers and other stakeholders working on healthy housing.

As the review makes clear, the consideration of health in housing policies is vital to improve population health and to avoid unintended consequences. The review's key conclusions and suggestions for a set of best practice principles (following adaptation to the specific setting) are summarized below.

Conclusions

Many housing policies focus on single health risks:

There are fewer examples of policies that explicitly attempt to address multiple health risks or are based on an integrated multisectoral approach. Further, most housing policies are not directly formulated with health protection as the central requirement; however, many are still likely to yield positive health benefits, such as those focused on improving housing energy efficiency or those considering thermal comfort.

There is variability in policy development and implementation globally:

The need for policy development and the priorities of existing policies vary by geographical region, climate zone and level of socioeconomic development. It appears that policies are generally more elaborated in high-income countries and less so in low-income settings.

Relevant policies take a wide range of forms:

They include those based on compulsory and voluntary mechanisms: legislation (laws passed by legislative bodies), regulation (requirements usually mandated by governments to implement legislation), and voluntary design guidance. In addition, there are examples of housing construction and upgrading programmes, initiated by local or national authorities, to improve housing (e.g. for health, safety or climate change reasons) and systems of grants for individuals to adapt their dwellings (e.g. to make them accessible).

Evidence demonstrates that housing policies can yield health benefits:

Reported health benefits include reductions in asthma symptomatic episodes, emergency room visits, hospitalizations, and reported second-hand smoke (SHS) exposure. Co-benefits of policies include economic benefits on a household and national level, fewer school and work absences, reduced health inequalities and cost savings to the household (e.g. related to decreased energy spending). However, policies may have unintended consequences such as enhanced health inequalities through increased costs of fuel and equipment and discrimination by property managers against certain demographics.

There are well-recognized enablers and barriers to policy implementation:

As discussed in the housing and health literature, these broadly align to other common “barriers and facilitators” to health-related policy, such as the requirements of multisectoral collaboration and adequate resources. This means that there are many good practices to draw upon from other health promotion activities to increase policy implementation for healthy housing. Development of housing and health policy has been facilitated by evidence on the impacts of interventions, by advocacy of expert groups, and through recognition of issues on the international arena. Effective implementation has been enabled by cross-sectoral collaboration (e.g. between built environment, legal and health practitioners), access to resources (e.g. flexible public funding), clear and usable policy guidance and tools, staffing resources (particularly where they can support enforcement and work across sectors), effective enforcement which creates a culture of accountability, and where policies achieve co-benefits, particularly economic benefits. Barriers to policy implementation include the lack of these factors and, additionally, lack of knowledge, interest and policy coverage for all housing types, including for people without legal land tenure.

Suggested set of best practice principles

1

Work to address gaps in housing policies that promote health locally: Despite numerous examples of implemented policies that support healthy housing, there are gaps in the existence of policy across all countries. There is, therefore, a need for countries to consider the development of housing policies that promote health, where they do not currently exist locally. Policy-makers may draw on the examples provided in this review to develop context-specific policies, using a process of consultation and impact assessment. Careful consideration of the noted barriers and enablers can further guide this process.

2

Recognize health as a core element in housing policies: Recommendations in the [HHGL](#) can be translated into context-specific policies and serve as a basis for monitoring and evaluating progress and success of implemented policies. Without putting health at the heart of housing policy-making, the right to adequate housing cannot be fulfilled, even where policies have co-benefits for health, such as those focused on energy efficiency.

3

Consider multiple health risks in a coordinated manner: Without due consideration, there is likely to be a trade-off between health risks. Furthermore, policies that consider multiple risks are likely to be more cost effective. For example, increasing shading to protect against high indoor temperatures may result in low indoor temperatures during cold weather. Policies should consider these trade-offs and go through an appropriate evaluation process to avoid unintended consequences.

4

Follow scientific evidence and examples of good practice: In most, perhaps all, settings, strengthening the mechanisms for the development of housing policy informed by scientific evidence and examples of good practice is highlighted.

5

Incorporate health costs and benefits analyses in policy-making: Mechanisms to ensure that analyses of the *health* costs and benefits of housing policy are routinely incorporated into policy decisions may accelerate the development of healthy housing. This could be through health impact assessment or other evaluation mechanisms. It is important to note that many housing policies have the potential to address multiple hazards/health outcomes as well as other (non-health-related) policy objectives and it is important to recognize this when considering the overall balance of costs and benefits.

6

Acknowledge housing is part of a complex system: Most aspects of housing policy exert influence and are influenced by a wide range of factors, reflecting the fact that housing is part of a complex system. The development of a successful policy is likely to be most effective if this complexity is acknowledged and policy objectives are not considered in isolation. A multisectoral “systems thinking” approach, based on structured participatory engagement with a broad range of stakeholders, is likely to result in more effective and holistic policy development and implementation.

7

Develop mechanisms to ensure effective and sustained policy implementation: The achievement of health benefits from any housing policy is contingent upon effective and sustained implementation. Mechanisms to ensure frequent monitoring, effective enforcement and updating of policy are therefore important elements of successfully promoting health and other policy goals through housing sector interventions.

8

Develop approaches that include the informal housing sector: Informal housing is one of the most challenging types of accommodation to make healthy because, by definition, it falls partly or entirely outside official regulatory and policy controls. An important objective for housing and health policy is therefore to develop tools, mechanisms and financing models to ensure access to adequate housing that enhances health and well-being, which may include upgrading informal housing and increasing access to formal housing of various tenures (e.g. social, intermediate or market-led). Housing development is core to community cohesion and should be done via an inclusive approach that involves communities in the decision-making process.

CHAPTER

1

1.
INTRODUCTION



4.
POLICY
EXAMPLES



INTRODUCTION

The purpose of the report and repository is to serve as an aid for policy-makers and stakeholders seeking to plan, formulate and implement similar policies.

The [WHO Housing and health guidelines](#) (HHGL) (WHO, 2018c) set out the evidence base for reducing a wide range of health hazards stemming from poor housing conditions and make practical recommendations on how to promote health and well-being and health equity through housing improvements.

View infographics for more information about healthy housing for a sustainable future.

VIEW INFOGRAPHICS



This follow-on project supports the implementation of the HHGL at national, regional and local levels through the development of a repository of model policies, regulations and legislation. The purpose of the repository (and the associated report) is to serve as an aid for policy-makers and stakeholders seeking to plan, formulate and implement similar policies. The repository and report are further intended to inform the development of tools guiding the policy development processes to promote healthy housing – meaning shelter that supports a state of complete physical, mental and social well-being.

Statutory (or in some cases voluntary) instruments can be applied to translate evidence-based guidance and standards into practice, supporting health through better housing. This report summarizes our policy review and identifies barriers and enablers for implementation. It also discusses the contexts that support such policies to be adopted in countries across the six WHO regions.

This report served as a background document for the expert consultation on the implementation of the HHGL (January 2020). Due to time constraints, we have undertaken a rapid review, with the recognition that the results and associated analysis are not fully comprehensive.

1.1 Policy and the policy process

The definitions and processes associated with developing policy, regulation and legislation for healthy housing vary internationally.

Public policy is broadly defined as “the deliberate decisions - actions and nonactions - of a government or an equivalent authority toward specific objectives”, including examples such as “statutes, laws, regulations, executive decisions, and government programs” (Weible, 2017).

The WHO Health and Environment Linkages Initiative provides summary information about the development of national legislation related to the environment and health, outlining example processes and types of policies (WHO & UNEP, 2020), including, “framework laws (for general categories), sectoral laws (for specific topics), and/or regulations that set standards or administrative requirements for the implementation of a particular law”.

In relation to housing and health, many governments adopt requirements through building codes or regulations. Using the example policy types above, in the United Kingdom of Great Britain and Northern Ireland (United Kingdom) there is legislation in the form of the Building Act 1984 (United Kingdom Government, 1984) that is applied through a system of building control administered by local government. National government publishes a set of “approved documents” or standards that describes routes to compliance with the legislation (United Kingdom Government, Ministry of Housing, Communities & Local Government, 2016). Policies from other policy domains and sectors, such as planning or the environment, may also affect the health-related aspects of housing. This report includes example policies from across these various types of “actions”, using the general term “policy” to encompass the range of available instruments.

This report distinguishes between the processes of developing and implementing policy based on Howlett et al.’s (2016) description of policy-making, which combines the perspectives of several policy process theories. Policy development (including formulation) is characterized as the complex and often contested process of collaboration across diverse actors to produce and adopt a policy (Howlett et al., 2016). Policy implementation involves enacting the policy, such as through the application of building regulations in a new development or banning smoking in social housing.

1.2 Aims

The review has two aims:

1. To identify policies, regulations and legislation that promote healthy housing at national, regional and local levels.
2. To explore the barriers and enablers to development and implementation and the health impacts and co-benefits of healthy housing policies.

1.3 Overview of the repository

The repository, which is available as an Excel document, compiles policies that promote healthy housing. For each entry, the policy title, the policy approach, health risks addressed, implementing agency, and year of implementation are provided. We have also included a link to the policy and a brief description. Where information is available, details are provided on the policy formulation, implementation and health outcomes (both actual and estimated), with the source of this information.

[VIEW REPOSITORY](#)



1.4 Overview of this report

Executive summary

Introduction	This report begins with a brief summary of the purpose and key findings of this review.
Chapter 2: Overview of methods	It then describes our review and analysis methods with details in Annexes 1–3.
Chapter 3: Policy approaches for healthy housing	Chapter 3 describes the policy approaches identified in the review.
Chapter 4: Examples of policies by health risk	Chapter 4 covers each of the housing and health risks outlined in the HHGL, with a subsection for each risk.
Chapter 5: Health outcomes of healthy housing policies	Chapter 5 gives examples of the health benefits of implemented policy.
Chapter 6: Barriers and enablers to policy development and implementation	Chapter 6 presents an analysis of commonly reported barriers and enablers to policy development and implementation.
Chapter 7: Discussion	Overarching themes that have arisen from this review are presented in the Discussion with reference to the wider literature. Finally, the report concludes with future directions and knowledge gaps.





OVERVIEW OF METHODS

This section provides an overview of the methods employed in this review to identify policies and analyse their development and implementation.

2.1 Identification of healthy housing policies

SCIENTIFIC LITERATURE SEARCH

Scientific bibliographic databases were searched to identify literature that discussed health and housing policies. After completing title and abstract screening, a subset of literature that most fully met our eligibility criteria for a full review and subsequent data extraction was prioritized. This search provided information about specific policies, the hazards they addressed, how they were developed and implemented, and their health impact.

POLICY SEARCH

In addition to the academic literature search, we also identified existing policies for housing and health via Advanced Google searches for selected countries. Country searching was prioritized by choosing the three countries in each WHO region with the highest GDP according to data from the World Bank (see Annex 2) under the assumption that these countries would most likely be leaders for housing and health policies in their region. However, exceptions were made where countries had a known reputation for excellence in housing and health policy and/or research, e.g. New Zealand. While we attempted to cover non-English speaking countries, these searches are not exhaustive given resource and language limitations. Searches in Arabic were completed by a team at Alexandria University.

EXPERT INPUT

Expert input was gathered to identify and fill gaps in the policies for housing and health identified through the literature review. Twenty housing and health experts were identified by the WHO. They received a draft form of the repository and a data entry sheet, through which they could provide additional policies for inclusion in the repository and/or report.

2.2 Development of the policy repository

The data from studies and reports were extracted and analysed in Excel, which formed the policy repository. Data was extracted across a number of categories, including WHO region, country and year of implementation; policy title; geographic scale of the policy; housing health risk addressed; policy instrument; implementing agency; and information on the policy development, implementation and impact, where possible.

2.3 Thematic analysis of barriers and enablers

In order to explore the common barriers and enablers to policy development and implementation, a thematic analysis of relevant papers identified in the literature search was completed. Key themes were generated through inductive coding (see Annex 3). Each theme is described in this report with examples from the literature.

2.4 Analysis of health impact and co-benefits

Papers from the literature search that included substantive information on the evaluation of policies were analysed to understand the potential impacts on health and other co-benefits. Co-benefits refer to the other positive impacts of a particular housing policy or design measure, in addition to those benefits related to health. For example, strategies to increase a home's thermal mass will support occupants' thermal comfort and reduce energy use for heating and cooling. For this analysis, data were extracted, compiled and tabulated to provide information on policy efficacy.





POLICY APPROACHES FOR HEALTHY HOUSING

Countries have employed a range of approaches and instruments towards healthy housing, however, specific approaches differ significantly between location and hazard. Countries will need to apply a combination of approaches depending on the local context.

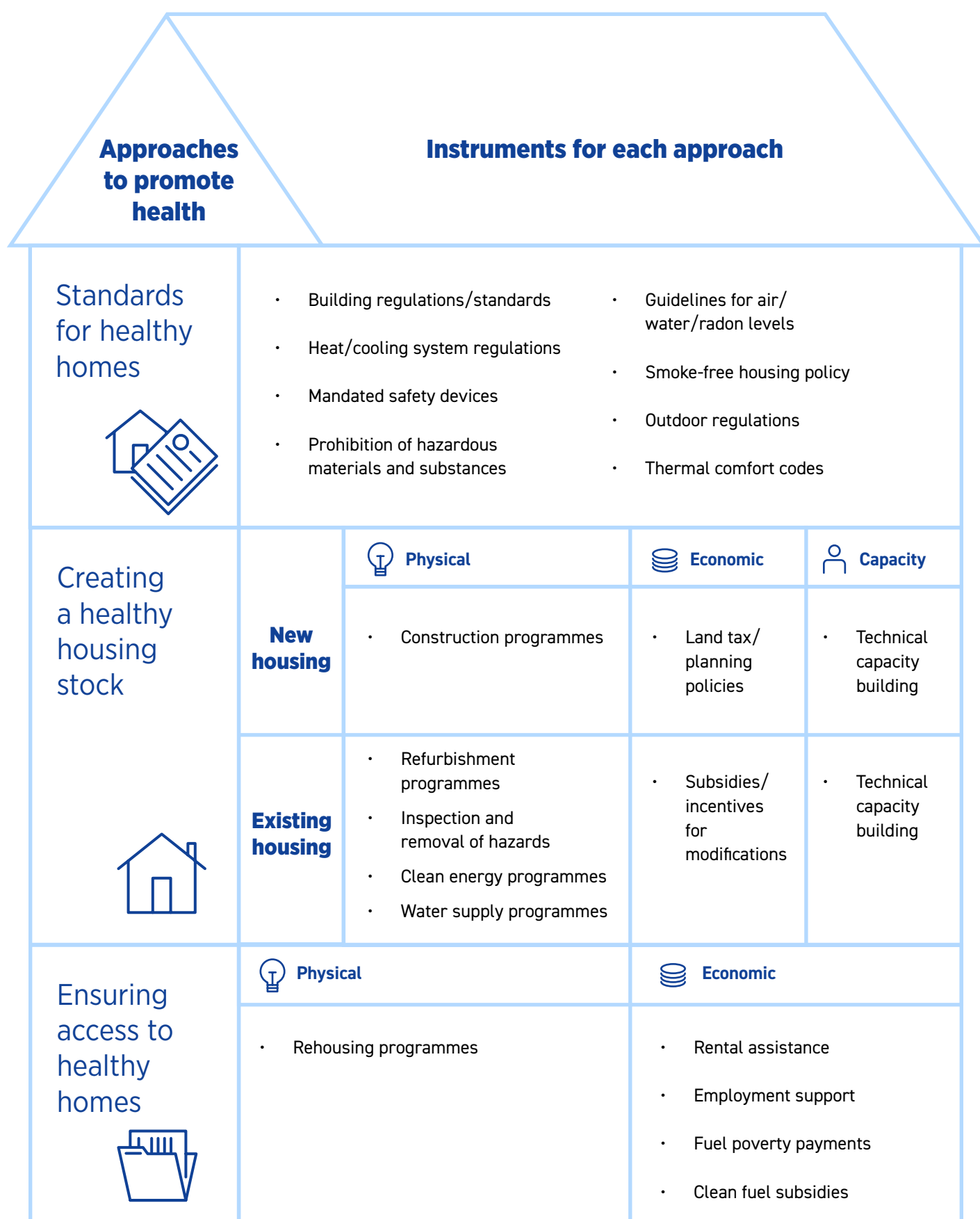
The review uncovered a wide range of policy approaches and instruments that have been developed to promote health. These range from building regulations to subsidies for clean fuels, highlighting the complex and multisectoral approach needed to ensure healthy housing. Policies were grouped into themes and subthemes following discussion during the expert consultation. An overview of the approaches and broad instruments are illustrated in Fig. 3.1. The approaches can be broadly split into three categories:

- 1. Standards for healthy housing that specify technical requirements** of housing including: safeguarding for building and indoor environmental quality (e.g. ventilation rates and heating/cooling systems) and the external environment (e.g. urban greening); prohibiting use of hazardous materials (e.g. lead and asbestos) and generation of pollutants (e.g. banning smoking); mandating safety devices (e.g. fire alarms); and guidelines for water quality, safe sanitation, air quality and radon..
- 2. Policies for creating a healthy housing stock** through:
 - **Construction of new housing**, via public-sector construction programmes or providing economic support/incentives for private-sector programmes or technical capacity to support new construction (e.g. training for the construction sector); and
 - **Modifying existing housing** via housing refurbishment (e.g. installing insulation) and clean energy technologies programmes; supplying clean water (e.g. via tankers), improved toilets and excreta conveyance and treatment (e.g. via sewer connections or on-site services); remediating hazards after inspections (e.g. removing mould and applying damp-course treatments); and providing subsidies/incentives for homeowners or housing providers to make modifications.
- 3. Policies to ensure access to healthy housing**, particularly for vulnerable groups, such as rental assistance or employment support for low-income groups or people with disabilities to access more suitable homes or the rehousing of vulnerable groups, and subsidies or payments to support fuel use to maintain safe indoor temperatures or access to clean fuels.

Further to the three categories, countries have also developed action plans aimed at tackling various health issues related to housing. These plans describe the steps necessary to reach a goal, and often stipulate the need for the development and enforcement of regulatory standards.

