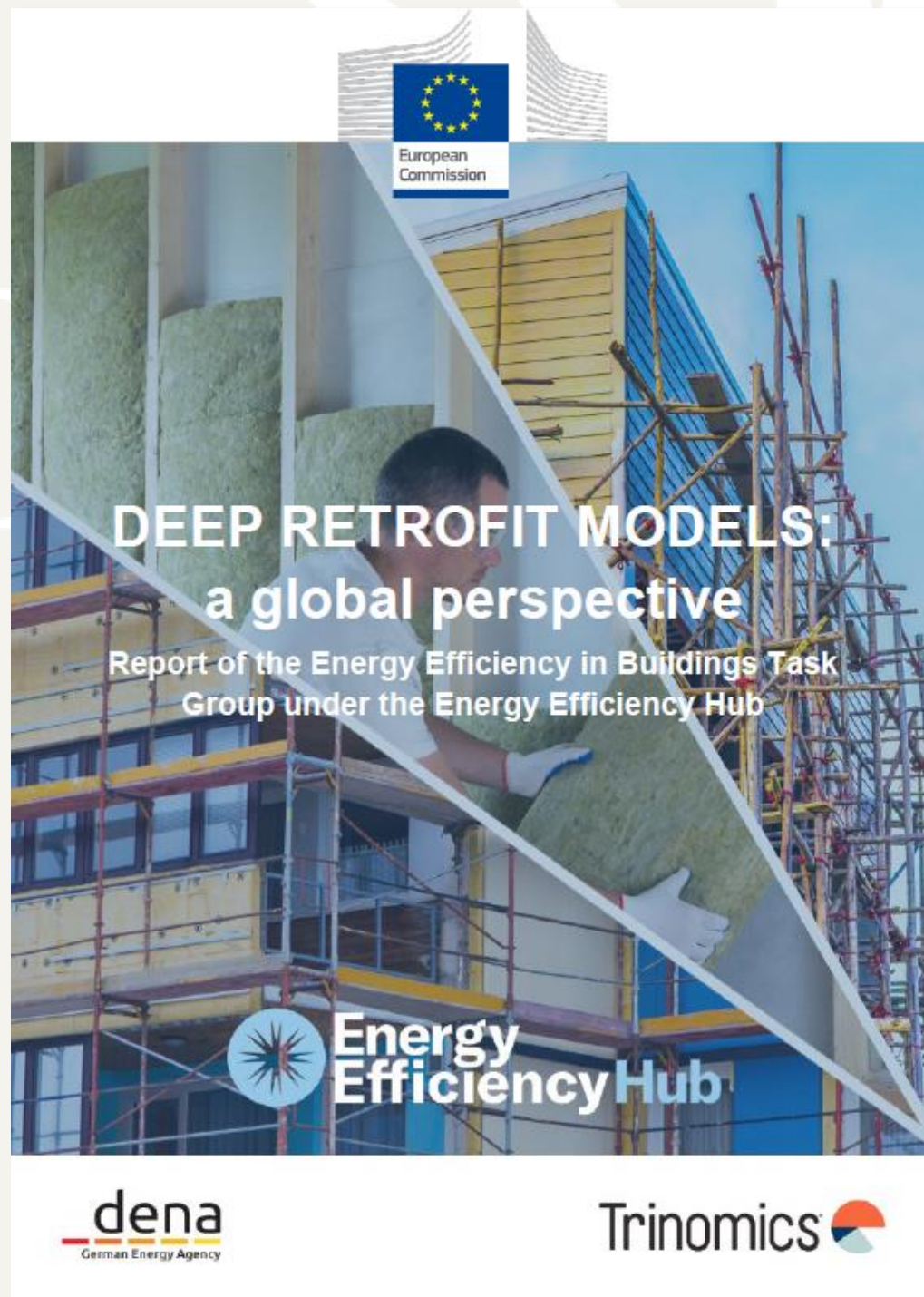




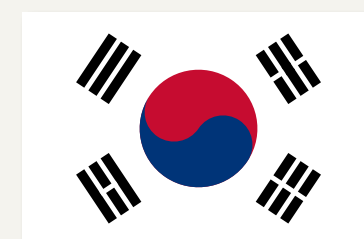
Deep Retrofit Models: a global perspective

