Sustainable Building Finance:

Supporting green mortgage development in Sri Lanka

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Foreword

Integrating green mortgage product development in the GEF/SAICM initiative

A GEF-funded (Global Environment Facility) project on "Global best practices on emerging chemical policy issues of concern under SAICM" was launched in 2019, targeting Sri Lanka amongst other countries. The activities under the project include a focus on tracking and controlling chemicals along the value chains of the building and construction sector. To that end, a team from the UN Environment Programme (UNEP) have been working with stakeholders in Sri Lanka on identifying chemicals of concern in the construction material value chain and working with manufacturers on end-product reformulations and alternatives. This includes work on eco-labelling and updating of product standards and assistance to SMEs to analyse their impacts and toxicity of building products and develop more sustainable business models.

In collaboration with this team from UNEP, UNEP FI (Finance Initiative), a global network of financial institutions that works to embed sustainability into institution practices and sector norms, has been tasked with developing guidance on green mortgage product development for Sri Lanka. This is complementary to the UNEP work on chemicals of concern in that reducing harmful materials that impact construction supplier and building occupant health and wellbeing and ecosystems are a key feature of green building strategies and should be incorporated into approaches to green finance of buildings.

This guide was developed as a resource to inform industry actors on possible approaches to green finance product development. The information can be used by Sri Lankan banks and other building and property stakeholders for capacity building on green finance within institutions and across the sector. It includes sections on

- green building design principles and technologies;
- the state of green construction practices and beliefs in Sri Lanka;
- a review of barriers and benefits of green buildings, and international evidence of financial value from green buildings;
- information needs in Sri Lanka to prepare preliminary green finance models;
- strategies for integrating green finance practices through underwriting, valuation, and regulatory and risk channels; and
- recommendations for new green building product development.

Executive summary

The importance of green finance in Sri Lanka

Worldwide, it is estimated that construction is responsible for between 20–50% of natural resources flows, and 50% of total solid waste (Vasilca et al 2021), while the building sector accounts directly and indirectly for 38% of global energy-related CO^2 emissions (GABC, 2021). With population growth and urbanisation trends, the housing stock and need for housing is growing—there was an increase of 19% in the Sri Lankan stock between 2001 and 2012. This is creating commensurate effects on material usage, energy and water consumption, waste, and carbon emissions. A small section of the building sector does utilise green building principles and practices, but there is scope to expand this.

Financial regulators and actors in Sri Lanka have taken concrete actions to shift the financial system to embed sustainability in finance decision-making. In the banking sector, the Sri Lanka Banks' Association have developed the Sri Lankan Sustainable Banking Principles. The Principles are a general framework to embed sustainability considerations into finance decision-making and facilitate national sustainable economic growth. The Principles were signed by 18 banks, and while they are sector agnostic, green building finance clearly aligns with Principles 1)—integrating ESG into business activities and 7)—activities that promote a cleaner, greener Sri Lankan economy. Moreover, the Central Bank of Sri Lanka published its green finance guiding manifesto in 2019, the Roadmap for Sustainable Finance in Sri Lanka. The objectives of the Roadmap are to bring cohesiveness to finance sector approach and regulation specific to ESG[1] issues; enhance finance institution resilience through effective ESG risk management; and facilitate green/climate finance products and services innovation to mobilise predominantly private capital for sustainable investment. Green mortgages and green bonds (potentially including asset backed securities) could animate Roadmap recommendations for innovative financial products and supporting capital market instruments.

Supporting market growth for green buildings

There is a massive need for capital to be deployed toward sustainable development outcomes including green building finance. Achieving the internationally agreed targets of the Paris Climate Accord and the Sustainable Development Goals requires a vast mobilisation of both public and private finance, some US$90 trillion over the next 15 years globally (UNEP 2016). Meeting the Sustainable Development Goals by 2030 presents a

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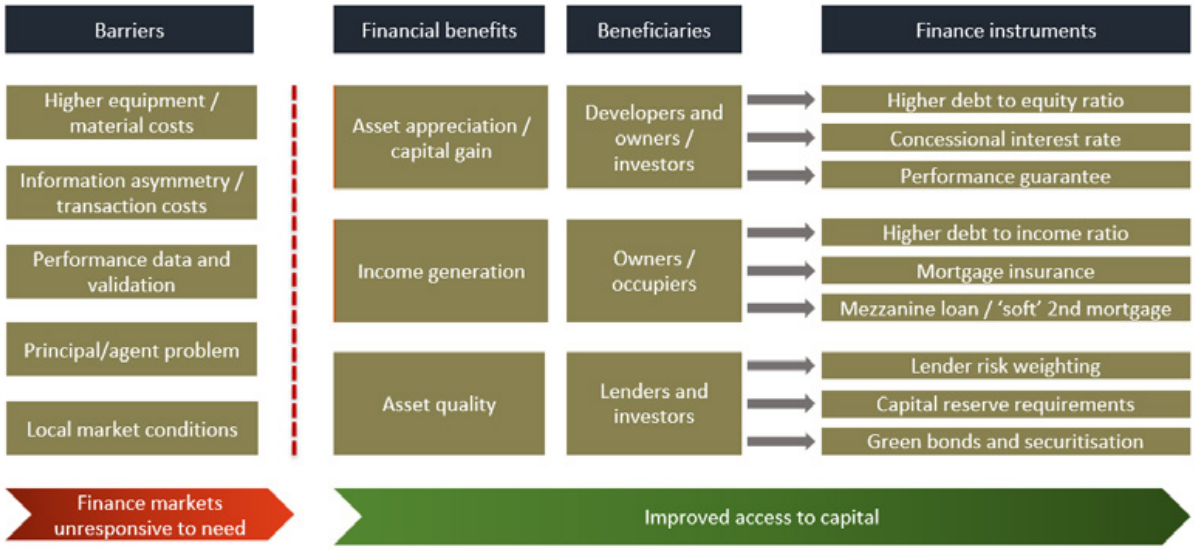
US$2.5 trillion global investment requirement in cities per annum (Business and Sustainable Development Commission 2016). IFC estimates the market opportunity for green buildings across all emerging market cities of 0.5 million people and above to be in the order of US$25 trillion by 2030 (IFC 2019).

There are many barriers which prevent greater investment in green buildings and energy efficiency. They include higher costs; information asymmetries; performance data and validation; and the principal/agent problem. Local market conditions such as interest rates, building energy consumption features, and depth of capital markets add to these investment barriers. Any green finance products created will need to be tailored to these local conditions.

The graphic summarises these barriers and potential finance instruments to address them.

Barriers and instruments to improve capital flows for green property finance



Source: Based on Promoting Energy Efficiency in Buildings in East Africa (UN-Habitat)

While there are reasonable concerns that green buildings will be more costly to deliver and thus impact upfront affordability, the available evidence suggests only modest cost premiums to design and build green are needed. Meanwhile, the evidence base that green buildings create financial benefits in excess of costs is solid and growing.

Recommendation: green concessional construction finance

In that green properties return higher values vis-à-vis comparable properties in the marketplace, and improve occupant/owner cashflow and satisfaction, they reduce both the likelihood of borrower default and the potential that foreclosed properties are liquidated at values below their debt liability. This is particularly relevant in the absence of a secondary market as primary lenders remain the long-term holder of the loan and security. These characteristics of green buildings shown in markets internationally can

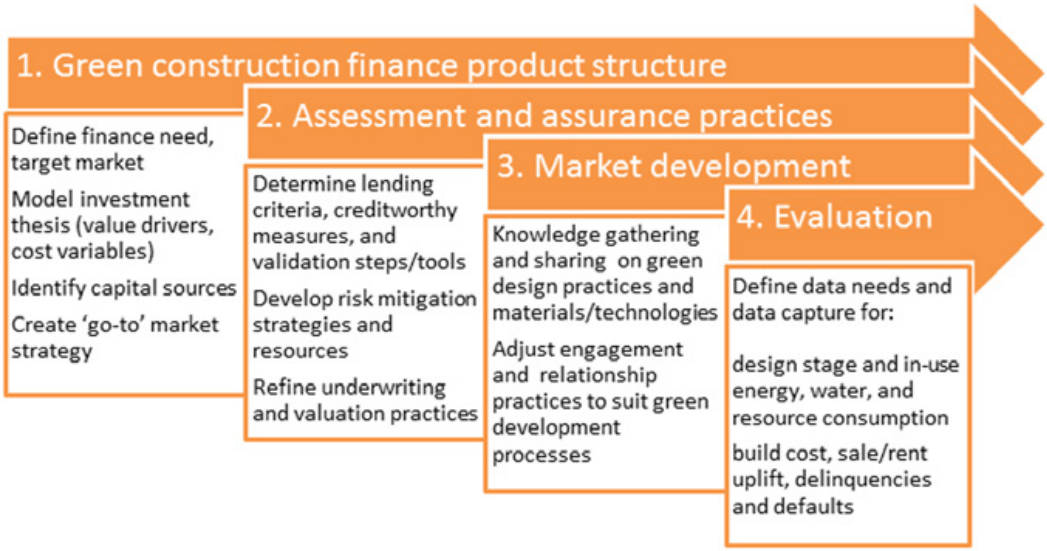
support Sri Lanka's banking sector in evaluating how modest adjustments to lending criteria and practices can result in more credit flows to green buildings.

As a first step, it is recommended that a green construction loan product be developed whereby project debt is provided at concessional interest rates in order to balance out any increase in project capex compared to non-green buildings. The end-result should be that the price borne by the end-buyer is equal or very close to that of comparable non-green properties in the market.

Having objective design and in-use assessment and performance data is foundational to making investment and lending decisions in green buildings. Fortunately, there are existing assessment tools in Sri Lanka developed specifically for the national market, as well as other international tools relevant to local practices and conditions.

The graphic below outlines a process for bringing a green construction finance product to market. Equalising the cost of construction between green and standard properties will start to build the supply of green properties; create producer and consumer understanding and demand for green properties; and build the evidence base on green building benefits.

Green finance product development process



Source: Based on Promoting Energy Efficiency in Buildings in East Africa (UN-Habitat)

1. Introduction

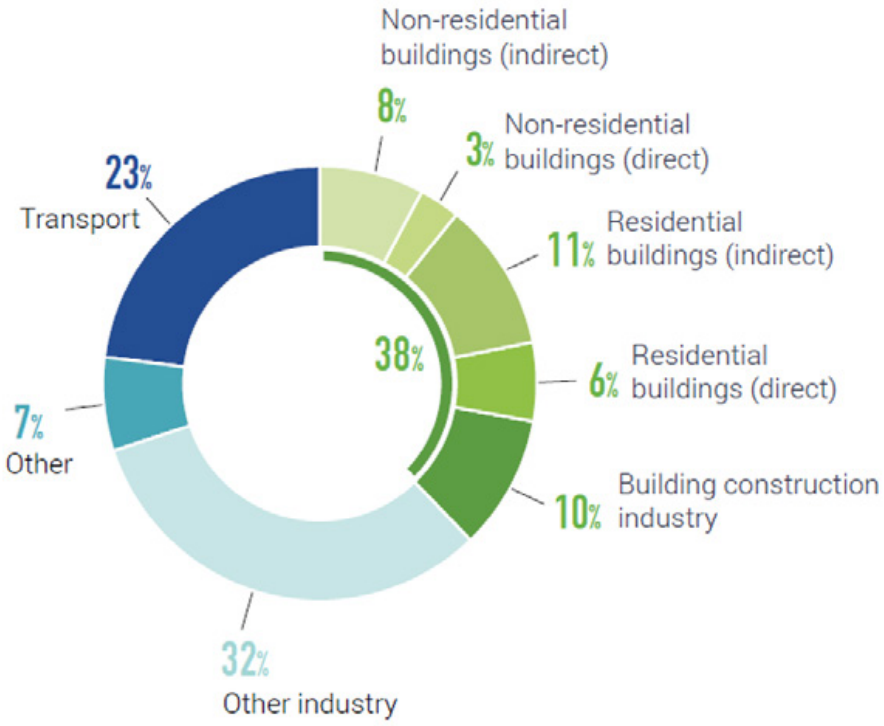
1.1 The importance of green buildings in Sri Lanka

Throughout this guide, the term green buildings will be used to refer to properties that are energy and resource efficient, utilise healthy materials (those free from chemicals of concern), are situated to allow access to transit and/or within walkable distance of key goods and services, and minimise intrusion into or impact on the natural environment. Such buildings offer a range of benefits such as lower running costs, quality indoor environments, reduced material flows and emissions, and space for biodiversity.

Material flows and carbon emissions attributed to the buildings and construction sector is significant global issue that has profound effects on climate change, biodiversity and habitat loss. Worldwide, it is estimated that construction is responsible for between 20–50% of natural resources flows, and 50% of total solid waste (Vasilca et al 2021). As shown in the graphic below, the building sector accounts directly and indirectly for 38% of global energy-related CO^2 emissions. The building and construction sector is one of the largest end markets for chemicals and features low levels of transparency as regards product formulations and negative effects of chemical exposure—particularly for multiple chemicals used in combination (UNEP 2021). Additionally, as most people generally spend 90% of their time indoors, the negative impact of poor indoor air quality from poorly constructed and located buildings and the use of harmful chemicals in materials has a direct impact on occupant health and wellness (Klepeis et al 2001).[2]

2 See also: buildinggreen.com/blog/we-spend-90-our-time-indoors-says-who

Graphic 1.1: Building sector carbon emissions as part of the global emission total



Source: [Decarbonizing the buildings sector: 10 key measures (Global Alliance for Buildings and Construction)]

The construction sector in Sri Lanka is large and growing, with a growth rate nearly double that of national GDP from the decade beginning in 2010.[3] Buildings account for approximately one-third of all construction value across property, utilities, and infrastructure.[4] With population growth and urbanisation trends, the housing stock and need for housing is expanding—there was an increase of 19% in the Sri Lankan stock between 2001 and 2012.[5] This is creating commensurate effects on material usage, energy and water consumption, waste, and carbon emissions. A small section of the building sector does utilise green building principles and practices, but there is room for improvement. A 2017 IFC study suggested a green building market opportunity in Sri Lanka of more than US$8 billion.[6]

Presently, buildings produced for the public sector are required to be certified under an existing green building certification scheme of the Sri Lanka Urban Development Authority (UDA), while private market actors can take advantage of certification through the Sri Lanka Green Building Council or international green certification schemes such as EDGE (International Finance Corporation / IFC); LEED (Leadership in Energy and Environmental Design / U.S. based); BREEAM (Building Research Establishment Environmental Assess-

3 opportunitysrilanka.com/wp-content/uploads/2020/07/Construction-Engineering.pdf.
4 Survey of Construction Industries Final report 2017/18.
5 Housing and Sustainable Urban Development in Sri Lanka
6 Climate Investment Opportunities in South Asia An IFC Analysis

ment Method / UK based); or others.[7] There are also green building assessments that focus more specifically on health and wellness, and in which issues of material use and other design features that affect occupant wellbeing are more fully assessed. Examples include Fitwell and WELL.[8] The number of certified buildings in Sri Lanka is small however, and greater uptake of green building practices and use of ratings is needed to materially improve resource and carbon flows, and health and wellness, indicators and metrics.

1.2 The importance of green finance

The international community have clearly determined the need for significant carbon emission reductions and prioritisation of sustainable development, as evidenced by the Paris climate accord and 2030 Agenda for Sustainable Development, both agreed to in 2015. Achieving the goals established in these requires a vast mobilisation of both public and private finance, some US$90 trillion over the next 15 years globally (UNEP 2016).

In response, both private and public finance will need to be redirected on a significant scale. For sources of private investment capital, the opportunity to realise economic returns while simultaneously delivering carbon reduction and sustainable development gains is substantial. Meeting the Sustainable Development Goals, i.e., 17 goals for ending poverty and hunger, reducing inequality, and tackling urgent challenges such as climate change by 2030, presents a US$2.5 trillion global investment requirement in cities per annum (Business and Sustainable Development Commission 2016). In another estimate, shifting cities toward low-carbon energy supply, and efficient buildings, industrial operations, and transport/spatial uses, a cumulative US$17 trillion global stream of energy efficiency savings could be generated through 2050 (based on the NPV of net energy savings from an annual 2.5% rise in energy costs and 3% discount rate) (NCE 2015). Specific to the property sector, IFC estimates the market opportunity for green buildings across all emerging market cities of 0.5 million people and above to be in the order of US$25 trillion by 2030 (IFC 2019).

Creating a finance system that enables and prioritises green and sustainable investments requires:

- National strategies to embed sustainability into long-term road maps for financial reform
- Financial technological innovation aligned with sustainable development
- Public finance to pioneer new markets, rules and practices

7 The green building assessment schemes listed are point-based systems that assess environmental design intent and/or environmental performance across multiple impact categories. Points are awarded for meeting or exceeding quantifiable or evidentiary thresholds, and certification is awarded on the basis of total points achieved. More information on these certifications can be found at Green Building Council of Sri Lanka; IFC; U.S. Green Building Council; and Building Research Establishment.

8 The health and wellness certifications which are internationally available are Fitwell was originally developed through the U.S. Center for Disease Control and is managed by the Center for Active Design; and WELL, sponsored by the International WELL Building Institute, or IWBI.

- Awareness raising so that policymakers and professionals are fully aware of sustainability imperatives and raise the quality of public debate
- Common methods, tools, and standards for integrating sustainability into investment decisions and financial sector performance (UNEP 2016a).

Financial regulators and actors in Sri Lanka have taken concrete actions to shift the financial system to embed sustainability in finance decision-making. In the banking sector, the Sri Lanka Banks' Association worked with a group of national stakeholders and international partners on a Sustainable Banking Initiative, yielding (amongst other outcomes) the development of the Sri Lankan Sustainable Banking Principles. The Principles are a general framework to embed sustainability considerations into finance decision-making and facilitate national sustainable economic growth. The Principles were signed by 18 banks, and while they are sector agnostic, green building finance clearly aligns with Principles 1)—integrating ESG into business activities and 7)—activities that promote a cleaner, greener Sri Lankan economy.