Countries have employed a range of approaches and instruments towards healthy housing, however, specific approaches differ significantly between location and hazard. Countries will need to apply a combination of approaches depending on the local context. For example, in countries with an ageing population, policy may aim to modify the existing housing stock through grants to support modifications to meet these changing population needs. On the other hand, countries faced with a rapidly growing population and shortage in housing provision may need to apply a combination of public-sector housing construction programmes, tax policies that encourage private housing development, and capacity building to the construction sector to meet the housing demand and minimize the development of unregulated housing. However, underlying each approach are codes and standards that detail the requirements for the design, performance and construction to ensure housing provides the physical and environmental conditions needed for good health.

FIGURE 3.1 OVERVIEW OF POLICY APPROACHES AND INSTRUMENTS IDENTIFIED IN THE REVIEW





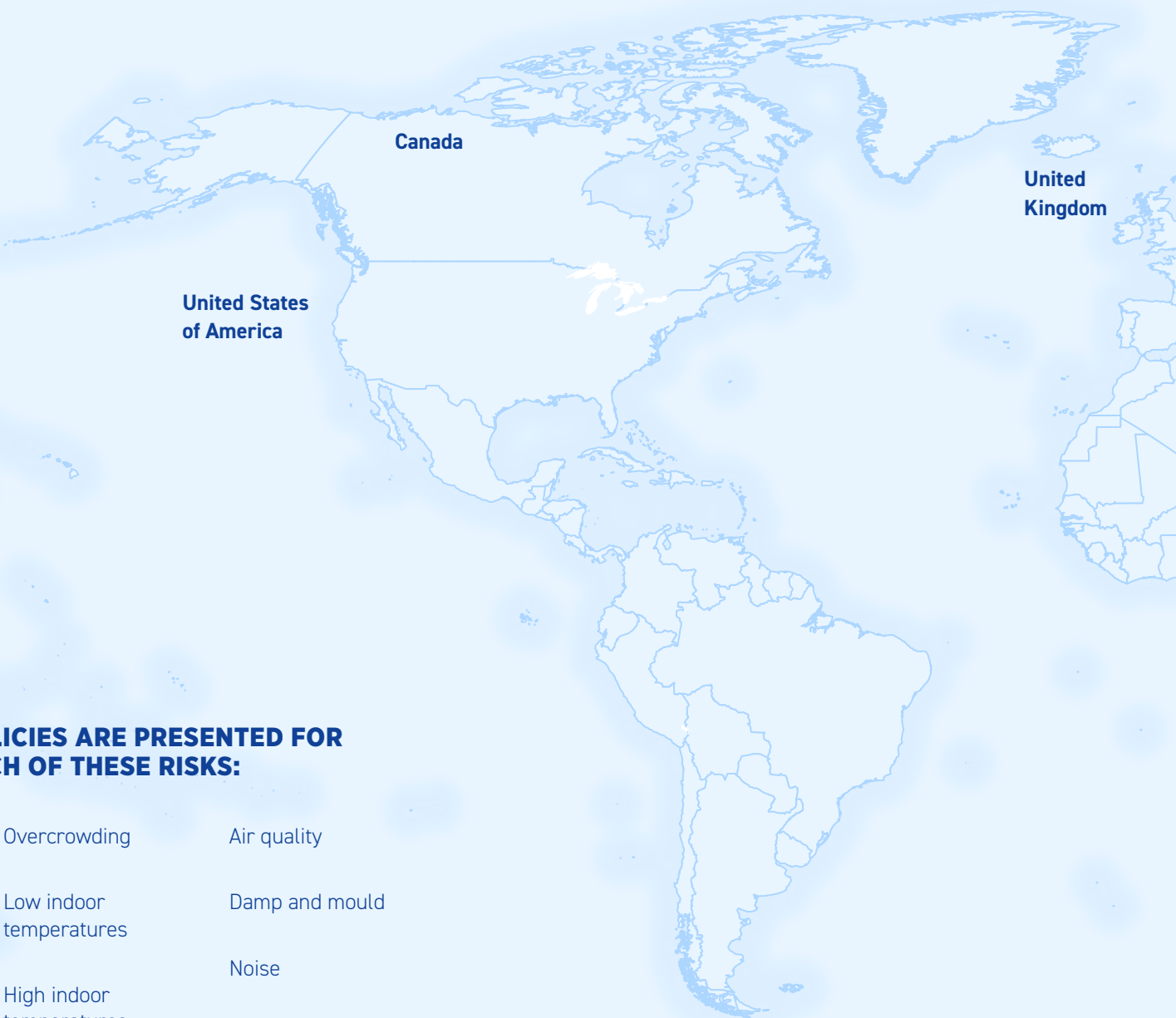
EXAMPLES OF POLICIES BY HEALTH RISK



This section considers policy examples by housing health risk (following the structure of the HHGL). Example policies that are included in the repository are described (WHO, 2020).

Click on the icons below to navigate to the different topics

Examples of healthy housing policies around the world



POLICIES ARE PRESENTED FOR EACH OF THESE RISKS:

- | | |
|--------------------------|----------------|
| Overcrowding | Air quality |
| Low indoor temperatures | Damp and mould |
| High indoor temperatures | Noise |
| Home injuries | Asbestos |
| Accessibility | Lead |
| Water quality | Radon |

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

This map shows the location of policy examples by housing health risk that are discussed in this report (and described in the repository). Click on the coloured circles in each location to navigate to the respective sections.



Data Source: World Health Organization (2020). Policies, regulations and legislation promoting healthy housing: a review. Geneva: World Health Organization.

Map Production: World Health Organization



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Click to
navigate



4.1 Overcrowding

The [HHGL](#) strongly recommend that strategies should be developed and implemented to prevent and reduce household crowding. Overcrowding is defined using different measures that need to be culturally appropriate. Frequently used measures are, for example, the UN-Habitat definition of more than three people per habitable room and the Canadian and European definitions based on single-person bedrooms (with exceptions for couples and young children/same-sex children). Given these context-dependent definitions, it is not surprising that space requirements and associated policy mechanisms to achieve housing providing adequate living space also vary internationally. To tackle overcrowding, national and local governments need to ensure access to affordable (a term that also varies internationally and may refer to cost or tenancy) and appropriately located housing (e.g. near employment networks or social links) for all income and social groups.



Crowding has been associated with respiratory diseases, gastroenteritis and diarrhoeal diseases, poor mental health outcomes including stress, sleep disorders and poor educational attainment.



SOURCE: WHO
Housing and health
guidelines

A complex set of economic, social and political factors determines household overcrowding and affordability, which requires a combination of policy mechanisms to address. It is key that policies ensure that housing is affordable and that new housing or relocation programmes do not disconnect people from social (family, childcare support etc.), economic (employment, businesses), education (schools) and health (hospitals and primary health care) networks. Most effective policies, particularly new construction and rehousing programmes, will employ a combined approach and consider employment support, improved household incomes and social support in the case of income shocks or loss of jobs (WHO, 2018c).

Countries have adopted various policies that will contribute towards tackling overcrowding, including increasing the number and size of dwellings through construction and refurbishment programmes (expansion or upgrading of existing homes). Tax and planning policies have been employed to encourage house building from the private sector. There are examples of supporting access to affordable housing through subsidies, employment assistance and the rehousing of those in crowded accommodation.

EXAMPLES OF POLICIES TO REDUCE OVERCROWDING

NIGERIA

National Housing Policy of Nigeria (1991)

The National Housing Policy of Nigeria (1991) considers multiple strategies to provide “decent and affordable housing for urban and rural dwellers” through financing housing programmes, the implementation of land use decrees, financial empowerment of construction industries, and special considerations for the homeless and the physically challenged (Ibimilua, 2011).

THAILAND

Baan Mankong Urban programme (2003)

The Baan Mankong Urban programme at the governmental Community Organizations Development Institute works with people to plan and build housing through channelling housing loans to poor communities (CODI, 2020). This is likely to help reduce overcrowding and numerous other health hazards. A brief summary is provided in Box 1.

TURKEY

Mass Housing Law (1984)

The Mass Housing Law (1984) is an example of a mass housing construction and financial support programme, where TOKİ (the public housing administration) constructed 43 145 houses and provided credit support for 940 000 houses over 19 years.

UNITED STATES OF AMERICA

Native American Housing Assistance and Self-Determination Act of 1996

The Native American Housing Assistance and Self-Determination Act of 1996 provides rental assistance to Native Americans living on reservations or other tribal lands, which are most at risk of overcrowding and poor housing conditions.

VIEW REPOSITORY





Repository of policies, regulations and legislation promoting healthy housing

Background

This repository of model policies, regulations and legislation is part of a smart which supports the implementation of the WHO housing and health guidelines at national, regional and local levels. The purpose of this repository is to inform the development of measures to guide policy development processes to promote healthy housing, meaning shelter that supports a state of complete physical, mental and social well-being.

User guide

The “Policy selector” tab offers a quick way of searching the policy database. Below this search tool, policies are selected by specifying the “housing health risk”, the “policy instrument” and the “WHO region” of interest. You must enable Exact Match for this to work. Policies which match your selection will appear in the “Policy examples” box. If no match is found, you will see text reading: “The repository currently has no policies matching your selection”. Each policy is assigned a unique ID, which can be used to search the “Policy details” tab for further details.

The “Policy details” tab provides more information on the policy, and links to policy documents where possible. Entries identified from the scientific literature are indicated by SL, entries identified from the grey literature searches are indicated by GL and those provided by experts are indicated by EXP.



Details and further development

For details of how the policy repository was constructed please see the accompanying report: *World Health Organization (2021). Policies, regulations and legislation promoting healthy housing: a review. Geneva: World Health Organization.*

This repository is a living document and will be expanded as the implementation of the WHO housing and health guidelines proceeds.

Note

The authors do not claim ownership of any of the text within the “Policy details” tab. The majority of this text was sourced from the policy or academic paper links provided.

Acknowledgments

Obitson, A, Ma, J, Ke, J, Pines, H, Wilkinson, P, & Davies, M.

BOX 1**THAILAND'S BAAN MANKONG "SECURE HOUSE" PROGRAMME**

Launched in 2003, the Baan Mankong "Secure House" programme used a community-driven approach to address issues of housing access.

The programme channels government funds directly to poor communities, who plan and carry out improvements to their housing. This includes ensuring tenure security and improvements in environmental and basic services. Community groups manage the budgets and the government support includes providing infrastructure and housing subsidies, loans for land and technical advice. The Baan Mankong Urban programme "puts Thailand's poor and informal communities (and their community networks) at the centre of a collective process of developing long-term, comprehensive, city-wide and richly varied solutions to problems of land and housing in Thai cities".

After 17 years, achievements of the Baan Mankong Urban programme include:

**1042 housing projects**

supported in 405 cities.

**105 739 families**

provided with decent, secure, permanent housing. Some 61% of these families have built their house on their original housing site, through strategies of upgrading, reblocking, reconstruction or land sharing.

**US\$ 393.46 million**

in budget for the programme.

SOURCE: Adapted from CODI (2020)

The examples above were adopted by national governments, yet local authorities can also play a strong role in policy development to reduce overcrowding. The London Borough of Tower Hamlets has worked collaboratively with registered social landlords and private sector landlords to tackle overcrowding and reduce under-occupied properties respectively. The council has employed multiple measures to increase the overall supply of housing including:

- construction of new family-sized houses with a development partner on small parcels of council land;
- construction of new council housing (i.e. social housing owned and managed by the council or its supplier);
- buying back dwellings that were previously owned by the council; and
- re-housing vulnerable populations and providing bigger pitches.

The council has also implemented measures to alleviate overcrowding in existing properties, including cash incentive schemes that encourage under-occupiers to move to the owner-occupied sector or downsize. They have also provided a rent deposit scheme for council tenants to secure private sector accommodation (Local Government Association, 2016).





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4.2 Low indoor temperatures

There is strong evidence to show that low indoor temperatures are harmful to health. Measures should be taken to ensure that temperatures are high enough, for example, 18 °C and above for countries with temperate or colder climates (WHO, 2018c), to protect residents in cold seasons. The [HHGL](#) recommend that implementing agencies should work to increase temperatures in cold homes, including through installing insulation with appropriate ventilation, as this is likely to have beneficial effects on health.

“

Excess winter deaths due to cold housing has been estimated at 38 200 per year (12.8/100 000) in 11 selected European countries.

”

SOURCE: WHO Regional Office for Europe (2011)

Various policy instruments have been developed to protect residents from low indoor temperatures. These include policies that maintain indoor temperatures via building regulations that mandate insulation, and providing adequate warmth through installing heating systems. Financial assistance has supported the implementation of measures and supported fuel use for maintaining warmth among low-income groups. In some locations, construction and refurbishment programmes have helped to achieve adequately performing homes, and locally appropriate thermal comfort codes have prescribed minimum conditions. There has also been widespread adoption of green building standards applied as mandatory or optional mechanisms to increase energy efficiency; such standards are likely to guard against low temperatures, among other indoor environmental quality factors (see Box 2).

BOX 2

GREEN BUILDING STANDARDS

Green (or sustainable) building standards have numerous potential health benefits and they are applied in countries around the world through diverse voluntary and mandatory systems (Cedeño-Laurent et al., 2018).

Studies of the health impact of green building standards in the USA have found indoor environmental quality improvements and self-reported health benefits compared with conventional housing. Two studies evaluated low-income families' health before and after moving to Leadership in Energy and Environmental Design (LEED) certified homes or having renovation completed to the Enterprise Green Communities standard. After moving to LEED certified housing, occupants reported:



47% fewer sick building syndrome symptoms and



fewer cases of mould, pests, inadequate ventilation and stuffiness in the green homes (Colton et al., 2015).

One study of a low-income housing renovation to Enterprise Green Communities standards found better self-reported health of residents (Breyse et al., 2011).

There are at least 42 green housing standards globally. These standards span countries of diverse income settings and many can be found on the World Green Building Council website (<https://www.worldgbc.org/rating-tools>). The most commonly adopted standards are the Building Research Establishment Environmental Assessment Method (BREEAM) and LEED (Schwartz & Raslan, 2013) and both standards have residential certification schemes. Healthy building standards have emerged in the last decade to offer a more focused assessment of the potential human health impacts of new buildings, including WELL and Fitwel (Pineo & Rydin, 2018).

Common methods through which national and municipal policy-makers can require green building standards include mandating certification (or use) on government-funded buildings, through private development requirements and through incentives (Retzlaff, 2009). For example, the USA Federal National Mortgage Association, commonly known as Fannie Mae, offers loan discounts to multifamily affordable rental housing projects that certify with Fitwel (Center for Active Design, 2020).

Common barriers to implementing sustainability standards include costs associated with certification and construction; lack of knowledge among government administrators and the real estate sector; and a perception that such standards are inflexible (Dixon et al., 2008; Retzlaff, 2009).

EXAMPLES OF POLICIES TO PROTECT AGAINST LOW INDOOR TEMPERATURES

There are various examples of **building regulations** that mandate insulation levels, as appropriate for the local climate. These normally have been established as a result of energy efficiency objectives.

NEW ZEALAND

Residential Tenancies Regulations 2019

New Zealand's recently developed Residential Tenancies (Healthy Homes Standards) Regulations 2019 will make it mandatory for all rental houses to include an efficient, affordable and healthy heating system that can heat to a minimum of 18 °C in the living room, minimum levels of insulation in ceilings and underfloor to 120 mm or in line with the 2008 Building Code and to apply draught-proofing measures.

SOUTH AFRICA

National Building Regulations and Building Standards Act

In South Africa, the National Building Regulations and Building Standards Act requires buildings to be "capable of using energy efficiently while fulfilling user-needs in relation to various things including thermal comfort".

UNITED KINGDOM

Building Regulations 2010

The Building Regulations 2010 (Approved Document Part L), United Kingdom, prescribe the mandatory level of insulation values of building elements (e.g. walls, glazing), allowable areas of openings, air permeability of the structure, heating efficiency, heating insulation and controls and hot water systems.

UNITED KINGDOM

Green Deal

Programmes to support the implementation of insulation include the United Kingdom's Green Deal, which was a loan scheme covering loft and external wall insulation (including solid and cavity walls), boiler upgrade or replacement with heat pump, renewable energy generation (solar panels or wind turbines), double glazing and draught-proofing. Although focused on renewable technologies, the United Kingdom's Domestic Renewable Heat Incentive provides financial incentives to promote the use of renewable heat in homes.

Examples of housing refurbishment programmes are provided in Table 4.1. This includes the Lambeth Housing Standard and the Liverpool Healthy Homes Programme, which both involve improving existing housing by inspecting dwellings and completing repairs. The Lambeth Housing Standard is a social housing programme applied to council housing, while the Liverpool Healthy Homes Programme leverages investment by landlords in the private rental sector. Both programmes tackled multiple health risks in housing, but particularly targeted excess cold, and estimate significant savings to regional health care. The Liverpool Healthy Homes Programme was informed by the United Kingdom's National Institute for Health and Care Excellence (NICE) guidelines on excess cold and employed the United Kingdom Housing Health and Safety Rating System (HHSRS) to assess hazards in housing as part of the programme.

TABLE 4.1 EXAMPLES OF HOUSING REFURBISHMENT PROGRAMMES IN THE UNITED KINGDOM TO PROTECT AGAINST LOW INDOOR TEMPERATURES

POLICY	LAMBETH HOUSING STANDARD	LIVERPOOL HEALTHY HOMES PROGRAMME
Policy details	- Aimed to create "safe, warm and secure dwellings; homes to take pride in". Housing refurbishment programme to council (social) housing. - Nine components targeting three health pathways: warmth and comfort (individual heating, insulation, common boilers, windows); safety and independence (aid and adaptations, kitchens, bathrooms); and security (windows, doors, common door entry and CCTV).	- Aimed to reduce the health burden by targeting housing deficiencies that cause or exacerbate preventable chronic disease and premature death (particularly excess cold). - Focused on the most vulnerable residents, principally the private rented sector. - Inspection and refurbishment programme to address health risks.
Involved actors	Lambeth Borough Council	Liverpool City Council and former Liverpool Primary Care Trust
Underlying evidence base	<i>Not reported</i>	Baseline assessment (following NICE guidelines) identified that of 148 000 private sector properties: 11 100 lacked central heating; 19 000 homes failed the Decent Homes Standard energy-efficiency requirements; 19 400 presented a health and safety risk; 44 100 were in fuel poverty. Inspections employed the United Kingdom HHSRS to classify hazards.
Estimated health outcomes	Energy efficiency levels interventions are estimated to lead to £78 million of social benefits by reductions in cardiovascular and respiratory illnesses, home-related falls and mental illness associated with fuel poverty.	- Estimated to save the National Health Service (NHS) in the region £439 405 per year (£4.4 million over a 10-year period). - Wider benefits to society, approximately estimated at £1.1 million per year (£11 million over 10 years).
Co-benefits/unintended consequences	Increased stress during the renovation works and due to delays in project completion	<i>Not reported</i>
Reference	(Ambrose et al., 2018)	(NICE, 2016)



4.3 High indoor temperatures

There is an association between high indoor temperatures and some adverse health effects. The [HHGL](#) recommend that strategies to protect populations from excess indoor heat should be developed and implemented. Measures should reduce indoor temperatures to a minimal risk temperature, particularly for vulnerable individuals, such as older people, children and people with chronic illnesses or disabilities. The maximum temperature thresholds will differ between climate regions, due to the ability of people to acclimatize and as shown in analysis for different regions.

