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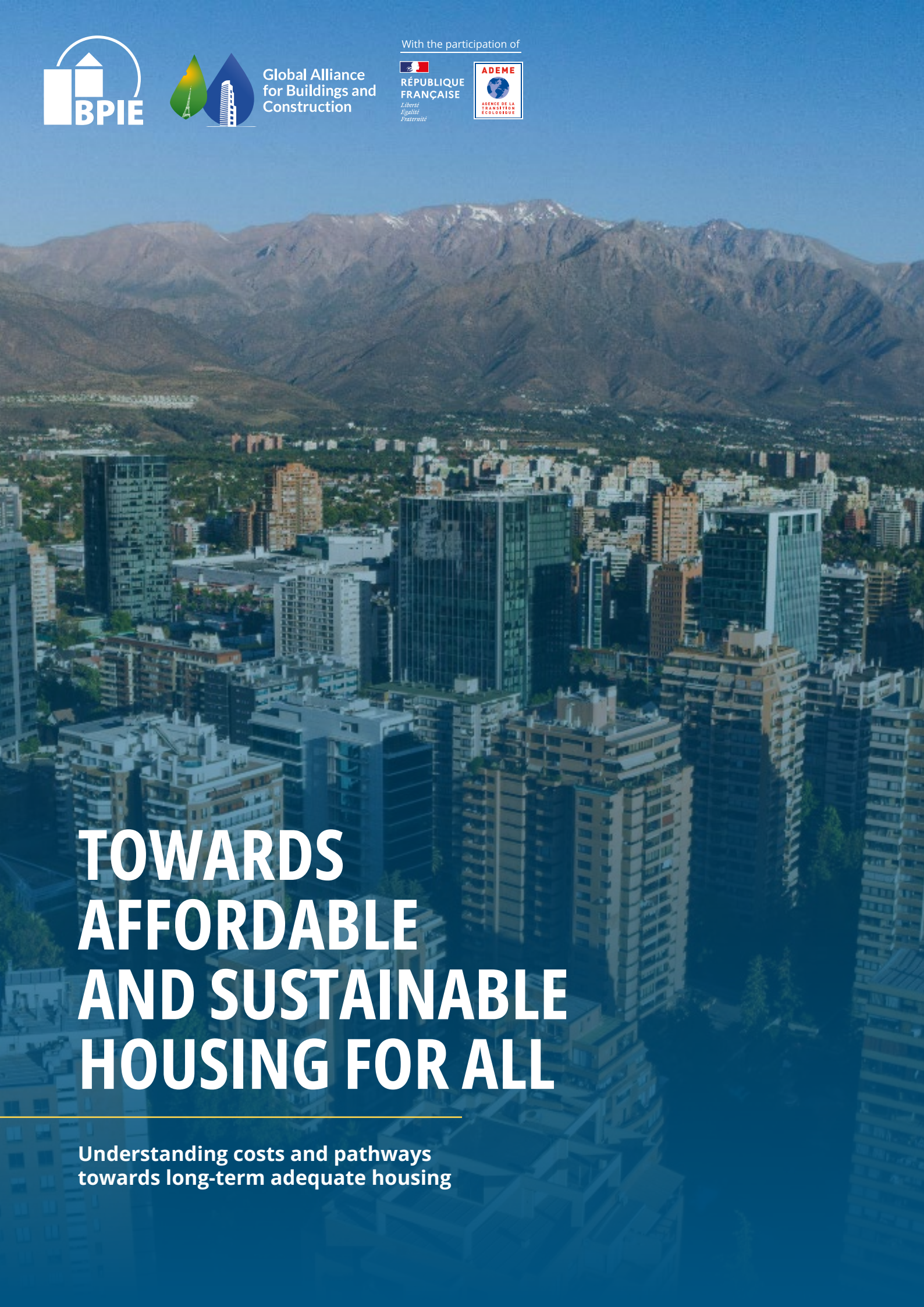

TOWARDS AFFORDABLE AND SUSTAINABLE HOUSING FOR ALL

Understanding costs and pathways towards long-term adequate housing

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LIST OF ABBREVIATIONS

ADEME	Agence de la transition écologique (French Agency for Ecological Transition)
AIA	American Institute of Architects
BIM	Building Information Modelling
BPIE	Buildings Performance Institute Europe
BREEAM	Building Research Establishment Environmental Assessment Method
BRS	Bail Réel Solidaire
C	Celsius
CO_2	Carbon dioxide
CO_2e/ $kgCO_2$e/ tCO_2e	Carbon dioxide equivalent; kilograms / tonnes of CO_2 equivalent
CBSW	Composite bamboo shear wall
CDC	Centers for Disease Control and Prevention (United States)
CESCR	(UN) Committee on Economic, Social and Cultural Rights
CLT	Community land trust
COP	Conference of the Parties
CORFO	Corporación de Fomento de la Producción de Chile (Chilean Economic Development Agency)
COVID-19	Coronavirus disease 2019
CPR	Construction Products Regulation (Regulation (EU) 2024/3110)
DG	Directorate-General (of the European Commission)
DGNB	Deutsche Gesellschaft für Nachhaltiges Bauen (German Sustainable Building Council)
DS49	Decreto Supremo No. 49 (Chilean housing subsidy scheme)
Éco-PTZ	Éco-prêt à taux zéro (zero-interest eco-loan)
EDGE	Excellence in Design for Greater Efficiencies (IFC green building certification)
EMC	Energy management contract
ESCO	Energy service company
ETS	Emissions Trading System
EU	European Union
EUR	Euro
FFEM	Fonds Français pour l'Environnement Mondial (French Facility for Global Environment)
G7	Group of Seven
GBP	Pound sterling
GDP	Gross domestic product
GHG	Greenhouse gas
GlobalABC	Global Alliance for Buildings and Construction
GNICE	A large-scale, sustainable municipal housing project in Austria
GP	General practitioner
HDFC	Housing Development Finance Corporation (India)
H-DREAM	Name of the HDFC Capital fund supported by IFC
HOAI	Honorarordnung für Architekten und Ingenieure (German fee scale for architects and engineers)
HVAC	Heating, ventilation and air conditioning
ICBC	Intergovernmental Council for Buildings and Climate
ICESCR	International Covenant on Economic, Social and Cultural Rights
IEA	International Energy Agency
IEQ	Indoor environmental quality
IFC	International Finance Corporation
IFPEB	French Institute for Building Performance (L'Institut Français pour la performance du bâtiment)
IGAHP	Indonesia Green Affordable Housing Programme
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
IPD	Integrated Project Delivery
ISO	International Organization for Standardization
ITUC	International Trade Union Confederation
kW	Kilowatt
LCA	Life cycle assessment
LCC	Life-cycle cost
LEED	Leadership in Energy and Environmental Design
LNG	Liquefied natural gas
m^2	Square metre
Medi-Cal	California's Medicaid programme
MEP	Mechanical, electrical and plumbing (engineering)

MINVU	Ministerio de Vivienda y Urbanismo (Ministry of Housing and Urban Development, Chile)
NAHB	National Association of Home Builders (United States)
NHS	National Health Service (UK)
NPV	Net present value
NZS	New Zealand Standard
OECD	Organisation for Economic Co-operation and Development
OEWG-H	Open-Ended Intergovernmental Expert Working Group on Adequate Housing for All
OFS	Organisme de Foncier Solidaire
OHCHR	Office of the United Nations High Commissioner for Human Rights
PNEEB	Senegalese national building energy efficiency programme (Programme National d'Efficacité Énergétique dans le Bâtiment)
PT	Perseroan Terbatas (Indonesian limited liability company)
PV	Photovoltaic
QALY	Quality-Adjusted Life Year
REITs	Real estate investment trusts
REPowerEU	EU plan to reduce dependence on Russian fossil fuels
RMB	Renminbi (Chinese yuan)
SCB Analysis	Social cost-benefit analysis
SDG	Sustainable Development Goal
SME	Small and medium-sized enterprise
TyCCAO	Typha Combustible Construction Afrique de l'Ouest (project)
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
UN-Habitat	United Nations Human Settlements Programme
US / USA	United States (of America)
USD	US dollar
WEF	World Economic Forum
WHO	World Health Organization

EXECUTIVE SUMMARY

Across the world, sustainable construction and renovation are still viewed as costly, despite resulting in benefits such as reduced energy bills, higher asset value, better health and climate resilience. Yet sustainability requirements represent a small fraction of total housing cost – and, as this report shows, affordability and sustainability are closely connected. When homes are not sustainably built, the costs do not disappear but show up later in household expenses and public spending.

More than 3.4 billion people live in housing that fails to meet basic standards of adequacy, such as security of tenure, access to water and sanitation, and affordability. At the same time, the global housing stock generates some 17–21% of global carbon emissions (UN-Habitat, 2026). Around half of the buildings that will exist in 2050 have not yet been built. Operational building emissions rose 6.5% between 2015 and 2024, whereas a 31.6% reduction was required to align with a 2050 net-zero pathway (UNEP, 2026).

The report explores the scale and drivers of the current crises in housing affordability and sustainability. It also proposes how sustainability should be integrated into the international framework[1] supporting the right to adequate housing. Based on this expanded framework, the report suggests four pathways to reduce costs while delivering long-term adequate housing for all.

The right to adequate housing is one of the oldest commitments in international development policy, tracing back to Article 25(1) of the 1948 Universal Declaration of Human Rights. Despite decades of research on housing rights, housing adequacy and housing affordability, these issues have only been linked to environmental sustainability in recent years. The first common declaration by governments committing to engage the entire buildings sector value chain in the transition to decarbonisation and climate resilience was the Déclaration de Chaillot, adopted only in 2024. Building on that momentum, the Belém Call for Action launched at the COP30 climate conference in November 2025 placed affordable and sustainable housing together at the centre of the global climate process for the first time, setting time-bound targets for 2035.

Affordable and sustainable housing are interlinked: for societies, unsustainable housing is increasingly unaffordable. Failing to address these issues now will result in increased social, environmental and economic costs in future.

[1] Which can be found in the CESCR General Comment No. 4, 1991.

Housing is simultaneously a fundamental human right and the world's primary financial asset, creating a tension and widening gap between what markets build and what people need – which is the root cause of the housing affordability crisis.

One-time construction decisions translate into a multi-decade climate liability, creating a misalignment between who builds and who bears the cost. A housing system that externalises its costs onto future occupants, future governments and the future climate is, by definition, unsustainable. This misalignment between short-term business models for housing and the long-term need for planning is one of the root causes of the housing sustainability crisis.

This report builds on a call from the UN Special Rapporteur in 2023 to better integrate sustainability into the right to adequate housing.[2] We suggest an update of the framework, extending habitability to encompass climate resilience, affordability to encompass the full cost of occupancy over a building's lifetime, and cultural adequacy to explicitly include vernacular and locally adapted construction. We also propose a new dimension: future-proof housing. Drawing on this, the analysis and solution pathways are designed to deliver long-term adequate housing.

The financial cost of inadequate and poorly built housing is measurable across health systems, household budgets and insurance markets. Consequently, the economics of housing should be assessed over the lifetime of buildings, not only at the point of construction. While more recent data are not available, numbers from 2016 show that inadequate housing cost EU economies nearly EUR 194 billion a year in direct healthcare costs and lost productivity, against a one-off cost of about EUR 295 billion to bring the EU housing stock up to an acceptable standard (Eurofound, 2016). The cost of housing that ignores climate resilience is becoming visible in asset losses and insurance markets. Only 43% of the USD 318 billion lost to natural catastrophes in 2024 was insured (Swiss Re Institute, 2025). Currently, 1.81 billion people – almost a quarter of the world's population – are directly exposed to 1-in-100-year flood risks (Rentschler, Salhab and Jafino, 2022). Imperial College London attributed 16,500 of the 24,400 heat-related deaths recorded across 854 European cities between June and August 2025 to climate change (Barnes et al., 2025). At the same time, the geopolitical cost of energy-dependent housing has become more concrete. The IEA described the 2026 closure of the Strait of Hormuz as the largest supply disruption in the history of the global oil market. By reducing energy demand and dependence on imported fossil fuels, renovated and decarbonised buildings help mitigate the impact of such crises on household energy bills.

The financial costs of inadequate buildings arrive later, fall on different budgets, and are rarely attributed to the original building decisions that caused them. Sustainability should not be treated as an additional requirement that makes housing more expensive, but as an investment that makes housing more affordable over time. The additional upfront costs for sustainability represent only a fraction of overall project costs. Energy efficiency, durability and climate resilience can reduce or avoid costs arising during occupation and over the building's life cycle. Buildings that are built unsustainably today lock in high operation, maintenance and repair costs as well as emissions for decades to come. The absence of regulation or enforcement further lock in this path of unsustainable and unaffordable housing.

[2] Published following the 52nd session of the Human Rights Council (A/HRC/52/28, 2023).

The main drivers of housing unaffordability are largely structural, and environmental sustainability requirements are a minor factor among them. The share of income spent on housing has risen consistently across regions, and 30% of low-income households in OECD countries now spend more than 40% of their disposable income on their rent or mortgage (OECD, 2025a). Residential real estate is valued at USD 286.9 trillion globally (Savills, 2025), yet this wealth is highly concentrated in a small number of markets and owners and disconnected from many households who need homes. The drivers behind unaffordability include land prices and ownership structures, construction and labour productivity stagnation, supply chain exposure, permitting delays, the financialisation of housing as an asset, and mismatches between what gets built and what households need. The quality and sustainability of buildings require low levels of investment relative to the total cost of a housing project, yet these solutions need to be scaled to contribute significantly to solving the sustainability crisis. These structural drivers need to be addressed to make housing affordable. Ensuring that housing is adequate over the long term – including by making buildings energy efficient and climate resilient, using durable, low-carbon materials – keeps it affordable to occupy, maintain and insure across its lifetime.

This report presents **four solution pathways** each of which address a cost component of housing.

The first pathway addresses physical construction costs. Design choices and material selection at the outset determine both upfront cost and the building's long-term performance. This pathway shows the importance and examples of design choices, such as circular design for deconstruction or locally sourced and vernacular materials choices, and modern methods of construction including offsite prefabrication and serial renovation. All these reduce construction costs while simultaneously delivering the habitability and future-proof dimensions of the updated housing adequacy framework.[3]

The second pathway addresses land acquisition costs. In many constrained urban markets, land is the largest single cost component and the one most subject to speculative price rises. This pathway shows how reusing and repurposing existing buildings can avoid new land acquisition, since the land is already paid for. It also explores ownership models such as community land trusts, housing cooperatives and schemes disconnecting land from the building that keep housing affordable by preventing it from being repriced out of reach through subsequent transactions.

The third pathway addresses other costs during planning and construction, especially financing and coordination costs such as interest charges, planning and permitting fees, and administrative overheads. This pathway shows how financial instruments reducing upfront barriers and community-led and neighbourhood-scale approaches can lower costs before a building is even constructed.

The fourth pathway addresses life-cycle costs such as energy bills, climate damage, maintenance and retrofit expenditure. Standard financial appraisals often fail to fully reflect these costs, particularly where they fall on different actors at a later point in time.

[3] (CESCR General Comment No. 4, 1991)

This pathway shows that energy efficiency and climate resilience reduce these costs directly. Life-cycle cost accounting makes them visible in investment decisions, closing the gap between what housing appears to cost at the point of construction and its true costs across its lifetime.

The four pathways will lead to more people having access to long-term adequate housing, but they cannot solve the affordable housing crisis alone. Other fundamental cost drivers require structural changes that go beyond the built environment. Nevertheless, to scale the solutions proposed, policymakers should treat climate resilience, life-cycle costs and environmental sustainability as prerequisites for long-term affordability, rather than optional additional criteria. A UN-level process should formally amend the Committee on Economic, Social and Cultural Rights (CESCR) framework on adequate housing and integrate sustainability, building on the proposal made by the UN Special Rapporteur in 2023. Investment assessment needs to be reoriented, moving away from a short-term return horizon towards covering the entire life cycle and accounting for health, energy and climate co-benefits and externalities alongside construction cost. Sustainability criteria should be widely integrated in the building's construction value chain, including through design principles or procurement criteria.

The table below shows the recommendations from the four solution pathways.

Solution pathway	Recommendation	Example from practice or literature
Physical construction costs	Conduct a scientifically sound life cycle analysis to evaluate the costs and benefits of local resources and vernacular construction. When relevant, update and implement building codes to recognise them and prioritise them in public procurement and subsidies.	Examples include the composite bamboo share wall system used in 10,000+ homes in Colombia, Peru and beyond, and Kenya's carbon-negative wall material made from rice/ sugarcane waste (10% the cost of conventional walls), but these remain largely absent from formal building codes. The New Zealand earth building standards (NZS 4297, 4298, and 4299) are an exception, giving vernacular earth construction formal recognition within the national building code.
	Mandate performance-based procurement for public housing, specifying outcomes rather than methods, and align this procurement framework with building standards and subsidy design to favour industrialised or offsite construction and effective project management practices. Link subsidies and building certification to combined energy performance and productivity requirements, including provisions for pooling projects delivered through prefabricated solutions.	Chile's MINVU programme is an example of a government–industry agreement linking subsidies (DS49 scheme) to certified, modular housing models meeting thermal and industrialisation criteria.
	Support prefabricated renovation programmes for social and low-income housing stock, backed by performance guarantees to de-risk adoption.	> 40,000 homes have been retrofitted or are under construction in Europe using the Energiesprong model, which often provides a >30-year performance guarantee on energy and comfort. The vast majority are low-income homes.

Solution pathway	Recommendation	Example from practice or literature
	Require new buildings in fast-growing cities to be designed so their materials can be reused or recycled later, rather than demolished as waste ("design for deconstruction").	The European Construction Products Regulation (CPR) revision from 2024 integrates circular economy principles, making reusability and recyclability core requirements for construction products sold in the EU.
	Provide financing support for sufficiency measures and better use of the existing stock, such as converting buildings into housing or mixed-use buildings.	Several North American and European city and state-level programmes provide support for the conversion of office buildings to housing (e.g. Boston, Calgary, Colorado).
Costs for land acquisition	Expand legal and financial support for ownership models that permanently separate land value from building value, so affordability is preserved through future transactions.	Under the French Bail Réel Solidaire model, resale-capped homes are 30-50% below market price due to dissociation of land and buildings. The German Mietshäuser Syndikat, with >200 completed projects, has a structural veto to prevent resale.
	Recognise collective ownership models including community land trusts and housing cooperatives in national housing strategies to limit speculative pressures and secure long-term tenure.	The number of community land trusts in Europe has grown from 33 in 2017 to nearer 350 today. Examples are also found in Kenya, South Africa, Brazil, Puerto Rico, India.
	Promote rental housing as a long-term investment vehicle in social housing, positioning the stable, recurring revenue that rental tenure generates as an attractive proposition for long-term investors such as institutional funds and public entities; keeping housing in rental tenure rather than selling it to individual owners ensures units remain permanently within the affordable housing stock.	Vienna's social housing model deliberately keeps affordable units in permanent rental tenure rather than allowing them to be sold off.
Other costs related to financing, planning and coordination	Combine preferential financing instruments (interest-free loans, blended finance, green mortgages) with sustained commitment from banks or lenders, as well as public awareness campaigns.	The French Éco-Prêt à Taux Zéro (Éco-PTZ) illustrates the importance of interest-free loans and sustained commitment.
	Expand results-based instruments (social impact bonds, energy efficiency contracts) to shift the upfront risk away from public budgets and towards measurable outcomes.	The French contrat à impact is an example of how social impact bonds could work for renovation. The Latvian RENESCO finances deep renovation upfront, recovering the investment via 15–20-year energy-savings contracts.
	Channel subsidies and infrastructure funding directly to resident-led community organisations and cooperatives rather than to property developers or centralised housing authorities. Include dedicated finance streams for resilient affordable neighbourhoods designed at community level to meet local needs.	Thailand's Baan Mankong programme channels funding directly to community organisations; it reached >90,000 households across >1,500 communities (2003-2011).

Solution pathway	Recommendation	Example from practice or literature
	Implement regeneration and infrastructure programmes at neighbourhood or district level to achieve collective (shared) solutions, procurement discounts and coordination savings that are not available to individual households.	Examples of collective purchasing schemes for heat pumps or insulation include Sønderborg in Denmark and Utrecht province in the Netherlands.
	Develop and implement carbon pricing mechanisms in the building sector, so that the environmental costs of construction and renovation are reflected in market prices rather than shifted onto future generations.	The EU Emissions Trading System II implements a carbon price through emissions trading targeting transport and heating fuels.
Reducing costs over a building's life cycle	Mandate life-cycle cost accounting using the net present value method and ISO 15686-5 as a reference standard and as a required element of appraisal for publicly funded housing and renovation programmes. Expand social cost-benefit analyses to account for health, energy and climate co-benefits alongside construction costs, so that future operating costs and wider returns are visible in investment decisions rather than excluded from them.	The IEA's 2025 review of 45 academic studies on energy efficiency found that 90% reported positive health impacts. New Zealand's home retrofit programme generated over USD 1 billion in health savings and a 43% reduction in hospital admissions for respiratory conditions. However, SCB analyses are not typically carried out.
	Set minimum standards for the energy efficiency and compactness of buildings, particularly in low- and lower-middle-income countries, where currently only around 25% of buildings comply with energy regulations, compared to around 50% in wealthier countries.	India's Eco Niwas Samhita demonstrates that a national residential building envelope code is achievable in a lower-income setting, though enforcement remains inconsistent and coverage incomplete. Indonesia's GlobalABC roadmap (2022) sets targets for mandatory passive cooling requirements in new residential construction but these are not yet in place nationally.
	Coordinate climate resilience measures, including flood protection, green and blue infrastructure and nature-based solutions, across the public administrations responsible for housing, infrastructure and urban planning. These should be planned and funded at neighbourhood scale, since the flood and heat reduction benefits of green infrastructure are collective outcomes that individual building interventions cannot replicate.	Medellín's Green Corridor project reduced heat island temperatures by 2°C across affected areas. A long-term Swedish insurance claims study found considerably fewer flood damage claims in neighbourhoods retrofitted with blue-green infrastructure than in conventional adjacent areas.
	Incorporate indoor environmental quality indicators covering indoor air quality, thermal comfort, ventilation, acoustics and lighting into national building regulations and cost-optimal calculations for renovation, rather than relying solely on energy performance indicators.	Only 33% of national indoor environmental quality standards are mandatory government regulations. The UK Warm Front scheme from 2000 enabled GPs to refer patients in cold, damp homes directly to insulation and heating improvement programmes. California's Medi-Cal reforms for the first time coupled clinical care with housing support, with major insurers investing directly in affordable housing renovation.

Solution pathway	Recommendation	Example from practice or literature
	Require passive design measures for both new residential construction and major renovation works, covering minimum insulation levels, airtightness targets, solar shading and protection, building orientation and natural ventilation calibrated to the climatic zone. For new construction, these requirements should be a condition of planning approval. For renovation projects, they should define minimum performance outcomes, bringing existing buildings measurably closer to appropriate climate standards rather than locking in underperformance for the remainder of the building's service life.	Jakarta's Governor Regulation No. 38/2012 demonstrates that mandatory passive design requirements are implementable in a lower-middle-income urban context, though coverage is limited to large buildings above 50,000 m^2. In an affordable housing development in Indonesia, passive measures increased construction costs by 4.7% but modelling estimated a 30% reduction in annual utility costs, giving a payback period of 1.8 years. A Swedish passive envelope retrofit study found final energy savings of 28–61%, with roof insulation consistently the most cost-effective measure.
	Incorporate climate-specific material performance requirements into building codes, particularly in tropical, coastal and high-humidity contexts where materials specified for temperate climates generate higher maintenance costs and shorter service lives, with minimum durability requirements matched to local climatic conditions.	Research on low-cost housing in the northern region of Malaysia finds that high humidity and heavy rainfall significantly accelerate the degradation of conventional construction materials, posing maintenance challenges that differ fundamentally from cooler, drier contexts. Material and system selection are among the most influential factors shaping long-term maintenance cost.

