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POLICY BRIEF

RETROFITTING BUILDINGS IN INDIA: BALANCING THE GOALS OF SUSTAINABILITY AND SOCIAL EQUITY

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About the Organisation

LexQuest Foundation (LQF) is an independent, non-profit, research and action organisation, established in 2014, in New Delhi. We are striving to create, advocate and implement effective solutions for a diverse range of development issues.

To endorse participative governance, we engage with a broad spectrum of stakeholders, from various sections of the society, to ensure that policy-making remains a democratic process. We utilize pragmatic and futuristic research to disseminate actionable knowledge to decision-makers, experts and the general public.

Our key activities include capacity and skill-building workshops, policy advisory programs, public outreach, and stakeholder consultations. We collaborate with the government, other organizations and individuals for impactful policy formulation and execution.

By employing sustainable and equitable solutions through our multidisciplinary, intersectional initiatives and programs, we are constantly working towards creating empowered communities.



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Image source: My Republica

Climate change has grave implications for our built environment, and buildings undoubtedly play a crucial role in the discourse. Natural disasters like floods and earthquakes, rising levels of Greenhouse Gas (GHG) emissions, and increased energy consumption, has made it pertinent to adhere to the principle of sustainability while constructing new buildings. However, it is **equally important to recognize the climate vulnerability of the existing stock of buildings and come up with sustainable solutions to mitigate the same.** Retrofitting of buildings has been identified as one such solution.

Retrofitting is the process of making additions to or alterations of existing structures. In the context of buildings, **retrofitting would involve making**



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modifications to the existing building stock in an attempt to make it more energy-efficient, reduce its seismic vulnerability or adopt it as a component of hazard mitigation in general.



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The Sustainability Quotient

While there has been an increasing emphasis on sustainability in the built environment reflected in the increasing (re)construction of buildings with 'green' building materials, the same is required for the vast stock of existing buildings in the country. **Retrofit measures are a crucial intervention to make existing buildings more sustainable while ensuring they become more inhabitable for the residents by markedly improving other associated factors** like **indoor environmental quality**, for instance. According to a **report** by the Disaster Mitigation and Management Centre of Uttarakhand, **retrofit measures take less time, can be carried out without compromising on the functional and operational aspects of the building, and generate less debris and other associated waste**. Additionally, in the case of buildings that have a considerable historical, social, or emotional significance, reconstruction becomes a thorny issue; retrofitting measures in such instances acquire significance as they can strengthen certain weak and climate-vulnerable aspects of the building without disrupting its original configuration. Retrofit interventions are mostly considered to be **cost-effective** in the long-term, however, in the case of certain cost-intensive interventions, a strategy of **optimization** of all the available resources can be adopted.

In a **case study** highlighted by TERI (The Energy and Resources Institute), certain retrofit measures were applied to the HVAC system of the commercial buildings at Sholinganallur, Chennai Campus, including replacement of the central air conditioning system, changes to the lighting system, and enhancements in the building envelope. This led to a proven reduction in energy consumption, an increase in indoor environmental quality, depletion of



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carbon emissions, and usage of harmful ozone-depleting chemicals like CFCs (Chlorofluorocarbons) and HCFCs (Hydrochlorofluorocarbons). This is significant especially owing to the imminent threat that climate change poses to India and its commitments, both national and international, to mitigate the same.



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Importance of Retrofit



Image Source: Constro Facilitator

India's demand for energy has witnessed a steady growth over the years making it the **fourth largest consumer of energy worldwide**, after the United States, China, and Russia. In this context, it is important to note that **buildings in India consume around 32% of the energy** generated, contributing to around **22% of the annual GHG emissions**. Higher standards of living and the concomitant purchase and use of energy run appliances has continued to raise the Heating, Ventilation, Air Conditioning System (HVAC) load- responsible for the **majority share of energy consumption in a building**, with existing buildings consuming more than the total amount of electricity estimated to be used by buildings that



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are to be constructed in the next twenty years. This makes a strong case for retrofitting existing buildings.

Additionally, many existing buildings in India are vulnerable to seismic activity, floods, and other natural disasters owing to the use of inadequate materials, inefficient techniques, or a lack of regulatory oversight during their original construction. Natural disasters pose a threat to the tangible structure of the buildings and consequently to the lives of its occupants. For instance, in 2012, recognizing the seismic vulnerability of Uttarakhand, the Disaster Mitigation and Management Centre (DMMC) of the Department of Disaster Management under the Government of Uttarakhand, undertook the seismic retrofitting of two government inter-colleges each, in the Districts of Dehradun and Tehri Garhwal, as an important measure in strengthening the District's resilience towards the seismic activity.