Report of the Energy Efficiency in Buildings Task Group
September 2024

Deep Retrofit Models: A global perspective report background



- **The Energy Efficiency in Buildings (EEB) is a Task Group of the Hub, established in 2022 is a platform to exchange policy information about improving energy efficiency in buildings.**
- The Task Group is co-led by Germany and the European Commission. Task Group Members include Argentina, Brazil, China, Korea and Saudi Arabia. The operating agent of the EEB Task Group is dena (Deutsche Energie-Agentur), the German Energy Agency.



- This report was funded by the European Commission's Directorate-General for Energy. The report was written by Jesse Glicker, Ling Ying Lee, Nora Cheikh, Frank Gérard of Trinomics B.V., a Brussels-based consultancy firm.
- The findings of report are based on the surveys conducted with the EEB Task Group Members and several other countries as well as a literature review of existing policies, practices and definitions.

Methodology

- This report focused on the experiences of Argentina, Brazil, People's Republic of China, the European Commission, Germany, Korea and Saudi Arabia.
- Insights from Belgium, Canada, France, Ireland and the United States are also included to ensure diversity of best practices.
- The findings of report are based on the surveys conducted with the Task Group Members and several other countries as well as a literature review of existing policies, practices and definitions.

Key questions addressed during the interviews include:

1. Is there a national understanding and/or definition of deep energy retrofits?
2. Are there existing policies / measures to support deep energy retrofits and building decarbonisation?
3. Are there national targets for deep building retrofits and/or building decarbonisation?
4. What are the key barriers to implementing deep energy retrofits?
5. Are there any good examples that could inspire others?

Deep retrofit is one of several solutions needed to reach building decarbonisation by 2050

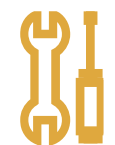
OBJECTIVE

To achieve building decarbonisation by 2050

PROBLEM

Buildings account for 26% of global GHG emissions due to low energy performance and use of fossil fuels

SOLUTIONS



**DEEP
RETROFIT**



**STAGED
RETROFIT**



**RENEWABLE
INTEGRATION**

BARRIERS TO DEEP RETROFIT

POLICY AND REGULATORY BARRIERS

FINANCIAL BARRIERS

TECHNICAL BARRIERS

SOCIAL BARRIERS



POLICY RECOMMENDATIONS

STRENGTHENING POLICY, STANDARDS AND REGULATORY FRAMEWORKS

INCREASING FINANCIAL SUPPORT AND INCENTIVES

STRENGTHENING LABOUR MARKET AND CAPACITY BUILDING

RAISING AWARENESS AND PROVIDING TECHNICAL SUPPORT

This framework aims to inform policy makers, industry stakeholders and practitioners to implement deep energy retrofits more effectively, ultimately contributing to global decarbonisation goals.

What is a deep retrofit?

DEEP ENERGY RETROFIT IS A SOLUTION TO ACHIEVE SIGNIFICANT ENERGY SAVINGS AND REDUCE BUILDING EMISSIONS WHILE ACHIEVING HIGH ENERGY PERFORMANCE.

There is not one definition of deep retrofit, as it is determined by national context.

WHAT FACTORS DETERMINE THE DEFINITION OF A DEEP RETROFIT?



Climate

In colder climates, energy renovations that minimise heat loss are prioritized, such as insulation, windows and doors and heat systems. In warmer climates, emphasis may be put on ventilation and enhancing efficiency of air conditioning systems.



Building Age and Type

Relatively new building stock may not require deep energy retrofit, while older historical buildings would need a significant energy performance improvement. Multi-family buildings require different improvements compared to single-family homes.



Historical, Cultural and Economic Context






A government's priorities, whether it is on the preservation of historical and cultural heritage or on affordability and accessibility, shape how the concept of deep energy retrofit is perceived and articulated in policies.



Existing Legal and Political Framework

Domestic legal traditions and existing policy structures dictate how the term of deep retrofit can be defined.