CONTENTS

EXECUTIVE SUMMARY 03

1. TWO SIDES OF ONE HOUSING CRISIS 12

1.1 A joint political agenda for affordable, sustainable housing 13
1.2 The housing affordability crisis and the housing sustainability crisis 15
1.3 From separate crises to a common housing challenge 17
1.4 From housing shortage to housing mismatch crisis 19

2. AN ADEQUACY FRAMEWORK FOR AFFORDABLE AND SUSTAINABLE HOUSING 23

2.1 The right to long-term adequate housing 24
2.2 Long-term housing adequacy across the housing continuum 27
2.3 Applying the long-term adequacy framework to this report 28

3. THE COST STRUCTURE OF HOUSING 29

3.1 Physical construction costs 33
Material costs 33
Construction productivity and labour costs 34
3.2 Costs of land acquisition 35
3.3 Other costs during planning and construction 37
Cost of financing 37
Engineering and planning costs 38
Costs of fragmented governance, coordination failure and permitting regulation 40
3.4 Cost over the building's life cycle 41
Life-cycle cost exclusion in investment decision 41
Operational energy costs and geopolitical exposure 43
Cost of deep renovation and maintenance 45
Climate resilience, insurance and asset losses 45
Health costs of inadequate housing 47

4. SOLUTION PATHWAYS FOR DELIVERING LONG-TERM ADEQUATE HOUSING 48

4.1 Reducing physical construction costs through design, materials and process optimisation 50

Building design and material choices 50

Reusing and adapting existing buildings 52

Serial renovation as a solution for low- and middle-income housing 53

Offsite construction 54

Industrialised construction as a public–private initiative 56

4.2 Reducing costs related to land acquisition through land policy and alternative ownership 58

Land governance and value capture 58

Housing tenure and ownership models that reduce land costs 60

4.3 Reducing other costs related to financing, planning and coordination 63

Financing costs 63

Reducing coordination and transaction costs through neighbourhood scale delivery 66

Faster permitting and integrated design to reduce engineering and planning costs 69

4.4 Reducing costs over the building's life cycle 70

Design for long-term affordability 71

Making long-term costs and benefits visible in decision-making 75

Reducing operational energy dependence 76

Reducing climate-related losses through building and neighbourhood resilience 77

Reducing health costs 78

5. OUTLOOK AND RECOMMENDATIONS 82

References 87



1 TWO SIDES OF ONE HOUSING CRISIS

Housing affordability and housing sustainability are increasingly inseparable dimensions of the same housing challenge. Many households cannot access housing that meets basic standards of adequacy; others live in homes that may be affordable to acquire or rent but are costly to operate, maintain or adapt, or are increasingly exposed to climate-related risks. At the same time, the way housing is constructed and operated has significant implications for energy demand, material use and greenhouse gas emissions. This chapter sets out these two dimensions in parallel and then considers how they interact. Its central argument is that policies focused only on increasing the number of dwellings, or only on reducing upfront costs, risk shifting costs to occupants, public budgets or future generations rather than resolving them.

© Tunde Buremo. An aerial view of Lekki-Ikoyi link bridge in Lagos, Nigeria.

A JOINT POLITICAL AGENDA FOR AFFORDABLE, SUSTAINABLE HOUSING

In recent years, housing affordability has increasingly gained political attention as it has become more evident that the housing crisis is no isolated problem but a structural issue that countries around the world are struggling with. However, while much has been written in recent decades on housing rights, housing adequacy and housing affordability by leading organisations such as UN-Habitat, the OECD and Habitat for Humanity International, these aspects of the housing crisis have only more recently started to be linked to housing sustainability. In a world with rising concerns about the impact of climate change on the housing system, the role of buildings' performance for national energy security, and the extent of whole-life-cycle emissions from material extraction for the construction industry, the sustainability aspects of housing directly impact housing rights, adequacy, and affordability.

The purpose of this report is therefore to examine affordability and sustainability within a common housing framework. It considers where the principal costs of housing arise, how these costs are distributed across the lifetime of a dwelling, and which policy and delivery approaches can reduce costs while maintaining housing adequacy over time.

In March 2024, representatives of 70 governments adopted the Déclaration de Chaillot at the first Buildings and Climate Global Forum in Paris, organised by the French government and UNEP. The Déclaration acknowledged the challenge of access to adequate and affordable housing alongside energy poverty, growing informal settlements and exposure to climate risk. It committed signatory governments to promoting the production and use of low-carbon, sustainably sourced and cost-effective construction materials, developing regulatory frameworks and financial incentives to increase the share of resilient, near-zero emission and affordable buildings, and establishing the Intergovernmental Council for Buildings and Climate (ICBC) to monitor implementation. **At COP30 in Belém in November 2025, the ICBC ministerial meeting launched the first call for action to fold housing affordability and sustainability into the official global climate process.** The Belém Call for Action sets time-bound targets for 2035, including integrating climate considerations into national housing policies. It reaffirms that:

> *Housing affordability and sustainability must be pursued together; recognising that affordable, adequate, resource-efficient, low-carbon, climate-resilient and durable housing is essential to a just transition, the achievement of the SDGs and the effective implementation of the Paris Agreement.*

WHAT HAPPENED BEFORE BELÉM?

The right to adequate housing is one of the oldest commitments in international development policy, tracing back to Article 25(1) of the 1948 Universal Declaration of Human Rights. The first legally binding commitment came in 1966: Article 11(1) of the International Covenant on Economic, Social and Cultural Rights (ICESCR) recognises "the right of everyone to an adequate standard of living, including adequate food, clothing and housing". The Vancouver Declaration on Human Settlements (Habitat I) in 1976 was the first major UN intergovernmental commitment to specify housing as a policy priority.

In 1991, the CESCR adopted General Comment No. 4, which for the first time gave concrete, justiciable content to "adequate housing" through seven elements in an effort to make Article 11(1) more measurable and create accountability. In 1996, the Istanbul Declaration and Habitat Agenda (Habitat II) affirmed adequate shelter for all as a global goal and committed governments to create enabling frameworks.

In 2009, the Office of the UN High Commissioner for Human Rights (OHCHR) and UN-Habitat popularised the CESCR's definition via Factsheet No. 21, The Right to Adequate Housing. In 2015, the 2030 Agenda for Sustainable Development adopted by all UN member states set Target 11.1 on "safe and affordable housing" to ensure access for all to adequate, safe and affordable housing and basic services, and upgrade slums. In 2016, the New Urban Agenda was adopted to implement SDG 11, which recognises the need for "adequate and affordable housing" within the framework of sustainable urban development. Adopted at Habitat III in Quito, it reaffirmed and extended this framework, bundling "sustainable, affordable, adequate, resilient and safe housing" as one connected outcome for the first time at an intergovernmental level. It encouraged the development of policies, tools, mechanisms and financing models that promote access to a wide range of affordable, sustainable housing options, including rental and other tenure options.

Resolution 2/7 was adopted by the UN-Habitat Assembly at its second session in Nairobi on 9 June 2023. It established the Open-Ended Intergovernmental Expert Working Group on Adequate Housing for All (OEWG-H), tasked with making recommendations for guidelines on adequate housing and proposing a framework for measuring and reporting on the adequacy of housing across diverse national and local contexts.

The G7 meeting in 2024 in Rome set specific intentions to share experience and knowledge on equitable climate change mitigation and adaptation programmes related to housing and urban development. The first-ever common declaration by governments committing to engage the entire value chain of the buildings sector in the transition to decarbonisation and climate resilience is the Déclaration de Chaillot from 2024, mentioned above.

THE HOUSING AFFORDABILITY CRISIS AND THE HOUSING SUSTAINABILITY CRISIS

THE GLOBAL HOUSING AFFORDABILITY CRISIS IS DIRECTLY AFFECTING LIVELIHOODS.

The scale

Earth's population is approximately 8.3 billion (UNFPA, 2025). More than 3.4 billion people worldwide live in housing that fails to meet basic standards of adequacy, such as security of tenure, access to water and sanitation, and affordability, with the latter defined as housing costs that do not compromise a household's ability to meet its basic needs (UN Committee on Economic, Social and Cultural Rights, 1991). Of these, 1.16 billion people live in what are known as informal settlements, deprived of basic services (United Nations Human Settlements Programme [UN-Habitat], 2026).

The share of household income spent on housing and related costs, such as rent, mortgage repayments or maintenance, has gradually increased across multiple regions (Arnerić, Kikerec and Skoko, 2024), making housing less and less affordable. Within OECD countries, this share rose from 20.8% to 25.1% between 1995 and 2024 (OECD, 2025b). Meanwhile, the proportion of households spending over 40% of their disposable income on rent or mortgages, referred to as the housing cost overburden rate, reached 30% of households in the bottom income quintile in 2024 (OECD, 2025a). Globally, 44% of households spend more than 30% of their income on rent (UN-Habitat, 2026).

Across the world, low- and middle-income households – whether in informal settlements, overcrowded rental accommodation, temporary housing or cost-burdened homeownership – are absorbing rising costs with stagnant or declining real incomes. As a result, people have to commute longer, housing is more overcrowded, maintenance is deferred, and homelessness and displacement are rising.

These developments stand alongside the fact that residential real estate is the world's single largest store of wealth, valued at USD 286.9 trillion globally, exceeding the combined value of all equities, bonds and gold ever issued (Savills, 2025). Yet this wealth is highly concentrated.

THE GLOBAL HOUSING SUSTAINABILITY CRISIS IS DIRECTLY AFFECTING LIVELIHOODS.

The scale

The global housing stock is neither low-carbon nor resource-efficient nor climate-resilient. Buildings and construction account for approximately 37% of global carbon emissions, with housing responsible for an estimated 17-21% of that total (UN-Habitat, 2026). The sector carries the largest material footprint of any industry, driving nearly 50% of global material extraction; cement, clinker, bricks, steel and aluminium alone account for 55% of material-related emissions (UNEP, 2026). Upfront carbon (the emissions locked in before a building is ever used) is projected to account for half of the entire carbon footprint of new housing provision between now and 2050 (World Green Building Council, 2025a).
Yet around 50% of the buildings that will exist in 2050 have not yet been built (UNEP, 2026). At current carbon intensities, and with global temperatures already 1.6°C higher than pre-industrial levels in 2025, the carbon budget available to produce the materials needed for these new buildings is shrinking. This makes the construction decisions of the next 25 years the single largest remaining opportunity to avoid emissions and maladapted housing that cannot respond to changing needs.

Between 2015 and 2024, operational emissions from buildings rose 6.5%, whereas a reduction of 31.6% was required over the same period to align with a 2050 net-zero pathway (UNEP, 2026). Energy intensity has improved by only 8.5% since 2015, which is roughly half the rate of reduction needed to stay on track (UNEP, 2025). In the EU alone, 85% of the building stock was constructed before 2000, and only around 1% of it is being renovated deeply each year (European Union, 2024a). Globally, the 273 billion m^2 of buildings standing today were largely built before modern energy codes existed; they represent decades of locked-in decisions resulting in buildings that are poorly insulated, fossil-fuel-dependent and climate-vulnerable among other issues.

Europe holds a quarter of global residential value while housing just 10% of the world's population. Africa and Asia – where the majority of humankind lives – hold a disproportionately small share.

Housing is simultaneously a fundamental human right and the world's primary financial asset, creating a tension and a widening gap between what markets build and what people need – which is the root cause of the **housing affordability crisis.**

Drivers of the housing affordability crisis

People are moving to cities faster than cities can house them, placing mounting pressure on land, infrastructure and housing markets. Global projections indicate that two-thirds of the growth of the world's population between now and 2050 will take place in cities, with most of the remaining third taking place in towns (United Nations, 2025). Climate change is also driving people to migrate from rural areas to cities due to factors such as drought, desertification and degraded cultivated land, among others. This puts additional strain on urban housing and pushes up rents as people seek safety. Weather-related disasters alone have caused 250 million people to be displaced internally over the past 10 years, equivalent to 70,000 displacements per day (UNHCR, 2026). In Europe in particular, shifting household structures, including more single-parent families and an ageing population, further strain housing provision (Arnerić, Kikerec and Skoko, 2024).

The concentration of economic activity in cities drives up rents and purchase prices, increasingly pushing low- and middle-income households to the urban periphery or out of the formal market altogether, deepening exclusion and territorial inequality while perpetuating informal housing markets. Where income inequality is high, demand for high-end housing grows while market-rate homes move out of reach for most. This increases housing market segmentation and pushes up housing prices (Ge and Moghaddasi Kelishomi, 2025a).

Although global income inequality was declining in the three decades before COVID-19, the pandemic reversed this trend, widening the gap between countries (World Bank, 2025).

The gap between the housing stock and the climate it now faces is also a regulatory failure; globally, only 19 countries mandate window or façade shading in building codes while just 69 countries require envelope insulation and 58 set glazing heat transmission standards, leaving the majority of the world's new and existing homes ill-equipped for the heat extremes already underway (UNEP, 2025).

Housing is simultaneously a one-time construction decision and a multi-decade climate liability, creating a misalignment between who builds and who bears the cost. A housing system that externalises its costs onto future occupants, future governments and the future climate is, by definition, unsustainable. This misalignment between short-term business models for housing and the long-term need for planning is one of the root causes of the **housing sustainability crisis.**

Drivers of the housing sustainability crisis

UNEP assumes that around 50% of the buildings that will exist globally by 2050 have not yet been built (UNEP, 2026). In the EU, more than 85% of today's buildings are likely to still be in use in 2050 (European Environment Agency, 2026). Roughly three-quarters perform poorly in terms of energy efficiency, while deep renovation rates sit at only about 1% annually (European Union, 2026a). Climate change is simultaneously a driver and an accelerant. Rising temperatures, more frequent extreme weather events, flooding and drought are degrading the habitability of existing housing stock, particularly in countries of the global majority, where informal settlements house hundreds of millions of people in locations with high physical exposure and minimal adaptive capacity. Between 2015 and 2023, CO_2 emissions from building operations increased by 5.4%, even though a reduction of 28.1% was required over the same period to align with the Paris Agreement (UN-Habitat, 2026).

The drivers are also structural. Construction supply chains remain heavily dependent on energy-intensive materials whose production accounts for a significant share of industrial emissions. Land-use patterns shaped by car dependency and sprawl increase both the carbon footprint of housing and its vulnerability to climate extremes. **The same financialisation dynamic that undermines affordability also undermines sustainability.**

Underlying all of this is a structural shift in what housing is understood to be. With housing increasingly treated as a financial asset rather than a social good, housing markets in much of the world are being driven by large real estate companies, such as real estate investment trusts (REITs), rather than by individuals or households (Holm, Alexandri and Bernt, 2023).

This can result in the creation of local housing market oligopolies and thus higher rents and prices that are often disconnected from real household incomes.

Policy has largely failed to correct this, and in some cases it has reinforced it with high interest rates and tighter lending conditions (OECD, 2025a). This has made homeownership harder for ordinary households, while institutional landlordism remains undisturbed.

For example, short investment horizons discourage the upfront capital expenditure required for low-carbon, resilient design. Passive cooling provisions remain critically underrepresented in building codes globally despite passive design being one of the lowest-cost available levers on operational energy demand. None of the mandatory codes currently in force are fully aligned with zero-emission standards (UNEP, 2026).

FROM SEPARATE CRISES TO A COMMON HOUSING CHALLENGE

While the above might suggest that there are two separate crises, they are in fact linked and mutually reinforcing. Recent research increasingly shows that housing affordability cannot be considered independently from the quality and performance of the housing itself. The World Green Building Council stresses that sustainable housing should account not only for upfront purchase or rental costs, but also for the ongoing affordability of living and operational costs, health, resilience and environmental performance. Tackling either the housing access gap or the housing quality gap individually does not solve the housing crisis. It relocates it either onto the cost of housing at a later point for occupants or owners, or onto the planet's carbon budget – and thus onto the general taxpayer whenever costs arise from environmental and social externalities not initially taken into account in current investment decisions (World Green Building Council, 2023). The European Commission's Joint Research Centre similarly treats housing affordability and energy poverty as a dual challenge, showing that housing without energy efficiency and low-carbon design can shift costs from rent or mortgage payments to energy bills, retrofit costs, and emissions (Ozdemir and Koukoufikis, 2025). Furthermore, as former Executive Director of UN-Habitat Maimunah Mohd Sharif emphasised in 2020, housing is not adequate or accessible if its cost threatens other basic needs such as food, healthcare, education and transport (UN-Habitat, 2020). The link between the two crises can therefore be understood through two related gaps:

1. The **housing access gap** concerns households that cannot access housing that meets their needs at an affordable cost. This can reflect an absolute shortage of dwellings, but also housing that exists but is vacant, inaccessible, unaffordable, of the wrong type or in the wrong location.

Land prices, speculation, high construction costs and a mismatch between supply and household needs can all contribute to this gap and make housing costly to acquire. When governments rush to close this gap by fast-tracking new builds, there is a risk of materials-heavy construction, which makes that same housing carbon-intensive to build. Housing may therefore exist physically while remaining financially or practically inaccessible to the households that need it.

2 The **housing quality or performance gap** refers to homes that exist but do not meet the needs of their occupants as they are unsafe, derelict, energy-inefficient or unfit for changing climate conditions. This includes homes built in flood-prone areas without adequate drainage or structural protection, coastal dwellings exposed to saltwater intrusion and storm surge, homes in high heat-stress zones without insulation or shading, and housing on clay-rich soils subject to swelling and shrinkage that causes structural damage over time. Poor construction quality determines the cost of maintaining, occupying and insuring a home and also generates disproportionately high renovation costs over time. In rapidly urbanising contexts, housing is frequently built to such minimal standards that it requires major structural intervention within a few years of completion. It also makes homes carbon-intensive to run for as long as they stand.

These two gaps are closely connected. Addressing the access gap through housing that is inexpensive to deliver but performs poorly can shift part of the cost from the initial construction or acquisition of the dwelling to its subsequent occupation. Energy expenditure, maintenance, future renovation needs and exposure to climate-related damage will arise even when not included in the initial cost of construction. **A key difficulty is that these costs are borne by different actors and at different points in time.** The developer or housing provider primarily encounters costs associated with land, construction, finance and project delivery. Occupants subsequently bear energy and maintenance expenditure. Owners and insurers may bear costs associated with physical climate damage, while governments can face expenditure associated with poor housing conditions through health systems, infrastructure, social support, disaster recovery or later renovation programmes. **As a result, the lowest cost decision at one point in the housing life cycle does not necessarily result in the lowest overall cost.** Chapter 3 returns to the question of cost structure.

Both the access and performance gap are measured against the same international legal standard: the right to adequate housing. Under international human rights law, a home is adequate only if it is secure in tenure, serviced, affordable, habitable, accessible, well-located and culturally appropriate (OHCHR and UN-Habitat, 2009); this is rooted in the 1948 Universal Declaration of Human Rights and is binding under the 1966 International Covenant on Economic, Social and Cultural Rights (ICESCR).

This official housing adequacy framework does not need to be replaced, but it needs to be read in the context of the climate crisis, which has intensified considerably since its creation. Chapter 2 proposes an updated reading of the adequacy framework that extends the affordability dimension to cover the full cost of occupancy over a building's lifetime, extends habitability to encompass climate resilience under projected future conditions, and adds a new dimension recognising that **housing constructed today at the expense of future ecological conditions cannot be said to fulfil the right to adequate housing for future generations.**

FROM HOUSING SHORTAGE TO HOUSING MISMATCH CRISIS

Better understanding the intersection of the housing affordability and housing sustainability crisis through the access and performance gap also enables the design of better policy solutions that consider the full complexity of the housing crises. **Currently, the dominant institutional view of the housing crisis is framed around the access gap**, more specifically, on the **shortage of new construction**. Indeed, new housing construction is one solution, especially needed in fast-urbanising regions, particularly across sub-Saharan Africa and South Asia, where at least 40 million additional housing units will be needed to meet rising demand driven by rapid population and urban growth (UN-Habitat, 2024).

However, some economic evidence suggests that supply constraints are not the main driver of housing price increases (Louie, Mondragon and Wieland, 2025). At the same time, a "housing mismatch" framing has recently gained prominence in international housing-policy discussions, drawing attention to the difference between the number of dwellings available and whether those dwellings correspond to the needs, incomes and locations of households. A 2025 World Economic Forum analysis argues that the global housing problem should be understood not only as a shortage, but also as a mismatch between supply, demand, affordability and access. The green paper *The housing we need for the future we want* frames this more precisely: **"the housing crisis is not simply a shortage of supply, but also a mismatch between the housing that is available and the housing people need"** (Toth et al., 2026).

The prevailing view of the housing crisis as primarily a supply crisis, rather than a mismatch between housing supply and needs, **is also reflected in how outcomes are measured**. A housing official from Southeast Asia, cited in a 2025 World Economic Forum analysis of global housing systems, expressed the dominant institutional mindset plainly: "Our targets are quantitative, not qualitative" (WEF, 2025), meaning success is measured in units built rather than in housing needs met. Research from Germany calls for a corresponding shift from a traditional construction policy focused on delivering new buildings to a broader housing policy that supports a wider range of solutions whose effectiveness is measured not only by the number of new dwellings but also by buildings reused, vacancies activated, floor area repurposed and need-based provision including rightsizing (BBSR, 2023). The emerging framing on housing mismatch can address this by highlighting other ways in which housing demand is not met that go beyond quantitative absolute housing availability:

1. **A spatial mismatch:** housing can exist but not where it is needed. Vacant dwellings may be concentrated in rural, shrinking or post-industrial regions while severe housing pressures remain in employment-rich urban areas. Japan illustrates this on an extreme scale where 9.13 million homes stood vacant as of October 2023, 13.8% of all housing stock, a number that has grown from 3.9 million in 1988 and is predicted to grow to 23 million by 2038 (Day, 2024).

Many of these houses are abandoned, available but in the wrong location. Across Ethiopia, Morocco and South Africa, comparative research found that significant shares of allocated units in state-subsidised programmes were not occupied by their intended beneficiaries – that is, households rejected units as poorly located or incompatible with their livelihoods (Beier, 2025).[4] **Building more units in aggregate does not resolve a locational mismatch**. A home in the wrong place, of the wrong size, or built to a standard that makes it expensive or unsafe to inhabit does not meet the household's need regardless of whether it is counted in the supply figure.

2 **Allocation mismatch of existing housing:** vacancy and shortage coexist in the same countries, often the same cities and sometimes the same neighbourhoods, yet this is often overlooked. In Europe, almost 20% of existing dwellings were vacant while 16.9% of the population lived in overcrowded homes in 2024 (Publications Office of the European Union, 2025; European Union, 2026c). The OECD's most recent analysis recommends that governments assess and activate existing vacant and under-occupied dwellings, as "affordable and social rental housing can ease short-term pressure in tight markets, with the potential to improve building quality and energy efficiency" (OECD, 2026). The European Commission's Affordable Housing Plan similarly highlights that a significant share of existing residential stock sits vacant or underused, and that mobilising it represents a faster, lower-carbon and often lower-cost route to meeting housing need than new construction. Reclaiming vacant residential properties through renovation alone could unlock 8 to 30 million additional dwellings across Europe, and the total potential from better use of the existing stock could reach 50 to 107 million homes (Toth et al., 2026). **Mobilising vacant and under-utilised homes therefore needs to be a key part of addressing the housing mismatch.** A forthcoming European Commission study by DG Environment will offer further insights into benefits, barriers and enabling conditions for unlocking the potential of existing buildings (Publications Office of the European Union, 2025).

3 **A mismatch between dwelling and household needs:** housing needs naturally change over a lifetime. The suitability of a home cannot be determined by floor area alone, but depends on households' and occupants' needs such as size and composition, age, disability, caring responsibilities and access to services. In most housing markets, the supply of alternatives at each stage is limited, moving is expensive and disruptive, and the homes that do exist cannot be easily adapted to changing needs. In the EU, one in three residents already lives in an under-occupied dwelling; reshaping existing stock, in the form of splitting, merging and reconfiguring without new construction, could unlock 8 to 15 million additional dwellings across Europe (Toth et al., 2026). **Rightsizing** – enabling households to move voluntarily to smaller, more accessible homes that are easier to maintain – **can also play a role, especially in dense cities with no space for new construction and low vacancy rates.** The sufficiency principle addresses precisely this mismatch, establishing true housing needs as the basis for rightsizing (IFPEB, 2024).

[4] The same holds true in Mexico (see e.g. Reyes, 2020).

Thus, a household may face an access gap because no dwelling exists, because existing housing is unaffordable or because available housing is in the wrong location or of the wrong type. A household may simultaneously face a performance gap if the housing it can access is unhealthy, unsafe, energy-inefficient, difficult to adapt or exposed to climate risk. **Looking only at aggregate unit numbers captures only part of these circumstances.**

The persisting mismatch has multiple causes: **planning and land governance influence where housing can be delivered**, household incomes shape effective demand, existing housing is often seen as slow and costly to adapt, and market and financing conditions influence which types of housing attract new development. The key structural driver is that private markets, left without policy intervention, tend to build housing for the segment that generates the highest financial return, which in most high-demand markets means higher-income households. Research using US metropolitan data from 2000 to 2019 finds that the assumed filtering mechanism whereby new high-quality supply gradually reduces prices at the bottom of the market as higher-income households vacate older stock is substantially weaker than commonly assumed. Supply added at the top of the quality distribution benefits low-income households far less than supply added directly at the affordable segment: the latter reduces bottom-decile prices up to five times more effectively than the former (Nathanson, 2026). Income inequality amplifies this dynamic. As higher-income groups capture a growing share of income growth, their disproportionate purchasing power bids up prices in desirable locations, shifting the composition of demand and narrowing the supply accessible to lower-income groups (Ge and Moghaddasi Kelishomi, 2025b). Empirical analysis across 15 OECD countries from 1975 to 2010 finds that absolute income inequality is positively correlated with house prices in the long run (Hailemariam et al., 2021). The implication for policy is that increasing housing supply is necessary, but not sufficient; what matters is where in the market that supply lands, and for whom it is designed.

Financialisation can further affect these dynamics. Financialisation is understood here as the "increasing dominance of financial actors, markets, practices, measurements and narratives at various scales resulting in the structural transformation of economies, firms (including financial institutions), states and households" (Aalbers, 2016). The literature describes a growing role for financial actors and investment logic in housing markets, with implications for ownership, pricing and the allocation of investment. At the same time, short investment horizons discourage the upfront capital expenditure required for low-carbon, climate-resilient design – the same financial logic that undermines affordability also undermines sustainability. A comprehensive analysis of financialisation, income distribution and wider housing-market regulation lies beyond the scope of this report. These issues are mentioned here to make clear that housing affordability cannot be explained by physical construction costs alone.

