

Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

Public Disclosure Authorized

Green Buildings

A FINANCE AND POLICY BLUEPRINT FOR EMERGING MARKETS

© International Finance Corporation (2019). All rights reserved.
2121 Pennsylvania Avenue, N.W.
Washington, D.C. 20433
Internet: www.ifc.org

The material in this work is copyrighted. Copying and/or transmitting portions or all of this work without permission may be a violation of applicable law. IFC encourages dissemination of its work and will normally grant permission to reproduce portions of the work promptly, and when the reproduction is for educational and non-commercial purposes, without a fee, subject to such attributions and notices as we may reasonably require.

IFC does not guarantee the accuracy, reliability, or completeness of the content included in this work, or the conclusions or judgments described herein, and accepts no responsibility or liability for any omissions or errors (including, without limitation, typographical errors and technical errors) in the content whatsoever or for reliance thereon. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of the World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries. The findings, interpretations, and conclusions expressed in this volume do not necessarily reflect the views of the Executive Directors of the World Bank or the governments they represent.

The contents of this work are intended for general informational purposes only and are not intended to constitute legal, securities, or investment advice, an opinion regarding the appropriateness of any investment, or a solicitation of any type. IFC or its affiliates may have an investment in, provide other advice or services to, or otherwise have a financial interest in some of the companies and parties named herein.

All other queries on rights and licenses, including subsidiary rights, should be addressed to IFC Communications, 2121 Pennsylvania Avenue, N.W., Washington, D.C. 20433.

The International Finance Corporation is an international organization established by Articles of Agreement among its member countries, and a member of the World Bank Group. All names, logos, and trademarks are the property of IFC and you may not use any of such materials for any purpose without the express written consent of IFC. “International Finance Corporation” and “IFC” are registered trademarks of IFC and are protected under international law.

About IFC

IFC—a sister organization of the World Bank and member of the World Bank Group—is the largest global development institution focused on the private sector in emerging markets. We work with more than 2,000 businesses worldwide, using our capital, expertise, and influence to create markets and opportunities where they are needed most. In the 2019 fiscal year, we delivered more than \$19 billion in long-term financing for developing countries, leveraging the power of the private sector to help end extreme poverty and boost shared prosperity.

For more information, visit www.ifc.org.

Green Buildings

A FINANCE AND POLICY BLUEPRINT
FOR EMERGING MARKETS



Creating Markets, Creating Opportunities

Contents

ii Acknowledgements

iii Foreword

v Executive Summary

1 Introduction

75 Annex

79 Acronyms and Endnotes

5

**UNDERSTANDING THE
MARKET FOR GREEN
BUILDINGS**

What is a Green Building? 6
Current and Potential Green Buildings Market 10
The Business Case for Green Buildings 18

29

**BUILDING THE MARKET
FOR GREEN BUILDINGS**

Financing Green Buildings 30
Policy and Regulatory Building Blocks 46
Voluntary Commitments to Green Buildings 58

69

**CONCLUSION AND
RECOMMENDATIONS**

BOXES

- 8 Box 1: EDGE: Powering green building transformation in emerging markets
- 14 Box 2: Estimating the investment opportunity in green buildings
- 17 Box 3: Winning strategy to appeal to institutional investors
- 19 Box 4: The cost of building green in emerging markets
- 24 Box 5: Green mortgages: A triple win
- 26 Box 6: Integrating resilience to climate impacts into building design
- 34 Box 7: Building a green real estate portfolio: From vision to supporting clients
- 35 Box 8: Shaping the green construction market in Colombia
- 36 Box 9: ING: Client education to strengthen client relationships
- 37 Box 10: Using green construction finance to launch a green mortgage program
- 38 Box 11: Examples of green bonds issued to finance green buildings in 2018
- 40 Box 12: How to issue a green bond, loan, or sukuk
- 41 Box 13: Barclays blueprint for green bonds
- 44 Box 14: Catalyzing the green buildings market in South Africa
- 55 Box 15: Clear green bond guidelines as a lever for the green buildings market
- 62 Box 16: Market response to multiple green buildings rating systems
- 64 Box 17: Greening offices through leases in Singapore
- 65 Box 18: Effecting change across the industry through collaboration
- 66 Box 19: AccorHotels' sustainability-linked loan facility

FIGURES

- 12 Figure 1: Investment Opportunity by Property Type and Region
- 13 Figure 2: Investment Opportunity Across Regions
- 15 Figure 3: Total Opportunity by Building Type
- 21 Figure 4: Green Hotel Value Example
- 22 Figure 5: Income Capitalization of Green Buildings
- 23 Figure 6: Green Mortgage Example
- 60 Figure 7: Differences Across a Sample of International and National Certification Systems and Their Uptake

Acknowledgements

IFC's work in green buildings has benefited from collaboration with development partners, in particular, the State Secretariat for Economic Affairs of Switzerland (SECO) and the United Kingdom government. Other partners included European Union; the Ministry of Finance of Japan; the Hungarian Export-Import Bank; the Canada Climate Change Program and the Department of Foreign Affairs, Trade, and Development, Canada; the Royal Ministry of Foreign Affairs of Denmark and the Danish Green Growth Fund; the Federal Ministry of Finance of Austria; the Ministry of Foreign Affairs of Finland; the GEF-IFC Earth Fund Platform; and the World Bank's Energy Sector Management Assistance Program (ESMAP).

This report was prepared by the Climate Business Department (Alzbeta Klein, Director), Climate Finance and Policy Group (Anup Jagwani, Manager). The authors are Irina Likhachova, Aditi Maheshwari, and Ayesha Malik, with support from Rebecca Menes, Elizabeth

Minchew, and Caitriona Palmer, and guidance from Corinne Figueredo, Rusmir Musić, and Ommid Saberi.

Elizabeth Lewis and Hlazo Mkandawire managed communications; creative design, layout, and printing services were provided by Irina Sarchenko and Gregory Wlosinski. Copy-editing services were provided by Clarity Editorial. Yulia Guzairova managed the budget, and Darius Maleki (intern) and Lyudmila Podgola provided additional support.

Many World Bank Group colleagues and experts provided critical input and ideas to shape this report, as well as feedback during review: William Beloe, Martina Bosi, Lenore Cairncross, Shamsah Dhala, Gabriel Goldschmidt, Neil Gregory, Ruth Hupart, Prashant Kapoor, Tom Kerr, Patrick Leahy, Shirong Meng, Rajesh Miglani, Marcene Mitchell, Eloshan Naicker, Shruti Narayan, Alexandrina Platonova-Oquab, Tigran Parvanyan, Sandra Pranoto, Randall Riopelle, Friedemann Roy, Autif Sayyed, Apoorva Shenvi, Lakshmi

Narayana Minnal Sreenivasan, Smita Thomas, Ronald Wu, and Nina Zegger.

The authors are grateful to several other colleagues for their input and peer review: Chris Botten (Better Buildings Partnership); Shamir Ghumra (BREEAM); Gina Hall (Carbon Trust); Nora Steurer (GABC/UNEP); Georgina Smit (Green Building Council South Africa); Alice Huang and Maxine Jordan (IEA); Vasudevan Suresh (Indian Green Building Council); Jessica Long (Nuveen); John Kraus (RICS); Alifia Doriwala (RockCreek Group); Brian Dean (SEforAll); Martina Otto and Matthew Ulterino (UNEP); Sean McMahon, Sarah Merricks, and Robert Tufts (U.S. Green Building Council); Luca De Giovanetti, Roland Hunziker, and Cristiana Jolivet (WBCSD); and James Drinkwater and Stephen Richardson (World Green Building Council). Their collective wisdom and contributions have dramatically improved the report's comprehensiveness and potential for impact.

Foreword



Albeta Klein
Director, Climate Business, IFC

IF YOU BUILD IT, BUILD IT GREEN: GREEN BUILDINGS OPEN THE DOOR TO BETTER BUSINESS AND A CLEANER WORLD

Green buildings represent one of the biggest investment opportunities of the next decade—\$24.7 trillion across emerging market cities by 2030.

Cities in emerging markets are expanding at a fast pace to keep up with high population growth and rapid urbanization. The floor area of the buildings that dot our skylines is expected to double by 2060. Most of this growth will occur in residential construction, particularly in middle-income countries. Meeting the demand for new buildings through green construction can spur low-carbon economic growth and create skilled jobs in emerging markets for decades to come.

Investors and financiers can take the lead in shaping and accelerating this multitrillion-dollar business opportunity. Smart investors understand the financial benefits of green buildings: lower long-term operating and maintenance costs, lower default rates, decreased odds of becoming a stranded asset, and potentially higher returns on investment.

Emerging evidence indicates that green buildings are a higher-value, lower-risk asset than standard structures. Besides lowering energy consumption, and therefore operational costs, greener buildings typically achieve higher sale premiums and attract and retain more tenants, ensuring a more continuous revenue stream.

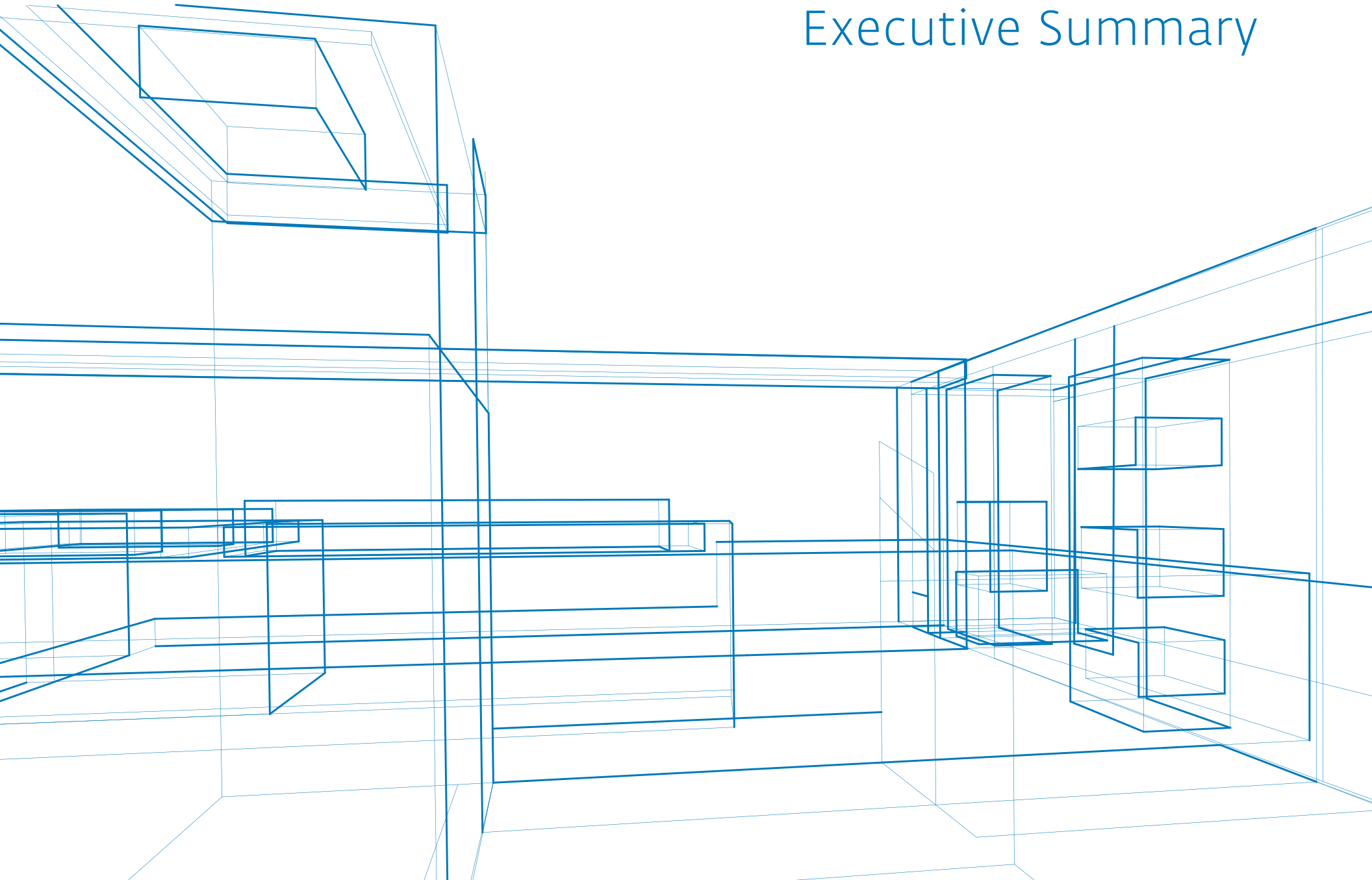
In addition, green buildings can help investors and owners manage the risks associated with a transition to a lower-carbon economy. This transition will bring regulatory, economic, and resource changes, and some energy-inefficient assets will no longer be profitable.

The private sector, governments, and financial institutions need to work together to transform real estate, especially in emerging markets, where most of the construction will happen and where green buildings could have the greatest impact. Investors, owners, and tenants are beginning to recognize the clear business case and are demanding buildings that can meet tenants' needs, maximize returns, and minimize their environmental impact. Governments can support the green transformation of real estate by providing regulatory frameworks and strategies to address market barriers and incentivize green construction in their markets. Mobilizing banks and institutional investors to offer green construction and green mortgage finance will be essential to expanding green building practices.

This report captures best practices by investors and financiers, governments, developers, and owners to provide an investment blueprint for green buildings across emerging markets. Ensuring that green buildings become the norm across emerging markets will go a long way towards supporting low-carbon economic growth.



Executive Summary





Executive Summary

Green buildings play a pivotal role in spurring low-carbon economic growth and securing a transition to clean energy as an increasing number of companies and governments aim to be carbon neutral by 2050.

As an impact investor focused on pursuing positive social and environmental outcomes through profitable investments, IFC views the green buildings sector as a multitrillion-dollar business opportunity and an avenue to reduce energy-related emissions.

Green buildings: A \$24.7 trillion investment opportunity

The green buildings sector represents a \$24.7 trillion investment opportunity by 2030 across all emerging market cities with a population of more than half a million people.¹ Most of this investment potential—\$17.8 trillion—lies in East Asia Pacific and South Asia, where more than half of the world's urban population will live in 2030.² The investment opportunity in residential construction, estimated at \$15.7 trillion, represents 60 percent of the market.

There is a strong business case for growing the green buildings market. Emerging evidence indicates that green buildings, or buildings that use energy and water more efficiently, are a higher-value, lower-risk asset than standard structures. While building green could range from savings of 0.5 percent to 12 percent in additional costs,³ green buildings can decrease operational costs by up to 37 percent,⁴ achieve higher sale premiums of up to 31 percent and faster sale times,⁵ have up to 23 percent higher occupancy rates,⁶ and have higher rental income of up to 8 percent.⁷



Investing in green buildings allows market players to manage potential risks that stem from the global transition to low-carbon economies. Globally, the buildings sector consumes more than half of all electricity for heating, cooling and lighting⁸ and accounts for 28 percent of energy-related greenhouse-gas emissions.⁹ It will require an estimated 50 percent more energy by 2050 than today.¹⁰ Resource-inefficient buildings run the risk of losing economic value or becoming stranded assets due to increasingly stringent regulations, pressure from financial regulators to manage and disclose climate risks, changing consumer preferences, and shareholder demands. Non-compliant buildings could become subject to legal action and fines, making them more expensive to operate and insure, and harder to lease or sell.

The floor area of the global buildings sector is expected to double by 2060.¹¹ Most of this construction will occur in emerging markets, particularly in middle-income countries experiencing high population growth, rapid urbanization, and income growth. New construction offers a significant opportunity to integrate energy efficiency into building design from the outset, helping to maximize the financial benefits that come from energy savings and avoid the need for costly retrofits later.¹²

Green buildings construction at the scale required can spur low-carbon economic growth and create skilled jobs in emerging markets for decades to come, while improving energy security, air quality, and people's wellbeing.

The current size of investments in green buildings, however, is only a fraction of the investment opportunity. Global investments in green buildings accounted for \$423 billion of the \$5 trillion spent on building construction and renovation in 2017. There are a number of constraints that hamper the development of a robust pipeline of green properties and widespread adoption of green construction. These constraints include the perception of high construction costs, a lack of alignment of incentives and benefits among market players, and a mismatch between relatively short hold periods of real estate assets in portfolios and the long lifespans of buildings and when they might be affected by climate change and stricter regulations.



Investment opportunity
by property type and region (USD billions)



Sub-Saharan
Africa



Middle East &
North Africa



South Asia



East Asia
Pacific



Europe &
Central Asia



Latin America
& Caribbean



Education	73.8	122.6	41.2	1,191.4	50.6	269.6	1,749.2
Healthcare	38.7	85.8	13.5	320.6	30.2	81.1	569.9
Hotels & Restaurants	11.9	35.2	38.8	1,345.7	23.6	54.2	1,509.4
Institutional/Assembly	27.6	50.2	17.3	733.7	24	26.7	879.4
Office	49.6	65.3	61.7	2,566.8	40.8	111.9	2,896.2
Retail	31.4	60.7	87.6	844.8	39.1	84.2	1,147.9
Transport	5.3	7.4	3.2	26.2	3.8	11.9	57.8
Warehouse	20.1	22.5	18.2	97.4	7.1	25.1	190.5
TOTAL COMMERCIAL	258.4	449.7	281.5	7,126.6	219.2	664.7	9,000.2
Multi-Unit-Residential	96.6	158.1	542.9	7,555.9	201.3	745.2	9,300
Single-Family-Detached	413	528.4	933.8	1,331.7	460.2	2,751	6,418.1
TOTAL RESIDENTIAL	509.6	686.5	1,476.7	8,887.6	661.5	3,496.2	15,718.1
GRAND TOTAL	768	1,136.2	1,758.1	16,014.2	880.7	4,160.9	24,718.3

Emerging markets, despite having ambitious targets for green buildings, struggle to put in place effective measures to mandate and incentivize large-scale adoption of green construction practices. This is partly due to low technical capacity to build, operate, and maintain green buildings, lack of knowledge, and weak enforcement regimes, as well as challenges in developing and implementing consistent standards and requirements for green construction across a highly local and decentralized industry.

These countries must also address an urgent need to meet a considerable shortfall in affordable housing—a challenge in itself without the added considerations of building green. Furthermore, low-income countries and fragile and conflict-affected states face additional challenges given weaker institutions and capacity, and underdeveloped financial systems, including the mortgage market.

Despite the challenges, realizing the full investment potential of green buildings is within reach, with established financing models and proven, easy-to-implement technologies that are readily available and continue to decrease in cost with their greater adoption. Investors, developers, owners, and governments will have to work together to meet demand for buildings in a way that is economically beneficial and aligned with global climate goals.

Investors and financiers can drive green buildings investment

Real estate investors and financiers hold tremendous influence to shape and accelerate the market for green buildings. There are clear market incentives—both on the opportunities and risks side—to focus investors' attention on financing green buildings.

Commercial banks are a key source of financing. Construction finance, mortgages, home improvement loans, and green financial products for resource-efficient buildings can significantly accelerate the uptake of green buildings, as can better financial terms such as lower interest rates and longer tenors. In return, banks can expand their client base and product offerings, build higher-value and lower-risk portfolios, and access new sources of finance through green bonds, green securitizations, and green credit facilities, potentially reducing their cost of capital.

Institutional investors participating in green real estate market can help inject liquidity and enable primary lenders to free up capital to develop new green lending products. They can also help scale up local currency financing through direct lending or equity investments.

National and multinational development finance institutions can catalyze nascent markets and facilitate the entry of private investors. They provide a range of financial products not readily available in emerging markets, often in combination with technical support and capacity-building programs. These institutions can also build governments' capacity to develop enabling environments.

Governments can create enabling environments to galvanize market growth

Governments can help create a pipeline of green building assets and incentivize financiers to channel capital to the sector. As large owners of and investors in real estate, governments can contribute to investor appetite by requiring all public buildings to be green. This can also build technical capacity and skills among designers, engineers, and workers, who then can build privately financed green buildings.

Governments have already signaled their interest in “building it right,” with the buildings sector referenced in 136 countries' Nationally Determined Contributions (NDCs).¹³ Nevertheless, two-thirds of the expected future construction will be in countries that do not have building energy codes, and where they do exist, they are often not robust or enforced.¹⁴ To achieve the high-level targets and policies, governments need to translate these ambitions into progressive regulations and incentives.

Fiscal incentives like tax breaks, grants, subsidies, loans, and rebates, complemented by non-fiscal incentives such as preferential or expedited permitting, density bonuses (such as increased height allowances), or public advocacy can be deployed. Mandatory building codes can ensure that green measures are incorporated from the outset and raise market awareness. Labeling and energy performance certifications for buildings and appliances can help ensure compliance with green standards, catalyze the market for energy-efficient technologies, and generate



market data to help financial intermediaries select efficient buildings to invest in.

These policy options can be tailored to local legal frameworks, socioeconomic context, and developmental priorities.

Governments must also ensure compliance with regulation. Training construction industry professionals and officials can make enforcement easier. Stakeholder engagement that incorporates the interests and

expertise of the public and private sectors can help remove some of the barriers to compliance. Mandating third-party certification can address green-washing concerns and ensure incentives go to eligible recipients without extensive public sector overheads.

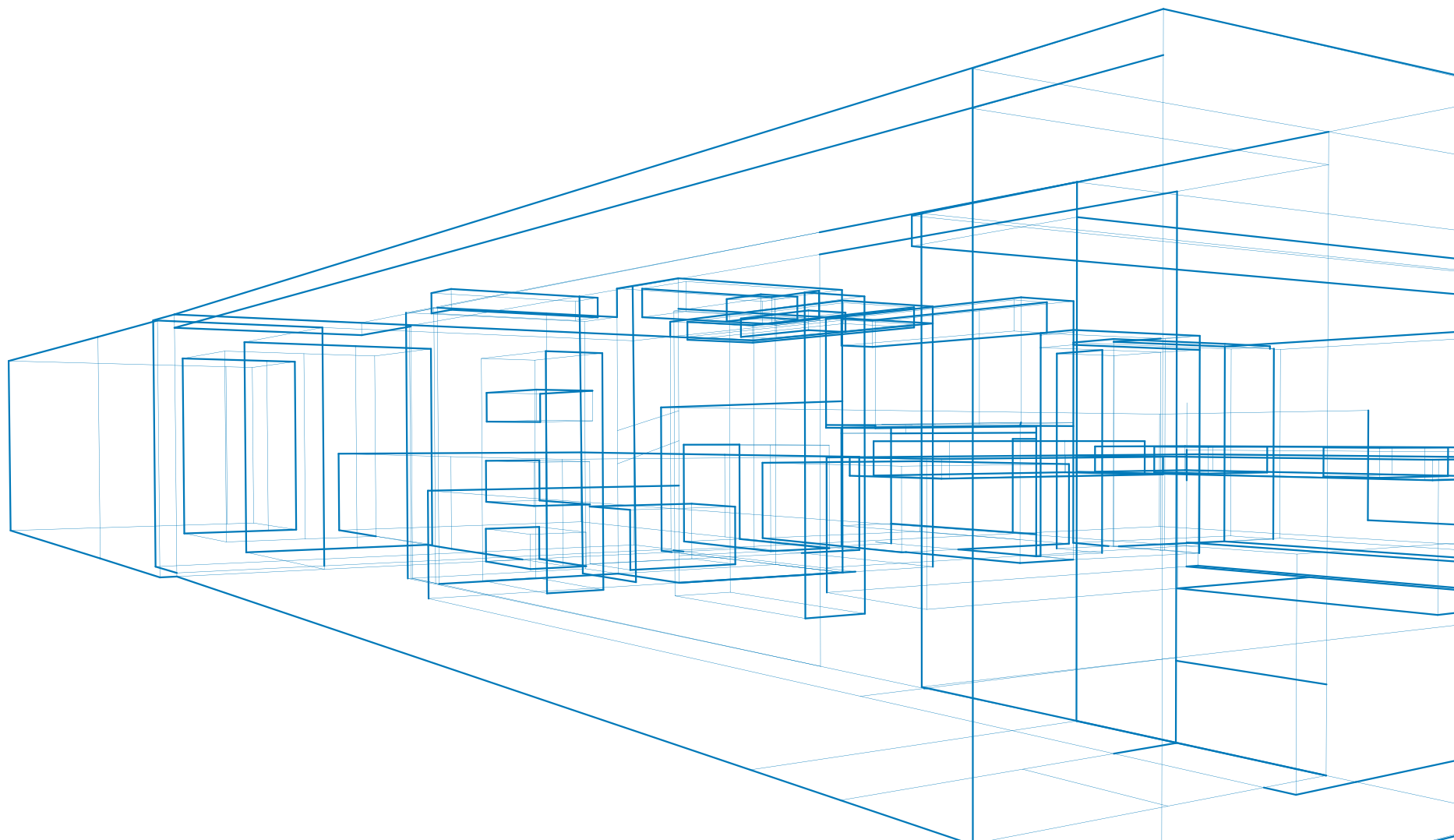
The private sector can lead the way through voluntary commitments to build green

Voluntary adoption of green construction practices by a number of private real estate developers and owners have created momentum, but must be scaled from limited commitments to industry-wide actions, particularly in emerging markets. Current commitments range from greening individual buildings and entire portfolios to joining ambitious pledges through international platforms and initiatives. Such commitments have been primarily linked to and delivered through green building certification programs.