Summary of national contexts

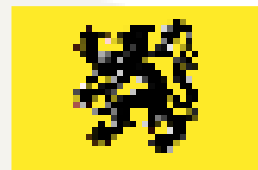
	 Climate	 Building Stock	 Typical Year Of Construction	 Cultural/ Economic	 Legal/ Political/ Language
ARGENTINA	Warm, Arid - cold	European-influenced architecture	1971-1975	Inflation & economic conditions	PRONEV (labeling)
BRAZIL	Tropical	Diverse building stock, Informal housing	1980-1983	Housing deficit	PBE Edifica (labeling)
EUROPEAN UNION	Varies	Predominantly old building stock	n/a	Diverse cultural/ economic conditions	Existing EU policy (EPBD, EED)
GERMANY	Temperate	Predominantly old building stock	1952-1964	Strong investment in efficient technologies	Existing EU/DE policy (EPBD, EED, GEG)
KOREA	Temperate	Rapid urbanisation	1993-1994	Increasing innovation and regulation for energy-efficient buildings	Green remodeling; Green New Deal 2.0
SAUDI ARABIA	Desert	Rapid urbanisation	1988-1989	Rapid growth and new construction	Vision 2030

Deep retrofit concept in legislation of selected countries



Argentina

Deep retrofit is defined as holistic energy improvements to buildings that reflect a reduction of energy consumption by $\geq 60\%$, considering environmental factors, behaviour patterns and comfort levels



Belgium - Flanders

Deep retrofit refers to the implementation of energy efficiency measures resulting in a Level A Energy Performance Certificate (EPC) label, corresponding to 100kWh/m²/year.



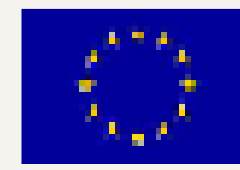
Canada

Deep retrofit is defined as a holistic approach to upgrading buildings and optimising energy and carbon performance with energy savings of $\geq 50\%$, and/or GHG emissions reduction of $\geq 80\%$, and may include measures to improve climate resiliency.



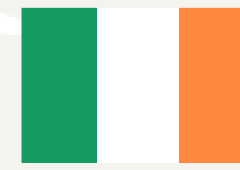
China

Deep retrofit is set out in 'Regulations on Energy Conservation in Civil Buildings (2008)' within comprehensive energy-saving measures for buildings.



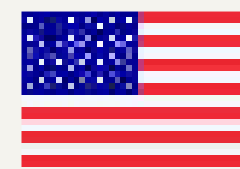
European Union

Deep retrofit is defined as a renovation in line with the 'energy efficiency first' principle and efforts to reduce whole life-cycle GHGs generated during the renovation. Such renovations focus on essential building items, such as wall insulation, ventilation and heating, etc. to ensure the necessary comfort of the occupants or to reduce at least 60% primary energy demand for worst-performing buildings.



Ireland

Deep retrofit is defined as a renovation carrying out multiple energy upgrades at once to achieve a Building Energy Rating (BER) rating of A.



United States

Deep retrofit undertakes a whole-building and integrative approach to maximise energy efficiency and emissions reductions. Additionally, deep retrofits aim to reduce energy use intensity by $\geq 40\%$ from a pre-renovation FY2019 baseline.

Barriers to achieving deep retrofit are not fully addressed by current policies



POLICY AND REGULATORY

Insufficient building retrofit ambitions

Lack of definition and policies addressing deep retrofit

Lack of integration between renewable energy policies

Frequent changes in political priorities



FINANCIAL

High up-front costs and long-term payback period

Lack of affordable financing options and subsidies for low-income households

Hindrance in investment due to the landlord-tenant dilemma



TECHNICAL

Skilled labour shortage and instability of labour supply

Constraints on the availability of construction materials due to international supply chain issues



SOCIAL

Lack of awareness of benefits of deep energy retrofits among owners and tenants

Lack of expertise and technical advice

Recommendations and best practices to address key barriers

RECOMMENDATIONS

Strengthen policy, standards and regulatory frameworks



Increasing incentives and financial support



Strengthening labour market and capacity building



Raising awareness and providing technical support



BEST PRACTICES

Designing comprehensive policy and regulatory frameworks and clear definitions of deep retrofit