This report focuses on the part of the housing challenge in which decisions about construction, design, renovation, land, project delivery, financing and building performance can materially influence costs. The evidence reviewed above indicates that the appropriate response to the crisis depends on the nature of the housing need. **A diversity of housing solutions is needed to effectively respond to the diversity of housing needs. Additional construction, renovation, reuse, adaptation and better use of existing housing can all form part of the response in different contexts.**

Chapter 2 therefore turns from the diagnosis of housing need to the standard against which housing outcomes can be assessed. It uses the international framework of housing adequacy to ask not only whether a dwelling is provided, but whether it remains affordable, habitable and appropriate for its occupants over time. This includes affordability not only at the point of acquisition but across the full cost of occupancy, habitability under the climate conditions the building will face in the decades ahead, and the wider benefits that adequate housing generates for health, energy security and household resilience. Under the proposed framework the value of a home extends beyond its purchase or rent price to the wider value it creates for the occupant across the building's lifetime.



2 AN ADEQUACY FRAMEWORK FOR AFFORDABLE AND SUSTAINABLE HOUSING

In a world that must adapt to climate change, definitions of adequate housing must respond to a need for long-term planning and inter-generational fairness. Aspects such as affordability and sustainability have long been part of debates on housing, but their assessment has typically only taken place at the point of occupancy or delivery. This section argues that housing adequacy should be assessed as a long-term feature: housing should remain affordable to occupy, habitable under the conditions it is likely to face over its lifetime, and low in its impact on the ecological systems that future generations will depend on.

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THE RIGHT TO LONG-TERM ADEQUATE HOUSING

Affordability is one of the seven dimensions of housing adequacy in the widely cited framework developed by the UN Committee on Economic, Social and Cultural Rights (CESCR). General Comment No. 4 on the right to adequate housing, adopted in 1991 (OHCHR and UN-Habitat, 2009), builds on more than four decades of international commitment to housing as a fundamental human right.

Sustainability has emerged more recently as a distinct dimension in the housing debate, and there have been various attempts to define sustainable and affordable housing, although several aspects now associated with sustainability were already embedded in the existing adequacy framework. The existing habitability dimension requires that adequate housing protect its occupants from threats to health and structural hazards, while the location dimension addresses exposure to harmful environmental conditions and the availability-of-services dimension includes access to energy, water and other essential services.

Climate change nevertheless raises questions that were less prominent when General Comment No. 4 was adopted, particularly whether housing will remain habitable under future climate conditions, whether its energy and other occupation costs remain affordable over time, and how its construction and operation affect the environmental conditions on which future generations depend. In the report of the Special Rapporteur on adequate housing from the 52nd session of the UN Human Rights Council in 2023 (A/HRC/52/28), it is recognised that "the right to adequate housing needs to be interpreted in consonance with the right to a clean, healthy and sustainable environment, recently recognized by the General Assembly, in its resolution 76/300" (United Nations, 2022). It states very clearly that states need to undertake progressive realisation so that the right to adequate housing can be enjoyed by all, including by future generations, and explicitly calls for the addition of sustainability within the existing CESCR framework.

Building on the CESCR framework and following the direction set out in the recommendation of the Special Rapporteur on adequate housing, this report attempts to apply a broader understanding of housing adequacy and to integrate sustainability and affordability into the framework. The central proposition is that **adequacy should not be assessed only at the point when a dwelling is delivered or occupied. Housing should remain affordable to occupy, habitable under the conditions it is likely to face over its lifetime, and low in its impact on the ecological systems that future generations will depend on.**

This report is intended to contribute to the discussion by proposing an expansion of the housing adequacy framework, building on the original legal text from 1991 (UN Committee on Economic, Social and Cultural Rights, 1991) and the 2009 framework from the OHCHR and UN Habitat (OHCHR and UN-Habitat, 2009). Table 1 below is not a replacement of the CESCR framework but a proposed contemporary reading of it, extending existing dimensions to reflect climate realities and adding one new dimension to address what the 1991 framework could not have anticipated – that is, that housing construction is itself now a climate decision with consequences for whether future generations can exercise the same right. The proposed changes are in bold below.

Table 1. Proposal for an integration of sustainability in the global framework for adequate housing

DIMENSION	DEFINITION
Legal security of tenure (unchanged)	Tenure takes a variety of forms, including rental accommodation, cooperative housing, lease, owner-occupation, emergency housing and informal settlements. Notwithstanding the type of tenure, all persons should possess a degree of security of tenure which guarantees legal protection against forced eviction, harassment and other threats. States parties should consequently take immediate measures aimed at conferring legal security of tenure upon those persons and households currently lacking such protection, in genuine consultation with affected persons and groups.
Availability of services, materials, facilities and infrastructure (unchanged)	An adequate house must contain certain facilities essential for health, security, comfort and nutrition. All beneficiaries of the right to adequate housing should have sustainable access to natural and common resources, safe drinking water, energy for cooking, heating and lighting, sanitation and washing facilities, means of food storage, refuse disposal, site drainage and emergency services.
Affordability	Personal or household financial costs associated with housing should be at such a level that the attainment and satisfaction of other basic needs are not threatened or compromised. Steps should be taken by States parties to ensure that the percentage of housing-related costs is, in general, commensurate with income levels. States parties should establish housing subsidies for those unable to obtain affordable housing, as well as forms and levels of housing finance which adequately reflect housing needs. **Housing-related costs should be understood to encompass not only the costs of acquisition, including rent and mortgage repayments, but also the recurring costs necessary to occupy and maintain the dwelling throughout its lifetime, including energy, maintenance, health costs associated with inadequate indoor environmental quality and, where relevant, costs arising from climate-related hazards. None of these costs should compromise the satisfaction of other basic needs.**
Habitability	Adequate housing must be habitable, in terms of providing the inhabitants with adequate space and protecting them from cold, damp, heat, rain, wind or other threats to health, structural hazards, and disease vectors. The physical safety of occupants must be guaranteed as well. **In the context of accelerating climate change, habitability further requires that dwellings are designed, constructed, renovated and maintained so as to withstand the physical impacts of current and projected climate conditions over the anticipated lifetime, including increased frequency and severity of extreme weather events to which housing is most exposed, such as flooding, heavy precipitation, storms, extreme heat and other climate-related hazards. Building standards and renovation programmes should reflect current and projected climate conditions.**
Accessibility (unchanged)	Adequate housing must be accessible to those entitled to it. Disadvantaged groups must be accorded full and sustainable access to adequate housing resources. Both housing law and policy should take fully into account the special housing needs of disadvantaged groups, including the elderly, children, persons with disabilities, victims of natural disasters and persons living in disaster-prone areas.
Location	Adequate housing must be in a location which allows access to employment options, health-care services, schools, childcare centres and other social facilities. Housing should not be built on polluted sites or in immediate proximity to pollution sources that threaten the right to health of the inhabitants. **Housing should furthermore not be situated in locations that expose occupants to disproportionate risk from climate-related hazards, including flood-prone areas, zones of acute heat stress, zones of coastal erosion, and areas susceptible to land degradation and soil erosion, in the absence of adequate protective measures.**

DIMENSION	DEFINITION
Cultural adequacy	The way housing is constructed, the building materials used and the policies supporting these must appropriately enable the expression of cultural identity and diversity of housing. Activities geared towards development or modernisation in the housing sphere should ensure that the cultural dimensions of housing are not sacrificed. **Where appropriate to the local context, housing policy should recognise and enable the use of locally sourced, vernacular and traditional building materials and techniques where these support cultural identity and meet relevant requirements for safety, habitability and environmental performance. Housing policies should encourage the integration of local knowledge and locally adapted design as a matter of cultural, ecological and economic value.**
Environmental sustainability	**Adequate housing should be constructed, renovated, operated, and where relevant, adapted or reused in ways that minimise its contribution to climate change and environmental degradation over its life cycle. This includes reducing the greenhouse gas emissions associated with the construction, renovation, operation and end-of-life of dwellings; improving the circular and/or efficient use of materials and natural resources; prioritising the continued use and adaptation of existing buildings; and enabling the use of low-carbon, sustainably sourced, reusable or recyclable building materials and practices. The progressive realisation of the right to adequate housing must not undermine the ecological conditions upon which the same right depends for future generations.**

LONG-TERM HOUSING ADEQUACY ACROSS THE HOUSING CONTINUUM

The housing system can be understood as a continuum, spanning a range of living conditions, tenure arrangements and levels of service provision. The continuum should not be interpreted as a ladder along which every household is expected to progress towards the same end point. Habitat for Humanity International's 2026 Global Housing Continuum instead presents different housing situations and interventions as parts of one housing system, requiring multiple approaches to operate simultaneously and in different combinations depending on context (Habitat for Humanity, 2026).

The continuum is particularly relevant to the long-term adequacy framework because it separates the outcome to be achieved from the physical means through which it is achieved. Adequacy is the outcome: housing that is secure, serviced, affordable, habitable, accessible, appropriately located and culturally adequate, and that remains so over time. The route towards that outcome can differ substantially according to context. It may involve a newly constructed dwelling, renovation of an existing dwelling, incremental upgrading, adaptation, repurposing, subdivision, social housing or other forms of provision.

Its five broad categories are homelessness, transitional, incremental, social and market-enabled housing (see figure 1). Referencing this continuum helps situate affordable housing within the broader landscape of options available to households. It also connects directly to the long-term adequacy framework proposed above. **The same adequacy objective can require different interventions in different contexts:** new construction where housing is absent, upgrading where basic services or structural quality are inadequate, renovation where existing housing no longer meets energy, climate or accessibility requirements, and adaptation, subdivision or repurposing where existing buildings can respond to changing housing needs.

The continuum therefore separates the outcome from the means of achieving it. Long-term adequate housing is the outcome. New construction, renovation, upgrading, adaptation and reuse are different pathways towards it. The appropriate pathway depends on the existing housing situation, household needs and local market and institutional conditions.

The continuum also reflects different functions of housing, ranging from housing primarily provided as a service to housing held as an asset. Importantly, the continuum highlights a current tension. Long-term adequacy requires that, irrespective of tenure or ownership model, housing continues to fulfil its primary function of providing adequate housing conditions to occupants. However, market housing, where much of the new housing supply would fall, treats housing mostly as an asset. According to UN-Habitat's 2026 World Cities Report, housing functions best when treated as a "long-term social and economic process rather than a one-off product or financial asset" (UN-Habitat, 2026). Section 4.2 explores solutions to this tension.

For the purpose of this report, we focus mostly on incremental, social and market housing as these play a central role in responding to rapid urbanisation, housing shortages, and the need for affordable and adequate housing solutions. These categories are also particularly relevant to the cost structure analysis that follows in chapter 3 because they include both new construction and interventions in existing housing.

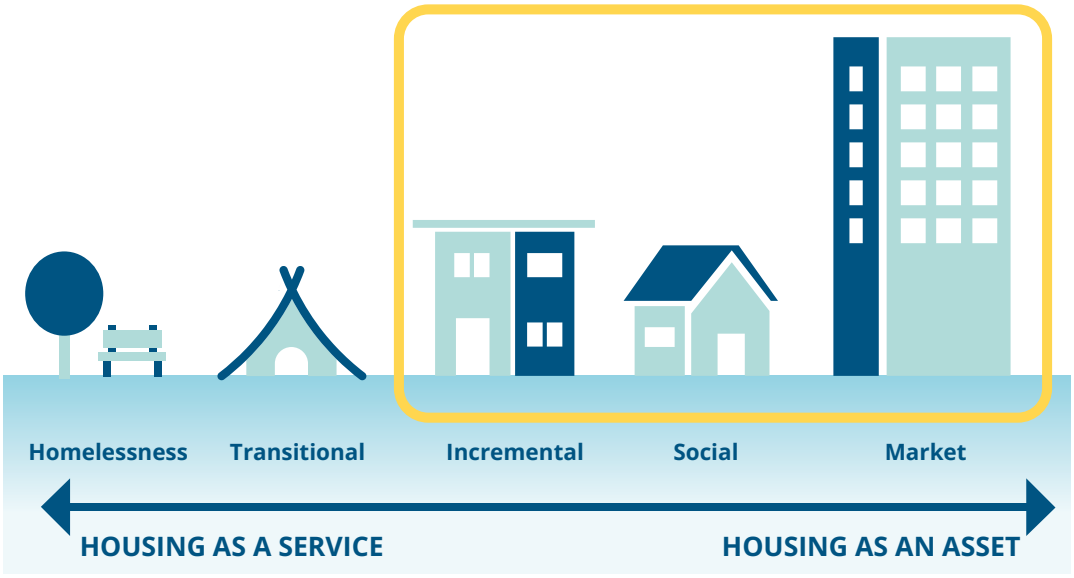

Figure 1. Based on the framework that appears in the Global Housing Continuum (Habitat for Humanity, 2026)

APPLYING THE LONG-TERM ADEQUACY FRAMEWORK TO THIS REPORT

The long-term adequacy framework provides the reference point for the remainder of this report. It highlights three considerations that are particularly relevant to the analysis of housing costs and solutions. First, adequacy is temporal. Hence the performance and affordability of housing need to be considered over time rather than only at the point of construction, purchase or rental. Second, adequacy is contextual, so it depends not only on the physical dwelling but also on its location, access to services, suitability for occupants and wider housing situation. Third, the costs associated with adequacy can fall on different actors and at different points in time. Upfront housing cost is therefore important, but does not by itself describe the full affordability of housing over its lifetime.

Chapter 3 applies this perspective to the cost structure of housing, distinguishing between upfront delivery costs and costs arising during occupation and over the building life cycle, and between evidence relating to new construction and the existing stock. Chapter 4 then considers how these costs can be reduced while maintaining or improving long-term housing adequacy.



3 THE COST STRUCTURE OF HOUSING

The long-term adequacy framework proposed in chapter 2 defines what housing should deliver over its lifetime, ensuring housing affordability and sustainability. A pragmatic lever to deliver the housing needed and alleviate the current multidimensional housing crisis is understanding the cost structure of construction and renovation and designing concrete solutions to tackle each cost component. Housing costs arise from multiple components and vary substantially according to location, tenure, business model, regulation and financing conditions. The physical construction of a dwelling represents only one part of total costs. Land, delivery, financing and other costs also contribute significantly, while additional costs arise over the lifetime of the dwelling. Land acquisition, soft costs including financing, insurance, planning and engineering, and physical construction costs are well but not *systematically* documented and their relative weight varies considerably across markets and contexts. The costs that arise over the life cycle of a building such as energy expenditure, maintenance, climate-related damage and retrofit are significant but are rarely captured in standard project appraisal, which tends to optimise for upfront cost at the expense of long-term adequacy.

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There is extensive literature[5] on costs of providing housing, especially looking at costs for new buildings in a business-as-usual way. However, the types of costs considered as well as their relative share differ. As with many other aspects, **the cost components' shares vary for example due to the underlying business model, financing conditions, local regulation, the geography, demography and jurisdiction.**

Often, construction costs are broadly divided into hard and soft components. Hard costs relate to onsite construction activities, such as materials, labour, equipment and other overheads for developers and contractors. Soft costs, on the other hand, are not directly related to onsite construction, but are necessary for the administration of the project. These include professional fees for consultants, regulatory fees, administrative expenses, financing costs, taxes and insurance (Hu and Skibniewski, 2021a). Engineering costs typically fall under "soft costs". However, this also varies. Taking the example of Germany, soft costs such as financing, taxes, insurance, the planning and engineering services are called construction ancillary costs ("*Baunebenkosten*") and typically account for 15-20% of the overall costs (Sparkasse, 2026). The physical construction costs ("*Baukosten*") then are distinguished from the costs for land, with literature showing a wide range of cost share for land. While mortgage lenders often cite costs for land acquisition of 15-20% (Schwäbisch Hall, 2025; Volksbanken Raiffeisenbanken, 2026), a recent study says that it amounts to 20-25% for land acquisition plus additional costs related to land acquisition ("*Grundstücksnebenkosten*") of 8-15% (IKND, 2024; Schwäbisch Hall, 2025). However, the share of land costs differs significantly within Germany depending on the city size and region ranging from below EUR 10/m^2 in rural municipalities in Eastern Germany and around EUR 225/m^2 in large cities in Bavaria. The physical construction costs make up around half of the construction costs (IKND, 2024) although other sources claim they make up to 60% (Schwäbisch Hall, 2025). Looking at cost development over time, Germany experienced cost increases since 2015 of 33.7% in labour costs, 40.5% in material costs, and 50% in costs for land acquisition (Deutscher Bundestag, 2024; IKND, 2024).

In other countries, similarly, the share of the cost components varies. A source for affordable housing in San Diego, US, reports that prices for land acquisition are roughly 26% of project costs (bae urban economics, 2025), while a source from Ireland puts land acquisition costs at 16% of total costs (SCSI, 2020). Another study from Ireland says that the share of construction costs is about 47%, soft costs account for 42% and land costs amount to 11% of the costs (Government of Ireland, 2023). Developers' margins are sometimes made transparent as well and differ across countries and projects. US builders spend an average of 12% of revenue on operating expenses including finance, sales and marketing, general and administrative costs, and owners' compensation, leaving a net profit margin of 8.7% after a gross margin of 20.7% (NAHB, 2025), while other sources claim a profit share of 11% for single-family buildings in the United States (Lynch, 2025). In Ireland, the margin for a semi-detached private home is similar, at 10-12% depending on the region (SCSI, 2023).

[5] While there is peer-reviewed academic literature on the costs of construction, it is comparatively thinner compared to industry sources and data provided by financing institutions.

More globally, land cost is the most volatile cost component ranging from 20-80% of the overall costs with high prices in cities like San Francisco and low prices where land is informally held. Construction costs are more stable around 40-60% of the costs (with some outliers) and soft costs can be particularly high in South Asia or sub-Saharan Africa due to slow land registration and permitting (World Bank, 2024a). A study looking at housing cost shares in cities of 15 different African countries shows ranges of physical construction costs including infrastructure between 49.1 and 84.3%, land costs ranging from <1% to 28.8% and other cost categories and soft costs such as compliance with regulation and other development costs between 8.7 and 29% (Gardner and Pienaar, 2019). However, the authors of the report point to difficulties in comparing the figures as the costs are not categorised in a uniform way (e.g. include or exclude costs for infrastructure, engineering costs, or high variation of benchmarking approaches to costing), illustrating the overall lack of cost data comparability. In India, costs for land acquisition typically vary between 40 and 50% of the construction costs and can be considerably cheaper in remoter areas but often come with more infrastructure costs in those peripheral regions (Naredco and Knight Frank, 2025).

Overall, the numbers from the literature show that there is no uniform way of clustering costs across the world for new residential buildings and the ranges can differ considerably also within countries.

Table 2. Examples of the relative share of costs for newly constructed residential buildings

Cost element	Germany	France[6]	Ireland[7]	EU[8]	USA[9]	Africa[10]	India[11]
Physical construction costs (hard costs)	50-60%[12]	55-66%	~49%	51-58%	~58%	49.1-84.3%	35-65%
Land acquisition costs	15-40%[13]	~30%	~15%	20-28%	~14%	<1-28.8%	25-50%
Other costs during planning and construction (soft costs)	10-35%[14]	3.5-15%	~36%	17-29%	~28%	8.7-29%	8.7-14%

Note that the examples above are chosen on the basis of data availability to the authors and are not necessarily representative of larger regions or whole countries. The data displayed in the table are also not comparable as the definitions of the cost categories as well as the reference years (2016-2026) vary. Also, the sources do not always state clearly if taxes were included or excluded. Sources are often from mortgage lenders or professional developers/ associations representing professional developers/ architects, sometimes including sales margins and profits, sometimes not. Thus, the table provides a snapshot from a wide mix of housing cost data for single-family or semi-detached houses.

[6] SDES, 2024.
[7] Own calculations based on (SCSI, 2023); other costs include developer margin (11%) and marketing expenses (~2.5%).
[8] Average figures taken from the three European countries.
[9] Marketing costs (0.8%), sales commission (2.8%), and profit (11%) are part of other costs (Lynch, 2025). Any kind of fees are also attributed to other costs (own calculations).
[10] The ranges showcase some outliers on both ends; one reason for this is the sometimes very large share of the infrastructure costs as part of the physical construction costs (4.9-28.2% of overall costs) (Gardner and Pienaar, 2019).
[11] Range built from different sources.
[12] Range built from different sources and own calculations.
[13] Range built from different sources (Schwäbisch Hall 2025, Volksbanken Raiffeisenbanken 2026, IKND 2024).
[14] Range built from different sources (Sparkasse 2026, Schwäbisch Hall 2025) and own calculation with average assumptions for a new single family building (100-130m^2 floor area, 400-600m^2 land).

The cost structure of new construction and renovation differs. New construction generally allows greater control over design and production processes, whereas renovation must respond to the condition and characteristics of existing buildings and may involve greater uncertainty. At the same time, renovation can avoid costs associated with new land acquisition and the construction of an entirely new structure. Evidence cited in this chapter therefore relates to new construction, renovation or both, depending on the available literature. Findings should not automatically be generalised from one form of intervention to the other.

The cost categories captured above are typically what needs to be financed upfront to construct. Over a building's lifetime, however, additional costs for operation, maintenance, repair, renovation and end-of-life treatment accumulate and can be substantial relative to the initial investment. Low-carbon buildings can be delivered at lower costs if carbon and financial costs are accounted for simultaneously. A comprehensive way of capturing environmental "costs" is to conduct a life-cycle assessment (LCA) of carbon emissions, expressed in kilograms of CO_2 equivalent per m^2 per annum. This method accounts for carbon emissions during the production and construction phases, as well as during use, maintenance and demolition. A review study found that the operation process accounts for 67% of life-cycle carbon emissions, followed by the production and construction phase at an average of 31% (Liang et al., 2023). Life-cycle cost analysis, standardised under ISO 15686-5, provides a methodology for counting these costs alongside construction cost. Incorporating life-cycle costs at the planning stage may considerably impact investment decisions, yet this remains uncommon in standard housing appraisal.

To summarise, **while the construction costs are monitored rather closely in many countries and land price developments are captured well in some countries compared to others, many cost components seem volatile and not monitored systematically or in a comparable way and the method of data collection is not always provided.** Taken together, literature and data allow for rough estimates showing that **physical construction costs often account for around 50-60% of the overall costs and both costs for land acquisition and soft costs are considerable in many cases.**

Figure 2 illustrates the different cost elements of construction as typically referred to in literature. While not providing exact ranges, it illustrates that **there are different levers to reduce costs beyond the physical construction costs and thus make housing more affordable.** Literature often separates soft and hard construction costs without spelling out life-cycle costs explicitly. **For long-term adequate housing it is essential to consider the cost of building over its lifetime to reflect the true cost of housing, including the costs occurring over the entire life cycle of the building.** It also facilitates integration of different phases in construction. If the planning, construction, operation, maintenance, and end-of-life phases are all thought of together, costs can be reduced.

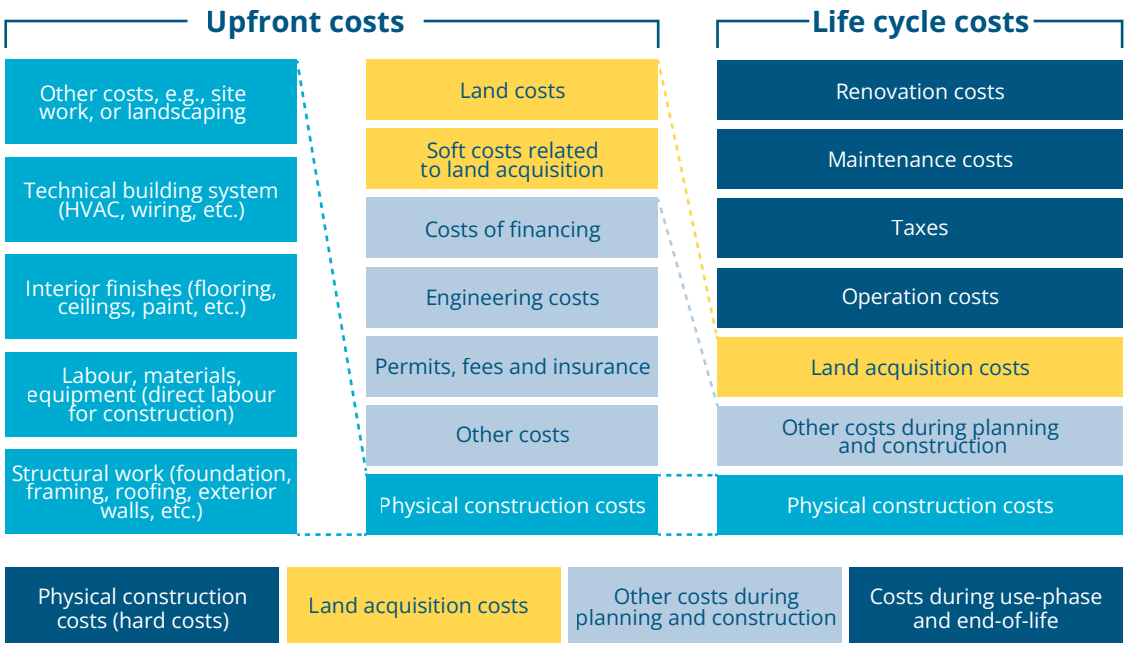

Figure 2. Cost elements for constructing and operating a building (Source: own graph inspired by Sutikno, Hardjomuljadi and Wiyanto, 2025)

PHYSICAL CONSTRUCTION COSTS

MATERIAL COSTS

Material costs are often seen as a main driver for increasing construction costs. The building and construction sector drives nearly 50% of global material extraction (UNEP, 2026), making housing production and prices structurally exposed to global commodity markets and the geopolitical conditions that affect them. The past five years have provided repeated and expensive demonstrations of this exposure. World Bank data show that global prices for key metals used in construction have risen sharply. The base metals index increased from 109 in 2023 to 160 in April 2026 (World Bank, 2026c), and the Bank projects record-high base metals prices in 2026, driven by supply disruptions linked to conflict in the Middle East and by strong demand (World Bank, 2026a). Prices of other inputs, such as timber and iron ore, have been broadly flat or lower, so exposure varies by material.