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Tackling Inequality



Image source: DNA India

Our built environment is not simply a resource to be used for climate mitigation but holds the potential to drive economic growth and make concerted efforts at reducing inequalities and improving the general quality of life of our population. The construction sector, further segregated into 'residential', 'non-residential' and 'other' sectors employs around **10% of the global workforce**. In India alone, the **construction sector is the second-largest employer, contributing to around 8% of the nation's GDP**. Additionally, it is a core sector that is intricately linked with other industries like the construction equipment manufacturing industry. COVID-19 has severely impacted the sector, with an estimated **14% to 29% reduction in investments** and **loss of infrastructural projects** putting **migrant laborers and those informally employed in particular, at risk of**

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temporary and permanent job losses. Additionally, the pandemic has exposed our existing vulnerabilities and inequalities embedded in the built environment by disproportionately impacting those who live in informal settlements with poor infrastructural facilities. For instance, the absence of dignified living conditions and sustainable infrastructure has exacerbated a host of health conditions for those living in the slums of Mumbai. Further, contributing to the crisis, **global investment in sustainable and energy-efficient buildings is projected to fall by 15% in 2020 from \$150 billion in the previous year,** impeding the progress of meeting climate change commitments via the building and construction sector.

In this context, building retrofit measures can be harnessed as a resource to directly **create more jobs in the construction sector**- particularly for laborers, stimulate demand in related industries like equipment, material, and manufacturing, provide training and up-skilling opportunities for different workers along with benefitting local supply chains and small and medium-sized industries. Additionally, **government support in promoting retrofitting appliances in buildings with more energy-efficient alternatives, at a reduced cost can spur production, manufacturing, and sales in the appliances sector.** In the case of building retrofits carried out in the two inter-colleges in Uttarakhand, the process also involved extensive community awareness of retrofit techniques, using local masons and builders for the project, and providing **intensive on-site skills training to 80 local masons on retrofitting techniques.** As retrofits include a variety of measures with different time lengths involving different sectors and broader environmental commitments,



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with local and national governmental support, there is ample potential for such jobs created to be sustainable in the long-term.

Further, extending retrofit measures to low-income residents and the marginalized can have marked equity benefits. After all, the workers and laborers who are often engaged in the manual work of implementing retrofitting measures for other commercial and residential buildings deserve to reap the benefits of such measures from their housing stock. In India, **the underpinning philosophy guiding social housing for the EWS (Economically Weaker Section) has been quantity and affordability, not sustainability.** National programs and policies to tackle housing for the marginalized have been aplenty in India with National Urban Housing and Habitat Policy, PMAY (Pradhan Mantri Awas Yojana), Smart Cities Mission, and Pradhan Mantri Gramin Awaas Yojana (PMGAY) leading the way. However, **apart from primarily focusing on urban areas, there has been a notable absence of environmental and sustainability measures, technologies, and infrastructures under these housing programs.** This has an impact on occupancy rates with a considerable section of the housing stock, **almost 23% in 2016** built under PMAY and other such schemes remaining vacant. Improper and incomplete infrastructure leading to physical discomfort, hazard vulnerability, and lack of scope for in-situ development, were among some of the reasons cited, highlighting the scope and potential for retrofit policies in low-income housing programs.

For instance, retrofit measures applied to **The Public Housing Fund of the Municipality of Ljubljana**, a low-income housing area, led to increased energy affordability and savings for the residents, reduction in discomfort especially those with respiratory issues, and also improved their self-esteem, mental



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health, and the broader community fabric. Similarly, the **Cato Manor Green Street Project**, financed by the Green Building Council of South Africa involving green retrofits in low-income buildings, executed in consultation with the local government and community, ultimately inspired policy and further scaling of retrofit measures. The savings generated through building retrofits went back into the local economy and the project established considerable **advocacy value** and awareness within the larger community. **These examples powerfully demonstrate that prioritizing building retrofits for those who are marginalized is a practical and effective way of achieving building sustainability without compromising on social justice and equity.** The Government of India can take inspiration from such examples and invest in extending building retrofits under the rubric of **'housing as healthcare'** to low-income areas and slums in India, and generate similar benefits for the residents.