International rating systems such as BREEAM, DNGB, EDGE, Green Star, and LEED are among the most popular and influential. In many countries, multiple systems, including locally developed rating systems, operate as complementary drivers of green building. These systems help expand the green buildings market by evaluating and benchmarking green buildings against local practices, as well as providing third-party verification.

This report provides a blueprint of the replicable and scalable solutions available to different market players to mainstream private investment in formal, new green buildings construction in emerging markets. It showcases current best practices by the players with the most influence to accelerate and amplify the green buildings market: financiers, policymakers, building owners, and developers across both developed and emerging economies.

Introduction



About this report

This report makes the case for investing in green buildings and provides practical guidance to financial institutions and investors across emerging markets on shifting their real estate portfolios to financing green buildings. By doing so, they can take advantage of the \$24.7 trillion investment opportunity across emerging market cities by 2030, build strong portfolios, stimulate demand for green buildings, and contribute to low-carbon economic growth.

The report also looks at commitments and actions by developers and owners of green buildings and governments, who are critical players in creating the market for the flow of finance to green construction.

It is intended primarily for financial institutions across emerging markets as they seek to expand their green construction and mortgage finance products in order to build higher-value and lower-risk portfolios and access global capital markets. It is recommended for building developers and owners across emerging markets who seek to better understand the business case for green buildings and how they can differentiate themselves in the market in order to grow their business and access to finance. It is also recommended for emerging markets' governments, particularly at the subnational and local levels, which can incentivize green construction to achieve green economic growth and meet climate commitments.

The report offers a uniquely private sector perspective on the investment potential in emerging markets and how to realize this potential, according to IFC. It draws on IFC's almost decade-long experience of helping design and implement green building codes across emerging markets. In addition, IFC has designed its own certification system specifically for emerging markets, EDGE, which is available in more than 150 emerging markets.

Through its investments, IFC complements existing work that is catalyzing sustainable markets. As of June 30, 2019, it has invested more

than \$4.5 billion in green building projects worldwide and mobilized an additional \$1 billion in financing for green homes, offices, hospitals, hotels, and retail buildings. Furthermore, it works within an extensive network of client banks across emerging markets to help develop and expand innovative financial products to scale up investments in green buildings.

The report focuses on the construction and use of green buildings and considers the business and climate benefits of energy efficiency, water savings, and waste reduction approaches. It does not consider the climate impacts associated with the production and supply of construction materials[†] or the practices necessary to address the emissions from the end-of-life demolition phase of the building lifecycle.

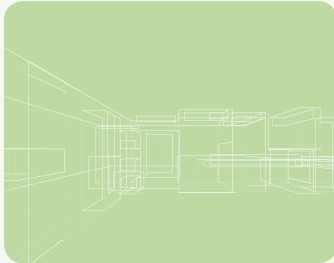
This report focuses on new buildings and does not discuss retrofits. Given the rapid growth of new construction, new buildings represent a larger investment potential. There is also an urgent imperative to “build it right” in order to avoid inefficient use of energy for decades to come. The market for retrofits is discussed briefly in the Current and Potential Green Buildings Market section.

The report does not differentiate between low-income and middle-income emerging markets. While the best practices reviewed in this report are intended to inform the application of green construction practices across markets, we acknowledge that lower-income and fragile and conflicted-affected states face unique challenges, and these countries will require significant time, effort, and support to transition to green construction and to develop the mortgage market.

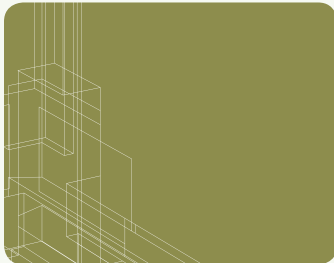
[†] Although the embodied carbon of construction materials—greenhouse-gas emissions generated during materials' production—is beyond the report's scope, it is important to note that it is a key issue in the context of decarbonizing the construction value chain. The construction industry is the world's largest consumer of raw materials and, if embodied carbon is taken into consideration, buildings' contribution to global greenhouse-gas emissions increases from 28 percent to 40 percent. Approaches to decarbonizing construction materials are covered in previous IFC reports.

Report structure

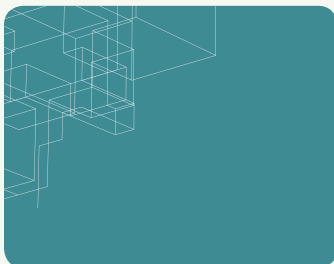
The report is divided into four chapters: Introduction (this chapter), Understanding the Market for Green Buildings, Building the Market for Green Buildings, and Conclusion and Recommendations.



Understanding the Market for Green Buildings defines green buildings and outlines the context and framing for subsequent analysis. The chapter estimates the size of the current market for green buildings and its potential in emerging markets. It reviews the investment opportunities by region and building type, and considers the business case for green buildings for investors, developers, and governments.



Building the Market for Green Buildings draws on the foundational definitions and business case and reviews key ingredients for functioning markets: finance, policy and regulation, and voluntary standards and actions by the market leaders.



The final chapter, **Conclusion and Recommendations**, distills the best practices reviewed throughout the report into recommendations for the key market players.





What is a Green Building?

Green buildings reduce or eliminate negative impacts on the environment and climate.¹⁵ Definitions of green buildings vary. They can be tied to carbon and energy objectives such as net zero emissions or 1.5°C-compliant, as well as considerations for people's health and wellbeing. While green buildings differ across local contexts and exhibit different green features, it is important to have an agreed on and comparable set of metrics that measure the most material characteristics of what makes a building green.

Clear and agreed on definitions of what constitutes these material characteristics, accompanied by relevant metrics to measure and verify a green building's performance, accounting for local variations, are important for market growth. Definitions and metrics are essential for:

- Industry policymakers to establish minimum requirements for compliance, as well as provide incentives for private sector innovation to raise the standard.
- Developers to build green buildings and get recognition from buyers for their superior quality.
- Financial regulators to develop market rules for green assets.
- Financiers and developers to gain access to capital markets for their green building portfolios.

Standardized metrics and clear reporting requirements are essential to catalyze investment at the scale required to green the new construction market. They will help investors assess green buildings for their financial

Photo: The EDGE-certified Samara Suites, a mixed-used building developed by Asia Green Real Estate and Sintesis Kreasi Utama, is located in the heart of Jakarta.

viability, sustainability credentials, and alignment with portfolio strategies.

Standards provide the necessary definitions while certifications such as BCA Green Mark, BREEAM, LEED, and others can offer an asset rating to help investors define, measure, and verify their green buildings investments. This facilitates the issuance of green bonds and other forms of green finance, which can increase capital flows to the sector.

IFC's definition of green buildings

From almost 15 years of investing in green buildings, IFC has learned that green buildings should be:

- Certified as green under one of the internationally recognized certification standards or an approved national standard.
- At least 20 percent more energy efficient than a baseline building without energy-efficient design.¹⁶
- Able to quantitatively report impact metrics, such as energy and water savings, and greenhouse-gas emissions reductions.

When IFC provides credit lines to its client banks and other financial intermediaries for on-lending for green building projects, it requires eligible projects to be certified and at least 20 percent more energy efficient than the benchmark.¹⁷

When IFC uses the proceeds of green bonds to finance green buildings, it reports on the following metrics: the type of green certification system applied; green floor space; reductions in energy, water, and energy embodied in materials against a benchmark; and reductions in carbon emissions. For residential projects such as low-income housing, additional metrics include the number of households or people served. In addition, it is best practice for green bond issuers to report on quantifiable green building performance to bond holders.



Residents of Greenox, Turkey's first "vertical forest" apartment complex built by Aycaan-Feres in Istanbul, holding their EDGE certificates.

The focus on operational energy efficiency and the resulting reduction in greenhouse-gas emissions aligns with what large commercial banks consider to be the most material characteristics for their green real estate portfolios.¹⁸ Energy use can be measured and verified; however, focusing on this alone disregards the other benefits of green buildings, namely water-use efficiency and reduced embodied carbon in building materials. Unlike most certification systems, IFC's EDGE incorporates



EDGE: Powering green building transformation in emerging markets

IFC's EDGE can be used to certify new and existing buildings at the design stage and after construction that achieve at least a 20 percent cut in energy, water, and embodied energy in materials compared to conventional buildings. Designed for emerging markets, EDGE offers a faster, easier, and more affordable approach to certification than was previously available. It consists of free design software, a streamlined online certification system, and the world's largest network of certifiers.

EDGE's software allows a user to apply different systems, solutions, and design techniques to discover the most cost-effective way to design and build green. These include energy-efficient lighting and cooling, shading, natural ventilation,

and low-flow water fixtures, which help optimize building performance. Incremental capital costs are indicated with the payback period, as well as the value that is transferred to future owners of the property. The software is calibrated to take local conditions into account, including climate and local industry costs and practice. EDGE is available in over 150 countries for residential, public, and commercial projects.

In September 2019, EDGE launched two new certification products to recognize high-performing projects:

- **EDGE Advanced:** Awarded to projects that improve energy efficiency by 40 percent or more, in addition to at least 20 percent

savings in water and materials as per EDGE certification requirements.

- **EDGE Zero Carbon:** EDGE Advanced projects that achieve 100 percent carbon neutrality through renewables or carbon offsets at the operational stage receive further distinction.

EDGE is the only system that requires efficiency in embodied energy in materials as a certification parameter. To better address the issue of embodied carbon in construction materials, IFC is exploring moving from requiring a minimum of 20 percent efficiency in embodied energy in materials to embodied carbon in materials.



these parameters, and ways to quantify them, into its definition of a green building, which requires a minimum of 20 percent greater water and energy efficiency, and 20 percent less embodied energy in building materials compared to a local business-as-usual benchmark.

IFC is leading discussions with other multilateral development banks to agree on a common definition of green buildings.

Extending the scope of certification to operations

While energy efficiency and other green measures are increasingly being incorporated into building designs, studies have shown that these often do not translate into expected reductions in energy consumption during the building's use due to occupant behaviors. This mismatch between design and operation is known as a performance gap. Certification systems—which are often aimed at the design stage of building construction—are working to incorporate requirements that verify that buildings are used in a way that maximizes the effectiveness of efficiency measures.¹⁹ They can then ensure that buildings that are designed to be green are also used in a green manner.

One approach is to complement design-focused certifications with building performance rating systems and certificates such as the EU's Energy Performance Certificates that help measure and monitor the building's energy performance, as well as provide tips on how to cost-effectively improve the building's energy rating (for further details, see the section on Policy and Regulatory Building Blocks).²⁰ However—as evidenced in China where less than 5 percent of certified green buildings hold green performance certificates²¹—this second stage of certification is less commonly used by developers than those for the design stage.

The next frontier: Net zero emissions and zero carbon certification

As technologies advance and governments' sustainability ambitions grow, so efficiency and decarbonization standards are becoming stricter. New buildings will have to comply with ever-improving standards and norms, and existing buildings will need to be regularly monitored and retrofitted to meet new, higher efficiency standards.

The next frontier for green buildings is to have net zero emissions. Net zero buildings are highly efficient buildings that use only renewable energy or carbon offsets. In 2017, there were 2,500 net zero emissions buildings worldwide that were recognized through a green building certification or adhered to an official standard.²² This number needs to significantly increase to reach the net zero emissions goal.

Cities like Boston are already incorporating carbon neutrality requirements for new buildings,²³ and others are following suit. In October 2019, Arthaland Corporation became the first company to receive an EDGE Zero Carbon certification, for its flagship office building in the Philippines.²⁴

The World Green Building Council is calling on the signatories of the Advancing Net Zero agenda—comprising businesses, cities, states, regions, and organizations—to take immediate climate action to reach net zero operating emissions in their building portfolios by 2030, and advocating for all buildings to be net zero in operations by 2050.²⁵ This is complemented by the Zero Carbon Buildings for All Initiative, which also calls for national and local leaders to drive decarbonization of all new buildings by 2030 and all existing buildings by 2050. It also challenges financial and industry partners to provide expert input and commit \$1 trillion in investment by 2030.



Current and Potential Green Buildings Market

The current market for green buildings

The floor area of the global buildings sector is expected to double by 2060, driven by growing population and urbanization rates across emerging markets.²⁶ The projected additional 230 billion square meters of new building construction is equivalent to adding the floor area of Japan every year until 2060.²⁷ It is imperative to ensure that these new buildings are built green to avoid higher carbon emissions for decades that stem from inefficient energy use. Rapid expansion of building construction and the need to reduce emissions present a \$24.7 trillion investment opportunity in the green buildings sector in emerging market cities until 2030.

Green buildings comprise a relatively small share of global construction. Global investments in green buildings accounted for \$423 billion of the \$5 trillion spent on building construction and renovation in 2017 and represent an even smaller share of the estimated \$217 trillion in global real estate value.²⁸ However, by some estimates, the global green buildings market is expected to grow at an average of over 10 percent annually between 2017 and 2023.²⁹

The residential construction sector accounted for over 60 percent of the global market for green buildings in 2018.³⁰ The green residential sector is expected to grow at a compound annual rate of 10.88 percent between 2018 and 2023.³¹ The non-residential segment of the market is expected to grow at a compound annual rate of 9.25 percent over the same period.³²



A 2018 study of world green building trends³³ surveyed 2,078 architects, engineers, contractors, owners, specialists, and investors employed in the construction industry across 86 countries. Almost half of the respondents expect green buildings to comprise over 60 percent of all their projects by 2021. The global average for the same group is expected to increase from 27 percent in 2018 to 47 percent in 2021. This supports the expected strong growth of green buildings as a share of total construction and the significant market potential.

A strong business case is driving the growth in green construction. Investor and client demand, as well as environmental regulations, are key triggers and business considerations. Property developers and end users, such as hotels, increasingly understand the financial and reputational benefits of building green.

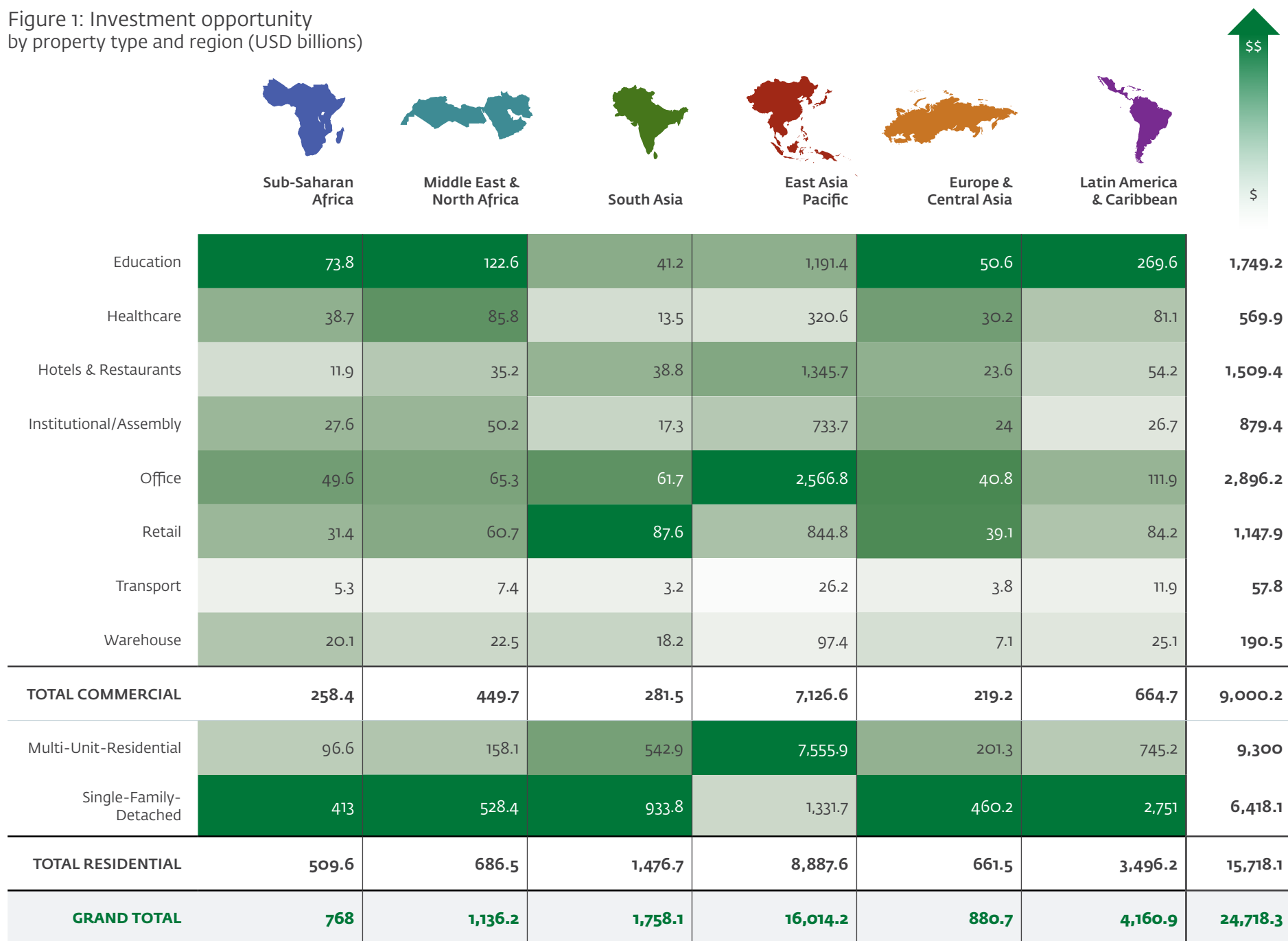
The potential market for green buildings: A \$24.7 trillion investment opportunity

The estimated \$24.7 trillion investment potential in green buildings between 2018 and 2030 in emerging market cities is due to the sharp increase in building construction expected over the next few decades and the opportunity to ensure these are built green.³⁴ This amount reflects the investment opportunity created by fully achieving explicit and implicit urban green buildings-related policies and targets set by local and national governments in emerging markets until 2030. It is informed by pledges, targets, and investment plans contained in city action plans, NDCs, and other policies.

These investment opportunity numbers assume that the total population in 2030 across six emerging market regions will be 7.5 billion, of which 4.1 billion people will live in urban areas, according to UN projections.



Figure 1: Investment opportunity by property type and region (USD billions)



The average overall rate of urbanization is assumed to be 56 percent, ranging from 40 percent in South Asia to over 80 percent in Latin America.³⁵

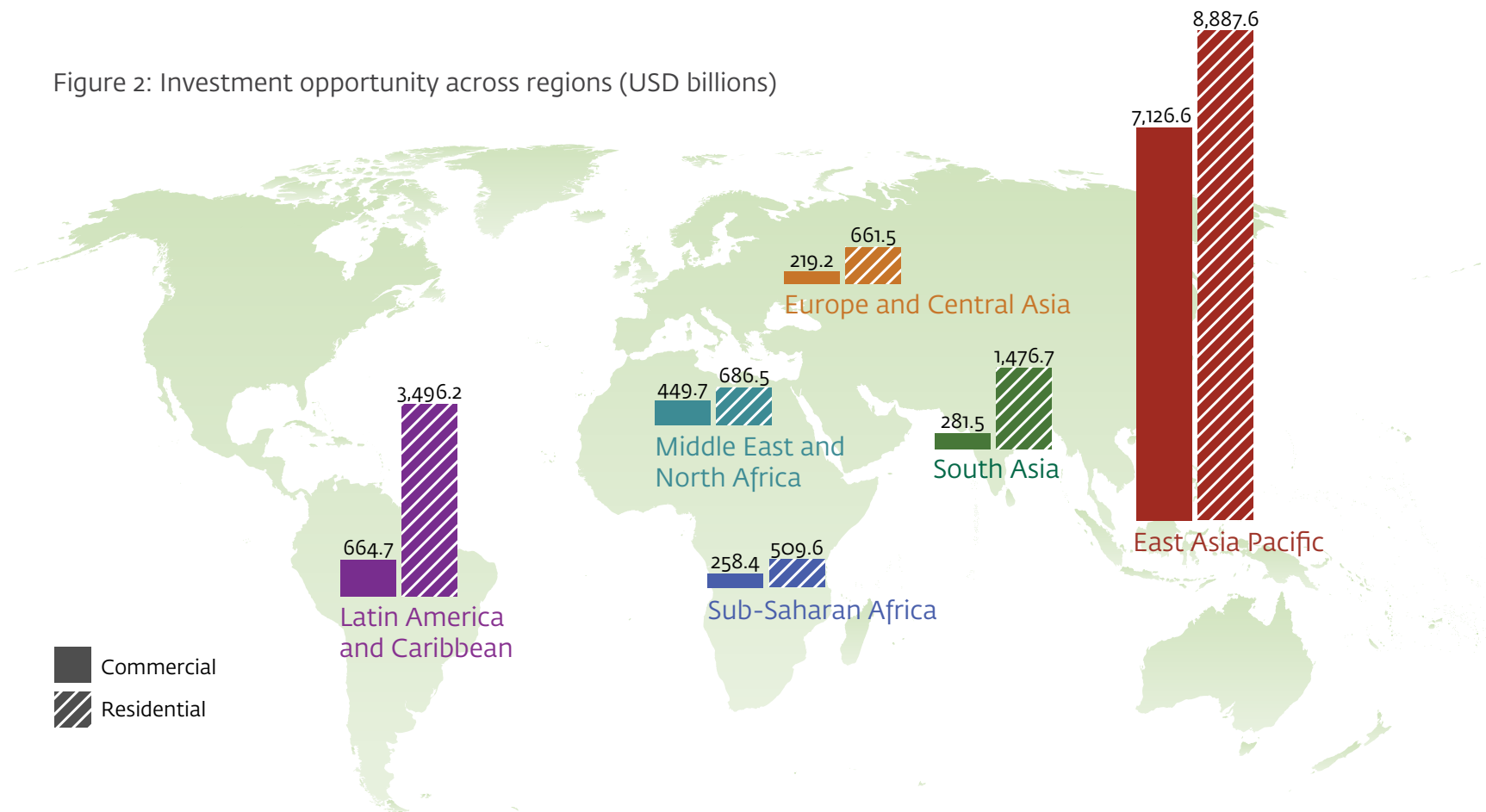
Investment opportunity across regions

More than half of the 4.1 billion people projected to live in urban areas by 2030 are expected to be in South Asia and the East Asia Pacific regions—they will need to be accommodated with additional residential and commercial building floor space. The East Asia Pacific region alone has an investment opportunity in green buildings of

\$16 trillion, accounting for over half of the total opportunity across all emerging markets. The investment opportunity in South Asia is an estimated \$1.8 trillion across rapidly growing secondary cities as well as megacities.

Eastern Europe and Central Asia have an investment opportunity of almost \$881 billion in new green buildings; however, this amount is likely to be much smaller than the investment opportunity in retrofitting old buildings to make them more energy and resource efficient, given that much of the needed building stock in this region already exists.

Figure 2: Investment opportunity across regions (USD billions)





Estimating the investment opportunity in green buildings

To estimate the size of the investment opportunity in green buildings, IFC first estimated the scale of the new real estate construction projected by 2030 across emerging market cities in the six regions where IFC works. This estimate relied on projections of population growth, urbanization rates, and the construction across existing and future emerging market cities with a population

of over half a million by 2030. Second, IFC projected the rate of green construction growth within the overall construction expansion in the target regions and countries. IFC used available historical data on the ratio and growth rate of green construction, data from its EDGE software, as well as stated commitments and targets by national and subnational governments related to urban green buildings.

Third, IFC relied on the actual costs plus potential inflation of green construction across emerging markets to calculate the size of the projected investment opportunity.

For a detailed methodology and list of sources used, please see IFC's Climate Investment Opportunities in Cities report.³⁶



Cities in the Middle East and North Africa have an investment opportunity of over \$1.1 trillion, much of which is expected to go towards new commercial and institutional construction,³⁷ in addition to addressing resilient housing needs to combat extreme heat and water stress in the region.

Sub-Saharan Africa’s cities are home to more than 470 million people today—a number that is expected to double over the next 25 years.³⁸ Meeting the housing gap as well as constructing commercial, institutional, and industrial buildings presents a major opportunity to green this future construction—worth about \$768 billion until 2030.