At a regional scale, there is evidence for a rise in construction material costs, especially due to the COVID-19 pandemic. For the European Union, large parts of the producers' cost increases are attributed to material prices (Eurostat, 2026). Also in the UK, overall construction material costs peaked in June 2022 at 46.4% above February 2020 levels and have not returned to pre-pandemic levels since (Obando, 2025). The US National Association of Home Builders reports that since the start of the COVID-19 pandemic, building material costs overall have risen 35.6% (Wong, 2024). **Price increases** peaked during the pandemic supply shock, remained more stable through 2023 and 2024 and have been rising again since 2024/2025, reaching their highest annual rate since December 2022 in mid-2026 (NAHB, 2026). Thus, these **are not temporary shocks** that have since reversed: five years after the pandemic, US builders remain heavily import-dependent for lumber, steel and cement.

In the US, the post-pandemic supply chain environment was described as a "new standard" of permanent volatility by a Boston-based contractor (Obando, 2025). Cost increases have had effects in most parts of the world and have put additional pressure on the provision of affordable housing (Pawson et al., 2022; Naredco and Knight Frank, 2025). **The supply chain exposure, which is built into the way the global construction sector functions, makes housing costs in every market sensitive to conflicts and disruptions** that no housing ministry can control.

CONSTRUCTION PRODUCTIVITY AND LABOUR COSTS

Construction is one of the few major sectors where productivity has barely moved in decades. Between 2000 and 2022, global construction productivity improved by only 10% in total, one-fifth of the rate of the overall economy over the same period, and productivity in the United States has remained stuck at roughly the same level as 80 years ago (Mischke, Stokvis and Koen, 2024). In advanced economies including the United States and across Europe, productivity in construction has not only stagnated but has sometimes even declined since 2000. This means construction costs rise faster than general inflation even before land and financing are added. A report from 2017 finds that if construction productivity were to catch up with the rest of the economy, the sector's value added could rise by USD 1.6 trillion a year, roughly enough to meet half of the world's annual infrastructure needs (Barbosa et al., 2017).



© Zach Wear - Construction workers in Uganda

Skilled-labour shortages are a problem across the world. In the EU, the vacancy rate in the construction sector surpassed that of all other sectors between 2016 and 2023 (Shiha and El-adaway, 2025). A workforce survey from 2023 shows that in the United States, 85% of construction firms report open positions, with 91% unable to fill at least some roles (AGC and Autodesk, 2023). In Japan, 60% of construction firms are experiencing labour shortages (Statista, 2025). The US National Center for Construction Education and Research found that approximately 41% of the current construction workforce is projected to retire by 2031 (Arnholz, 2025). A 2024 report by the International Labour Organization identified the skills gap as a major contributor to substandard construction work and escalating project costs across Africa (Crown Publications, 2025).

In South Africa, the skills shortage is projected to extend to carpenters, electricians, bricklayers, plumbers, painters and plasterers within a few years. The vast majority (79.1%, 72 out of 91 surveyed) of global markets reported skilled labour shortages, with Africa recording the highest average construction cost inflation at 5.7%, partly attributable to this scarcity (Turner & Townsend, 2024). The top three causes of the shortage of skilled labour identified consistently across developing countries are low and irregular wages, poor vocational training provision, and the SME-dominated structure of the sector which prevents individual firms from investing in workforce development at scale (Hassan and Riaz, 2025).

A study by ITUC Just Transition and the European Federation of Building and Woodworkers estimates that up to 1.5 million additional workers are needed in the construction sector in Europe between 2023 and 2030 (Mella and Werna, 2023). However, the sector's largely SME-dominated structure means it struggles to invest in workforce development and to adopt modern methods at the pace needed. If the labour and productivity gap is not closed, global construction output could fall a total of USD 40 trillion short of demand by 2040, meaning there would be fewer homes, slower delivery and insufficient investment in efficient buildings across every region (Mischke, Stokvis and Vermeltfoort, 2025).

Increasing productivity will allow builders to reduce the construction costs. Modular and prefabricated methods for construction are a way to enhance productivity. The workforce needed to cut construction costs through modular and prefabricated methods is the same workforce needed to build to low-carbon and climate-resilient standards, thus building sustainably with modern methods could be a way to use the workforce more efficiently. A widely cited report by McKinsey estimates cost reductions between 27 and 38% for the builder due to productivity gains through changes in design and engineering processes, standardisation, procurement, supply chain management, improved onsite project management, digitalisation and other technological innovation as well as an upskilled workforce (Barbosa et al., 2017). This suggests that **workforce and productivity investments should be treated as one shared strategy rather than splitting resources across affordability and sustainability**. While this is an example of how the benefits of productivity gains for the construction sector are addressed in literature, there is little literature about how the productivity gains translate into actual cost reductions for housing. This would require a more targeted analysis as market prices also strongly depend on other factors such as land scarcity and demand.

COSTS OF LAND ACQUISITION

Land, rather than the building on it, is often the fastest-growing and least-transparent component of housing cost. A cross-country study tracking house prices from 1870 to 2012 across 14 advanced economies found that "land prices hold the key to understanding the upward trend in global house prices" and that "more than 80 percent of the increase in house prices between 1950 and 2012 can be attributed to land prices" (Knoll, Schularick and Steger, 2017). The contribution of land prices to national housing price growth varies by country, including estimates of 93% for France, 95% for Canada, 90% for Australia, 87% for the United States, and 77% for Denmark (ibid).

Land prices are influenced not only by the physical characteristics of land and its location, but also by the conditions under which land can be developed. For example, evidence from Los Angeles County suggests that developers pay approximately 50% more for land with pre-approved, ready-to-use permits than for otherwise equivalent raw, unpermitted land. The authors estimate that permitting-related costs account for around a third of the gap between house prices and construction costs (Soltas and Gruber, 2026). The study measures the value of development approval in a market in which landowners can obtain permits and subsequently sell land with those approvals attached. It therefore reflects the value associated with avoiding the costs, delays and uncertainty of the permitting process, rather than a comparison between buildable and non-buildable land.

It is important, however, to distinguish between the costs associated with planning and regulatory processes and increases in land value resulting from planning decisions (e.g. rezoning, or permission to build at higher density). The granting of development rights can substantially increase the market value of land relative to land with more restricted development potential. The resulting increase in value does not necessarily represent a physical cost of providing housing; it reflects, at least partly, the economic value created by the right to develop the land. **The underlying policy question is not only how to reduce planning costs, but how land values created through planning are distributed and whether part of this value can be captured for public purposes, including the provision of affordable housing and infrastructure.**

Besides the availability of land, patterns of land ownership and control can significantly impact affordability. In some contexts, increasing concentrations of land ownership can affect the availability of land for development and the incentives governing when land is brought forward for housing. High concentrations of land ownership by a small number of owners can limit the number of actors able to influence land supply and may create incentives to retain land in anticipation of future increases in land value. As land prices account for a significant proportion of the final housing value, this trend can significantly impact overall housing affordability. Where a small number of individuals own large amounts of land, the construction of affordable homes is at risk of slowing down, as private owners may prioritise maximising the land's speculative value over promoting affordable housing development (Paccoud et al., 2022). **Approaches that separate ownership of land from ownership or use of the dwelling provide one potential response to these dynamics.** Community land trusts and related models can limit the extent to which increases in land value are capitalised into the resale price of housing (see chapter 4.2).

Land cost can be a key argument for policies prioritising the existing building stock over new construction, particularly in high-demand urban markets. In most markets, a home's total value reflects two assets, namely the structure of the physical building and the land beneath it. Structures lose value over time, while well-located land tends to grow in value as cities grow and space to build becomes scarcer (Davis et al., 2021). Research tracking house prices across 14 advanced economies from 1870 to 2012 finds that more than 80% of the long-run increase in house prices is explained by rising land values rather than rising construction costs (Knoll, Schularick and Steger, 2017).

In older homes in high-demand cities, it is therefore often the location, rather than the quality or sustainability elements such as the energy performance of the building, that accounts for a substantial part of market value. **Retrofitting an existing home in an expensive city does not require the purchase of additional land.** While market evidence is inconsistent, **there are** also clear **cases where costs for conversion are lower than new construction**: an analysis of office-to-housing conversion projects across four European cities found that all were delivered below the cost of equivalent new construction, in part precisely because the land and structure were already in place (Graaf, Bankert and Toth, 2025). However, this finding should not be generalised across all locations or building types. The costs and feasibility of sufficiency measures such as conversion depend on factors including the condition and configuration of the existing structure, regulatory requirements and local market conditions. The cost advantage of reuse is therefore likely to be greatest where land costs are highest and where existing buildings are structurally sound.

OTHER COSTS DURING PLANNING AND CONSTRUCTION

COST OF FINANCING

Recent geopolitical crises have not only led to an increase in construction costs but also to an increase in interest rates for construction (Beck, 2026; Sagner and Voigtländer, 2026). Mortgage interest rates rose by more than five percentage points between January 2021 and October 2023 in the United States, causing the monthly capital and interest repayments on a loan of USD 400,000 to increase by more than USD 1,265, which is a 78% increase driven independently of any sustainability specification (CFPB Office of Mortgage Markets, 2024). The effect of interest rates on construction and renovation costs can be significant. **Rising interest rates make mortgages more expensive for consumers and loans more expensive for builders** (Palesch, 2024). An IMF analysis finds that new borrowers entering the market at the end of 2022 would see their mortgage bills increase by one quarter on average across a sample of European economies compared to 2021 levels. In the United Kingdom, debt service repayments increased by one third, and buying power would have been reduced by 40% if rates had continued rising (Valderrama et al., 2023). By 2024, household borrowing capacity remained lower than in 2019 in roughly half of EU Member States, with the decline driven by higher interest rates despite income growth partly mitigating the effect (Cousin et al., 2025). A Canadian sensitivity analysis shows that both new construction and, to a lesser degree, renovation are highly affected by interest rate changes (Chernis and Luu, 2018). **While construction activity generally slows down when interest rates are high, fixing mortgage rates at high levels could, in the medium term, lead to renovation as a preferred alternative investment to building new** (Ifo Institute, 2026).

Part of the other costs incurred during the planning and construction phases relates to insurance cover against risks arising during development and construction, as well as in relation to long-term liability issues concerning structural damage. **Insurance requirements, construction risks and climatic factors can affect project costs, risk premiums and ultimately the terms of financing.**

While insurance costs typically account for a relatively small proportion of the total construction costs, they can vary substantially by country, project type, contractual allocation of risk, cover limits and climate exposure. Insurance is also essential for making the project financially viable from the perspective of financial institutions. **Projects involving higher risks have a direct impact on financing terms by increasing interest rates, reducing the loan-to-value ratio and triggering additional requirements from lenders**, such as completion guarantees or higher equity contributions (Clayton et al., 2021; Walker, 2026).[15]

While costs of financing have been rising, the investments financed do not necessarily reflect all relevant costs. Mortgages and investment risk models typically consider a home's upfront construction or purchase cost, and increasingly also aim to consider true lifetime costs such as energy bills, climate and disaster exposure, maintenance, and the health impacts of poor living conditions (Rusinova and Weissler, 2026). However, it is still the case that a cheap-to-build but expensive-to-run home might look financially safer under current models than a more efficient or resilient one (Rastei et al., 2025). This creates situations where households, especially those with lower incomes, cannot access homes that would actually cost them less to live in. Nevertheless, evidence from the UK using micro-level mortgage data finds that loans on energy-efficient properties are measurably less likely to fall into payment arrears than those on energy-inefficient ones. The researchers also say that rising energy prices widen this credit risk gap further (Guin, Korhonen and Moktan, 2022).

Thus, **while energy efficiency materially reduces mortgage default risk, this risk continues to be underestimated under current lending criteria and regulations. Lower-income households are at the highest risk of being unable to afford their housing.**

ENGINEERING AND PLANNING COSTS

Engineering and planning costs form a distinct component of residential project budgets, covering architectural design, structural and MEP (mechanical, electrical, plumbing) engineering, feasibility and site assessment, permitting and code review, energy-performance modelling, and documentation of existing conditions for renovation work. **For new-build residential projects, these planning and engineering fees typically range between 10 and 15% of the construction costs, whilst renovation and conversion works incur significantly higher fees, which are often 12-20% higher than the cost shares for comparable new-build projects** (Pedroza, 2025). The reason for this is the additional complexity involved in working with existing buildings, uncertainties regarding the condition of the existing structure, and stricter requirements regarding documentation to demonstrate compliance with building regulations (Pedroza, 2025; Yuen, 2026). This is a factor that is consistent with the general finding in the literature on cost overruns, namely that projects characterised by greater uncertainty and longer decision-making cycles experience disproportionately higher cost overruns (Ahmed, 2023).

[15] General note on the literature: most information comes from market actors including builders, insurance, financing and related media; they do not provide evidence on the exact question at hand, sometimes relate to commercial buildings and not residential buildings. Nevertheless, the diverse available resources do provide evidence that the general logic holds true.

Costs for engineering, design and planning provide a concrete intervention point and lever to cut costs for housing provision. **In some cases, better project management may lead to cost savings. In other cases, a higher upfront investment in the design phase for solutions that secure affordable and sustainable construction and operation of the building often pays off in the longer term** (see chapter 3.4). Higher investments in planning for more sustainable alternatives often pay off, as Figure 3 shows. The graph shows that the planning phase is also the stage at which the greatest influence can be exerted on future costs.

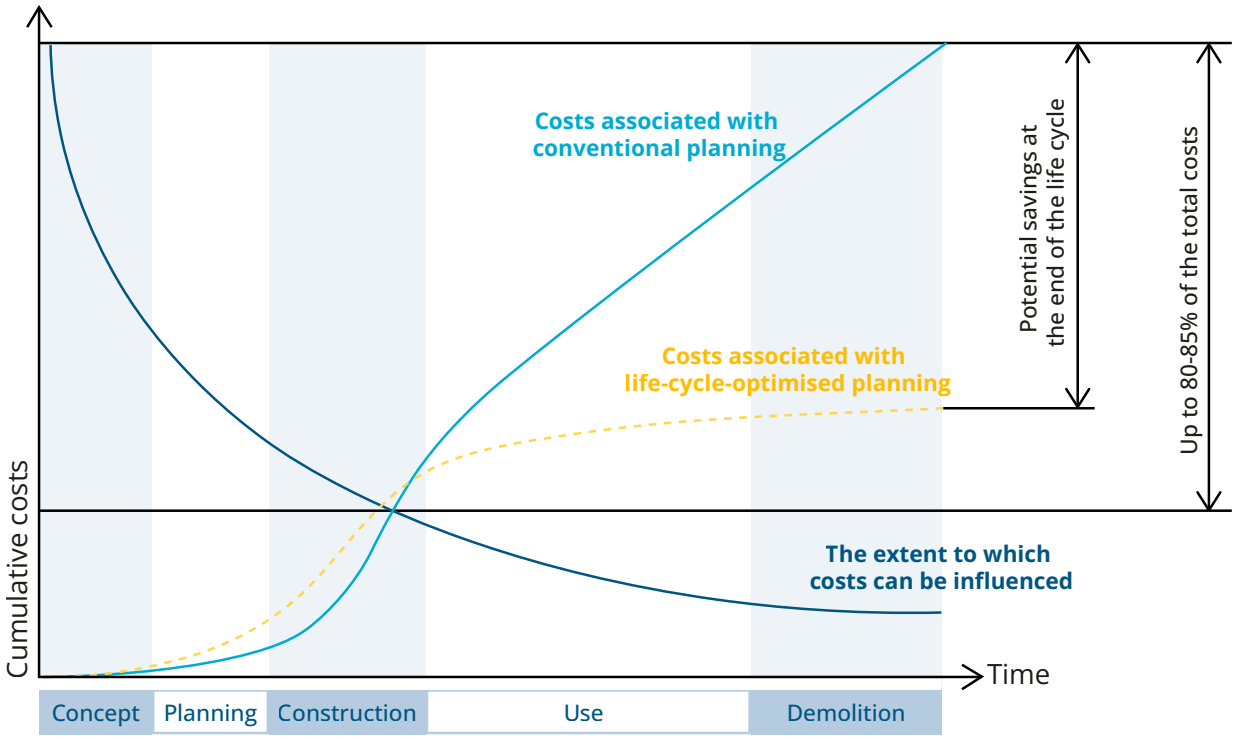

Figure 3. Illustration of the potential for cost savings through early planning and investments in life-cycle-optimised construction over a building's lifetime; own illustration based on (BBSR, 2019)

The lack of a skilled workforce is one important factor to help explain the upward trend of the engineering and planning costs. A structural shortage of qualified architects and engineers has driven up staff costs in the planning sector, as companies compete for the few skilled professionals capable of managing projects that are increasingly technical and governed by building regulations (CITB, 2026).

Public and professional guidance on how to set the fees for engineering and design work, mainly for publicly financed projects, is another reference point for understanding where the costs arise and thus points to levers for reducing them. There are ample examples of that guidance from around the world, although their form and legal status vary. Most divide the construction process into distinct phases, each of which is tied to certain services. This runs counter to integrated project management, which is one way to improve processes, address the lack of workforce and cut overall project costs. Some phase-based fee frameworks have begun to adapt this.

The 2021 HOAI amendment formally recognised BIM-based services within its fee structure (HOAI, 2021), and AIA has published IPD-specific contract documents (ACD, 2021) to accommodate integrated delivery. Despite some changes, integrated project management where design and construction are thought of as one process is often not deployed, which drives overall engineering and design cost increases as changes throughout the construction process become more likely.

COSTS OF FRAGMENTED GOVERNANCE, COORDINATION FAILURE AND PERMITTING REGULATION

Across the housing market, permitting delays and fragmented governance add cost and uncertainty without adding quality, impacting the provision of housing. Research in Washington State estimates that reducing the average permitting process time by one month could reduce the holding costs by approximately USD 4,400 per unit (Smith, 2022). The architecture firm LAI Design Group (Colorado, US) estimates that regulatory delay reduces project value by 1-3% per month. This is because capital remains tied up in unapproved projects, then interest accumulates, as does the risk of material and labour cost increases even before construction begins (LAI Design Group, 2025). The World Bank has documented that unpredictable, lengthy and expensive permitting procedures directly influence developers' decisions on whether and where to build (Molfetas and Wille, 2018). A study analysing the market in Los Angeles, United States, finds that permitting costs represent one third of the gap between construction costs and house price (Soltas and Gruber, 2026). Another challenge is posed by prescriptive building codes that favour new construction and make compliance for alternative approaches (such as reuse of buildings, elements and materials, adaptation, and repurposing) considerably more difficult.

The argument here is not against regulation as such. Ambitious building codes, energy performance standards and land-use policies that limit sprawl are precisely the regulatory instruments that make sustainable and adequate housing possible. The problem can be regulatory complexity and delay independent of the ambition level. **Housing, infrastructure and climate adaptation are typically governed by separate authorities with separate timelines, mandates and budgets, which makes coordinated institutional delivery difficult.**

Where institutional capacity is weak, delays, duplicated effort and missed economies of scale are common, and those inefficiencies are ultimately priced into housing costs or affect housing availability. The same coordination failure that limits affordable delivery is what limits renovation and retrofitting at scale.

In Ethiopia, research on urban land administration institutions across rapidly growing cities found a systematic lack of functional clarity, poor vertical and horizontal coordination, inadequate monitoring, and flawed feedback loops between agencies (Emiru, Adam and Dadi, 2023). Evidence from the Indian Jawaharlal Nehru National Urban Renewal Mission initiative also illustrates the consequences of weak institutional coordination. It was found that inadequate monitoring and misaligned incentives between central, state and municipal authorities consistently produced outcomes favouring private developers over slum residents, undermining the programme's stated equity objectives (Sabah, 2025).

UN-Habitat's member-state working group on adequate housing has explicitly identified the strengthening of local governance capacity and the development of evidence-based national housing strategies as the foundational preconditions for progress on both affordability and sustainability. The group notes that **no nation can address the housing crisis through isolated action alone** (Uwaegbulam, 2025).

COST OVER THE BUILDING'S LIFE CYCLE

The costs of construction or renovation are only one part of the total cost a building generates. Once occupied, a building continues to produce costs through energy and water use, maintenance, repair, future renovation and end-of-life treatment. Owners and occupants additionally face costs associated with climate-related damage, insurance and inadequate indoor conditions. These "true costs of housing" are real and often large, yet they are systematically excluded from standard project appraisal, which optimises for upfront cost. This gap between what appraisal measures and what housing actually costs has a direct consequence for sustainability investment. A building designed without adequate insulation, passive cooling or climate resilience will generate higher operational costs that are borne by the occupant, higher climate damage costs that are borne by the insurer or public sector, and higher health costs that fall on health systems. While the right design decision, made at construction stage, can reduce such costs, current financial incentives do not encourage decision-makers to consider costs arising later in a building's lifetime. The developer passes on the building once constructed or renovated, the lender prices only upfront credit risk, and the occupant often has no say in early design decisions but bears the consequences. This is the central market failure that life cycle cost accounting, if properly applied, is designed to correct.

LIFE-CYCLE COST EXCLUSION IN INVESTMENT DECISION

Life-cycle cost (LCC) analysis provides an established methodology for integrating these costs from acquisition through operation to disposal. ISO 15686-5:2017, the international standard for building life-cycle costing, provides requirements and guidelines for performing LCC analyses of buildings and constructed assets, covering relevant costs and cash flows arising from acquisition through operation to disposal (ISO, 2017). For example, a study of London building archetypes directly comparing refurbishment against replacement on both life cycle cost and life cycle carbon footprint found that refurbishment achieved a reduced life cycle carbon footprint of 1,100 to 1,500 $kgCO_2e/m^2$, compared with 1,220 to 1,850 $kgCO_2e/m^2$ for replacement, while life cycle costs were also lower (GBP 440 to 680/m^2 versus GBP 550 to 890/m^2). Even over a 20-year assessment period, refurbishment was the more favourable option on both financial and environmental measures (Schwartz, Raslan and Mumovic, 2022). This case study illustrates that **when life cycle costs are counted properly, the sustainability premium at construction frequently disappears or reverses**. The LCC methodology exists and is internationally standardised. The key question is: why it is not routinely applied in housing investment decisions?

The answer lies in a structural misalignment of incentives across the housing value chain. The developer who designs and builds a home primarily encounters costs associated with construction, land and financing. The occupant who subsequently lives in it bears energy and maintenance expenditure. The insurer and the public sector absorb the costs of climate damage and poor health outcomes. The building is the same, but the costs fall on different actors at different points in time. No single actor experiences the full cost of the original design decision, and no actor who does experience those costs had leverage over the original decision.

One documented instance of this misalignment is the landlord-tenant split incentive. The IEA describes the landlord-tenant relationship as a classic principal-agent or "split incentive" problem. A landlord may finance insulation or efficient equipment while the tenant receives the resulting reduction in energy expenditure (IEA, 2007). Empirical studies find that this difference affects investment behaviour. Using US residential energy-consumption data, Melvin (2018) found underinvestment by landlords whose tenants paid utility bills across measures including insulation, windows, heating and weatherisation. Tenants' bills were estimated to be nearly 2% higher as a consequence (Melvin, 2018). More recent quasi-experimental evidence using a panel of 3.8 million Dutch dwellings similarly identifies landlord-tenant split incentives as a significant barrier to energy-efficiency investment (Aydin et al., 2026).

The choice of time horizon and discount rate in any life cycle cost calculation reinforces this problem. Research on residential energy-efficiency investment in Australia found that the discounting framework was the main driver of differences in estimated costs and benefits between higher-efficiency design options, and that the preferred performance level changed according to the discount rate used (Morrissey et al., 2013). A later study of alternative energy retrofit packages found the discount rate to have approximately four times the influence of energy price uncertainty on life cycle-cost results (Copiello, Gabrielli and Bonifaci, 2017). **A review of the wider literature similarly identifies the discount rate as one of the most influential and inconsistently treated variables in economic assessments of building energy efficiency** (Copiello, 2021). These findings do not imply that low discount rates should automatically be used to favour sustainability investments. Rather, they show that conclusions about what is "cost-effective" partly depend on assumptions about how future costs and savings are valued. **Transparent assessment periods, discount-rate assumptions and sensitivity analysis are therefore important where alternatives have substantially different upfront and operating cost profiles**.

A related and compounding barrier arises when the investment horizon of the decision-maker is shorter than the physical or economic life of the building intervention. A critical challenge is the mismatch between financing durations and the long payback periods typical of energy upgrades. This is a barrier that has been documented across EU Member States and identified as a reason why building owners settle for incremental improvements rather than deeper interventions with long-term benefits (Barbosa and Almeida, 2025). **The structural mismatches outlined above cannot be resolved by better information alone but require financing instruments and regulatory frameworks that align the incentives of the actor making the design decision with the actor bearing the long-term cost**. How these instruments and frameworks can operate is addressed in section 4.4.2.