“

The May 2010 heat wave in Ahmedabad, India, was associated with significant excess all-cause mortality: 4462 all-cause deaths occurred, meaning an estimated 43.1% increase when compared with the reference period with 3118 deaths.

”

SOURCE: Azahr et al. (2018)

Climate change is leading to ongoing temperature increases, and enhancing the frequency and intensity of excess indoor heat. To avoid contributing to greenhouse emissions from cooling buildings, e.g. through using air conditioning, and thereby exacerbating climate change, it is crucial to address high indoor temperatures through sustainable and environmentally friendly interventions. Such measures include urban design strategies mitigating urban heat island effects, energy-efficient housing design and different types of ventilation.

Various approaches have been developed that are likely to protect against high indoor temperatures. Building regulations that address indoor temperatures, for example through requirements for shading or ventilation rates, or regulations that stipulate the performance of cooling technologies, are likely to provide protection. Some urban planning strategies aim to minimize ambient temperatures through measures such as greening. Various countries have set thermal comfort requirements, which support improved housing design, and construction and refurbishing programmes have been established to ensure homes meet the regulations. In addition, financial support to households has supported the implementation of measures and helped ensure use of cooling technologies (i.e. fuel poverty payments).

EXAMPLES OF POLICIES TO PROTECT AGAINST
HIGH INDOOR TEMPERATURES

There are various examples of **building regulations** that consider shading and ventilation for the protection against high indoor temperatures.

CANADA

Ontario Building Code

The Ontario Building Code, Canada, prescribes natural ventilation in all rooms or spaces in a dwelling unit, which can be provided by mechanical ventilation at the rate of 0.5 air change per hour if there is mechanical cooling or one air change per hour without cooling.

SINGAPORE

Singapore Building
Control Regulations

The Singapore Building Control (Environmental Sustainability) Regulations require that buildings are designed to minimize the solar heat gain through the roof and building envelope (primarily for energy efficiency targets).

BOX 3

INDIA COOLING ACTION PLAN

The India Cooling Action Plan (ICAP), established in 2019, is a long-term vision to meet the cooling demand and reduce the load through energy efficiency. These aims are achieved through a series of actions across multiple sectors.



Promote climate responsive buildings to bring indoor temperatures within acceptable thermal comfort bands through passive measures; and



Leverage existing cooling technology, such as efficient air conditioners and ceiling fans, to make it available for wider market adoption.

The ICAP identifies the need to target affordable housing projects for low-income populations by ensuring the wider adoption and enforcement of energy-efficient building codes by housing providers and local government bodies. Furthermore, the ICAP encourages the development of urban heat action plans.

Although the ICAP focuses heavily on energy efficiency to reduce cooling loads and achieve thermal comfort, the action is likely to indirectly protect against high indoor temperatures (Government of India, Ministry of Environment Forest & Climate Change, 2019).



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4.4 Home injuries

Risks of injury inside the home include those relating to structural failure of the dwelling, fall and trip hazards, risks of electrocution and fire risks. There is strong evidence between housing hazards and unintentional injuries, often affecting children. The [HHGL](#) recommend that homes should be equipped with safety devices (such as smoke and carbon monoxide alarms, stair gates and window guards) and measures should be taken to reduce hazards that lead to unintentional injuries. Risks can be minimized by measures such as good design, the regulation and control of standards relating to structural integrity, good maintenance, and regulation relating to electrical systems and devices and combustion devices. While many risks can be minimized through appropriate regulation and enforcement, education and awareness are important to help ensure high standards of maintenance, especially by owner occupiers.

“

Worldwide, about 646 000 individuals die each year from falls, of which over 80% occur in low- and middle-income countries, and more than 37 million falls require medical attention.

”

SOURCE: WHO (2018a)

To reduce home injuries, various policy instruments have been adopted. Building regulations make recommendations for buildings to be free of hazards or assert preventative measures, such as banisters between levels or on stairs. There are examples of mandates to ensure the presence of safety devices that protect against hazards, for example smoke alarms. Inspection and repair programmes that remove hazards from existing homes have been found to be successful in improving health outcomes. Furthermore, financial support has helped aid housing modifications and the installation of safety devices.

EXAMPLES OF POLICIES TO REDUCE HAZARDS IN THE HOME

Several countries have developed **inspection programmes** which aim to assess and rank housing health hazards and identify priorities for remediation work:

AUSTRALIA

Housing for Health (HFH) programme

In New South Wales (NSW), Australia, the Housing for Health (HFH) programme targeted Aboriginal communities, which were recognized as being most affected by substandard housing. This seven-step programme measures, rates and fixes home hardware, such as ovens and showers, deemed necessary for health. Across HFH communities, there has been a 40% reduction in hospitalizations in diseases typically linked to poor housing.

NEW ZEALAND

Rental Warrant of Fitness

The Rental Warrant of Fitness, a voluntary programme available in Wellington, New Zealand, includes a housing quality checklist consisting of 29 criteria such as habitability, insulation, heating, ventilation, safety, amenities, and basic structural soundness. The policy was claimed to be strongly influenced by the United Kingdom HHSRS and USA Federal Government housing standards (Telfar-Barnard et al., 2017).

SOUTH AFRICA

National Building Regulations

An example of building regulations considering injury is South Africa's National Building Regulations, which state that where there are changes in levels (such as balconies, flat roofs etc.) protection against falls should be considered.

UNITED KINGDOM

Housing Health and Safety Rating System (HHSRS)

The United Kingdom HHSRS is an assessment tool for building surveyors to assess and prioritize remediation measures. This was developed with evidence of housing and health risks across the United Kingdom and provides risks for average homes in the United Kingdom.

Further details of these policies are provided in Table 4.2.

The mandated **installation of smoke alarms** is varied across the world. Surveying by Manchester et al. (2009) found that 29% of responding countries have nationwide legislation. However, some are adopted at a state/province/territory level. There was wide adoption across Europe, but findings of Manchester et al. suggested that in Asia, legislation was only available in Japan. There is evidence that mandated smoke alarms result in a reduction of hospitalizations.

AUSTRALIA

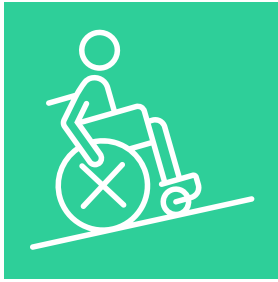
Smoke Alarm Legislation

Introduction of the Smoke Alarm Legislation – Environmental Planning and Assessment Amendment (Smoke Alarms) Regulation 2006, implemented in NSW, Australia, following a series of fatal fires, has seen hospitalization rates reduced by an estimated 36% annually.

TABLE 4.2 EXAMPLES OF HOUSING INSPECTION AND REPAIR PROGRAMMES TO REDUCE HOME INJURY HAZARDS

COUNTRY	AUSTRALIA	NEW ZEALAND
Region	Aboriginal communities in NSW	National (currently undergoing regional testing)
Policy	Housing for Health programme	Rental Warrant of Fitness
Policy details	A seven-step programme to improve housing and health in Aboriginal communities in NSW. The novel methodology measures, rates and fixes household hardware deemed essential for health.	A tool for private landlords which hopes to improve the management of their rental investment by ensuring that their properties meet all regulatory compliance, adherence to standards and Ministry of Business, Innovation and Employment regulations.
Involved actors	NSW Government	Ministry of Business, Innovation and Employment; Housing New Zealand
Underlying evidence base	Living conditions were recognized as substandard across Aboriginal communities, and poor health status was commonly attributed to these living conditions.	The development of the Rental Warrant of Fitness was based on two decades of research on the impact of housing quality on health and well-being and strongly influenced by the United Kingdom HHSRS and USA Federal Government housing standards.
Reported health outcomes	40% reduction in hospitalization of diseases typically associated with poor living conditions in HFH communities.	<i>Not reported</i>
Co-benefits and unintended consequences	<i>Not reported</i>	<i>Not reported</i>
Reference	(Lea & Torzillo, 2016)	(Telfar-Barnard et al., 2017)





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4.5 Accessibility

There is strong evidence to show that people with functional impairments living in accessible home environments have better health and are able to accomplish everyday tasks and to manage independent living better than those in conventional or inaccessible home environments. The [HHGL](#) recommend that an adequate proportion of the housing stock should be accessible to people with functional impairments. An ageing population, increasing in many countries worldwide, makes considerations of access and adaptation measures increasingly important. Effective policy requires input at national, regional and local levels to improve regulation for accessibility and to increase the number of accessible home environments and mechanisms for installation of adaptation measures when needed.

“

The world's population over 60 years of age, who tend to spend more time at home, will double by 2050.

”

SOURCE: WHO (2015)

Policy approaches adopted to ensure accessible home environments include increasing the number of accessible homes through construction and refurbishment programmes. Technical capacity building programmes for the construction industry have helped increase the number of skilled workers able to implement accessible housing. There are also examples of programmes providing financial support to households to implement changes as per their specific needs and rental assistance to support those with functional impairments to access accessible homes.

EXAMPLES OF POLICIES TO IMPROVE HOUSING ACCESSIBILITY

There are numerous examples of **building regulations** that provide guidelines for accessible homes. Voluntary standards have been key in some locations to accelerate action and the implementation of regulations (Box 4).

SAUDI ARABIA

In Saudi Arabia, the architectural requirements code sets specifications for entrance approaches, door dimension and location and functional organization to aid accessibility.

UNITED KINGDOM

In the United Kingdom, the building regulations include access to and use of buildings (Approved Document M) which intends to ensure that people are able to access and use buildings and their facilities.

Subsidies and tax incentives for adapting housing to be more accessible can support adaptations in existing homes.

SWEDEN

Housing Adaptation Act

In Sweden, the Housing Adaptation Act provides grants for people with disabilities to adapt their homes. The programme is publicly funded and administered by a given municipality in response to a client's application-based needs assessment and certification by a health professional.

BOX 4

INTEREST GROUPS CHAMPIONING ACCESSIBLE HOUSING STANDARDS

Both in Australia and the United Kingdom, accessible housing standards have been developed through collaborations between professionals and affected communities. These collaborations responded to concerns that there were vital gaps in existing standards resulting in inaccessible and inconvenient housing for large sections of the population.

Livable Housing Design Guidelines, Australia

Livable Housing Australia originated from the highly successful National Dialogue on Universal Housing Design, convened in October 2009.

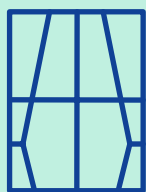


The Dialogue brought together leading stakeholders from the residential building and property industry, the human rights sector, representatives of vulnerable populations and government to discuss how housing could be designed and built to better respond to the changing needs and abilities of people over their life course.

Members of the National Dialogue were provided secretariat support by the Department of Families, Housing, Community Services and Indigenous Affairs. The Department of Industry, Innovation, Science, Research and Tertiary Education and the Australian Building Codes Board acted as observers to the Dialogue, given the discussion related to developing guidelines. The Department of Planning and Community Development also provided technical advice.

Lifetime Homes Standard, United Kingdom

The Lifetime Homes Standard incorporates 16 design criteria to apply to new homes, at a minimal cost. The concept was developed in the early 1990s by a group of housing organizations looking at the impacts of ageing on design and the needs of people with disabilities (Lifetime Homes, 2010).



This led to the **development of design criteria covering** features such as parking, entrances, bathrooms, stairs, window openings.



Based on five principles of:

- inclusivity,
- accessibility,
- adaptability,
- sustainability and
- good value.

Although the United Kingdom building regulations now consider accessibility (Approved Document Part M), the Lifetime Homes Standard is more extensive than the regulations (Habinteg, 2015). Many local planning policies require the Lifetime Homes Standard in new developments, for example, the London Plan. It is an existing requirement in Wales and Northern Ireland for new, publicly funded homes to comply with the Lifetime Homes Standard.





4.6 Water quality

Safe drinking-water, sanitation and hygiene are crucial to human health and well-being. Drinking-water may contain biological, chemical and radiological agents that are harmful to health. The quality of water and supply mechanisms vary significantly between countries, regions and cities, with many countries lacking a continuous and safe supply of water. Given the evidence of poor water quality on health, the [WHO Guidelines for drinking-water quality](#) recommend (WHO, 2017):

- Safe levels of chemical contaminants (such as copper, lead) and microbial pathogens (such as legionella, *Escherichia coli*) for drinking-water.
- Adequate quantities and continuity of drinking-water supplies for domestic uses, including drinking, cooking and hygiene (e.g. continuous access via piped supplies).
- Good practices related to water collection and transport, for example, the addition of chlorine where water is delivered by tankers and clean, closed containers for collection.
- Adequate plumbing, that is appropriately designed, installed and maintained.
- Where dual water systems are present, reducing risks of cross-contamination between potable and non-potable supplies, proper labelling, installation management, and regulation of the systems.
- Water should be stored in clean tanks, that are regularly disinfected and have not been used previously for non-food grade liquids.
- Where safe water is not available, an effective water treatment method should be used and the treated water safely stored to prevent recontamination.
- Risk assessment and management approaches, such as water safety planning, to ensure that measures put in place continue to be effective.

“

2.2 billion people lacked safely managed drinking water services in 2017 and 2 billion people still lack even a basic sanitation at home.

”

SOURCE: WHO & UNICEF (2019)

National and local governments should develop appropriate regulations and other measures to meet these recommendations, depending on the local context and current water supply systems to ensure access to safe drinking-water.

Sanitation – that is toilets, conveyance to treatment and disposal or use of treated waste – is a public good, providing health, economic and social benefits across society. The impacts of poor sanitation include loss of safety and dignity, many sanitation related illnesses and economic losses which all disproportionately affect the most vulnerable and disadvantaged.

While households may invest in improved toilets, public policy across multiple sectors is needed set sanitation minimum safety standards and public investment is needed to ensure systems convey and treat waste away from contact with householders and the surrounding community.

Comprehensive guidance is provided in the [WHO Guidelines on Sanitation and Health](#) covering minimum performance requirement and policy and regulatory guidance for all aspects of sanitation systems and behavior change (WHO 2018b).

Tackling issues of poor water quality and supply are complex, and multiple steps are required to achieve access to safe drinking-water, including those relating to the safety of the water sources, its processing and distribution, and to monitoring and remediation. Policies developed included those focused on improving the quality of the current supply systems through, for example, installing piped water supply and constructed water treatment facilities. Financial support has been used to help the implementation of such measures or the repair of existing systems. Capacity building has helped to ensure good hygiene practices. Furthermore, water quality requirements have been often adopted at a national level to stipulate safe drinking-water levels.

For more information

on drinking-water, sanitation and hygiene, view these publications.

VIEW PUBLICATIONS



EXAMPLES OF POLICIES TO IMPROVE WATER QUALITY

Numerous countries have adopted **water quality requirements** which define levels safe for consumption.

JORDAN

**National Building Law
(1993 and updated in 2018)**

The Jordan National Building Law asserts standards to create and sustain potable water delivery systems to be able to maintain water quality delivered to all housing units.

PAKISTAN

**National Drinking
Water Policy (2009)**

In Pakistan, the National Drinking Water Policy (2009) asserts that “access to safe drinking water is the basic human right of every citizen and that it is the responsibility of the Government to ensure its provision to all citizens”. It aims to provide safe drinking-water access for all by 2025.

UNITED STATES OF AMERICA

Safe Drinking Water Act (1996)

The Safe Drinking Water Act (1996) (USA) is a federal law aiming to ensure safe drinking-water for the public. This requires the Environmental Protection Agency (EPA) to set drinking-water quality standards and supervise all states, localities and water suppliers that implement the standards.

EXAMPLES OF POLICIES AND PROGRAMMES TO IMPROVE SANITATION

The publication [*Achieving total sanitation and hygiene coverage within a generation: lessons from East Asia*](#) (WaterAid, 2016) illustrates how housing policy in East Asian countries in the 1960–70s was instrumental in achieving sanitation for all. At the time these policies were enacted per capita income was equivalent to many sub-Saharan African countries today. Examples from the report include:

MALAYSIA

The Malaysian Government built improved rural villages for people with low income to resettle in ensuring equitable outcomes in its nation's building efforts. The villages were designed to be desirable with better agricultural land, schools and clinics, security and higher quality housing with water and sanitation services.

REPUBLIC OF KOREA

The provision of sanitation infrastructure in low-income housing projects was an integral part of parasite eradication efforts. Development plans and programmes such as the New Village Movement incorporated sanitation as part of a national-level drive to improve the lives of citizens.

SINGAPORE

The Keep Singapore Clean campaign included access to household sanitation through large Government-subsidized low-income housing and punitive behaviour change measures. The campaign saw many people move from informal “kampong” housing, where open defecation was common, to flats with access to private safe sanitation.





4.7 Air quality

The association between poor air quality and negative health outcomes is widely established. WHO has published several guidelines on ambient and indoor air quality (WHO, 2006, 2014; WHO Regional Office for Europe, 2009a, 2010), which are also relevant in the context of healthy housing. Indoor air quality is affected by a number of aspects of the indoor and outdoor environment. This includes the ventilation system, structure of the dwelling, outdoor pollution as well as fuels and devices used for cooking, lighting and heating. Indoor air quality is also affected by the types of furnishing, adhesives and coatings used in the building. It is further impacted by tobacco smoking by occupants or infiltrations of tobacco smoke coming from neighbouring units. Measures should be taken to ensure safe indoor air quality levels to avoid a number of cardiovascular and respiratory diseases including pneumonia, stroke and lung cancer.