Latin America is the second most urbanized region in the world, with 81 percent of the population living in cities, of which almost a third are

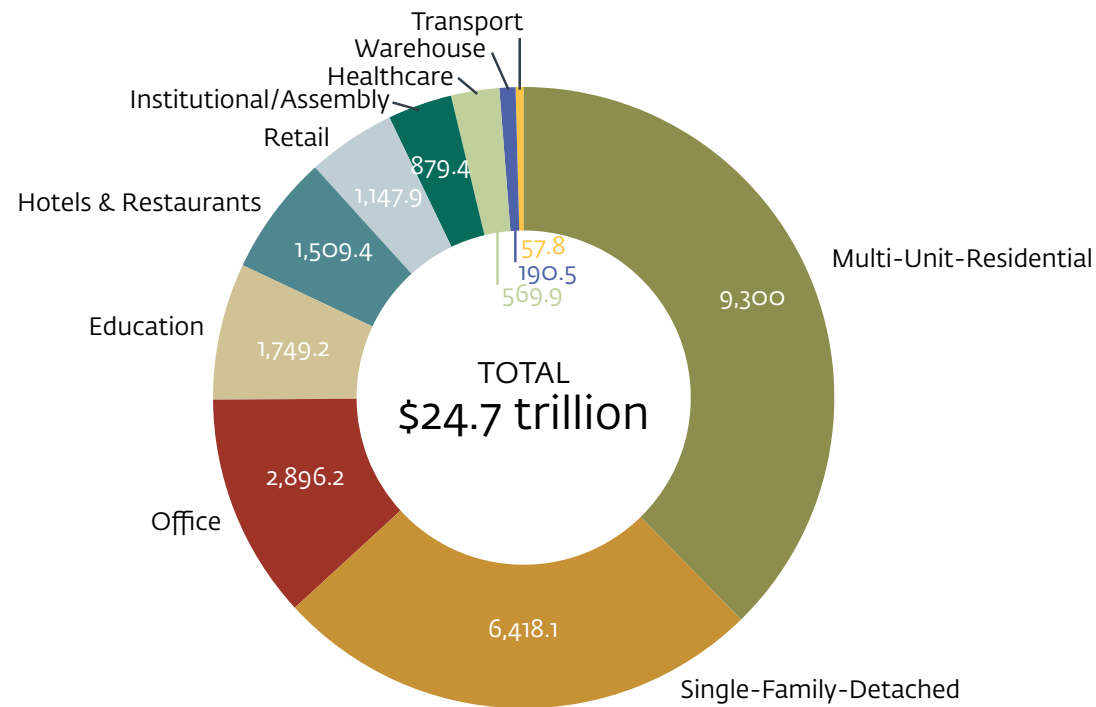
in emerging, intermediate cities.³⁹ Green housing construction is already a priority in many of the region’s countries, and meeting stated goals and expected demand for housing will create an estimated investment opportunity of \$4.1 trillion in green buildings.

Opportunity by building type

In emerging markets, residential buildings⁴⁰ account for most of the investment potential until 2030—\$15.7 trillion across all regions.

In comparison, the estimated investment opportunity in commercial buildings⁴¹ is \$9 trillion, or about 36 percent of the total investment opportunity in emerging markets.

Figure 3: Total opportunity by building type (USD billions)



The investment opportunity in the green residential sector is driven by the growing demand for housing, governments' concerted efforts to meet housing demand for its citizens, and underinvestment in energy efficiency measures in the sector.

Rapid population growth and increased urbanization will compound the current housing deficit in emerging markets—particularly in affordable housing. India alone needs an estimated 60 million additional housing units to be built between 2018 and 2022 to meet the existing shortfall.⁴² By 2025, 440 million households globally—an estimated 1.6 billion people—will live in substandard housing.⁴³

Residential construction and affordable housing are key priorities for governments in emerging markets. The Indian government has launched Housing for All by 2022, a policy that aims to meet the gap in urban housing with increased private sector participation.⁴⁴ Affordable housing is a key component of Kenya's Big Four development pillars, and the country is on track to build 500,000 affordable homes by 2022.⁴⁵ Similar trends in all regions will help drive demand for investment in buildings—and there is a huge opportunity to make these buildings green.

While residential buildings account for almost 75 percent of energy use by buildings globally, they receive only half of the energy efficiency investment in buildings.⁴⁶ There is scope for greater investment in energy efficiency measures, including building envelopes, appliances, water efficiency, and waste management.

In tandem with residential construction, emerging market cities will also see an increase in demand for commercial construction given population growth in cities and the associated increase in economic activity. Commercial buildings have been a key user of green building certifications, driven in part by competition for capital and tenants, as well as increasingly more stringent regulation. The projected increase in commercial building construction presents a significant opportunity for green buildings.

The retrofit market

Although beyond the scope of this report, retrofitting existing buildings represents another sizeable investment opportunity and plays a key role in reaching global climate goals. To bring the buildings sector onto a 1.5°C compatible pathway, 3 percent to 5 percent of the existing global building stock would need to be renovated every year until 2050.⁴⁷ The vast majority of the buildings built today will still be used in 2050. This means that almost every building that is not carbon neutral will need to be retrofitted at some point in the next 30 years.

Undertaking these retrofits presents both a challenge and a significant investment opportunity. The retrofit market is expected to grow at a compound annual growth rate of 8 percent from 2018 to 2023.⁴⁸ Energy efficiency retrofits have shown attractive returns on investment, even for short-term investors. This is because in addition to generating direct cost savings, these measures positively affect the overall value of buildings.⁴⁹



Winning strategy to appeal to institutional investors

Asset manager Asia Green Real Estate invests capital and sustainability expertise in buildings in Asian metropolises. The firm finances residential and commercial properties for both the expanding middle class and the growing number of national and international companies in the region.

Asia Green Real Estate provides an opportunity for private and institutional investors who are looking for both financial and sustainability returns. It offers returns of 8 percent to 12 percent, with increasing land value making these investments relatively safe, as the underlying asset is the acquired land.

To develop a strong pipeline of projects and attract capital from investors looking to fulfill

their sustainability commitments, Asia Green Real Estate has an in-house team of architects and engineers with considerable experience in green design and construction. The company helps its clients identify and apply the most practical and cost-efficient solutions to maximize the benefits. To support this effort, it has developed a proprietary sustainability assessment system, EcoTool.

With the EcoTool, a building can be evaluated by resources, health, and comfort, with the aim of achieving above-market sustainability standards within a local context. Based on an analysis of strengths and weaknesses, the company then develops solutions for improvement with the highest benefit-to-cost ratio.

Asia Green Real Estate has also committed to certifying the projects that it finances with IFC's EDGE. All projects that qualify for financing are required to commit to certification before a transaction proceeds.

To date, Asia Green Real Estate has invested in more than 2 million square meters of green floor space. Each of its projects consumes less energy and water and has a lighter carbon footprint than traditional buildings. The value for clients is created by lower operational costs, lower vacancy rates, and potentially higher resale prices. As 80 million people are projected to enter Asia's middle class in the next few years, the demand for housing will continue to rise, creating ample business opportunities for investors.





The Business Case for Green Buildings

Investing in green buildings—whether single-family homes, apartment complexes, office buildings, or industrial setups—makes good business sense for a wide variety of stakeholders. This section of the report considers available evidence of the business case for four main groups of stakeholders: investors and financial intermediaries, developers, owners, and governments. These players own and finance a large proportion of real estate across emerging markets and can benefit significantly from shifting their portfolios to green buildings.

Most of the evidence surrounding the benefits of green buildings comes from studies focused on developed markets. However, IFC's investment and operational experience, combined with anecdotal evidence, points to similar benefits in emerging markets. The type and degree of benefits inherent in building green can differ depending on the climatic conditions of different regions. To build a comprehensive business case for green buildings in emerging markets and to attract substantial public and private financing for green construction, IFC, with financial support from the UK government, will be undertaking further research over the next two years.

Studies and evidence across several markets suggest that to build green could range from savings of 0.5 percent to 12 percent in additional costs.⁵⁰ Green buildings are more efficient than traditional buildings and can lower operating costs, increase revenues, and reduce exposure to the physical and transition risks presented by climate change. These factors can increase the valuation of green buildings, making them stronger credit assets and better collateral.




Photo: The EDGE-certified Renault Bucharest Connected is the new home of Groupe Renault Romania. Globalworth, the investor behind the project, has certified more than 70 percent of its properties as green.



The cost of building green in emerging markets

The cost of building green varies across locations, driven by climatic conditions, cost, and availability of building materials as well as energy- and water-efficient equipment, and availability of technical expertise in green construction, among other factors. It is, therefore, difficult to definitively say what it costs to build green across emerging markets. The EDGE software is calibrated to take local conditions into account, including climate and local industry costs and practice. The software allows its users to apply different green systems, solutions, and design techniques and estimate the associated incremental capital costs and the projected payback periods. The examples below from three continents provide anecdotal evidence that building green in emerging markets can be affordable even for low-income housing.

In South Africa, IFC client International Housing Solutions (IHS), a low-income housing developer, reports the additional cost to build in accordance with the EDGE standard to be about

\$270 per housing unit. This represents less than 1 percent of the construction cost, yielding an internal rate of return between 20 percent and 30 percent. IHS green homes demonstrated annual utility savings equal to one month's rent compared to IHS non-green development and gave the company a competitive advantage in the market. Having seen that the business benefits outweigh the additional cost of building green, IHS exceeded its original target for green construction by 21 percent and has registered or certified close to 7,000 units with EDGE. Other examples of low-income housing developers in Africa that have embraced the business case for green construction include EchoStone in Nigeria (see p. 65).

In Mexico, IFC client Vinte builds affordable communities that include hospitals and health clinics, parks, and schools. Vinte's homes, with a starting price equivalent to \$20,000, feature solar panels, modern induction stoves,

smart meters, and other green features. The cost of adding green technologies and EDGE certification is about \$300 per home. Thousands of EDGE-certified homes by Vinte will enter the market in early 2020. Vinte's commitment to sustainability has placed the company on Fortune Magazine's 2019 list of companies that change the world.⁵¹

In Indonesia, the EDGE-certified development Citra Maja Raya reported the additional cost of green measures to be 4.7 percent, with a payback period of 1.8 years. The green measures included optimum window sizing, external shading, insulation of roof and external walls, natural ventilation, and energy- and water-efficient systems. The utility savings per year amount to 30 percent. Some residents reported that their monthly utility bill decreased from an equivalent of \$55 in previous non-green housing to \$14.



Certified green buildings can lower operating expenses and improve resource efficiency by lowering utility bills, waste output, and maintenance costs. Green buildings can save more than 20 percent on energy and water consumption compared to typical buildings. This can help save green homeowners an average of 15 percent to 20 percent on their utility bills.⁵² Green commercial buildings have recorded operating costs of between 18 percent and 37 percent lower than traditional buildings.⁵³ Green buildings that incorporate recycling can reduce waste output by 90 percent and use 30 percent less energy, equating to a 5 percent increase in net operating income compared to traditional buildings.⁵⁴ Green buildings use technologies with a longer anticipated lifespan and/or more durable components (such as LED lights), reducing maintenance costs.

In addition, green property developers can benefit from tax incentives, expedited permitting processes, and density bonuses such as permission to build additional floors beyond the usual limit for conventional buildings, which policymakers are putting in place to incentivize green construction.

Green buildings can increase revenues through higher rent, better occupancy rates, and higher sale prices. Energy-efficient and certified green buildings can attract between 8 percent⁵⁵ and 25 percent⁵⁶ higher rents than conventional code-compliant buildings. Certified green buildings also enjoy occupancy rates of up to 23 percent higher,⁵⁷ higher tenant retention, and lower vacancy rates. Certified green commercial buildings have demonstrated resale prices of 10 percent to 31 percent higher.⁵⁸ The sale prices are 4 percent to 10 percent higher for green residential properties, which sell as much as four times faster than conventional residential buildings.⁵⁹ As building owners, buyers, and tenants become more aware of the financial benefits of green buildings, developers of green properties stand to benefit from higher demand and growing market share.

Reduced operating costs and higher revenues are just part of the opportunity. The high resource efficiency of green buildings (water, waste, and energy) can help manage transition and some physical risks posed by climate change, such as increasing energy prices and demand, increasing water shortages and usage restrictions, increased legal

liabilities, increased reputational risks, and increased vulnerability to extreme temperatures.

Green buildings can help protect portfolios from the risk of stranded assets, which stems from more stringent green building and energy codes and carbon taxes, and changing consumer preferences. Laws such as the recent Climate Mobilization Act in New York, which sets emissions caps for buildings over 25,000 square feet and large fines for missing the target,⁶⁰ will reward green and penalize energy-intensive buildings in their jurisdictions.

Non-compliant buildings will become subject to legal action and fines, making them more expensive to operate and insure. Such buildings may be more difficult to lease and sell or may face premature termination of leases if tenants seek to move to more energy-efficient buildings. Owners of non-green buildings may have to sell their property at a discount or pay for costly retrofits to meet new, stricter requirements or to be competitive in the market. Developers that do not build green may experience slower sales times, lower sales prices, lower occupancy rates, and a loss of market share. Their access to finance may become limited as lenders are starting to screen new real estate assets for efficiency to avoid deterioration in the value of their real estate portfolios and a higher rate of non-performing loans.

In addition to these transition risks, buildings are exposed to physical risks associated with climate change. Green buildings may not necessarily be less prone to flood and hurricane damage, but temperature changes will alter heating and cooling demands. Green buildings will be better positioned to minimize the consequent impact on operating costs (see the box on Integrating Resilience to Climate Impacts into Building Design).

Lower operating costs, increased revenues, and reduced exposure to physical and transition climate risks make green buildings a well-performing asset class for investors and financiers, developers, owners, and governments to have in their portfolios. Green buildings can represent a higher-value and lower-risk asset.

Figure 4: Green hotel value example (India)
Effects of energy efficiency (EE) on the value of a hotel (USD)

Particular	Hotel without EE	Hotel with EE		
Income (Annual)			SAME NET INCOME	This example assumes the same occupancy rates for a green and a regular hotel
Room	503,029.00	503,029.00		
Other	3,595.00	3,595.00		
Gross income (IG)	506,624.00	506,624.00		
Vacancy rate (VR) (35%)	177,318.40	177,318.40		
Net income (NI=GI-VR)	329,305.60	329,305.60		
Operating expenses			LOWER OP. COST	Energy efficiency measures can save \$10,919/year for a green hotel
Electricity	18,766.00	10,450.00		
Gas	5,447.00	2,850.00		
Other	177,171.20	177,171.20		
Total expenses	201,384.00	190,471.20	HIGHER VALUE	Net operating income and therefore the opinion of value will be higher given the savings from energy efficiency
Net operating income	127,921.40	138,834.40		
Capitalization rate	8.75%	8.75%		
Opinion of value	1,461,958.86	1,586,678.88	EE PROVIDES +97K	Net energy efficiency effect is the difference between opinion of value of two hotels minus the cost of energy efficiency measures, resulting in \$97K potential return on investment.
EE effect		124,720.00		
Additional cost of EE		27,680.00		
Net EE effect		97,040.00		

Lower operating costs due to energy savings help increase the valuation of green buildings. Figure 4 shows how energy efficiency could increase the valuation of a hotel in India by 6.6 percent.

Other factors that can increase the valuation of green properties are higher occupancy rates, higher rental income, and further potential savings from not having to pay future carbon taxes or fines for non-compliance with emissions or building standards. Figure 5 provides an example of how a building's green features could be captured in the income capitalization valuation model. As the green buildings market

grows, so does the importance of ensuring that sustainability features and business benefits of green buildings are captured and valued appropriately to benefit the owner, investors, and financiers. Although it is the appraiser who would ultimately reflect green features in the valuation of properties, investors and lenders can request these services from valuation professionals. In addition, investors and financiers can develop and implement approaches to reflect the valuation of green properties in their financial models.

Figure 5: Income capitalization of green buildings*

$\frac{\text{Gross revenue}}{\text{– Vacancy}}$	(higher rents) (lower vacancy vs. market)
Effective revenue	(revenue up)
$\frac{\text{Operating expenses}}{\text{– Net operating income}}$	(lower utility bills, maintenance, reserves) (NOI up)
$\text{NOI/Cap rate – value}$	(lower cap rate)

*Income capitalizations shown for simplicity. An appraisal using a discounted cash flow model is likely to redirect similar performance adjustments

Source: Institute for Market Transformation, Appraisal Institute (2013), Green Building and Property Value: A Primer for Building Owners and Developers, available at: <https://www.appraisalinstitute.org/assets/1/7/Green-Building-and-Property-Value.pdf>.

The development of a widely accepted standard for the valuation of green properties could help direct finance towards green real estate.

Lower operating costs due to energy savings are a key factor in strengthening the credit risk profile of green buildings and green borrowers. Banks in the United States and Europe enjoy a default rate of up to 33 percent lower from green home buyers.⁶¹ This is partly because green homeowners, as they pay lower utility bills, could direct more of their income towards mortgage payments. In the United States, green building owners report a 7 percent⁶² increase in asset value due to a higher resale price than conventionally built homes, making them better collateral.

Utility savings can be particularly significant for low-income families in emerging markets. IHS, a real estate investment and rental company for low-income housing in South Africa, estimates that utility savings equate to one month’s rent per year for the families renting some of their green-certified properties (see Box 4).

Banks across emerging markets can treat savings in utility bills as their clients’ additional income, improving a borrower’s credit and risk profile. Some banks in emerging markets are starting to offer green home buyers a range of beneficial mortgage terms such as lower down payments, reduced interest rates and fees, and longer loan tenors and grace periods, or approve them for larger loans.

Even without beneficial mortgage terms, green mortgages can benefit both banks and homeowners. The calculation in Figure 6 shows that monthly energy savings compensate a green homeowner for the initial cost of “green” improvements. These savings reduce the cost of owning a more expensive and better-performing asset. At the same time, a lending institution will finance a larger mortgage to cover the cost of green improvements, bringing more income for a lower-risk and higher-value asset on its books.

Developers of green properties represent a better credit risk profile due to faster sales and higher sale premiums on green buildings. Banks across emerging markets can share a portion of their higher income

Figure 6: Green mortgage example

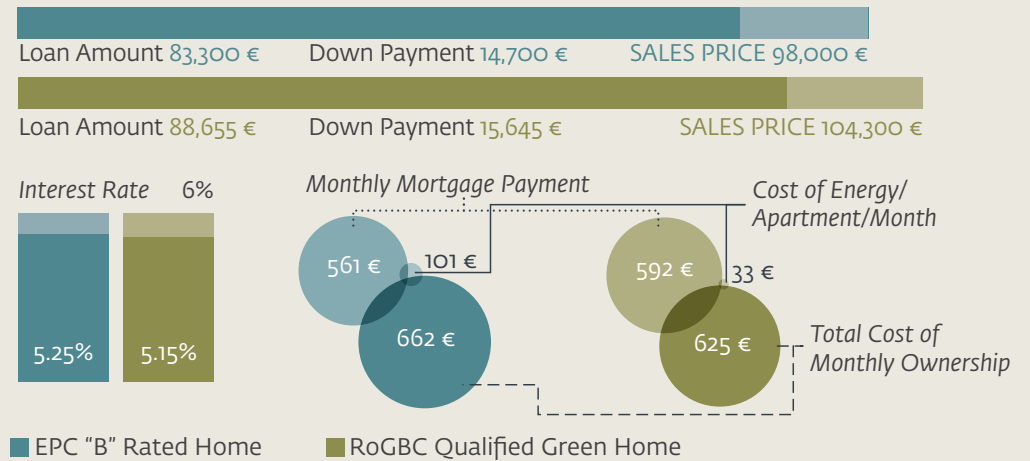
	Standard building: Standard mortgage	Green building: Green mortgage			
Base purchase cost	50,000	50,000	HIGHER AMOUNT	<ul style="list-style-type: none"> • Additional cost of efficiency measures • Costs can be lowered if EDGE is utilized early in the process 	
Green measures (3% higher costs)		1,500			
20% down payment	(10,000)	(10,300)			
Loan amount	40,000	41,200	3%		
Rate	11%	11%	TERM CAN VARY	<ul style="list-style-type: none"> • Benefits accrue even on commercial terms, but bank can incentivize adoption 	
Term	20 yrs	20 yrs			
Monthly payment	\$413	\$425			
Utility savings (20%)		(20)			
Cost of monthly ownership	\$413	\$405	-2%		
Bank income (yr 1)	4,371	4,502	3%	WIN-WIN	<ul style="list-style-type: none"> • Lower bills for the borrower • Higher income for the bank

(3 percent in the example above) with developers by offering them a range of financial incentives to encourage green construction and build their pipeline of green properties to finance. In turn, banks benefit from owning a portfolio of green assets with greater value and less risk.

Building a portfolio of green buildings opens access for financiers and developers to new sources of capital through green bonds, green credit lines, green securitizations, and impact funds that aim to generate positive environmental and social outcomes alongside financial returns. Green bonds inject liquidity and diversify banks’ and developers’ funding sources by connecting them to new investors, potentially reducing funding costs. The proceeds of green bonds and green loans can be used to finance green buildings certified with internationally

accepted standards. According to the Climate Bond Initiative,⁶³ in 2018, 13 percent of green bond proceeds were earmarked for green buildings in emerging markets.

Finally, green buildings bring a range of economy-wide financial, societal, and environmental benefits. They can help strengthen countries’ and cities’ water and energy security by reducing demand and thus the need for energy imports. More broadly, they can play a significant role in helping countries meet their NDC goals to reduce emissions. Delivering on this green growth trajectory is expected to result in net job growth, with 9 million skilled jobs being created in renewables and construction by 2030 globally.⁶⁴ Due to economic linkages between sectors, jobs in manufacturing, services, and waste management will also grow.



RoGBC's model assumes a 70-square-meter home with a 15 percent down payment and a payment period of 20 years. Borrowers in both scenarios have the same credit score, determined through typical underwriting procedures. The "B" rated home is determined by an Energy Performance Certificate score and represents a conventionally designed home. The RoGBC Qualified Green Home must pass an RoGBC audit of additional, stringent green criteria. Calculations are meant to be indicative and the interest rate may or may not be the same as banks participating in the initiative.

Green mortgages: A triple win

The Romania Green Building Council (RoGBC) created the SMARTER Finance for Families program to convince banks to introduce green mortgages. The program argues that green mortgages can deliver a triple win for developers, banks, and home buyers.

- A participating developer builds a more expensive green home on the condition that a participating bank will provide a larger loan to a green home buyer to cover the extra cost of building green.
- The bank books a larger and less risky loan, earning a higher return.
- The home buyer benefits with a lower monthly ownership cost for a superior

home through a combination of preferential mortgage terms and utility savings.

Seventeen organizations from 14 countries—representing a mix of financial institutions, institutional investors, universities, think tanks, green building councils, and manufacturers—are participating in the program.

Two of the participating banks, Raiffeisen Bank and Alpha Bank, offer a green mortgage discount of 75 and 50 basis points respectively on the conventional mortgage rate of 5.25 percent. Raiffeisen developed a specialty branch, trained its staff, and started marketing green mortgages on its website to target first-time home buyers. Alpha Bank recently

launched a national television campaign. About a dozen developers provide green building assets—30 housing projects in total, or 6,500 units that are 60 percent more energy efficient.

It is still too early to know whether these green mortgages will result in fewer late payments or loan defaults—or if they will take off in other European markets. SMARTER Finance for Families will share data among participants to help them better understand how green mortgages perform in comparison to ordinary home loans. The results will show whether the lesser risk of green mortgages does indeed bring better rewards.



Photo: Universidad del Medio Ambiente believes that each student entering the university will become an agent of change. The EDGE-certified building won this year's international "Energy & Hot Climates" prize offered by Construction21.



Governments own, operate, and occupy a substantial portion of real estate, including government office buildings, schools, hospitals, low-income housing, and commercial properties. For example, according to some estimates, the U.S. government owns about 15 percent of the country's commercial real estate.⁶⁵ A 20 percent saving in energy and water in government-owned buildings would lower utility bills, freeing up public funding for priority development areas to improve citizens' lives. In addition, green social housing would allow low-income tenants to save on their utility bills, thus reducing utility-related subsidies provided by governments. The section on Policy and Regulatory

Building Blocks further discusses governments greening their own buildings to shift the market.

Ensuring that government buildings are green creates new technical capacity for architects, designers, builders, appraisers, and certifiers. Large government contracts and policies to encourage green buildings can help create new markets for green products and services, stimulating economic growth. Green buildings could also strengthen the local tax revenue base. Many municipalities collect taxes on local businesses' profits. As local businesses retain a greater share of their profits due to reduced operating costs, so the government's tax revenue will go up.

Integrating resilience to climate impacts into building design

Because of their long lifespans, buildings are continually subjected to physical climate risks that are only set to intensify over time. Climate impacts can negatively affect a building's safety, habitability, and financial performance. Properties' financial performance is impaired by unforeseen expenses to address damages from acute climate-related events (such as extreme precipitation affecting structural integrity), as well as chronic events (such as sea level rise), that can significantly change a building's valuation. This will hurt insurance groups, as well as borrowers and lenders locked into long-term mortgages with a maturity mismatch in risks that could spark defaults and financial losses.