OPERATIONAL ENERGY COSTS AND GEOPOLITICAL EXPOSURE

In a globalised world, the materials required for housing provision often have complex supply chains subject to societal stability and geopolitical tensions. As shown above, the COVID-19 pandemic has resulted in higher costs for construction material (Wong, 2024). However, it is not merely the increase in material costs, but a **broader disruption across the entire supply chain that shows how globally exposed supply chains threaten the provision of affordable and sustainable housing**. Empirical evidence from a study of the Indian construction sector found that failures in stakeholder coordination were the single largest driver of supply disruption during the pandemic, followed by external pressures such as raw material price instability, trade restrictions, and limited material availability (Deep et al., 2025). The study argues that, particularly in developing economies, institutional and coordination capacities are a significant bottleneck for recovery. Because of the large share of micro, small and medium-sized enterprises, the general vulnerability is amplified since delayed payments and limited working capital cannot be offset (ibid). The pandemic increased lead times and reduced the reliability of key supplies. These effects increase the overall project costs because contractors and developers price in increased risks of delay. Furthermore, delays in project completion, in turn, postpone the occupancy and thus the period during which rental or other project revenues are generated.

The geopolitical cost of energy-dependent housing has become more obvious in recent years. **The higher a home's global exposure to price increases and volatility is, the more costly it becomes to operate**. The IEA has described the 2026 closure of the Strait of Hormuz, through which around 20% of the global oil trade and a similar share of global LNG transits, as "the largest supply disruption in the history of the global oil market" and "the greatest threat to global energy security in history" (IEA, 2026b). The crisis pushed Brent crude up 10-13% within days. Analysts warned that prices could reach USD 100-200 a barrel if disruption persisted. The crisis also triggered the IEA's largest-ever coordinated release of emergency oil reserves of 400 million barrels (Bloomberg, 2026; IEA, 2026c). This is precisely the exposure that energy-efficient, low-carbon housing insulates against. Almost 36% of the EU's natural gas imports are used to heat buildings, and efficiency measures already implemented in EU buildings between 2020 and 2024 saved around 25 million tonnes of oil equivalent, which is as much as Hungary's entire energy consumption in 2024 (European Union, 2025c). Air conditioning accounts for around 52% of total electricity consumption in Saudi Arabia, and cooling demand reaches up to 70% of peak electricity demand in the United Arab Emirates (Abu Dhabi Media Office, 2026). The IEA projects that global cooling degree days will rise a further 25% by 2050 (IEA, 2018). This is a trajectory that the Gulf is already experiencing, and it shows that building envelope efficiency through insulation, shading, or glazing is a direct lever on peak load and fossil generation capacity, not only on household bills. In the European case, a full renovation of Europe's building stock could cut EU gas demand and imports by up to 60 billion cubic metres a year by 2040, a reduction of roughly 60% (European Union, 2026b).



© EqualStock - A group of women standing next to a pile of bricks

The reverse risk is illustrated by the example of India, where roughly 70% of the urban infrastructure needed by 2030 has not yet been built. Business-as-usual construction is projected to make the buildings sector emit seven times more CO_2 by 2050 than in 2005, with residential energy use rising eightfold over the same period (RMI India, 2021).

Energy poverty is one of the most direct and measurable costs of inadequate, inefficient housing stock. Households affected by energy poverty are also most affected by price changes due to global exposure of supply chains. In the EU, between 35 and 72 million people face challenges meeting the cost of their energy bills, with 9.2% of Europeans being unable to keep their homes adequately warm in 2024 (European Union, 2025b). In the same year in the United States, 22% of households kept their home at a temperature that felt unsafe or unhealthy (Rosenbach, Castillo and Valdes, 2025). In Brazil, energy poverty was found to affect around 11% of households (Bezerra et al., 2022). However, no harmonised indicators are used. Systematic household-level data on what energy-inefficient housing actually costs to occupy remain largely absent or based on single studies, especially in countries of the global majority, making it impossible to calculate a global equivalent of the EU figures. **Properly addressing energy poverty and directing energy efficiency investments to building segments occupied by energy-poor households thus requires a better understanding of where those households are actually located**.

Beyond efficiency gains, the IPCC's Sixth Assessment Report treats demand-side measures especially to reduce energy use in buildings as one of the largest available levers for emissions reduction, alongside supply-side decarbonisation (IPCC, 2022a). For housing, this means **renovation and design that lowers absolute energy demand and whole-life carbon emissions and therefore carries a double benefit: it cuts emissions today, and it permanently reduces a household's exposure to exactly the kind of price shock the Strait of Hormuz crisis illustrates**.

COST OF DEEP RENOVATION AND MAINTENANCE

When renovation is required, whether for maintenance, adaptation or energy upgrading, it generates its own cost structure that mirrors the upfront construction categories: physical works, professional fees, financing and, where applicable, the cost of temporarily relocating occupants. In the context of affordable and sustainable housing, a common question is how much more it costs to renovate to a higher environmental quality standard than to carry out a business-as-usual refurbishment. **A large body of** scientific and grey **literature examines the return on investment of deep renovation, but results are highly case-specific. They depend on the baseline definition, discount rates and the renovation standard aspired to, as well as on the underlying assumptions of energy price or carbon price developments**, which make the extra cost (often referred to as green premium) difficult to generalise. Another approach in line with decomposing the housing cost elements is to understand the relative share of costs for renovations coming on top of the costs for maintenance and cyclical investments.

For Germany, several studies evaluate the additional costs of different ambition levels of energy refurbishments. In the case of a complete refurbishment, energy-related additional costs can account for roughly 30-55% of the total refurbishment costs depending e.g. on the type of building, the initial and final energy states, or technology choice. Where comprehensive repairs are already necessary, the percentage of additional costs may be lower (dena, 2010; Henger et al., 2026).

A further gap in life cycle cost analysis concerns end-of-life costs. Most studies on upgrading existing buildings have neglected the financial costs associated with recycling, reusing and disposing of construction materials. Integrating these costs into life cycle appraisal would provide a more accurate picture of the full investment required and, by making circular material flows financially legible, could support more sustainable renovation decisions (Balasbaneh, Sher and Li, 2025).

CLIMATE RESILIENCE, INSURANCE AND ASSET LOSSES

The costs documented below are largely the consequence of design and location decisions made at the point of construction, which illustrates that upfront cost optimisation without life cycle cost consideration is not a cost-saving strategy but rather defers cost to other actors and other times. **The cost of housing that ignores resilience to climate hazards is now becoming visible in asset losses and insurance markets**. The data on insurance and assets illustrate the high costs of inaction. The insurance protection gap for infrastructure such as housing is a major physical and financial risk. Swiss Re writes that "**Adaptation is no longer optional: it is increasingly a prerequisite for insurability**" (Swiss Re Institute, 2026). No comprehensively disaggregated data are currently available for buildings. Weather- and climate-related extremes have cost the EU an estimated EUR 822 billion in asset losses between 1980 and 2024, with over EUR 208 billion (25% of the total) incurred in just the last four years, and annual losses now running roughly five times higher than the 1980s average. Globally, 0.3% of GDP was lost to natural catastrophes in 2024 (Swiss Re Institute, 2025). Only 43% of the USD 318 billion this represented was insured (Swiss Re Institute, 2025), but that average masks a very uneven world.

In Latin America and the Caribbean, the average protection gap stands at 81%, leaving just 19% of climate-related losses insured (MAPFRE Economics, 2025). Asia's protection gap is even wider, at 82.8%. In Africa, only 0.5% of economic losses from climate-related disasters were insured in 2023 (Glemarec, Solana and Babinsky, 2025). US Federal Reserve Chair Jerome Powell warned the Senate Banking Committee in February 2025 that entire US regions could become unmortgageable within 10 to 15 years (Martin, 2025).

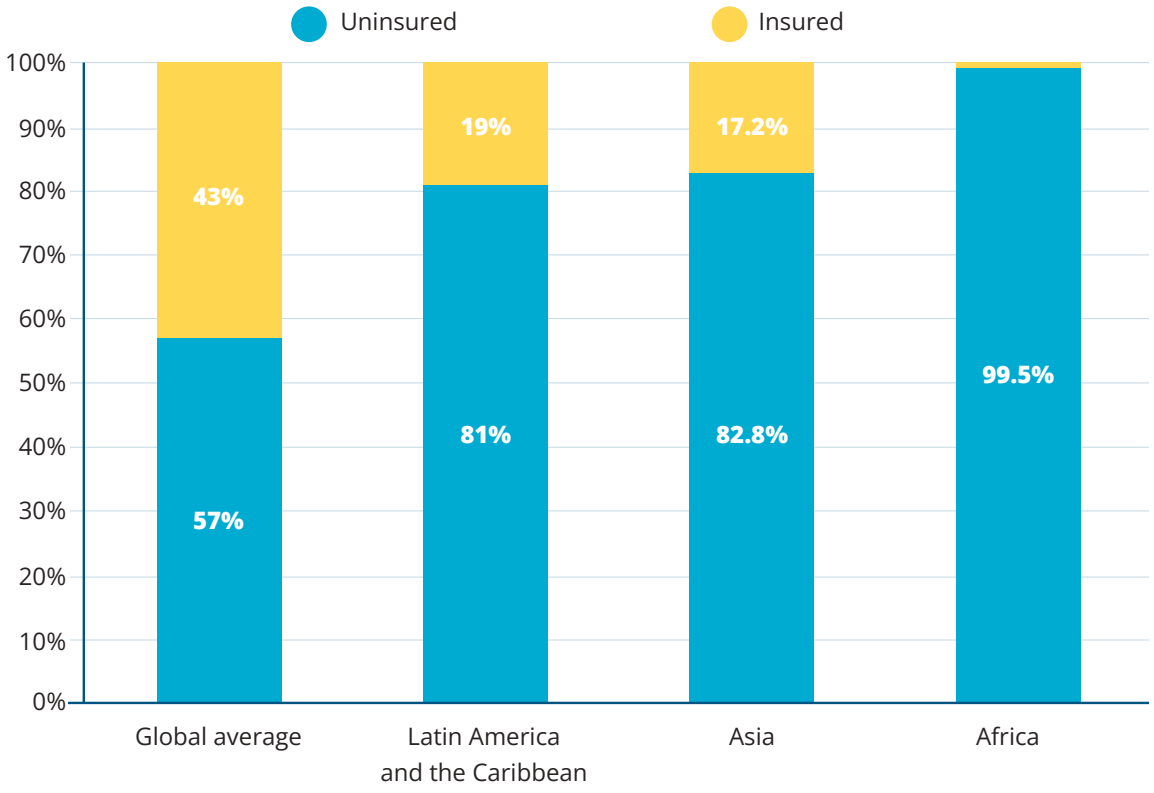

Figure 4. Insurance protection gap for climate-related disaster losses (based on Swiss Re Institute, 2025; MAPFRE Economics, 2025; Glemarec, Solana and Babinsky, 2025).

Globally, 1.81 billion people, or 23% of the world population, are directly exposed to 1-in-100-year flood risks. Of these, 1.24 billion are located in South and East Asia, with China and India accounting for over a third of global exposure. **Of the world's flood-exposed people, 89% live in low- and middle-income countries, and of the 170 million facing both high flood risk and extreme poverty**, 44% are in sub-Saharan Africa (Rentschler, Salhab and Jafino, 2022). From 2000 to 2019, flooding affected 1.6 billion people and caused USD 651 billion in economic damage globally. Annual flood exposure damages are currently estimated at USD 6 billion a year, projected to rise to USD 52 billion by 2050 (Yousaf, Seenath and Speight, 2025). **Systematic property-level flood and climate exposure data are largely absent outside the United States and parts of Europe. The lack of data does not allow households, lenders or insurers to price risk accurately**, and it also means that governments cannot target resilience investment. The countries facing the largest exposure, particularly in South and Southeast Asia and sub-Saharan Africa, are often those with the least data.

Imperial College London attributed 16,500, or 68%, of the 24,400 heat-related deaths recorded across 854 European cities between June and August 2025 to the additional heat caused by climate change (Barnes et al., 2025). **Homes risk failing to protect people from extreme heat**, especially in Europe, the fastest-warming continent on Earth. Buildings are built or left unrenovated under the assumption that upgrading them would be too expensive, with resilience treated as optional. To be able to manage the increasing risks of climate change, France's third National Adaptation Plan (March 2025), has led to the reference trajectory of +4°C in mainland France by 2100 being written into the Environmental Code (décret n° 2026-23) as the binding planning basis for housing and infrastructure policy (France Adapts, 2025).

HEALTH COSTS OF INADEQUATE HOUSING

The financial cost of inadequate and poorly built housing is measurable across health systems and household budgets, and it consistently exceeds what it would have cost to build adequately in the first place. It is best documented in Europe, where Eurofound found that inadequate and poor-quality housing costs EU economies nearly EUR 194 billion a year in direct healthcare costs and indirect costs such as lost productivity, against a one-off cost of about EUR 295 billion to bring the EU's housing stock up to an acceptable standard – meaning the investment would be repaid within roughly 18 months through healthcare and social savings alone (Eurofound, 2016). On a narrower scale, the UK's Building Research Establishment puts the cost of poor housing to the National Health Service specifically at GBP 1.4 billion a year (Garrett et al., 2021). Comparable estimates of the full economic cost of inadequate housing were not found for most countries of the global majority, where the health burden is almost certainly larger relative to GDP. The information gap leads to the systematic underrepresentation of the health costs of inadequate housing on a global scale.



4 SOLUTION PATHWAYS FOR DELIVERING LONG-TERM ADEQUATE HOUSING

Across the world, no two housing markets share the same characteristics, and no single fix will work everywhere. A solution built for an ageing, energy-inefficient stock in Europe is not the solution to a supply shortfall in a fast-urbanising city in South Asia, and a financing innovation that works where mortgage markets are big will do little where they barely exist. This chapter proposes four solution pathways for making long-term adequate housing the norm for new construction and renovation alike, and for showing that this ambition is more affordable when costs are accounted for transparently and over time.

The solutions under each pathway are meant as a source of inspiration, not a universal blueprint.

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Long-term adequate housing, as proposed in the updated framework in chapter 2, is housing that is affordable not only to acquire but to occupy throughout its lifetime, habitable under the climate conditions in the decades ahead, independent of supply chains and energy sources that expose households to geopolitical risk, and constructed in ways that do not exhaust the ecological conditions on which future generations will depend. The framework's updated dimensions enable a vision for housing that serves the people who live in it across the full length of the building's life, particularly the extended affordability dimension, the climate-resilient reading of habitability, the cultural adequacy dimension that now explicitly includes vernacular and locally adapted construction, and the new low environmental impact dimension.

The four solution pathways that follow are organised around the four cost categories identified in chapter 3, each addressing a different point at which cost can be reduced and long-term adequacy delivered. They do not provide a single universal model but identify areas in which policy and delivery choices can reduce costs while supporting the conditions for long-term housing adequacy.

The first pathway addresses physical construction costs, showing that design choices, material selection and process innovation reduce both upfront cost and the embodied carbon and climate vulnerability that generate costs later. The second addresses land acquisition costs, using repurposing of existing buildings and ownership models that permanently prevent affordable housing from being repriced out of reach through subsequent transactions. The third addresses other costs related to planning and construction (the so-called 'soft costs' of housing delivery) through instruments that restructure who bears the upfront cost and through delivery models that aggregate demand and reduce institutional friction. The fourth addresses life cycle costs directly, showing that energy efficiency, climate resilience and neighbourhood-scale infrastructure reduce the energy bills, climate damage, health burdens and retrofit costs that standard appraisal excludes, and that life cycle cost accounting makes these costs visible in investment decisions before they materialise.

The technical solutions required already largely exist in practice. The challenge ahead lies mostly in clever, well-targeted policy design, governance structures, and an optimisation for long-term affordability rather than short-term construction cost. Each pathway corresponds to one or more dimensions of the expanded adequacy framework proposed in this report and addresses different cost categories as levers to achieve more affordable housing. Taken together they show how the framework's updated dimensions can be delivered not as additional costs but as design principles that reduce total housing costs across a building's lifetime.

REDUCING PHYSICAL CONSTRUCTION COSTS THROUGH DESIGN, MATERIALS AND PROCESS OPTIMISATION

Physical construction costs account for a significant share of total housing project costs for new buildings. Choices for design and methods of construction can have significant impacts on the material costs and other costs directly related to the construction work onsite. **The following subchapter sets out solutions to reduce physical construction costs relating to more vernacular building design and material choices, better use of existing buildings, and modern methods of construction**.

BUILDING DESIGN AND MATERIAL CHOICES

Design is the first and most consequential cost decision in any new building project. Decisions on construction design and processes determine not only upfront cost but embodied carbon, maintenance cost, and the building's capacity to respond to local climate conditions. Better design can reduce material use, construction complexity and future adaptation requirements simultaneously. One way to reduce costs is to opt for more local and vernacular design and material choices.

A systematic review of housing construction cost studies across Africa, Asia and Latin America finds that the unit cost of housing built with local materials is consistently lower than that of housing built with industrialised imported inputs, in some documented cases by a factor of three (Morales-Cristóbal et al., 2020). This comparison is context dependent; for example, it holds more strongly where imported materials are expensive relative to labour and where local alternatives exist. A meta-analysis of affordable mass housing cost criteria covering 129 references identifies local material sourcing and vernacular architecture principles as among the most significant and consistently documented levers for reducing the design and construction costs of housing (Faraji et al., 2024).

A well-documented example of vernacular construction at scale is the composite bamboo shear wall (CBSW) system, developed from traditional Latin American bahareque construction and now codified in the structural standards of Colombia, Ecuador and Peru. Over the past 30 years, at least 10,000 homes have been built using this system across Colombia, Costa Rica, Nepal, Ecuador, Peru, Mexico, El Salvador and the Philippines. When properly designed and built, CBSW housing carries approximately 50% or less of the embodied carbon of conventional reinforced masonry housing (Kaminski, 2025). The system is cost-competitive because bamboo is locally grown and does not require energy-intensive manufacturing processes, making it less exposed to global commodity price fluctuations. The cultural adequacy dimension of the updated framework explicitly recognises vernacular and locally adapted construction as a legitimate and valuable component of adequate housing. Building codes and procurement frameworks that support these approaches can allow for more cost-effective choices and are also aligned with the adequacy standard this report proposes. However, any upscaling efforts require a thorough impact assessment so that unexpected consequences including damage to ecosystems or conflicts over land use are prevented.

Decisions must be based on a scientifically sound life cycle assessment of the performance of solutions and favour those which perform better.

In Kenya, a carbon-negative construction material substitute for walls was developed entirely from locally available agricultural waste from rice and sugarcane (using inputs such as rice husk ash, wood ash and rice straw). The cost of the main construction walls is only 10% that of traditional wall construction (Liiv et al., 2025). While showing a comparable structural performance to cement-based materials, it eliminates the need for Portland cement and generates a net carbon capture during the hardening phase. In West Africa, the TyCCAO programme has investigated the use of typha, a rapidly growing invasive wetland plant widespread in the Senegal River basin, as a construction resource in Senegal and Mauritania (FFEM, 2024). Co-funded by FFEM, ADEME and the French Ministry for Ecological Transition, the programme integrates invasive biomass valorisation with the development of local material supply chains, improved building energy performance and institutional frameworks supporting sustainable construction (FFEM, 2018, 2024). Built on Senegal's PNEEB/Typha programme (2013-2017), its construction component has addressed the development of earth-typha composites, bio-based concrete and thatched roofing systems, and has explored the production of rigid insulating panels (FFEM, 2018). Typha shows promising potential for construction, particularly through its thermal insulation properties and its ability to contribute to indoor moisture regulation when combined with earth or suitable binders. However, its performance depends strongly on formulation, particle morphology and manufacturing conditions. Each application therefore requires careful optimisation to balance thermal performance, mechanical strength and durability. Further attention is needed to validate these benefits at building scale, assess environmental gains through life-cycle analysis, and establish the economic feasibility and replicability of the solutions. Indeed, while the use of typha can offer significant benefits in terms of construction costs and environmental performance, these benefits are highly dependent on the conditions of use and the solutions implemented. As with many emerging local materials, further research and testing are needed to validate performance, optimise applications and support wider adoption. However, the actors involved often lack the resources to finance such work, while funding agencies remain reluctant to support these studies, creating a barrier to the development and scaling-up of typha-based construction solutions.

In an effort to explore how modern Javanese homes can reduce their electricity demand, traditional houses were analysed for their energy efficiency. A modern Javanese house applying vernacular design principles was found to reduce total electricity consumption by 31%, with its open layout and atrium lowering night-time temperatures by about 5°C compared to daytime and 1.6°C compared to outdoors (Sari, Sudirman and Chiou, 2022). This illustrates that vernacular design knowledge embeds passive cooling and thermal performance that modern imported construction standards might fail to replicate, and that recovering this knowledge through design is a low-cost route to habitability improvements that would otherwise require expensive technical systems. While being the exception, the "Earth standards" in New Zealand (NZS 4297/4298/4299) are recognised in the New Zealand Building Code promoting earth walls as a means and solution to comply with mandatory performance requirements (Standards New Zealand, 2020).

In contexts of rapid urbanisation and informal settlements where population growth is fastest and housing deficits are most acute, new housing provision is unavoidable. In line with the solution pathway, the priority here should also be on circular design or design for deconstruction.

This refers to buildings designed from the outset so that their components can be disassembled, reused and re-entered into the material economy at end of life, avoiding the locking in of value in glued, composite or inseparable elements that end up as waste. **Over time, it will create a locally grounded supply chain less prone to external risks.** The revised EU Construction Products Regulation (CPR) from 2024 provides the emerging regulatory framework for this approach in Europe. The CPR requires that construction products be designed to facilitate the separation of components and materials at deconstruction and demolition, avoiding mixed, blended or intricate materials where possible, and introduces a mandatory Digital Product Passport for construction products that must include deconstruction potential, disassembly and reuse information at end of life (European Union, 2024b). This creates a product-level framework that incentivises manufacturers to design for disassembly but does not yet extend to building-level design requirements for new residential construction. A systematic review of design for disassembly policy confirms that mandatory building-level requirements would be the most effective driver of adoption but are not yet in place in any national building code (Vorobjev et al., 2026).

REUSING AND ADAPTING EXISTING BUILDINGS

Where existing buildings can be adapted to meet current needs for adequate housing, retaining usable structures can reduce the quantity of new construction required and therefore avoid part of the material, structural and labour expenditure associated with demolition and replacement. Reuse can preserve value that is already embodied in structures where they remain technically suitable for continued use. Especially in regions where a primary challenge is not shortage but a mismatch of the housing offer and need, affordable housing strategies that ignore the existing stock are neither economically nor environmentally defensible. In Europe alone, an estimated 20% of properties are vacant, including vacant units, seasonal homes, and underused properties (European Commission, 2025). The European Affordable Housing Plan (2025) reinforces the shift towards reuse of existing stock, calling explicitly for the activation of vacant buildings and the renovation of existing stock as a first-order housing supply response.

Evidence on the cost advantage of reusing the existing building stock remains highly context- and measure-dependent, as acquisition price, utility connection, structural depth and layout, façade requirements, building condition and maintenance, fire and accessibility requirements and planning constraints can substantially reduce or eliminate that advantage. For specific, well-chosen conversion projects, costs can be lower than equivalent new construction. Evidence from Europe on office-to-affordable-housing conversion projects in Brussels, Barcelona, Marseille and Cork found that all four case study projects achieved lower total costs than equivalent new-build projects, though the study explicitly cautions that this finding cannot be generalised, as hidden structural defects or hazardous materials can lead to unforeseen costs once work begins (Graaf, Bankert and Toth, 2025). **Although every building is unique, evidence from the literature and these case studies suggests that conversion can reduce emissions by more than 60% compared with the new construction of comparable residential units** (Graaf, Bankert and Toth, 2025).

There exist several North American and European policies to support office-to-housing conversions including through tax abatements (Colorado General Assembly, 2024; City of Boston, 2026) or direct support via grant schemes (e.g. Downtown Strategy Calgary, 2026). **Internalising carbon pricing for construction materials could yield significant savings for reusing existing buildings compared with new construction**, as for example shown for Hong Kong (Langston, Chan and Yung, 2018). A Dutch analysis of rooftop extensions puts their cost at approximately EUR 2,350 per m^2, broadly comparable with new construction once the avoided cost of land acquisition is included (Greve and Koning, 2024). In this case, the construction itself is therefore not necessarily cheaper. However, the economic advantage arises from adding homes to an existing site and making further use of infrastructure already in place.

The public fiscal argument is stronger and more generalisable. Greenfield development requires local authorities to fund roads, water and sewerage connections, schools and other services that do not appear in the developer's project budget and are costs that can be saved if better use of existing buildings is prioritised. Irish evidence estimates that servicing a low-density suburban household costs 244% more than servicing an urban household, reflecting the infrastructure and services required for dispersed development (OPR, 2024). The infrastructure required for greenfield development can add EUR 100,000-150,000 per dwelling in Ireland alone (ibid). Infill and densification within existing serviced areas avoid or defer these costs, even where the construction itself is no cheaper. A Finnish municipal net-present-value analysis found that urban infill projects reached financial break-even for municipalities in 25-30 years, while greenfield development required almost 50 years, a difference driven by the timing and scale of upfront infrastructure investment (Vihola and Kurvinen, 2016).