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Climate Change Commitments and Retrofit Policy Initiatives

India's obligation to improve the environment is outlined under Article 48A, of the Constitution and its **National Action Plan on Climate Change (2008), which lists eight national missions** including the mission to achieve enhanced energy efficiency. Further, at the Conference of the Parties (COP) 15 in Copenhagen in 2008, India announced its voluntary targets to reduce its emissions intensity. India affirmed its commitment to the 2030 Agenda for Sustainable Development, which includes 17 Sustainable Development Goals (SDGs), by proceeding with the implementation of the plan of action from January 2016. **Investing in retrofitting of buildings, in particular, to achieve resiliently energy-efficient and de-carbonized buildings form an integral component of achieving some of these goals.** The relevance and importance of the built infrastructure in achieving the SDGs is further reflected under Goal 11 to “Make cities and human settlements inclusive, safe, resilient and sustainable”. Retrofit initiatives and directives have been developed and implemented under the general drive towards energy efficiency. The Government of India has developed a rather **robust policy framework for energy efficiency under the broader SDG 7 target to “ensure access to affordable, reliable, sustainable and modern energy for all”**. The **Energy Conservation Act** was passed in 2001, with the Bureau of Energy and Efficiency (BEE) as a statutory body to ensure the implementation of the Act. Initiatives like the **GRIHA rating scheme** for existing buildings, encouraging retrofits to achieve higher energy standards, and the **Ujala Yojana**, offering subsidized LED light bulbs to be used in place of incandescent bulbs is in alignment with the **targets** of increasing “the share of renewable energy” (7.3) and promoting “investment in energy infrastructure”



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(7.a). The Ministry of Power, through the Bureau of Energy and Efficiency, launched the Energy Conservation Building Code in 2007 establishing minimum energy standards for commercial buildings. Adherence to the Code was made mandatory by the Ministry of Power on 13th February 2018. While ECBC was developed by the Central Government, its ratification, modification, and implementation lie with the State Government and Urban Local Bodies. The Code, under Section 3, mandates that any additions and alterations to existing buildings, i.e., any retrofit measures have to comply with the energy-efficient directives provided under the Code. A similar code for residential buildings was launched under ECO Niwas Samhita, 2018, which, however, does not contain any mandates for retrofits.

The strongest alignment of retrofitting policies is with SDG Goal 9, the target to “upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes...” and under Goal 11 to “substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change”. A substantial and ambitious policy initiative centered on retrofitting was launched by the Government in 2017, titled the National Energy Efficient Buildings Programme, to retrofit 20,000 public and private buildings, to be implemented by Energy Efficiency Services Limited (EESL), a joint venture under the Ministry of Power. EESL is an Energy Services Company (ESCO) that engages in implementing energy efficiency measures in liaison with a host. ESCOs assist with financing, operation and maintenance, and capacity building, and are considered by BEE



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to be one of the most technically and financially viable mediums of achieving energy retrofits. With an investment of INR 1000 crore, covering more than 10,000 large government/private buildings, the scheme aimed to retrofit 1 crore LED lights, 15 lakh energy efficient ceiling fans, and 1.5 lakh energy efficient ACs in the buildings; energy-efficient appliances in NITI Aayog, Nirman Bhawan, Sardar Patel Bhawan, Shastri Bhawan, J&K Assembly, Jammu Secretariat, Rajiv Chowk Metro Station, among others, have been retrofitted under the scheme. Additionally, TERI has also published a comprehensive and detailed set of guidelines for retrofitting for commercial buildings, however, the principle of “inclusion” as cited in the targets under Goal 9 and Goal 11 has not been reflected in current retrofitting programs as they do not extend to those who are marginalized and/or in low-income housing.

Even though India has made commendable strides in terms of acknowledging the climate vulnerability of existing buildings, there has been a marked lack of implementation at the State level with large stocks of buildings **in parts of Central and East India untouched and with no comprehensive national policy directives regarding retrofitting to mitigate the damage or challenges caused by natural disasters**. Lack of awareness and information regarding retrofit initiatives, setting standards for building materials and techniques to be used, along with inadequate training of workers, architects and engineers have impacted the investment for such initiatives at the State and Local level. Some of the challenges have been highlighted below:



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1. LACK OF AWARENESS

- ❑ The absence of extensive data and the lack of concerted efforts towards wider dissemination of available data has created a notable **lack of awareness in terms of the present retrofit policies**, regulatory and certification standards, technologies, available building materials, and measurement and verification protocols (M&V) to understand post-implementation benefits. **Lack of data has proven to be a hindrance in defining an energy baseline**- a reference tool needed to compare the energy use of buildings before and after improvements, thereby impacting the overall efficiency of energy retrofits in buildings.
- ❑ Due to the consistent and overt policy focus on quantity instead of quality, when it comes to low-income housing and buildings, **retrofits to achieve sustainability and climate resilience have been perceived as a luxury by most who live in low-income housing**. There has been a notable absence of advocacy efforts and partnerships with the local community to increase awareness and participation.
- ❑ Most residents, building owners, and building professionals suffer from an information barrier when it comes to actual operational costs, savings, and payback periods associated with retrofit measures. **Estimation and measures of energy savings in low-income housing, for instance, is difficult to achieve as it suffers through a “rebound effect”**. This is when low-income households use less electricity as they cannot afford more but the “savings” generated from this activity goes into buying more electricity for other needs.