Hurricane Dorian, which hit the Bahamas in 2019, could cost the country \$7 billion in insured and uninsured losses from damage

to commercial, residential, and industrial properties as well as expenses resulting from business interruption.⁶⁶ To minimize future losses, all the reconstruction must be designed to be resilient as well as green. According to World Bank analysis, the overall net benefit of investing in resilient infrastructure is \$4 for every \$1 invested.⁶⁷

Awareness of the need to factor in resilience and energy security in investments is growing globally. More than 70 percent of organizations surveyed by Johnson Controls in 2018 consider resilience an extremely important factor when considering future energy and building infrastructure investments, in order to maintain critical operations during severe weather events or extended power outages.⁶⁸

TOOLS FOR RESILIENT NEW CONSTRUCTION

IFC is developing the Climate Resilience Index for Buildings to help developers assess and report location-specific climate-related risks and risk mitigation measures used for different types of buildings. This web-based tool focuses on climate variables that materially affect buildings, in addition to volcanic, fire, and seismic risks. The objective is to provide a simple self-declaration system for developers applying for construction finance to identify and address risks to the property, while providing a tool for banks and insurance companies to understand the asset's risk potential. This unified system to measure risk and resilience across all building types and developments will provide consistent definitions for all actors and increased



transparency to support enhanced resilience in developments and reduced risks for all involved. This tool is being developed for piloting in the Philippines. When paired with green building certification, this tool will ensure both emissions mitigation and resilience in buildings.

The U.S. Green Building Council recently adopted RELi, a new resilient construction standard that takes a holistic approach to design. It is used to assess and mitigate against all acute hazards that buildings and communities can face during unplanned events. Based on the assessment, buildings are designed and built to maintain critical life-saving services during an extended loss of power, heating fuel, or water. The new certification system gives property owners points for features like adaptive design for extreme weather, resilient

and urban flood prediction, and access to emergency supplies. To be eligible for RELi certification, all prospective projects must also register for LEED certification. Other certifiers, such as the Indian Green Building Council, provide a design and construction framework for buildings that emphasizes using less water and incorporating resilience features suited for local climatic conditions.

Sustainably developing the built environment to address climate risks is no longer a nice-to-have. It must be considered within all decision-making processes to ensure that buildings are fit for use over their lifespan.



EXAMPLE: IFC EDGE FOR GREEN AND RESILIENT CONSTRUCTION IN THE PHILIPPINES

Developers and banks in the Philippines are interested in IFC's resilience tool, given the frequent natural disasters in the country. Developers such as The Ascott Limited and Itaipinas Development Corporation are already using EDGE to build green and command greater value in the market. They are interested in using the climate resilience index tool under development, together with major banks such as Banco de Oro, China Bank, Rizal Commercial Banking Corp., Union Bank, and Security Bank. The tool will help integrate new technologies into buildings to withstand extreme weather events and help the financial sector assess the impact of climate and disaster risks to projects seeking green financing. The tool's five-level grading system, with a grade of A given to projects that bear the least risk, will also help buyers understand the risks involved in buying properties. The aim is to make green certification and the new resilience tool a standard for green building development in the country.



Key barriers to the uptake of green construction

Despite the growing evidence of the business case for green buildings, the market remains small, with global investments in certified green buildings only accounting for \$423 billion of the \$5 trillion spent on building construction and renovation in 2017.⁶⁹ A number of constraints hamper the development of a robust pipeline of green properties and widespread adoption of green construction.

The perception that green construction involves high upfront costs is a key barrier to its widespread adoption. In some cases, the perceived additional cost is as high as 30 percent, whereas the actual cost ranges from savings of 0.5 percent to 12 percent in additional costs.⁷⁰ New

technological advances in construction, stricter building codes, and maturing supply chains for green materials and technologies will continue to reduce the incremental cost of building green. As more data becomes available from the growing green construction market, the perception of high costs will change.

Another constraint to the growth of green construction stems from differing incentives and benefits among market players. Developers are reluctant to absorb the additional costs of green design when energy-saving benefits are realized by owners. Owners often focus on immediate affordability over uncertain utility savings or long-term appreciation. Bankers fail to provide additional financing to cover extra capital costs, for fear of increasing non-payment risk, and are reluctant to establish systems to validate savings if there is an insufficient green building pipeline.

There is also a mismatch between the relatively short hold periods of real estate assets in portfolios and the long lifespans of buildings, as well as when they might be affected by climate change and stricter regulations. For example, investors and financiers hold assets for seven to 10 years and building owners about 10 to 15 years. In contrast, a building's full lifecycle is 70 to 100 years. As such, market players may not feel the immediate need to invest in green measures as the adverse impacts are likely to be felt when they no longer have the asset.

Although many developing countries have ambitious targets for green buildings, they struggle to put in place effective measures to mandate and incentivize large-scale green construction. This is partly due to low technical capacity, lack of knowledge, and weak enforcement regimes. In addition, the construction industry is highly local and decentralized. This poses challenges in developing and enforcing consistent standards and requirements for green construction. Low-income countries and fragile and conflict-affected states face additional challenges given weaker institutions and capacity, and underdeveloped financial systems, including the mortgage market.

The remaining sections of this report examine emerging best practices among investors, financiers, developers, building owners, and governments in providing various products and policies to overcome these market barriers, align incentives across different market players, and generate economic benefits for all.



Building the Market for Green Buildings



Financing Green Buildings

Real estate is a large and well-established long-term investment asset class for institutional investors and commercial banks. Institutional investors—pension funds, insurance companies, sovereign wealth funds, hedge funds, and mutual funds—hold \$100 trillion in assets,⁷¹ of which about 8 percent to 10 percent comprises real estate investments.⁷² Commercial banks hold over \$110 trillion on their balance sheets⁷³ and are a key source of financing for real estate through construction finance, mortgages, and home improvement loans. The global market for residential mortgages was estimated to be more than \$31 trillion at the end of 2018.⁷⁴

Mobilizing institutional investors is essential to accelerate the uptake of green building practices. Institutional investors participating in the green real estate market will help inject liquidity and enable primary lenders to free up capital to develop new green lending products. They can also play a key role in scaling up local currency financing through direct lending or equity investments in green buildings. Likewise, commercial banks can significantly accelerate the uptake of green building practices by developers and owners through new green financial products for resource-efficient buildings. In return, investors and banks can expand their client base and product offering, build a higher-value and lower-risk portfolio, and access new sources of finance through green bonds, green securitizations, and green credit facilities. To reap these benefits, investors and financiers will need to adjust how they do business: from modifying internal practices and procedures, to overcoming barriers in the green buildings market.



Photo: The homes of Ecoloft Jababeka Cikarang, developed by Asia Green Real Estate and certified with EDGE, are estimated to be more than 80 percent energy efficient.

How to build a green real estate portfolio

To build green real estate portfolios, investors and banks can follow these steps and best practices from both developed and emerging markets.



Develop a green buildings asset strategy and process

- Develop a green buildings asset strategy for the company.
- Define green buildings and eligibility criteria for projects and develop a selection and valuation process.
- Embed green building criteria into loan documents.
- Establish a system for identifying, analyzing, and reporting green buildings finance.
- Train investment and credit staff on how to identify and screen projects.

Best practice is to rely on well-established green building certification and labeling systems for an industry-accepted definition and eligibility criteria for green buildings. The most material considerations for green assets include resource efficiency and carbon emissions that can be measured, tracked, and reported.



Create green buildings finance products

- Develop green buildings finance products—green construction loans, green equity, and green mortgages—and consider appropriate financing terms for specific markets.
- Consider developing interlinked products (such as financing green construction and offering green mortgages for the same building).
- Consider developing products to expand services to existing clients (for example, loans to improve the energy efficiency of existing buildings in your portfolio or green loans to existing developers).
- Consider developing new capital markets products such as green bonds and securitizations to boost liquidity.

Best practice is to consider providing better financing terms that can help offset or spread over time the higher upfront cost of green construction to developers and home buyers.



3

Determine appropriate funding sources to support rollout of green buildings finance products

- Own capital.
- Access capital markets through green bonds.
- Access dedicated green loans.

The green bond and green loan markets are expanding rapidly, with the potential to provide lower-priced capital to support the expansion of green buildings financial products. Green buildings are included in the acceptable use of proceeds within both the Green Bond Principles and the Green Loan Principles, as well as climate bonds and impact investing.

4

Generate a pipeline of eligible projects

- Develop a marketing and outreach strategy for developers and home buyers.
- Develop internal technical expertise in green construction and green finance. Consider training through an internationally accepted green building certification system.
- Provide technical advice and support to developers on green construction and how to minimize upfront costs.
- Train residential property developers on how to issue green building certificates to each home buyer, so that banks can issue a green mortgage.

Best practice is for financial institutions to actively engage developers to demonstrate the economic benefits of green construction and offer technical support on how to cost-effectively build green. To reach prospective home buyers, it is important to explain that the long-term benefits of green homeownership outweigh the slightly higher upfront cost. IFC is helping banks generate a pipeline of eligible green building projects through its EDGE Green Building Market Transformation Program. It can also train financial institutions' staff on technical aspects of green construction, as well as developing and securitizing green finance products.

5

Collect and report data

- Capture data on the performance of green real estate projects.⁷⁵
- Report annually to green funding sources that the funds are allocated to green projects and share performance data.

Best practice is to disclose environmental impacts using consistent metrics such as type of green certification system; green floor space; reductions in energy, water, and materials use against a benchmark; and reductions in carbon emissions. For low-income housing projects, additional metrics could include number of households or people served.



Building a green real estate portfolio: From vision to supporting clients

Dutch bank ABN AMRO views sustainability within the real estate sector as strategically important for managing risk and opportunity. The bank aims to become the most sustainable property bank in the Netherlands and to accelerate the transition to sustainable commercial property. To implement this vision, ABN AMRO developed a sustainability policy to guide its real estate business.⁷⁶ The policy sets out specific due diligence standards and minimum requirements for lending to different real estate asset classes, divided into new and existing buildings. It identifies five crucial sustainability issues for real estate: energy consumption and greenhouse-gas emissions, regulatory risk, vacancy levels, asset value, and innovation. The policy establishes processes and targets for each of these five issues to monitor and manage the associated risks.

According to the bank's policy, all new buildings must have a minimum energy label of "A," in line with Energy Performance Certificate requirements, and new commercial buildings must have a BREEAM "excellent" or LEED "platinum" certification. Existing buildings must have an average energy label of "C" on gross floor area in square meters, and a strategy for reducing "D," "E," "F," and "G" labels.

To help commercial real estate clients transition to sustainable real estate, ABN AMRO has launched an online application that allows clients to calculate the investment, return times, and carbon reduction figures for each energy efficiency measure, such as insulation, LED lighting, and solar panels. These economically effective measures can improve a property's energy label by at least two grades. The bank has made €1 billion in financing available for these improvements.⁷⁷

Types of green financial products

The following green financial products are being used by financiers leading the transition to green building portfolios.

GREEN CONSTRUCTION FINANCE: DEBT AND EQUITY

Many banks in emerging markets lack a pipeline of green properties to finance. To build this pipeline, banks can incentivize green construction practices by offering financial incentives to developers and actively engaging with them to raise their awareness and improve capacity in green construction.

To help spread out or offset the higher upfront costs of building green for developers, banks can offer beneficial financing terms such as a discounted rate, longer tenor, longer grace period, or lower front-end fee. To ensure that beneficial financial terms will be used for green construction, banks can start with a conventional loan until the preliminary green certification, based on the planned design, has been achieved. Following the preliminary certification, the beneficial conditions of a green loan will kick in, with clear requirements of the timeframe within which the building has to be completed and certified green.

Another financial benefit that banks can offer is to cover green certification costs in part or in full. To offset this investment, banks can peg their green mortgage product to the certified building they are financing to build.

Shaping the green construction market in Colombia

Bancolombia, Colombia's largest commercial bank, provides over 40 percent of the construction finance in the country. Realizing the business value of green construction, it decided to grow its green building portfolio. To finance this expansion, the bank issued a \$117 million green bond with IFC in 2016.

Using the proceeds of the green bond and its own capital, the bank offered green construction financing at an interest rate of 0.5 percent to 2 percent lower than conventional loans. The more measurably green the project was, the better the financing rate. Qualified projects had to receive a preliminary certification from an approved green building rating system such as LEED or IFC's EDGE and confirm the certification on the building's

completion. Until the preliminary certification was received, the bank provided a developer with a conventional, non-discounted loan.

To build its pipeline of green construction projects, Bancolombia held events in 17 cities around the country, attracting 500 property developers. An intensive digital marketing strategy supplemented this approach with an online knowledge platform, webinars, prime-time advertising, and social media. In the first year, 25 projects were put forward by developers to secure the discounted rate.

In addition, Bancolombia offers green mortgages to qualifying home buyers who buy certified properties at a rate 65 basis points lower than usual for the first seven years of the loan.

To recover its investment and continue to expand its green construction and mortgage portfolio, the bank is tapping into lower-cost capital. In 2018, it issued a second green bond worth \$100 million. The bond was oversubscribed 2.8 times and attracted 72 domestic investors, lowering the cost of capital for the bank.

Access to the bond market and cheaper capital is key to the bank's strategy to profitably build a better portfolio of green assets. The bank expects that once there is sufficient proof that greener assets have greater value and less risk, the cost of incentives can be assumed by the other players in the market.

Next, the bank plans to expand its program to El Salvador and Panama, where it also operates.

ING: Client education to strengthen client relationships

ING, the largest commercial real estate financier in the Netherlands, developed an app to help its borrowers identify the energy improvement measures for their buildings that provide the most attractive financial returns and biggest carbon emission reductions. The borrower enters basic information about their buildings such as type, age of construction, and floor area. The app analyzes their portfolio and recommends the top 10 measures per building to lower energy costs and reduce carbon emissions, showing indicative costs, financial returns, and carbon reductions. If the app indicates energy savings greater than €15,000

per year for a building, the client is offered a free on-site BREEAM and energy audit.

Within its first two years, the app had been used to scan 18,000 buildings measuring 10 million square meters (65 percent of ING's real estate finance portfolio). ING's goal is to reach 5,000 clients that would equal to 28,000 buildings. It plans to roll out the app to other European countries. In addition, to help stimulate the Dutch market, ING has started providing discounts on "sustainable loans," as well as providing advice and offering free Energy Performance Certificate assessments to its clients.⁷⁸

In other words, banks can finance the same building twice: through green construction finance and through green mortgages. The building's green certification could satisfy the conditions required for green mortgages without extra appraisal steps.

To support the development of new green construction finance products, banks can boost their liquidity and lower their cost of capital through green bonds, green securitizations, green loans, and government programs designed to incentivize building green.

Offering beneficial financial terms attached to green products may be necessary to jump-start the market. However, such terms could be phased out over time as awareness of the benefits of green buildings grows among developers and buyers, and the upfront incremental costs decline due to economies of scale with the wider adoption of green building practices. Alternatively, banks may choose to retain these incentives to maintain their competitive position and remain attractive to lower-risk borrowers.

Banks have also been incorporating outreach and support to developers into their business marketing efforts to raise awareness and build capacity in green construction, and build a pipeline of projects to finance. Such outreach efforts include holding road shows to present the business case for green buildings and the bank's green construction finance offering, providing information on various green building certification systems, and employing a technical specialist on green construction who can advise clients. As building codes and building energy efficiency codes become more stringent to drive green construction, the need for developer education will diminish. However, banks may choose to continue to educate consumers as part of their marketing outreach and customer service to help clients comply with new requirements.

In addition to commercial banks, equity investors such as real estate funds and real estate investment trusts (REITs) can offer similar products.

Photo: Fourleaf Estate by Similan Properties offers more than 300 low-income, EDGE-certified homes in Port Elizabeth, South Africa.



RETAIL BANKING: GREEN RESIDENTIAL MORTGAGES

Home buyers are often more concerned with a home's immediate affordability than its long-term operating costs. Typically, a green home is more expensive than regular construction, though not as much as the market perceives, and the cost can be minimized if green measures are brought early into the design process. Banks can work together with developers to educate home buyers about how the energy performance of a green home will yield a return on a high sales price through lower utility bills and other benefits, decreasing the cost of homeownership over time.

An important tool to advance greater adoption of residential energy and resource efficiency is flexible mortgage pricing or underwriting that reflects the savings that come from resource efficiency. It can include a lower down payment, as savings on utility bills can be redirected into a larger loan payment. Banks can adjust the debt-to-income ratio by treating savings as an increase in a customer's income, allowing them to expand the pool of eligible customers. They can also pass lower interest rates for green financing to end customers to incentivize buying green homes and to build a higher-value, lower-risk mortgage portfolio.

Banks have been reluctant to implement these incentives partly because there has been insufficient data on loan performance to justify such measures. However, a recent survey of 10 large European banks found that the emerging financial case for green energy improvements is compelling enough to test green products without a perfect green

Using green construction finance to launch a green mortgage program

In 2016 Costa Rican bank Banco Promerica obtained a \$30 million loan from the Dutch development bank, FMO, to launch a green construction finance and green mortgage program.

Before the bank could launch a green mortgage program, it had to build a sufficient pipeline of certified green properties. To incentivize developers to build green, the bank offered a discount on green construction finance. It charged 8.75 percent (instead of 9.25 percent), offered a 0.75 percent front-end fee (instead of 1 percent), and provided a four-year term (instead of three years). Depending on the project,

the discount on the front-end fee covered most of the cost of the upfront requirement of green certification. Promerica succeeded in building a sufficient supply of green properties to start offering green mortgages. It offers qualifying home buyers a 30-year fixed rate that is slightly higher than the market rate for 30-year variable-rate mortgages in the country. It aims to expand its mortgage portfolio, which is currently 10 percent of its business. To finance this expansion, the bank plans to securitize its green mortgage portfolio once it reaches \$20 million to \$30 million in size.





Examples of green bonds issued to finance green buildings in 2018



Financial institution ING: \$3 billion. About 35 percent of the proceeds will finance buildings with an Energy Performance Certificate Label A and emissions performance within the top 15 percent of the Dutch market.



Mortgage institution DNB Boligkreditt: \$1.7 billion. Proceeds will finance or refinance new and existing mortgages for housing that complies with the Norwegian building codes 2010 (TEK10) or 2017 (TEK17), corresponding to the top 7 percent of Norwegian housing in terms of energy performance.



Lithuania placed the first tranche (€20 million, or \$24 million) of its sovereign green bond program, with proceeds earmarked for energy efficiency upgrades to about 160 apartment buildings.



Industrial Development Corporation, South Africa: \$651 million for low-carbon buildings.



performance data history and, in the process, collect data to further assess the financial performance of green buildings loans.⁷⁹ Furthermore, 47 European banks and mortgage lenders have joined the EU-sponsored Energy Efficient Mortgage Initiative, under which they provide preferential financial terms for buying energy-efficient buildings or improving the energy efficiency of existing buildings. The initiative collects large-scale empirical evidence from the participating financial institutions on the financial performance of energy-efficient mortgages.⁸⁰

GREEN BONDS

Building a portfolio of certified green buildings provides an opportunity for banks to increase their liquidity, develop new capital markets products, and expand their access to lower-cost capital, and for institutional investors to put their capital in green assets.

Green bonds tap into international resources to leverage a wider investor base such as pension funds, sovereign wealth funds, and insurance companies and can potentially reduce the cost of borrowing for the issuer. Offering a similar risk-return profile to traditional bonds, green bonds provide lower-cost, stable funding opportunities. Low-carbon buildings are one of the eight sectors accepted for the use of proceeds under the Green Bond Taxonomy.

To provide sector-specific real estate guidance for issuers and investors, the Global Real Estate Sustainability Benchmark (GRESB) developed the Green Bond Guidelines for the Real Estate Sector. The guidelines establish a framework to identify eligible green projects, implement and manage investment proceeds, and communicate outcomes.

2018 saw a record \$167.4 billion in green bond issuances, bringing the total market size to \$521 billion. 2019 is expected to be another record year, with issuances estimated to reach \$250 billion. Commercial banks, property banks, and REITs were the most active in financing real estate property in 2018.

Banks have used mainly senior unsecured bonds to fund mortgage lending programs for energy-efficient homes (ABN AMRO, Barclays) and commercial properties (BerlinHyp, LBBW), along with residential mortgage-backed securities (Obvion, NAB) and covered bonds



Photo: IHS invested in the EDGE-certified Waterfall Park, located outside Johannesburg, which offers affordable homes for rent and sale.



How to issue a green bond, loan, or sukuk

Any entity that has suitable green assets can issue a green bond, a green sukuk (the Arabic name for financial certificates that comply with Islamic religious law commonly known as Sharia), or a green loan. Green assets that are suitable for these instruments include renewable energy, low-carbon transport, low-carbon buildings, sustainable water and waste management, sustainable land use, and climate change adaptation measures such as flood defence infrastructure. To issue a green bond, loan, or sukuk, follow these key steps:

- 1

Develop a green bond framework that outlines eligibility criteria for projects/assets, a selection process, and a tracking and reporting mechanism.
- 2

Arrange an external review, which could include:

 - An assurance report to confirm the framework’s compliance with the Green Bond Principles and the Green Loan Principles.
 - A green rating against a well-recognized third-party rating methodology to consider the investments’ environmental aspects.
 - A verification report by a third party before and after issuance confirming that the use of proceeds of the certified climate bond adheres to the Climate Bonds Principles and Sector Criteria and the 2°C scenario and full decarbonization by 2050.
- 3

Check for local subsidies and support. Some governments offer grants, subsidies, and tax deductions to cover green advisory and issuance fees, and the cost of external reviews.
- 4

Issue a green bond, sukuk, or loan.
- 5

Report after issuance every year on the allocation of funds to green projects. It is best practice to also report on the environmental performance of financed projects in absolute terms and against an accepted benchmark.

Adapted from the Climate Bonds Initiative report: <https://www.climatebonds.net/resources/reports/green-bonds-state-market-2018>.





Barclays blueprint for green bonds

Barclays has a significant presence in the UK residential mortgage market. In 2017, it launched the Barclays Green Bond Framework to enable it to finance and refinance low-carbon buildings. The framework, which complies with the International Capital Market Association's 2017 Green Bond Principles, articulates the use of proceeds and the process for evaluating and selecting projects, managing proceeds, and reporting.

Use of proceeds: Barclays will allocate an equivalent amount of funding proceeds from its green bonds to finance and refinance energy-efficient residential mortgages that are in the top 15 percent of the lowest carbon-intensive properties, based on Energy Performance Certificate data.

Process of evaluation and selection:

Barclays' residential mortgage portfolio will be mapped against the latest Energy Performance Certificate data and filtered to ensure mortgages are not encumbered and are in the top 15 percent of the lowest carbon-intensive properties.

Managing proceeds:

The size of the allocated portfolio of eligible mortgage assets will be monitored monthly, while redeemed or ineligible mortgages will be replaced by other eligible mortgage assets.

Reporting:

Barclays will publish an annual investor report. A suitably qualified assurance provider will also perform and report on verification testing.



for commercial property (Berlin Hyp, Deutsche Hypo) or housing (SpareBank 1, DNB Boligkreditt). Securitization remained the second-largest bond type, driven by the \$20 billion issued by mortgage loan company Fannie Mae. Swedish mortgage bank SCBC issued its debut green covered bond in January 2019. Of the green bond allocations made for green buildings, 13 percent were by emerging market issuers and 19 percent by developed market issuers.

GREEN LOANS

In March 2018, the Loan Market Association published the Green Loan Principles to support and encourage green lending. Modeled on the Green Bond Principles, the Green Loan Principles specify how loan proceeds should be used and how projects should be selected in order to qualify for green-loan status. The market for green loans is expected to surpass the market for green bonds because it is more widely accessible. In 2018, the green loan market reached nearly \$56 billion,⁸¹ with real estate entities issuing 32 percent of green loans by amount.⁸²

GREEN INSURANCE PRODUCTS

Insurance companies play a unique role in advancing green construction. They are both a source of capital, as institutional investors managing \$31 trillion in assets,⁸³ and insurers that can help promote green finance products.

Insurance companies' ability to develop new green insurance products depends largely on green building certifications, because going through well-established green building certification systems allows developers to better identify and reduce risk, making them better candidates for insurance.

New insurance products that support the growth of the green buildings market include:⁸⁴

- Premium discounts for homes that meet stringent efficiency and sustainability standards.
- Homeowners' coverage for replacing or rebuilding after a loss with more eco-friendly materials as part of a standard homeowner's policy. Some companies will pay homeowners extra if they replace

old energy-inefficient appliances with Energy Star devices and recycle debris rather than send it straight to a landfill.

- Policies designed for homeowners who generate their own power. These policies cover income loss due to power outages and extra expenses homeowners might incur to buy electricity from another source. They generally cover the cost of getting back online, such as utility charges for inspection and reconnection.
- For commercial properties, green upgrade insurance enables policyholders to replace traditional systems and materials with green ones, in accordance with well-established certification systems. If the entire building is destroyed, green insurance will often pay for the replacement with a green-certified building.

For properties that have already been certified green, some insurers offer reduced rates and provide coverage for vegetated roofs, alternative water systems, and green power generation equipment if a loss occurs. In addition to providing green insurance, many companies are starting to provide green risk management consulting. They help clients select the most cost-effective and proven options to reduce energy consumption and costs, decrease operating costs, and reduce risk and losses.

Investors needed to create markets

Mobilizing private investors and financiers to participate in the green construction market is essential to reducing emissions from buildings at the scale required to reach carbon neutrality. National and multinational development finance institutions and governments play a critical role in catalyzing nascent markets and facilitating the entry of private capital.