In 2016, household air pollution was responsible for 3.8 million deaths, and 7.7% of the global mortality



SOURCE: WHO (2020)

Due to the various factors affecting indoor air quality, a singular policy mechanism is unlikely to provide adequate indoor air quality levels. Instruments developed to support air quality in housing include building regulations with minimum requirements for ventilation to ensure the removal of pollutants generated indoors and filter out pollutants from the ambient environment. Countries have developed programmes that support the transition to clean cooking, heating and lighting. Additionally, subsidies have supported the use of clean fuels, policies have banned smoking indoors and countries have developed guidelines for safe ambient air quality, which will ingress into a house.



For more information

on the impacts of ambient and household air pollution on health, view these infographics.

[VIEW INFOGRAPHICS](#)



[VIEW INFOGRAPHICS](#)



Learn more about Clean Household Energy for Health in this video.

[VIEW VIDEO](#)



EXAMPLES OF POLICIES TO IMPROVE AIR QUALITY

A growing number of countries are implementing **smoking bans** in housing, in efforts to reduce exposure to SHS.

NEW ZEALAND

Canterbury Smoke-free Social Housing Toolkit (2016)

The Canterbury Smoke-free Social Housing Toolkit (2016) in New Zealand serves as a guide for social housing providers in the design and implementation of smoke-free rules. It contains checklists, templates and information to help engage stakeholders. This includes information on the health benefits of smoke-free rules; planning and policy development; implementation and evaluation; and quality improvement.

UNITED STATES OF AMERICA

U.S. Department of Housing and Urban Development Smoke-free Public Housing Rule (2017)

The U.S. Department of Housing and Urban Development Smoke-free Public Housing Rule (2017) requires each public housing agency to implement a smoke-free policy. The rule has been introduced to promote indoor air quality and health. In addition, it reduces the risk of fire and lowers maintenance costs.

An increasing number of countries introduce policies to promote the **transition to clean household energy**.

CHINA

Air Pollution Prevention and Control Action Plan 2013-2017

An example of a transition to a clean fuel programme is China's Air Pollution Prevention and Control Action Plan 2013–2017 (see Table 4.3). The plan, in part, involves removing coal for residential use. China's Clean Stove Initiative aims to scale up access to clean and efficient cooking and heating solutions in China through capacity building, policy development and support of selected government action plans.

There are several examples of **national air quality guidelines**.

AUSTRALIA

National Environment Protection Measure (1998)

Australia's National Environment Protection (Ambient Air Quality) Measure (1998) sets national ambient air quality standards and establishes a national framework for the monitoring of common air pollutants.

SOUTH AFRICA

Air Quality Act (2004)

Similarly, in South Africa, the Air Quality Act (2004) sets standards for the regulation of air quality. It gives powers to the Minister of Environmental Affairs to enforce measures through the creation of a national framework.

UNITED STATES OF AMERICA

Clean Air Act (1963 and later amendments)

In the USA, the Clean Air Act (1963 and later amendments) is a federal law that regulates emissions from mobile and stationary sources. It provides technical and financial assistance for preventing air pollution at both state and local governmental levels. In addition, it authorizes the Environment Protection Agency to put in place ambient air quality standards.

TABLE 4.3 EXAMPLES OF RELEVANT CHINESE CLEAN FUEL TRANSITION PROGRAMMES

Region	Beijing-Tianjin-Hebei (BTH) region	Beijing, Tianjin and 26 other municipalities in the surrounding area
Policy	Airborne Pollution Prevention and Control Action Plan 2013–2017	Clean Winter Heating Plan in Northern China (2017–2021)
Policy details	The action plan focuses on the transformation of fuel consumption from coal to gas or electricity (referred to as "coal-to-gas" and "coal-to-electricity") in the BTH region. It aims to achieve a 25% reduction in PM2.5 concentration and a 10% reduction in PM10 concentration for the BTH region. For coal consumption in particular, as a major proportion of the entire energy mix, the aim was to reduce use from 68% to 65% in 2017.	The policy aims to tackle the winter air pollution problem in the northern China region, with a focus on the BTH area. The policy aims to address the issue at a wider geographical area as the surrounding regions serve as transmission channels of polluted air and smog. The policy focuses on addressing clean heating in all urban areas and to enable the use of clean energy for at least 80% of the population in the urban-rural junction area, and 60% in rural areas. The policy promotes a gradual transition to clean energy over several years and promotes multiple clean energy fuels including gas, biomass heat pumps, electric heating and geothermal. Compared with the "coal-to-gas/electricity" policy in BTH, the scope was expanded to transform the entire heating system in northern China and the clean energy type was expanded to include various other energy types such as renewable energy.
Involved actors	National Energy Board, Ministry of Ecology and Environment, local government, gas/electricity supply companies at all levels, town gas/electricity companies and upstream gas/electricity suppliers in China.	National Development and Reform Commission, Ministry of Housing and Urban-Rural Development, National Energy Administration, local government, and companies in the field of power, oil and gas, renewable energy, heating and other related companies.
Underlying evidence base	Reduction in the emission and concentration of PM10 and PM2.5 due to coal consumption will reduce smog and air pollution.	Northern China has the highest regional level of air pollution in China resulting from intensive industrialization. Improvement of indoor air quality will reduce emissions.
Reported health outcomes	Reductions in mortality and fewer years of life lost. However, no significant changes were found in the concentrations for ozone and nitrogen dioxide.	<i>Not reported</i>
Co-benefits and unintended consequences	Emerging research on potential unintended consequences includes exacerbated energy poverty in certain areas such as Hebei Province which relies heavily on coal heating in winter. It was also reported that residents in rural Hebei could not afford winter heating after the coal-to-gas conversion.	The policy asserts that to prevent energy poverty, the clean heating policy implementation is a long-term process, which indicates that a certain proportion of areas in northern China will continue to use the original heating approach in 2021. As the clean heating resources, such as gas and electricity, are limited and there is a large demand for financial subsidies, the priority for transformation will be given to certain areas with potential unintended consequences for other areas.
References	(Caixin News, 2019; Huang et al., 2018; Wang, 2017; Zhang et al., 2019)	(Barrington-Leigh et al., 2019; China Government News, 2018; Hua & Kang Lim, 2017; Meng et al., 2019)



Click to
navigate

4.8 Damp and mould

Dampness and mould are potential risks to health and there is no level for mould growth that is considered safe for health. The [WHO guidelines for indoor air quality: dampness and mould](#) recommend that dampness and mould growth on building surfaces and structures should be avoided or remediated (WHO Regional Office for Europe, 2009a). This requires national, regional and local agencies to implement measures that reduce dampness and mould in housing.

Presence of dampness and mould is a complex interaction between the thermal performance and ventilation of a building, the indoor generation of humidity and water ingress from outdoors. Policy instruments that have aimed to tackle this include building regulations which have requirements for appropriate ventilation, guttering and drainage and to minimize thermal bridges. There are examples of remediation programmes for mould removal.

EXAMPLES OF POLICIES TO PROTECT AGAINST DAMPNESS AND MOULD

CANADA

Residential indoor air quality guidelines: moulds (2007)

The Residential indoor air quality guidelines: moulds (2007) contain information on mould relating to physical and chemical properties, conditions for growth, health effects and recommendations for mould prevention and removal.

NEW ZEALAND

Residential Tenancies Regulations (2019)

New Zealand's Residential Tenancies (Healthy Homes Standard) Regulations (2019) set standards for ventilation, including openable windows or external doors and extractor fans for kitchens and bathrooms.

UNITED KINGDOM

Housing Act (2004)

The Housing Act (2004) in the United Kingdom states that maintenance and repair of structural and exterior damage are the landlord's responsibility. Therefore, when dampness or mould are caused by structural defects, the landlord must carry out repairs.





4.9 Noise

Inappropriate noise levels can lead to auditory and non-auditory effects on health. The [WHO Night noise guidelines for Europe](#) (WHO Regional Office for Europe, 2009b) and the [WHO Environmental noise guidelines for the European Region](#) (WHO Regional Office for Europe, 2018) recommend that measures should be taken to reduce noise exposure. Although there is good evidence on the adverse effects of excessive noise levels on health, there are likely some differences between countries on perceived levels of noise.

Measures to protect against noise include the reduction of outdoor noise as well as noise insulation. There are various policy instruments that have been developed to protect against noise exposure. These include: building regulations with sound insulation requirements, regulations that minimize outdoor noise such as restrictions for flight paths. Urban planning regulations have also considered noise through specifying the location of dwellings.

“

The world's urban population is expected to double by 2050, i.e. 70% of the world's total population.

”

SOURCE: United Nations (2016)



EXAMPLES OF POLICIES TO PROTECT AGAINST NOISE

AUSTRALIA

Protection of the Environment Operations Regulation (2017)

In Australia, the Protection of the Environment Operations (Noise Control) Regulation (2017) regulates noise production from a variety of products including building intruder alarms and air conditioners.

CANADA

Ontario Building Code

Building regulations such as the Ontario Building Code in Canada set minimum sound transmission class ratings for space separators in buildings.

UNITED KINGDOM

British Standards Institute Guidance on sound insulation and noise reduction for buildings (2014)

The British Standards Institute Guidance on sound insulation and noise reduction for buildings (2014), provides guidance for the control of noise in and around buildings.

UNITED STATES OF AMERICA

Noise Control Act (1972)

Noise regulations, such as the Noise Control Act (1972) in the USA, seek to eliminate noise that adversely affects the health and well-being of the population. For example, this act establishes federal noise emission standards for commercial products.



4.10 Asbestos

In the context of housing, asbestos can, for example, be found in asbestos-cement roof sheets, ceiling boards, asbestos-cement blocks and ducting. Exposure to asbestos (mainly arising from inhalation of asbestos dust) is associated with increased risk of a range of illnesses including asbestosis, mesothelioma, lung cancer and diffuse pleural thickening/pleural plaques. There is no safe level for exposure to asbestos (International Agency for Research on Cancer, 2012). Several [WHO documents](#) provide guidance and recommendations related to the use of asbestos, in general recommending that exposure to asbestos should be kept as low as possible.

Measures should regulate against the use of asbestos in any building materials, components or fixtures and the safe removal of asbestos-containing materials from the house, particularly where asbestos-containing materials have become damaged. Policy instruments include:

- banning of materials containing asbestos;
- removal of hazardous materials.

EXAMPLES OF POLICIES TO PROTECT AGAINST ASBESTOS

Many countries have a total **ban on asbestos**, while some have no restrictions and some only have partial restrictions. Total bans are recorded for 66 countries including European Union Member States, Canada and Japan.

CANADA

Prohibition of Asbestos and Products Containing Asbestos Regulations

In Canada, the Prohibition of Asbestos and Products Containing Asbestos Regulations ban new asbestos and asbestos-containing products from entering the market.

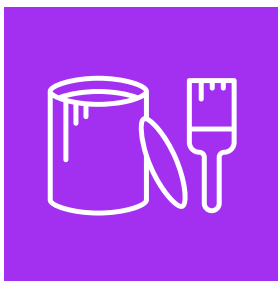
UNITED KINGDOM

Control of Asbestos Regulations

In the United Kingdom, the Control of Asbestos Regulations prevents new uses but permits existing asbestos to remain where it is in good condition and undisturbed. Further, the act sets maximum exposure limits and mandates training of those handling hazardous material.

There are numerous regulations and guidance documents that specify the **safe removal** of hazardous materials. This includes New Zealand's National Asbestos Health and Safety at Work (Asbestos) Regulations and South Africa's Occupational Health and Safety Act.





4.11 Lead

Lead is a highly toxic metal, which is or has been used in many products in common usage, including petrol, batteries, paints, electronics, jewellery, ceramics, glass, water pipes and other plumbing fittings. Lead in pipework (including through the use of lead solder) is now one of the primary routes for lead exposure. In many countries lead is used as an additive to paint intended for domestic use. Such use has been banned in some countries, for example, the United Kingdom and the USA, though lead paint may still be found in older properties. The relationship between exposure to lead and negative health outcomes such as high blood pressure and idiopathic intellectual disability is well established. There is no level of exposure to lead that is known to be without harmful effects. Young children are particularly vulnerable to lead because they absorb four to five times as much ingested lead as adults from a given source. WHO has issued guideline values for lead in drinking-water (WHO, 2011) and in the air (WHO Regional Office for Europe, 2000), and a set of recommendations to prevent childhood lead poisoning (WHO, 2010), including some recommendations related to housing. The most effective way to protect against exposure to lead is to remove all use of it in the home.

Policies developed to remove lead include the banning of materials containing lead, the removal of hazardous lead fittings and paint and controlling the pH of municipal water to reduce the release of lead from existing lead-containing pipework.

EXAMPLES OF POLICIES TO PROTECT AGAINST LEAD

NEW ZEALAND

New Zealand provides guidelines for the safe removal of lead paint from existing homes. The guidelines provide comprehensive information on the health hazards, statutory responsibilities, surveillance, as well as sampling and analysis techniques.



UNITED ARAB EMIRATES

ALSA'FAT Dubai Green Building Evaluation System

In the United Arab Emirates, the ALSA'FAT Dubai Green Building Evaluation System includes requirements to reduce lead exposure. It stipulates that paints or other materials containing lead or other heavy metals (with percentages more than the approved specifications by Dubai Municipality) must not be used unless the metal is encapsulated in a system such as a photovoltaic cell.

UNITED KINGDOM

The United Kingdom has issued guidelines aimed at homeowners to inform the safe removal of lead paint from existing homes.

UNITED STATES OF AMERICA

There are a numerous policy measures for tackling lead hazards in the USA, for example, at a national level the **Toxic Substances Control Act** requires action to eliminate lead-based paint in housing and the **EPA Lead Renovation, Repair and Painting Rule** aims to protect the public from lead-based paint hazards associated with renovation, repair and painting activities.

Where there are state lead laws it has been found that it is 79% less likely to have residential addresses with subsequent lead poisoning cases among children younger than 72 months (Kennedy et al., 2014). **Philadelphia's Lead Court** is a dedicated court dealing with the inaction of lead removal by homeowners and has been found to be very effective in supporting enforcement (Campbell et al., 2013).

For more information

on lead exposure and the impacts on health, view these infographics.





4.12 Radon

Radon is a colourless, odourless gas and one of the main natural sources of exposure to ionizing radiation. Exposure to radon gas can cause adverse health outcomes, including lung cancer. Radon is emitted from soil underneath buildings and, to a lesser extent, from building materials. The [WHO Handbook on indoor radon](#) proposes measures in the construction of new buildings (prevention) and in existing buildings (mitigation or remediation) to address radon (WHO, 2009). The primary radon prevention and mitigation strategies focus on sealing radon entry routes, on ventilation and on reversing the air pressure differences between the indoor occupied space and the soil underneath the building, employing different soil depressurization techniques. A combination of strategies is likely to provide the highest reduction of radon concentrations. Where home energy efficiency measures are adopted to increase airtightness, these need to be carefully evaluated to avoid increased indoor exposure to radon.



84 000 deaths from lung cancer were caused by residential radon in 2019.



SOURCE: GBD results tool. Global Health Data Exchange
(<http://ghdx.healthdata.org/gbd-results-tool>)

Policies adopted include building regulations that have rates for ventilation and require the sealing of radon entry routes. Countries have adopted guidelines which detail reference levels for dwellings in terms of a maximum annual average activity concentration. An example for such a reference level is the international requirements for homes that apply to radon (300 Bq/m³) in the International Atomic Energy Agency General Safety Requirements Part 3 (GSR Part 3), which are co-sponsored by eight organizations including WHO (International Atomic Energy Agency, 2014). Besides, there are examples of radon measurement programmes.

More information on national radon risk management interventions can be found on the [WHO Global Health Observatory](#).



EXAMPLES OF POLICIES TO PROTECT AGAINST RADON

SWITZERLAND

Swiss National Action Plan concerning Radon (2012-2020)

The Swiss National Action Plan concerning Radon (2012–2020) and the Swiss standard SIA 180 revision brought new international standards under Swiss legislation to protect occupants in dwellings.

UNITED KINGDOM

Approved Document C

In the United Kingdom, in relation to the building regulations, Approved Document C deals with radon. It references a Building Research Establishment document (Scivyer, 2015) which provides guidance on radon protective measures appropriate for areas where different proportions of homes are predicted (and shown on maps) to have radon at or above the radon action level of 200 Bq/m³. It also notes that use of an alternative “radon risk report” approach will provide a more accurate assessment of whether radon protective measures are necessary for a particular property and, if needed, the level of protection that is appropriate.

UNITED STATES OF AMERICA

Toxic Substances Control Act

In the USA, the Toxic Substances Control Act requires the “Department of Housing and Urban Development to develop an effective departmental policy for dealing with radon contamination that utilizes any EPA guidelines and standards to ensure that occupants of housing covered by this section are not exposed to hazardous levels of radon”. The policy should utilize the EPA guidelines, information and standards for:

- testing residential and non-residential structures for radon;
 - identifying elevated radon levels;
 - identifying when remedial actions should be taken;
 - identifying geographical areas that are likely to have elevated levels of radon.
-

HEALTH OUTCOMES OF HEALTHY HOUSING POLICIES



Policy-makers should adopt participatory and integrated assessment methods when considering proposed housing policies to identify potential health benefits, co-benefits and unintended consequences.

Evidence demonstrates that many policies implemented to improve health in housing do yield health benefits. Table 5.1 summarizes the results of studies that have evaluated the health outcomes of selected healthy housing policies. Health benefits included reductions in asthma symptomatic episodes, emergency room visits, hospitalizations, and reported SHS exposure.

Several studies reported side-effects of healthy housing policies (either intentional or unintentional) that either resulted in positive (termed co-benefits) or negative (termed unintended consequences) impacts. Positive co-benefits beyond health included: economic benefits to the local economy; fewer working and school days lost; reduced health inequalities; and cost savings to households, health and other services. A few studies reported unintended consequences of housing policies, which included: increased health inequalities; increased costs of fuel and equipment for poorer households; and discrimination by property managers against certain demographics. However, in many cases it was unclear whether studies were actively seeking to evaluate co-benefits and unintended consequences, which makes it difficult to assess any patterns. Policy-makers should therefore adopt participatory and integrated assessment methods when considering proposed healthy housing policies to identify potential health benefits, co-benefits and unintended consequences.