Similarly, the Central Bank of Sri Lanka (CBSL) joined the IFC-convened Sustainable Banking Network In 2016, a network of central banks, banking regulators and banking associations from 43-member countries representing US$43 trillion (86 percent) of the total banking assets in emerging markets. This network exposes national organisations to international best practices and helps foster a 'race to the top' in sector development and regulation. Following the lead of several other network members, CBSL published its green finance guiding manifesto in 2019, the Roadmap for Sustainable Finance in Sri Lanka. The objectives of the Roadmap are to bring cohesiveness to finance sector approach and regulation specific to ESG[9] issues; enhance finance institution resilience through effective ESG risk management; and facilitate green/climate finance products and services innovation to mobilise predominantly private capital for sustainable investment. Green mortgages and green bonds (potentially including asset backed securities) could animate Roadmap recommendations for innovative financial products and supporting capital market instruments. Other finance sector initiatives around green finance include the Colombo Stock Exchange joining the Sustainable Stock Exchange Initiative, a UN partnership programme for peer-to-peer learning amongst exchanges, in collaboration with investors, regulators, and companies. The SSE works to enhance corporate transparency and performance on ESG issues and encourage sustainable investment.

1.3 The chemicals of concern in the building and construction sector initiative

The Strategic Approach to International Chemicals Management (SAICM) is an international policy framework that works with all stakeholders to promote chemical safety around the world. Chemicals in products have been a long-standing Emerging Policy Issue (EPI) under this framework and Building and construction is one of the most chemical-intensive sectors downstream of the chemical industry and the sector generating

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the highest chemical revenue. Many of the sector's products are chemical-intensive and some of the chemicals used in building and construction products can cause severe harm to human health and the environment during material production, construction, building occupation, and building alteration or demolition. While exposure can differ to workers and occupants and at different stages, the potential for harm exists throughout the lifecycle to all. More so, wider environmental impacts may result through off-gassing, improper management of dust during construction or demolition, or through landfill or burning, meaning air- and watersheds and other flora and fauna can be impacted.

To advance this issue, a GEF-funded (Global Environment Facility) project on "Global best practices on emerging chemical policy issues of concern under SAICM" was launched in 2019, targeting Sri Lanka amongst other countries. The activities under the project include publishing a global overview of the challenge that chemicals of concern pose in the context of products relevant for the building and construction sector, and a focus on tracking and controlling chemicals along the value chains of the building and construction sector. To that end, the UN Environment Programme (UNEP) has been working as project implementing agency with stakeholders in Sri Lanka on identifying chemicals of concern in the construction material value chain and working with manufacturers on end-product reformulations and alternatives. This includes work on eco-labelling and updating of product standards for the Green Building Council of Sri Lanka product certification scheme and green building standard, and assistance to SMEs to analyse their impacts and toxicity of building products and develop more sustainable business models. In parallel, the Sri Lanka National Cleaner Production Centre are developing a building materials ecolabel aligned with international (ISO) standards and those of the Sri Lanka Accreditation Board. This material certification scheme may in the future become part of a national government sustainable procurement policy.

In addition, UNEP are coordinating a programme on eco-innovation to support businesses (particularly SMEs) in a stepwise approach to developing and executing a business strategy to improve profit while reducing environmental impact. A new supplement on building materials is under development, and through a partnership with the National Cleaner Production Centre the supplement is being piloted by building sector SMEs in Sri Lanka. The aim is both reducing chemicals of concern in materials while developing more circular practices and products and reducing the carbon and water impacts of common building materials.

In collaboration with this team from UNEP, UNEP FI (Finance Initiative) has been tasked with developing guidance on green mortgage product development for Sri Lanka. Minimising harmful materials that impact construction supplier and building occupant health and wellbeing and ecosystems are a key feature of green building strategies and should be incorporated into approaches to green finance of buildings. Doing so can support interest from the growing middle class in Sri Lanka for healthy and safe buildings.

1.4 Structure of the finance guide

The guide was developed as a resource to inform industry actors on possible approaches to green finance product development; and as material from which local actors can generate green finance outreach, dissemination and training activities. The several chapters of the finance guide provide information on

- general green building design principles and technologies;
- the state of green construction practices and beliefs in Sri Lanka;
- a review of barriers and benefits of green buildings, and international evidence of financial value from green buildings;
- the need for and information gaps in Sri Lanka to prepare preliminary green finance models;
- strategies for integrating green finance practices through underwriting, valuation, and regulatory and risk channels; and
- recommendations for new green building product development and potential sources of wholesale capital to meet the market need.

The manual is based on literature review of studies and papers on green building finance practices and case studies and stakeholder outreach led by the National Cleaner Production Centre (NCPC) over a several month period beginning late 2020 into middle 2021. Content of the guide is also drawn from a UN-Habitat managed and GEF funded project to increase energy efficiency and green building financing in East Africa, the Promoting Energy Efficiency in Buildings in East Africa initiative which ran from 2015–2018.

2. Green building overview

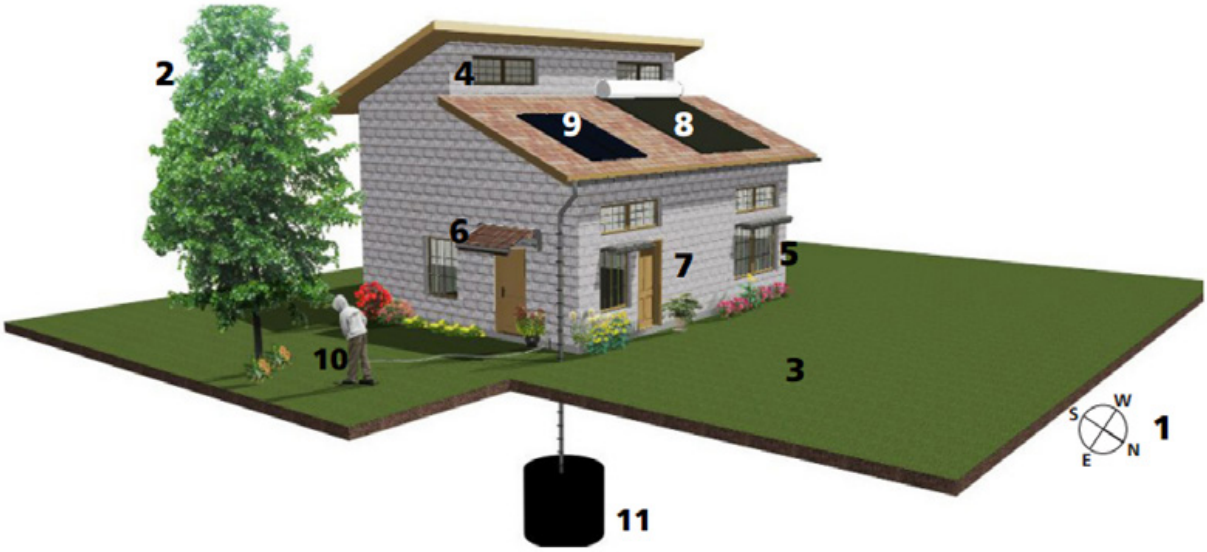
There is no single, strict definition of what constitutes a green building. In general, a building can be classified as green if it has the following attributes linking to a wide variety of potential environmental and human health impacts:

- Energy-, water-, and material resource-efficient
- Constructed of materials with minimised environmental impacts
- Improves occupant comfort and well-being through healthy indoor air quality, stable ambient temperatures, use of natural daylight, and presence of exterior views
- Improves onsite ecology and minimise offsite pollution impacts during operation
- Use of low-carbon on-site energy generation and demand management systems

There are many green building rating and assessment tools used in the region and globally that create a form of green design and measurement standardisation. Measures and labels for green buildings can be tied to investment decisions by lenders and buyers of properties.

Different passive design, mechanical and electrical systems and technology, and material choices influence building performance. Optimising environmental performance during a building's use phase results from how they work together and complement one another to meet building performance criteria.

Graphic 2.1: Examples of integrated green building strategies



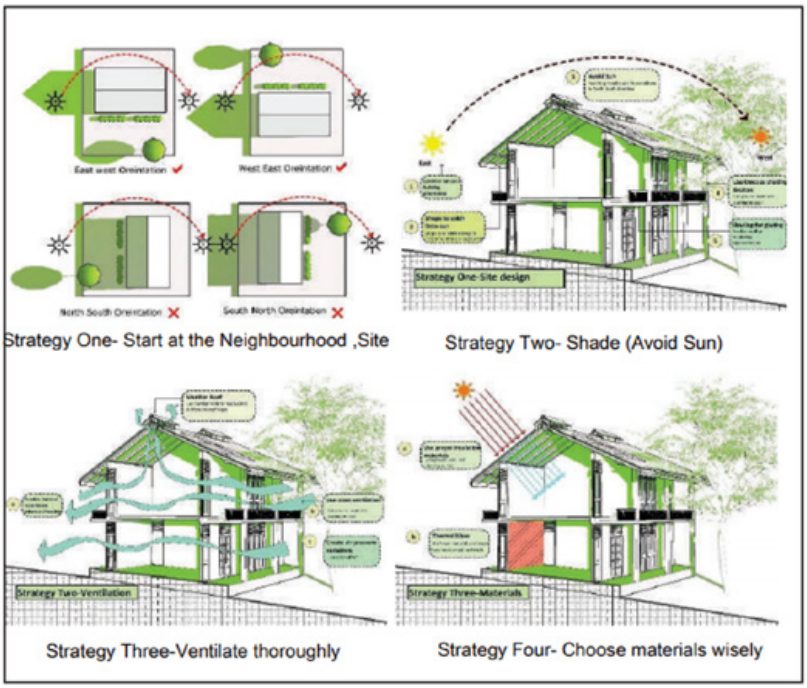
Key:

1. Orientation
2. Vegetation
3. Permeable area
4. Natural vertical ventilation
5. Natural lighting
6. Overhang for shading
7. Local building materials
8. Solar Water Heaters (SWH)
9 Solar Home System (SHS) (photovoltaics)
10. Waste water reuse
11. Rain water collection

Source: Urban Energy Technical Note 01: Guidelines for Green Building Design (UN-Habitat).

Passive design strategies rely principally on building siting, shading, and materials as a means to minimise energy consumption for space conditioning and lighting. A publication from the Sri Lanka Sustainable Energy Authority (SEA) offers a four-element approach to passive design focused on: neighbourhood and lot orientation; ventilation; shade; and materials. The SEA estimates, for example, that carefully positioned trees and landscaping can yield savings of up to 25% of a typical household's comfort-related energy.

Graphic 2.2: Passive building strategies

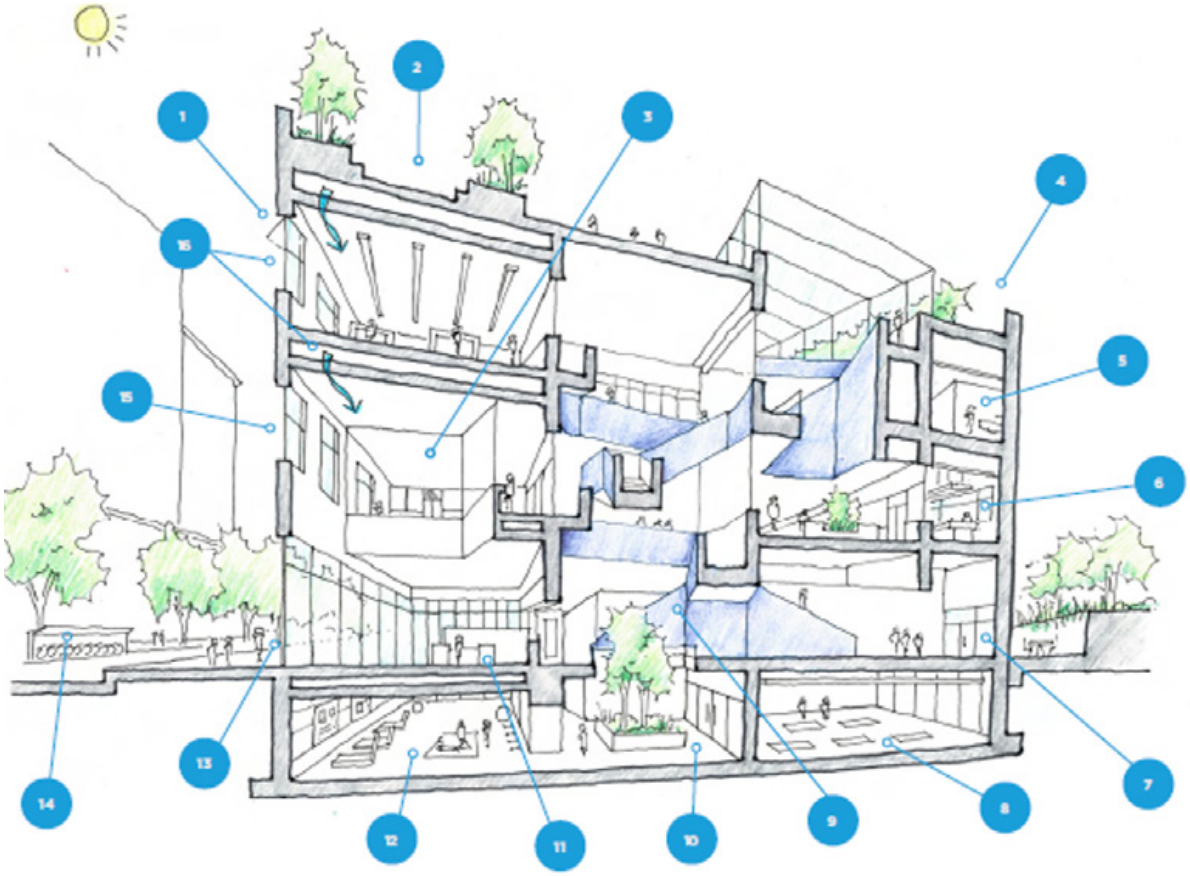


Source: Guideline for Sustainable Energy Residences in Sri Lanka (Sri Lanka Sustainable Energy Authority)

The COVID-19 pandemic has drawn increasing attention to how buildings affect health and wellness and is partly responsible for driving increased attention to how buildings are ventilated, their location and access to active and passive outdoor recreation spaces and essential services, their in-use flexibility, and feelings of occupant safety. A study of paints in Sri Lanka released in 2013 showed, that half of the major paint brands sold in the country contained lead exceeding the permitted levels with a quarter of the examined paints exhibiting dangerously high levels of lead (Rubesinghe et al 2013). Long product lifetimes mean that negative effects could be felt by construction workers, renovators, and demolition workers with professional or non-professional backgrounds, as well as building inhabitants.

Some health and wellness features of commercial buildings is shown in Graphic 2.3 below. Large commercial and public/institutional buildings have a particular need to manage health and wellness due to the potential occupant density, large visitation numbers, and mixing of multiple groups. Certainly there is also a need for housing to integrate wellness features—particularly for residences where there may be large or multi-generational households. A recent study on the rising demand for healthy buildings shows strong investor appetite for developing/owning healthy buildings and for securing health and wellness focused certification amongst other tangible measures. This is being driven significantly by tenant/occupant demands and perception of a value premium associated with healthy buildings.

Graphic 2.3: Healthy building features



Source: [A New Investor Consensus—The Rising Demand for Healthy Buildings (Center for Active Design, BentallGreenOak, UNEP FI)]

3. Green building in Sri Lanka

This chapter explores the present certification systems for green buildings and green construction materials in Sri Lanka, the levels of green construction activity, and professional and consumer attitudes toward green buildings.

3.1 Green certifications and eco-labelling

The use of independent third-party green building assessments and product labelling has been well embedded in the buildings and construction sector globally for the past couple of decades. Such assessment and labelling schemes establish building performance and normative management standards to address the negative impacts on energy and resource use, carbon emissions, human and ecological health, social wellbeing, and biodiversity from the buildings and construction sector. The most commonly used assessment and labelling schemes set criteria against multiple environmental and social impact categories under which points are awarded for exceeding threshold measures, and then aggregated into single award scores that designate good to best practices. There are three popular green building certification standards in Sri Lanka.

Green Building Council of Sri Lanka (GBCSL)

- GBCSL was established in 2009 and is a member of the World Green Building Council.
- There are 45 buildings in Sri Lanka certified by the GBCSL, the vast majority of which are 'Platinum' or 'Gold' rated.

Urban Development Authority (UDA)

- The UDA is the strategic and regulatory planning for urban land and buildings in Sri Lanka. Since 2017, UDA have utilised their own green building certification scheme developed under Blue Green Sri Lanka programme.
- All newly constructed government and semi government buildings over 400m^2 require certification under the scheme.[10]

10 Note that the chairman of the UDA stated that the compulsory Green Building Certification will extend for all private property development within the next five years in 2019. However, documents relating to progress from this proposal could not be found. Stakeholder discussions also indicated a possible consolidation between these two main national green certification schemes in Sri Lanka (the UDA and Green Building Council schemes), but it is unclear if this is presently part of the formal agendas at either organisation.

LEED certified green buildings

- LEED is one of the oldest and most widely used green building certification schemes available globally. There are 100 buildings listed in Sri Lanka as certified under the LEED standard.

Of the health and wellness assessment schemes referred to Section 1.1, information from the International WELL Building Institute shows four projects in Sri Lanka. There are no Fitwell certified projects in Sri Lanka though a small number have been certified in India.

The level of green building certification seen in Sri Lanka is probably too low to foster widespread awareness of green building benefits, evidence of market advantages, and significant professional capacity and supply chain shifts that should work to remove or dramatically narrow the capital cost premia from green construction. During the preparation of this guide, information was sought on the level of green construction (green certification) that has been driven by the UDA mandate for public sector buildings since 2017. Details on volume and the cost-benefits of green buildings for government owners could not be sourced and therefore it cannot be asserted the extent to which public procurement has or could move the market. Additionally, the UNEP programme on chemicals of concern in building materials is seeking to implement a 'sustainable public procurement' policy in Sri Lanka that would cover construction materials, though timelines for doing so have not yet emerged. This could be a lever to increase awareness of healthy materials and offer a further supply push to increase the range of materials available and bring cost closer to 'standard' less healthy material choices.

Other building certification schemes are available for use in Sri Lanka and which are internationally recognised by developers, owners and building financiers, but have gained little or no traction in the country. This includes the International Finance Corporation's (IFC) EDGE tool, which was developed specifically for middle-income and emerging economies. There are no projects currently rated through EDGE in Sri Lanka, though the scheme is well utilised in India.