DEVELOPMENT FINANCE INSTITUTIONS

National and multinational development finance institutions pursue a number of development objectives, including climate goals. While the amount of financing they have invested in green buildings is small in absolute terms, these institutions play a critical role in catalyzing markets and facilitating the entry of private investors.



Photo: The triple-certified Shanghai headquarters of Johnson Controls has earned LEED Platinum, EDGE Advanced, and China's Three-Star certification.

Development finance institutions provide a range of financial products, including blended finance, not readily available in their markets, often in combination with technical support and capacity-building programs for local financial institutions, developers, and other stakeholders. They also advise governments on developing the enabling environment to incentivize green construction and green finance, and work with multiple stakeholders to create the right conditions for the green buildings market to grow.

IFC is coordinating the development of a green building programmatic approach with other development finance institutions and is sharing best practices and lessons learned. In collaboration with the Inter-American Development Bank, GIZ, and others, IFC is advancing green buildings

through joint investments, and technical trainings, and by demonstrating the business case in emerging markets.

In addition, development finance institutions have a clear role in supporting the growth of green affordable housing. Many emerging markets face the urgent need to meet the shortfall in affordable housing. The priority has been placed on building fast and at scale, while the attention on green construction has been lagging. The green buildings market is currently too nascent to scale and compete with the cost margins of conventional practices. Development finance institutions can help demonstrate the viability of affordable green housing finance through their own investments in partnership with private lenders for the market to follow.

Catalyzing the green buildings market in South Africa

In South Africa, supply of affordable quality housing falls far short of the demand. To address the shortage of low-income houses, in 2015, IFC invested \$21 million in a \$300 million fund managed by the IHS—a large equity investor in South Africa’s affordable housing sector. The fund focused on building, buying, renting, and selling single and multifamily housing, along with converting existing real estate to multifamily housing.

IFC saw an opportunity to open the market in South Africa for green residential construction through the IHS Fund. However, the developers could not pass the extra cost of greening measures to low-income homeowners and renters. This meant that the fund’s expected returns to investors would take a hit.

To encourage the fund and partner developers to incorporate cost-effective green technologies in the design of their projects without affecting the expected returns to investors, IFC structured a \$10 million concessional equity investment with funds from the Global Environmental Fund to partially cover the incremental greening costs. KfW, a partner in the IHS Fund, followed suit using the same structure.

In addition, IFC helped build technical capacity within the IHS Fund on applying the EDGE certification standard. The fund then trained the developers and provided technical support at the design, construction, and operation phases to meet the certification requirements.

The fund succeeded in convincing developers to adopt green technologies, which have demonstrated 20 percent energy and water savings, lowering utility bills for home buyers

and renters. The greening costs also decreased substantially over time, from 2-6 percent to 0.25-0.8 percent per unit in 2018 in the fund-supported green projects.

IHS also compared the performance of a 200-unit green development against a similarly sized non-green development next door. Green homes demonstrated annual utility savings equal to one month’s rent. Such significant savings make green homes attractive to buyers and renters, helping developers compete for buyers and tenants in a price-sensitive affordable housing market. This competitive advantage, in combination with decreased incremental costs of green measures, convinced the developers of the advantages of EDGE certification. Most of the builders participating in the IHS Fund have pledged to build all their properties as EDGE-certified.





Today, the IHS Fund has 4,900 EDGE-certified homes, and is on track to exceed its target of 6,000 homes. Another 7,000 homes are being planned for green construction. Furthermore, IHS is expanding into Botswana, Kenya, and Namibia and has announced that all new projects will be EDGE-certified.

The blended finance and technical support from IFC were critical to opening the market for green homes in South Africa. The partnership with IHS Fund has had a far-reaching demonstration effect: it created broad market awareness among the developers and consumers about the financial benefits of green construction and demonstrated how to implement existing green technologies cost-effectively. IHS plans to apply this knowledge and experience to projects in other countries.



GOVERNMENTS

As a large owner of and investor in real estate, governments significantly influence the development of the green buildings market. As an investor, they can influence green construction directly by setting and requiring green standards for all the buildings they own, finance, and buy. By taking the lead in requiring public buildings to be built green, governments catalyze and enable markets through building technical capacity and skills among designers, engineers, and workers, who can then build privately financed green buildings. In addition, they can catalyze the market for a green supply chain such as producing energy-efficient cooling and heating systems and appliances. For example, China's Ministry of Housing and Urban-Rural Development mandated that all public buildings, including offices, schools, hospitals, and affordable housing in major cities, meet green building standards from 2014 onwards.⁸⁵

Governments can also play a critical role in developing financial incentives and programs to promote green construction and energy efficiency improvements and make green homeownership affordable. For example, a U.S. government-sponsored residential lender, Fannie Mae, has introduced a range of green lending products that offer preferential pricing (at least 10 basis points) and a free energy and water audit report to borrowers to finance green property improvements.⁸⁶ The U.S. government's Property Assessed Clean Energy model is an innovative mechanism that allows building owners to repay the upfront costs of investing in energy efficiency and renewable energy over time (10 to 12 years) through property assessments.⁸⁷ Under the Pay As You Save program, utilities finance and install energy efficiency technologies at no upfront cost, and subsequently recover the costs through tariffs included in customers' monthly bill for their meters. Since 2011, Mexico's federal organization INFONAVIT ("Instituto del Fondo Nacional de la Vivienda para los Trabajadores"), the fourth largest mortgage institution in the world, has required all of its mortgages to be for green homes or green home improvement measures.⁸⁸



Policy and Regulatory Building Blocks

One of the main barriers to unlocking the \$24.7 trillion investment opportunity in green buildings across emerging markets is the lack of green buildings for investors and financiers to finance. The previous section, Financing Green Buildings, provides examples of banks and funds that are developing a pipeline of green properties to finance by offering better financial terms and actively reaching out to and educating developers. Not all financiers are willing to undertake such efforts, however. This is where the government's role is critical to create an enabling environment for developers to build green and, thus, create a robust pipeline of green assets for financiers to finance, while creating conditions for the growth of green finance practices in the financial sector.

Governments have already signaled their interest in “building it right”—the buildings sector is referenced in 136 countries’ NDCs,⁸⁹ and several cities are incorporating green buildings into their Climate Action Plans.⁹⁰ Ambitious targets and high-level policies must be complemented by regulations and incentives if governments are to translate policy into action.

Clear market signals are needed to amplify the pace and scale of green construction. Policymakers must drive performance through stricter building codes to improve benchmarks. They can also incentivize the private sector to outperform those codes. Building codes that incorporate energy efficiency and green measures will move developers to build a pipeline of green buildings, aided by fiscal and non-fiscal incentives to exceed the minimum code requirements.




Photo: Vinte's homes feature solar technologies, state-of-the-art induction stoves, smart meters, and more, bringing high quality and affordability to residents in the State of Mexico.

Governments can demonstrate their commitment by requiring publicly owned and financed buildings to be green, but they can also go further, shifting the market with their huge aggregate demand, which in turn can trigger the development of a pipeline of green buildings and related products. Policymakers can help incentivize banks to provide direct capital to the sector by establishing guidelines for green finance instruments and requiring reporting on climate risk in investment portfolios. Green labeling or performance certificates can help investors verify, compare, and manage their investments to expand their green portfolios.

Economy-wide energy efficiency policies and NDCs can indicate priority sectors for investment and growth, working in concert with market-based mechanisms that can make green buildings more cost-effective than higher-carbon alternatives. These not only create the underlying policy framework to develop green project pipelines, but also signal the opportunities that can arise from investing in climate-smart assets such as green buildings.

These examples are a few among the vast suite of regulatory options that are being deployed by governments to help developers create a pipeline of investable green buildings projects and incentivize investors to direct their capital to them. The following section reviews some of the best-practice policy and regulatory instruments related to building enabling environments for green buildings and green finance. Not all of these will be applicable in every context in the same way—governments across emerging markets can work with experts to choose which of these policy options might be relevant in their jurisdictions. These must be tailored to legal frameworks, socioeconomic contexts, developmental priorities, and other local conditions.

Nationally Determined Contributions (NDCs)

Since December 2015, 194 countries have submitted NDCs—national plans that outline governments’ commitment to reducing emissions through climate solutions, including renewable energy, low-carbon cities, and energy efficiency. Of these, 136 mention the role of the buildings sector, with 104 citing energy efficiency and 51 committing to using renewable energy in buildings as ways to reduce their economy-wide emissions.⁹¹ These government priorities signal to investors and developers where future demand can come from.

— **India’s** NDC calls specific attention to a “building sector based on energy conservation,” pledging to make its Energy Conservation Building Code (ECBC) stricter, highlighting its domestic building rating system GRIHA (Green Rating for Integrated Habitat Assessment), which scales energy efficiency in buildings.

— **Lesotho’s** updated NDC, released in 2017, commits the country to decarbonizing its buildings sector by implementing climate-smart building codes and standards, launching energy efficiency programs, and encouraging the use of energy-efficient appliances.⁹²

— **Grenada’s** NDC commits the nation to achieving energy savings targets of 30 percent for new construction through new energy efficiency codes, in addition to a 20 percent reduction in energy consumption of existing buildings through retrofits by 2030.⁹³

Energy efficiency policies

In 2017, mandatory energy efficiency policies covered 34 percent of energy use from buildings worldwide,⁹⁴ increasing to about 40 percent in 2018.⁹⁵ Demand for energy-efficient buildings can be created by policies at regional, national, and local levels, particularly as governments attempt to translate their NDCs into concrete policies, and enhance the energy security and energy efficiency of their economies. For example:

As of 2018, the Energy Efficiency Directive and the Energy Performance of Buildings Directive by the **European Commission** includes a non-binding target to improve energy efficiency by 32.5 percent by 2030, to be reviewed again in 2023.⁹⁶ As part of this, the Energy Performance of Buildings Directive will require member states to develop long-term strategies to fully decarbonize and reduce the energy use of their entire building stock.⁹⁷

In 2017, China released its 13th Five-Year Plan for Building Energy Efficiency and Green Building Development. This plan mandates that 50 percent of all new urban buildings are certified green and includes pilot programs for energy-efficient schools, hospitals, and public buildings.⁹⁸ Following this national directive, almost 20 Chinese cities have set even more ambitious targets, with cities including Shanghai, Beijing, Shenzhen, and Chongqing requiring all new commercial buildings to be certified green.⁹⁹

In conjunction with energy efficiency policies, incentives and regulations that encourage distributed renewable energy sources for buildings and otherwise green the electricity grid will also reduce carbon emissions from buildings.

Green requirements for government-owned or -financed buildings

As owners of large portfolios of real estate and buildings, governments have significant sway to shift market demand. Many governments begin by mandating energy efficiency in public buildings.

For example, **Gabrovo, Bulgaria**, has adopted an energy-saving target of at least 30 percent for its public buildings, committing to track progress using an energy management system. To help meet this target, Gabrovo aims to develop and implement a program that will include portfolio benchmarking, energy audits, operational and maintenance improvements, energy efficiency standards, and energy performance contracts.¹⁰⁰

Given that public procurement accounts for about 12 percent of gross domestic product in OECD countries and up to 30 percent in emerging markets,¹⁰¹ governments can significantly influence markets to shift to green products, and align the use of public funds to achieve governmental priorities such as reducing carbon emissions.

If structured correctly, green public procurement policies can incentivize suppliers to develop climate-smart products and processes without increasing the initial purchase price, helping to reduce green building emissions. Public procurement policies and distribution schemes have been particularly effective at creating markets for greener appliances and products, which in turn increases private demand.

Increases in procurement costs can be avoided by aggregating the public sector's buying power through bulk procurement. India's UJALA scheme—the largest non-subsidized LED distribution program in the world¹⁰²—lowered the upfront cost of investment in LEDs for public utilities and state governments by creating mass awareness and buying in bulk.¹⁰³ The scale of public demand shifted the whole market, incentivizing private consumers to also switch to LED, making India the second largest LED market in the world in 2015.¹⁰⁴ This scheme was part of the Indian government's efforts to facilitate energy efficiency projects under Energy Efficiency Services Limited, a company that

is also promoting energy-efficient cooling through its Super-Efficient Air Conditioning program.¹⁰⁵ Product and design specifications that incorporate energy and water efficiency into such policies can help incentivize the use of, and thus create demand for, energy-efficient appliances.

Both national and subnational governments are developing guidelines and implementing policies for green public procurement to suit their contexts:

— In **South African City of Tshwane's** Integrated Environmental Policy outlines a strategy to promote and implement municipal green procurement practices. The intention is to develop a green procurement guideline that will select five categories of green products each year to be included on the city's procurement list.¹⁰⁶ With a specific section dedicated to green buildings, Tshwane specifies how to incorporate sustainable technologies in all buildings and advocates for sustainable supply chains.¹⁰⁷

In **South Korea**, government agencies submit implementation plans on green purchases every year, along with the previous year's performance records, to the Ministry of Environment.¹⁰⁸ Each institution must also set its own green purchase target and a corresponding implementation plan. Green purchases can include items such as energy-efficient appliances that help reduce emissions from the day-to-day use and occupation of public and government buildings.

As of 2017, there is now a global standard for sustainable procurement. The International Standards Organization launched ISO 20400 to help companies improve the sustainability and ethical levels of their supply chains.¹⁰⁹ This standard aims to build global consensus around what responsible procurement means. It describes the principles and core ideas behind sustainable procurement, and provides guidance on how to integrate sustainable procurement practices at both strategic and operational levels within an organization.¹¹⁰ While the standard is not specifically tied to green buildings, it aligns with the UN Sustainable Development Goals and includes environmental and climate-related practices.

Photo: The Bac Ninh Exhibition Center of Urban Development and Architecture, which has been certified with EDGE, celebrates the architecture of Bac Ninh province in northern Vietnam.





Photo: Developed by PPP Habitacional, the EDGE-certified Julio Prestes apartment complex is part of São Paulo's efforts to revitalize its urban core

Green building codes

The most cost-effective way to reduce the use of resources during a building's life is to integrate green measures during design and construction.¹¹¹ Mandatory building codes ensure that green measures are considered from the start, playing a significant role in promoting green construction and raising market awareness in a cost-effective way.

When mandatory codes are enforced, they establish the minimum requirements for performance and energy efficiency across the building types covered by the policy, reducing the entire sector's energy intensity and emissions. However, in 2018, two-thirds of all countries lacked mandatory building energy codes, resulting in new construction that potentially locks in low performance and high energy and carbon intensity for a building's lifetime. Even once passed, building codes take a long time to implement and significant resources to enforce.¹¹²

To encourage developers to sufficiently reduce emissions from their new constructions, building codes must continuously raise the baseline. For example, India updated its ECBC for commercial buildings in 2017 and its ECBC-R for residential buildings in 2018. The ECBC now includes energy performance standards for commercial buildings, requires passive

design principles and renewable energy sources to be integrated into building design, and mandates that new buildings demonstrate energy savings of at least 25 percent to be code-compliant.¹¹³ This code is also one of the first to make provisions for improvement and performance beyond minimum code compliance by defining incremental, voluntary energy efficiency performance levels: ECBC compliant (energy savings of 25 percent), ECBC Plus (energy savings of 35 percent), and Super ECBC (energy savings of 50 percent).¹¹⁴ Continuously improving building codes also forces voluntary certifications to improve to retain their additionality.

In order to decarbonize the buildings sector effectively, building codes need to incorporate energy and water efficiency requirements. Such codes could also benefit from input from the private sector and taking locally available technology into consideration. Various government departments need to be engaged to ensure adequate resources are budgeted for long-term enforcement. The codes should account for the costs and benefits of different options and should initially streamline suggested approaches to a limited number of requirements, which can then be built on incrementally. Finally, governments must invest in capacity building for enforcement for building codes to be effective.

Fiscal and non-fiscal incentives for developers

FISCAL INCENTIVES

In addition to incentives and regulations aimed directly at the financial sector, governments are using fiscal policies such as property tax incentives, technical assistance, grant provisions, and loan programs to encourage developers to build green.¹¹⁵

In **Argentina**, residential buildings receive a 10 percent VAT exclusion if they include insulation Class B, solar hot water collectors, and LED lighting up to 140,000 UVA. The tax exemption is for the first 60,000 units that apply and are built by August 2022.¹¹⁶

Both residential and commercial buildings in **Colombia** qualify for a 19 percent VAT exclusion and a 25 percent income tax deduction for using project design services and technical solutions such as insulation and energy-efficient air conditioning systems.¹¹⁷

Japan offers tax deductions for installing energy-efficient equipment such as high-efficiency air conditioning systems, highly insulated windows, and LEDs in the residential sector.¹¹⁸

In **Bulgaria**, a 100 percent real estate tax exemption is given to building owners for 10 years for installing renewable energy technology. Building owners are required to obtain a certificate under the Energy Efficiency Act and the Building Certificate Regulation.¹¹⁹

The **City of Mandaluyong** in the Philippines worked with IFC to develop a green buildings ordinance that compensated property owners for compliance through several measures such as a real property tax discount of 50 percent on machinery installed in accordance with the green building regulation.¹²⁰ These discounts, independent of others applicable through the city's tax code, were found to be attractive enough for developers to adopt even if their buildings were not required to comply.

Such policies can help reduce the upfront cost of implementing green measures and incentivize builders to choose green alternatives, expanding the pipeline of green building projects for investors.

NON-FISCAL INCENTIVES

Because buildings are local, city-level permitting processes and regulations can have a greater impact on the sector than those from national governments.

San Borja, a residential district in the capital of Peru, passed an ordinance¹²¹ that allows property developers to build three or four stories higher, depending on the zone, if the apartment buildings are certified green, are set back from the curb, and have green roofs and gardens that are at least 50 percent visible by pedestrians. The ordinance, the product of a collaborative approach, resulted in a new style of architecture and increased uptake in certified green buildings, demonstrating how public-private engagement can help achieve green goals.¹²²

Arequipa, Peru, also used height bonus incentives to encourage green construction of residential, commercial, and educational buildings. Developers can build one extra floor and benefit from a reduction in parking space requirements if their building is certified green, has 40 percent green roofs, has 50 percent transparent fences, and includes waste segregation and bicycle racks.¹²³

Other non-fiscal policies available to local authorities include expedited permitting processes and reduced permitting requirements. Such incentives and policies can help reduce the emissions intensity of individual buildings and projects, as well as encourage cities to move towards green urban development. Providing incentives for waste segregation and distributed generation in building complexes, as well as for the construction of mixed-use buildings near transit nodes, can help reduce city-wide emissions and generate a pipeline of green projects that create value for investors.

Labeling and energy performance certification

Labeling and energy performance certifications for buildings and appliances help ensure compliance with green standards, and help investors measure, verify, and compare their green building investments. For example:

The European Energy Performance of Buildings Directive introduced an energy performance label for buildings from “A” to “G,” with “A” being the most energy efficient. In 2018, the Dutch government adopted a decree requiring office buildings to have an energy performance label of “C” or higher by 2023 and an “A” label by 2030. An office building falling short of the requirements can no longer be used, sold, or leased, effectively making it a stranded asset.

Similarly, the EU’s mandate to require Energy Performance Certificates was strengthened by instituting independent quality control of Energy Performance Certificates, introducing penalties for non-compliance, requiring the energy label to be displayed in advertisements, requiring sellers or landlords to provide buyers or tenants with a copy of the Energy Performance Certificate on sale of the building or rent transactions, and improving renovation recommendations.¹²⁴

Labels are an important tool for governments to implement new policies and for financial intermediaries to manage climate transition risk in their portfolios and select energy-efficient buildings for financial support. Labeling existing buildings also provides market data to developers, which influences the design decisions of new buildings.

Market-based mechanisms

Market-based mechanisms like carbon taxes and cap-and-trade programs place an explicit price on emissions or energy use to encourage businesses to find innovative, cost-effective ways to reduce their energy consumption or carbon footprint.¹²⁵

Given that emissions from electricity and gas consumption can significantly outweigh emissions from other stages of a building’s life such as raw materials manufacturing or demolition,¹²⁶ several governments are implementing regulatory instruments that encourage green design and target efficient energy and water use by tenants. The following are examples of market-based mechanisms aimed at reducing emissions by incentivizing the use of green, energy-efficient building design:

India’s Perform, Achieve, and Trade program is a regulatory cap-and-trade instrument that aims to reduce energy consumption in specific energy-intensive sectors using a market-based mechanism through which participants (known as designated consumers) can get certification for and trade excess energy savings.¹²⁷ While the program was initially created for large industrial businesses, it was extended to hotels for the year 2020–2021.¹²⁸ Energy-saving certificates equal to 1 metric ton of oil equivalent of energy savings are awarded to designated consumers when they meet their savings target, and can be sold to other designated consumers that fail to do so at a price set by market supply and demand.¹²⁹ As of 2017, 150 to 200 hotels consuming about 1,000 million metric tons of oil equivalent have already been appointed as designated consumers¹³⁰ eligible to receive and trade energy-saving certificates, provided they meet their targets.¹³¹

South Korea applied an emissions trading system at the point of electricity consumption to expand the mechanism’s scope to include entities such as large buildings that would have otherwise been exempt.¹³²

Ireland has levied a carbon tax on fossil fuel imports for sectors other than heavy industry and power as covered under the EU's emissions trading system, including on heating in buildings. This tax is passed on to consumers at the point of purchase.¹³³

Subnational governments are also using similar mechanisms:

Tokyo's emissions trading system covers urban facilities, including public institutions, commercial buildings, lodging, educational facilities, medical facilities, and office buildings—the latter accounts for four-fifths of the covered entities.¹³⁴

Shanghai's pilot program for an emissions trading system covers “indirect” emissions, calculated using electricity consumption and a default grid emissions factor, from entities including large buildings such as hotels. Such measures can incentivize consumers and owners to choose green buildings that are energy efficient or incorporate renewable energy such as rooftop solar, thus driving demand and creating a market for the sector.¹³⁵

British Columbia's 2008 carbon tax on fuel use reduced natural gas consumption in commercial buildings “by a much larger amount than would be expected on the basis of the normal response to changing natural gas prices”.¹³⁶

However, market mechanisms like carbon pricing can be politically unfeasible for the residential sector and may disproportionately affect vulnerable groups.¹³⁷ Hybrid models that combine elements of quantity-based emissions trading systems and price-based tax instruments can provide the flexibility needed to maximize the emissions coverage while accommodating socioeconomic priorities and variances in building type, asset class, and market type.¹³⁸ Hybrid models could also help to minimize price volatility, which would appeal to investors and governments.



Photo: Maintenance workers clean solar panels on the rooftop of a government building in Gandhinagar, India. © Dominic Chavez/IFC

Financial sector regulations and incentives

Frameworks on climate risk management, such as the Taskforce on Climate-related Financial Disclosures, are clarifying the link between climate change and systemic financial risk. Given the transition and physical risks posed by climate change, greening the financial system and incentivizing low-carbon investments is essential. Regulators and central banks in emerging markets are beginning to develop policies and implement innovative financial tools to direct capital towards green real estate to diversify their economies and mitigate climate-related financial risks.

For example, the Central Bank and Supervisors Network for Greening the Financial System brings together financial regulators to share best practices, exchange experiences, mitigate climate risk to financial systems, and mobilize finance for transitioning to sustainable economies.¹³⁹ In April 2019, it published “a call for action,” which outlines recommendations for central banks on how they can direct the financial sector towards achieving global climate goals.¹⁴⁰ These recommendations, although non-binding, promote more stringent climate risk approaches within the financial sector.

Similarly, the Sustainable Banking Network brings together financial sector regulatory agencies and banking associations from 38 emerging markets to improve environmental, social, and governance (ESG) and climate risk management and create positive climate impact by increasing capital flow.¹⁴¹ For example, the Mongolian Bankers Association, a network member, includes the construction and infrastructure sectors in its Sustainable Finance Principles and Sector Guidelines, developed in consultation with multiple parties, including the country’s central bank. The guidelines identify environmental and social risks associated with residential, commercial, and industrial building construction and suggest methods to limit those risks. Investors are made aware of these risks—and can direct their capital towards green buildings that mitigate them.

At a sectoral level, financial regulation and policy incentives are being used to target high-emitting industries—including the buildings sector:

— The Bank of **Bangladesh** has mandated that all commercial banks must provide a discounted financing rate of 9 percent for the extra cost of green measures applied to light industry buildings.¹⁴²

The **Lebanese** government has implemented a National Energy Efficiency and Renewable Energy Action initiative, which encourages commercial banks to provide cheap credit to the private sector for renewable energy, energy efficiency, and green building projects.¹⁴³ The Lebanese Central Bank reduces the obligatory reserve requirements of commercial banks that provide green loans to such projects by an amount equal to 100 percent to 150 percent of the loan.¹⁴⁴

In **Indonesia**, the Financial Services Authority (Otoritas Jasa Keuangan) issued a national regulation that requires banks to report annually on their green financing products and services; growth in green finance portfolios; organizational, governance, and risk management changes to ensure their compliance with ESG norms; and internal capacity building related to sustainable finance. This regulation has pushed banks to recognize green assets as a separate asset class and develop green growth strategies. A second regulation which defined green bonds in terms of eligible use of proceeds, reporting requirements, and obligatory third-party verification, included certified green buildings as an eligible use of funds. Building on this foundation, policymakers are exploring how lower mortgage rates could be made available for green homes. The Bank of Indonesia has announced a 5 percent increase in the maximum loan-to-value ratio for green property.