TABLE 5.1 EXAMPLES OF HEALTH BENEFITS

GEOGRAPHICAL SETTING	POLICY	HOUSING HEALTH RISK(S) ADDRESSED	STUDY OBJECTIVE	MAIN RESULT(S)	REFERENCE
Baltimore, USA	Green and Healthy Homes Initiative	Lead; damp/mould; high indoor temperatures; low indoor temperatures	To evaluate the impact of the Green and Healthy Homes Initiative on childhood asthma.	Findings from the health surveys at intake and 6 months after the intervention provide evidence of the impact on the reduction of asthma symptomatic episodes, emergency room visits, and hospitalizations, while showing improvements in school attendance and parents' work attendance.	(Norton & Brown, 2014)
Beijing-Tianjin-Hebei region, China	Coal-to-electricity policy	Air quality	To evaluate the health benefits of the residential coal-to-electricity policy in the BTH region.	The private health benefits from indoor air quality improvements do not justify the costs. However, adding the spill-over public health benefits from ambient air quality improvements, the policy brings net social benefits to the BTH region.	(Zhang et al., 2019)
Broward and Miami-Dade Counties, Florida, USA	Smoke-free multi-unit housing policies	Air quality	To evaluate the impact of smoke-free policy implementation on SHS exposure in low-income multi-unit housing properties.	The percentage of residents reporting SHS exposure within their apartments from elsewhere in or around their building decreased from 31.1% before policy implementation to 23.6% at follow-up ($p = 0.02$).	(Hollar et al., 2017)

TABLE 5.1 EXAMPLES OF HEALTH BENEFITS cont.

Lambeth, London, United Kingdom	Lambeth Housing Standard	Low indoor temperatures; damp/mould; housing accessibility; injury hazards	To evaluate the costs and benefits of the Lambeth Housing Standard.	Monetized benefits of £227 million for individuals, the NHS, social care services, criminal justice system and the local economy.	(Ambrose et al., 2018)
NSW, Australia	State legislation requiring all homes to be fitted with fire alarms	Injury hazards	To assess the health impact of changes in smoke alarm legislation in NSW in terms of hospitalizations for residential fire injuries.	Following the introduction of legislation, hospitalizations decreased by an estimated 36.2% (95% CI: 16.7–55.8).	(Harvey et al., 2013)
Norway	The Norwegian Housing Allowance	Overcrowding	To investigate housing market behaviour in a treatment group in a situation in which variations in housing situation feeds directly into variations in the amount of housing allowances received.	Empirical analyses revealed that the probability of moving out of crowded housing conditions is 14% higher among housing allowance receivers whose amount of housing allowances is affected by marginal variations in the pre-allowance housing expenses, than in the control group.	(Nordvik, 2015)
United Kingdom	Lifetime Homes Standard	Injury hazards; damp/mould; low indoor temperatures; radon; asbestos; water quality; overcrowding; noise; air quality; high indoor temperatures	To model the potential direct and indirect health benefits associated with the Lifetime Homes Standard.	Compared with average homes, a new-built Lifetime Homes Standard home has the potential to save the NHS a further £691 during its 60-year lifespan above the £3561 saved on hazards not affected by the Lifetime Homes Standard. This is £194 more than an average new home built to current building regulations.	(Roys, 2012)



CHAPTER

6

BARRIERS AND ENABLERS TO POLICY DEVELOPMENT AND IMPLEMENTATION



We identified a wide range of barriers and enablers to the formulation and implementation of policies that aim to promote healthy housing. Many of these factors are recognized by the [HHGL](#), which describe the varying national contexts that will affect the adoption and implementation of the guidelines. Here we discuss types of barriers and enablers via themes identified through our review across two policy stages – development and implementation (Table 6.1). These themes are not necessarily comprehensive and may not reflect the situation in each Member State or for each health hazard covered by the HHGL. Indeed, some of the enablers discussed would likely apply to both policy development and implementation (such as collaboration).

TABLE 6.1 THEMES OF BARRIERS AND ENABLERS TO HEALTHY HOUSING POLICY DEVELOPMENT AND IMPLEMENTATION

POLICY DEVELOPMENT	POLICY IMPLEMENTATION
Advocacy by interest groups	Interest in and knowledge of policy existence and purpose
Knowledge and evidence	Public funding
International agendas	Economic (dis)incentives
Disasters	Collaboration between sectors
	Clarity and usability of policy guidance, communication and tools
	Enforcement and accountability
	Positive and negative consequences: actual and perceived
	Personnel capacity and skills
	Housing outside of policy reach

6.1 Policy development

As previously mentioned, what we have termed the policy development process encompasses a range of activities that may occur over months or years. In essence, there are agenda-setting and policy formulation processes that converge in a final decision about a particular policy to be adopted (Howlett et al., 2016). It is during these stages that a so-called “policy window”¹ may appear, when a problem, policy

¹ Originating from John Kingdon’s Multiple Streams Theory (*Agendas, alternatives and public policies*. Boston: Little Brown; 1984).

solution(s) and political will converge. The facilitating (or hindering) factors that occur during this stage include collaboration among actors or the occurrence of events that shift political will.

ADVOCACY BY INTEREST GROUPS

Key in some settings, has been advocacy for the development of policies that promote healthy housing. For example, advocacy by communities affected by the lack of accessible homes in Australia led to the development of voluntary housing design guidelines. The housing industry resisted efforts to make these guidelines compulsory due to perceived issues of cost and low market demand. However, continued community advocacy has recently progressed action toward implementing universal design principles in the National Construction Code (Ward & Bringolf, 2018). In New Zealand, academics of the He Kainga Oranga (Health and Housing Research programme) based at the University of Otago, Wellington, have helped establish multiple initiatives for healthy homes, such as the New Zealand Healthy Homes Index and the Rental Warrant of Fitness (Telfar-Barnard et al., 2017).

KNOWLEDGE AND EVIDENCE

Knowledge and evidence of the health risks in housing and the impact of interventions are vital to the development of policy that tackles these risks. For example, widespread evidence on climate change has contributed to the development of green building standards, which provide guidance on energy efficiency in housing and often stipulate minimum levels of insulation or building performance requirements (Cedeño-Laurent et al., 2018).

Missing evidence on the effectiveness of measures has been reported as a reason for the lack of policy in some cases. For example, in the area of air quality, Kingsbury & Reckinger (2016) report the shortage of evidence on exposure to smoking and SHS in affordable homes and the need for more studies to investigate the impact of smoke-free housing policies on smoking behaviour and SHS exposure (Kingsbury & Reckinger, 2016).

High-quality evidence on the effects of interventions on health outcomes can lead to the development of policies. For example, the Liverpool Healthy Homes Programme was supported by the NICE guidance on interventions for health risks of indoor cold (NICE, 2016). Continued evidence generation on the health effects of poor housing conditions and (multi-component) interventions to promote healthy housing is a key requisite to support the development of effective policy.

INTERNATIONAL AGENDAS

Politicians' attention and motivation to develop housing and health policies is influenced by the agendas set by international organizations such as UN-Habitat and WHO. Key international conventions have helped to gain traction for policy formulation for some health risks. For example, the UN Basel Convention has supported total bans on asbestos, as it provided a "legal framework for asbestos control and management" as countries ratified (Lin et al., 2019). Similarly, international attention on climate change has helped to increase action on energy efficiency in buildings. This has led to the establishment of energy efficiency targets across many countries. For example, the European Union Directive on Energy Efficiency [EED] (2012/27/EU)

ensured the establishment of energy efficiency policies in housing across European Member States, which enforce building performance targets.

DISASTERS

Policy development is often reactive in nature and follows events that bring heightened awareness to the need for increased regulation. For example, smoke-alarm legislation in Australia was introduced after a series of fatal fires in homes (Harvey et al., 2013). In the United Kingdom, the Homes (Fitness for Human Habitation) Act 2018, which legally requires landlords to comply with existing health and safety standards, “was in part, a response to the tragic events of the Grenfell Tower fire” (Bevan, 2019).

6.2 Policy implementation

Once a policy has been adopted, the process of implementation begins. In the case of building regulations, implementation may be aided by clear permitting stages for new construction and enforcement activities. Other policy objectives may be harder to achieve as mechanisms are not as structured. There are multiple factors that can promote or inhibit the implementation of healthy housing policies, with some overlap across the policy development stage.

INTEREST IN AND KNOWLEDGE OF POLICY EXISTENCE AND PURPOSE

Lack of interest in a policy area or lack of knowledge about the purpose and existence of health-promoting policies related to housing can be a barrier to policy implementation. For example, the “lack of awareness of the topic of energy efficiency amongst common construction practitioners” in Egypt is reported to be a key barrier in the adoption of the Egyptian Residential Buildings Energy Code (Ahmed et al., 2011).

In the USA, where landlords voluntarily adopt smoke-free housing policy, various research studies have revealed that: health-related arguments are not a motivating factor for some landlords (Pizacani et al., 2011); landlords who smoked were less interested to adopt policies (Farley et al., 2015); and knowledge about the legal power to prohibit smoking and knowledge of the health effects of second-hand smoking was correlated with policy uptake (ibid). These studies suggest that it is crucial to raise awareness of both the existence of policy as well as the potential health effects.

PUBLIC FUNDING

Availability of public funding is required to implement housing policies that support health. Absence of funding, limited funding or funding that is difficult to access is commonly described as a barrier to policy implementation and this can be manifested in various ways. For example, in the United Kingdom, a lack of public funds has led to implementation failures of specialized supported housing (Mencap & Housing LIN,

2018). In South Australia, unclear responsibility between social care services and disability support services was found to inhibit the flow of funds regulated by the Commonwealth State Territory Disability Agreement, which aims to provide people with particular health needs access to appropriate housing (Battams & Baum, 2010).

ECONOMIC (DIS)INCENTIVES

There are a number of economic benefits to healthy housing policies (co-benefits) that can help support policy implementation if articulated to the right stakeholders. For example, Pizacani et al. (2011) recommend emphasizing the business case of smoke-free housing policies to landlords. Similarly, Levy et al. (2016) estimate the economic benefits of increased insulation levels in new homes at approximately US\$ 33 million across 665 000 homes or approximately US\$ 50 per home per year. The Urban Land Institute's Building Healthy Places programme has produced a number of publications outlining design and planning strategies to promote health and well-being. Their 2014 report focused on the business case for the property industry (specifically developers) in which they highlight the increased property and rent values (among other metrics) of building health-promoting properties in the USA and Australia (Kramer et al., 2014). In the report, the case study properties had improved health-related factors such as indoor air quality and daylighting. Importantly, developers who participated in the project reported that the additional costs to achieve these healthier projects were minimal.

In contrast to these summaries of the "business case", narrow techno-economic assumptions in policy formulation can result in policy failures (Galvin, 2014). For example, the United Kingdom's Green Deal assumed that "home-owners act economically rationally" and hence paybacks from energy savings provided enough incentive for homeowners to borrow money to fund insulation and other home adaptations (Galvin & Sunikka-Blank, 2017); eventually this scheme was stopped due to lack of demand. To encourage uptake of energy efficiency measures in housing, a subsidy could be more effective (Shrubsole et al., 2014) and policy should be reframed to reflect the practices of everyday life (Judson & Maller, 2014).

There may also be perceived financial disincentives to policy implementation. This occurs when the construction industry or property owners believe their profit, occupancy rate or other factors would be negatively affected by acting upon a policy. In the United Kingdom, some construction industry stakeholders reported that the Lifetime Homes Standards and Part M Regulations for Housing Design are perceived to be too expensive to be implemented at the beginning of a project despite reduced long-term costs (Rooney et al., 2013). The same was reported with Australia's Livable Housing Design Guidelines, where the housing industry has resisted formal regulations due to perceived high costs (Ward & Bringolf, 2018).

COLLABORATION BETWEEN SECTORS

Collaboration between the sectoral agencies responsible for housing and health is frequently reported as vital to policy success. The Liverpool Healthy Homes Programme saw the joint involvement of the local council and the primary care trust, as well as local advocates, environmental health practitioners and a large network of referral partners as a key factor to success. On reflection, it was found that investing time to develop relationships as well as generating buy-in from stakeholders that will see the end benefits to health savings were crucial for programme success (NICE, 2016). Similarly, Pizacani et al. (2011) noted the importance of building

partnerships with both public and private stakeholders to implement smoke-free housing policies. Battams & Baum (2010) reviewed policies and policy processes to ensure appropriate housing for people with mental health disorders and found that “success was attributed to local leadership and established relationships and processes across local health and housing services”. Furthermore, Campbell et al. (2013) found that collaboration between health and legal agencies allowed for greater understanding and improved efficiency when dealing with cases brought to the Philadelphia Lead Court, which dealt with the inaction of homeowners failing to comply with city health codes in response to lead hazards.

CLARITY AND USABILITY OF POLICY GUIDANCE, COMMUNICATION AND TOOLS

Clearly communicated guidance, forms and other documentation support policy implementation. Using local data that were relevant for stakeholders' needs for both reporting progress (NICE, 2016) and to develop relevant (educational) messages, aided the successful implementation of smoke-free housing policies (Pizacani et al., 2011). Furthermore, clear and consistent information has been attributed to compliance with smoke-free housing policy in multi-unit housing (Kaufman et al., 2018). New Zealand's Rental Warrant of Fitness, which includes 29 criteria for habitability, insulation, heating, ventilation, safety, amenities, and basic structural soundness, was viewed as easy to implement and hence well received by landlords because the inspection form was easy to understand and use (Bennett et al., 2016). On the other hand, a lack of clear guidance of operation can be the main barrier for policy success. The Part M Building Regulations for Housing Design in the United Kingdom can be perceived as too timid and vague to implement (Rooney et al., 2013).

ENFORCEMENT AND ACCOUNTABILITY

Legislative support and enforcement with housing and health-related policies is a significant component of their success. Enforcement may occur at different stages of a home's life cycle, for example, at the stage of new construction or in relation to obligations of social landlords. The Philadelphia Lead Court is an example of an “innovative law enforcement strategy to compel property owners to comply with city health codes to remediate their properties of lead hazards” (Campbell et al., 2013). Campbell et al. (ibid) found that this specialized court (and its associated features) not only resulted in action on lead hazards but also helped to create a culture of accountability where homeowners became aware of their responsibilities and the consequences of non-compliance. The political environment, such as administrative inefficiencies and political corruption, can also influence the efficacy of delivery of policies, such as the National Housing Policy in Nigeria (Ibimilua, 2011).

Both adoption and enforcement become problematic where policies are voluntary and there is no legislative support or where the landlord or homeowner has primary responsibility. For example, a common barrier to smoke-free policy implementation is difficulty in identifying policy violators (Stein et al., 2016). In the context of injury hazards, pest removal and smoke-free policies, tenant behaviours including lack of cooperation are reported where landlords are responsible for enforcement (Kaufman et al., 2018; Polletta et al., 2017).

POSITIVE AND NEGATIVE CONSEQUENCES: ACTUAL AND PERCEIVED

Positive impacts of policies can enable implementation, as satisfaction will aid uptake and long-term success. High occupant satisfaction has been reported for the social facilities and open spaces provided with Turkey's flagship affordable housing policy, which was likely crucial to its long-term success (Gür & Dostoğlu, 2011). In contrast, negative consequences can result in policy failure. For example, in New Delhi, resettlement of low-income residents resulted in under-occupation as families moved back to informal settlements after the provided multistorey flats inhibited the development of economic opportunities and social connections (Centre for Urban and Regional Excellence, 2005). The United Kingdom's Lifetime Homes Standards are perceived to hinder the design of dwellings, and Part M Building Regulations for Housing Design did not focus on the needs of individuals, which may limit uptake (Rooney et al., 2013).

In some cases, negative impacts of a particular policy are perceived among stakeholders without supporting evidence, requiring implementing agencies to overcome or address these concerns. For example, in the USA, owners of multi-unit housing cited increased staff time dedicated to implement smoke-free policies as a barrier to uptake. However, a study reviewing the impacts of implemented smoke-free policies on staff time found it to be unaffected (Stein et al., 2016).

PERSONNEL CAPACITY AND SKILLS

Adequate personnel resources, with appropriate skills and training on the policy initiative, are vital for successful implementation. In New Zealand, a lack of highly trained workforce to quantify health and safety risks is recognized as a limitation for the implementation of Rental Warrant of Fitness policy (Telfar-Barnard et al., 2017). In the context of the Housing Adaptation Act in Sweden, Westlin & Bjorklund (2016) report that the implementing grant managers often lack important information to make decisions on the home adaptations required, as a consequence of those involved in writing housing adaptation certificates lacking knowledge on the grant rules. Tailored training to personnel would likely help the efficiency of these initiatives.

Where there are adequate staff resources to support monitoring and enforcement, this has been reported to encourage policy compliance (Kaufman et al., 2018). Staff that are able to perform multiple roles and work across sectors, as both case-support workers and energy efficiency/fuel poverty advisors, are more likely to have greater understanding and acceptance, and deal with the programme on a holistic basis rather than case by case (NICE, 2016). The simple IT system used for Liverpool's Healthy Homes Programme limited dependence on expert personnel and reduced IT system costs, making it more efficient to implement (NICE, 2016).

HOUSING OUTSIDE OF POLICY REACH

Certain sections of the housing stock may fall outside the reach of policies. This is particularly the case of housing which may not have formal rights due to its legal status. Land tenure is seen as a crucial barrier for the implementation of housing policies, as those without legal rights often fall outside the remit of current policies. Within the USA, the legal status of Native American tribes was found to be crucial for the delivery of the Housing Assistance and Self-Determination Act of 1996, to address overcrowding (Congressional Research Service, 2015).

In some cases, policies are not applicable to all housing or households. For example, in India, those who already have access to a “pucca” house (one made of permanent materials) are not able to access the flagship Pradhan Mantri Awas Yojana (Housing for all by 2022) policy, irrespective of the quality of the housing conditions. The Energy Conservation Building Code also only applies for buildings above a floor area of 1000 m², which excludes the majority of individual homes (Chandel et al., 2016). Furthermore, “platinum level” compliance with the Livable Housing Design Guidelines in Australia is reported to be the most inclusive rating in regards to accessibility; however, it is unlikely to be achievable for smaller dwelling structures due to restricted physical space (Galbraith, 2018).

DISCUSSION

This report summarizes example policies from across six WHO regions with the potential to promote health and equity through housing, as set out in the HHGL, and some of the barriers and enablers to policy development and implementation reported in the literature.