For financiers that offer (or are interested in offering) green mortgages or similar instruments such as sustainability-linked loans or green bonds (see Section 4.3.3 for more detail), these green rating schemes offer a ready-to-use and stringent proxy through which lenders or investors can make objective judgements on a project or portfolio's eligibility for green financing. This is explored in more detail in Section 6 of this guide.

In addition to its building certification scheme, the GBCSL also have ecolabelling standards that apply to building products and materials. GREENSL Labelling System (GLS) was developed to accelerate the uptake of rigorously tested materials for construction, benefitting worker and occupant health as well as for promoting local manufacturing of green products, and/or to steer concessional treatment by government to green product manufacturers and importers. Similar to the above building certifications, the GLS requires assessment against multiple environmental impact categories that affect all

stages of the product lifecycle, from raw material extraction to demolition and disposal. Certified products under the categories of cement, paints and coatings, roof tiles, and floor/wall tiles are found at the GBCSL website. The SAICM/GEF project to address chemicals of concern in building materials in Sri Lanka is working with the GBCSL on increasing the range of product standards and supporting the local manufacturing and supply sector in volume of products available. Further, the SAICM/GEF project, through the NCPC Sri Lanka, is working to develop and start rolling out an eco-label type I certification[11] for selected building products, including criteria related to chemicals of concern. The use of certified green materials used in building construction may be another proxy against which financiers may assess projects for qualification for preferential green financing.

3.2 Green building knowledge and attitudes

Over several months in late 2020 and early 2021, outreach was made by the National Cleaner Production Centre to individuals (households); building architects and engineers, and material suppliers; real estate developers and construction companies, and commercial property occupiers; and property financiers. Most outreach focused on Colombo, though limited additional outreach was made in Gampaha and Kandy. Surveys and individual discussions were used to generate information on the above groups' knowledge of green building practices, and dynamics that drive supply of and demand for green buildings. A summary of this outreach follows in the paragraphs below. Fuller findings and a list of responding companies is found in Appendix 1.

In general, there is a base level of awareness of green building technologies, building features, and design and management practices across the groups. Both supply and demand lag, however, due to actual or perceived higher costs, and ability to make the business case for a shift in practices within developer or occupier organisations. The higher costs filter through to the capital cost of construction or higher acquisition or rental prices, and also the costs associated with building certification—initially at design and construction, then for on-going recertification of properties post-occupancy which is a requirement for continuing to display and market green certification credentials.

11 ISO 14024 defines eco-labels type I as "A voluntary, multiple-criteria based, third party program that awards a license which authorizes the use of environmental labels on products indicating overall environmental preferability of a product within a particular product category based on life cycle considerations." https://globalecolabelling.net/what-is-eco-labelling/

Table 3.1: Green building certification costs

Certification scheme	Price of certification	Services included (certification/ certification and additional services)
GBC GREENSL	0.95–3.2 Mn LKR (approximately US$5,000–15,000)	Certification Only
UDA	Rs. 100/m^2 Or Rs. 50/m^2 (educational institute, place of religion, health institute, elderly and childcare home)	Certification Only
LEED	Scaled to building area: for an approximately 250,000 sf area US$19,450 for a USGBC member US$23,500 for a non-member.	Preliminary review and final certification review. Integration and access to the new Arc platform Dedicated LEED coach

Source: National Cleaner Production Centre

When asked for their views on what qualifies as a green building, practitioners and consumers associate common features such as passive design that minimises the need for space cooling, natural daylighting and efficient lighting, solar electric generation, lead-free paints, and rainwater harvesting as representative features. Building engineers and some occupiers suggest that such features can generate utility savings in the order of 5% to 30%, which offer a compelling case for implementation. This is anecdotal however, and robust data on utility usage and cost savings that can be used for benchmarking 'standard' properties compared to 'green' properties is not available.

There is some evidence that environmentally conscious householders or commercial occupiers are seeking out green properties, and that the development and construction sector is presently able to meet this demand. The target customers tend to be higher income households, high-end hospitality and hotels, and companies with international profiles and/or in export-oriented industries. Anecdotally, such green properties do attract higher sale or rental prices though detailed data to allow for cost comparisons is also lacking. **Overall, respondents believe that this is a limited market and that demand is minimal.** There is a 'chicken and egg' problem with low interest in green properties from owners and occupiers, leading to low supply or developer intent. The capacity to design/construct and sell more green buildings if a clear rise in demand is seen is generally available.

The market for healthy/green construction materials similarly suffers from a lack of sustained demand, and also broader consumer awareness of the benefits of these materials. Stronger consumer awareness appears to correlate with wealth/income levels, and some respondents to the surveys indicated a willingness to pay for green materials if there is a small premium compared to other products. Therefore, premium brands will seek to market themselves as lead-free (in the case of paints) or less harmful.

It is generally a feature of niche markets (in this case, green materials) that product costs will be higher due to smaller production volume and narrower distribution channels. This is likely to hold for green materials in Sri Lanka. However, a preliminary review of the market for paints shows that for some products no premium applies, as shown in the table below.

Table 3.2: sampling of paint costs (green and standard)

Company	Product	Price (Rs/L)
Macksons Lanka Paints*	Premium sheen emulsion	1070
	Weather guard ultra	1250
Nippon Paint Lanka*	Nippolac emulsion Interior Paint	1350
	Nippolac Weatherproof	1490
Robbialac	Emulsion paint	1095
	Weather guard	1450

*GREENSL® Certified Product

Source: National Cleaner Production Centre

Representatives from suppliers that provide green products stated that 10% to 15% by volume of all products are green labelled or promoted. They did not indicate a significant change in demand after 2017 after the initiation of the green building policy for government buildings.

4. Value of green buildings—barriers, benefits, and finance instruments

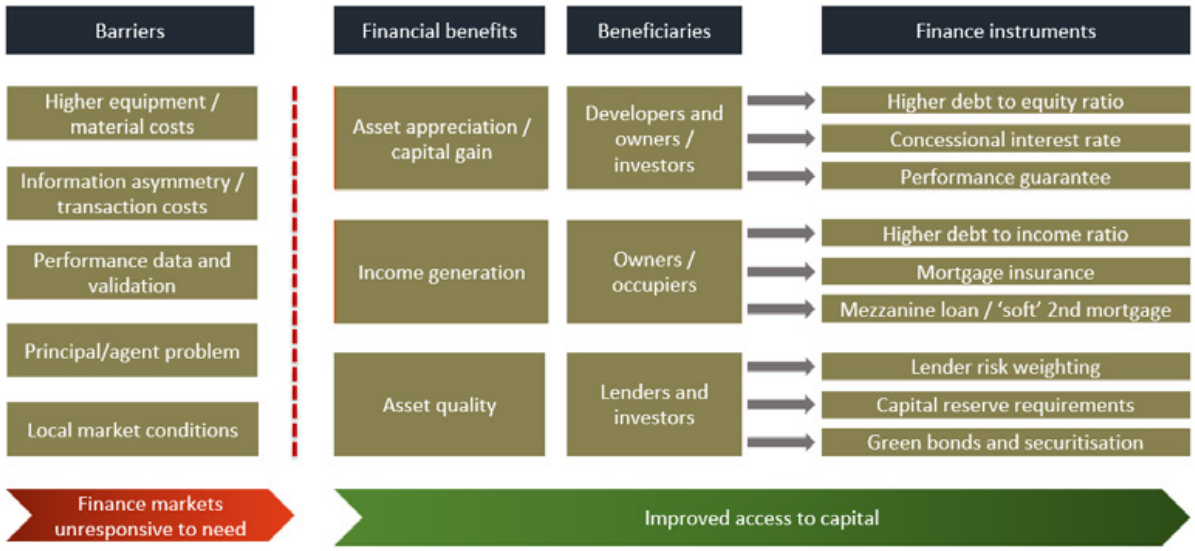
Green buildings can create many benefits to their developers, owners, and occupants such as improved financial returns and occupant comfort and wellbeing. Not all values are easily quantified, derived in the short-term, nor realised equitably (that is, there may be a gap between who pays and who benefits). Understanding the typical cost premiums for delivering these benefits and how to overcome them, which parties benefit, and the timeframe in which those benefits accrue is a challenge for the property development and finance sectors. Fortunately, finance instruments can play a role in rationalising these temporal, cost and value capture, and agency difficulties. Evidence from academic and case study literature, and applied examples of dedicated finance instruments for green property development and retrofits internationally, can be used to build the case for action and to support financial product development in Sri Lanka.

It is important to note the emphasis in this chapter on energy efficiency specifically rather than a range of green building benefits more generally. The reason for this is two-fold. The first is that there is a substantial evidence base for correlating good energy performance with higher building values and a reduction in credit risk. The second is that energy performance is a tangible feature which offers a quantifiable and monetizable benefit against which financial modelling can be constructed. Both factors support financial institutions wishing to create finance products targeting green buildings, with energy performance the lead factor in green mortgage products seen globally. That other environmental and social benefits are captured in green building assessments which might support credit decisions and underwriting is seen as a broadly beneficial and a useful supporting feature, but harder to factor and generally not captured in financial product modelling.

In spite of the evidence that efficiency creates value and finance products can be designed around this feature, most real estate markets have an 'energy efficiency gap,' that is a difference between cost effective design features and improvement options available to building developers and owners, and what is actually provided. This chapter will overview the barriers to green/energy efficiency building development; the benefits from green properties; and relevant finance instruments that can remove the barriers

and increase finance flows so as to unlock the inherent financial value of green buildings and energy efficiency. These elements are summarised in the chart below.

Figure 4.1: Barriers and instruments to improve capital flows for green property finance



Source: Based on Promoting Energy Efficiency in Buildings in East Africa (UN-Habitat)

A table at the end of the chapter maps these finance instruments against the barriers.

Given the high rates of new construction in Sri Lanka, it is this market segment where it is critical to integrate green design and energy efficiency. This chapter will focus principally on new property finance development or acquisition as a result.[12] Financing energy efficiency upgrades to existing buildings at the time of property sale or refinance, thus linked to mortgage underwriting rather than extending credit for discrete energy efficiency or on-site renewable energy retrofit works, is also a potential area for product development though not specifically investigated here.[13] Even though the emphasis in this chapter is on energy efficiency and structuring finance instruments around these expected energy savings, other sustainability features such as health and wellness and reduction in harmful chemicals in the construction value chain can be incorporated into green mortgage product development and underwriting decisions (explored in Sections 6 and 7).

12 Generally, green mortgages for new properties are referred to as Energy Efficiency Mortgages (EEM), and refinance/retrofit products labelled as Energy Improvement Mortgages (EIM).

13 Given the transaction costs with refinancing, the trigger to do so will likely be reasons other than to fund energy efficiency improvements. Refinance events where green retrofits could be added to the borrowing include property resales, refinancing balloon payments, or other property upgrades coincidental with an equity release.

4.1 Barriers to green property development and retrofits

The first four barriers presented below are general inhibitors to a well-functioning market for financing green and energy efficient properties. These are grouped as:

- Higher equipment and materials costs (capex)
- Information asymmetries and transaction costs
- Performance data and validation
- Principal/agent problem

These are somewhat universal and applicable to Sri Lanka. A last barrier—local market conditions—is meant to highlight the marked differences between Sri Lanka and experience elsewhere, that is, mature market/higher income countries where most of the evidence base on barriers (and benefits) is drawn from. It is essential that finance solutions be calibrated to local conditions.

4.1.1 Higher equipment and material costs

Where there is a cost premium for developing green properties, it derives from a combination of hard costs (project capex) and soft costs (the process and project management elements of a project budget). Separating the two is inexact and rarely done in the literature. The majority of the cost premium, however, will be attributed to project capex which is the focus here[14], with soft costs discussed in section 4.1.2 below. It is important to note that **the available international evidence suggests only modest cost premiums are needed to design and build green high-performance buildings**.

Many green building features are cost-neutral—employing passive design principles does not require additional technologies or hardware, and could even reduce capital spend on heating and cooling equipment. However, where products or technologies are more resource efficient than 'standard' specifications (e.g., low-flow water fixtures, low energy consuming lighting or HVAC equipment, low embodied carbon materials), cost premiums are typical. This is largely due to differences in market volumes and reliance on imported products for the more efficient substitutes. The variance thus is the incremental cost between the standard and the premium item, e.g., an incandescent light bulb versus a LED. Other green building elements clearly bring additional costs for technologies that fall outside of standard practice, for example, greywater diversion systems, advanced building sensors and controls, or on-site renewable energy generation.

Most evidence on cost differentials comes from mature markets, mainly the US, UK, Australia, Singapore, France, Netherlands, and Germany. They feature green certification rating tools that have been in use for a decade or more, which are important for clarifying standards and requirements, measuring outcomes, and driving down costs through continual industry 'learning by doing.' Evidence on the green building cost premium in Sri Lanka is sparse and mostly anecdotal, with practitioners interviewed for this study suggesting an additional 8—10% from typical budgets.

14 The information cited does not attempt to disaggregate hard and soft costs unless explicitly done so by the referenced author/source.

The World Green Building Council prepared a global review of the evidence for green building premiums and found that actual design and construction costs have been documented to be in the range of -0.42 to 12.5% from a baseline of code-compliance, with the high premium value corresponding to a zero-carbon building project (WGBC 2013).[15] For the majority of certified green buildings, the added cost, if any, typically is less than 4%. In China, the Ministry of Housing and Urban—Rural Development, in a 2010 survey of all green-labelled dwelling buildings, concluded an average added green cost of 4.1% over the typical price of a newly-built housing unit in the same year (Qiu, 2012, as referenced by Deng, Y. and Wu, J, 2014). The WGBC report referenced above also assessed practitioner attitudes and perceptions, finding that they are out of line with the evidence. Many industry professionals are reported as operating under the general assumption that building green increases design and construction cost by approximately 10–20% (with estimates as high as 29%) compared to the cost of conventional code compliant buildings.

4.1.2 Information asymmetry and transaction costs

This barrier relates to gaps in understanding the:

- opportunity and benefits to energy efficiency and green buildings, and the means to execute projects (i.e., a network of suitable delivery partners); and
- costs linked to creating a business case/project team buy-in, designing the solution, and executing the idea.

In simplest terms, most actors in the property design, development, and finance chain lack substantial technical and administrative skills on green design and certification; the sets of valued peer and business counterparty relationships with specialists in the sector and/or suppliers of healthy materials; and actual experience on green property projects. Added to this is the uncertainty on future energy prices and difficulty in effectively modelling cost effectiveness based on a range of known and unknown factors. This creates a level of inertia that makes consideration and execution of alternative solutions out of reach for most projects, and generally unattractive to lenders concerned about risk exposure to properties and loans not considered mainstream. Overcoming this inertia requires organisational expenditure by developers, borrowers, and lenders—whether it is internal time and resource allocation, or contracting for external advice and skills.

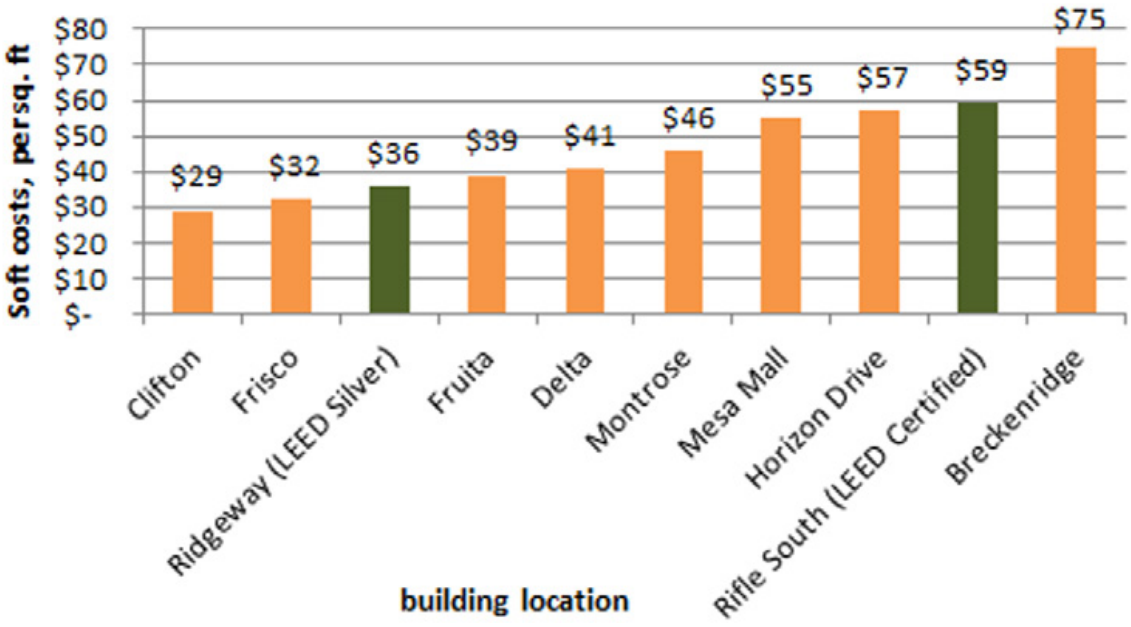
On a project level, costs to address the information asymmetries and the added transaction elements to execute a green project may include:

- materials or mechanical/electrical product and materials research by design teams;
- energy modelling and additional design engineering work;
- specialist design and/or project management review;
- value engineering assessment by lenders;
- more rigorous construction and post-construction commissioning; and
- costs to register and assess buildings with green rating certification systems or organisations.

15 Cost data have been taken from a wide variety of building types, including offices, homes, schools, warehouses, banks, supermarkets, health centres, community facilities, academic buildings, and public buildings, based on studies published between 2000 and 2012. Buildings are from the United States, United Kingdom, Australia, Singapore, and Israel.

Fortunately, a study green premium for the design and delivery of eight similar buildings in the US state of Colorado (two of the eight were green certified through the LEED rating system) concluded that while some soft costs are unavoidable (e.g., fees for LEED certification with the US Green Building Council), the total soft costs for the green versus non-green buildings was immaterial in a range of typical projects.

Figure 4.2: Soft Costs per square foot (adjusted for location and time of Construction (2011 dollars)), LEED versus non-LEED certified projects



Based on: Mapp, Nobe, Dunbar (2011): The Cost of LEED—An Analysis of the Construction Costs of LEED and Non-LEED Banks. JOSRE, Vol 3, No 1—2011.