Clear green bond guidelines as a lever for the green buildings market

The increased uptake of green bonds in several markets is mainly due to central banks and regulators providing clear guidelines on how to issue these bonds. The People’s Bank of China published its Green Bond Guidelines in 2015 as a way to improve market integrity. It has subsequently released a Green Bond Endorsed Project Catalogue that provides a comprehensive, official list of types of projects eligible for green bond financing.¹⁴⁵ This regulatory clarity has helped China’s green bond market to grow to the second largest in the world as of 2018, accounting for 18 percent of total global issuance, valued at over \$30 billion. Similar trends are seen across

regions: India, the Association of Southeast Asian Nations, Chile, Peru, and Egypt are only a few other examples of countries issuing green bond guidelines. Many of these issuances are being used for financing green buildings.

Such guidelines and frameworks, although not directly aimed at the green buildings sector, can help increase green investment across the economy. By including low-carbon buildings in official lists of project types eligible for such financing, governments can enable a project pipeline in the sector without directly targeting it.¹⁴⁶



Photo: The EDGE-certified Verde Two Monteverde Tower in Jakarta was developed by FARPOINT and Asia Green Real Estate.

Lessons learned and next steps

In 2017, existing policies covered just over 50 percent of carbon dioxide emissions related to global buildings.¹⁴⁷ Even if current NDCs are achieved, policy coverage would only increase to 63 percent¹⁴⁸—a clear indication that the buildings sector commitments for 2020 must be more ambitious. In addition to policy coverage, the targeted energy intensity of the global buildings sector per square meter needs to improve by 30 percent by 2030, which will be essential to keeping global temperatures to under 1.5°C.¹⁴⁹

How public policies and regulations are structured and sequenced, and how they are implemented, are key to achieving their goals. IFC's lessons learned are shared below.

First, IFC's experience in South Asia and Latin America suggests that non-fiscal incentives at the city level tend to be a more effective first step than financial incentives in nascent or developing markets. Introducing non-fiscal measures is easier as they can be executed without having to coordinate between the different government departments, which is necessary for financial incentives.

Second, policies need to be effectively implemented and enforced. IFC's work with governments has brought to light several approaches that can be used to make it easier for developers and other value chain actors to comply with green building requirements:

IFC successfully helped improve code compliance in **Vietnam** and **Indonesia** by training over 1,000 construction industry professionals and monitoring officials in each country. It also created checklists for inspectors and technical guidance for code criteria, making enforcement easier.

Colombia's national chamber of construction, Camacol, played a crucial role in including the private sector in the process of creating the first mandatory green building code in Latin America. This multi-stakeholder engagement helped raise awareness about the ease, affordability, and operational savings generated by building green, thereby boosting code compliance.

The governments of Arequipa and San Borja in **Peru** awarded height bonuses to developers based on third-party certification of their green buildings, which helped prevent greenwashing, ensured compliance, and directed incentives to eligible recipients.

Every level of government needs to take action to develop and enforce the underlying enabling frameworks to create a market for green buildings:

Policymakers should set minimum standards with compulsory codes and encourage voluntary certification to spur private sector ambition and innovation. Policymakers and regulators can design policies that consider industry-specific factors to induce behavioral change. Policies need not have fiscal impacts. For example, easing processes and procedures for building green, such as expediting construction permits, can be a low-cost way of encouraging the uptake of green buildings. Templates or checklists that help developers fulfill green requirements can be made publicly available to ease the burden of compliance.

Governments can help bridge existing data gaps and improve gathering and sharing of information on buildings. Factors such as energy intensity in the buildings sector, the expected rate of growth, the grid's emissions factor, and other relevant variables, if made public, can help the private sector plan its investment in green buildings. Publicly available data on buildings' energy and resource consumption through, for example, building labels can also encourage building owners and tenants to choose green buildings, creating demand in the sector.

Policies and regulations must work for all actors along the green buildings value chain, as well as embody and encourage transparency, longevity, and certainty. They must be designed together with stakeholders in order to understand the tensions, challenges, opportunities, and pathways that will bring about sustained change. Governments need to set clear targets and work with contractors, investors, and consumers to develop approaches to implement and achieve them. The actions taken at these levels must align with each other to ensure policy certainty and a clear understanding of what it means to build green for the private sector.



Photo: The Gerardo Arango S.J. Building—School of Arts, located on the campus of Pontificia Universidad Javeriana in Bogotá, has been certified with EDGE.



Voluntary Commitments to Green Buildings

Certifications enabling commitments

Voluntary commitments from private sector actors across the value chain have driven much of the development of the green buildings market. This has largely been in the absence of comprehensive policies or mandates requiring such practices. Companies outside the construction sector are increasingly taking on green buildings commitments that move beyond individual buildings to portfolio and industry-wide efforts. These commitments provide a clear signal to financiers that there is growing demand. They also provide an entry point, particularly in emerging economies, to further grow the green buildings market.

Most of these commitments have been delivered through green building certification programs. Such programs have been instrumental in expanding the market by evaluating and benchmarking levels of building achievement in energy and other sustainability dimensions for design, construction, and operational performance, and by providing third-party verification and certification.

BREEAM, DGNB, EDGE, Green Star, LEED, and NABERS are among the most influential international rating systems. Many countries have also developed their own systems,¹⁵⁰ often based on BREEAM and LEED, with modifications to reflect local priorities and market conditions. To date, 85 countries have adopted national or local building certification programs, which can be voluntary or mandatory for all or part of the buildings sector.¹⁵¹ To achieve net zero carbon for




Photo: Developed by Flamingo Dai Lai Joint Stock Company, Forest in the Sky immerses its residents in the atmosphere of a tropical jungle. Awarded EDGE Advanced certification, the project is located in Hanoi.

all new construction by 2030, these standards will need to become more stringent and consistently enforced to mitigate the risk of greenwashing.

Brief snapshots of a small selection of international and national certification schemes are included in Figure 7. It is not an exhaustive overview of the main schemes currently available, but instead shows the broad variety in approaches, areas of focus, and scale of uptake in these systems. Elements such as recognition of pre-qualified accredited professionals across programs, including LEED and EDGE, ensure consistent messaging and shared goals. While not all rating tools are applicable in all markets, in many countries multiple systems operate in parallel, serving as complementary drivers of green building (see box on Market Response to Multiple Green Building Rating Systems). Certifications help to create awareness, and offer a verifiable performance indicator that financiers can lend against, helping to advance green building practices.

Of the 1,005 real estate companies, developers, REITS, and funds, representing more than \$4.1 trillion in assets under management, that reported to GRESB in 2019, 90 percent align their projects with green building rating standards for construction and operations. In addition, 45 percent of them require a specific level of certification for more than three-quarters of their projects under development.¹⁵² With 48 percent floor area coverage, hotels lead property types in certified floor area, narrowly ahead of offices.¹⁵³ The consistency and replicability of performance ratings is key to enabling this growth in both the commercial and residential market.



Figure 7: Differences across a sample of international and national certification systems and their uptake

International systems¹⁴⁷

Certification system and managing organization	Building Research Establishment Environmental Assessment Method (BREEAM)—BRE Global†	Excellence in Design for Greater Efficiencies (EDGE)—International Finance Corporation‡	Leadership in Energy and Environmental Design (LEED)—U.S. Green Building Council‡	
Type of certification	Green building rating and certification system through on-site independent third-party verification for new construction, in-use, refurbishment and fit-out, commercial interiors, core and shell, schools, retail, healthcare, homes, communities, and infrastructure	Online platform to determine cost-effective options for designing green within a local climate context, a green building standard, and a certification system for new construction, existing buildings, and major retrofits of commercial/residential structures	Green building program for buildings, communities, and cities, providing a rating and certification system through second-party verification for new construction, existing buildings, operations and maintenance, commercial interiors, core and shell, schools, retail, healthcare, homes, neighborhood development, and cities	
Areas of focus	Weighted performance in 9 categories with minimum standards: Energy, health and wellbeing, transport, water, materials, waste, land use and ecology, management, and pollution No prerequisites for in-use	Independent certification for projects achieving EDGE standard of 20% less energy use, 20% less water use, and 20% less embodied energy in materials compared to a base case building EDGE Advanced certification for >40% energy savings, with at least 20% savings in water and materials EDGE Zero Carbon for 100% carbon neutrality, with >40% energy efficiency required on-site	Performance across 9 categories scored out of 110 points: Sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, locations and linkages, awareness and education, innovation in design, and regional priority through a set of prerequisites and credits	
Number of countries covered	83	154	176	
Total number of projects certified by building type	Residential	1,648	34,632	
	Office	5,240	19,236	
	Retail	3,231	7,640	
	Education	2,506	6,035	
	Hospital	730	1,353	
	Hotel	Included in Other	18	846
	Other	8,187	6	10,987
Total floor area registered (m²)	1,060,000,000	16,304,630	1,291,791,279	
Total floor area certified (m²)	235,000,000	7,697,001	806,871,943	



Market response to multiple green building rating systems

Many countries have seen multiple green building rating systems thrive, as they meet different market needs for recognition domestically and internationally. For example, EDGE, BREEAM, and LEED are operating alongside the national Green Building Evaluation Label (GBEL) in China, also known as the Three-Star rating system, which has standards for different building types covering the design, construction, operation, and retrofit stages. The national system supports the country's ambitious goals, including requiring green certification for at least half of all newly constructed buildings by 2020, and all public

buildings and others over 20,000 square meters are mandated to use this system to build sustainably.¹⁵⁵ In parallel, designers and building owners can use IFC's EDGE software to achieve credits towards the Three-Star system. This is the first time that a software product from an international system has been benchmarked and aligned with GBEL to encourage green building growth. Thirty public buildings have successfully achieved two- or three-star GBEL certifications using the EDGE app. Similarly, BREEAM and the Chinese Society for Urban Studies (CSUS) Green Building Research Centre are developing a dual-certification system of

green buildings under both standards. China is the second biggest market for LEED outside the United States. Its uptake is a good indicator of growing market demand, particularly in the commercial properties segment, due to its independent status. In 2018, LEED-certified Grade A office buildings exceeded 523 million square meters across China and accounted for more than 27 percent of the total market share in 10 prominent cities.¹⁵⁶ Some buildings are pursuing multiple certifications—the Asia-Pacific headquarters of Johnson Controls in Shanghai has received triple certification in GBEL, EDGE, and LEED.



Committing to green buildings through global platforms

International platforms and initiatives are critical—not only to building momentum and encouraging action, but also to extending demand for building green outside the construction sector. For example, the World Green Building Council’s Advancing Net Zero calls on businesses, organizations, cities, states, and regions to reach net zero carbon operating emissions within their portfolios by 2030 and to advocate for all buildings to be net zero carbon by 2050. As of October 2019, 31 businesses (including investors, designers, engineering firms, developers, owners, and product manufacturers), 26 cities, and six regions have committed to this goal.¹⁵⁷ These companies are part of a wider group committed to The Climate Group-led EP100 initiative, which aims to help them double their energy productivity through energy-efficient innovations.¹⁵⁸

These platforms have enabled companies outside the construction sector to take on green buildings commitments that extend beyond their direct operations. For example, multinational clothing retailer H&M has pledged to double its energy productivity by 2030. By building stores that use 40 percent less energy than those constructed today, and investing in new technologies for lighting, heating, ventilation, and air conditioning, it intends to generate immediate financial and sustainability benefits. These ambitions are being extended beyond its own operations. H&M aims to have all its suppliers enrolled in an energy efficiency program by 2025, while reducing the energy used in its logistics, transport, and warehouses. It envisages a climate neutral supply chain for its first- and second-tier suppliers by 2030. To date, H&M has reduced greenhouse-gas emissions in factories in Bangladesh, China, India, and Turkey.¹⁵⁹ Financiers with lending activities spanning industry-specific value chains can use such commitments to develop financial products that encourage corporates to adopt green buildings across their operations.

The Zero Carbon Buildings for All Initiative pledges to make new buildings carbon neutral by 2030 and existing buildings by 2050 in member countries. The initiative is targeting financiers. Multilateral

development banks and private financial institutions have committed to aligning their financing of buildings with global agreements on climate change and national climate policies—a move that could lead to a potential \$1 trillion in “Paris compliant” buildings investment in developing countries by 2030.¹⁶⁰ Through the Better Buildings Partnership, 23 of its members, covering £300 billion in assets under management and over 11,000 commercial properties, have committed to net zero carbon real estate portfolios by 2050. Another program with significant reach across both financiers and the built environment is the Science Based Targets Initiative. Of the 689 companies from both developed and emerging markets that have committed to aligning with the Paris Agreement, almost 50 are financial institutions and more than 100 are involved in the buildings sector.

Individual building, portfolio-wide, and industry commitments

Building owners, developers, and corporations are taking on individual commitments to green their buildings or portfolios. They are also acting at an industry level to reap the business benefits, such as an 8 percent saving in operating costs in the first year and increased building asset values of 7 percent for new green buildings.¹⁶¹ These commitments provide a strong signal that the demand for green construction is across all building types and not restricted to any one sector. As such, banks and investors seeking to grow their green real estate portfolios can finance a wide spectrum of borrowers and investees to expand the green buildings market.

OFFICES

Almost 50 percent of all office buildings covered under GRESB have green certification for their operations. Green offices achieve lower operating costs, and higher rent and tenancy rates compared to conventional offices in most markets, raising their values. They also provide better collateral due to higher resale values, representing a higher-value asset for investors and financiers, which in turn improves access to finance for owners and developers.



Greening offices through leases in Singapore

Early adopters of green leases tend to be large organizations with environmentally friendly internal cultures facing the possibility of strict government regulations. For example, City Developments Limited from Singapore initiated a Green Lease Partnership Programme in 2014 to support its commercial tenants' efforts to lower their carbon footprint. Since 2017, all existing tenants have pledged their commitment to go green by signing a Green Lease Memorandum of Understanding. All new tenants receive green guidelines and checklists to help them in fitting out works and operations. As a result, nine of City Developments' commercial properties have been awarded the BCA Green Mark Pearl and Pearl Prestige Award, which are given to building owners with a substantial number of tenants who are Green Mark certified under the Green Mark occupant-centric schemes.¹⁶²

Client demand has driven the construction of green office spaces, as these are often central to corporates achieving their low-carbon strategies. Corporate tenants are also increasingly aware of the strong connection between green buildings and employee health and wellbeing, job satisfaction, recruitment, and staff retention. Tenants can recoup their costs through lower utility bills and improved productivity and comfort.¹⁶³ Many landlords are using the building's sustainable operations as a selling point. Class A office spaces are now mostly being constructed to meet green credentials in order to attract premium corporate tenants. In Beijing alone, almost 45 percent of the total floor area of Grade A office buildings is LEED certified.¹⁶⁴ South African developer Growthpoint Properties has pledged that all its new office developments will achieve at least a four-star Green Star SA rating from the Green Building Council South Africa and the green performance of its existing office buildings will be improved.¹⁶⁵

Such efforts are being driven in part by owners and renters using green leases. A green lease adds smart, energy-aligned clauses to commercial leases to unlock investments in energy efficiency and sustainability that benefit both landlords and tenants. Landlords define the green building operating program to be used in the commercial properties using standards such as BREEAM, and subsequently align the lease to the standards. Green leases have yet to be introduced to and implemented in all property markets.

RESIDENTIAL

Residential developers pass the value of lower operational costs directly to their customers. This value transfer results in an opportunity, including in affordable housing, as developers can distinguish their properties from the competition and demonstrate that they care about their customers and the environment. They are increasingly able to benefit from incentivized financing offered by progressive banks and investors to encourage the design of better-performing buildings. Other reasons why residential developers are starting to take a portfolio approach to certification include to improve their business models and attract international attention to their brands.

Examples of large-scale commitments by property developers include the following:

EchoStone plans to build 182,000 affordable, certified green homes in Lagos, Nigeria, by 2023. By working with local banks, it ensures that home buyers have access to low interest rates and long mortgage tenors.

Vinte has committed to certifying its entire future portfolio at a rate of almost 4,000 homes per year in Mexico. The company has issued two sustainability bonds to finance the certification, guaranteeing investors climate-smart social impacts.¹⁶⁶

HOTELS

Hotels account for 1 percent of global emissions—a percentage that is expected to increase as the industry continues to grow.¹⁶⁸ Integrating sustainability measures into operations is critical for hotels, with such efforts having an effect on most of the drivers of the industry’s growth: cost efficiency, city policies (both regulations and incentives), internal sustainability goals, corporate/brand image, and better guest satisfaction. Getting the design right at the outset is critical, as the cost of resource-efficient solutions at this stage is marginal compared to making corrective measures later. Sustainability efforts drive business models and ultimately profitability, thereby positioning hotels to take advantage of green finance options that lower long-term risk assessment from investors and lenders, and enhance the cost of financing.



Effecting change across the industry through collaboration

Led by the CEOs of leading developers and financial institutions, the Sustainable Housing Leadership Consortium is a first-of-its-kind voluntary private sector consortium that works to mainstream green homes in India. The consortium is committed to building and certifying all of its new housing as green, contributing 110 million square feet of green housing by 2020.¹⁶⁹ The aim is for at least 20 percent of India’s new housing developments to be green by 2022. It is achieving this through scalable, market-ready technologies to decrease costs, working with the government to create an enabling policy environment for green buildings to become the mainstream choice, and stimulating demand for green homes through a multimedia awareness campaign targeting 7 million people.



AccorHotels' sustainability-linked loan facility

AccorHotels has made sustainability a core component of its long-term financing strategy. It aims to contribute to limiting rising global temperatures by achieving carbon neutrality. This requires more demanding green building requirements in the construction and renovation phases, and constantly cutting its hotels' energy consumption and emissions through efficient equipment and building design. Its constructions and renovations are certified with the highest recognition in each

country. At the end of 2018, about 50 buildings among all Accor and AccorInvest buildings were certified or in the process of being certified.¹⁶⁹

AccorHotels' commitment to sustainability is demonstrated in its corporate practices. Its recent five-year, €1.2 billion multi-currency senior unsecured revolving credit facility, led by BNP Paribas, will be used in line with the company's sustainability ambitions. The facility's pricing mechanism includes a correlation

between AccorHotels' financing cost and its overall ESG performance; and the introduction of an additional margin adjustment parameter linked to AccorHotels' ESG score. The external score required by the financing is provided by Sustainalytics, while various provisions are included in the documentation to ensure the incentive mechanism is well implemented and maintained.¹⁷⁰



Leading hotel brands are turning to green certifications to help secure group business, such as corporate travel and conferences, as corporations look to “green” their entire business:

ITC Hotels has committed to the highest green building standard, with its entire portfolio of hotels across India certified as LEED Platinum. Several measures were used to minimize its carbon footprint, reduce waste, and improve water efficiency while ensuring the comfort of hotel guests.¹⁷¹

Host Hotels & Resorts—the world’s largest lodging REIT, owning 93 properties with 52,000 rooms—collaborates with operators and managers to adopt industry best practices that improve environmental performance and enhance asset value. Over the past four years, Host has invested more than \$210 million in engineering projects with sustainability components, with expected annual savings of \$30 million. This equates to a 14 percent cash-on-cash return and about \$320 million in enterprise value.¹⁷²

RETAIL

As brands with physical retail spaces seek new ways to stand out from online competitors and peers, sustainability has become an asset. Retail centers typically spend 11 percent of their total operating costs and 19 percent of their net revenue on energy.¹⁷³ By pursuing green building certification, they can reduce their overhead, minimize waste, and benefit from decreased dependence on energy, while attracting customers who care about the environment. According to the Retail Industry Leaders Association, 93 percent of global consumers expect the brands they use to support social and environmental issues.¹⁷⁴ Developers and owners of retail stores can demonstrate achievement of ESG goals to their investors, customers, and other stakeholders. For example:

Global chains like Starbucks are championing green buildings, having pursued certification for every new, company-operated store since 2008 globally. As of 2018, it has committed to designing, building, and operating 10,000 “greener stores” globally by 2025, under a framework developed with SCS Global Services and WWF. These stores are expected to save \$50 million in utilities expenses over the next 10 years, enhancing returns and appealing to investors.¹⁷⁵

Retail mall developers are also committing to building green. Novare Equity Partners—a developer of malls and retail stores across Africa—recently sought green certification for the construction of the Novare Great North mall in Lusaka, Zambia, to attract well-known African retailers Shoprite Holdings and Pick n Pay. The mall’s resource-efficient measures were implemented at a minimal additional cost and utility bills are expected to reduce by over 40 percent.¹⁷⁶

HOSPITALS

Hospital investors and operators are discovering that resource efficiency leads to better patient care. For example, the Costa Rican Social Security Fund has built two lower-carbon medical clinics in Belén that support Costa Rica’s commitment to become carbon neutral by 2021. Through eco-efficient solutions, energy and water consumption are reduced. Operational savings can be used to buy better equipment and pay for more medical professionals, improving patients’ wellbeing. The fund aims to become a model public institution for its connection to communities and commitment to environmental performance.¹⁷⁷

WAREHOUSES

Modern warehouses are becoming sustainable facilities that serve as hubs for high-tech tracking, repackaging, and quality control testing. Chinese pharmaceutical distributor Jointown used green certification tools to identify resource efficiency opportunities in its 13 new warehouse distribution centers and three offices across six provinces. Introducing high-performance building envelopes; optimizing lighting, heating, and cooling systems; and using solar energy are expected to yield average energy savings that are 25 percent better than code requirements, reducing the warehouses' costs and improving their profitability.

DATA CENTERS

Data centers are significant users of energy. As the pace of digitization continues to increase, the demand for them will keep in step. Owners are planning for this by sustainably addressing their growing energy needs:

CyrusOne is a global data center REIT. Two of its existing London facilities run on a 100 percent renewable energy tariff, which transfers the annual energy usage, equivalent to 52,000 households, to zero emissions sources. It has committed to running all new data center inventories in London off renewable energy, benefiting customers through reduced unit costs through the procurement process and exemptions from the Climate Change Levy.¹⁷⁸

Microsoft has committed to pursuing LEED Gold certification for all of its data centers. Together with the U.S. Green Building Council, it has created standardized design and expected performance criteria for the LEED data centers standard, which will serve as a blueprint for Microsoft and others to build greener.¹⁷⁹



Photo: ALP North's three EDGE-certified warehouses in Kenya were developed by Africa Logistics Properties.

Moving from commitments to scale

Global platforms and individual and industry commitments have been critical to growing the green buildings market. Large property owners and developers pledging to green their entire building portfolios has increased awareness in the market, attracted green finance, and encouraged smaller companies to follow suit. However, this progress has been uneven across the world, and the scale of initiatives and commitments has not kept up with the rapid pace of urbanization and construction.

These voluntary efforts are key to maintaining momentum in the sector and need to be scaled from individual to industry-level actions, particularly in emerging markets, allowing for concerted advancement of green construction. Investors and banks must seize this momentum and increase the flow of finance to owners and developers of green buildings to incentivize scale and take advantage of the sizeable investment opportunity they represent. Policymakers can expedite this by embedding consistent green requirements into construction and finance policy frameworks and providing incentives. Collectively, these efforts can sustain the transition towards a net zero carbon buildings sector by 2050.



Conclusion and Recommendations



Conclusion and Recommendations

The future of building construction is green. It must be if we are to reach global climate goals and restrict global warming temperatures to under 1.5°C from pre-industrial levels. Green buildings can substantially reduce the carbon emissions that come from heating and cooling spaces and powering multiple appliances and devices.

Reducing emissions through green buildings comes with a \$24.7 trillion investment opportunity over the next decade across emerging market cities, which are growing and building at a rapid pace.

There is a strong business case for investing in green buildings. They are more efficient than traditional buildings, driving up revenues and lowering operating costs. Equally important, they can reduce the risk of buildings becoming stranded assets as a result of their exposure to the physical and transition risks stemming from climate change.

Realizing the full investment potential in green buildings is within reach. Technologies to build green are well known and easy to implement; and the cost of applying these technologies continues to decrease with their greater adoption. Furthermore, financing and investment mechanisms for constructing and operating buildings are well known.

This report has identified and reviewed best practice approaches that can be replicated and scaled to move emerging markets towards green construction. A summary of recommended actions that key market players can take to translate the multitrillion-dollar investment opportunity in green buildings into investment projects is set out below.

Investors and financiers

Investors and financiers hold tremendous influence in shaping and accelerating the capital-intensive real estate market's transition to green construction. This shift will help take advantage of the significant green building investment opportunity and build stronger real estate investment portfolios resilient to financial, regulatory, and reputational risks associated with the transition to low-carbon economies. The valuation of green properties can be higher because they have lower operating costs and higher occupancy rates and rental income. In the clean energy transition scenarios, the valuation of green buildings can increase further because they avoid the increasing likelihood of penalties imposed on carbon emissions. All these factors also make green buildings a better credit risk asset and better collateral.