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2. IMPLEMENTATION

- ❑ Lack of strong legal mandates, combined with mostly voluntary components has rendered the implementation of existing policies at the discretion of the States and Local Municipal Bodies, many of whom have been lackadaisical in ensuring implementation.
- ❑ In a country like India, retrofit measures have to be adopted keeping in mind the varying climatic conditions across the country and the availability of resources indigenous to any particular location. The absence of comprehensive and scalable guidelines that are flexible and adaptable to the needs of each region is lacking.
- ❑ Substantive overlaps between different green rating systems like GRIHA, LEED, etc., and inconsistency in terms of which system is supported at the National, State, or Regional level has led to confusion and fragmentation within building sustainability agencies and government policies, hampering the intended impact of such programs. Additionally, most policy initiatives consider registration for such rating systems sufficient instead of complete certification itself.
- ❑ Issues of competing ownership of buildings, lack of adequate documentation of ownership, building blueprints, etc., or the loss of such documentation due to, say, natural disasters, are an additional hurdle on the implementation front.
- ❑ Conflicting interests of building owners, developers, and the tenants/residents prove to be a challenging hurdle in implementing retrofit measures. Many building owners and developers are unwilling to bear the cost of retrofits, fear the loss of business on account of retrofits



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that require deeper intervention for a long time and many tenants resist such interventions due to fear of relocation.

3. FINANCING

- ❑ Even though retrofits have been proven to have low operational costs, the long payback period demotivates financial investments taken by building owners.
- ❑ The perceived high risk of such projects, relatively small market demand, and high transaction costs associated with small transactions like retrofits contribute to the financing of such projects by Local Financial Institutions (LFIs). Preference for asset-based corporate loans which are more traditional, instead of project-based loans as would be required by retrofit projects reflects the general lack of financial confidence displayed by LFIs and prove to be a formidable barrier for retrofits in low-income housing which would need substantial financial confidence.
- ❑ Mismatching of estimated building performance and actual performance after retrofits along with discrepancies between credit terms and performance verification of retrofit measures, whereby the savings generated through retrofits are not enough to pay back the original loan.

Owing to the need for sustainable development, reinforcing the capacity of existing buildings, has become paramount. Retrofitting of existing buildings is a practical measure to combat the carbon footprint of the building sector, enhance energy efficiency and climate resilience of buildings, along with generating employment, monetary, and equity benefits for the community.



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Recommendations to Improve Retrofit Initiatives in the Country

- ❑ Add a section, similar to Section 3 of the ECBC Code for Commercial Buildings to the ECBC Code for Residential Buildings under ECO Niwas Samhita. Further, include these Codes in State by-laws, which can be developed in consultation with municipal legislators, along with establishing regulatory bodies at the Municipal and State level to ensure better implementation of these Codes.
- ❑ Set up both on-site and off-site skills and training programs, in retrofit measures primarily targeting local builders, masons, and laborers.
- ❑ Taking a cue from Singapore, develop/legally mandate one national certification and rating system with regional/local adaptations to simplify the green rating systems and make its implementation more strict and efficient. The certification should not only include whole building use but also provide comparative trade-offs between different building materials and construction technologies available. Further, the achievement of complete certification instead of mere registration should be made legally mandatory to achieve better compliance and prevent greenwashing of projects.
- ❑ In cognizance of tools like the [Responsible Retrofit Guidance Wheel](#), where almost 50 different measures are displayed highlighting different building capacity and function, and the climatic context, develop a similar Retrofit Matrix/Decision Support Tool for the Indian context which would be a fruitful guiding mechanism and increase accessibility to retrofit measures.