4.1.3 Performance data and validation

Many investments in energy efficiency and in green buildings (retrofits particularly, but new construction as well) are based on the assumption that in-operation cost reductions will result from upgrades or investments in more efficient equipment and design features. In energy efficiency retrofits, standard practice is to establish an energy baseline from the equipment age and type, building use and operation profile, and actual energy consumption data. With this baseline, comparisons can be made to similar properties and systems to discern performance gaps, and engineering investigations made to determine causes of poor performance and actions to ameliorate. Before and after savings can be clearly tracked and measured, against which finance decisions may be based.

For new properties, discerning an appropriate consumption baseline from which energy savings can be estimated is difficult. Energy modelling may be used during project design, particularly for commercial or multi-residential properties, to generate esti-

mates.[16] Engineering professionals treat these findings as guides with wide tolerances, with factors such as product substitution, workmanship, commissioning (or lack thereof) during construction and handover, and the inherent difficulties of translating design options to real world performance, all contribute to common variances between design and measured performance.[17] Moreover, consumption figures between residential properties due to individual occupant behaviours show wider ranges than is typically the case in commercial properties where usage patterns track closer to a norm.

At issue is the level of energy and therefore cost savings that can be assumed to support the level of project finance required during design and construction, should capital costs be higher than the norm and need to be repaid out of ongoing operational savings or, indirectly, higher sales prices. Anecdotal evidence suggests a high level of conservatism is warranted when assessing predicted energy efficiency gains from which finance decisions are based. In other words, the lender may assume that only a portion of the modelled savings will actually materialise and can be used as a source of repayment for any debt incurred to create the savings.

Data availability on in-use performance and a deep data pool is critical. Such data sets are frequently unavailable or substandard throughout the world, but particularly so in less mature markets. This **lack of data heightens the risk of under or overvaluing energy efficiency improvements**. Performance guarantees may be part of the solution to this barrier.

4.1.4 Principal/agent problem

The principal/agent problem (also known as split incentive) arises where the party that invests in energy efficiency or green premium does not secure the benefits in terms of lower utility bills or higher sale income. This is most common in landlord/tenant situations where the primary benefits will accrue to the occupant in terms of lower occupancy costs, rather than the building owner who may be unable to charge higher rental rates to compensate for the investment. A different split incentive problem often arises with homeowners who, if uncertain of their long-term plans to remain at the property, forgo efficiency investments if they perceive the payback period to be anything but very short term and lack confidence that they can recoup the investment at the point of sale to the new owner.

Evidence that green properties deliver higher value to owners should help overcome the principal/agent barrier. Yet it remains as a significant drag on the motivation to invest. One study on the value of green property in Singapore shows that principal/agent issues remain even when developers secured a green premium for Green Mark (GM) rated residential buildings. 18,224 transactions from 62 GM-rated housing complexes

16 Performance modelling may also be used for buildings in operation where actual data is lacking or cannot be assembled from all parties—for example, in multi-tenanted buildings were several parties have control over energy consumption. Modelling is also used in certain jurisdictions (for example, within the EU) to assign performance labels to existing properties, similar to A-F energy ratings found on appliances.

17 Based on concerns about the 'performance gap' between modelled and actual energy consumption, an academic and NGO-led initiative in the UK is aggregating anonymised building and energy data from properties across the UK to highlight and assess these differences. See carbonbuzz.org/ for more detail.

were assessed and showed that the green premium was about 10% at the resale stage, compared to about 4% during the presale stage. This implies that while developers pay for almost all of the additional costs of energy efficiency during construction, they only share part of the benefits associated with such green investments (Deng and Wu, 2014). The fact that higher premiums are found at resale does demonstrate, however, the role of in-use energy/environmental performance data for creating the uplift.

4.1.5 Local market conditions

This last barrier has been added to highlight some particular challenges to capitalising and capturing the value of green property and energy efficiency in countries such as Sri Lanka, namely:

- the high cost of capital compared to mature (wealthy country) property markets,
- comparatively low energy usage amongst large segments of the population, and
- the still extensive and common availability of materials with chemicals of concern which are often the 'default' option in design specification and construction team procurement.

As will be described in Section 4.2, there is solid evidence that green and energy efficient buildings offer improved value across a number of measures including sales and rental premiums and reduced energy costs. There is extensive literature showing investments that reduce energy expenditure are financially sound and generate attractive rates of return. **Key variables that create this cost-effectiveness are a) the cost of capital (or its related discount rate if assessing on a net present value basis); b) the unit cost of energy and expectations of future costs; and c) the volume of energy consumed. These variables are significantly different from high- to middle-or low-income country markets, and most of this evidence is based on findings from mature markets.** Therefore, measuring assumed or realised value needs careful assessment.

The high cost of finance both for construction and for end-mortgages pressures developers to keep costs low. This affects the capacity to absorb soft costs such as professional skills to design/integrate green features, and hard cost premiums for green materials and resource-efficient fixtures and technologies. More so, interest rate sensitivity affects the long-term capitalisation of green features if higher debt is required, for example for borrowers who are equity constrained. This makes the clarity and sensitivity of the financial value proposition for green design/efficiency so critical. Modelled results from an investigation into payback periods and interest rate subsidies needed to generate positive or attractive returns for countries in East Africa illustrates the point. The case in Sri Lanka is unlikely to be as extreme given the differences in interest rate environments (generally 15% or above in the East African countries assessed, versus below 10% in Sri Lanka), but the findings may be instructive for understanding the confluence of factors that affect bankability.

Energy use will also be a factor in the level of the investment that is financially beneficial. Higher income households clearly have higher energy expenditures in whole numbers than low-income households (though not as percentage of income or household expenditure). This allows for more 'headroom' in the incremental capital costs to move from

standard to green/efficient products and materials. The following figures, drawn from a study in the United States published in 2011, demonstrates the effect. It shows the maximum cost-effective energy efficiency investment for householders varied by income level, assuming a 15-year measure life, 5% discount rate, and energy cost increases in line with those seen between 2005 and 2010.

Table 4.1: Maximum cost-effective energy efficiency investment, by income level (Minnesota, US)

	Poverty level			
(All figures US$)	≤ 200%	201–300%	301–400%	> 400%
2005 avg. annual energy cost	1,750	1,894	1,987	2,271
2010 avg. annual energy cost	1,911	2,069	2,170	2,480
Present value of 25% energy savings	5,551	6,008	6,303	7,204
Present value of 40% energy savings	8,882	9,613	10,085	11,526

Based on: Office of Energy Security, Minnesota Department of Commerce (2011). Financing Energy Improvements—Insights on Best Practices to Engage Consumers and Marry Dollars with Demand.

The elasticity between poverty level of energy expenditure is likely to be greater in Sri Lanka than shown above. Lower income households can be expected to consume energy at far lower levels relative to in-country higher income peers meaning efficiency investments will take longer to amortise, other factors remaining equal.

None of this is presented to suggest that pursuing energy efficiency and other benefits of green design to individual consumers is inadvisable. Rather, the potential need for concessional or subsidised solutions for certain markets or interventions (to deliver both consumer and societal benefits), requires a level of investigation and sensitivity modelling that is presently underdeveloped.

4.2 Financial benefits

The benefits from green properties and building energy efficiency can be grouped as:

- asset appreciation and capital gains,
- income generation, and
- asset quality

The benefits have different value to different agents and stakeholders in the property sector: developers and owners/investors, owners and occupiers, and lenders.

For developers and owners/investors, additional benefits that may be realised from green buildings include:

- improved tenant retention and reduced vacancies,
- shorter letting-up periods,
- brand and marketing advantages,
- mitigation against future regulatory impacts,
- higher net operating income (NOI) (a function of higher rents and lower utility and/or maintenance costs),
- income from on-site energy generation,
- lower capitalisation rates, and
- sale price premiums.

For owner and occupiers of buildings (residential and commercial), general benefits include:

- utility savings and potential energy generation income,
- improved indoor air quality with attendant health and productivity benefits,
- lower maintenance costs, and
- above average asset appreciation.

Tenants can also reap the same utility saving and health and productivity rewards from occupying green buildings. Commercial tenants can also use occupancy of green buildings in brand and marketing, particularly related to corporate social responsibility (CSR).

For lenders, the benefits can include lower risk of borrower default and product differentiation to increase market share.

The evidence for the benefits is based on reports and studies almost entirely from high-income markets, principally Europe and North America. Though this is a maturing field of study, separating out benefits attributed only to green and efficiency from other property features has methodological challenges. However**, the overall case for benefits in excess of costs is compelling**. The slow build in the evidence base and bias toward mature economies is a challenge for market development actions in Sri Lanka. As proxies, however, the totality of the evidence does give a strong theoretical foundation to creating policies and instruments to accelerate the market for green building finance.

4.2.1 Asset appreciation/capital gains

The first parameter that can be assessed from the literature is whether developers of properties or subsequent owners or investors see sale price premiums as a result of green building or energy performance metrics. Typically, the metric is the whether the property has a green certification or is part of a rating programme/system common in that market. These studies investigate the value of future returns (a function of implied energy savings and other indirect positive green building attributes) compared or in addition to the explicit day-to-day cost savings.

A 2018 'meta-study' that collated a number of previous research papers on sale price premiums across Europe summarised the evidence base for a link between energy efficiency and value as follows (figures capture ranges across different studies, markets and property types):

- an increase of 3–8% in the price of residential assets, and an increase of around 3–5% in residential rents compared to similar properties; and
- a commercial buildings premium of over 10 % (and in some studies even over 20%) in sales price increase, and a 2–5% rental price increase compared to similar properties (Zancanella, P., Bertoldi, P., Boza-Kiss, B. 2018).

Importantly, as information on efficiency becomes more well-known and absorbed into the market, the sale and rental gains appear higher.

Appendix 2 summarises some other sources of literature for evidence that (mature) markets are positively pricing in energy performance from which developers/owners of assets can extract value.

4.2.2 Income generation

The income generation benefits of green and energy efficient buildings are a reflection of:

- utility and other outgoings/operating cost savings due to a property's energy and water efficiency, demand management, and energy generation features; and
- higher rents and lower vacancies in tenanted properties.

The **day-to-day savings realised by occupiers (owner or tenants) can be treated, from a lender's perspective, as income suitable for debt service vis-à-vis other comparable properties where net costs are higher**. How best to measure and verify this income, and whether a portion of the income potential should be discounted in repayment ability calculations, is subject to some debate and requires careful consideration. Note, however, that for buildings featuring on-site energy generation, energy yields/cost of producing energy is predictable and measured benefits highly reliable.

The evidence that well-designed and managed buildings reduce costs is solid. For example, a 2019 study into the energy savings achieved by commercial office buildings in the United States shows that, on average, energy consumption is reduced by 8% after a building receives green certification (e.g., LEED or BRREAM) (Eichholtz, P., Holtermans, R., and Kok, N. 2019). Although a costs-benefits assessment of the efficiency intervention was not included the in the study, the savings can translate into income through which efficiency investments can be financed.

A summary of some of additional key literature sources related to green buildings and improved savings or income is found in Appendix 2.

4.2.3 Asset quality

Assuming that green properties carry a higher capital cost (even if a small one, circa <5%)—a valid assumption given that the green building market is at early-stage in Sri Lanka—lenders will need to push more capital into the market to reach these borrowers.

This is true irrespective of whether debt to equity/debt to income ratios remain constant or are perhaps relaxed due to equity constraints of borrowers. This carries more risk, particularly with the latter (i.e., relaxed ratios), and will require more absolute capital to be kept in reserve.

In theory, extending additional debt is prudent based on the sales premiums, rental premiums, and/or operating cost savings described in the two preceding sections. Moreover there is an additional benefit from green properties meaningful to lenders—the improvement in asset quality. Extending finance to properties that return higher values vis-à-vis comparable properties in the marketplace, and that improves occupant/owner cashflow and satisfaction, should reduce both the likelihood of borrower default and the potential that foreclosed properties will be liquidated at values below their debt liability. This is particularly relevant in the absence of a secondary market where primary lenders remain the long-term holder of the loan and security. **Recent research from both the commercial and residential sector provides evidence that lender risk is lower where capital is extended to green and energy efficient properties.**

Much recent and current research into the correlation between energy performance and credit risk for lenders (via measures such as loss given default or probability of default) are from Europe. This is due, in part, to investigations of central banks and finance regulators on levers and mechanisms through which capital flows can be increased to meet the European Union's climate policy goals. This may include differing capital reserve requirements against collateral that is demonstrated as 'green' vis-à-vis other assets. A research and stakeholder engagement programme sponsored by the European Commission—the Energy Efficiency Financial Institutions Group, or EEFIG—includes a "loan risk and assessment performance" working group studying the evidence between energy use and loan quality, with results due for publishing in late 2021.[18] Other research benefitting from European Commission funding includes that from the Energy Efficient Mortgage Action Plan (EeMAP), which has gathered a collection of European Banks for developing green mortgage products and informing European policy makers on default risk analyses. A 2019 report from EeMAP of empirical and econometric studies demonstrates a link between the energy performance of buildings and credit default risk regardless of whether energy efficiency is captured via individual energy performance labels or proxies (EeMAP 2019). Similarly, a report from the Bank of England showed that about 0.93% of residential mortgages against energy efficient properties are in payment arrears—which is 0.21 percentage points lower than non-efficient properties (Bank of England 2020).

In the United States, research from the U.S. Department of Energy has been investigating the effect from energy use intensity of buildings and also energy price variations to assess implications to lenders and whether either factor should be considered in credit risk analyses of borrowers. While these are national studies, the research focuses on a limited number of commercial mortgage markets centred around metropolitan regions. A 2018 paper concluded that variations in building energy intensity could raise or lower the default rates in these properties by between 5% and 40%; and that electricity pricing (costs between markets as well as variability) has an even greater effect, e.g., a nearly

18 Preliminary findings from statistical analyses undertaken by several individual banks of their loan books shows that better energy performing properties are correlated with lower mortgage defaults.

60% change in default rate in the Denver area and nearly 90% in northern California (Mathew et al 2018). This latter finding suggests a relationship between net operating income and mortgage performance tied to energy. A further 2020 report based on the same research project suggests an approach lenders might take to incorporating energy risks into mortgage lending.

Other research on U.S. commercial property markets (An and Pivo, 2015) assess the relationship between building sustainability features and performance of corresponding US commercial mortgages across property types including office, retail, apartment, and industrial.[19] Results show that borrowers of ENERGY STAR properties[20] are 20% less likely to default than comparables, based on a default probability model where conventional predictors such as original LTV, contemporaneous LTV and debt service coverage ratio (DSCR), current occupancy rate, refinance incentives, macroeconomic conditions, MSA-fixed effects (metropolitan statistical area), and more, are already included and held constant. Another U.S. study (Kaza et al, 2014) looks at home mortgage loan performance against sustainability variables, drawing a 71,000 home sample from across the US. About a third of the sample set is homes with an ENERGY STAR label. All homes are on 30-year fixed mortgages. The assessment shows that the odds of a mortgage default on an ENERGY STAR residence, other variables held constant, are one-third less than those on a home in the control group. A mortgage on an ENERGY STAR residence is also 25% less likely to be prepaid. More so, within the ENERGY STAR pool of properties, the level of energy performance matters—more efficient homes exhibit even lower mortgage risks than those on their less efficient but still ENERGY STAR-rated counterparts.

4.3 Finance instruments

Based on the benefits discussed in the preceding sections and to help overcome the market barriers to green properties, there are a range of finance instruments that could be considered to increase capital flows to developers and end-buyers of green/energy efficient properties. These are briefly described below, noting that the list is not necessarily exhaustive nor instruments which are all directly within the control of banks/loan originators. For some, other market actors or regulators will need to take action which can benefit banks and/or to which they may advocate for to share risk and deepen the market for green finance. The instruments are organised as per Figure 4.1: those targeting a) developers and owners/investors; b) owners/occupiers; and c) lenders and investors.

4.3.1 Developers and owners/investors

Based on the findings that green buildings offer sales premiums compared to standard buildings, borrowers could take on additional/larger borrowed amounts to cover the added capital costs in development or investor acquisition costs. Higher pre- or re-sales prices could recover the extra borrowing. This can be accommodated through several means.

19 All assets have been securitised / issued as commercial mortgage backed securities (CMBS) notes

20 The finding holds for both retail and office. There is no multifamily ENERGY STAR thus no such properties in the sample.

- **Higher debt to equity ratio**. For developers who are equity constrained but seeking additional capital to deliver green properties, lenders could allow high debt to equity ratios for qualifying projects. Effectively, borrowers would put up the same equity stake in absolute figures, but this would be lower as a percentage of total project costs due to the higher capex. It is assumed that the end buyers/investors of the properties recognise the value of green buildings and pay higher prices commensurate to the capex premium.
- **Concessional interest rate**. Given the higher capex faced by developers, lenders could offer a lower interest on project financing for qualifying projects. This would effectively lower the cost of development so that it is par with standard development costs. This can maintain affordability and reduce repayment risk where green sales premiums are not yet present in the market. Examples from Mexico and South Africa are described in Appendix 3.
- **Performance guarantee**. The use of an energy performance guarantee can be a tool to a) incentivise developers to build green properties for which sales premiums can be applied based on expected energy costs savings, and b) borrowers to gain comfort in taking on additional debt to cover the sales premium. The guarantee would cover the risk of energy under-performance, i.e., expected savings that fall short of additional income needed for debt coverage. This could help narrow any pre-sale/resale differential of green properties as has been observed in Singapore (see discussion on Principal/Agent problem in the Barriers section above).

4.3.2 Owners/occupiers

For owners of properties (occupiers or investors), green and energy efficient buildings offer a level of income generation through one or several factors such as lower running/operating costs (mainly utility bills), rent premiums and reduced vacancies, and on-site energy production. Covering the additional borrowing needed to purchase these higher priced properties could be accommodated through the following instruments which may be used singly or in combination.

- **Higher debt to income ratio**. As most lending models take a limited view of householder or building owner expenditure that misses utility expenditure, borrowers could be approved for larger loans above standard debt to income allowances to factor in lower energy costs. This would capture the higher sales price the buyer is committing to but otherwise not affecting the borrower's ability to repay. Appendix 3 describes examples from Mexico, and this model has been applied by lenders in Europe and the United States.
- **Mortgage insurance**. Mortgage insurance is used internationally for borrowers taking on high loan to value obligations, e.g. borrowing 90% of the property sale price. Equity constrained borrowers of green properties could take on higher LTV loans provided insurance is available to cover default risk—mainly that the low upfront equity is insufficient to recover outstanding debt in the case of repossession and sale by lender. As with any insurance product, triggering events are expected to be rare if they are properly structured and based on sound risk assumptions. In Canada, high LTV borrow-

ers receive up to a 25% mortgage loan insurance refund/rebate on green properties based on the presumptive value of the energy savings and the borrower's subsequent ability to pay.