In emerging markets, banks and funds are starting to take it upon themselves to educate developers and customers about the benefits of building and buying green and, at times, offer favorable financing terms to incentivize green construction and green homeownership. By doing so, financiers can develop new green finance products, capitalize on the first mover advantage to expand into new market segments, access diverse and potentially cheaper sources of capital through the green bond market, and build higher-value and lower-risk portfolios.

Investors and financiers can do the following to build their green real estate portfolios:

- Develop a green buildings asset strategy and process, which relies on green building certification and labeling systems for industry-accepted definitions and eligibility criteria.
- Create green buildings finance products that could include favorable financing terms to offset higher upfront costs of green construction for developers and home buyers. This will help jump-start the market and ensure a pipeline of projects.
- Determine appropriate funding sources to support the rollout of green buildings finance products, such as rapidly expanding the green bond and loan markets to provide additional capital for expanding green buildings finance products.
- Generate a pipeline of eligible projects by actively engaging developers on the economic benefits of green construction and explaining the long-term advantages of green homeownership to prospective buyers.
- Collect, analyze, and report data on the environmental and financial performance of green real estate projects and the allocation of funds to green projects.

Governments as investors and regulators

As the world's largest investor, owner, and operator of real estate, governments have significant power to shape the green buildings market. Governments set rules and create incentives for market players through policies, regulations, and monitoring compliance. By requiring and incentivizing green construction practices, governments can help create a strong pipeline of green assets for banks and investors to finance.

Governments stand to benefit from the transition to green construction both financially and in meeting their environmental and social objectives. Green public buildings deliver significant budget savings through paying lower utility bills. Green buildings can drive up tax revenue on profits from local businesses, which in turn are able to benefit from lower operating costs. Green buildings can help strengthen countries' energy and water security and help them achieve their goals to reduce emissions.

Governments can catalyze the green construction if they:

- Require all new public buildings to be built green in line with well-established green building certification systems.
- Help build technical capacity in the market to design, build, appraise, and finance green buildings.
- Put in place procurement policies for green building systems and appliances to incentivize the cost-efficient production of green heating and cooling equipment, as well as energy-efficient appliances and lighting.
- Collect, analyze, and report data on the environmental and financial performance of green buildings to communicate the business case to the market.
- Develop incentives and programs to help cover higher upfront costs of green construction and green homeownership to accelerate the transition to green construction beyond public buildings.

Governments—national, subnational, and local—can create the right conditions for the growth of the green buildings market and provide clarity and policy certainty to the private sector through regulations. To do so, they can:

- Set national targets for emission reductions, sending a clear signal to the market and setting clear objectives across ministries and different levels of government to develop enabling policies and regulations (energy codes, building energy codes, and green building codes).
- Adopt mandatory labeling and certification systems that can help drive enforcement of policies and regulations and provide assurance to the market that buildings meet the requirements. Training government and industry professionals will optimize enforcement.
- Develop and implement programs to incentivize practices that go beyond mandatory codes, including, as appropriate, tax incentives— income tax, VAT, and real estate tax breaks, grants for capital expenditure buy-downs, interest rate rebates, and technical capacity-building programs.
- Implement effective non-financial incentives, such as expedited and/or preferential permitting processes and density bonuses—increased height and/or footprint allowances—for green buildings.
- Align financial regulations to incentivize the flow of finance to green buildings, including the definition of the green buildings as an asset class, the mechanism for monitoring allocation of finance to green buildings, and reducing capital adequacy requirements for green buildings finance. Develop guidance for domestic markets on how to issue green bonds.

Not all of these steps can, nor should they, be taken simultaneously or in the same linear sequence in every market. They must be tailored and applied as best suited to local conditions, according to the legal frameworks, socioeconomic contexts, and developmental priorities in each market.

Developers and owners

The green buildings market can also be shaped by progressive companies—developers and owners—that demonstrate a proof of concept and pave the way for others to follow. Voluntary commitments and actions by these players have been critical in the absence of comprehensive policies and practices mandating and incentivizing green construction.

Standard-setting organizations have contributed to these efforts by developing green building certification systems, building technical capacity, and continuously advocating for higher standards and bolder commitments from leading market players towards net zero carbon buildings.

Certifying with well-established green building certification systems allows developers to differentiate their products in the market and reap the benefits of a green building label—including access to faster sales times and higher sale premiums; additional sources of finance earmarked for green lending, such as green bonds, green loans, and green funds; and lower-priced loans. Additional benefits to developers include tax incentives, expedited permitting processes, and permissions to build higher.

Based on best practice among progressive developers, others can consider the following recommendations:

- Integrate green features into the project specification, contracts, and early design to find the most cost-effective way to build green.
- Invest in green building certification to demonstrate compliance with today's green finance criteria and to ensure market recognition by customers.
- Explore financial and non-financial incentives, as well as support programs offered by national, subnational, and local authorities to build green.
- Explore specialized green construction finance products and other incentives offered by commercial banks and/or issue green bonds to access cheaper capital for green construction.

- Collect and analyze data comparing the business benefits of green and traditional properties. The data can be used to consider adjustments to the business model, such as integrating the impact of utility savings into building valuation models.
- Communicate data on the benefits of green buildings to customers and financiers to gain a competitive differentiation in the market.

Corporations and large brands around the world also drive voluntary adoption of green building practices, as they make commitments to reduce emissions from their buildings and operations. In the process they benefit from lower utility bills and lower maintenance costs, and reduced legal and reputational risk.

Recommendations for corporate property owners and operators include the following:

- Communicate sustainability goals and actions to send clear signals to developers and financiers.
- Acquire green buildings to benefit from lower operating costs and higher revenue, and to ensure that the values of their assets are preserved over the long term.
- Measure, analyze, and report resource usage and emission reductions, as well as the financial benefits of owning and operating green buildings.

A common consideration for all market players is the importance of raising awareness of the business case for green buildings and building technical capacity across markets. All market players have stepped into this role, which not only serves their needs, but also contributes to advancing the green buildings market.

Awareness and capacity-building efforts intend to support both new entrants and those looking to increase their green building ambitions. Increased collaboration among these initiatives will help generate robust and transparent markets across all types of stakeholders.



Photo: A construction worker on the job at DCM's Elements near Mexico City, which has received EDGE Advanced certification. Rooftop co-generation systems will provide power to meet electricity and hot water demand.

Future direction

NEED FOR DEFINITIONS AND METRICS

Accepted definitions and metrics of what constitutes a green building are foundational to the efforts by all market players to catalyze investment at the scale required to green the massive new construction market.

Definitions and metrics are essential for:

- Policymakers to establish minimum code requirements and provide incentives for the private sector and financial innovation.
- Developers to create green building assets and get recognition from buyers and financiers for their superior quality.
- Financiers to access capital markets for their portfolio of green building assets.

To date, the most common material characteristics of green buildings have included energy efficiency and emission reductions measurements.

Clear definitions and metrics enable the collection and reporting of information on the size and performance of green building portfolios, bringing transparency to the market. The availability of larger datasets enhances investors' ability to make more informed decisions. Greater awareness of the business case for green buildings will help stimulate supply and demand in the market—growing a pipeline of green building assets and the financial products to finance them. Increased consumer awareness of the financial benefits of green buildings will further stimulate demand for green construction.

It is critical that the market players continue to work towards widely accepted definitions and metrics for green buildings that can apply across geographies and enable skills transfer. It is important to ensure that these definitions and metrics incentivize continuous improvement along a progression scale, from a minimum of 20 percent energy-efficient improvements towards net zero carbon buildings.

EXPANDING SCOPE

It is also vital to work towards reducing carbon emissions from the production of construction materials. The construction industry is the world's largest consumer of raw materials such as cement, steel, bricks, aluminum, and glass. If embodied carbon is taken into consideration, buildings are responsible for 40 percent of global greenhouse-gas emissions.¹⁸⁰ Addressing the issue of embodied carbon is particularly important because emerging markets are in a construction boom.

A holistic approach to construction is needed to reduce buildings' emissions, from their development to the end of their lives. While outside of the scope of this report, approaches to decarbonizing construction materials have been covered in separate IFC reports on the construction value chain.¹⁸¹ IFC is also working to address the issue of embodied carbon through its EDGE certification. EDGE is the only system that requires efficiency in embodied energy in materials as a certification parameter and IFC aims to measure embodied carbon in the future.

Annex

Building Awareness and Capacity Among Key Market Players

The complex nature of buildings—and green buildings in particular—has generated a range of legal requirements, certification schemes, and marketing initiatives. To build awareness and capacity, there are a variety of supporting initiatives, exchanges, hubs, programs, and projects. Efforts target a variety of audiences, including governments, developers, owners, investors, and other financial institutions, at the local, national, regional, and global levels. Increasing awareness and building capacity can be done through policy development, financial support, and market building, with many additional cross-cutting initiatives:

- **Policy:** Capacity-building initiatives that focus on policy provide an overview of existing policies, as well as best practices and lessons learned.
- **Finance:** Financial capacity-building efforts can help develop a pipeline of creditworthy and bankable projects.
- **Cross-cutting** activities and initiatives incorporate both finance and policy approaches to create demand and generate markets. These types of initiatives develop reporting frameworks and create tools to assist, quantify, and reduce the built environment's impact.

A selection of relevant initiatives from these three categories is provided below.

Sample initiatives

Understanding the technical aspects of green buildings as well as the various certification schemes and marketing tactics can be overwhelming. There is a wide range of initiatives, alliances,

coalitions, and other support mechanisms available to support new entrants and existing participants looking to increase their ambitions. Increasing awareness and building capacity can be done through policy development, financial support, and market-building initiatives, many of which are cross-cutting. This annex looks at some of these efforts.

POLICY DEVELOPMENT AND SUPPORT

Implementation of Sustainable Consumption and Production in India (SCP):

Aims to generate awareness among policy and decision makers on the importance of adopting SCP approaches in India's sustainable development policy.

- » More info: <https://www.oneplanetnetwork.org/initiative/implementation-sustainable-consumption-and-production-india>

International Energy Agency (IEA) Global Exchange for Energy

Efficiency: A resource for policymakers to learn about sector-specific policies and lessons learned around the world.

- » More info: <https://www.iea.org/topics/energyefficiency/>

Regional Policies Towards Green Buildings (REGREEN): Operates across the EU, targeting developers and investors to improve regional development policies and promote green regions as part of a broader green economy.

- » More info: <http://www.re-green.eu/en/go/objectives>

FINANCIAL SUPPORT AND MOBILIZATION

Asia Sustainable Finance Initiative (ASFI) Knowledge Hub: A multi-stakeholder forum in Singapore that supports financial institutions in implementing ESG practices to harness and amplify the finance sector's ability to create resilient economies that deliver on the Sustainable Development Goals and the Paris Agreement.

- » More info: <https://www.asfi.asia/#>

ENERFUND: An Energy Retrofit Funding Tool that rates and scores deep renovation opportunities based on a set of parameters, such as energy performance certificates, the number of certified installers,

existing governmental schemes, and the quality of heating systems. It aims to enhance investments in the refurbishment of buildings across Europe.

» More info: <http://enerfund.eu>

European Bank for Reconstruction and Development (EBRD) Green

Cities: Has over €1 billion in committed funds and is operational in more than 20 EU cities. It is focused on building a better and more sustainable future for cities and their residents by identifying, prioritizing, and connecting cities' environmental challenges with sustainable infrastructure investments and policy measures.

» More info: <https://www.ebrdgreencities.com/about>

European Covered Bond Council: Energy Efficient Mortgages Initiative (EeMI) is organized by the European Covered Bond Council and consists of EeMAP (Energy efficient Mortgages Action Plan) and EeDaPP (Energy efficient Data Protocol and Portal). Both projects are funded via the European Commission's Horizon 2020 Programme.

» More info: <https://hypo.org/ecbc/market-initiative/emf-ecbc-energy-mortgages-initiative/>

Financing Sustainable Cities Initiative (FSCI): A partnership between the World Resources Institute (WRI) Ross Center for Sustainable Cities, C40 Cities Climate Leadership Group, and Citi Foundation. Main components include the development of a peer-to-peer learning community, technical assistance, and an online engagement platform.

» More info: <http://financingsustainablecities.org/>

Global Alliance for Buildings and Construction (GABC): A UN initiative that aims to increase the pace and scale of the green buildings transformation and to keep the buildings and construction sector on warming path of well below 2°C. GABC's Programme for Energy Efficiency in Buildings (PEEB) combines financing for energy efficiency in large-scale projects with technical assistance through policy advice and expertise for building sector professionals.

» More info: <https://globalabc.org/> and <https://www.peeb.build/>

Kreditanstalt fuer Wiederaufbau (KfW) Energy Efficient Construction

Program: Supports building and acquiring new energy-efficient residential buildings with low energy consumption and reduced carbon emissions. It offers an incentive reduction of between 5 percent and 15 percent on the total amount on which interest is paid, depending on achieved KfW energy efficiency building standards, in addition to favorable interest rates.

» More info: <https://www.kfw.de/kfw.de-2.html>

MARKET BUILDING

Better Buildings Initiative: A U.S. initiative that aims to enforce multifamily affordable rental housing and acts as a non-profit developer to make commercial, public, industrial, and residential buildings 20 percent more energy efficient over the next decade.

» More info: <https://betterbuildingssolutioncenter.energy.gov/>

Concrete Sustainability Council: Partners from Europe, the United States, Latin America, and Asia promote and demonstrate concrete as a sustainable building material to enable informed decisions in construction. The council uses its certification system for responsibly sourced concrete, which includes the complete concrete supply chain: cement producers, aggregates suppliers, and concrete manufacturers.

» More info: <https://www.concretesustainabilitycouncil.com/>

Construction Industry Development Board (CIDB) Malaysia, Sustainable Construction Excellence Centre (MAMPAN), and Malaysian Carbon Reduction & Environmental Sustainability Tool (MyCREST):

CIDB Malaysia regulates, develops, and facilitates the construction industry by delivering a high-quality and sustainable built environment. MAMPAN focuses on sustainable construction. MyCREST aims to guide, quantify, and reduce the built environment's carbon impact while considering a more holistic view of the built environment and integrating socioeconomic considerations.

» More info: <http://www.cidb.gov.my/index.php/en/focus-areas/sustainable-construction> and <http://www.cidb.gov.my/index.php/en/bidang-utama/pembinaan-mampan/mycrest>

European Commission Level(s) program: A voluntary reporting framework to improve the sustainability of buildings. Using existing standards, Level(s) provides a common EU approach to the assessment of environmental performance in the built environment.

» More info: <https://ec.europa.eu/environment/eussd/buildings.htm>

Energy in Buildings and Community Program (EBC): Allows researchers and experts funded by national programs and industry to pool their collective expertise to produce high-quality project outputs, creating and reinforcing technical networks.

» More info: <https://iea-ebc.org/ebc/about>

Passive House Institute: Researches and develops construction concepts, building components, planning tools, and quality assurance for energy-efficient buildings. The institute provides building consultancy and technical guidance.

» More info: <https://passivehouse.com/>

SBT4buildings: A World Business Council for Sustainable Development (WBCSD) initiative to accelerate the transformation of the built environment to reduce carbon emissions and pave the way to a net zero built environment by 2050. It develops guidance for companies in the building and construction system that want to set their carbon reduction targets in line with keeping global warming below 1.5°C.

» More info: <https://www.wbcd.org/Programs/Cities-and-Mobility/Sustainable-Cities/Science-based-targets>

UNEP United for Efficiency (U4E): A UNEP-led global effort that informs policymakers of the potential environmental, financial, and economic savings of a transition to high-efficiency products; identifies and promotes global best practices in transforming markets; and offers tailored assistance to governments to develop and implement national and regional strategies and projects to achieve a fast and sustainable market transformation.

» More info: <https://united4efficiency.org/>

UN Green Growth Knowledge Partnership (GGKP): Consists of three knowledge platforms—the Green Growth Knowledge Platform, the Green Industry Platform, and the Green Finance Platform. They offer quick and easy access to the latest research, case studies, toolkits, learning products, principles, and protocols to empower policymakers and advisors, small and medium-sized enterprises, and banks, insurance, and investment firms to make evidence-based decisions about how to green their operations.

» More info: <https://www.greengrowthknowledge.org/sector/buildings>

UN Sustainable Buildings and Climate Initiative (SBCI): A UNEP initiative that promotes and supports sustainable building practices on a global scale with a focus on energy efficiency and greenhouse-gas emissions reduction. SBCI brings together stakeholders involved in the building, planning, and policymaking process at the local, national, and international level by providing a platform for dialogue and collective action.

» More info: <https://www.unenvironment.org/explore-topics/resource-efficiency/what-we-do/cities/sustainable-buildings>

WBSCD Energy Efficiency in Buildings Amplify (EEB Amplify):

A convening vehicle for the private sector to engage with local governments and collaborate on ensuring that the right policies, funding mechanisms, capacity-building programs, and awareness initiatives are in place to maximize market growth of energy-efficient buildings.

» More info: <https://www.wbcd.org/Programs/Cities-and-Mobility/Energy-Efficiency-in-Buildings/Resources/EEB-Amplify-2017-2020>

Acronyms and Endnotes

Acronyms

BREEAM	Building Research Establishment Environmental Assessment Method
C	Celsius
ECBC	Energy Conservation Building Code
EDGE	Excellence in Design for Greater Efficiencies
ESG	Environmental, social, and governance
EU	European Union
GBEL	Green Building Evaluation Label
GRESB	Global Real Estate Sustainability Benchmark
IFC	International Finance Corporation
IHS	International Housing Solutions
LED	Light-emitting diode
LEED	Leadership in Energy and Environmental Design
NDC	Nationally Determined Contribution
REIT	Real estate investment trust
RoGBC	Romania Green Building Council
UK	United Kingdom
UN	United Nations
US	United States
USD	United States dollar
VAT	Value-added tax

Endnotes

- 1 IFC (2018), Climate Investment Opportunities in Cities, available at: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/climate+business/resources/cioc-ifc-analysis.
- 2 United Nations, Department of Economic and Social Affairs, Population Division (2017), Probabilistic Population Projections based on the World Population Prospects: The 2017 Revision, available at <http://esa.un.org/unpd/wpp/>.
- 3 World Green Building Council (2013), The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants, available at: <https://www.worldgbc.org/news-media/business-case-green-building-review-costs-and-benefits-developers-investors-and-occupants>.
- 4 World Green Business Council (2013), The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants, available at: https://www.worldgbc.org/sites/default/files/Business_Case_For_Green_Building_Report_WEB_2013-04-11-2.pdf.
- 5 Fuerst, F. and McAllister, P. (2011), Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values, available at: http://immobilierdurable.eu/images/2128_uploads/Fuerst_article_autoris_.pdf.
- 6 World Green Business Council (2013), The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants, available at: https://www.worldgbc.org/sites/default/files/Business_Case_For_Green_Building_Report_WEB_2013-04-11-2.pdf.
- 7 Eichholtz, P., Nils Kok, N., and Quigley, J. (2010), Why Companies Rent Green: CRS and the Role of Real Estate, available at: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.457.4571&rep=rep1&type=pdf>.
- 8 IEA/UNEP (2018), 2018 Global Status Report, available at: <https://www.globalabc.org/uploads/media/default/0001/01/obf694744862cf96252d4a402e1255fb6b79225e.pdf>.
- 9 IEA/UNEP (2017), Global Status Report 2017, available at: www.globalabc.org.
- 10 See <https://www.iea.org/topics/energyefficiency/buildings/>.
- 11 IEA/UNEP (2017), Global Status Report 2017, available at: www.globalabc.org.
- 12 See <https://www.usaid.gov/energy/efficiency/economic-impacts>.
- 13 IEA (2019), Perspectives for the Clean Energy Transition, available at: <https://www.iea.org/publications/reports/PerspectivesfortheCleanEnergyTransition/>.
- 14 IEA (2019), Perspectives for the Clean Energy Transition, available at: <https://www.iea.org/publications/reports/PerspectivesfortheCleanEnergyTransition/>.
- 15 See <https://www.worldgbc.org/what-green-building>.
- 16 IFC (2018), Climate Metrics for Intermediary Financing, Version 1.3.
- 17 IFC (2018), Climate Metrics for Intermediary Financing, Version 1.3.
- 18 UN Environment Inquiry/Climate Strategy & Partners (2017), Green Tagging: Mobilising Bank Finance for Energy Efficiency in Real Estate, available at: <https://unepinquiry.org/publication/green-tagging-mobilising-bank-finance-for-energy-efficiency-in-real-estate/>.
- 19 See <https://www.usgbc.org/education/sessions/qatar-green-building-conference-2015/closing-performance-gap-6085290>.
- 20 See <https://www.epcregister.com/>.
- 21 Paulson Institute (2019), Insuring to Ensure Green Buildings, available at: <http://www.paulsoninstitute.org/paulson-blog/2019/05/06/insuring-to-ensure-green-buildings/>.
- 22 World Resources Institute (2019), Accelerating Building Decarbonization: Eight Attainable Policy Pathways to Net Zero Carbon Buildings for All, available at: <https://wriorg.s3.amazonaws.com/s3fs-public/accelerating-building-decarbonization.pdf>.
- 23 Plautz, J. (2019), Boston to require carbon neutral design for new city buildings, available at: <https://www.smartcitiesdive.com/news/boston-to-require-carbon-neutral-design-for-new-city-buildings/564624/>.
- 24 Philippine Daily Inquirer (2019), World's first "EDGE Zero Carbon" building is in PH, available at: <https://business.inquirer.net/280824/worlds-first-edge-zero-carbon-building-is-in-ph>.
- 25 See <https://www.worldgbc.org/thecommitment>.
- 26 IEA/UNEP (2017), Global Status Report 2017, available at: www.globalabc.org.
- 27 IEA/UNEP (2017), Global Status Report 2017, available at: www.globalabc.org.
- 28 IEA/UNEP (2018), 2018 Global Status Report, available at: <https://www.globalabc.org/uploads/media/default/0001/01/obf694744862cf96252d4a402e1255fb6b79225e.pdf>.
- 29 Principles for Responsible Investment/UNEP FI/UN Global Compact (2018), Impact Investing Market Map, available at: <https://www.unpri.org/thematic-and-impact-investing/impact-investing-market-map-green-buildings/3540.article>.
- 30 IEA/UNEP (2017), Global Status Report 2017, available at: www.globalabc.org.
- 31 Globe Newswire (2019), Green Building Market 2019: Global Industry Overview By Historical Analysis, Comprehensive Research Study, Opportunities, Competitive Landscape and Regional Trends by Forecast to 2023, available at: <https://www.globenewswire.com/news-release/2019/06/12/1867490/0/en/Green-Building-Market-2019-Global-Industry-Overview-By-Historical-Analysis-Comprehensive-Research-Study-Opportunities-Competitive-Landscape-and-Regional-Trends-by-Forecast-to-2023.html>.
- 32 Globe Newswire (2019), Green Building Market 2019: Global Industry Overview By Historical Analysis, Comprehensive Research Study, Opportunities, Competitive Landscape and Regional Trends by Forecast to 2023, available at: <https://www.globenewswire.com/news-release/2019/06/12/1867490/0/en/Green-Building-Market-2019-Global-Industry-Overview-By-Historical-Analysis-Comprehensive-Research-Study-Opportunities-Competitive-Landscape-and-Regional-Trends-by-Forecast-to-2023.html>.
- 33 Dodge Data & Analytics (2018), World Green Building and Construction Trends 2018, available at: <https://www.construction.com/toolkit/reports/world-green-building-trends-2018>.
- 34 IFC (2018), Climate Investment Opportunities in Cities, available at: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/climate+business/resources/cioc-ifc-analysis.
- 35 The calculation considers the projected growth in building stock and the climate commitments by city and national governments (including Nationally Determined Contributions), and green construction targets and investment plans contained in city action plans and other policy documents. For further detail on methodology, see IFC's Climate Investment Opportunities in Cities report (2018).
- 36 IFC (2018), Climate Investment Opportunities in Cities, available at https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/climate+business/resources/cioc-ifc-analysis.
- 37 Dodge Data & Analytics (2018), World Green Building Trends 2018: Middle East/North Africa, available at: https://www.worldgbc.org/sites/default/files/SMR0918_MENA_24Nov18.pdf.
- 38 IFC (2018), Climate Investment Opportunities in Cities, available at: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/climate+business/resources/cioc-ifc-analysis.
- 39 IFC (2018), Climate Investment Opportunities in Cities, available at: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/climate+business/resources/cioc-ifc-analysis.
- 40 Residential buildings include apartments, condominiums, single or multifamily homes, and dormitories.
- 41 Commercial buildings include office buildings, medical centers and hospitals, educational buildings, hotels and restaurants, retail buildings and malls, institutional and assembly buildings, transport-related buildings, and warehouses.
- 42 McKinsey Global Institute (2016), Addressing the Global Affordable Housing Challenge, available at: <http://pubdocs.worldbank.org/en/773591464879251915/housing-finance-conference2016-session-1-presentations.pdf>.
- 43 McKinsey Global Institute (2014), A blueprint for addressing the global affordable housing challenge, available at: <https://www.mckinsey.com/featured-insights/urbanization/tackling-the-worlds-affordable-housing-challenge>.