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- ❑ Initiate retrofit projects in low-income areas as has been done in South Africa, Brazil, etc., before incorporation into codes or policies. This will be useful to understand the specific technical, financial, and social challenges associated with such retrofits, as opposed to the commercial and residential buildings sector which has already witnessed several projects and generate community awareness, engagement, and advocacy value. Based on the data generated, a specific set of guidelines and/or codes for retrofitting in low-income buildings could be developed which could then be incorporated into the existing social housing schemes in India like the PMAY.
- ❑ Combat the lack of data through better Measurement and Verification Plans, more detailed and precise Investment Grade Audit, and life-cycle cost analysis of retrofit measures. This is important to generate investor confidence and an accurate estimation of projected costs and savings. Post analysis, sufficient temporary relocation measures for the residents could also be included as a part of the retrofit project requiring extensive intervention.
- ❑ Introduce energy efficiency tax benefits on buildings to combat split incentives on the part of building owners and new financial instruments like Energy Savings Insurance products, to ensure that there would be no mismatch between estimated savings and the original loan amount.
- ❑ Make greater investment in ESCOs to scale their financial capacity. Subsequently, the financial support from ESCO's can be used to develop, manage, and implement retrofit measures in low-income buildings. As ESCOs have been one of the target beneficiaries of government financial schemes like Partial Risk Guarantee Fund for Energy Efficiency



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(PRGFEE) and Venture Capital Fund for Energy Efficiency (VCFEE),
providing equity fund and risk coverage support, such funds could be directed specifically towards low-income housing sector.



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Concluding Remarks

Climate change and its myriad impacts have given rise to new vulnerabilities while exposing and amplifying our existing ones. This holds special significance when it comes to our built environment. Retrofitting policies are not only crucial for the tangible structure of the buildings but have an intangible value in terms of their potential for improving social equity. While the merits of retrofitting buildings by reinforcing and strengthening existing capacity have been undisputed, the challenge is to scale the benefits and make them more inclusive. The ability to make and enjoy homes that are resilient, safe and energy-efficient should not be a privilege of the few. Ultimately, retrofitting policies in India have to be developed and operationalized with the understanding that sustainability and accessibility should be two sides of the same coin.



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References

1. [Resource Pages](#), Whole Building Design Guide
2. [Seismic retrofitting of lifeline structures in Uttarakhand: A Report](#), Disaster Mitigation and Management Centre, Uttarakhand, India
3. [The application, benefits and challenges of retrofitting the existing buildings](#), Muhammad Khairi, Aini Jaapar and Zaharah Yahya
4. [Strengthening and Retrofitting of Existing Structures](#), Anibal Costa, Antonio Arede and Humberto Varum
5. [Roadmap for Incorporating Energy Efficiency Retrofits in Existing Buildings](#), The Energy and Resources Institute
6. [India's Move to Make Buildings Efficient](#), Sumedha Malaviya and Bharath Jalraj
7. [The Construction Sector in India and Climate Change](#), "Case Study for Construction in India" - by Development Alternatives in "Structural Transformation Process towards Sustainable Development in India and Switzerland" - published by INFRAS publication, Zurich
8. [India 2020, Energy Policy Review](#), International Energy Agency
9. [Energy Efficiency](#), Ministry of Power, Government of India
10. [Energy Conservation Building Code, 2017](#)
11. [Govt. of India launches Energy Efficient Buildings Programme](#), FICCI Media Division.
12. [NDMA says residential high-rise towers don't conform to earthquake safety standards; comes up with norms on seismic retrofitting](#), Aman Sharma



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13. [Advances in Energy and Built Environment: Select Proceedings of TRACE 2018](#), D.P. Singh and E. Singh
14. [Energy Conservation Building Directive – 2018 \(based on ECBC 2017\)](#)
15. [How cities can strengthen local economic recovery by investing in building retrofits](#), C40 Cities Climate Leadership Group
16. [COVID-19: Assessment of Economic Impact on the Construction Sector in India](#), KPMG
17. [Sustainable Housing Can't Slip Under the Radar Once the COVID-19 Crisis Subsides](#), P.K. Das
18. [Sustainable Social Housing in India](#), Gregor Herda, Sonia Rani, Pratibha Ruth Caleb, Rajat Gupta, Megha Behal, Matt Gregg, Srijani Hazra
19. [Sustainable Recovery: World Energy Outlook Special Report](#), IEA (2020), Sustainable Recovery, IEA, Paris
20. [Guidelines for Financing Energy Efficiency Projects in India](#), Bureau of Energy Efficiency, Ministry of Power, Government of India
21. [Transforming our World: The 2030 Agenda For Sustainable Development](#), United Nations
22. [National Ujala Dashboard](#), UJALA - Unnat Jyoti By Affordable LEDs for All