- **Mezzanine loan / 'soft' second mortgage**. A mezzanine loan (second lien position) could be applied to the primary loan to cover the added costs between a standard and a green property.[21] This could be concessional to dampen the effect of the extra borrowing, as is used in Germany as described in Appendix 3. Similarly, a soft second mortgage could be used to cover the variance between the standard and green costs and be structured with conditional terms, e.g., deferring upfront borrower obligations for a time period. This assumes that the borrowers' income grows over time which reduces the relative payment risks. The delay on the soft second would allow the borrower's income to grow so as to cover the extra debt due to the green features. Optimally, the mezzanine or second loan would be folded into the primary loan for a single payment/servicing structure.

4.3.3 Lenders and investors

The following can help lenders build loan volume and facilitate increased market liquidity for green properties based on their positive asset quality and income attributes. These instruments are designed to create a more efficient and better functioning market, supported by improved property-level detail on efficient features and the value of green buildings.

- **Lender risk weighting**. Applying variations in the credit risk assessments of individual borrowers and projects based on property attributes could expand a bank's pool of eligible customers. This would use green/energy efficiency measures as a strong potential value driver and predictor of asset value.
- **Capital reserve requirements**. For properties that meet suitable green criteria, lenders could be allowed to maintain lower capital reserve margins based on their lower risk profile. This would free up otherwise dormant capital and help grow market volume.
- **Green bonds and asset-backed securities**. Green labelled properties provide a signifier that could be used to raise capital for property investment or to capitalise bank lending. Green bonds are a well-established instrument for real estate developers, investor corporates, and banks to tap capital markets for wholesale or project debt where use of proceeds is tied to carbon emission reductions and/or other sustainability outcomes. Properties that meet or exceed verifiable ESG thresholds would be eligible for development, acquisition and (re)financing under the bond terms. In most cases, use of proceeds for property-based green bonds or loans are tied to nationally or internationally accepted building certification schemes (such as LEED, EDGE, GREENSL, etc.) which act as a signifier that the project adheres to appropriate environmental standards. External opinion letters can be used to corroborate the rigour of the proposed standard or threshold, particularly where bespoke standards are being proposed. The use of building certification removes subjectivity from the project lender for bond use of proceeds and helps streamline use of proceeds reporting.

21 Note that this type of instrument could suit both project (construction) and end-mortgage finance.

Similarly, green properties as designated through certification schemes could be collateralised in single- or multiple-mortgage note pools and sold by loan originators to investors.

It is understood that in Sri Lanka, little or no green bond issuance and asset securitisation has been seen, though building an ABS (asset-backed securities) market has been recommended through capital market development programme of the Asian Development Bank. The Securities and Exchange Commission (SEC) of Sri Lanka have also expressed interest in market development activities for green bond issuances. Should either market develop, institutional investors could target or be attracted to green property bonds to increase the capital and investor base, and in the case of ABS's, to create liquidity where otherwise there is none. As an example, Appendix 3 includes information on one lender's green ABS's in the Netherlands.

4.3.4 Mapping finance instruments to the market barriers

The high-level barriers presented in this chapter will need to be overcome through a range of interventions and initiatives. Increasing the availability of finance and having targeted finance instruments to suit the particulars of the market is critical. The table below which maps finance instruments to market barriers can serve as a starting point for considering which tools can address certain barriers.

Table 4.2: Finance instruments to overcome market barriers

	Higher equipment and material costs	Information asymmetry and transaction costs	Performance data and validation	Principal/agent problem	Local market conditions
Higher debt to equity ratio	✓				✓
Concessional interest rate	✓			✓	✓
Performance guarantee	✓	✓	✓	✓	
Higher debt to income ratio	✓				✓
Mortgage insurance	✓				✓
Mezzanine loan / 'soft' second mortgage	✓		✓	✓	✓
Lender risk weighting		✓			
Capital reserve requirements		✓	✓		
Green bonds and asset-backed securities		✓	✓		✓

Source: Based on Promoting Energy Efficiency in Buildings in East Africa (UN-Habitat)

Finance in of itself will be insufficient to substantially move the buildings sector toward achievable carbon emission and resource use reductions presently being under-delivered. Information resources, technical skills, standards and regulations, etc. are all complementary pieces and which are described further in Chapters 6 and 7.

5. Green mortgage modelling

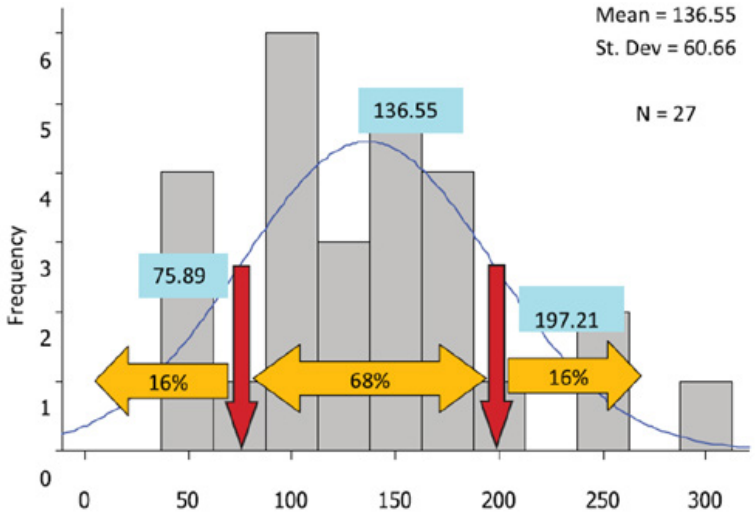
5.1 Data inputs from Sri Lankan sources

Green mortgages can be developed to help balance what are likely to be higher capital costs for development or acquisition costs for buyers of green buildings with ongoing operating costs savings, higher income generation, and/or capital appreciation. These benefits could be the repayment or collateral value sources against which extra borrowing can be justified and overcome the first higher cost barriers common to green buildings. It is the energy savings that most green finance products are based and that is also the basis of most academic literature and programmatic research as reviewed in Section 4 above. The 'willingness to pay' for healthy buildings or wellness benefits has also shown to be important to occupiers[22] and can be a secondary consideration in lender decision-making for green properties. This creates a link with the UNEP-led programme in Sri Lanka to address chemicals of concern in the buildings sector as described in Section 1.

Modelling finance products for the Sri Lankan market was not possible in that key variables on energy consumption (by property type and within properties), energy costs, land prices, construction costs, sale prices, rental rates, and typical construction finance terms were generally not available from public sources or through expert interviews. Some limited data and anecdotal evidence did emerge—for example, an undated Energy Consumption Benchmark Analysis from the Sri Lanka Sustainable Energy Authority does present benchmark best and worst performance energy data from a sample of commercial buildings and hotels. These are shown in the graphics below.

22 See for example consumer research undertaken for this project as highlighted in Appendix 1. Academic research has also explored the connection between energy efficiency improvements and healthy buildings, and the additional contribution that health and wellness may make in correlation studies between energy performance of buildings and asset values—see for example Sayce, S. and Wilkinson, S. (2020) Decarbonising real estate: the evolving relationship between energy efficiency and housing in Europe. Journal of European Real Estate Research. centaur.reading.ac.uk/89550/

Graphic 5.1: Distribution of energy consumption figures for commercial buildings in Sri Lanka (consumption in kWh/m2 per year / sample size = 27 properties)



Graphic 5.2: Specific primary energy consumption levels for hotel industry

Category	Description	Sample Size	Occupancy	Minimum	Maximum	Mean	Std. Deviation
Five Star	Primary Energy Consumption (kWh/ Room Night)	11	62 %	85.3	241.6	162.6	151
			77 %	70.3	203.4	137.4	42.4
			92 %	60.0	177.4	120.1	37.8
Four Star	Primary Energy Consumption (kWh/ Room Night)	8	62 %	47.5	211.4	107.4	46.9
			77 %	41.4	169.7	90.7	40.1
			92 %	41.4	142.1	79.9	35.5
Three Star	Primary Energy Consumption (kWh/ Room Night)	8	62 %	43.7	195.2	96.5	44.9
			77 %	35.1	154.7	79.3	37
			92 %	29.3	127.8	68.6	32.3
Two Star	Primary Energy Consumption (kWh/ Room Night)	8	62 %	38.0	102.1	65.2	26.1
			77 %	32.1	85.9	54.5	20.7
			92 %	27.4	80.4	47.3	17.6
One Star	Primary Energy Consumption (kWh/ Room Night)	4	62 %	13.9	104.9	69.1	50
			77 %	11.6	89.0	58.4	42.5
			92 %	10.1	77.7	50.9	37.2

Source: Energy Consumption Benchmark Analysis (Sri Lanka Sustainable Energy Authority)

For the housing sector, modelled (rather than actual as above) household energy consumption, energy expenditure, and PV system sizing appropriate to the demand was developed by the Sustainable Energy Authority in its 2019 Guideline for Sustainable Energy Residences in Sri Lanka. It also shows significant variation between consumption rates and savings generated and is also suggestive that green finance products premised on energy efficiency 'income' is possible.

Graphic 5.3: Energy consumption variations of sustainable energy residences and air-conditioned residences

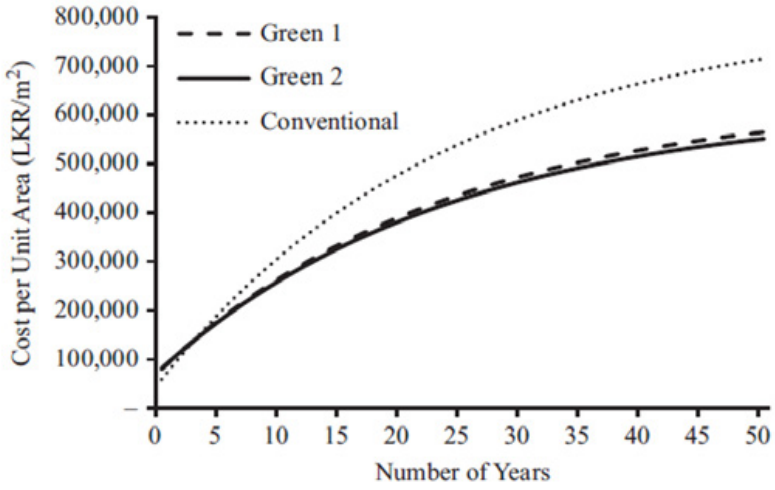
Load	Electricity Use (kWh) per Month			
	Sustainable Energy Residence - Single Storey	Air-Conditioned Residence - Single Storey	Sustainable Energy Residence - Apartment Block	Air-Conditioned Residence - Apartment Block
Cooling and Ventilation	24	255	48	279
Lighting	18	29	22	33
Electrical Appliances	108	123	163	193
Total	150	408	233	505
Electricity cost, LKR	3,044	14,324	6,449	18,689
PV system size for net zero, kWp (@115kWh/month/kWp)	1.5	3.5	2	4.5

Source: Guideline for Sustainable Energy Residences in Sri Lanka (Sri Lanka Sustainable Energy Authority)

The figures from the three above datasets demonstrate a wide variance in performance, suggesting that strong energy performers can deliver tangible financial benefits to owners and occupiers. But drawing conclusions is very difficult without more information on building vintage, systems, and operations and management practices. Overall, without comparable energy costs and construction or retrofit cost data capturing green buildings and standard buildings, it is difficult to undertake modelling to support creating green finance product typologies and demonstrate available excess income (compared to standard properties) to repay extra borrowing.

To better understand the higher first costs associated with green buildings, one academic study from Sri Lanka published in 2018 compared three industrial properties—two green and one standard—to assess life cycle costs and property net present value over a 50-year time horizon. In the literature review for the study, it cited previous research in Sri Lanka of the green building cost premium, i.e., the construction cost of green buildings is 20–25% higher than that of conventional buildings (Bombugala and Atputharajah, 2010). For the industrial buildings assessed in the 2018 study, the cost differential was even higher at 37% (Weerasinghe and Ramachandra 2018). Yet the ongoing utility and O&M (operations and maintenance) savings for the green properties still yield an attractive investment against the life cycle model. The graphic shows the life cycle costs (LCC) of the three buildings, with the curves intersecting in the third year of the 50-year analysis and widening over time.

Graphic 5.4: Life Cycle Cost (LCC) comparison: green vs conventional building



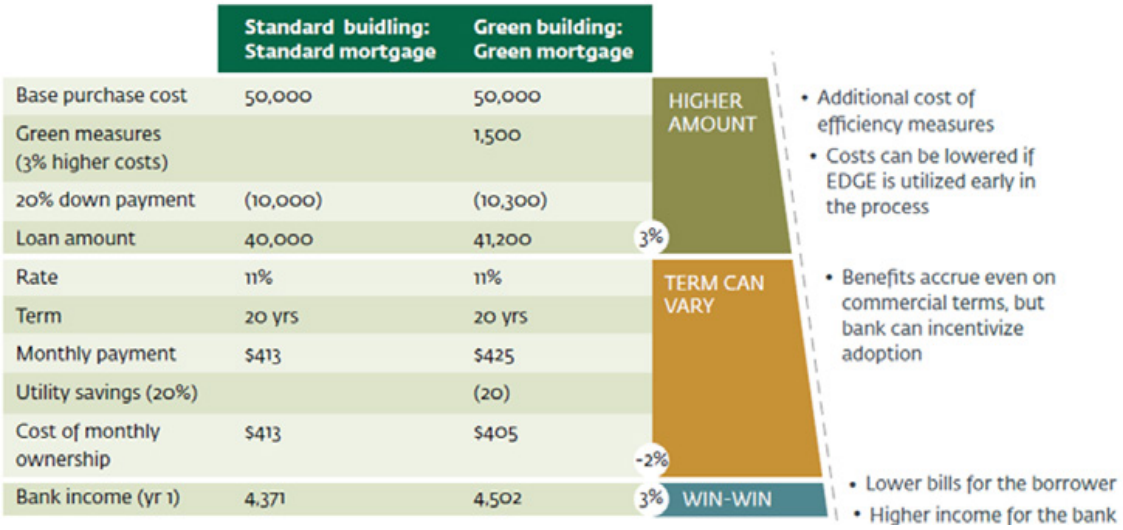
Source: Economic sustainability of green buildings: a comparative analysis of green vs non-green (Weerasinghe and Ramachandra 2018).

With the limited market data in Sri Lanka on the costs and benefits of energy efficiency measures and savings achieved through green features; on repayment and loan quality metrics for green buildings; and on rental or sale premia achieved by developers/owners of green buildings versus comparable standard buildings, it is difficult to know how products should be structured and the level of market acceptance that the higher capital costs associated with green building construction can be recaptured. **Though the international evidence linking green building and financial returns is solid, the business case for lenders in Sri Lanka will need to be supported first by modelling against local construction and borrowing costs and sale prices, and then tracking of data so that the evidence for a green premium can accumulate.**

5.2 Indicative approaches to green lending

In lieu of detailed modelling against local conditions, the below graphics offer representations of how energy savings or improved loan quality (lower credit risk) can be the levers through which finance can be unlocked. Both relate to residential (homebuyer) mortgages. Graphic 5.5 is from the IFC and illustrates how energy savings from a green building can be applied to additional borrowing to cover an increase in capital costs for green construction. From the consumer perspective, the savings are sufficient to meet the extra debt coverage. From the lender perspective, targeting buyers of green properties yields higher debt packages and greater repayment income over the life of a loan, compared to a standard property.

Graphic 5.5: Green mortgage vs. standard mortgage



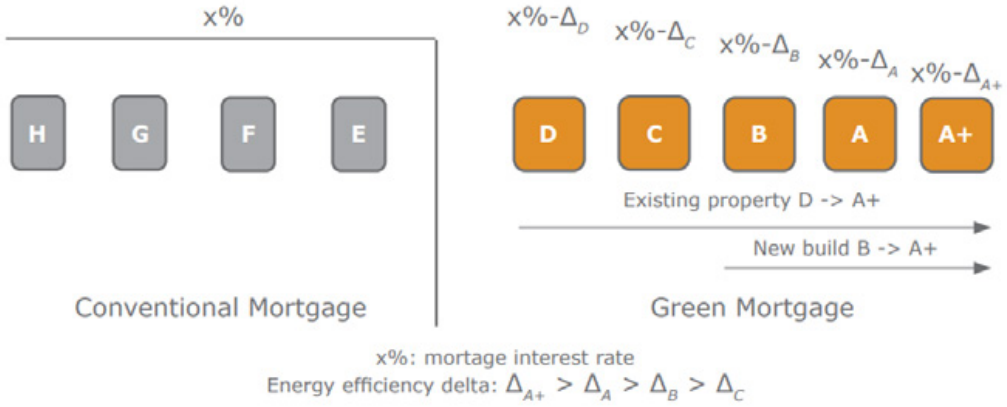
Green Buildings: Finance and Policy Blueprint for emerging markets (IFC)

The interest rate and equity contribution in percentage terms remains constant in the above. For borrowers who are equity constrained, however, the approach may be ineffective. Lenders could consider slightly increasing the debt-to-equity ratio in order to equalise in whole numbers the equity contribution for both the green and standard property (i.e., 10,000 downpayment in each scenario).

The approach represented in the second graphic from the European Mortgage Federation-Energy Efficiency Mortgage Action Plan is premised on the correlation between green properties and credit risk (i.e., lower probability of default and loss given default). On that basis, the lender is incentivised to offer preferential lending rates to borrowers pledging green collateral. The lender is taking on less risky loans and the borrower is receiving a slightly lower interest rate for a property that meets or exceeds various energy performance metrics.[23]

23 The letters shown in the graphic refer to energy performance labels which are mandatory in the European Union. They are similar to letter ratings for appliances with expected energy consumption based on modelled parameters and scores assigned from best (A+) to worst (H) performing assets.