Financial schemes addressing attractiveness and affordability of deep retrofit and innovative de-risking schemes

Knowledge sharing platforms and investment programmes for upskilling and reskilling

Technical assistance and awareness raising programmes

Deep dives



Deep dive: Policy and Regulatory Barriers

Insufficient or inefficient ambitions to reach national emissions targets

Lack of policies addressing deep retrofit and/or a definition of deep retrofit

Lack of integration of strategies (Renewables & EE; Existing and new buildings)

Select best practice examples:

Canada

- 2020 Emissions Reduction Plan & Green Buildings Strategy
- Clear definition of deep retrofit

European Union

- Renovation Wave Strategy & Energy Efficiency First principle
- Clear definition of deep retrofit

United States

- Building Decarbonisation Blueprint
- US building Decarbonisation Blueprint: National strategy to decarbonise US buildings by 2050, including targets to achieve an annual retrofit rate of 3% for residential



RECOMMENDATIONS

Strengthen and harmonise existing policies and regulations to set ambition energy efficiency targets

Develop comprehensive energy efficiency policies and regulations, including an established definition of deep energy retrofit

Deep dive: Financial Barriers

Lack of economic attractiveness (high upfront costs and long payback time)

Difficulty for low-income households to access financial resources

Split incentive problem (conflicting incentives of landlords and tenants)



RECOMMENDATIONS

Expand existing financial support mechanisms to encourage deep energy retrofits

Establish dedicated funding mechanisms or funds to provide support specifically for deep energy retrofits

Select best practice examples:

Argentina

- Weatherizers Without Borders (pilot project in Buenos Aires)

Canada

- Deep Retrofit Accelerator Initiative (funding to organisations for deep retrofit of multi-unit residential and commercial buildings)
- Greener Affordable Housing Program (low-interest loans for deep retrofit)

France

- MaPrimeRénov (Grant based on income and energy savings)

Germany

- KfW renovation support (loans and grants, rewarding higher efficiency achievements with more financial support)

Ireland

- National Home Energy Upgrade Scheme (low energy performing homes are eligible for grants up to 50% of a typical deep retrofit)
- Warmer Homes Scheme (grant scheme for low-income households and worst performing buildings)

Deep dive: Technical Barriers

Skills gap

(labour shortages in the required professions to design and implement deep retrofit)

Constraints on construction material availability

Select best practice examples:

Germany

- Best Practice Portal (online portal by the German Energy Agency for best practices for climate-neutral construction and renovation)

European Union

- Pact for Skills (promotes joint action across Member States to maximise the impact of investing in upskilling and reskilling in the construction sector)

United States

- Better Buildings Initiative (knowledge sharing platform focused on energy efficiency strategies in buildings)



RECOMMENDATIONS

Establish training initiatives and capacity building programmes (vocational training, certifications/ continuing education, workforce development initiatives, knowledge sharing)

Continue knowledge sharing among national governments as well as local stakeholders

Deep dive: Social Barriers

Lack of awareness among owners/residence

Lack of technical assistance



RECOMMENDATIONS

Launch public awareness campaigns highlighting the benefits of deep energy retrofit

Establish technical assistance programmes to provide renovation support, e.g. one-stop shops

Select best practice examples:

Belgium

- Woningpas and EPC+ (BRP linked to EPCs and includes digital logbook)
- Homegrade (One stop shop catering to homeowners and homeowner associations, offering technical advice, financial aid navigation and contractor referrals)

European Union

- ELENA (provides technical assistance funding to support planning and financing energy efficiency projects)

France

- Passeport Efficacité Énergétique (Building Renovation Passport (BRP) via online platform)

Germany

- Individueller Sanierungsfahrplan (publicly funded energy audits, focussing on staged approach to renovation)

Next Steps

- This report focused on a particular type of building retrofit, **the deep energy retrofit**, which significantly reduces energy consumption and emissions while enhancing building energy performance.
- Deep energy retrofits are vital for achieving decarbonisation goals in the buildings sector.
- Task Group Members have expressed their commitment to expand and deepen their analysis of deep energy retrofits and to continue developing enabling frameworks.



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