- 44 JLL/Indian Chamber of Commerce (2016), Affordable Housing in India, Key Initiatives for Inclusive Housing for All, available at: <https://smarnet.niua.org/sites/default/files/resources/Affordable%20Housing-ICC%20-%20Final.pdf>.
- 45 Bloomberg (2019), Kenya on Course to Deliver 500,000 Homes by 2022, President Says, available at: <https://www.bloomberg.com/news/articles/2019-06-01/kenya-on-course-to-deliver-500-000-homes-by-2022-president-says>.
- 46 IEA/UNEP (2018), 2018 Global Status Report, available at: <https://www.globalabc.org/uploads/media/default/0001/01/obf694744862cf96252d4a402e1255fb6b79225e.pdf>.
- 47 Ecofys/NewClimate Institute/Climate Analytics (2016), CAT Decarbonisation Series, Constructing the Future: Will the Building Sector Use Its Decarbonisation Tools?, available at: https://climateanalytics.org/media/cat_decarbonisation_series_buildings.pdf.
- 48 Environment + Energy Leader (2018), Energy Retrofit Systems Market to Grow 8% by 2023, available at: <https://www.environmentalleader.com/2018/11/energy-retrofit-systems-market-to-grow-8-by-2023/>.
- 49 UNEP Finance Initiative (2014), Commercial Real Estate, Unlocking the Energy Efficiency Retrofit Investment Opportunity, available at: <https://www.unepfi.org/publications/investment-publications/property-publications/commercial-real-estate-unlocking-the-energy-efficiency-retrofit-investment-opportunity/>.
- 50 World Green Building Council (2013), The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants, available at: <https://www.worldgbc.org/news-media/business-case-green-building-review-costs-and-benefits-developers-investors-and-occupants>.
- 51 Shared Value Initiative, 2019 Fortune Change the World List, available at <https://www.sharedvalue.org/groups/2019-fortune-change-world-list>
- 52 Institute for Market Transformation/UNC Center for Community Capital (2013), Home Energy Efficiency and Mortgage Risks, available at: https://www.imt.org/wp-content/uploads/2018/02/IMT_UNC_HomeEEMortgageRisksfinal.pdf.
- 53 World Green Business Council (2013), The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants, available at: https://www.worldgbc.org/sites/default/files/Business_Case_For_Green_Building_Report_WEB_2013-04-11-2.pdf.
- 54 Bushnell, S. G. (2010), Insurance and Going Green, available at: <https://www.insurancejournal.com/magazines/mag-features/2010/11/14/160495.htm>.
- 55 Eichholtz, P., Kok, N., and Quigley, J. (2010), Why Companies Rent Green: CRS and the Role of Real Estate, available at: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.457.4571&rep=rep1&type=pdf>.
- 56 World Green Business Council (2013), The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants, available at: https://www.worldgbc.org/sites/default/files/Business_Case_For_Green_Building_Report_WEB_2013-04-11-2.pdf.
- 57 World Green Business Council (2013), The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants, available at: https://www.worldgbc.org/sites/default/files/Business_Case_For_Green_Building_Report_WEB_2013-04-11-2.pdf.
- 58 Fuerst, F. and McAllister, P. (2011), Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values, available at: http://immobilierdurable.eu/images/2128_uploads/Fuerst_article_auroris_.pdf.
- 59 Institute for Market Transformation/UNC Center for Community Capital (2013), Home Energy Efficiency and Mortgage Risks, available at: https://www.imt.org/wp-content/uploads/2018/02/IMT_UNC_HomeEEMortgageRisksfinal.pdf.
- 60 City Lab (2019), New York City Passes Sweeping Climate Legislation, available at: <https://www.citylab.com/environment/2019/04/new-york-city-climate-mobilization-act-energy-efficient-buildings/587548/>.
- 61 Institute for Market Transformation/UNC Center for Community Capital (2013), Home Energy Efficiency and Mortgage Risks, available at: https://www.imt.org/wp-content/uploads/2018/02/IMT_UNC_HomeEEMortgageRisksfinal.pdf.
- 62 See <https://www.worldgbc.org/benefits-green-buildings>.
- 63 Climate Bonds Initiative (2018), Green Bonds: The State of The Market 2018, available at: https://www.climatebonds.net/files/reports/cbi_gbm_final_o32019_web.pdf.
- 64 International Labour Organization (2018), Greening with Jobs—World Employment and Social Outlook 2018, available at: <https://www.ilo.org/weso-greening/>.
- 65 Forbes (2017), Solving the Mystery of Government-Owned Real Estate, available at: <https://www.forbes.com/sites/bisnow/2017/04/11/solving-the-mystery-of-government-owned-real-estate/#6d47309f2bdo>.
- 66 The Nassau Guardian (2019), Dorian caused \$7B in damage to the Bahamas, estimates catastrophic modeling firm, available at: <https://thenassauguardian.com/2019/09/09/dorian-caused-7b-in-damage-to-the-bahamas-estimates-catastrophic-modeling-firm/>.
- 67 World Bank (2019), Lifelines: The Resilient Infrastructure Opportunity, Sustainable Infrastructure Series, available at: <https://openknowledge.worldbank.org/handle/10986/31805>.
- 68 Johnson Controls (2018), Energy Efficiency Indicator Survey, available at: <https://www.johnsoncontrols.com/media-center/news/press-releases/2018/11/15/2018-energy-efficiency-indicator-survey>.
- 69 IEA/UNEP (2018), 2018 Global Status Report, available at: <https://www.globalabc.org/uploads/media/default/0001/01/obf694744862cf96252d4a402e1255fb6b79225e.pdf>.
- 70 World Green Building Council (2013), The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants, available at: <https://www.worldgbc.org/news-media/business-case-green-building-review-costs-and-benefits-developers-investors-and-occupants>.
- 71 IMF (2016), Working Paper: From Global Savings Glut to Financing Infrastructure: The Advent of Investment Platforms, available at: <https://www.imf.org/external/pubs/ft/wp/2016/wp1618.pdf>.
- 72 Institutional Real Estate, Inc (2018), 2018 Institutional Investors Real Estate Trends, available at: https://irei.com/wp-content/uploads/woocomerce_uploads/2018/04/2018_IRE-Trends-Survey.pdf.
- 73 G2o Energy Efficiency Finance Task Group/IEA/UNEP FI/IPEEC (2017), G2o Energy Efficiency Investment Toolkit, available at: <https://www.unepfi.org/wordpress/wp-content/uploads/2017/05/G2o-EE-Toolkit.pdf>.
- 74 See <https://www.prnewswire.com/news-releases/residential-mortgages-market-worth-31k-billion-globally-by-2018-289672451.html>.
- 75 The Global Real Estate Sustainability Benchmark (GRESB) has become the benchmark for environmental, social, and governance (ESG) reporting for real assets, aligned with international reporting standards such as the Global Reporting Initiative and Principles for Responsible Investment. GRESB works in collaboration with the real estate industry and institutional investors to provide standardized and validated ESG data to the capital markets.
- 76 ABN AMRO (2018), Summary – Sustainability Requirements for Commercial Real Estate, available at: https://www.abnamro.com/en/images/Documents/o4o_Sustainable_banking/o7o_Sustainability_policy/ABN_AMRO_CRE_Sustainability_Policy_summary.pdf
- 77 ABN AMRO (2016), ABN AMRO makes 1 billion euros available for energy transition of real estate clients, available at: <https://www.abnamro.com/en/newsroom/press-releases/2016/abn-amro-makes-1-billion-euros-available-for-energy-transition-of-real-estate-clients.html>
- 78 Better Buildings Partnership (2017), BEYOND RISK MANAGEMENT: How sustainability is driving innovation in commercial real estate finance, available at: https://www.hermes-investment.com/wp-content/uploads/2018/10/beyond-risk-management_how-sustainability-is-driving-innovation-in-commercial-real-estate-finance.pdf
- 79 UN Environment Inquiry/Climate Strategy & Partners (2017), Green Tagging: Mobilising Bank Finance for Energy Efficiency in Real Estate, available at: <https://unepinquiry.org/publication/green-tagging-mobilising-bank-finance-for-energy-efficiency-in-real-estate/>.
- 80 See <https://eemap.energyefficientmortgages.eu/>.
- 81 See <https://www.linklaters.com/en-us/insights/thought-leadership/sustainable-finance/the-rise-of-green-loans-and-sustainability-linked-lending>.
- 82 Climate Bonds Initiative (2018), Green Bonds: The State of The Market 2018, available at: https://www.climatebonds.net/files/reports/cbi_gbm_final_o32019_web.pdf.
- 83 G2o Energy Efficiency Finance Task Group/IEA/UNEP FI/IPEEC (2017), G2o Energy Efficiency Investment Toolkit, available at: <https://www.unepfi.org/wordpress/wp-content/uploads/2017/05/G2o-EE-Toolkit.pdf>.
- 84 Bushnell, S. G. (2010), Insurance and Going Green, available at: <https://www.insurancejournal.com/magazines/mag-features/2010/11/14/160495.htm>.
- 85 See http://www.mohurd.gov.cn/wjfb/201703/t20170314_230978.html.
- 86 Better Buildings Partnership (2017), Beyond Risk Management: How sustainability is driving innovation in commercial real estate finance, available at: <http://www.betterbuildingspartnership.co.uk/beyond-risk-management-how-sustainability-driving-innovation-commercial-real-estate-finance>.
- 87 <https://www.energy.gov/eere/slsc/property-assessed-clean-energy-programs>.
- 88 Infonavit (2011), GREEN MORTGAGE PROGRAM INFONAVIT—MÉXICO, available at: http://www.ecpamerica.org/data/files/Initiatives/energy_efficiency_working_group/eewg_mexico_workshop/infonavit.pdf
- 89 IEA/UNEP (2018), 2018 Global Status Report, available at: <https://www.globalabc.org/uploads/media/default/0001/01/obf694744862cf96252d4a402e1255fb6b79225e.pdf>.

90 U.S. Green Building Council/C40/World Green Building Council (2015), Green Building City Market Briefs, available at: <https://www.c4o.org/researches/c4o-usgbc-and-wgbc-green-building-city-market-brief-compendium>.

91 IEA/UNEP (2018), 2018 Global Status Report, available at: <https://www.globalabc.org/uploads/media/default/0001/01/obf694744862cf96252d4a402e1255fb6b79225e.pdf>.

92 IEA/UNEP (2018), 2018 Global Status Report, available at: <https://www.globalabc.org/uploads/media/default/0001/01/obf694744862cf96252d4a402e1255fb6b79225e.pdf>.

93 UNEP (2018), A Guide for Incorporating Buildings Actions in NDCs, available at: <https://www.globalabc.org/uploads/media/default/0001/02/05f09bba8699afcc3115c02ce6daa96eaa0920a7.pdf>.

94 IEA (2018), Market Report Series: Energy Efficiency 2018, available at: https://webstore.iea.org/download/direct/2369?fileName=Market_Report_Series_Energy_Efficiency_2018.pdf.

95 See <https://www.iea.org/tcep/buildings/>.

96 IEA (2018), Market Report Series: Energy Efficiency 2018, available at: https://webstore.iea.org/download/direct/2369?fileName=Market_Report_Series_Energy_Efficiency_2018.pdf.

97 IEA (2018), Market Report Series: Energy Efficiency 2018, available at: https://webstore.iea.org/download/direct/2369?fileName=Market_Report_Series_Energy_Efficiency_2018.pdf.

98 See <https://www.weforum.org/agenda/2017/06/china-clean-green-buildings-future/>.

99 See <https://www.weforum.org/agenda/2017/06/china-clean-green-buildings-future/>.

100 See <https://buildingefficiencyaccelerator.org/bea-cities/#gabrovo>.

101 UNEP (2017), Global Review of Sustainable Public Procurement 2017, available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/20919/GlobalReview_Sust_Procurement.pdf?sequence=1&isAllowed=y.

102 The Economic Times (2019), Over 25 crore LED bulbs distributed under UJALA scheme: EESL, available at: <https://economictimes.indiatimes.com/industry/energy/power/over-25-crore-led-bulbs-distributed-under-ujala-scheme-eesl/articleshow/59635515.cms>.

103 See <https://eeslindia.org/content/raj/eesl/en/Programmes/UJALA/About-UJALA.html>.

104 See <https://eeslindia.org/content/raj/eesl/en/Programmes/UJALA/About-UJALA.html>.

105 See <https://eeslsmart.in/>.

106 Agyepong and Nhamo (2016), Green procurement in South Africa: Perspectives on legislative provisions in metropolitan municipalities, available at: <https://link.springer.com/article/10.1007/s10668-016-9865-9>.

107 Agyepong and Nhamo (2016), Green procurement in South Africa: Perspectives on legislative provisions in metropolitan municipalities, available at: <https://link.springer.com/article/10.1007/s10668-016-9865-9>.

108 See <https://www.oneplanetnetwork.org/initiative/green-public-procurement-republic-korea>.

109 GreenBiz (2017), First global standard for sustainable procurement hits the market, available at: <https://www.greenbiz.com/article/first-global-standard-sustainable-procurement-hits-market>.

110 ISO (2017), Sustainable Procurement—Guidance, available at: <https://www.iso.org/obp/ui#iso:std:iso:20400:ed-1:vi:en:sec:4>.

111 IFC (2019), Greening Construction: The Role of Carbon Pricing, available at: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/climate+business/resources/greening-construction.

112 See <https://www.iea.org/tcep/buildings/>.

113 IEA (2018), Market Report Series: Energy Efficiency 2018, available at: https://webstore.iea.org/download/direct/2369?fileName=Market_Report_Series_Energy_Efficiency_2018.pdf.

114 IEA (2018), Market Report Series: Energy Efficiency 2018, available at: https://webstore.iea.org/download/direct/2369?fileName=Market_Report_Series_Energy_Efficiency_2018.pdf.

115 See <https://www.edgebuildings.com/market-players/governments/#toggle-id-1>.

116 See <https://www.edgebuildings.com/market-players/governments/#toggle-id-2>.

117 See <https://www.edgebuildings.com/market-players/governments/#toggle-id-5>.

118 See <https://www.iea.org/policiesandmeasures/pams/japan/name-24270-en.php>.

119 KPMG International (2015), Taxes and Incentives for Renewable Energy, available at: <https://assets.kpmg/content/dam/kpmg/pdf/2015/09/taxes-and-incentives-2015-web-v2.pdf>.

120 City of Mandaluyong (2014), Ordinance No. 535, S-2014: Green Building Regulations of Mandaluyong City, available at: <http://www.mandaluyong.gov.ph/updates/downloads/files/merged.pdf>.

121 See <https://busquedas.elperuano.pe/normaslegales/ordenanza-de-promocion-de-edificaciones-sostenibles-en-zonas-ordenanza-no-610-msb-1710516-1/>.

122 See <https://www.edgebuildings.com/market-players/governments/>.

123 See <https://www.edgebuildings.com/market-players/governments/#toggle-id-7>.

124 BPIE (2016), Building Renovation Passports: Customised roadmaps towards deep renovation and better homes, available at: http://bpie.eu/wp-content/uploads/2017/01/Building-Passport-Report_2nd-edition.pdf.

125 See <https://www.czes.org/content/market-based-strategies/>.

126 IFC (2019), Greening Construction: The Role of Carbon Pricing, available at: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/climate+business/resources/greening-construction.

127 See https://www.iea.org/policiesandmeasures/pams/india/name-30373-en.php?s=dHlwZTlZS2ZdGFodXMgT2s_s&return=PG5hdipZD0iYnJlYWRjcjVtYiIiLW5lcmd5IEVmZmljaWVvY3k8L2E-PC9uYXY-.

128 See <http://www.econiwias.com/blog-details-7.html>.

129 See https://www.iea.org/policiesandmeasures/pams/india/name-30373-en.php?s=dHlwZTlZS2ZdGFodXMgT2s_s&return=PG5hdipZD0iYnJlYWRjcjVtYiIiLW5lcmd5IEVmZmljaWVvY3k8L2E-PC9uYXY-.

130 IEA/UNEP (2017), Global Status Report 2017, available at: www.globalabc.org.

131 Bureau of Energy Efficiency (2018), Perform Achieve and Trade—Hotel under PAT Sectors, available at: <https://beeindia.gov.in/sites/default/files/Perform%20Achieve%20and%20Trade%20-%20Hotel%20under%20PAT%20sectors.pdf>.

132 Resources for the Future (2016), Pricing Carbon Consumption, available at: <https://media.rff.org/documents/RFF-DP-16-49.pdf>.

133 ACEEE (2016), Learning from 19 Carbon Taxes: What Does the Evidence Show?, available at: https://aceee.org/files/proceedings/2016/data/papers/9_49.pdf.

134 Resources for the Future (2016), Pricing Carbon Consumption, available at: <https://media.rff.org/documents/RFF-DP-16-49.pdf>.

135 Resources for the Future (2016), Pricing Carbon Consumption, available at: <https://media.rff.org/documents/RFF-DP-16-49.pdf>.

136 ACEEE (2016), Learning from 19 Carbon Taxes: What Does the Evidence Show?, available at: https://aceee.org/files/proceedings/2016/data/papers/9_49.pdf.

137 Marie-Laure, N., Branger, F., and Quirion, P. (2014), Abating CO₂ emissions in the building sector: The role of carbon pricing and regulations, available at: https://cecilia2050.eu/system/files/Marie-Laure%20et%20al.%20%282014%29_Abating%20CO2%20emissions%20in%20the%20building%20sector.pdf.

138 IFC (2019), Greening Construction: The Role of Carbon Pricing, available at: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/climate+business/resources/greening-construction.

139 See <https://www.banque-france.fr/en/financial-stability/international-role/network-greening-financial-system/about-us>.

140 Network for Greening the Financial System (2019), A Call for Action Report, available at: https://www.banque-france.fr/sites/default/files/media/2019/04/17/ngfs_first_comprehensive_report_-_17042019_o.pdf.

141 See https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/company-resources/sustainable-finance/sbn.

142 See <https://www.edgebuildings.com/market-players/governments/#toggle-id-3>.

143 See <https://www.iea.org/policiesandmeasures/pams/lebanon/name-158840-en.php>.

144 Campiglio, E. (2014), Beyond carbon pricing: The role of banking and monetary policy in financing the transition to a low-carbon economy, available at: <http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/06/Working-Paper-160-Campiglio-20142.pdf>.

145 Climate Bonds Initiative (2018), Green Bonds: The State of the Market 2018, available at: https://www.climatebonds.net/files/reports/cbi_gbm_final_o32019_web.pdf.

146 Climate Bonds Initiative (2018), Green Bonds: The State of the Market 2018, available at: https://www.climatebonds.net/files/reports/cbi_gbm_final_o32019_web.pdf.

- 147 IEA/UNEP (2018), 2018 Global Status Report, available at: <https://www.globalabc.org/uploads/media/default/0001/01/obf694744862cf96252d4a402e1255fb6b79225e.pdf>.
- 148 IEA/UNEP (2018), 2018 Global Status Report, available at: <https://www.globalabc.org/uploads/media/default/0001/01/obf694744862cf96252d4a402e1255fb6b79225e.pdf>.
- 149 IEA/UNEP (2017), Global Status Report 2017, available at: www.globalabc.org.
- 150 For example, in East Asia, Indonesia has GREENSHIP; Malaysia has GBI (Green Building Index); the Philippines has BERDE (Building for Ecological Responsive Design Excellence); Singapore has GREENMARK; Thailand has TREES (Thai's Rating of Energy and Environmental Sustainability); and Vietnam has LOTUS (by Vietnam Green Building Council or VGBC) and new rating tool VACEE (by Vietnam Association of Civil Engineering Environment). In the Middle East and North Africa, Egypt has TARSHED, Abu Dhabi has the Pearl Rating System for Estidama, and Lebanon has the ARZ.
- 151 See <https://www.iea.org/tcep/buildings/buildingenvvelopes/>
- 152 See <https://gresb.com/2019-real-estate-results/>.
- 153 See <https://gresb.com/2019-real-estate-results/>.
- 154 Whole Building Design Guide (2019), Green Building Standards and Certification Systems, available at: <https://www.wbdg.org/resources/green-building-standards-and-certification-systems>.
- 155 See <https://www.export.gov/apex/article2?id=China-Construction-and-Green-Building>.
- 156 See <https://www.export.gov/apex/article2?id=China-Construction-and-Green-Building>.
- 157 IEA (2019), Perspectives for the Clean Energy Transition, available at: <https://www.iea.org/publications/reports/PerspectivesfortheCleanEnergyTransition/>.
- 158 See <https://www.theclimategroup.org/EP100-members>.
- 159 The Climate Group (2018), Why high street fashion retailer H&M is committed to smarter energy use and switching to 100% renewables, available at: <https://www.theclimategroup.org/news/why-high-street-fashion-retailer-hm-committed-smarter-energy-use-and-switching-100-renewables>.
- 160 UN (2019), Climate Action Summit 2019: In the face of worsening climate crisis, UN Summit to deliver new pathways and practical actions to shift global response into higher gear, available at: https://www.un.org/en/climatechange/assets/pdf/CAS_main_release.pdf?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosgenerate&stream=top.
- 161 Dodge Data & Analytics (2018), World Green Building and Construction Trends 2018, available at: <https://www.construction.com/toolkit/reports/world-green-building-trends-2018>.
- 162 See <https://www.cdlsustainability.com/cdl-six-capitals/manufactured-capital/green-lease-tenant-engagement/>.
- 163 FM Link (2019), Find out what award-winning landlords and tenants are doing to save energy and reduce costs, available at: <https://fmlink.com/articles/imt-doe-2019-green-lease-leaders-boma-event/>.
- 164 CBRE Research (2017), China Green Building Report: From Green to Health, available at: <https://www.cbre.us/research-and-reports/China-Major-Report---China-Green-Building-Report-2017>.
- 165 See <https://growthpoint.co.za/environmental-sustainability/targets>.
- 166 See <https://www.revistatqv.mx/soluciones-verdes/certificacion-edge-es-adoptada-por-miembros-de-la-adi/>.
- 167 Delegation of the European Union to India and Bhutan (2017), The Sustainable Housing Leadership Consortium launches #greenhomes campaign for 20% of India's new homes to become green by 2022, available at: https://eeas.europa.eu/delegations/india_en/30112/The%20Sustainable%20Housing%20Leadership%20Consortium%20launches.
- 168 Urban Land Institute (2019), Sustainability in Hotels, available at: <https://americas.uli.org/wp-content/uploads/sites/2/ULI-Documents/ULI-HotelSustainabilityReport.pdf>.
- 169 ACCOR (2018), 2018 Registration Document, available at: https://s3-us-west-2.amazonaws.com/ungc-production/attachments/cop_2019/476637/original/ACCOR_2018_RD.pdf?1563202028.
- 170 See https://cib.bnpparibas.com/sustain/accommodating-sustainability_a-3-2196.html.
- 171 See <https://gbc.org/leed-itc-hotels-video>.
- 172 Urban Land Institute (2019), Sustainability in Hotels, available at: <https://americas.uli.org/wp-content/uploads/sites/2/ULI-Documents/ULI-HotelSustainabilityReport.pdf>.
- 173 See <https://www.edgebuildings.com/building-types/retail/>.
- 174 Retail Industry Leaders Association (2016), The Value of Sustainability in Retail Marketing, available at: <http://www.retailcrc.org/sustainability/Lists/Briefings/Attachments/14/RILA%20Issue%20Brief%20-%20The%20Value%20of%20Sustainability%20in%20Retail%20Marketing.pdf>.
- 175 MarketWatch (2018), Starbucks Announces Global Greener Stores Commitment, available at: <https://www.marketwatch.com/press-release/starbucks-announces-global-greener-stores-commitment-2018-09-13>.
- 176 See <https://www.edgebuildings.com/projects/novare-great-north/>.
- 177 See <https://www.edgebuildings.com/green-hospitals/>.
- 178 FM Link (2019), CyrusOne's move to 100% renewable energy in its London data centers shows how the industry can leverage its size to reduce energy use and costs, available at: <https://fmlink.com/articles/cyrusone-london-data-centers-100-renewable-energy/>.
- 179 Microsoft (2017), Building and Operating Greener Datacenters: Our Commitment to LEED Gold, available at: <https://blogs.microsoft.com/green/2017/11/08/building-operating-greener-datacenters-commitment-leed-gold/>.
- 180 World Economic Forum (2016), Shaping the Future of Construction: A Breakthrough in Mindset and Technology, available at: http://www3.weforum.org/docs/WEF_Shaping_the_Future_of_Construction_full_report_-.pdf.
- 181 IFC (2019), Greening Construction: The Role of Carbon Pricing, available at: https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/climate+business/resources/greening-construction.



2121 Pennsylvania Ave., NW
Washington, DC 20433, USA
www.ifc.org/greenbuildingsreport