Graphic 5.6: Green mortgage rate differential against energy performance metrics



Source: European Mortgage Federation 2017 Factbook Article (EMF—EeMAP)

As shown above, each level of energy improvement based on a property's 'energy performance certificate' qualifies for a lower interest rate. The product eligibility varies between existing building acquisition and purchase of newly built properties, with new builds requiring a higher efficiency 'floor' than existing premises. The EMF—EeMAP product development framework also includes an option to include extra borrowing for energy renovations of existing properties, with the renovation capital added to the total mortgage loan and repaid on that same long-term basis. Once the property has undertaken the renovation and can produce an updated energy performance certificate, the loan shifts to the lower interest rate.

In both green finance product illustrations above, lenders could also choose to slightly relax debt to income ratios if borrowers are nearing or exceeding standard ratios due to the green building's higher capital or acquisition cost. This assumes that the energy savings (expenditure differential between a green property and a standard property) offers a source of 'income' for debt repayment that is not typically captured in lender ability to pay calculations. A research project undertaken in the UK[24] attempted to estimate the energy cost variability as a portion of household expenditure based on different home energy performance ratings, with the suggestion that lenders could adjust their borrower assessments. Purchasers of higher rated homes could potentially qualify for larger mortgages on the basis of this greater disposable income (lower household expenditure), all other factors equal.

The abovementioned UK research was a theoretical exercise to inform banks of the possibility that property details can be predictive of expenditure levels, and that lender calculations of borrower capacity could change as a result. Note, however, that drawing such conclusions and formulating lender practices is highly dependent on significant data sets on energy consumption and property and occupant co-variates to create credible results, which presently does not exist in Sri Lanka. Another factor for lenders (and policy makers) to consider when linking capital expenditure on efficiency to greater ability to repay in the Sri Lankan context is where energy use is comparatively low. This may be particularly the case at lower ends of the income scale where, compared to

24 The Lenders—Improving energy costs in mortgages—Promoting energy efficiency in homes project. See report with project summary details atukgbc.org/wp-content/uploads/2017/09/Lenders_Core_Report_1.pdf

higher income households, the savings generated may only be marginal and therefore insufficient for debt repayment when considering the added capital costs and interest rate environment. Therefore, **sensitivity testing of this premise against householder income, energy consumption, green capital cost differential, and interest rates should be undertaken.**

Another approach to green mortgage development is to focus on commercial project construction debt rather than end-buyer mortgages. In mature property markets with longstanding experience and data on green building development and associated property values, lenders may feel comfortable with higher capital cost 'green' projects (compared to 'standard' comparables) recognising that either the market will price the green property higher and the debt can be readily retired at the end of construction; or that a permanent take-out loan will reflect the sound leasing and income fundamentals that green buildings attract. Lenders may also offer modest interest rate discounts to the borrower on the basis that the loan is less risky, i.e., the property will attract higher post-construction sale and rental prices and/or sell or lease more quickly.

Similar to the abovementioned challenges noted on energy consumption and other householder data, altering lender approaches to green construction debt in Sri Lanka may be hindered by the lack of evidence for a market premium for green buildings. Loans for green projects may therefore be higher risk due to the increased capital costs for the associated project compared to standard commercial property construction costs, and the debt may need to be priced higher as a result. Therefore, a market and product development approach that is suited to earlier-stage green property markets is to attract dedicated lines of credit or wholesale capital at preferential interest rates—for example from multilateral or national development banks—that banks on-lend to their commercial construction clients for green projects. This is likely to be a special and time-limited programme to build experience and advance the market. The goal is to offer lower than market rate construction debt so that the total green project construction costs (hard costs + soft costs + cost of capital) is near or equal that of a standard comparable project. **This reduces risk where it is uncertain that the developer can achieve a green premium in sales or leasing.** To demonstrate the point, the table below is drawn from green mortgage development research for lenders in East Africa and should be treated as indicative only. The costs presented are unlikely to be representative of construction costs in Sri Lanka, and the interest rate environment differs as well with lower prevailing rates than in East Africa. However, it does illustrate the effect of the interest rate subsidy to equalise end-product costs where there is a 5% and 8% additional expenditure on green features, and the range of discount wholesale capital that may be required. The model is for the delivery of a 100-unit, middle income housing development, where the land value is assumed as 10% of development costs and credited as an equity contribution. The construction debt baseline is a 3-year note with quarterly interest and principal payments priced at 18%.

Table 5.1: Concessional interest model results (20% equity contribution)

Key financial indicators	Standard	5% premium	8% premium
Development cost per m^2	720	756	778
Total development cost	5,760,000	6,048,000	6,220,800
Equity contribution	1,152,000	1,209,600	1,244,160
Balance to be financed (loan principal)	4,608,000	4,838,400	4,976,640
Total payment (principal and interest), 3 years	6,064,102	6,008,361	5,977,202
Total investment (equity plus debt payments)	7,216,102	7,217,961	7,221,362
Break even cost on total investment, per unit	72,161	72,180	72,214
Unit price with developer profit (20%)	86,593	86,616	86,656
Interest rate	**18.00%**	**14.00%**	**11.75%**

All figures in US$

Source: Sustainable Building Finance: A Practical Guide to Project Financing in East Africa (UN-Habitat)

The model assumes the borrower is able to provide the additional equity contributions to maintain the 20% equity and keeping the lender's risk equal provided the concessional capital can be sourced.

The narrative and graphics in the preceding paragraphs offer insight on data foundations and frameworks from which green finance products can be developed. The next chapters will focus more on market development activities to accelerate availability of finance for green buildings.

6. Green mortgage underwriting

The level of green/efficient property design and development is still at a fairly early stage in Sri Lanka. As with any paradigm shift, the effort to change standard practices and refocus supply and finance chains to accommodate the new opportunity takes time and is invariably supported by a combination of regulatory push and market pull. Fortunately, **the fundamental approaches to how loans are underwritten do not require change. What will be needed, however, is a step-change in knowledge of how data and performance measurements, valuation practices, and lender risk and prudential standards can help address the supply of and demand for green financial products.** Similar to the evidence base for the value and benefits of green buildings, there is substantial experience and resources from outside the region which can inform how green finance practices may accelerate in Sri Lanka.

6.1 Role of green building standards and data monitoring

In general, international experience with green mortgage product development and underwriting relies on external standards and proxies for performance, rather than detailed knowledge by lending officers at banks of green design features and discrete performance measures. Lenders then need to know only of the existing external tools and resources and that achieving certification becomes one of the steps in the underwriting process. Such tools require registration and certification fees to the industry association or NGO that manages the standard—generally this will be borne by the project sponsor but it is possible that the lender cover these costs or fold them into the mortgage loan as an incentive to promote green development practices to its clients. As market actors presently indicate that certification costs are a barrier to green building development, options to lower this cost should be explored. There are also some examples of tools specifically developed to support loan underwriting/green finance product origination at single or groups of financial institutions, as has been utilised in markets such as Mexico (as shown in Appendix 3), as well as India, Brazil, United States, and others.[25] The more likely path, however, is for Sri Lankan banks to rely in existing tools already used in the market such as *GREENSL® RATING SYSTEM* from the Green Building Council of Sri Lanka, Blue-green Sri Lanka from the Urban Development Authority, and

25 En:Eff ResBuild of National Housing Bank in India; Selo Casa Azul in Brazil; and Enterprise Green Communities Criteria in the U.S.

LEED from the U.S. Green Building Council; as well as tools designed for middle-income and emerging markets, e.g. *EDGE* from the IFC.

Most green finance origination will rely on design-based tools—or least certification at the design stage, rather than in-use property certification. These latter assessments though can be made conditional upon receiving green finance and for ratcheting down interest rates post construction. Design tools set principles and guide decisions from preliminary design through to construction and handover. While they are predictive of enhanced building performance, they do not guarantee in-use performance. As a basis for lending decisions, however, they do provide value through the process controls they create (e.g., staged checks, prescribed information collection and management, etc.); and guidance on best practices related to elemental design and healthy material selection, applicable 3rd party standards, and modelling protocols for energy use and water consumption.

As described in Chapter 4, green ratings can act as a proxy for ability to repay additional 'green premium' borrowing from realised energy savings, or as a factor in sale or rental price uplift. In fact, it can be argued that because efficiency and energy use are treated indifferently (that is, assumed to be of equal relevance in all properties), present practices not only fail to justify green premiums but potentially miss 'brown' discounts that should be applied to properties unlikely to hold value over time based on changing market conditions, energy prices, and regulatory changes.[26]

In addition to requiring certification as a qualifying factor for green finance, other actions that lenders can consider during underwriting and the construction period to improve green building information flows, and credit and risk analyses, include:

- lenders obtaining permission from borrowers to collect energy data as part of the credit agreement;
- instituting process performance steps and checks between lenders and developers to ensure that the process for delivering green buildings (which varies from standard buildings) is systematic and verifiable, e.g. following integrated design principles, using energy modelling and forecasting, adhering to green specification and construction material checklists to ensure readily available materials that omit chemicals of concern are included, detailed commissioning plans, post-occupancy measurement and verification plans, green design handover for occupant and staff training, etc.; and
- standardising how green/efficiency features are communicated in marketing materials and agent listings.

26 For example in the UK, it has been a requirement since 2018 that any properties rented out in the private rented sector to have a minimum energy performance rating. Properties of poor energy quality face retrofit costs that other more efficient properties can avoid. This is a potential risk for lenders if their portfolio includes many inefficient properties with high/long remaining balances.

Other practices for consideration involve more rigorous data capture and validation for individual buildings over time for longer tenor (post-construction) loans can help with data gaps in building performance and evidence of a green premium. For example:

- Commitment agreements: the developer/borrower commits to achieving a specific post-construction in-use energy rating; in return, the developer may advertise the rating in advance of its measurement, with contractual levers to ensure rectification of the in-use performance lags.[27]
- Based on trials in a handful of European countries, industry associations have lobbied for the use of Building Passports. The passport would be assigned to the building (not the owner). It would be issued at new construction or re-sale and capture all key system and material specifications and construction records, and add data over time based on energy and post-occupancy audits to measure health and productivity indicators, improvement options, measured energy data, material recycling or reuse options, proper material disposal requirements, etc. It would systematically track environmental performance data post-retrofit and be used to plan for and record staged retrofits over many years.

These ideas listed above are realistically medium- and long-term market structuring initiatives. Meanwhile, **the availability of green assessment tools that have been successfully applied in emerging markets offers a solid platform from which lending practices can evolve**. So too do the material eco-labelling and certification initiatives which can be used to identify healthy materials for inclusion in project specifications. It must be remembered, however, that rating tools measure environmental outcomes, not financial outcomes, and thus should not necessarily be the sole basis for underwriting decisions (Muldavin 2010). Valuation practices can be a bridge between the environmental insights generated by rating tools and the financial evidence base.

6.2 Valuation practices

Lenders' investment decisions weave facts about the borrower's ability to pay with the value of the property that secures the loan. For the latter, independent, 3rd-party valuation reports provide the evidence for the appraised value that sets the loan limit. Securing credit for properties with higher capex costs and/or price premiums vis-à-vis comparable properties will be difficult unless the market appraisal assures the bank the additional borrowing is justified. As the underwriter makes its risk assessment, it needs to be educated on the benefits of energy efficiency and ability to effectively review the valuer's findings (Doyle and Bharhava 2012).

27 Commitment agreements have been put in place in Australia, and studied in the UK, utilizing a version of the Australian NABERS energy in-use performance assessment tool. (Information on can be found at this resource from Energy Action / the UK Better Buildings Partnership, and Design for Performance). Presently, sustainability linked loans are being underwritten by lenders where interest rates can vary depending on borrowers meeting or exceeding environmental and sustainability criteria, which is a form of a commitment agreement. These are more likely to corporate loans or lines of credit rather than project-based instruments, but the principle applies. See here for examples of sustainability linked loans linked to borrower assessment under GRESB (Global Real Estate Sustainability Benchmark), a data capture and peer benchmarking platform for real estate funds.

Valuation practices often use one of the following methods. Any have the potential to incorporate energy efficiency and green design features, but are challenged in doing so due principally to lack of data. The first two are more common in residential markets (single-family homes) and the latter two for commercial properties.

Table 6.1: Summary of valuation practices

Method	Green property assessment barriers
Cost approach—determines the cost to replicate the house in its current location	Lack of data on the green premium capex (if any), or knowledge about which features of the property are green and their cost basis, can create inaccuracies. There may also be uncertainties at the economic life of green technologies and how these are depreciated.
Sales comparison analysis—compares the asking price against similar local properties	In a market with very few green properties, identifying and citing comparables is challenging.
Income or income capitalisation method—rental values that the property could generate, and the implied risk to the income stream	In areas with few rental properties, or where the green rental premium (if any, and how generated[28]) is not accurately assessed, value can be misquoted. Capitalisation rates can also be subject to valuer judgements.
Discounted cash flow analysis (DCF)—an analysis of future expected cash flows (e.g., rental income) discounted back to present value based on the investment inputs	Financial modelling requires a range of data points (including qualitative factors such as occupant satisfaction) that may be hard to generate, and also subject to valuer judgements, e.g., discerning residual value or exit yield at the end of the cash generating period.

The latter two methods perhaps offer the greatest scope to deliver near-term appraisal differentiation for green properties given the shallow market data on costs and sales. Properties with distributed energy assets are particularly well suited to these methods as the energy generation income is predictable based on data from comparable national and international locations.

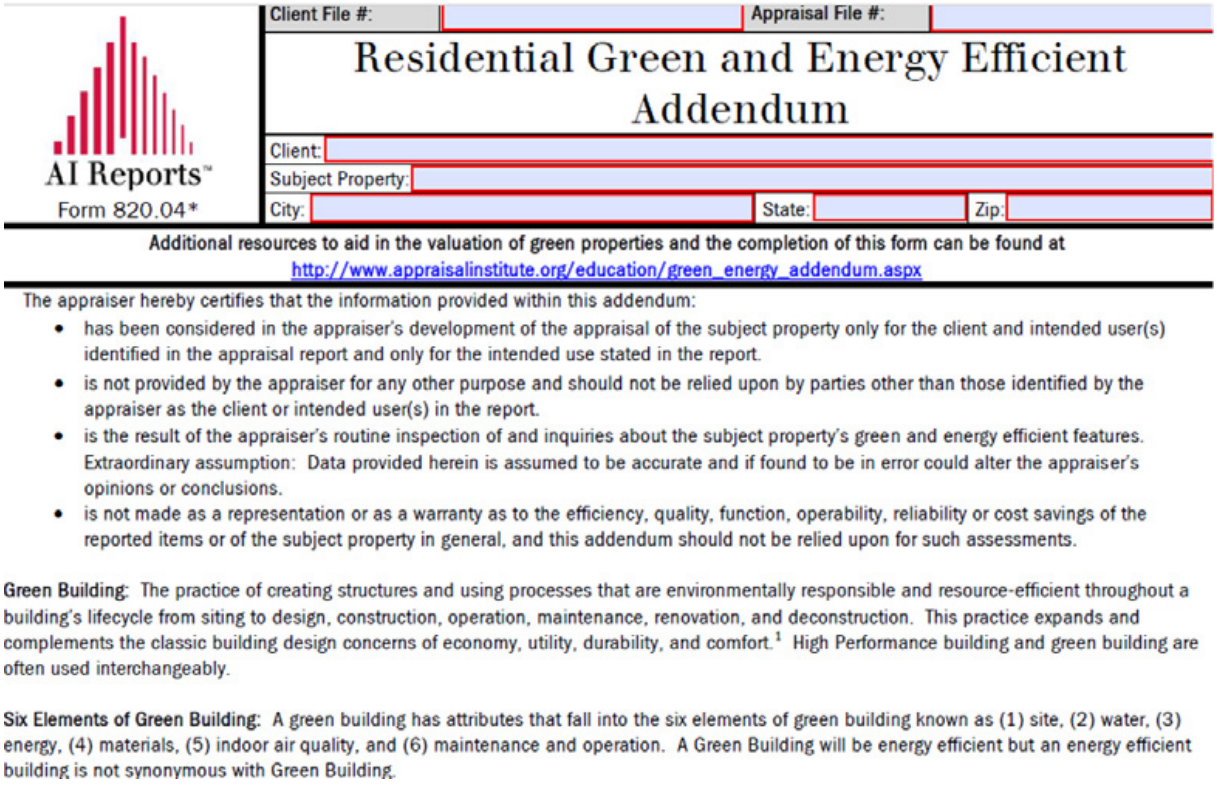
Experience internationally again shows where appraisal methods are evolving. In the UK, the RICS (Royal Institute of Chartered Surveyors) has since 2014 listed sustainability as a factor that valuers need to take into account when performing valuations and risks assessments for their clients. It requires valuers to collect sustainability related information which could potentially impact on value, regardless whether there is direct market evidence. This change in standards is linked to an agreed industry process for improving data collection, from which market values can be more accurately discerned over time.

28 For example, income generators may be the result of incentives, the timing of which is ideally known and fixed but may in reality be uncertain. Changes to feed-in-tariffs for renewable energy in several European countries (UK, Spain) and US states (Hawaii, Arizona) are cases in point.

Valuers are also required to flag up the absence of information, or the failure to provide this information, as a potential risk factor to lenders.[29]

RICS provides valuers with a standardised sustainability checklist for gathering data and modelling. Similarly, the Appraisal Institute (US) has, since 2011, offered a Sustainability Addendum for use with the Uniform Residential Appraisal Report. The three-page form provides appraisers an opportunity to formally recognize energy efficiency improvements as a part of a home valuation assessment. The addendum addresses not only energy efficiency, but sustainability factors such as water conservation measures and public transportation as well. A commercial version is also available.

Graphic 6.1: Appraisal Institute residential sustainability addendum (excerpt)



AI Reports™
Form 820.04*

Client File #: | Appraisal File #:

Residential Green and Energy Efficient Addendum

Client:
Subject Property:
City: | State: | Zip:

Additional resources to aid in the valuation of green properties and the completion of this form can be found at
http://www.appraisalinstitute.org/education/green_energy_addendum.aspx

The appraiser hereby certifies that the information provided within this addendum:

- has been considered in the appraiser's development of the appraisal of the subject property only for the client and intended user(s) identified in the appraisal report and only for the intended use stated in the report.
- is not provided by the appraiser for any other purpose and should not be relied upon by parties other than those identified by the appraiser as the client or intended user(s) in the report.
- is the result of the appraiser's routine inspection of and inquiries about the subject property's green and energy efficient features. Extraordinary assumption: Data provided herein is assumed to be accurate and if found to be in error could alter the appraiser's opinions or conclusions.
- is not made as a representation or as a warranty as to the efficiency, quality, function, operability, reliability or cost savings of the reported items or of the subject property in general, and this addendum should not be relied upon for such assessments.