There are other examples of the better use of existing buildings in other parts of the world, notably the award-winning Habilis project in Sydney, Australia, where a former furniture factory was transformed into long-term housing for people experiencing homelessness and mental illness. This example shows that it is not only important to construct high-performing studio apartments. Human-centred design solutions are also essential for creating healthy buildings (Australian Institute of Architects, 2025).

Globally, however, comparable cost evidence from adaptive reuse outside high-income countries is limited. **The cost advantage of reuse is therefore most robust where land costs are highest, where existing buildings are structurally sound, and where public infrastructure is already in place.** Measures that appear more expensive at project level may still have a lower total cost when public infrastructure savings and avoided carbon emissions are included in the comparison.

SERIAL RENOVATION AS A SOLUTION FOR LOW- AND MIDDLE-INCOME HOUSING

Process innovations such as prefabrication in a factory are not only relevant for new construction but also for the existing building stock, and may reduce renovation time by 18% with fewer builders needed on site and shorter installation times (D'Oca et al., 2018). Renovation companies can complete activities significantly faster (dena, 2026), and serial renovation making use of industrial prefabrication can reduce costs by up to 20% by shifting work to standardised, industrial value-added stages such as planning, prefabrication and logistics (Munich Strategy, 2024).

Housing can be provided faster to more people and meet high sustainability standards, with reported costs being comparable with conventional methods (Yildiz et al., 2024).

Renovation costs can be made competitive with conventional approaches through process innovation, removing the assumption that higher performance means higher cost. Retrofitting with prefabricated elements to a zero or nearly zero-energy home has gained traction as an affordable solution for middle-income groups as well as for social housing in Europe. The Energiesprong model, inspired by a Dutch initiative to renovate buildings to a net-zero emission standard using prefabricated façades and plug-and-play energy modules, has been adapted in various jurisdictions across Europe and beyond. In the Netherlands, where the model originated, more than 5,700 homes have been retrofitted to date, with whole-home makeovers typically completed in seven to ten days and covered by a 30-year performance guarantee on both energy and indoor comfort. In total, more than 40,000 mostly low-income dwellings have been renovated or are under construction in Europe under this model (Energiesprong, 2026a). The model demonstrates that prefabricated renovation can deliver a fully warranted performance outcome at a speed and cost structure that conventional renovation cannot match. **Serial solutions for renovation have an additional advantage as they typically remove the need for individual technical judgement, reduce the number of decision points for homeowners and come with minimal disruption for the occupants**. However, in turn, the supply side needs to have the technical capacity to deliver the solutions which differ from conventional renovation approaches and typically require capacity building for the workforce.

OFFSITE CONSTRUCTION

Offsite construction solutions with industrial prefabricated elements are increasingly seen as a viable solution for new buildings across the world, not only to provide affordable housing in a faster and cheaper way, but also to ensure decent quality housing that does not compromise on sustainability.



© Etex - Offsite construction in the UK

A growing number of commercial solutions are on the market including in the US (Smithson, 2025), Brazil (Tecverde, 2026), Egypt (Social Housing and Mortgage Finance Fund, 2023; World Bank, 2024b), India (Bras et al., 2020) and Viet Nam (KEN Research, 2026).

Offsite and modular construction offer significant advantages over conventional onsite construction (Jankovic and Elnagar, 2026). Through prefabrication in a controlled factory environment and a parallel preparation of the site, construction processes can be 20-60% faster than traditional construction methods (Luke et al., 2024). On cost specifically, analysis of modular construction finds cost reductions of around 20% are achievable in the right conditions, with offsite manufacturing reducing onsite labour costs by up to 25% (Bertram et al., 2019). Overall, material cost reductions of 5 to 10% are also documented, though the evidence base remains fragmented and context dependent. Furthermore, labour costs and disruptions are lowered, the quality of work increases, and errors are significantly reduced (Kouhirostami and Chini, 2022; Bertram et al., 2019). Figure 5 illustrates how the different construction phases shift in this process towards a more work-intensive design, planning and offsite manufacturing phase unlocking time and cost savings during onsite construction.

Industrialised construction is often associated with multi-family blocks in the 1970s and 1980s. With modern construction methods, advanced digital planning and material choices, offsite-produced renovation solutions are aesthetically much more appealing.

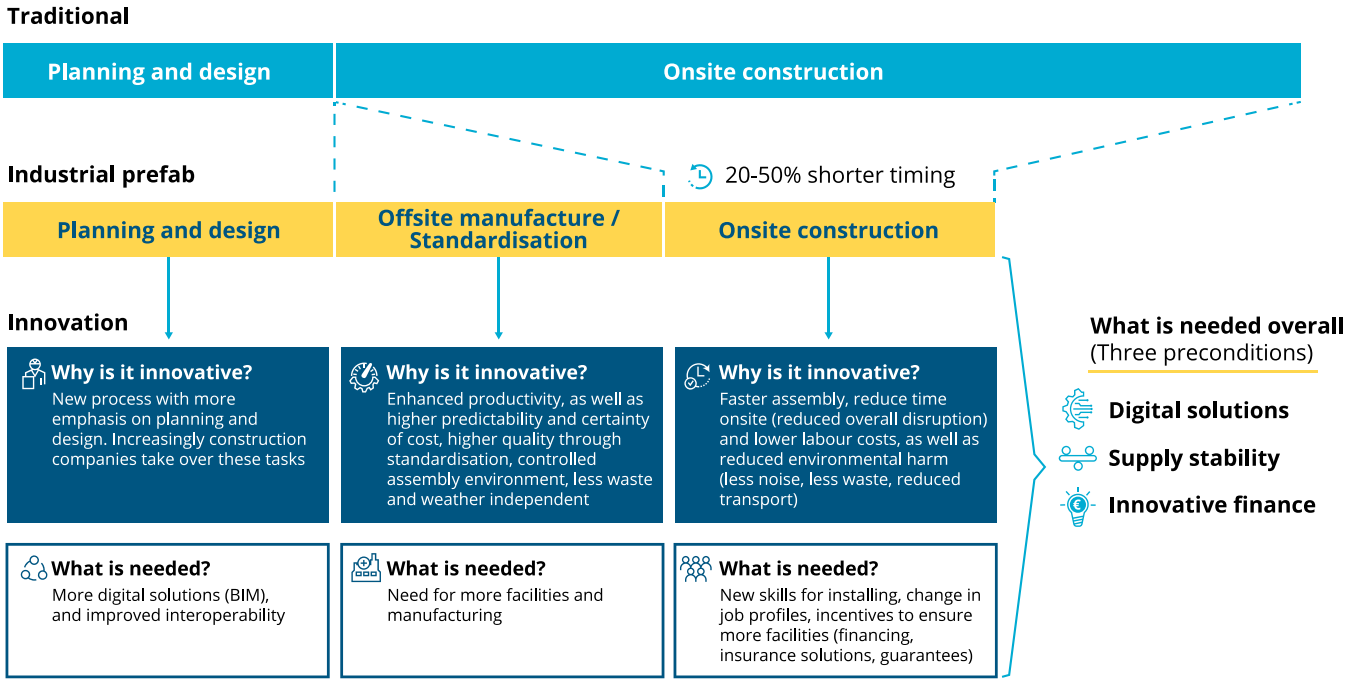

Figure 5. Shift in construction process phases due to offsite manufacturing and attached benefits (Glicker and Broer, 2022)

INDUSTRIALISED CONSTRUCTION AS A PUBLIC–PRIVATE INITIATIVE

The cost and quality benefits of industrialised construction require deliberate alignment between public procurement, building standards, subsidy design and industrial policy. The Chilean MINVU's programme is a comprehensively documented example of how this alignment can be achieved at national scale, and its results illustrate what becomes possible when the system is designed around the construction method rather than adapted to it after the fact.



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In Chile, the housing deficit is being addressed by an agreement between the Ministry of Housing and Urban Development (MINVU) and construction companies that work largely offsite in an industrialised way to jointly design prefabricated housing models (MINVU, 2024). Each housing model must comply with thermal regulations and energy labelling requirements but must also demonstrate compliance with minimum industrialisation and modularity indicators to secure affordable housing with significant environmental and social benefits. Households who construct one of the 17 certified housing models receive subsidies from the central government, including the DS49 subsidy scheme for vulnerable households. One example is the ProZero Industrialised Building (Corporación de Fomento de la Producción de Chile [CORFO], 2025). Due to their flexibility in mounting and disassembly, these modular social housing units allow for relocation in emergency situations such as earthquakes or fires. They have also quickly shown a significant reduction in environmental impact through savings of energy, water and waste compared to traditional construction methods.

Thus, by changing construction methods and aligning financial and regulatory systems, MINVU is showing that lower-cost, scalable and more sustainable housing can be achieved simultaneously. The experience also demonstrates how **public procurement, building standards and industrial policy can work together to create demand for sustainable housing solutions at scale**.

Policy recommendations to reduce physical construction costs

- Conduct a scientifically sound life cycle analysis to evaluate the costs and benefits of local resources and vernacular construction. When relevant, update and implement building codes to recognise them and prioritise them in public procurement and subsidies.

- Mandate performance-based procurement for public housing, specifying outcomes rather than methods, and align this procurement framework with building standards and subsidy design to favour industrialised or offsite construction and effective project management practices. Link subsidies and building certification to combined energy performance and productivity requirements, including provision for pooling projects delivered through prefabricated solutions.

- Support prefabricated renovation programmes for social and low-income housing stock, backed by performance guarantees to de-risk adoption.

- Provide financing support for sufficiency measures and better use of the existing stock, such as converting buildings into housing or mixed-use buildings.

- Require new buildings in fast-growing cities to be designed so their materials can be reused or recycled later, rather than demolished as waste ("design for deconstruction").

REDUCING COSTS RELATED TO LAND ACQUISITION THROUGH LAND POLICY AND ALTERNATIVE OWNERSHIP

Chapter 3.2 showed that land acquisition is a volatile and opaque cost component in housing provision, and that long-run house price appreciation across advanced economies is explained by rising land values rather than rising construction costs. Unlike physical construction costs, land values are strongly shaped by location, urbanisation trends, scarcity and public decisions concerning land use, development rights, infrastructure and the timing of land release. **Public policy therefore cannot determine land values outright, but it can influence the supply of developable land, the distribution of value created through planning decisions, and the extent to which increases in land value are translated into the cost of affordable housing**.

LAND GOVERNANCE AND VALUE CAPTURE

When a planning authority grants development rights, the value of the affected land can increase dramatically, often without any investment by the landowner. The policy response should seek to recover part of this uplift for public purposes, including affordable housing delivery.

Planning obligations and developer contributions are the most widely used instruments across OECD countries. In England, Section 106 agreements require developers to fund infrastructure or provide affordable housing as a condition of planning approval and yielded an estimated GBP 3.7 billion in contributions in 2011/12 (TCPA, 2018). The mechanism works but has documented weaknesses: for example, case-by-case negotiation favours well-resourced developers, viability assessments have been used to reduce affordable housing contributions, and the system captures value from land being developed rather than from all land that benefits from planning decisions.

More structural approaches seek to capture planning-created value through public land development itself. In Germany, municipalities can acquire land before major urban development measures are implemented, undertake planning and infrastructure provision, and subsequently dispose of serviced plots. Under the *Städtebauliche Entwicklungsmaßnahmen* instrument, **land can in specified circumstances be acquired at a value reflecting conditions prior to the planned public investment or rezoning**. Where owners retain their land, they can instead be required to pay an amount corresponding to the land-value increase generated by the development measure. **The mechanism** therefore **allows part of the uplift associated with public planning and infrastructure decisions to contribute to the costs of development rather than accruing entirely to the original landowner** (OECD, 2021).

The Netherlands has traditionally used a related form of active land policy. Municipalities acquire land, rezone and service it, provide roads and public spaces and subsequently recover their investment through the sale or lease of developed plots. The OECD describes strategic land management as an important component of Dutch spatial planning, housing policy and land-value capture, although municipalities also bear land-market and financing risks when using this model (OECD, 2021).

Public land leasing provides a related mechanism by separating development rights from permanent disposal of public land. Long-term municipal leasehold systems have been used in countries including the Netherlands, Sweden and Finland. **Rather than transferring freehold ownership, the public authority retains the land and grants long-term use rights in return for a ground rent**. The specific objectives and contractual arrangements vary; they have included facilitating housing development, retaining public influence over land use, generating municipal revenue and retaining part of future land value for public purposes. Amsterdam, for example, has operated a municipal ground-lease system since the late nineteenth century in which the city remains the landowner while long-term leaseholders obtain rights of use and pay a ground rent (City of Amsterdam, 2016).

There is further evidence that public policy can influence land supply and, in turn, housing market outcomes. In Hong Kong, econometric analysis of transaction data between 2003 and 2018 shows that releasing government-owned land measurably increases housing supply, while private landowners facing rising prices may have incentives to delay development in anticipation of further price increases. Public land release can therefore be timed to counter that dynamic directly (Ren, Wong and Chau, 2025).



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Singapore provides an example of a system in which public land policy, housing provision and land value capture have been used in combination to address housing supply and affordability.[16] Starting from a severe housing shortage in 1960, the government used state land ownership and a range of land acquisition, land release and land value capture instruments to deliver affordable public housing at scale, raising the share of the population in public housing from 9% in 1960 to close to 80% today while maintaining a median price-to-income ratio below five (Singapore Management University, 2026). The lesson is not that land markets should be abolished, but that land supply, development rights and planning-created land values can significantly affect housing affordability.

[16] Singapore's Housing and Development Board, established in 1960, has delivered approximately seven in ten of all dwellings built in the country over the past half century. The system rests on three coordinated instruments comprising state land acquisition and release, a mandatory household savings mechanism through the Central Provident Fund used for housing purchase from 1968, and a land value capture system formalised through the Development Charge (1964) and Land Acquisition Act (1966).

The available evidence illustrates that **public policy can influence the timing and quantity of land released for development and can determine how some of the value created through planning decisions is distributed or captured.** The appropriate policy response will depend on national and local contexts, including housing demand, land ownership patterns and institutional arrangements.

For governments and municipalities with significant land holdings, the strategic use of public land provides a further instrument for affordable housing policy. Recent EU policy discussions have increasingly emphasised the mobilisation of publicly owned land for affordable, social, cooperative and non-profit housing. The European Parliament's 2026 housing resolution calls on public authorities to mobilise public land and infrastructure-ready sites for such uses (European Parliament, 2026). The 2026 Commission proposal on fighting housing exclusion also identified mobilisation of public land as an avenue for the timely delivery of new social and affordable housing (European Commission, 2026a).

HOUSING TENURE AND OWNERSHIP MODELS THAT REDUCE LAND COSTS

The challenge with land acquisition cost is not only its level at any given moment but how it develops over time. In the absence of structural intervention, land values in growing cities tend to rise faster than income (Knoll, Schularick and Steger, 2017). **Ownership models that permanently separate land value** from building value address this dynamic at the root. They do not reduce land acquisition cost at the point of delivery, but they **prevent that cost from returning through subsequent transactions**. Housing cooperatives use collective ownership structures to prevent individual resale, removing units from speculative markets by design and maintaining affordability through every ownership transfer without ongoing subsidy.

Under the community land trust model, land ownership is separated from building ownership. The trust owns the land while residents lease or own the buildings, limiting displacement and gentrification. In continental Europe, use of the model has grown over recent years, from 33 community land trusts in 2017 rising to more than 350 in 2023 (Dickinson, 2023). A 2024 Lincoln Institute of Land Policy report drawing on insights from 115 CLTs across the United States found that the model reduces the upfront cost of homeownership and keeps homes affordable for future income-qualified households across multiple ownership cycles (Shewman, 2024). The model is used in countries outside Europe too – including Kenya, South Africa, Brazil, Puerto Rico and India – to secure land tenure for those living in informal settlements (International Center for Community Land Trusts, 2026). Research on the neighbourhood-level effects of community land trust acquisitions in the United States finds that they stabilise nearby property values without generating detectable increases in displacement, suggesting the model can be scaled without generating the gentrification effects that other affordable housing interventions sometimes produce (Ali and Raviola, 2025).



Figure 6. Simple illustration of a community land trust model, own depiction

The European collaborative housing sector is developing new financing and support infrastructure to scale these models. In Catalonia, the housing cooperative Sostre Cívic secured a EUR 31 million loan from the Council of Europe Development Bank, reflecting a growing institutional recognition of cooperative housing as a reliable non-profit housing provider (Housing Europe, 2026). Across Central and Southeast Europe, MOBA Housing has developed an accelerator mechanism providing early-stage finance to emerging cooperative housing projects, with repayments recycled into new developments to build intermediary capacity in regions where cooperative housing sectors remain limited.

France has developed an instrument called the Bail Réel Solidaire (BRS), introduced in 2016 and now established as a central tool of social homeownership policy. Like the community land trust model, the BRS separates land ownership, which is retained by a non-profit organisation called the Organisme de Foncier Solidaire (OFS), from building ownership, which is acquired by the household. Resale prices are capped by the OFS, preventing speculative gains and maintaining permanent affordability. In practice, BRS housing is delivered at 30-50% below market price; the average price of BRS homes delivered in 2024 was EUR 2,471 per m^2 against EUR 4,900 per m^2 for equivalent new market housing nationally (Wüest Partner, 2025). In the Grand Paris metropolitan area alone, seven OFS organisations had launched BRS operations comprising 2,800 housing units by the end of 2024, with prices ranging from EUR 3,500 to EUR 5,000 per m^2, 20-65% lower than free-market new housing prices (Apur, 2025).

In Germany, the Mietshäuser Syndikat was founded in 1992. This model creates a dual ownership structure for each housing project: a limited liability company is established jointly by the Syndikat and the residents' association, which purchases the building through a bank loan repaid by residents' rents. A structural veto right held by the Syndikat prevents any future sale of the building to a private owner, permanently removing it from the speculative market. The network encompasses more than 200 housing projects covering more than 150,000 m^2 of living space and housing more than 3,800 residents across Germany (Mietshäuser Syndikat, 2026). A distinctive feature of the model is that it has a self-reinforcing financing logic: loans on existing projects are paid off by rents, and income from rent is recycled to finance newly established projects elsewhere in the network, reducing dependence on external subsidy over time. The model has also spread beyond Germany, with similar initiatives adapting the legal structure to Dutch and Spanish contexts. These ownership models directly operationalise the legal security of tenure dimension of the adequacy framework, and by preventing speculative repricing they make the affordability dimension permanent rather than temporary.

An example of **keeping affordable housing in permanent rental tenure and preventing its sale** is Vienna's social housing model. The model explicitly relies on investors willing to forgo a market-rate return, such as municipal or limited-profit (Limited Profit Housing Association) developers, in exchange for stable, long-term, non-speculative returns (Litschauer, Altreiter and Kumnig, 2026).

Property-linked finance takes a different approach to the same problem of upfront costs. Rather than changing who owns the homes, it changes how the investment is repaid, linking financing to the property itself rather than to the individual borrower. Repayments are attached to the asset, are aligned with the life of the asset, and are transferable to future owners. This solution can provide long-term funding for environmental upgrades to buildings while helping to overcome upfront cost barriers (GFI, 2024).

Policy recommendations to reduce costs for land acquisition

- Expand legal and financial support for ownership models that permanently separate land value from building value so affordability is preserved through future transactions.
- Recognise collective ownership models including community land trusts and housing cooperatives in national housing strategies to limit speculative pressures and secure long-term tenure.
- Promote rental housing as a long-term investment vehicle in social housing, positioning the stable, recurring revenue that rental tenure generates as an attractive proposition for long-term investors such as institutional funds and public entities; keeping housing in rental tenure rather than selling it to individual owners ensures that units remain permanently within the affordable housing stock.

REDUCING OTHER COSTS RELATED TO FINANCING, PLANNING AND COORDINATION

Beyond physical construction and land, a substantial share of total housing cost arises from financing charges, planning and permitting processes, professional fees, insurance, administrative overhead and the transaction costs of coordinating across multiple actors and institutions as well as across construction stages. Unlike physical construction costs, which are driven by productivity and materials, these costs are primarily driven by institutional design, i.e. how housing is financed, how its delivery is governed, and how well the actors involved can coordinate. **This pathway addresses financing costs directly through instruments that restructure who bears the upfront cost and when it is repaid, and coordination costs through delivery models that integrate project delivery, aggregate demand, simplify administration and involve communities in ways that reduce the overhead that conventional development processes generate**.

FINANCING COSTS

As shown in Chapter 3.3, financing costs are a growing and underappreciated component of total housing project cost. To ensure affordable and sustainable housing can be provided despite rising costs for finance, several mechanisms are used in practice.

In France the Éco-Prêt à Taux Zéro (Éco-PTZ), a zero-interest green loan programme for home energy retrofits, was introduced in 2009. The Éco-PTZ programme shows that **zero-interest financing can significantly boost renovation activity**. A causal evaluation of the programme finds that eligibility increased the probability of renovation by 20-22% on the extensive margin (the decision to undertake renovation) in the first two years after the scheme's introduction and increased the intensive margin by 3-5% (the amount spent on renovation works). These effects were concentrated in 2009 and 2010. From 2011 onwards, no statistically significant effect was detected. The programme also enabled 1.5% of eligible households to switch from fossil fuel heating systems to cleaner alternatives. The programme particularly benefited low-income households by reducing credit constraints, with leverage estimates of 1.4-1.7 in the effective period, suggesting each euro of public expenditure on interest subsidies induced up to EUR 1.7 of additional private renovation investment. However, participation declined sharply after 2011, when banks reduced their promotion of the scheme. This highlights the importance of effective programme delivery and awareness in achieving high uptake (Eryzhenskiy, Giraudet and Segú, 2024).

In low- and middle-income countries, private debt financing for green construction and related supply chains remains scarce, reflecting the fact that their sustainable finance markets are less developed than those in advanced economies. To address these gaps, **financing and de-risking instruments such as sustainability-linked debt, green mortgages and blended finance can help channel investment into mitigation and adaptation efforts by improving the risk-return profiles for private investors**, making investments viable where they are currently not.

A number of initiatives show that financing affordable and sustainable housing is possible. In India, the IFC-supported H-DREAM fund, led by HDFC Capital, mobilises private capital for low- and middle-income housing that meets EDGE (Excellence in Design for Greater Efficiencies) sustainability and efficiency standards (IFC, 2023). Other similar blended finance initiatives with local financial institutions include the Green Home Loan which is subsidised by Home First Finance Company with a cashback of 2.4% of the loan amount and includes upgrades such as water efficiency or energy-efficient cooling, smart shading or cool roofs (Sodani, 2026).



© Iqro Rinaldi - View of worker from a construction building in Jakarta, Indonesia.

A concrete example of how blended finance, risk mitigation instruments and capital market mechanisms can be integrated into a single national platform in practice is the Indonesian Programme for Environmentally Friendly, Affordable Housing (IGAHP). It is led by the Ministry of Public Works and Housing and receives technical support from the Korean Green Growth Trust Fund, as well as facilitation from the World Bank. The programme aims to close a structural financing gap. Indonesia's mortgage lending amounts to just 4.7% of GDP, which is far below that of comparable countries in the region such as Malaysia (36%) and India (7.9%), whilst at the same time the country faces a shortfall of 12.7 million households in terms of home ownership and a shortfall of 23.7 million households in terms of housing quality, with the majority of these homes being neither climate-resilient nor energy-efficient. In addition, households with informal incomes account for almost 60% of the demand for home ownership. The solution proposed by the IGAHP is a blended finance platform structured through a special purpose vehicle (PT Sarana Multigriya Finansial). It combines concessional capital from multilateral development banks, development agencies and philanthropic investors with commercial investments, and channels this to financial institutions in the form of debt (microfinance, green construction finance, green co-financing) as well as in the form of equity (green housing project finance). **The combination of this financing structure with targeted technical support and risk-mitigation tools as parallel measures sets the platform apart, as it directly addresses the risk-return and capacity barriers that typically deter private lenders from serving borrowers with low incomes and informal earnings**. The estimated financing facility amounts to USD 725 million and aims to provide one million homes by 2030 (Trisaputra Zuna, 2023; IHRB, 2024).

Social impact bonds and outcome-based financing instruments reduce the financing costs of sustainable housing investments by shifting the timing and conditionality of the payment. Specific solutions are being developed and applied for the renovation of existing buildings occupied by vulnerable groups. In France, the idea of so-called contrat à impact is being presented as a policy solution to increase renovation for low-income households (EU Peers, 2025). This idea of a **social impact bond** building on earlier experiences with the French programme Hémisphère (GO Lab, 2021) **involves a social operator responsible for overseeing the project, a financial institution providing pre-financing, and a public authority repaying the investment once the project is completed, based on the social or environmental benefits achieved** (which are quantified using pre-defined indicators). Social impact bonds can help channel investment towards the most effective actions and reduce the financial risk for the public sector, making them particularly valuable in contexts of fiscal constraint. They also encourage climate change mitigation efforts in the housing sector, while placing a value on the societal and environmental benefits of renovation measures (ADEME, Energies Demain and Technopolis Group France, 2024).

Other established schemes also provide pre-financing, such as energy performance contracting, where upfront investments are repaid through energy savings. Those energy service company (ESCO) models proved to work in the non-residential sector but there are also examples of ESCOs financing energy renovations of multi-family apartments. A prominent example is the Latvian Renesco, where deep renovation is fully financed upfront and recovered through 15-20 year energy savings contracts (Renesco, 2026). The Energiesprong business model is also based on an energy service contract combined often with a >15-20-year performance guarantee to ensure a long-term financially viable renovation model (Energiesprong, 2026b). One-stop shops play a vital role in supporting energy-efficient building renovation by providing technical assistance and facilitating access to finance through banks or local financial institutions. **Some one-stop shops also offer specific loans for vulnerable households where repayment is deferred until the property is sold or transferred, as well as pre-financing for public support schemes** such as Oktave in France (Oktave, 2026) or Amiestas in Lithuania (Amiestas, 2026). The provision of technical capacity both for homeowners and for local supply chain actors is a crucial success factor alongside the provision of financial support (IEA, 2025b).