The report is intended to provide interested stakeholders with an overview of existing policies rather than a comprehensive listing. While the restrictions as regards to time and geographical scope of the current search have likely led to some omissions and biases, the repository is envisaged as a living document to be complemented by additional examples from a broader range of countries as implementation of the [HHGL](#) proceeds.

This section comments on a number of themes relating to healthy housing policy implementation, discusses challenges with policy development and implementation, such as the variable state of regulation internationally, and describes the imperative of monitoring to inform knowledge about “what works”, and to support enforcement where required.

MULTIPLE POLICY DOMAINS AND LIMITED MULTISECTORAL ENGAGEMENT

Many policies focus on individual housing-related health risks. However, achieving healthy housing requires policies that entail multisectoral action. A notable example of a policy that does tackle multiple health risks is the United Kingdom HHSRS (see Box 5), which has helped to inform similar initiatives in New Zealand and the USA.

The development and implementation of such policies require private and public sector stakeholders to collaborate and identify workable solutions, recognizing that actors will have varying interests. Relevant stakeholders include multiple tiers and sectors of government, the construction industry, social housing associations, interest groups (including owners and renters) and others.

It appears that regulation is generally better established in relation to the avoidance of health hazards that are recognized on an international scale (such as water quality, asbestos). Other issues, such as improved access for people with functional impairments are limited to a few countries (accessibility standards are not universally required, for example).

Many health risks, such as overcrowding, are complex challenges that require consideration of the economic, social and political factors. They require the joint involvement of public and private sector organizations and individuals to take action to address these issues.

BOX 5**THE UNITED KINGDOM'S HOUSING HEALTH AND SAFETY RATING SYSTEM**

The HHSRS is a risk assessment procedure for the evaluation of housing conditions in the United Kingdom. It has shifted the focus of housing quality assessment from identifying defects and deficiencies in the structure and facilities to the potential threats to health and/or safety attributable to the condition of the housing, including its design and maintenance.

It was developed over 10 years by the University of Warwick Law School supported by the United Kingdom Building Research Establishment and the London School of Hygiene and Tropical Medicine. It is based on a scientific assessment of the level of health risks (for several classes of potential harm) associated with 29 specific housing conditions. This assessment was developed from a literature review as well as epidemiological analyses that linked health statistics (mortality, hospital admission, accident and emergency attendance, general practice consultations) with data on housing conditions derived from the national House Condition Survey.

The underlying principle adopted for the HHSRS is that a dwelling should be designed, constructed and maintained so that "any residential premises should provide a safe and healthy environment for any potential occupier or visitor". The assessment procedure generates a numerical hazard score (a banding) to reflect the potential impact of individual hazards and of all hazards combined on occupants of different levels of vulnerability.

In 2006, the HHSRS was incorporated into legislation as the prescribed statutory standard for assessing housing conditions in England and Wales, replacing the Standard of Fitness (originally introduced in 1954). Since then, its daily use by English and Welsh local authority officers has validated it and shown it to be a robust and practical tool. It has also been shown to be transferable, having been adopted in 2010 by the United States Department for Housing and Urban Development as an option for "healthy homes grant" applicants to measure housing conditions. Local housing authorities use the HHSRS to determine whether enforcement action is necessary under Part 1 of the United Kingdom's Housing Act 2004. Enforcement options range from advice on hazards, through to emergency prohibition or remedial action orders, depending on the degree and type of hazards.

Adapted from Telfar-Barnard et al. (2017).

VARIABILITY OF POLICIES BY REGION AND SETTING

The needs and priorities of housing and health policies vary by geographical region, climate zone and level of socioeconomic development. Policies appear to be most elaborated in high-income countries compared with low-income settings. Of the identified policies included in the repository: 25% were from the Region of the Americas (predominantly USA and Canada); 25% from the European Region; 22% from the Western Pacific Region (predominantly Australia and New Zealand); 13% from the Eastern Mediterranean Region, 9% from the South-East Asia Region; and 5% from the African Region. Although our review was not comprehensive and may have biases in the identification of policies, these figures may give a broad indication of the variation across WHO regions.

Policies aimed at the promotion of well-being as opposed to avoidance of hazards tend to be more common in higher income settings. In part, regulation reflects local needs, e.g. regulation aimed at protection against risks from low indoor temperatures is common in countries with temperate climates, although these often tend to be

energy efficiency policies focused on reducing energy use in buildings through increasing thermal performance.

Differences in regulation translate into differences in risks. These are perhaps most apparent in relation to vulnerability to extreme weather and natural disasters. For example, the World Bank (2015) contrasts deaths resulting from earthquakes of similar magnitudes in California (USA) and Bam (Islamic Republic of Iran), where the former experienced two deaths and the latter 40 000. Whilst health care and emergency management systems are key factors, the report notes the role that improved design, construction, and regulatory compliance can play in reducing life loss. Some of that variation is attributable not only to the level of regulation and its effective implementation but also to the proportion of informal housing in different settings, as discussed below.

COMMON BARRIERS AND ENABLERS TO POLICY IMPLEMENTATION

The development of housing and health policy was facilitated by evidence on housing and health and the impacts of interventions, advocacy by expert groups, and through recognition of such issues on the international agenda. Effective implementation was enabled by cross-sectional collaboration, access to public funding, clear and usable policy guidance and tools, staffing resources, effective enforcement that creates a culture of accountability, and where policies achieve co-benefits, particularly economic benefits. Barriers to policy implementation included the lack of the before mentioned factors, and additionally, a lack of knowledge and interest and where policy reach failed to encompass all housing types, such as those without legal tenure.

Inserting health considerations into housing policy encounters similar difficulties to policy development and implementation in many other areas of policy, such as the need for appropriate resources and collaboration among stakeholders. Facilitators (or enablers) identified in this review overlapped with those noted to be the most significant by Weiss et al. (2016) who reviewed facilitators and barriers to health-promoting policies. These included: collaborative decision-making, effective leadership, availability of resources and trained and knowledgeable staff. Similarly, Carmichael et al.'s (2012) study on barriers and facilitators to incorporating health and well-being in spatial planning grouped findings by four factors: knowledge, partnership, management and resources, and policy process.

There are many guidance documents produced by health and built environment organizations that address these fundamental requirements for policy development and implementation. The Canadian Institute of Planners & HP Lanarc (n.d.) guidance calls for collaboration and integrated policy-making that does not consider built environment components in isolation. A Royal Institution of Chartered Surveyors (RICS) report (Pineo & Rydin, 2018) highlights a well-known barrier to developing healthy new housing, that is, developers' concerns that there will be added costs that will not be adequately covered by future returns (through sales or leasing of new homes). The RICS report (Pineo & Rydon, 2018) explains the distributed costs and benefits of healthy housing, demonstrating that costs are paid by different actors from those who reap the benefits (financial and otherwise). The authors emphasize the ability to achieve healthy design at little or no additional cost, a message which requires further advocacy among decision-makers and has been a key message of other healthy building reports (e.g. Chang, 2018).

NEED FOR EFFECTIVE ENFORCEMENT AND MONITORING

It is self-evident that housing regulation achieves little without effective implementation. There are many examples where deficiencies of health protection arise from inadequacy of compliance rather than from a lack of regulation or guidance. A recent review of the United Kingdom building regulatory system highlights multiple deficiencies (see Box 6). A related issue is the need for monitoring of building performance over time, including both new and existing housing stocks. This is understood by multiple stakeholders who may seek to check building performance in the residential sector, including government building regulation inspectors, architects, building owners and occupiers (among others). Some post-construction or post-occupancy evaluation (POE) and monitoring activities relate to compliance with regulations, whilst others offer a valuable opportunity to understand what works and what needs to be fixed or how the use of the dwelling may have changed (overcrowding etc.). Compliance with building regulations is not equally monitored or enforced internationally, creating significant risks such as those outlined above regarding natural disasters.

There are various risk assessment tools which can be used to assess housing conditions and establish the level of harm, examples include the United Kingdom HHSRS and New Zealand's Healthy Homes Index. These inspections may need to be supplemented with long-term monitoring of risk that vary with time. For architects and design teams, a POE provides an important quality assurance mechanism that establishes whether a building functions as it was intended or whether certain design solutions or technologies have failed (RIBA et al., 2016). Despite their importance, POEs are rarely performed (Hay et al., 2018), representing a significant missed opportunity to check that new buildings will promote health and can be operated effectively by building managers and occupiers.

BOX 6

REVIEW OF THE BUILDING REGULATORY SYSTEM IN THE UNITED KINGDOM

Even in settings with ostensibly good housing regulation, there are still challenges with ensuring that regulations respond to changes in technology, climate, engineering/design practices and other factors. The United Kingdom, for example, has a fairly comprehensive set of building regulations that cover the construction and extension of buildings and these regulations are supported by approved documents. Approved documents set out detailed practical guidance on compliance with the regulations. Despite decades of development and a comprehensive suite of documents, the 2018 Hackitt Review of Building Regulations and Fire Safety identified worrying deficiencies in the current system of building regulations. Key issues included:

- Ignorance of the regulations coupled with misunderstanding and misinterpretation.
- Indifference (summarized as "the primary motivation is to do things as quickly and cheaply as possible rather than to deliver quality homes which are safe for people to live in").
- Lack of clarity on roles and responsibilities.
- Inadequate regulatory oversight and enforcement tools.

Furthermore, the Committee on Climate Change (2019) reported that deficiencies in the United Kingdom building standards are "leading to safeguarding risks, needlessly high utility bills and poorer levels of health, well-being and comfort for householders.... Loopholes that have allowed poor-quality housing to be built also need to be closed". These recent independent reports demonstrate the importance of frequent monitoring and updating of building regulations to safeguard the health, safety and well-being of the public.

INFORMAL HOUSING

A high proportion of the global population, especially in low-income settings, continues to live in housing developed via informal mechanisms (including informal settlements [slums] and unauthorized developments) (UN-Habitat, 2016). By definition, this housing is wholly or in part outside of formal mechanisms of control enshrined in laws, building codes, development plans and funding remits. Such housing is very varied in terms of materials, design and facilities, with the poorest households using insubstantial materials and often lacking basic services and utilities. In many settings, informal housing contributes to multiple health risks, including exposures to poor indoor air quality, excess indoor temperatures, lack of sanitation, inadequate access to improved water, unsafe structures, fire and electrocution risks, infestations and exposure to vector-borne diseases.

It is therefore important to recognize the role of informal housing globally and the need to improve the opportunities of access to higher quality homes. This may include ensuring access to the formal sector where safety and security can be better protected through regulation and planning. However, there is a vital need to support incremental, local housing development undertaken by residents through suitable regulatory and financial frameworks that encourage safe and healthy housing (Sengupta, 2010; UN-Habitat, 2016).

ALIGNMENT OF HEALTH WITH OTHER HOUSING OBJECTIVES

Further, there is potential for alignment of health objectives with other housing policy aims. This is perhaps clearest for the example of home energy efficiency, the improvement of which has potential benefits for health, climate change, energy security and reduction of social and gender inequalities. The potential value of using a **“systems thinking” approach** in relevant policy development has been noted (Macmillan et al., 2016). This means involving different knowledge sources and types (e.g. across sectors and including communities) to understand a problem. Stakeholders should jointly consider how different factors related to a policy are interconnected, such as property refurbishments, house prices and tenure security. Furthermore, policy impacts should be monitored with collaboratively produced indicators to ensure that the intended outcomes have resulted from implementation. One example of the need for systems thinking arises from the improvement of home energy efficiency. Such improvements are a key target for regulation and housing improvement programmes in higher income settings because of the need to reduce greenhouse gas emissions to tackle climate change. However, improving the energy efficiency of dwellings through better insulation and improved efficiency of heating and cooling systems, also has potential “co-benefits” for health because of its protection against the adverse effects of winter indoor cold and potentially also summer heat, and because it can help reduce “fuel poverty”. Consideration of the range of such benefits can help improve the cost-benefit calculus of an intervention because the same capital investment typically results in multiple (positive) outcomes – for the environment, for health, for society and equality. This raises the importance of action in such policy areas where multiple objectives can be achieved. A recent report highlighted the opportunity for translating cost-benefit data into a message for policy-makers and thus promoting the many benefits of investing in better housing (Eurofound, 2016).

UNINTENDED CONSEQUENCES OF POLICIES

While policies/regulation seek to protect health, there are important examples of how policies may sometimes lead to unintended adverse consequences for health. An example is again that of home energy efficiency (Shrubsole et al., 2014). Measures to improve home energy efficiency by design often entail a reduction in the air exchange within dwellings to help limit heat losses. However, the consequences of such action can be negative as well as positive. Whilst reduced ventilation helps to reduce heat losses and protect against the ingress of air from the outdoor environment, it is likely to increase the concentration of pollutants arising inside the home, including particles of indoor origin (e.g. from cooking), volatile organic compounds from furnishings, radon, second-hand tobacco smoke and, in some circumstances, mould. For example, there is evidence from modelling (Milner et al., 2014) and empirical measurement (Symonds et al., 2019), that home energy efficiency improvements in the United Kingdom are likely to be responsible for increases in the concentration of indoor radon levels. Avoiding such unintended consequences requires a multisectoral approach towards policy and intervention design and regular monitoring to allow for timely remedial in case detrimental effects occur.

MOVING TOWARDS A SET OF BEST PRACTICE PRINCIPLES

1

Work to address gaps in housing policies that promote health locally: Despite numerous examples of implemented policies that support healthy housing, there are gaps in the existence of policy across all countries. There is, therefore, a need for countries to consider the development of housing policies that promote health, where they do not currently exist locally. Policy-makers may draw on the examples provided in this review to develop context-specific policies, using a process of consultation and impact assessment. Careful consideration of the noted barriers and enablers can further guide this process.

2

Recognize health as a core element in housing policies: Recommendations in the [HHGL](#) can be translated into context-specific policies and serve as a basis for monitoring and evaluating progress and success of implemented policies. Without putting health at the heart of housing policy-making, the right to adequate housing cannot be fulfilled, even where policies have co-benefits for health, such as those focused on energy efficiency.

3

Consider multiple health risks in a coordinated manner: Without due consideration, there is likely to be a trade-off between health risks. Furthermore, policies that consider multiple risks are likely to be more cost effective. For example, increasing shading to protect against high indoor temperatures may result in low indoor temperatures during cold weather. Policies should consider these trade-offs and go through an appropriate evaluation process to avoid unintended consequences.

4

Follow scientific evidence and examples of good practice: In most, perhaps all, settings, strengthening the mechanisms for the development of housing policy informed by scientific evidence and examples of good practice is highlighted.

5

Incorporate health costs and benefits analyses in policy-making: Mechanisms to ensure that analyses of the *health* costs and benefits of housing policy are routinely incorporated into policy decisions may accelerate the development of healthy housing. This could be through health impact assessment or other evaluation mechanisms. It is important to note that many housing policies have the potential to address multiple hazards/health outcomes as well as other (non-health-related) policy objectives and it is important to recognize this when considering the overall balance of costs and benefits.

6

Acknowledge housing is part of a complex system: Most aspects of housing policy exert influence and are influenced by a wide range of factors, reflecting the fact that housing is part of a complex system. The development of a successful policy is likely to be most effective if this complexity is acknowledged and policy objectives are not considered in isolation. A multisectoral "systems thinking" approach, based on structured participatory engagement with a broad range of stakeholders, is likely to result in more effective and holistic policy development and implementation.

7

Develop mechanisms to ensure effective and sustained policy implementation: The achievement of health benefits from any housing policy is contingent upon effective and sustained implementation. Mechanisms to ensure frequent monitoring, effective enforcement and updating of policy are therefore important elements of successfully promoting health and other policy goals through housing sector interventions.

8

Develop approaches that include the informal housing sector: Informal housing is one of the most challenging types of accommodation to make healthy because, by definition, it falls partly or entirely outside official regulatory and policy controls. An important objective for housing and health policy is therefore to develop tools, mechanisms and financing models to ensure access to adequate housing that enhances health and well-being, which may include upgrading informal housing and increasing access to formal housing of various tenures (e.g. social, intermediate or market-led). Housing development is core to community cohesion and should be done via an inclusive approach that involves communities in the decision-making process.