Green Building: The practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's lifecycle from siting to design, construction, operation, maintenance, renovation, and deconstruction. This practice expands and complements the classic building design concerns of economy, utility, durability, and comfort.[1] High Performance building and green building are often used interchangeably.

Six Elements of Green Building: A green building has attributes that fall into the six elements of green building known as (1) site, (2) water, (3) energy, (4) materials, (5) indoor air quality, and (6) maintenance and operation. A Green Building will be energy efficient but an energy efficient building is not synonymous with Green Building.

Source: Appraisal Institute

Other initiatives in the EU supported by European Commission grant funding (now concluded) were created to narrow the skills gap in the valuation industry. Renovalue[30] created and trialled a training toolkit for property valuation professionals, with particular attention to factoring energy efficiency and renewable energy into valuation practices. ReValue[31] developed standards so that the value of energy efficiency value in residential real estate (private and social) is fully captured.

29 Conversely, there are instances of valuers receiving instructions by lenders to ignore green property features due to the uncertainty in areas such as costs and prices. However, following this instruction would result in a misleading appraisal report that does not reflect the true physical and economic characteristics of the property. See adomatisappraisalservice.com/TAJ_WI15_Feat1-ValuingGreen.pdf.

30 renovalue.eu/

31 revalue-project.eu/

6.3 Lender terms and prudential standards

Surveys made to banks in Sri Lanka suggest a level of mortgage product standardisation for consumer (end-mortgage) home purchases. Present interest rates vary between 7% to 12.5%—the most common rate cited (by six banks) is 9%. Borrowing amounts varies between institutions, with most issuing loans ranging between Rs. 500,000 to Rs. 100 Million, and generally at a debt ratio of 70% to 75% of the total purchase price. It is common to have a payback period of 25 years with 3 to 5 years grace period.

There is less uniformity with commercial (construction) debt. Given the risk, the rates are generally higher than the consumer pricing cited above. Rate and equity contributions are negotiated between sponsors/developers and bank client relation officers. Pricing factors as stated by the bank representatives are client reputation, risk of project, bargaining power of the client/client-bank relationship, and current financial climate.

Based on the discussion points from Section 5 related to capital cost, energy benefit and cost of capital variables, green mortgages may need to move out toward the margins of industry standards and practices, e.g., approving higher debt levels relative to income, or smaller equity contributions relative to the size of the loan. **Additional product modelling and then stakeholder consultation is required to understand the marginal changes needed and regulatory space to do so.** Other features of green mortgages utilised in other countries, such as lower interest rates or longer tenors, may already sit within individual bank discretion. However, at present, the relatively shallow capital market in Sri Lanka and common bank capitalisation practices (i.e., relying on short-term borrowing and deposits) means that securing long-term wholesale debt that would make significant rate or tenor concessions feasible for long tenor loans may require some form of government subsidy or international financial institution collaboration.

Better data on building performance, and locally relevant investigations on the cost and value of green properties, would significantly improve banks' understanding of risk and appropriate product pricing for green property mortgages. This data set will build over time as will understanding of the 'bankability' of the green performance factors. For example, there will be degrees of lender appetite to value all or a portion of the energy and cost savings projected. In a study of multifamily housing properties in New York City that were subject to energy efficiency retrofits, a retrospective review of the universe of properties found that while fuel savings projections ranged from 25% to 50% across about two-thirds of the buildings, most projects actually only saved 10% to 40% from their previous baseline consumption (Deutsche Bank 2012). The report lists a number of potential factors for the mismatch: how much of the associated scope of work was implemented, equipment specifications, the quality of construction and ongoing facility management, and the quality of the energy audit. The conclusion for lenders is to establish a 'cap' on the energy savings against which the loan is written. How this cap is derived will vary, but individual lenders should use both modelled and empirical evidence to support theirs.

It may be that lenders will require independent opinions on energy performance in support of finance it offers. This is not uncommon in energy efficient finance programmes globally. This will then need to be integrated to the underwriting process

in a manner analogous to appraisals. Providing additional energy assessments/green design assessments to support lending decisions may add to underwriting costs an amount commensurate with valuations (and passed to the borrower directly or indirectly). More discussion with practitioners, for example energy services companies (ESCOs), can help situate this cost range.

Note too that it is possible that an individual's energy consumption will rise as buyer/occupants move from substandard to better quality housing. This may be particularly so for low-income groups. In this case, the value of the green property to the owner/occupier may still be higher but quantified in different ways, e.g., occupant health, satisfaction, and comfort. **How lenders should assess these circumstances and assess value is an area that requires deeper investigation.** It may be that the aggregate social benefits are sufficient to warrant public resources to secure the outcome, for example, interest rate subsidies or downpayment assistance. However, even where borrowers are spending more on energy in new premises compared to old, asset value should still improve over time vis-à-vis other new properties lacking green design features.

Lenders will also need to weigh considerations on general market conditions, e.g., will vendors for green materials or renewable energy systems be viable entities over the course of warranty periods. Additionally with on-site energy, lenders will need to consider the different ownership structures (particularly 3rd-party owned) and counterparty arrangements and the effect on credit risk and valuations.

Fortunately, **there is good experience with lending for solar energy for buildings in Sri Lanka, and which may also offer a model from which a green mortgage market development programme could be developed.** One key feature of the programme that should be replicated is the provision of capital but also technical assistance support to improve capacity and accelerate market growth. Capital for solar energy loans made by individual banks comes largely from the Rooftop Solar Power Generation Project (RSPGP), initiated in 2017 between the Asian Development Bank (ADB) and Government of Sri Lanka. Proceeds from this $50 million credit line from ADB to the Ministry of Finance are then disbursed to individual banks[32] for lending to its clients. To ensure the smooth implementation of the investment project, ADB provided $1 million for project readiness activities (plus an additional $250,000 in 2020) to support the preparation of technical guidelines and standards to be used in rooftop solar installations, and the creation of a pipeline of bankable subprojects through the participation of financial institutions. The scheme features below-market lending to accelerate uptake and provides consumer information and protection resources through the Sustainable Energy Authority, a part of the Sri Lanka national government.

32 Participating banks per ADB project documents are: Bank of Ceylon, Commercial bank of Ceylon, DFCC Bank, Hatton National Bank, National Development Bank, Nations Trust Bank, People's Bank, Regional Development Bank (Pradeshiya Sanwardhana Bank), Sampath Bank, and Seylan Bank

7. Developing green property finance products

The target market recommendations that follow are suggested starting points for the finance and development sectors to increase capital flows to green, healthy, efficient, and low-carbon buildings. These will help position the Sri Lanka finance sector alongside broader international trends for green capital deployment.

From the research conducted with property developers and owners, it appears there is **a base level of demand for green commercial (office space) and industrial premises.** These sectors show an understanding of the financial benefits/returns from efficiency features, even if their experience in green new building or building retrofitting is limited. **Other markets with good levels of awareness of the issues are the hospitality sector and industries that export manufactured goods.** In these cases, foreign investors or management partners may be a source of influence if experienced with green building projects or mandates in other markets. Stakeholders engaged suggest that targeting the 'higher' end of the market will generate more green building activity in the near term—that is, higher income residences, offices for large (and international) corporates, export-oriented manufacturers, and 4- and 5-star hotels and resorts. Within higher income household sector of the market, there appears to be tolerance to pay a premium, and health and wellness may be as much or more of a motivating factor than is energy efficiency or other utility cost savings.

Lastly, **the mandate for new public buildings to secure a green certification since 2017 suggests a role for public procurement in shaping the market—both at the building and the material production and supply levels**. Information was not available on the number of public buildings certified to green standards, nor the finance and delivery mechanisms typically employed for these buildings. If, for example, public agencies acting as project sponsors secure construction finance from the private market, and rely on private architects, engineers, project developers, and construction companies, their development activities can seed knowledge of best practices to this wide range of market actors. Even if project capital is sourced from government budgets, and public agencies are the main source of technical and professional skills, learnings from government projects on capital cost increase (if any), energy and other resource savings, payback periods, ability to source healthy materials at equal or near-equal costs to more common but less healthy materials, occupant satisfaction and productivity gains, etc. should be tracked and communicated to the industry at large.

Applying green standards to middle-income or social housing projects and programmes offer key benefits for occupiers that are generally income constrained and would greatly benefit by lower utility bills, not to mention improved comfort and wellness factors. Reaching this segment of the market would likely mean collaboration with international agencies or donors and could be explored by government. The present emphasis from multilateral agencies and international cooperation programmes emphasising a 'green' COVID-19 recovery may make this an opportune time for government and other stakeholders to prioritise green housing and construction programmes. In fact, a newly initiated project in Sri Lanka between three UN agencies is working with key public and private stakeholders in Sri Lanka on a roadmap towards a resource efficient, low carbon and climate resilient buildings strategy.[33]

7.1 Concessional construction finance

To address the gap in green/energy efficiency mortgage finance, targeting development rather than end-mortgage finance is recommended as a first priority.[34] The main reason for this is the inherent programme development and management efficiencies in influencing a small number of developers that are creating a large volume of housing and commercial units, as opposed to engaging with individual buyers who require one-by-one targeting on the value of green property. Though there are good international examples of targeting borrowers/developing products for green construction as well as focusing on end-mortgage finance in low- and middle-income countries, the former is generally seen as a viable market building step.

The construction debt should be provided at concessional interest rates so that the resulting green property price borne by the end-buyer is equal or very close to the cost of competing non-green properties in the market. No dedicated green end-mortgage finance would be required so long as the concessional construction finance creates this cost parity.

The construction finance would be targeted to projects that meet a prescribed energy efficiency or green design standard, and/or utilise an approved list of sustainable technologies and eco-friendly materials which can be independently verified. For the former, this may be one or of the Sri Lankan rating/assessment schemes, or international tools such as LEED (with many certified buildings already in Sri Lanka), or EDGE which is designed for emerging or middle-income markets. Any of these cover a wide range of property types. A technology list approach such as has been utilised for green mortgages in Mexico (Infonavit Hipoteca Verde, further described in Appendix 3) is better suited to the residential sector. Incorporating healthy materials into such a list-based approach to underwriting could draw from the list of certified materials/suppliers from the Sri Lanka Green Building Council and link with UNEP activities on chemicals

33 See: oneplanetnetwork.org/sdg12-resource-efficient-housing

34 For existing buildings and property holders seeking to retrofit buildings to improve energy performance amongst other features, one possible approach with strong international success is an ESCO/energy performance contracting or guarantee where an efficiency renovation specialist takes out project financing and executes a project for the end client (building owner/occupier) and guarantees the level of energy savings (and recaptures the savings to repay the debt). The borrower is the efficiency/renovation service provider, not the owner/occupier.

of concern and product eco-labelling in the building and construction sector presently underway in Sri Lanka. In lieu of a list-based approach for healthy materials which requires technical capacity within lending institutions or assistance of an independent expert body to monitor market activity for these material and adjust the list over time so that better and best practices are ratcheted up, material and indoor air quality credits available under the multi-criteria green building assessment tools should be updated to reflect chemicals of concern guidance and stakeholder activities underway in Sri Lanka.

To reiterate, the cost for green building certification has been cited by market participants as a barrier to uptake of green design and construction. However, such labels are critical proxies for the underwriting process where loan officers lack detailed technical knowledge or assessment capacity of green buildings. Lenders could consider strategies to minimise this upfront cost barrier, for example adding certification fees to the financing so that it is paid back through the loan. Banks could alternatively absorb these certification costs as a means to build market share with a view that lending against green properties carries lower risk.

Where green construction finance targets residential development, underwriters could additionally consider working across business lines within their institutions to develop green end-mortgages for consumers if that is the take-out/exit strategy for the project (i.e., sale of units to individual purchasers to retire the construction debt). The approaches described in the preceding sections, e.g., slightly relaxed debt to income or loan to value ratios, or modest interest rate reductions, could potentially feature in these end-mortgages on the basis of expected occupier utility cost savings and asset quality in event of mortgage default. The European Mortgage Federation provides an excellent resource that overviews the principles and process steps to developing consumer green mortgage development.

Any initiative should be structured to capture data on cost variances, post-occupancy energy consumption, occupant satisfaction measures, and information on any pre-sale or re-sale premiums. This will build evidence for developers, lenders and consumers that green properties can be delivered within reasonable cost tolerances, and that energy and resource efficiency features perform and create savings and value as expected. This will enable the eventual introduction of green end-mortgages to compensate for an expected loss of concessional construction finance following a period of early-stage market growth.

There is a challenge in ensuring that bank engagement with property developers on green design is well-informed and at an early enough stage so that green features can be cost-effectively incorporated. The concessional product will also need to be sufficiently improved over 'business as usual' to overcome inertia to new development processes and generally low-risk attitudes within the industry. Green building generally suffers from "ambiguity aversion", i.e., the uncertainty over the distribution of project returns leads to avoidance even if modelling and research suggests positive financial gains. This means a borrowing rate lower that the projected project IRR—perhaps by several points—may be needed (Bardhan et al 2014). Managing equity constraints of developers may also require consideration and potential application of targeted financial instruments (e.g., debt to equity ratio changes, performance guarantees).

7.2 Potential capital and project finance resources

Potential sources of wholesale/investment capital and support instruments, and finance resources to facilitate trials and accelerate deal flow, should be targeted for early-stage market development. The experience with the abovementioned ADB solar energy programme offers a reference point for a combination of lower-cost capital and technical support to build the market for green finance. Whatever the source, channelling lower cost wholesale capital from for green construction finance can be structured through:

- credit lines extended to individual large developers (including governmental/parastatal organisations);
- credit lines extended to individual financial institutions who on-lend to development projects; or
- a credit facility held by an individual lending institution such as a national or regional development bank or development agency to provide senior or subordinated debt to construction projects.

Concessional capital could also be blended with Sri Lankan commercial bank and investor sources and structured as:

- a single senior project loan at a below market rate,
- a subordinated concessional loan to cover the capex differential between standard and green construction, or
- a project guarantee to cover equity contribution shortfalls (in case of default); or project under-performance (e.g., efficiency savings below modelled ranges[35]).

World Bank/IFC is an obvious target for collaboration in green property initiatives based on their experience in the region and internationally lending to banks and developers for green construction finance (See Appendix 3 for more details).

For commercial banks in Sri Lanka seeking a first-mover advantage and with sufficient institutional capacity, raising capital through a green bond issuance may also be an option. There is good international experience of green bond use of proceeds conditions for sustainable outcomes, e.g., green construction. Cost of capital may not be significantly lower, though experience shows slight improvement on pricing at the margins and access to a wider pool of investors. Real estate makes up only a small proportion of the roughly US$1 trillion market of outstanding 'climate aligned' bonds as tracked by the Climate Bonds Initiative, but the sub-market benefits from clear standards and alignment with increased policy ambition targeting the sector.[36]

35 Several insurance schemes have been developed for markets in Latin America to support investments in building and other infrastructure (e.g., street lighting, solar electricity), providing assurance between financial and energy performance measures. See Green Finance for Latin America and the Caribbean for more information.

36 Climate Bond Initiative's (CBI) Climate Investment Opportunities: Climate-Aligned Bonds & Issuers 2020 report includes a section on real estate. Standards for green building issuances from CBI can serve as a reference for accessing the market and associated practices (use of proceeds, reporting, etc.). Green Bond Principles from ICMA (International Capital Markets Association) also offer a guide on structuring issuances, use of proceeds, and reporting. ICMS guidance lists green buildings as a use of proceeds category with projects eligible "that meet regional, national or internationally recognised standards or certifications for environmental performance."

Lastly, while there is a REIT (Real Estate Investment Trust) law in Sri Lanka, there has yet to be any REITs enter the market. Structuring a REIT on the basis of green labelled properties is a possibility in theory, similar to a green bond approach targeting green project use of proceeds. While evidence is limited, research into a commercial property REIT in North America shows that that when the share of environmentally certified buildings increases by one percent, there is a corresponding 17 basis point decline in corporate bond spreads (Eichholtz et al. 2015). Another study comparing 18 green REITs to 49 non-green REITs, also in North America, offers evidence that performance (efficiency) gains leading to improved operating performance is a significant contributor to green REITs generating a higher return on assets, leading to superior stock performance (Sah et al. 2013).

In its Monetary and Financial Sector Policies for 2021 and Beyond, Central Bank of Sri Lanka have also indicated their support for developing a green finance taxonomy which sets objective criteria for economic activities and sectors that market actors can identify for finance issuance and investment opportunities. A taxonomy is not a precondition for green wholesale capital, green bonds or green REITs, but they are mutually supportive. A taxonomy is a likely accelerant in markets where there has been little or no green capital raising to date. International experience can be drawn upon for taxonomy criteria to apply to buildings and property.

7.3 Underwriting practices

Experience in mature and emerging economies shows that capacity building/training to underwriters to write green loans is critically important. Where project finance initiatives have proven more successful, significant engagement between programme sponsors (internally within finance institutions or externally from wholesale capital sources) and underwriters has featured. By extension, capacity development needs to be targeted at borrowers, too (i.e., developers)—both to build demand for green finance products and also to ensure that underwriters and borrowers are vested in the process and can manage additional or differentiating process features compared to conventional projects.