Carbon pricing can improve the relative economic viability of low-carbon construction and renovation measures by raising the cost of the emissions-intensive alternative. It works by attaching an explicit monetary cost to the emissions associated with construction materials, heating, cooling and electricity use, which narrows the gap between the higher upfront cost of low-carbon building measures and their long-term value. A review of studies assessing the costs of greenhouse gas mitigation in buildings found that a large share of building-sector emissions can be avoided through relatively low-cost measures. At a price of USD 20 per tonne of CO_2 equivalent, many efficiency measures and material choices will shift from net costs to net savings because of the price signal (Levine et al., 2007).

While there is a dedicated European emissions trading scheme for building and transport fuels (European Commission, 2026b), carbon pricing globally is still under-applied to buildings. The buildings sector currently has only about 13% of its emissions covered by a direct carbon price, well below roughly 51% coverage in the power sector and 43% in industry, pointing to significant room for pricing to strengthen the business case for sustainable construction as coverage grows (World Bank, 2026a).

Where carbon pricing has been implemented, the evidence suggests it delivers real emission reductions. A 2024 meta-analysis of 21 carbon-pricing policies found that at least 17 produced emissions reductions of between 5% and 21% (Döbbeling-Hildebrandt et al., 2024). **A carbon price becomes an effective policy instrument if it is part of a policy mix**. Carbon taxes, emissions targets, green building codes and regulatory incentives are tools governments can use to increase the economic viability of new building decarbonisation business models, which in turn helps attract private financing, effectively converting previously unpriced externalities into quantifiable, bankable returns for developers and lenders (Chang, Fornara and Sanghvi, 2024). As the scope of CO_2 pricing and price levels continue to rise, the economic viability of sustainable, low-carbon and affordable housing is evolving from a niche concept reliant on subsidies into a mainstream investment model.



© Krzhck - Duntou Town, Haian, Nantong, Jiangsu, China.

REDUCING COORDINATION AND TRANSACTION COSTS THROUGH NEIGHBOURHOOD SCALE DELIVERY

A share of the other costs arises from the fragmentation of housing delivery across multiple actors, institutions and governance levels. Where individual households, developers, local authorities, infrastructure providers and financiers each navigate separate processes, the transaction costs accumulate at every interface. Neighbourhood-scale and community-led delivery approaches address this directly by aggregating demand, consolidating processes, and in some cases transferring coordination responsibility to community organisations that operate at lower overhead than conventional development pipelines.

The IEA notes that **shifting the scale of renovation from individual buildings to a building cluster or to district level can enable energy retrofitting at a quicker pace and reduce overall cost** (IEA, 2022), while also creating opportunities to address housing affordability, grid integration and urban planning in one coordinated intervention. Individual homeowners or tenants cannot access the procurement discounts, logistical efficiencies or design standardisation that make industrialised renovation viable; at neighbourhood or district scale, these constraints disappear.

CASE STUDY

The Xingsheng Village project in China's Ningxia Hui Autonomous Region

The Xingsheng Village project in China's Ningxia Hui Autonomous Region provides a case study in which reduced emissions and improved living conditions were achieved at neighbourhood scale. The zero-carbon village project in Xingsheng Village, a rural community in China's Ningxia Hui Autonomous Region, has gained broad recognition as a scalable model for decarbonising China's vast rural areas; it was initiated at the local level and was made possible through the collective efforts of multiple stakeholders. During the pilot phase, 33 houses were completed by the end of 2024, providing local residents with affordable, zero-carbon, future-ready housing and delivering a significant reduction of 978.4 tCO_2e per year.

Replacing the previous reliance on coal for heating and cooking, the new homes are equipped with an integrated zero-carbon energy system that includes high-performance prefabricated façades, solar PV, heat pumps and battery storage, and all-electric heating and cooking. This system not only enhances comfort at an affordable cost but also enables residents to sustain a largely self-sufficient lifestyle with small-scale agriculture. Such pilots and studies in China are contributing to the formulation of mandatory energy-efficiency design standards for rural housing, and demonstrate the viability of applying zero-carbon rural concepts in comparable settings, which collectively account for about 20% of operational greenhouse gas emissions from buildings in China.

In order to serve as role models, projects have to be closely monitored, as was the case in Xingsheng Village. In terms of cost monitoring, a conventional approach was chosen. Affordability was defined primarily by two indicators, the upfront construction cost and the long-term operational cost for residents. In the project, the more critical of these was the construction cost. The business-as-usual scenario refers to a conventional rural house with a construction cost of RMB 1,500/m^2 corresponding to around EUR 194/m^2 or USD 222/m^2, typically without insulation and relying on coal for heating. The target cost for the project was to stay below RMB 2,000/m^2 (approx. EUR 250/m^2 or USD 295/m^2): with high-quality insulation and zero-carbon energy systems, this was the maximum amount residents could afford based on previous local willingness assessments. The affordability was achieved through technical optimisation (e.g. choosing cost-effective insulation, prefabricated walls, optimising window-to-wall ratios), government subsidies for high-performance buildings, and an innovative business model (energy management contract (EMC) through an ESCO) that eliminated the need for residents to pay the high upfront cost for energy equipment. The optimised 75% energy efficiency solution achieving net-zero energy consumption by supplying the remaining energy with onsite PV reduced the building cost to RMB 1,800/m^2 compared to RMB 2,700/m^2 for a passive house standard. The village energy station model lowered the initial investment for heating equipment from RMB 18,000 per household to RMB 12,000-15,000. Finally, the EMC business model was validated, showing a viable path to profitability for the ESCO within seven to nine years.

Community-led delivery reduces coordination costs for a related but distinct reason: it **internalises information that conventional top-down delivery has to purchase or approximate**. Residents possess knowledge about a settlement's drainage patterns, movement routes, tenure arrangements and social networks that no external planner holds and that determines whether an intervention is appropriately targeted. **Where this knowledge is excluded, interventions are frequently mismatched to actual need, generating the waste and rework costs that inflate total project cost without adding adequacy**. A systematic review of 10 published case studies on upgrading informal settlements across low-income regions found that projects with higher levels of participation led to more sustainable and resilient outcomes. In contrast, top-down approaches where community input was limited often produced outcomes that were less durable and reduced community ownership of the resulting actions. A comparative analysis of government-led and community-led upgrading strategies in sub-Saharan Africa reached the same conclusion, namely that community-led initiatives consistently prioritise local empowerment, affordability and contextual appropriateness and decrease the risk of gentrification, while government-led projects, though better resourced, are more at risk of producing outcomes that fail to match residents' actual needs or result in displacement (Dinye et al., 2025).

Under Thailand's "Baan Mankong" programme, government housing subsidies and infrastructure funding are channelled directly to community organisations rather than to property developers or public housing authorities. Between 2003 and 2011, the programme enabled over 90,000 households in more than 1,500 communities to improve their own housing conditions and infrastructure through community-led planning and construction projects (Norford and Virsilas, 2016). This built trust, increased security of tenure, and led to the development of upgrading strategies that better met local needs than comparable top-down investment. The social networks and mutual support structures built through the programme proved to have value beyond the physical housing improvements themselves. **When the COVID-19 pandemic hit, these community bonds became a critical resource for collective response and recovery, demonstrating that community-led housing delivery builds social resilience that outlasts the construction phase** (Wungpatcharapon and Pérez-Castro, 2022). The programme's cost efficiency compared to conventional developer-led social housing reflects the elimination of developer margin, reduced administrative overhead and better targeting, all of which are coordination cost reductions.

Renewable energy communities and collective purchasing schemes enable shared investment in clean energy, reducing unit costs and improving access to technologies that individual households could not finance alone. More than 8,000 energy communities now exist across the EU, having grown substantially following the REPowerEU target of at least one energy community per municipality with a population over 10,000 (European Union, 2025a). Research on collective self-consumption platforms finds that community members can purchase clean energy at around 30% below standard retail electricity prices, while simultaneously achieving significant emissions reductions (Šironja, Antić and Capuder, 2025). There are increasing examples of the collective purchase of heat pumps or insulation material in municipalities such as in Sønderborg, Denmark (ProjectZero, 2026), Utrecht, Netherlands (NPLW, 2024), or within the Global Energiesprong Alliance (Energiesprong, 2024).

FASTER PERMITTING AND INTEGRATED DESIGN TO REDUCE ENGINEERING AND PLANNING COSTS

Decisions taken during the planning phase and an integrated planning approach can significantly reduce engineering costs for new builds. Integrated Project Delivery (IPD) is a business model in which the client, architect and contractor share risks and rewards under a single contract. The American Institute of Architects found that over 90% of the IPD projects they analysed met or exceeded their budget targets, with cost savings of up to 20% compared with traditional construction management (AIA California Council, 2010). A study commissioned by the British Government found that integrated approaches reduced construction costs by between 2% and 10% for individual projects and by up to 30% for a series of recurring projects, with structural engineering in particular being identified as a key area for cost savings (Viana et al., 2020). **When engineers, architects and building contractors work together from the outset, rather than in successive handover phases, rework, the administrative burden of documentation and planning errors can be reduced**. Furthermore, IPD cost-sharing models (where teams share any unused funds with the client) create direct incentives for engineers to find more cost-effective and better-coordinated solutions, rather than resorting to conservative, isolated designs (Ashcraft, 2022). **Digital solutions such as Building Information Modelling (BIM) may further help to streamline, standardise and integrate processes**.

Governments can support integrated project delivery through their public procurement laws and procedures (Schwarzwälder, 2023). One way of support would be to mandate integrated methods such as IPD and BIM applications as a condition of winning public contracts. While this is often thought of as a solution for larger non-residential buildings, this is increasingly being applied for new construction projects, especially if large numbers of dwellings are to be built. **Pilot projects in the public sector help to demonstrate the feasibility of the solution and thereby de-risk adoption for the wider industry**. Serial renovation with prefabricated façades is an example of where digital project and process management and integrated design are crucial (see section 4.1; Yildiz et al. 2024).

Linked to a change in construction and renovation project management is the question of available workforce. While these BIM-based processes and IPD require different qualifications compared to traditional methods, the overall labour intensity of the construction or renovation project decreases and cost reductions can be expected at least in the medium term (Amorocho, Graaf and Steuwer, 2025).

Policy recommendations on reducing other costs related to financing, planning and coordination

- Combine preferential financing instruments (interest-free loans, blended finance, green mortgages) with a sustained commitment from banks or lenders, as well as public awareness campaigns.
- Expand results-based instruments (social impact bonds, energy efficiency contracts) to shift the upfront risk away from public budgets and towards measurable outcomes.
- Channel, where possible, subsidies and infrastructure funding directly to resident-led community organisations and cooperatives rather than to property developers or centralised housing authorities. Include dedicated finance streams for resilient affordable neighbourhoods designed at community level to meet local needs.
- Implement regeneration and infrastructure programmes at neighbourhood or district level to achieve collective (shared) solutions, procurement discounts and coordination savings that are not available to individual households.
- Develop and implement carbon pricing mechanisms in the building sector, so that the environmental costs of construction and renovation are reflected in market prices rather than shifted onto future generations.

REDUCING COSTS OVER THE BUILDING'S LIFE CYCLE

This pathway is most directly linked to the report's concept of long-term adequacy. A dwelling may meet affordability criteria at the point of acquisition while failing to remain affordable if it exposes occupants to high energy expenditure, climate-related damage, avoidable health burdens or major future adaptation costs. **Considering costs over the building life cycle therefore operationalises intergenerational dimensions of housing adequacy**.

In the absence of comparable data on the share of different cost elements along the life cycle of a building, we propose to collect data more systematically in the future to move from anecdotal evidence to representative figures per building type across different segments of the housing continuum in different global regions along the following cost categories, to better understand the impact of more sustainable solutions:

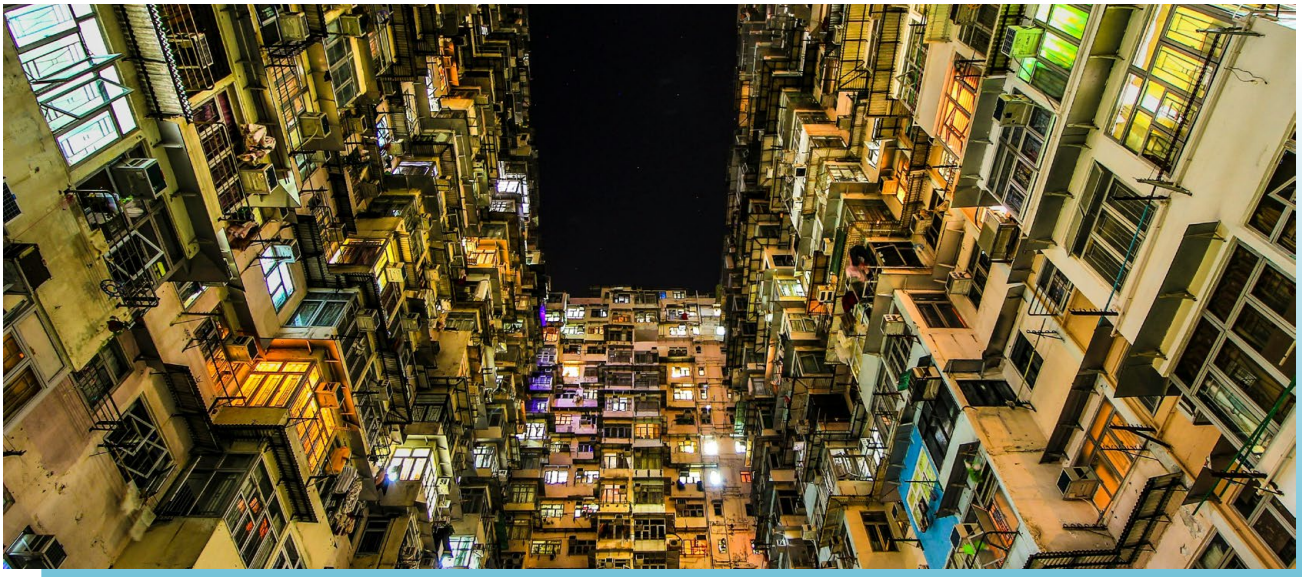
Table 3. Impact of sustainable measures on housing cost

	Cost element	Impact on cost category due to a more sustainable solution
Total costs of a building over a 50-year lifetime	**Costs for land acquisition**	Alternative ownership models such as community land trusts can keep land costs affordable over the long term by removing land from speculative markets and separating land ownership from building ownership.
	Physical construction costs for new build (materials, equipment, workforce)	Higher investments in materials, insulation and technical building systems reduce operating costs and increase the building's overall value.
	Planning and design of building	Higher investment in the planning phase for sustainable solutions (shading, orientation, etc.) often pays off as they help to avoid operating and maintenance costs over the lifetime.
	Costs for financing of construction and renovation	Sustainable construction alternatives can lower the cost of financing through green loans, subsidies, and favourable lending terms, while reduced operating costs and lower risk of stranded assets improve long-term affordability.
	Physical construction costs for renovation and repair	Design for reuse and disassembly as well as choice of long-lasting, context-adapted materials and technologies to a future-proof standard reduce needs and costs for major renovation and early replacements.
	Costs for energy during operation (annually and over the life cycle)	Renewable heating systems offer lower and more stable operating costs than fossil-fuel systems.
	Expenditure on CO_2 costs (annually and over the life cycle)	Annual CO_2-related costs are close to zero for renewable heating systems, since they largely avoid the carbon pricing applied to fossil heating fuels.
	Costs for maintenance during operation (annually and over the life cycle)	Sustainable buildings adapted to the needs of the occupants and the climatic context require less maintenance.
	Insurance over the lifetime of the building	Investments in sustainable buildings adapted to needs and climatic conditions are less risky and thus costs for financing and insurance are comparatively lower.
	Health costs over the life cycle of the building	Improved indoor environmental quality and climate-resilient buildings have health benefits for the occupants translating into substantial savings in public health spending.

DESIGN FOR LONG-TERM AFFORDABILITY

The decisions with a disproportionate influence on a building's lifetime costs are made before construction begins. **Design choices about insulation levels, glazing specifications, heating system type, building orientation and structural layout determine not only upfront construction cost but the energy bills, retrofit costs, health costs, and climate resilience over the lifetime in which the building is used**. The IPCC identifies insulation, solar shading, natural ventilation, orientation, thermal mass, reflective materials and green building elements among the design measures available to improve buildings' performance under changing climatic conditions. Passive cooling is particularly dependent on decisions concerning building form and envelope that are most easily incorporated at the design stage (IPCC, 2022b).

The appropriate solution varies by climate and building type, and passive measures cannot eliminate mechanical heating or cooling requirements everywhere. Nevertheless, integrating appropriate envelope design, shading, orientation and ventilation early can reduce subsequent energy demand and the size or use of mechanical systems. IFC documents the cost implications of passive design decisions in the EDGE-certified Citra Maja Raya affordable housing development in Indonesia. EDGE is a voluntary green building certification system. In the EDGE-certified development, measures including an optimised window-to-wall ratio, external shading, insulation and natural ventilation increased reported construction costs by 4.7% with a payback period of 1.8 years, while EDGE modelling estimated a 30% reduction in annual utility costs (IFC, 2019). This is a project-specific result rather than a universally applicable cost premium, but it illustrates how design can shift the balance between upfront and operating expenditure. Mandatory energy efficiency requirements for low-income residential housing do not yet exist at national level in Indonesia. However, Jakarta's Governor Regulation No. 38/2012 on Green Buildings established a mandatory green building code setting minimum energy and water efficiency requirements for new and existing large buildings in Jakarta. The code applies to residential buildings above 50,000 m^2 of floor area, meaning it covers large apartment developments but not most low-income or small-scale residential construction (IEA, 2012). From 2012 to June 2019, a total of 389 buildings representing approximately 25 million m^2 of floor area met the requirements, achieving a reduction of 1,079,361 tonnes of CO_2 (Sahid, Sumiyati and Purisari, 2021).



© Florian Wehde - High density apartment buildings in Hong Kong.

Maintenance, repair and future renovation are a natural part of building expenditure over time, yet costs can be reduced by considering maintainability, durability and adaptability from the planning stage onwards. Reviews of the literature identify accessibility of components, material and system selection, simplicity of maintenance and the ability to inspect, repair and replace components as factors that can influence maintenance requirements and life cycle cost. A study of high-rise residential buildings found significant relationships between design deficiencies and maintenance costs, identifying architectural design, material selection and access for maintenance among the relevant factors.

Decisions need to be context specific. A material or construction system that performs durably in one climate may generate higher maintenance requirements in another. For example, research on low-cost housing in Malaysia's northern region finds that the tropical climate (consistently high temperatures, high humidity and heavy rainfall) significantly accelerates the degradation of construction materials and building components, posing specific challenges for maintenance that differ fundamentally from cooler, drier contexts (Zubir and Suleiman, 2025). Material selection matched to the local climate and building use is therefore a design decision with maintenance cost consequences that extend well beyond the construction phase.

Additionally, the assumptions and methods employed to calculate the LCC of buildings from an investment standpoint can yield different outcomes for the same building (Hu and Skibniewski, 2021b; Zhang et al., 2024; Balasbaneh, Sher and Li, 2025). Historically, developers, policymakers and lenders evaluated building performance primarily in terms of initial capital expenditure and immediate operational costs. Today, however, this assessment is shaped by a more complex set of factors, including construction cost premiums (Hu, 2022), whole-life carbon and life-cycle assessments (Schwartz, Raslan and Mumovic, 2018; Liang et al., 2023), the valuation of multiple co-benefits (Taranu, Zuhaib and Gokarakonda, 2024), increasingly stringent building regulations (Evans, Roshchanka and Graham, 2017; Ürge-Vorsatz et al., 2020) and strategic government commitments (Natural Resources Canada, 2024), market-driven green premiums (Dalton and Fuerst, 2018; Addae-Dapaah and Wilkinson, 2020) and financial incentives (Department of Finance Canada, 2024).

It is generally believed that sustainable buildings are more expensive to construct. Evidence on the cost premiums associated with green buildings varies by region, building type, and the methods used for estimation. A systematic review of 31 studies found a median and mean green cost surcharge of 7% across all building types and regions globally, with Europe recording the lowest value of 3% (Hu, 2022). The meta-study, however, highlighted the lack of comparability of data due to differences in data collection methods and studies focussing on real data versus those focussing on hypothetical costs (ibid). In the UK, Passivhaus Trust research from 2015 found that a Passivhaus home costs 10-23% more than an affordable home built to standard Part L regulations. A separate comparison with a typical existing dwelling found a 20-25% cost uplift (Passivhaus Trust, 2015). More recent Passivhaus Trust evidence from 2021 suggests a lower average cost premium of around 8%, with the additional investment recovered over a payback period of approximately 8 to 21 years, depending on the heating source (Passivhaus Trust, 2021). These figures use different reference points and are therefore not directly comparable; however, the more recent data confirm that Passivhaus construction has scaled up and average costs have come down (World Bank, 2026b).

In a review, the World Green Building Council found that cost premiums for certified sustainable residential buildings ranged between 0.4% and 12.5% compared to building-code-compliant construction (World Green Building Council, 2025b). UK zero-energy homes bear a cost premium of around 12.5%, likely reflecting the higher technical specifications required to achieve near-zero energy performance in a cold climate with an older building stock. In Switzerland, research on MINERGIE-certified residences finds a green premium of 2.45% across the canton of Zurich as a whole, rising to 4.91% in the city of Zurich itself (Kempf and Syz, 2022).

While estimates vary considerably by region, building type and methodology, the **overall evidence suggests that green cost premiums, though real, are moderate and are declining as sustainable construction methods become more widespread**. An Australian case study found that green-certified affordable housing reduced total housing costs for tenants by 1.7-3.8% over a 10-year tenancy through operational utility savings (MacAskill et al., 2021). This is a useful corrective to the cost-premium framing. It shows that **when life cycle occupancy costs are included, certified sustainable housing frequently costs less in total than conventionally built alternatives, even when it costs slightly more to construct**.

Analysing the life-cycle assessments of 28 new DGNB-certified residential buildings in Germany, a study assessed what additional expenses or cost savings clients can expect when carrying out life cycle-optimised, more climate-friendly residential building projects. It showed that there is no clear negative or positive correlation between the attainment of limit values for life cycle greenhouse gas emissions and construction costs. While average life-cycle-optimised buildings are marginally more expensive, numerous individual projects show that life-cycle-optimised construction can be realised at much lower costs compared to average construction costs. The analysis also confirmed that there is no correlation between low CO_2-values during building use and high construction costs. The latter can even be lower for buildings with lower GHG emissions (DGNB and BPIE, 2025) as also illustrated in Figure 7.

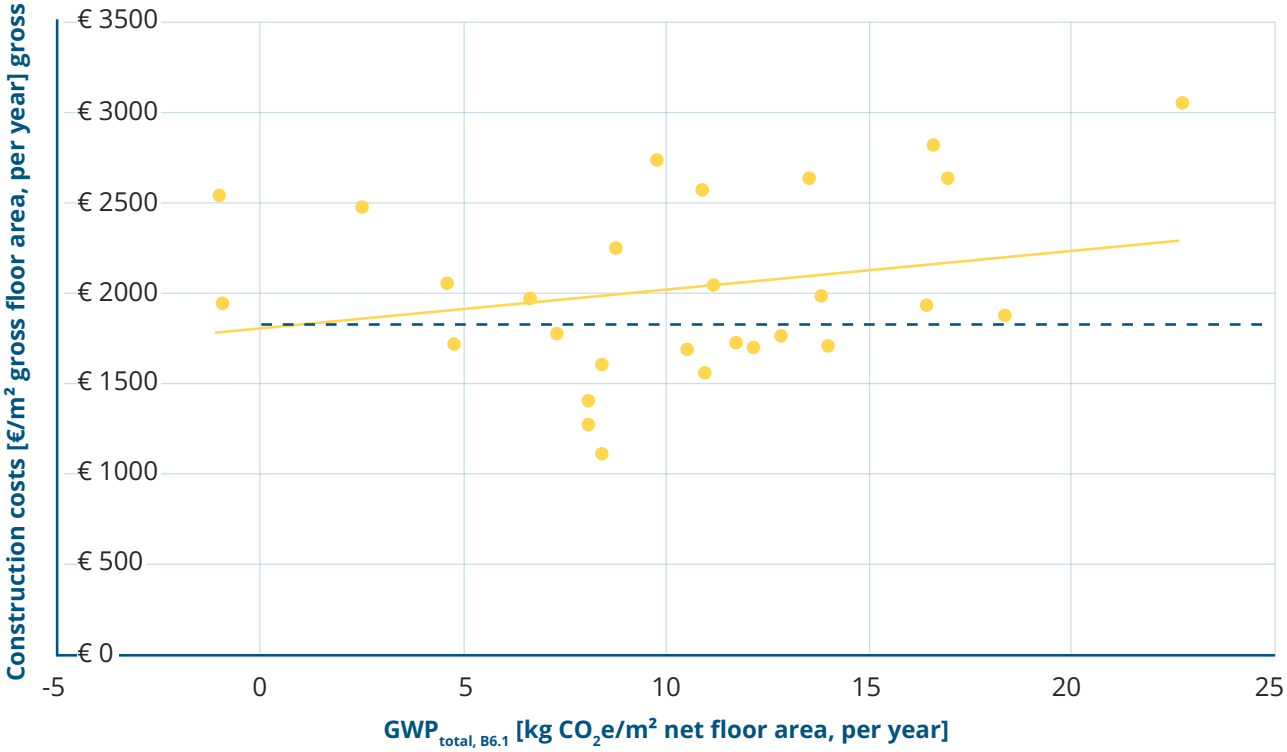


Figure 7. Correlation between CO_2 emissions for building use (horizontal axis) and construction costs (vertical axis) in the case of 28 new residential building projects in Germany; source (DGNB and BPIE, 2025).