REFERENCES

- Ahmed AN, Samaan MM, Farag OMA, El Aishy AS (2011). Using simulation tools for enhancing residential buildings energy code in Egypt. 12th Conference of International Building Performance Simulation Association, Sydney. Proceedings of Building Simulation. 2011;1141–1148.
- Ambrose A, Bashir N, Foden M, Gilbertson J, Green G, Stafford B (2018). Better housing, better health in London Lambeth: The Lambeth Housing Standard Health Impact Assessment and Cost Benefit Analysis. Project Report. Sheffield: Sheffield Hallam University.
- Azhar GS, Mavalankar D, Nori-Sarma A, Rajiva (2018). Mortality in India: excess all-cause mortality associated with the 2010 Ahmedabad heat wave. PLOS ONE. 9(3):e91831.
- Barrington-Leigh C, Baumgartner J, Carter E, Robinson B. E, Tao S, & Zhang Y (2019). An evaluation of air quality, home heating and well-being under Beijing's programme to eliminate household coal use. Nature Energy, 4(5):416–423. <https://doi.org/10.1038/s41560-019-0386-2>
- Battams S & Baum F (2010). What policies and policy processes are needed to ensure that people with psychiatric disabilities have access to appropriate housing? Social Science and Medicine. 70(7):1026–1034. <https://doi.org/10.1016/j.socscimed.2009.12.007>
- Bennett J, Howden-Chapman P, Chisholm E, Keall M, Baker MG (2016). Towards an agreed quality standard for rental housing: field testing of a New Zealand housing WOF tool. Australian and New Zealand Journal of Public Health. 40(5):405–411. <https://doi.org/10.1111/1753-6405.12519>
- Bevan C (2019). Improving housing conditions in the private and social rented sectors: the Homes (Fit for Human Habitation) Act 2018 - fit for habitation but fit for purpose? Modern Law Review. 82(5):897–921. <https://doi.org/10.1111/1468-2230.12439>
- Breyse J, Jacobs DE, Weber W, Dixon S, Kaweck C, Aceti S et al. (2011). Health outcomes and green renovation of affordable housing. Public Health Reports. 126(suppl 1):64–75. <https://doi.org/10.1177/00333549111260s110>
- Caixin News (2019). Potential aggregated energy poverty in coal to gas. Retrieved from: <http://companies.caixin.com/2019-12-31/101499652.html> [English translation]. 研究：“煤改气”、“煤改电”或加剧能源贫困’, accessed 31 December 2019.
- Campbell C, Gracely EJ, Cummings C, Pan S, Palermo P, Gould GD (2013). Philadelphia's lead court is making a difference. Journal of Health Politics, Policy and Law. 38(4):709–733. <https://doi.org/10.1215/03616878-2208585>
- Canadian Institute of Planners & HP Lanarc (n.d.). Healthy communities practice guide.
- Carmichael L, Barton H, Gray S, Lease H, Pilkington P. Integration of health into urban spatial planning through impact assessment: Identifying governance and policy barriers and facilitators. Environ Impact Assess Rev. 2012;32(1):187–194. doi:10.1016/j.eiar.2011.08.003
- Cedeño-Laurent JG, Williams A, MacNaughton P, Cao X, Eitland E, Spengler J et al. (2018). Building evidence for health: green buildings, current science, and future challenges. Annual Review of Public Health. 39(1):291–308. <https://doi.org/10.1146/annurev-publhealth-031816-044420>

- Center for Active Design (2020). About Fannie Mae's Healthy Housing Rewards™. New York: Center for Active Design (<https://centerforactivedesign.org/healthyhousingrewards>, accessed 26 May 2020).
- Centre for Urban and Regional Excellence (2005). Upgrade or resettlement? New Delhi: India.
- Chandel SS, Sharma A, Marwaha BM (2016). Review of energy efficiency initiatives and regulations for residential buildings in India. *Renewable and Sustainable Energy Reviews*. 54:1443–1458. <https://doi.org/10.1016/j.rser.2015.10.060>
- Chang M (2018). Securing constructive collaboration and consensus for planning healthy developments: a report from the Developers and Wellbeing project. Town and Country Planning Association: London.
- China Government News (2018). Interpretation of clean heating plan for northern China in winter for 2017-2021. Retrieved from: http://www.gov.cn/zhengce/2018-01/24/content_5260167.htm [English translation]. '北方地区冬季清洁取暖规划（2017-2021）解读 _ 解读 _ 中国政府网', accessed 31 December 2019.
- CODI [website] (2020). Baan Mankong Urban programme. Bangkok: Community Organizations Development Institute (<https://en.codi.or.th/baan-mankong-housing/baan-mankong-rural/>, accessed 28 May 2020).
- Colton MD, Laurent JGC, MacNaughton P, Kane J, Bennett-Fripp M, Spengler J et al. (2015). Health benefits of green public housing: associations with asthma morbidity and building-related symptoms. *American Journal of Public Health*. 105(12):2482–2489. <https://doi.org/10.2105/AJPH.2015.302793>
- Committee on Climate Change (2019). UK housing: fit for the future? London.
- Congressional Research Service (2015). The Native American Housing Assistance and Self-Determination Act of 1996 (NAHASDA): Background and funding. In CRS reports (Library of Congress. Congressional Research Service) (Vol. R43307).
- Dixon T, Colantonio A, Shiers D, Reed R, Wilkinson S, Gallimore P (2008). A green profession? A global survey of RICS members and their engagement with the sustainability agenda. *Journal of Property Investment & Finance*. 26(6):460–481. <https://doi.org/10.1108/14635780810908352>
- Eurofound (2016). Inadequate housing in Europe: costs and consequences. Luxembourg: Publications Office of the European Union (<https://www.eurofound.europa.eu/publications/report/2016/quality-of-life-social-policies/inadequate-housing-in-europe-costs-and-consequences>, accessed 28 May 2020).
- Farley SM, Waddell EN, Coady MH, Grimshaw V, Wright DA, Mandel-Ricci J et al. (2015). Correlates of smoke-free housing policies and interest in implementing policies among multiunit housing owners in New York City. *Journal of Urban Health*. 92(2):291–303. <https://doi.org/10.1007/s11524-014-9934-z>
- Galbraith P (2018). Home coming? A story of reassurance, opportunity and hope for universally designed housing in Australia. *Studies in Health Technology and Informatics*. 256:324–335. <https://doi.org/10.3233/978-1-61499-923-2-324>
- Galvin R (2014). Why German homeowners are reluctant to retrofit. *Building Research and Information*. 42(4): 398–408. <https://doi.org/10.1080/09613218.2014.882738>
- Galvin R & Sunikka-Blank M (2017). Ten questions concerning sustainable domestic thermal retro fit policy research. *Building and Environment*. 118:377–388. <https://doi.org/10.1016/j.buildenv.2017.03.007>
- Government of India, Ministry of Environment Forest & Climate Change (2019). India Cooling Action Plan. New Delhi (<http://ozonecell.in/wp-content/uploads/2019/03/INDIA-COOLING-ACTION-PLAN-e-circulation-version080319.pdf>, accessed 28 May 2020).
- Gür M & Dostoğlu N (2011). Affordable housing in Turkey: user satisfaction in TOKI houses. *Open House International*. 35(3):49–61.

- Habinteg (2015). Accessible Housing Standards 2015. London: Habinteg.
- Harvey LA, Poulos RG, Sherker S (2013). The impact of recent changes in smoke alarm legislation on residential fire injuries and smoke alarm ownership in New South Wales, Australia. *Journal of Burn Care & Research*. 34(3):e168–75. <https://doi.org/10.1097/BCR.0b013e318257d827>
- Hay R, Samuel F, Watson KJ, Bradbury S (2018). Post-occupancy evaluation in architecture: experiences and perspectives from UK practice. *Building Research & Information*. 46(6):698–710. <https://doi.org/10.1080/09613218.2017.1314692>
- Hollar TL, Cook N, Quinn D, Phillips T, DeLucca M (2017). Smoke-free multi-unit housing policies show promise in reducing secondhand smoke exposure among racially and ethnically diverse, low-income seniors. *Journal of Immigrant and Minority Health*. 19(6):1281–1289. <https://doi.org/10.1007/s10903-016-0430-2>
- Howlett M, McConnell A, Perl A (2016). Weaving the fabric of public policies: comparing and integrating contemporary frameworks for the study of policy processes. *Journal of Comparative Policy Analysis: Research and Practice*. 18(3):273–289. <https://doi.org/10.1080/13876988.2015.1082261>
- Hua J & Kang Lim B (2017). China unveils 2017-2021 winter clean heating plan. Reuters. 17 December 2017 (<https://www.reuters.com/article/us-china-energy-heating-idUSKBN1EB02P>, accessed 27 May 2020).
- Huang J, Pan X, Guo X, Li G (2018). Health impact of China's Air Pollution Prevention and Control Action Plan: an analysis of national air quality monitoring and mortality data. *The Lancet Planetary Health*. 2(7):e313–e323. [https://doi.org/10.1016/S2542-5196\(18\)30141-4](https://doi.org/10.1016/S2542-5196(18)30141-4).
- Ibimilua AF (2011). The Nigerian national housing policy in perspective: a critical analysis. *Journal of Social Development in Africa*. 26(2):165–188.
- International Agency for Research on Cancer (2012). Asbestos. Lyon.
- International Atomic Energy Agency (2014). Radiation protection and safety of radiation sources: international basic safety standards. General safety requirements part 3 (GSR Part 3). Vienna: International Atomic Energy Agency. (<https://www.iaea.org/publications/8930/radiation-protection-and-safety-of-radiation-sources-international-basic-safety-standards>, accessed 23 December 2020).
- Judson EP & Maller C (2014). Housing renovations and energy efficiency: insights from homeowners' practices. *Building Research & Information*. 42(4):501–511. <https://doi.org/10.1080/09613218.2014.894808>
- Kaufman P, Kang J, Kennedy RD, Beck P, Ferrence, R (2018). Impact of smoke-free housing policy lease exemptions on compliance, enforcement and smoking behavior: a qualitative study. *Preventive Medicine Reports*. 10:29–36. <https://doi.org/10.1016/j.pmedr.2018.01.011>
- Kennedy C, Lordo R, Sucosky MS, Boehm R, Brown MJ (2014). Primary prevention of lead poisoning in children: a cross-sectional study to evaluate state specific lead-based paint risk reduction laws in preventing lead poisoning in children. *Environmental Health*. 13(1):1–10. <https://doi.org/10.1186/1476-069X-13-93>
- Kingsbury JH & Reckinger D (2016). Clearing the air: smoke-free housing policies, smoking, and secondhand smoke exposure among affordable housing residents in Minnesota, 2014–2015. *Preventing Chronic Disease*. 13(8):1–8. <https://doi.org/10.5888/pcd13.160195>
- Kramer A, Lassar T, Federman M, Hammerschmidt, S (2014). Building for wellness: the business case. Washington, DC: Urban Land Institute.

- Lea T & Torzillo P (2016). The cunning of data in indigenous housing and health. *Journal of Prevention and Intervention in the Community*. 44(4):272–282. <https://doi.org/10.1080/10852352.2016.1197723>
- Levy JI, Woo MK, Penn SL, Omary M, Tambouret Y, Kim CS et al. (2016). Carbon reductions and health co-benefits from US residential energy efficiency measures. *Environmental Research Letters*. 11(3):034017. <https://doi.org/10.1088/1748-9326/11/3/034017>
- Lifetime Homes (2010). *The Lifetime Homes Standard*. London: Lifetime Homes; (<http://www.lifetimehomes.org.uk/pages/revised-design-criteria.html>, accessed 28 May 2020).
- Lin RT, Chien LC, Jimba M, Furuya, S, Takahashi K (2019). Implementation of national policies for a total asbestos ban: a global comparison. *The Lancet Planetary Health*. 3(8):e341–e348. [https://doi.org/10.1016/S2542-5196\(19\)30109-3](https://doi.org/10.1016/S2542-5196(19)30109-3)
- Local Government Association (2016). *Tower Hamlets – reducing overcrowding*. London: Local Government Association (<https://www.local.gov.uk/tower-hamlets-reducing-overcrowding>, accessed 28 May 2020).
- Macmillan A, Davies M, Shrubsole C, Luxford N, May N, Chiu LF, et al. (2016). Integrated decision-making about housing, energy and wellbeing: a qualitative system dynamics model. *Environmental Health*. 15:S37. <https://doi.org/10.1186/s12940-016-0098-z>
- Manchester T, Meklenburg J, Moise K, Potts B. International smoke alarm legislation and technology in residential structures: a review for Fire Protection Association Australia [thesis]. Worcester MA: Worcester Polytechnic Institute; 2009.
- Mencap, & Housing LIN (2018). *Funding supported housing for all: specialised supported housing for people with a learning disability*. London: MENCAP.
- Meng W, Zhong Q, Chen Y, Shen H, Yun X, Smith KR et al. (2019). Energy and air pollution benefits of household fuel policies in northern China. *Proceedings of the National Academy of Sciences of the United States of America*. 116(34):16773–16780. <https://doi.org/10.1073/pnas.1904182116>
- Milner J, Shrubsole C, Das P, Jones B, Ridley I, Chalabi Z et al. (2014). Home energy efficiency and radon related risk of lung cancer: modelling study. *BMJ (Online)*. 348:1–12. <https://doi.org/10.1136/bmj.f7493>
- Ministry of Housing, Communities and Local Government (2018). *Independent Review of Building Regulations and Fire Safety: final report*. (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/707785/Building_a_Safer_Future_-_web.pdf, accessed 28 May 2020).
- NICE (2016). *Liverpool Healthy Homes Programme: delivering NICE Guideline NG6 'Excess winter deaths and morbidity and the health risks associated with cold homes.'* London: National Institute for Health and Care Excellence (<https://www.nice.org.uk/sharedlearning/liverpool-healthy-homes-programme-7-years-of-pre-empting-nice-guideline-ng6-excess-winter-deaths-and-morbidity-and-the-health-risks-associated-with-cold-homes>, accessed 28 May 2020).
- Nordvik V (2015). Housing allowances, mobility and crowded living: the Norwegian case. *Journal of Housing and the Built Environment*. 30(4):667–681 (<https://oda.hioa.no/en/housing-allowances-mobility-and-crowded-living-the-norwegian-case>, accessed 28 May 2020).
- Norton RA & Brown BW (2014). Green & healthy homes initiative: improving health, economic, and social outcomes through integrated housing intervention. *Environmental Justice*. 7(6):151–157. <http://doi.org/10.1089/env.2014.0033>
- Pineo H & Rydin Y (2018). *Cities, health and well-being*. London: RICS (<https://www.rics.org/globalassets/rics-website/media/knowledge/research/insights/cities-health-and-well-being-rics.pdf>, accessed 28 May 2020).

- Pizacani B, Laughter D, Menagh K, Stark M, Drach L, Hermann-Franzen C (2011). Moving multiunit housing providers toward adoption of smoke-free policies. *Preventing Chronic Disease*. 8(1).
- Polletta V, Reid M, Barros E, Duarte C, Donaher K, Wensley H, Wolff L (2017). Role of landlords in creating healthy homes: Section 8 landlord perspectives on healthy housing practices. *American Journal of Health Promotion*. 31(6):511–514. <https://doi.org/10.1177/0890117116671081>
- Retzlaff RC (2009). The use of LEED in planning and development regulation: an exploratory analysis. *Journal of Planning Education and Research*. 29(1):67–77. <https://doi.org/10.1177/0739456X09340578>
- RIBA, Hay R, Bradbury S, Dixon D, Martindale K, Samuel F, Tait A (2016). Building knowledge: pathways to post occupancy evaluation. Value of Architects, University of Reading.
- Rooney C, Hadjri K, Craig C (2013). Assessing lifetime homes standards and Part M building regulations for housing design in the UK. *Design Journal*. 16(1):29–50. <https://doi.org/10.2752/175630613X13512595146871>
- Roys M (2012). Assessing the health benefits of Lifetime Homes. London: Department for Communities and Local Government (http://data.parliament.uk/DepositedPapers/Files/DEP2012-1192/HealthBenefitsLifetimeHomes_final.pdf, accessed 28 May 2020).
- Schwartz Y & Raslan R (2013). Variations in results of building energy simulation tools, and their impact on BREEAM and LEED ratings: a case study. *Energy and Buildings*. 62:350–359. <https://doi.org/10.1016/j.enbuild.2013.03.022>
- Scivyer C (2015). Radon: Guidance on protective measures for new buildings. Watford, UK: Building Research Establishment.
- Sengupta U (2010). The hindered self-help: housing policies, politics and poverty in Kolkata, India. *Habitat International*. 34(3):323–331. <https://doi.org/10.1016/j.habitatint.2009.11.009>
- Shrubsole C, Macmillan A, Davies M, May N (2014). 100 Unintended consequences of policies to improve the energy efficiency of the UK housing stock. *Indoor and Built Environment*. 23(3):340–352. <https://doi.org/10.1177/1420326X14524586>
- Stein AH, Baker LE, Agans RP, Xue W, Collins NM, Suttie JL (2016). The experience with smoke-free policies in affordable multiunit housing in North Carolina: a statewide survey. *American Journal of Health Promotion*. 30(5):382–389. <https://doi.org/10.1177/0890117116646346>
- Symonds P, Rees D, Daraktchieva Z, McColl N, Bradley J, Hamilton I et al. (2019). Home energy efficiency and radon: an observational study. *Indoor Air*. 29(5):854–864. <https://doi.org/10.1111/ina.12575>
- Telfar-Barnard L, Bennett J, Howden-Chapman P, Jacobs DE, Ormandy D, Cutler-Welsh M et al. (2017). Measuring the effect of housing quality interventions: the case of the New Zealand “Rental Warrant of Fitness.” *International Journal of Environmental Research and Public Health*. 14(11). <https://doi.org/10.3390/ijerph14111352>
- United Kingdom Government (1984). Building Act 1984. United Kingdom Government (<http://www.legislation.gov.uk/ukpga/1984/55>, accessed 28 May 2020).
- United Kingdom Government, Ministry of Housing, Communities & Local Government (2016). Approved Documents. London: GOV.UK (<https://www.gov.uk/government/collections/approved-documents>, accessed 28 May 2020).
- United Nations (2016). Habitat III. Revised zero draft of the New Urban Agenda. Quito: United Nations.
- UN-Habitat (2016). World cities report 2016: urbanization and development. Nairobi: UN-Habitat.

- Wang Y (2017). Beijing-Tianjin-Hebei coal-to-gas project is about to be completed, involving more than 1.9 million households. Retrieved from News.163 website: <https://web.archive.org/web/20171211204936/http://news.163.com/17/1113/18/D351KL06000187VE.html> [English translation]. ‘本年度京津冀“煤改气”工程即将完工，共涉及约190多万户_网易新闻’，accessed 31 December 2019.
- Ward M & Bringolf J (2018). Universal design in housing in Australia: getting to yes. *Studies in Health Technology and Informatics*. 256:299–306. <https://doi.org/10.3233/978-1-61499-923-2-299>
- WaterAid (2016). Achieving total sanitation and hygiene coverage within a generation – lessons from East Asia. London: WaterAid (<https://washmatters.wateraid.org/publications/achieving-total-sanitation-and-hygiene-coverage-within-a-generation-lessons-from-east>, accessed 23 December 2020).
- Weible CM (2017). Introduction: the scope and focus of policy process research and theory. In CM Weible & PA Sabatier, editors. *Theories of the Policy Process*. New York: Westview Press.
- Weiss D, Lillefjell M, Magnus E (2016) Facilitators for the development and implementation of health promoting policy and programs - a scoping review at the local community level. *BMC Public Health*. 16(1). doi:10.1186/s12889-016-2811-9
- Westlin E & Bjorklund A (2016). A Delphi study of occurring information in housing. *Scandinavian Journal of Occupational Therapy*. 23(5):357–365.
- WHO (2006). Air quality guidelines – global update 2005. Geneva: World Health Organization (https://www.who.int/phe/health_topics/outdoorair/outdoorair_agg/en/, accessed 28 May 2020).
- WHO (2009). WHO Handbook on indoor radon. Geneva: World Health Organization (http://apps.who.int/iris/bitstream/10665/44149/1/9789241547673_eng.pdf, accessed 30 May 2020).
- WHO (2010). Exposure to lead: a major public health concern. Geneva: World Health Organization (<http://www.who.int/ipcs/features/lead.pdf>, accessed 30 May 2020).
- WHO (2014). WHO guidelines for indoor air quality: household fuel combustion. Geneva: World Health Organization (https://apps.who.int/iris/bitstream/handle/10665/141496/9789241548885_eng.pdf?sequence=1, accessed 18 September 2020).
- WHO (2015). World report on ageing and health. Geneva: World Health Organization (https://apps.who.int/iris/bitstream/handle/10665/186463/9789240694811_eng.pdf?sequence=1, accessed 30 May 2020).
- WHO (2017). Guidelines for drinking-water quality, fourth edition incorporating the first addendum. Geneva: World Health Organization (<https://apps.who.int/iris/bitstream/handle/10665/254637/9789241549950-eng.pdf?sequence=1>, accessed 18 September 2020).
- WHO (2018a). Falls. 16 January 2018. (<https://www.who.int/news-room/fact-sheets/detail/falls>, accessed 23 December 2020).
- WHO (2018b). Guidelines on sanitation and health. Geneva: World Health Organization (<https://www.who.int/publications/item/9789241514705>, accessed 23 December 2020).
- WHO (2018c). WHO Housing and health guidelines. Geneva: World Health Organization (<https://apps.who.int/iris/bitstream/handle/10665/276001/9789241550376-eng.pdf>, accessed 18 September 2020).
- WHO (2020). The Global Health Observatory. Public health and environment [website]. World Health Organization (<https://www.who.int/data/gho/data/themes/public-health-and-environment>, accessed 18 September 2020).

- WHO (2021). Repository of policies, regulations and legislation promoting healthy housing (available at <https://www.who.int/docs/default-source/air-pollution-documents/air-quality-and-health/healthy-housing-policy-repository.xls>). Geneva: World Health Organization.
- WHO Regional Office for Europe (2000). WHO Air quality guidelines for Europe, second edition. Copenhagen: World Health Organization Regional Office for Europe (https://www.euro.who.int/_data/assets/pdf_file/0005/74732/E71922.pdf, accessed 20 May 2020).
- WHO Regional Office for Europe (2009a). WHO Guidelines for indoor air quality: dampness and mould. Copenhagen: World Health Organization Regional Office for Europe (https://www.euro.who.int/_data/assets/pdf_file/0017/43325/E92645.pdf?ua=1, accessed 20 May 2020).
- WHO Regional Office for Europe. (2009b). WHO Night noise guidelines for Europe. Copenhagen: World Health Organization Regional Office for Europe (https://www.euro.who.int/_data/assets/pdf_file/0017/43316/E92845.pdf, accessed 20 May 2020).
- WHO Regional Office for Europe (2010). WHO Guidelines for indoor air quality: selected pollutants. Copenhagen: World Health Organization Regional Office for Europe (https://www.euro.who.int/_dataassets/pdf_file/0009/128169/e94535.pdf, accessed 20 May 2020).
- WHO Regional Office for Europe (2011). Environmental burden of disease associated with inadequate housing: a method guide to the quantification of health effects of selected housing risks in the WHO European Region. Copenhagen: World Health Organization Regional Office for Europe. <https://apps.who.int/iris/handle/10665/108587>
- WHO Regional Office for Europe (2018). WHO Environmental noise guidelines for the European Region. Copenhagen: World Health Organization Regional Office for Europe (https://www.euro.who.int/_data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf, accessed 20 May 2020).
- WHO & UNEP (2020). Health and Environment Linkages Initiative: legislation and regulation [website]. World Health Organization and United Nations Environment Programme (https://www.who.int/heli/tools/legis_regul/en/, accessed 30 May 2020).
- WHO & UNICEF (2019). Progress on household drinking water, sanitation and hygiene 2000–2017. Special focus on inequalities. Geneva: World Health Organization and the United Nations Children's Fund (<https://www.who.int/publications-detail-redirect/9789241516235>, accessed 23 December 2020).
- Zhang X, Jin Y, Dai H, Xie Y, Zhang S (2019). Health and economic benefits of cleaner residential heating in the Beijing–Tianjin–Hebei region in China. *Energy Policy*. 127:165–178 (<https://doi.org/10.1016/j.enpol.2018.12.008>, accessed 28 May 2020).

ANNEXES

Annex 1: Literature review search protocol

SEARCH AIMS AND SCOPE

This search aimed to identify policies, regulations and legislations that promote healthy housing at a national, regional and local level. To do this, a review of papers discussing housing policies and their effectiveness was completed.

INCLUSION AND EXCLUSION CRITERIA

The eligibility criteria were based on the research aims and developed by the review team. The following aspects were considered:

- **Geographical scope eligibility:** Papers discussing policies from all geographical regions were eligible for inclusion. Policies considered include national, regional and local level regulations that directly focus on housing and health.
- **Policy focus eligibility:** Papers that did not directly discuss housing policies were not included, for example, radon regulations that do not refer to housing. Where papers focused on relocation or housing provision policies, and health was not an explicit aim or there was no clear focus on improvement to conditions or services, the policy was not included, although there are likely some benefits to health from such policies.
- **House type eligibility:** This review did not exclude any papers based on its targeted housing group, e.g. social housing, rental or private housing, and all housing types were included (flat, single-family home etc.). Mobile home and houseboats were not included.
- **Age eligibility:** Papers only published since 2010 were included, as this was deemed most relevant to the current political and economic context. Where papers discussed policies that were not yet in use but planned for implementation in the future, were also included. This means that current or future policies were considered.

SEARCH STRATEGY, INFORMATION SOURCES AND CHECKING OF ARTICLES

The review team developed the search strategy. The search strategy consisted of terms related to: 1) housing policies; 2) health or housing conditions; and 3) health-related aspects of housing as included in the HHGL. The range of text words, synonyms were identified by scanning key documents, the HHGL and discussion with

the review team. No language restrictions or study design filters were applied to the search strategy.

The following bibliographic databases that list policies were searched during November 2019:

- MEDLINE (via Ovid)
- EMBASE (via Ovid)
- Social policy and practice (via Ovid)
- Science Citation Index (via Web of Science)
- Political Science Database (via ProQuest)
- Scopus.

The search strategy was tailored to the individual database to yield the most effective results; an example strategy is provided below.

Each search was documented in a research journal, which included the search terms used and the date of search. Results from each search were downloaded and input in Rayyan for the screening of articles. The screening of articles was undertaken in three stages. In the first stage, the titles and abstracts were checked for relevance and eligibility; this was done by two individual reviewers, each checking 10% of the other's for quality assurance. As the second stage, eligible articles were rated 1, 2 or 3 to represent the most to least relevant by reviewing the titles and abstracts. Full texts of articles that were rated 1 or 2 were then retrieved and further assessed for eligibility in the final stage.

DATA EXTRACTION AND APPRAISAL

Data extraction from eligible full papers was carried out by two reviewers and was independently checked by another reviewer for consistency. Any disagreements were resolved through discussion until a consensus was reached or through the involvement of a third reviewer. The extracted data were input into an Excel sheet.

For each record, the following data were extracted:

- Publication details (title, data, authors etc.)
- Policy, regulation or legislation discussed
- Focus country, region and/or locality
- Details of the policy:
 - Date of implementation or publication
 - Implementing agency
 - Housing and tenancy type
 - Housing-related health hazards targeted
- Potential barriers and enablers for implementation
- Sectors and partners involved in the implementation
- Required resources for implementation
- Underlying evidence base of policy
- Health outcomes
- Co-benefits of policies.

Where additional data on the policy were required, these were extracted from the appropriate website or policy documentation.

EXAMPLE SEARCH STRATEGIES

Below we provide an example search strategy as applied in a bibliographic database.

Search strategy for MEDLINE

Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations and Daily Citations via OVIDSP

Searched on: 11th November 2019

Records retrieved: 1114

SET	RESULTS	SEARCH DETAILS
1	7 453 271	(health* or illness* or medical condition or mental* or well-being or well being or disease* or condition* or impairment or disability).ab,ti.
2	73 862	(housing condition* or living condition* or habita* or adequate housing or housing quality).ab,ti.
3	13 707	((hous* or dwelling* or habitation or home*1 or residen* or apartment* or flat* or bungalow* or homeowner* or rent* or tenan*) adj5 (polic* or code* or act or standard* or guideline* or guidance* or regulation* or legislation*)).ab,ti.
4	762 029	(air condition* or temperature* or indoor heat or hot spell* or heat wave* or heatwave* or indoor temperature* or heat or heat exposure or thermal comfort or thermal condition*).ab,ti.
5	426 700	(heating system* or central heating* or indoor cold* or cold spell* or winter* or cold exposure* or indoor temperature or cold or cool or warm or insulat* or thermal comfort or thermal condition* or permeability or airtightness or air change rate or leak*).ab,ti.
6	1 381 316	(accident* or hazard* or safe* or electric accident or electrocution or explosion or fall* or home accident or structural collapse or accident prevention or "home safety" or inhalation or fire or "fire protection" or hot surface or smoke detector or fire blanket).ab,ti.
7	1 868 975	(accessib* or functional* or disab* or "retirement home" or elder* or "care home" or assistive or "universal design").ab,ti.
8	72 920	(water quality or water tank or contaminated water or water storage or water collection or water tanker or taps or pipes or drinking water).ab,ti.
9	544 046	(air quality or pollut* or smoke or particulate matter or carbon monoxide or ventilation or extract fan or exhaust or smoking or cooking fuel or heating fuel or solid fuel* or biomass fuel or cow dung or wood or chimney or stove hood or combustion or kerosene or second-hand smoke or second hand smoke or coal).ab,ti.
10	455 271	(damp or mould* or mold or humid or thermal bridge or insulat* or ventilation or permeability or airtightness or air change rate or leak* or gutter* or drainage).ab,ti.
11	21 374	(overcrowd* or crowd* or shared occupation or multiple occupation or shared room).ab,ti.
12	6493	radon.ab,ti.

13	12 540	asbestos.ab.ti.
14	131 205	noise.ab.ti.
15	582 792	lead.ab.ti.
16	5 242 925	4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15
17	17 018	housing/
18	2374	policy/
19	29	17 and 18
20	13 727	19 or 3
21	7 498 852	1 or 2
22	2586	21 and 20 and 16
23	1114	limit 22 to (humans and yr="2010 -Current")

Key

/ = indexing term

* = truncation

.ti,ab. = terms in either title or abstract fields

adj5 = terms within five words of each other (any order)

Annex 2:

Policy search protocol

SEARCH AIMS AND SCOPE

This search aimed to identify existing policies, regulations and legislations that promote healthy housing at a national, regional and local level. The search covered all health-related aspects of housing, as included in the HHGL, covering overcrowding, low indoor temperatures, high indoor temperatures, injury hazards, housing accessibility, water quality, air quality, tobacco smoke, noise, asbestos, lead and radon.

We prioritized country searching by choosing the top three countries in each WHO region by GDP according to data from the World Bank (<https://databank.worldbank.org/home.aspx>) (Table A2.1).

It was our assumption that these countries would be most likely to be leaders for housing and health policies in their region. However, exceptions were made where countries had a known reputation for excellence in housing and health policy and/or research, e.g. New Zealand.

TABLE A2.1 TOP THREE COUNTRIES BY GDP FOR EACH WHO REGION ACCORDING TO THE WORLD BANK DATABASE

WHO REGION	SELECTED COUNTRY
African	Nigeria
	South Africa
	Algeria
Americas	United States of America
	Brazil
	Canada
Eastern Mediterranean	Saudi Arabia
	Islamic Republic of Iran
	United Arab Emirates

European	Germany
	United Kingdom
	France
South-East Asia	India
	Republic of Korea
	Indonesia
Western Pacific	China
	Japan
	Australia

INCLUSION AND EXCLUSION CRITERIA

The eligibility criteria were based on the research aims and developed by the review team. The following aspects were considered:

- Policies that did not directly include housing were not included, for example, radon regulations that do not refer to housing.
- This review did not exclude any policies based on its targeted housing group, e.g. social housing, rental or private housing, and all housing types were included (flat, single-family home etc.).
- Policies were not excluded based on year of implementation; however, where policies were updated or discontinued and no longer in use, the most current policy was included and proceeding version excluded. Policies were included, that were not yet in use, but planned for implementation in the future – these will be highlighted to make it clear that they are currently not active. This means that only currently active policies meet the inclusion criteria.

SEARCH STRATEGY, INFORMATIONAL SOURCES AND SCREENING OF POLICIES

An advanced Google search was completed to search for policies of the targeted countries. The search strategy was based on the literature review strategy as described in Annex 1.

Each country was searched using terms written in their major language. The original search terms were developed in English and, where necessary, were translated into the appropriate language using Google Translate. The searches are not exhaustive given resource and language limitations.

Searches in Arabic were provided by a team at Alexandria University, they completed searches for Saudi Arabia, United Arab Emirates, Jordan and Morocco.

The results were scanned for policies, legislations or guidelines which, once found, were recorded in a database. If the result was not the original source of the policy, legislation or guideline, an attempt was made to find the original source using further Google searches. The result searching stopped when Google returned a page of 10 results which contained no relevant material or no new relevant material – the results page at which this occurred was then recorded.

DATA EXTRACTION AND APPRAISAL

For each record, the following data were extracted where possible:

- Categorization of policy, regulation or legislation
- Country, region and/or locality
- Date of implementation
- Implementing agency
- Hazards targeted
- Specific details of the policy (e.g. minimum number of rooms prescribed).

DETAILED ADVANCED GOOGLE SEARCH STRATEGY

Two approaches were applied to identify policies.

Google search strategy by housing health risk

Search terms:

1. [Country]*
2. Housing OR home OR house OR dwelling
3. Health
4. Policy OR legislation OR guide OR act OR standard OR regulation
5. Damp OR mould
6. Radon
7. "lead paint" OR "lead pipe" OR "lead roofing"
8. Asbestos
9. Noise
10. "tobacco smoke" OR smoking
11. "water quality"
12. Air quality
13. accident OR hazard OR electrocution OR fall OR "home accident" OR "structural collapse" OR "home safety" OR fire OR "fire protection" OR hot surface OR smoke detector OR fire blanket
14. "high indoor temperature" OR heat OR air conditioning
15. "low indoor temperature" OR cold OR insulation
16. Overcrowding"
17. Housing accessibility"
18. "Cooking fuel" OR stove OR "heating fuel" OR "biomass fuel"

* [Country] is the country of interest e.g. United Kingdom.

Combination of terms:

#1 AND #2 AND #3 AND #4 AND #[any single number from 5 to 18]

In addition, specify the language and specific country of interest in Google advanced search options.

Google search strategy by specific policy instrument

Search terms:

1. [Country]*
2. [Housing health risk] (from Table A2.2)
3. [related policy instrument] (from Table A2.2)

* [Country] is the country of interest e.g. United Kingdom.

Search details:

#1 AND #2 AND #3

In addition, specify the language and specific country of interest in Google advanced search options.

TABLE A2.2**HOUSING HEALTH RISKS AND COMMON POLICY INSTRUMENTS USED TO ADDRESS THESE RISKS**

Housing health risk	Policy instrument
Overcrowding	Housing construction/refurbishment programmes (including extensions and slum upgrading)
	Tax and planning policies to encourage building of affordable housing
	Rehousing programmes
	Rental assistance/regulations
	Support employment and improve household incomes (supporting access to homes)
Low indoor temperatures	Building regulations/standards (including mandating insulation and energy efficiency)
	Heating system regulations (including energy efficiency)
	Subsidies and tax incentives for implementation of measures
	Housing construction/refurbishment programmes
	Energy use subsidies (i.e. fuel poverty payments)
	Thermal comfort codes
High indoor temperatures	Building regulations (including orientation, minimum requirements for shading, ventilation etc.)
	Cooling technology regulations (including air conditioning)
	Urban planning regulations (including green roofs, urban design, shading)
	Subsidies and tax incentives for implementation of measures
	Thermal comfort codes
	Housing construction/refurbishment programmes
Injury hazards	Energy use subsidies (i.e. fuel poverty payments)
	Building regulations/standards
	Inspection and repair programmes
	Mandated safety devices (e.g. smoke alarms regulations)
	Subsidies and tax incentives for modifications

Housing accessibility	Housing construction/refurbishment programmes for accessible homes
	Building regulations/standards
	Technical capacity building
	Subsidies and tax incentives for implementation of measures
	Rental assistance/regulations for access to accessible homes
Damp/mould	Building regulations/standards (including minimum requirements on ventilation, thermal bridges etc.)
	Remediation programmes for mould removal
Air quality	Building regulations/standards (including minimum requirements on ventilation)
	Transitions to clean fuel programmes
	Clean fuel subsidies
	Air quality guidelines (safe levels)
	Smoke-free housing policies
Noise	Building regulations/standards (sound insulation requirements, double glazing)
	Outdoor noise regulations (flight paths etc.)
	Urban planning regulations (dwelling location)
Asbestos	Banning of materials containing asbestos
	Removal of hazardous materials
Lead	Banning of materials containing lead
	Removal of hazardous materials
Radon	Building regulations/standards (ventilation requirements, sealing radon entry routes)
	Radon guidelines (reference levels of radon concentration)
	Radon measurement programmes
Water quality	Water quality requirements
	Water supply programmes (tanker delivery, piped supply)

Annex 3:

Thematic analysis

Thematic analysis of the extracted data was conducted to explore barriers and enablers for implementation. The data analysis aimed to provide an overview of examples of main barriers and enablers of the development and implementation of healthy housing policies.

The extracted data were analysed using Excel. This process was carried out by three researchers – two were involved in the data extraction process and one (with policy development and implementation experience) reviewed and discussed the results. The process involved an interactive approach of data analysis and collaborative discussion to reach agreement at each stage.

The following steps were taken:

1. **Familiarization with the data:** Researchers read the extracted data (and relevant full papers where needed) to become familiar with the data.
2. **Generating preliminary codes:** From the extracted data, open coding was completed to generate a set of preliminary codes through identifying patterns in the data. The codes were shared and discussed internally within the research team.
3. **Generating initial themes:** These codes were then refined and combined to generate overarching themes by grouping.
4. **Refining themes:** The themes were then applied back to the data to check whether the themes were able to represent all the data sufficiently and were then refined retrospectively.
5. **Defining themes:** Each theme was defined according to the aspects of the data it represents and its relevance to the research question. Themes were discussed and refined internally.
6. **Summaries of the themes:** For each theme, a description was generated by summarizing the theme and providing examples from the data.