MAKING LONG-TERM COSTS AND BENEFITS VISIBLE IN DECISION-MAKING

Chapter 3.4 introduced the case that life-cycle costs are often excluded from standard financial appraisal. From a life-cycle costing perspective, standard cost measurement practice often considers only investment or construction costs, leaving out operating costs, maintenance, renovation and end-of-life costs that can substantially alter the economic case for different building strategies. A systematic review of LCC estimation methods in the building upgrade literature finds that the net present value (NPV) method is the most frequently used LCC indicator in the reviewed papers (Balasbaneh, Sher and Li, 2025). ISO 15686-5:2017, the international standard for building life-cycle costing, provides the reference framework for performing these analyses (ISO, 2017). The idea behind LCC is to combine all past, present and future expenses into today's monetary value. Key components include initial capital, future operational costs, and the discount rate. Traditional LCC methods consider only financial costs, omitting environmental costs. Since energy expenditure typically makes up a large share of operational costs, standard LCC already rewards energy efficiency. However, carbon emissions remain unpriced beyond what existing carbon prices capture, so the environmental benefits of low-carbon options are not fully reflected in the result. **To align investment decisions with climate goals, LCC frameworks need to integrate environmental costs including carbon pricing or global-cost approaches alongside financial costs as well**.

The split incentive problem, where a landlord finances energy improvements while the tenant receives the benefit through lower bills, is addressed most directly through instruments that either change who bears the cost of poor performance or make performance legible to those who bear it. On the regulatory side, the revised Energy Performance of Buildings Directive sets a national trajectory for residential buildings requiring Member States to progressively reduce the average primary energy use of the residential stock, with the long-term objective of achieving zero-emission buildings by 2050 and a minimum global warming potential disclosure requirement for new buildings from 2028 (ECNO, 2026). By making building performance a matter of national housing strategy rather than individual choice, this creates the policy environment in which split incentives would become more costly to sustain. On the market side, voluntary certification systems such as BREEAM and LEED make energy and environmental performance legible to buyers and lenders at the point of transaction, creating a price signal (the green premium) that partially internalises future performance into current asset value. Evidence confirms that certified green buildings command a premium in sale and rental markets, though this signal is stronger in commercial than in residential markets and largely absent in the affordable housing segment where the split incentive problem is most acute (Hu and Skibniewski, 2021a).

The discount rate and investment horizon problems are addressed by instruments that convert long-term savings into upfront financial value or spread upfront costs over time. The net present value method was the most widely used life-cycle cost indicator in a review of academic literature on building upgrades (Balasbaneh, Sher and Li, 2025). When applied with a social discount rate that reflects the longer time horizons of buildings rather than the short-term rate of return expected by a private investor, it consistently makes the case for deeper renovation. The challenge is that private actors apply private discount rates.

Zero-interest or concessional renovation loans could be instruments to reduce the effective cost of financing for the household, in the zero-interest case to zero for the loan term, so that annual energy savings cover repayments **and justify the upfront investment**. France's Éco-Prêt à Taux Zéro, described in section 4.3, demonstrated this, as eligibility increased the probability of renovation by 20-22% in its effective period (Eryzhenskiy, Giraudet and Segú, 2024). Green mortgages work from the lender's side. Loans on energy-efficient properties are measurably less likely to fall into arrears than those on energy-inefficient ones, giving lenders a financial reason to offer preferential rates that reflect the lower long-term risk (Guin, Korhonen and Moktan, 2022).

The actor mismatch problem, where costs and benefits fall on different actors across the building's lifetime, requires social cost-benefit analysis that makes the full distribution of costs and benefits visible at the point of investment. Applied to a zero-carbon renovation programme in Salzburg, Austria, this approach found a benefit-cost ratio of 1.06 and a return on investment of 5.7% over 50 years when health co-benefits including reductions in GP visit costs and respiratory disease incidence were included alongside energy savings (Taranu, 2025). The IEA's 2025 review of 45 academic studies on energy efficiency confirms the broader pattern. It finds that 90% reported positive health impacts, with New Zealand's home retrofit programme generating over USD 1 billion in health savings and a 43% reduction in hospital admissions for respiratory conditions. In South Africa, energy retrofits led to an 81% reduction in self-reported illness. In Canada, every dollar spent on energy efficiency programmes was estimated to generate between USD 4 and USD 7 in GDP between 2017 and 2030 (IEA, 2025a). These returns do not appear in standard project appraisal because they fall on health systems and social budgets rather than on the developer's project account. Making them visible is the precondition for investment decisions to reflect them, for example, by assigning them contractually to specific actors through outcome-based financing instruments.

REDUCING OPERATIONAL ENERGY DEPENDENCE

Building insulation and passive design are the most direct available levers on operational energy expenditure. A home that does not need imported fossil fuels to heat or cool itself is not exposed to the price shocks documented in chapter 3.4. The evidence on what building performance improvement delivers at the portfolio scale is well established in Europe. Improving the insulation of building envelopes to achieve a minimum of 20% reduction in final energy demand could save 45% of final energy consumption across the sample, and reduce gas consumption by up to 44% (BPIE, 2022b). In 2022, following Russia's full-scale invasion of Ukraine, EU households faced energy bills 24% higher than pre-2020 averages (Pinzon Amorocho, Kockat and Milne, 2024), reflecting the fact that households (especially in energy-inefficient buildings) are subject to geopolitical tensions. Renovations directly reduce dependence on energy imports. The scale of what is already being delivered confirms the potential documented in chapter 3.4. Efficiency measures already implemented in EU buildings between 2020 and 2024 saved around 25 million tonnes of oil equivalent and a full renovation of Europe's building stock could cut EU gas demand and imports by up to 60 billion cubic metres a year by 2040 (European Union, 2026b).

The solutions for reducing operational energy dependence differ between new construction and existing stock, and between heating-dominant and cooling-dominant contexts. **For new construction, passive design measures, such as insulation, solar shading and protection, natural ventilation, building orientation and thermal mass, determine how much mechanical heating and cooling a building will require for decades.** These decisions cost little more at the design stage than their alternatives but generate compounding savings over the building's lifetime. A cost-effectiveness analysis of passive envelope retrofit measures for a typical 1970s Swedish multi-family apartment building found that final energy savings of 28 to 61% were achievable, with additional roof insulation consistently the most cost-effective measure across all economic scenarios modelled (Boussaa et al., 2023). The IEA's Energy Efficiency Policy Toolkit 2025 recommends doubling the global building retrofit rate and extending building energy code coverage by 2030 as the most impactful near-term policy levers, noting that replacing fossil fuel boilers with heat pumps can reduce energy use by up to 75% (IEA, 2026a).

In contexts where cooling dominates energy consumption, the same approach also applies, in this case with a preference for **passive cooling strategies that can reduce indoor temperatures and mechanical cooling that does not contribute to substantial energy consumption, such as façade shading, green roofs, natural ventilation and reflective surfaces**. Combining passive measures with efficient active cooling systems significantly reduces energy consumption and cuts both emissions and cooling-related costs (European Commission, 2024).

REDUCING CLIMATE-RELATED LOSSES THROUGH BUILDING AND NEIGHBOURHOOD RESILIENCE

Whether it is the water of a flood or the heat of summer, a single climate-adapted building will not be fully protected from climate impacts unless the neighbourhood around it is also adapted. **Green infrastructure acts as a sponge during heavy precipitation and cools buildings**. Interventions to improve housing therefore need to consider the wider built environment and ecological context in which a home is placed.

A new global assessment of building vulnerability from the European Commission's Joint Research Centre published in Nature provides the most comprehensive available global picture of buildings' vulnerability to climate risk (Florio et al., 2026). Using satellite-derived building footprint data covering the entire world, the study finds that 43% of all buildings globally were constructed before 1980, when few to no energy efficiency policies existed. It introduces the concept of "climatization vulnerability". This is defined as the combination of old building age and unsuitable building compactness in relation to local climate conditions. It finds that 48 million people currently live in buildings classified as vulnerable under this definition, a figure that could rise by 10-30% by 2100, especially in sub-Saharan Africa. The geography of this vulnerability is currently shifting. For example, current concentrations in cold regions of Eurasia will be relieved as warming reduces heating demand there, while the number of cooling degree days in the Sahel zone, Gulf countries and Pakistan could become up to five times higher by 2100, creating new and more acute vulnerability in regions where air conditioning is least affordable and least available.

The study also finds that only around 25% of low- and lower-middle-income countries implement building energy codes, compared to around 50% of upper-middle and high-income countries, meaning the countries experiencing the most rapid growth in construction are also the least equipped to ensure that growth leads to efficient buildings. This also points to an opportunity. Among countries of the global majority, India's Eco Niwas Samhita (Part I: Building envelope) residential and sustainable building code was launched by the Bureau of Energy Efficiency in December 2018 and further complemented thereafter, with a consolidated version launched in 2024 (Government of India, 2024). The building codes have to be formally notified by the states to be subsequently implemented and enforced. The adoption and enforcement of the code remains inconsistent. Moreover, the scope of application is limited to buildings or building complexes with a connected load of 100 kW or a plot area of 3,000 m^2. States and municipalities are free to change the plot area based on the prevalence in their respective areas of jurisdiction. Nevertheless, the example of India demonstrates that a national residential building envelope code covering heat gain limits, thermal comfort, natural ventilation and daylighting can be implemented in various building typologies, including low-income housing, subject to their inclusion within the scope of the codes (NITI Aayog Government of India, 2026). Indonesia's GlobalABC country roadmap from 2022 similarly sets targets for extending mandatory passive cooling requirements to new residential construction, but acknowledges these are not yet in place nationally (Svendsen and Danish Energy Agency, 2022). In tropical and hot regions of Africa and South Asia, where newer, more lightweight buildings with low thermal mass now dominate, the risk of thermal discomfort is higher. Policy responses can target two different levels. **At the building level, regulators could establish building codes that require interventions for construction or renovation** (e.g. thermal mass standards, compactness limits, façade shading requirements) or provide guidance on design decisions such as natural ventilation and building orientation. **At the neighbourhood or city level, urban planning regulations which govern tree canopy coverage, permeable surface ratios or maximum ground coverages could reduce heat island effects and flooding exposure in a way that individual building intervention cannot address**. An example comes from Medellín in Colombia, whose Green Corridor project converted areas which most lacked green spaces through the planting of 30 green corridors on the verges of roads and waterways, reducing the heat island temperatures from which the city was suffering by 2°C (Wesley et al., 2025). Another example is a study that followed long-term Swedish insurance claims, which found that considerably fewer flood damage claims were recorded in neighbourhoods retrofitted with blue-green infrastructures compared to conventional areas (Sörensen and Emilsson, 2018).

REDUCING HEALTH COSTS

The health costs of inadequate housing documented in section 3.4 **are reduced by improving the thermal quality, ventilation and structural condition of existing homes.** A systematic review of 39 housing intervention studies found that affordable warmth and energy efficiency measures produce improvements in general health, respiratory health and mental health, with interventions targeted at those with inadequate warmth consistently most effective (Thomson et al., 2013). Australia's Victorian Healthy Homes Programme, a randomised controlled trial delivering energy efficiency and warmth upgrades to 1,000 low-income households, found that the intervention group reported improved physical functioning, mental health and quality of life outcomes compared to the control group, alongside improvements in breathlessness and reduced time away from usual activities (Lazo Green et al., 2024).

The economic returns from these health improvements are large relative to the cost of the interventions. The IEA's 2025 review found that **energy efficiency measures to make homes warmer and drier generated returns of up to USD 4 for every dollar invested when health and social costs were included**, with New Zealand's home retrofit programme saving over USD 1 billion in health costs and producing a 43% reduction in hospital admissions for respiratory conditions (IEA, 2025a). At EU-level, the most comprehensive study dates back to 2016. It shows that bringing the housing stock to an acceptable standard would cost approximately EUR 295 billion as a one-off investment but would generate EUR 194 billion in annual healthcare and productivity savings, a payback period of roughly 18 months (Eurofound, 2016).

The table below shows the health co-benefits of the GNICE plus-energy neighbourhood demonstration project using the multiple benefits calculator tool MBx developed in the EU-funded Syn.ikia project (BPIE and syn.ikia, 2020). The GNICE demonstration project in Salzburg, Austria, combines the construction of 250 new social housing units and a kindergarten with the refurbishment of existing buildings in the same neighbourhood. Although the tools used to calculate and monetise additional benefits could be further improved, the project demonstrates that, over the entire life cycle of a building, savings in the healthcare sector alone can make a significant contribution to offsetting the construction costs incurred as a result of more sustainable construction (Taranu, 2025).

Table 4. Selected health co-benefits of the plus-energy neighbourhood GNICE in Salzburg (around 250 residential units) expressed in EUR million. Table based on (Taranu, 2025).

Savings in million EUR				
Benefit category	**Evidence quality**	**after 5 years**	**after 10 years**	**after 50 years**
Reduce inpatient hospital visits	High	1.3	4.2	9
Reduce GP visits - publicly funded (institution contribution)	Medium	0	0.1	0.1
Reduce GP visits - privately funded (patient co-payment)	Medium	0	0	0.1
Health and quality-of-life gains (QALYs)	Medium	0.3	1	2.2
Increase in disposable income due to energy efficiency (reduction in energy poverty)	Medium	0.1	0.3	1.1

The fundamental barrier for the consideration of health impacts in construction practice is that the building owner or developer who invests does not receive the healthcare savings, which accrue to health systems, insurers and public budgets. Several documented instruments address this directly. In California, major healthcare insurers including Kaiser Permanente and Sutter Health have invested directly in affordable housing renovation, explicitly linking housing investment to reduced hospitalisation and emergency care costs, a model enabled by Medi-Cal reforms that for the first time coupled clinical care with housing support (Graziano Burgin, 2022).

In the US, the Centers for Disease Control and Prevention (CDC) identified home improvement loans and grants as a documented upstream health intervention, with evidence that integrating healthcare funding with housing renovation reduces asthma triggers, prevents falls and reduces repeat hospitalisation costs (CDC, 2024). None of these models has been deployed at scale. However, social prescribing, meaning that doctors formally refer patients to housing improvement schemes as a non-medical intervention, provides a lighter-touch version of the same logic and is growing across the UK and Europe (Anderst et al., 2022). The UK's Warm Front scheme structured an explicit link between NHS referral pathways and housing improvement grants, enabling GPs and healthcare professionals to refer patients in cold, damp homes directly to insulation and heating improvement programmes, one of the few documented examples of health system capacity being structurally connected to housing renovation subsidy (Olsen, 2001).

Indoor environmental quality, which encompasses air quality, thermal comfort, ventilation, acoustics and lighting, is the building dimension through which most housing-related health impacts are transmitted. WHO's Housing and Health Guidelines provide the normative framework, and an open international database now covers IEQ standards and guidelines from over 40 countries. However, only 33% of national entries are government regulations; the majority remain non-binding guidelines, and many national standards lag behind WHO recommendations (Haverinen-Shaughnessy et al., 2025). **Integrating IEQ parameters into building codes and cost-optimal calculations for renovation** so that indoor air quality, ventilation and thermal comfort are treated as minimum performance standards rather than optional certifications **is a regulatory instrument that would simultaneously reduce health costs and strengthen the case for renovation investment**.

Policy recommendations for reducing costs over the building's life cycle

- Mandate life-cycle cost accounting using the net present value method and ISO 15686-5 as a reference standard and as a required element of appraisal for publicly funded housing and renovation programmes. Expand social cost-benefit analysis to account for health, energy and climate co-benefits alongside construction cost, so that future operating costs and wider returns are visible in investment decisions rather than excluded from them.

- Set minimum standards for the energy efficiency and compactness of buildings, particularly in low- and lower-middle-income countries, of which currently only around 25% comply with energy regulations, compared to around 50% in wealthier countries.

- Coordinate climate resilience measures, including flood protection, green and blue infrastructure and nature-based solutions across the public administrations responsible for housing, infrastructure and urban planning. These should be planned and funded at neighbourhood level, since the flood and heat reduction benefits of green infrastructure are collective outcomes that individual building interventions cannot replicate.

- Incorporate indoor environmental quality indicators covering indoor air quality, thermal comfort, ventilation, acoustics and lighting into national building regulations and cost-optimal calculations for renovation, rather than relying solely on energy performance indicators.

- Require passive design measures for both new residential construction and major renovation works, covering minimum insulation levels, airtightness targets, solar shading and protection, building orientation and natural ventilation calibrated to the climatic zone. For new construction these requirements should be a condition of planning approval. For renovation they should define minimum performance outcomes, bringing existing buildings measurably closer to climate-appropriate standards rather than locking in underperformance for the remainder of the building's service life.

- Incorporate climate-specific material performance requirements into building codes, particularly in tropical, coastal and high-humidity contexts where materials specified for temperate climates generate higher maintenance costs and shorter service lives, with minimum durability requirements matched to local climatic conditions.



5 OUTLOOK AND RECOMMENDATIONS

In political debates about how to resolve the housing crisis, environmental sustainability requirements in buildings are frequently presented as an expenditure that governments and households cannot afford to prioritise. The evidence assembled in this report suggests this framing misses much of the picture. **Sustainability requirements in construction represent a relatively small share of total housing cost in the cases documented here. The costs of inadequate energy performance, climate vulnerability and poor indoor conditions tend to arrive later and fall on different budgets** – household energy bills, health systems, insurance markets and public disaster funds.

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The central normative contribution of this report is to propose a shared standard against which housing outcomes can be assessed. This report has built on the framework for housing adequacy elaborated by the UN Committee on Economic, Social and Cultural Rights in General Comment No. 4 (1991), itself grounded in Article 11(1) of the International Covenant on Economic, Social and Cultural Rights. Drawing on the 2023 proposal of the Special Rapporteur on the right to adequate housing to extend the framework to future generations (A/HRC/52/28), it proposes an **updated reading centred on the concept of long-term adequate housing**: housing that is affordable not only to acquire but to occupy across its lifetime, habitable under the climate conditions it will face in the decades ahead, and built in ways that do not foreclose adequacy for future generations. This is not a new standard but a contemporary reading of the right to adequate housing recognised in Article 11(1) of the ICESCR, adopted in 1966 and binding on States Parties since 1976. It also resonates with the Belém Call for Action from COP30 in November 2025, calling for an integration of climate considerations into affordable housing policy. The goal of this report was to make that standard actionable by showing how to deliver sustainable and affordable housing.

There are many structural drivers for the affordable and sustainable housing crisis, including the financialisation of housing as an asset instead of a service, income inequality and wider housing market regulation. This report has named them and their consequences, while focusing its **solution pathways on the levers that are more directly within the control of the actors who design, finance, build and regulate housing**. What this report has shown is that the cost drivers related more directly to the provision of affordable housing are more complex and varied than political debates might suggest. **Each cost component of affordable housing can be a potential lever to reduce costs and make housing more affordable**. Physical construction costs are typically treated as a main cost driver for housing. However, a large share of the costs for housing relate to land acquisition and other costs – often referred to as "soft costs" which include costs for engineering and planning, insurance, and financing. **The perspective on costs changes considerably if life-cycle costs, covering energy, maintenance, climate damage and health, are taken into account instead of a mere focus on upfront investment costs. They largely determine whether housing can be long-term affordable**. In short, sustainable housing supports long-term affordability.

The four solution pathways address each cost category in turn (reducing physical construction costs, land costs, other costs including financing and planning, and reducing costs over the life cycle of buildings), drawing on documented practice from across the world. The policy recommendations that follow are organised by cost category. They are intended as a starting point rather than an exhaustive prescription, and their applicability will vary by national and local context. What they share is a **common foundation in the goal of long-term adequate housing** and in the recognition that the instruments to pursue it, even under fiscal constraint, already exist in documented practice around the world.

Table 5. Policy recommendations by cost category

Policy recommendations to reduce physical construction costs

- Conduct a scientifically sound life cycle analysis to evaluate the costs and benefits of local resources and vernacular construction. When relevant, update and implement building codes to recognise them and prioritise them in public procurement and subsidies.
- Mandate performance-based procurement for public housing, specifying outcomes rather than methods, and align this procurement framework with building standards and subsidy design to favour industrialised or offsite construction and effective project management practices and link subsidies and building certification to combined energy performance and productivity requirements, including provision for pooling projects delivered through prefabricated solutions.
- Support prefabricated renovation programmes for social and low-income housing stock, backed by performance guarantees to de-risk adoption.
- Provide financing support for sufficiency measures and better use of existing buildings, such as converting buildings into housing or mixed-use buildings.
- Require new buildings in fast-growing cities to be designed so their materials can be reused or recycled later, rather than demolished as waste ("design for deconstruction").

Policy recommendations to reduce costs for land acquisition

- Expand legal and financial support for ownership models that permanently separate land value from building value so affordability is preserved through future transactions.
- Recognise collective ownership models including community land trusts and housing cooperatives in national housing strategies to limit speculative pressures and secure long-term tenure.
- Promote rental housing as a long-term investment vehicle in social housing, positioning the stable, recurring revenue that rental tenure generates as an attractive proposition for long-term investors such as institutional funds and public entities; keeping housing in rental tenure rather than selling it to individual owners ensures that units remain permanently within the affordable housing stock.

Policy recommendations for reducing costs over the building's life cycle

- Mandate life-cycle cost accounting using the net present value method and ISO 15686-5 as a reference standard as a required element of appraisal for publicly funded housing and renovation programmes and expand social cost-benefit analysis to account for health, energy and climate co-benefits alongside construction cost, so that future operating costs and wider returns are visible in investment decisions rather than excluded from them.
- Set minimum standards for the energy efficiency and compactness of buildings, particularly in low- and lower-middle-income countries,

Policy recommendations on reducing other costs related to financing, planning and coordination

- Combine preferential financing instruments (interest-free loans, blended finance, green mortgages) with a sustained commitment from banks or lenders, as well as public awareness campaigns.
- Expand results-based instruments (social impact bonds, energy efficiency contracts) to shift the upfront risk away from public budgets and towards measurable outcomes.
- Channel, where possible, subsidies and infrastructure funding directly to resident-led community organisations and cooperatives rather than to property developers or centralised housing authorities. Include dedicated finance streams for resilient affordable neighbourhoods designed at community level to meet local needs.
- Implement regeneration and infrastructure programmes at neighbourhood or district level to achieve collective (shared) solutions, procurement discounts and coordination savings that are not available to individual households.
- Develop and implement carbon pricing mechanisms in the building sector, so that the environmental costs of construction and renovation are reflected in market prices rather than shifted onto future generations.

where currently only around 25% of countries comply with energy regulations, compared to around 50% in wealthier countries.

- Coordinate climate resilience measures including flood protection, green and blue infrastructure and nature-based solutions, across the public administrations responsible for housing, infrastructure and urban planning. These should be planned and funded at neighbourhood scale, since the flood and heat reduction benefits of green infrastructure are collective outcomes that individual building interventions cannot replicate.
- Incorporate indoor environmental quality indicators covering indoor air quality, thermal comfort, ventilation, acoustics and lighting into national building regulations and cost-optimal calculations for renovation, rather than relying solely on energy performance indicators.
- Require passive design measures for both new residential construction and major renovation works, covering minimum insulation levels, airtightness targets, solar shading and protection, building orientation and natural ventilation calibrated to the climatic zone. For new construction these requirements should be a condition of planning approval. For renovation they should define minimum performance outcomes, bringing existing buildings measurably closer to climate-appropriate standards rather than locking in underperformance for the remainder of the building's service life.
- Incorporate climate-specific material performance requirements into building codes, particularly in tropical, coastal and high-humidity contexts where materials specified for temperate climates generate higher maintenance costs and shorter service lives, with minimum durability requirements matched to local climatic conditions.

Apart from pathway-specific solutions, the following overarching recommendations can be derived from the research. To scale the solutions proposed, this report recommends that policymakers **treat the expanded dimensions of adequate housing** (climate resilience, affordability over the life cycle, environmental sustainability) set out in the report **as prerequisites for long-term affordability** rather than as optional additional criteria and **initiate a process at UN level to formally amend the CESCR framework on adequate housing and integrate sustainability**, building on the proposal made by the UN Special Rapporteur in 2023. In general, it is important to **reorient investment assessment**, moving away from a narrow return horizon of 5 to 8 years towards covering the entire life cycle. Investment assessments should also **account for health, energy and climate co-benefits and/or expenses in addition to construction costs and widely integrated sustainability criteria in the building's construction value chain**, e.g. through design principles or procurement criteria. Policymakers also need to address deeper structural causes (the financialisation of housing as an asset, income inequality, and access to and distribution of land) beyond measures at the level of construction and construction financing.

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