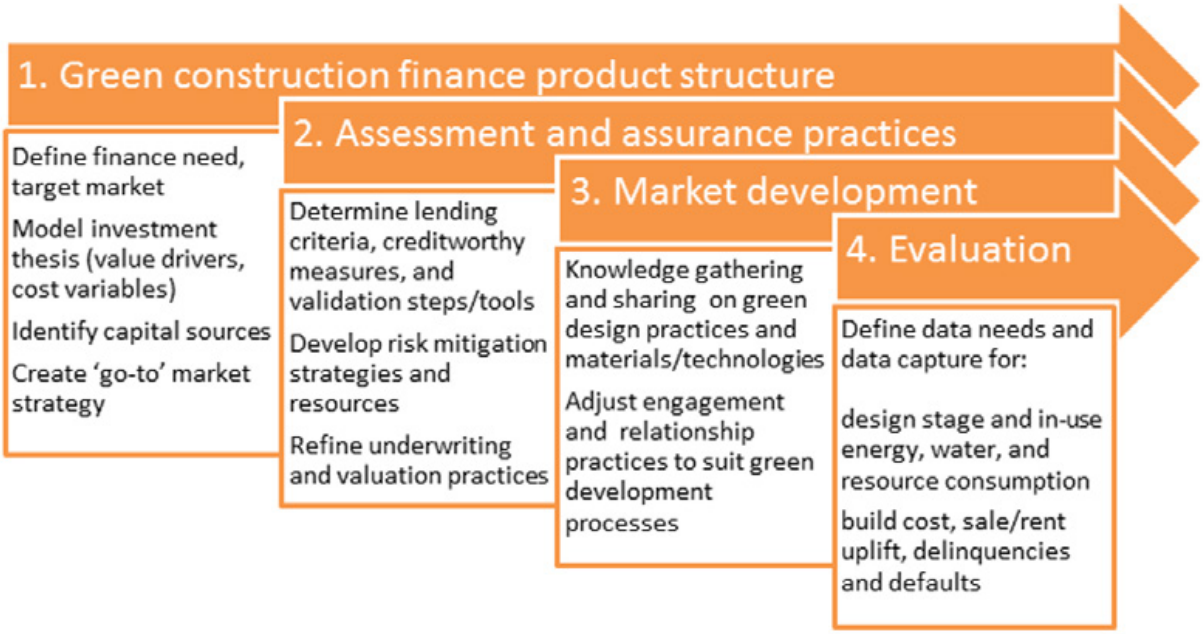
Addressing the skills and capacity gap could be taken up by the several bankers or developers associations, banking regulators, housing and construction agencies, and civil society organisations in Sri Lanka that have shown their interest in and capacity for green buildings and finance. This may also be included in market development activities from financial market regulators.

7.4 A framework for capacity and market development

The framework diagram below, while simplified, show that there are several connected areas which are part of a holistic product development and market building exercise. **Focused effort is needed in creating locally relevant data sets, and costs/benefits and value capture models. While the international evidence base on green value premiums and the role of finance mechanisms in unlocking this value is instructive, assumptions and models need to be carefully calibrated to the local market conditions.**

Figure 7.1 outlines a bank-led process for bringing a green construction finance product to market, as described above. The intent of this project finance is to equalise the cost of construction between green and standard properties and thus end-price to buyers/ occupiers. This will start to build the supply of green properties; create producer and consumer understanding and demand for green properties; and build the evidence base on green building benefits.

Figure 7.1: Green construction finance: product and market development activities



Source: Based on Promoting Energy Efficiency in Buildings in East Africa (UN-Habitat)

Though not a comprehensive list, the following best practice and knowledge and partner resources may be drawn upon to deliver this finance mechanism.

Table 7.1: Green finance product development resources

Product & market development activities	Resources & best practices
1. Green construction finance product structure	▪ International green mortgage products (e.g., from FIs in Mexico, South Africa, India, European Union, etc.) ▪ IFIs and national institutional investors ▪ International green bond market
2. Assessment and assurance practices	▪ Green building tools (e.g., GREENSL, UDA, EDGE) ▪ Green material labels and assessment (GREENSL, USEtox model, NCPC ecolabel) ▪ Performance guarantees and mortgage insurance (e.g., Brazil, Canada) ▪ RICS (UK), Appraisal Institute (US) and RenoValue, ReValue (EU) green valuation checklists and knowledge tools
3. Market development	▪ Sri Lanka Banks Association Sustainable Banking Initiative ▪ Central Bank of Sri Lanka and Colombo Stock Exchange ▪ Green Building Council of Sri Lanka ▪ National Cleaner Production Centre
4. Evaluation	▪ International energy and water audit protocols and post-occupancy evaluation methods ▪ Loan and property performance tracking (e.g., UK government—IFC Market Accelerator for Green Construction programme[37])

While a green mortgage/loan initiative should be driven by individual institutions within the banking sector and finance products tailored by individual financial institutions to their client base, there may be appetite for a broader range of stakeholders to come together and whose input and active participation will be beneficial to build the ecosystem for green buildings and green finance. As an outline only, the table below suggests some of the participating groups and relevant focus areas and issues that could be structured under an overall green building finance initiative, for example as coordinated by one of the financial regulator or banking industry associations in Sri Lanka, a government agency, or an appropriate civil society organisation. Such collaborative efforts should also support the building of capacity and knowledge of all actors along the building value chain on different environmental impacts of the sector, including impacts related to chemical pollution, climate change, or ecosystem degradation. This could also facilitate momentum for overcoming market impasses of low demand and high prices and support increasing the market share of green solutions in the building sector.

37 The programme which aims to build markets for green construction and finance in several middle-income countries includes a research component where market data against green loans is tracked to discern the presence of a green market premia. More information can be found at the UK government development tracker project page for Market Accelerator for Green Construction programme.

Table 7.2: Stakeholders to a green finance market development initiative

Focus area	Stakeholders
Design and engineering guidance and best practices	▪ National architecture and engineer associations ▪ Universities (design and engineering degree programmes)
'Stretch' building codes and standards Integration of green building objectives into NDCs	▪ Ministry of Environment ▪ Ministry of Urban Development ▪ Urban Development Authority ▪ Municipal Councils and Urban Councils
Green building and material standards and certification Green material supply chain and eco-innovation in building materials	▪ Urban Development Authority ▪ Green Building Council of Sri Lanka ▪ National Cleaner Production Centre ▪ Ministry of Industry and Commerce ▪ International standard/certification setters ▪ UNEP
Building and property market data and green building benefits research	▪ University researchers ▪ Sustainable Energy Authority ▪ Institute of Valuers of Sri Lanka ▪ National real estate associations ▪ Green Building Council of Sri Lanka
International best practices in green finance (in products, and institutional practices and sustainability disclosures)	▪ National banking industry associations ▪ UNEP FI ▪ Multi- and bi-lateral development banks and donor funds ▪ Global Alliance for Buildings and Construction
Finance product standards and regulations	▪ Central Bank of Sri Lanka ▪ Securities and Exchange Commission of Sri Lanka ▪ National banking industry associations ▪ International banking and capital markets associations

Appendix 1—Stakeholder consultation summary

Introduction

National Cleaner Production Centre Sri Lanka were engaged to undertake market research and stakeholder outreach to understand:

- market demand for green buildings, presently and what may be induced;
- market supply of green buildings and how the market supply capacity may be grown
- finance market characteristics that may impact the cost-benefits of green property features and design of green finance products, and ability of banks to raise and deploy capital for green properties

The following pages summarise this research and outreach undertaken between the period of December 2020 and May 2021.

The stakeholder viewpoints were gathered through email surveys/questionnaires and online interviews, with information supplemented through desktop literature review. Inputs from the Green Building Council of Sri Lanka, plus government organisations such as the Board of Investment, Industrial Development Board, Ministry of Industry and Commerce, and others were received and helped in identifying stakeholders and data points for assessing levels of green building activity and perceptions. The main stakeholder groups targeted were residents, experts in the field, commercial building owners or occupiers, government organisations, and financial institutions. Over the data collection period a total of 138 interviews were held as summarised below.

Table A.1: Groups and individuals interviewed in the project

Groups	#Interview
Residential interviews[38]	50
Commercial sector interviews	10
Government representatives interviewed	23
Financial sector	10
Representatives from material supply chain and construction companies	45

38 35 respondents were from the Colombo area, and the remaining 15 were from Gampaha and Kandy.

List of consultees (partial)

Commercial building occupiers

- Hayleys PLC—Hotel and Manufacturing sector
- MAS—Textile and Apparel sector
- Hirdaramani—Textile and Apparel sector
- Brandix—Textile and Apparel sector
- Camso Loadstar—Rubber Sector
- Jetwing hotels—Hotel/hospitality Sector
- Kandalama Hotel—Hotel/hospitality Sector
- Finlays Tea Plantations—Tea Sector
- Thalawakele Tea Plantations—Tea Sector

Government organisations

- Central Engineering Consultancy Bureau (CECB)
- Central Environmental Authority
- Ministry of Industries and Commerce
- Industrial Development Board
- Sri Lanka Tourism Development Authority
- Board of Investment (BOI)
- Urban Development Authority (UDA)
- Institute of Engineers Sri Lanka
- Sri Lanka Institute of Development Administration (SLIDA)
- Ministry of Environment

Construction companies[39]

- Maga Engineering
- Prime Residencies
- Kelsey Homes
- Nawaloka Holdings
- Sanken Lanka
- Access Engineering
- JAT Construction

Construction material suppliers

- JAT
- Casuseway
- Insee Cement
- Nippon Paints
- Multilac
- Samson Rajarata
- Royal Ceramic Lanka Tiles
- Hasthi Cement
- Madushika Paint
- Tharanga Grout
- Union Chemicals
- Asian Paints

39 A few additional discussions with small constructors were held, but the consultees preferred not to disclose their names. Eight architects were also consulted and similarly chose not to disclose their names.

Banking sector

- Hatton National Bank
- Bank of Ceylon
- National Savings Bank
- DFCC Bank
- Nation Trust Bank
- Pan Asia Banking Corporation PLC
- Sampath Bank PLC
- Commercial Bank of Ceylon PLC
- People's Bank
- NDB

Summary findings—demand for green buildings

Residential sector

High income residents

- The awareness level of green buildings—average
- Most popular method of financing—a higher percentage of the total finance with personal capital and assisted with housing loans
- Willingness to pay a premium for green buildings—low to average
- Highest concern when purchasing a house—cost, and safety of products used for construction
- Motivation, if any, to consider purchase of a green building—safety

Medium income residents

- The awareness level of green buildings—low
- Most popular method of financing—bank loan
- Willingness to pay a premium for green buildings—low
- Highest concern when purchasing a house—initial cost and recurring cost of utilities and maintenance
- Motivation, if any, to consider purchase of a green building—generally not applicable, but some willingness to add green features such as solar panels and rainwater harvesting to save on utilities

Low income residents

- The awareness level of Green buildings—low
- Most popular method of financing—bank loan (but face challenges in providing necessary documents)
- Willingness to pay a premium for green buildings—low
- Highest concern when purchasing a house—initial cost and recurring cost of utilities and maintenance
- Motivation, if any, to consider purchase of a green building—generally not applicable due to low awareness.

The surveys suggest an overall low awareness of, and priority given to, green features. However, the responses from medium- and low-income households of their interest in utility savings may indicate a latent market for green buildings. These cohorts also rely on bank financing which may create a market opportunity for lenders.

Commercial and industrial sector

Export-oriented companies appear more focused on green building options and benefits than sector peers, for example in tea, rubber, and apparel. Hospitality and tourism also have experience with promoting green features of their premises.

- The awareness level of green buildings—average
- Willingness to pay a premium for Green Buildings—the willingness to pay for green building benefits are highly dependent on management's view of acceptable costs and benefits
- Highest concern when obtaining new building—initial cost, location, and government regulations
- Motivation, if any, to consider purchase of a green building—
  - For commercial entities, occupying green buildings is a marketing tool to promote their products and services to environmentally conscious customers. This is evident within the hotel and hospitality industries. Companies that export products for foreign customers are also concerned about their reputation as an environmentally friendly organization—satisfying foreign customers is a point of interest.
  - The second reason most companies state as an incentive to move to green buildings is the savings on utility. The use of solar panels is a popular solution among these industries.
- The major barriers present with the commercial sector regarding the adoption of green buildings—
  - Low return on investment
  - Lack of regulations to push industries towards green buildings
  - Some industries use green buildings as a marketing tool for their customers but do no recertify their buildings due to the high cost
  - Not all decision makers in the company are aware of the advantages of green buildings
  - The high initial capital to renovate/convert existing buildings to green buildings
  - The lack of incentive to switch towards green buildings

Better data on costs and benefits that can accrue to businesses occupying green buildings can help in building the business case within organisations and help in convincing management to select or renovate premises that meet green building standards. Incentives either through public bodies or that can be offered by lenders (e.g., discounted cost of borrowing) may be useful in seeding market demand.

Public sector

Since 2017, there is a requirement on government and semi-government (e.g., universities) through the Urban Development Authority that new premises and major renovations of existing premises obtain green building certification through the Blue Green Sri Lanka programme.

Data on number of certified projects, their procurement routes (whether utilising public or private finance, design and engineering, and construction and delivery partners), commonly utilised green design features and technologies, and costs and benefits was not made available. Nor was there information available or perspective offered on

whether the mandate has started to shift the market in terms of professional practices, finance availability, material and technology sourcing, etc. that can help narrow the cost gap between 'standard' and 'green' building. Anecdotally, constraints on government approved capital budgets, particularly for renovations, may mean buildings are not achieving intended green building features and performance levels. There also may be a lack of awareness of green building mandates and on green building features within procuring organisations, leading to a slower adoption of the policy than might otherwise be the case.

The role of government procurement in building and accelerating the market for green design and construction can be a significant lever in overall market development but may be lagging in Sri Lanka. This needs to be addressed through improved policies and capacity building. Government organisations that seek private finance for new development or renovations (for example, universities that generate income streams against which entities can be approved borrowers) can be prioritised through their relationships with lenders to raise awareness and evidence on capital costs, credit risks, and cost-benefits.

Summary findings—supply of green buildings

Construction companies

Consistent with other large organisations as described above, large construction companies have an average awareness of green construction and buildings. They frequently add green and environmentally friendly features such as solar panels, natural lighting and safe building materials like lead free paint and other green certified products to the buildings they construct as a marketing tool.

According to interviews, the addition of green features is made in order to target higher income, environmentally conscious residential buyers. Interviewees also indicated modest levels of information requests about material safety (e.g., non-toxicity) used in the construction of the buildings. Commercial clients also make requests for the construction of environmentally friendly features such as solar electric and rainwater harvesting systems, but specifying a 'green building' is rare.

Anecdotally, the buildings that are marketed as green, sustainable and/or environmentally friendly are marketed as such in order to demand a higher price than other comparable properties. The suppliers of such properties believe there is some level of willingness to pay this premium, but it is a small customer base.

To test this hypothesis, some comparison research of apartments was made. The units are for Colombo properties, with data points obtained from interviews and online price listings. US$ value was obtained by dividing Rupee value by 200.

Table A.2: real estate listings and green building comparables

Apartment Name	Location	Area (Sq.Ft)	Selling Price (Mn LKR.)	Price per sq.ft (Rs.)	Price per sqft US$
Fimco Estate (Agent)	Colombo 5	1145	26	22707.4	114
Fimco Estate (Agent)	Mount Lavinia	790	18	22784.8	114
Sea View	Colombo 6	2740	50	18248.2	91
Fimco Estate (Agent)	Ethul Kotte	1040	21	20192.3	101
Fimco Estate (Agent)	Colombo 6	705	18.5	26241.1	131
Fimco Estate (Agent)	Dehiwala	900	16	17777.8	89
Fimco Estate (Agent)	Dehiwala	1275	19.5	15294.1	76
Fimco Estate (Agent)	Mount Lavinia	1307	22.5	17215.0	86
Fimco Estate (Agent)	Nugegoda	1300	27.5	21153.9	106
Fimco Estate (Agent)	Colombo 4	1100	28	25454.6	127
Home land skyline Pvt Ltd	Kahathuduwa	712	11.3	15870.8	79
TWELVE Residences	Rajagiriya	950	24	25263.2	126
Clearpoint	Rajagiriya	5300	150	28301.9	142
Clearpoint	Rajagiriya	4500	135	30000.0	150
Clearpoint	Rajagiriya	2350	72	30638.3	153
Elements	Rajagiriya	1700	52	30588.2	153
Bella Apartment	Rajagiriya	887	23	25930.1	130

Source: National Cleaner Production Centre

Green highlight certified green building

Yellow highlight typical building around the same area (Rajagiriya)

The research was limited and no clear pricing difference emerges. More listing, valuation and price/sale comparison research is needed to make any conclusions. Still, the findings are generally consistent with data and market reviews internationally, that is, there are many constituent elements to market pricing and often separating the green price premium is inexact or inherently difficult to do. This also suggest that differences in capex that need to be recaptured at the point of sale between green and standard properties may not be as great as many industry participants believe to be the case.

The outreach to medium and smaller construction companies suggests that the awareness of green buildings and green building demand in the market is generally low for these companies. They state that their clients focus mainly on the affordability and low maintenance of the household over its lifetime, and that they do not provide nor advocate for many green features unless specifically requested by the client.

It should be noted that the Sri Lankan market features many conglomerates who have capacity as developers and construction companies, and who may also be significant investors in banks and other financial institutions. There should be some leverage points between these market segments and players to accelerate green building supply and green building finance.

Architects and engineers

The design professions can have a significant impact on building style and material selection, but the state of practice within these professions in Sri Lanka does not demonstrate high attentiveness or capacity toward green building. The current trend is to design minimalist buildings that are easy to construct and maintain—this is not necessarily incompatible with green building but does not indicate a high level of integrated design at present. There also seemed to be only modest understanding of the green certification options available and their requirements.

Fortunately, natural lighting and natural ventilation are a part of the local architecture styles, and this vernacular design can be part of a trend amongst practitioners to promote green building concepts. Practitioner discussions did show capacity for integrating green features such as natural lighting, ventilation and solar power into the design of the buildings, but there is a generally cost premium with this and thus needs to be demand driven. (Demand is presently low.) Estimates were for price differences between the construction of a green and standard building to be 8% to 10%. Interviewees believe that there is a gradual decrease in utility usage in green buildings but quantitative data could not be provided.

The Sri Lankan market also features energy services companies or ESCOs who provide energy retrofit engineering and implementation services. This includes installation of solar electric and solar thermal systems, a market that has been accelerated through the Rooftop Solar Power Generation Project (RSPGP), an ADB technical assistance and loan programme initiated in 2017. ESCOs were consulted primarily to gather anecdotal evidence on market conditions that affect the demand for efficiency products and retrofits and green buildings, and the benefits achieved. Data sets and structured studies were not available, but interviews suggested the following:

Table A.3: summary of market conditions for energy efficiency in Sri Lanka

Energy savings achieved	Barriers	Payback period
Ranges between 20 -60%. Activities to deliver efficiencies were categorised as ▪ System upgrades ▪ Energy audits ▪ Awareness raising programmes	▪ Investment risk (high upfront cost) ▪ Uncertain savings / benefits ▪ Low awareness at clients ▪ Lack of the infrastructure for integrating new technologies at certain premises ▪ Lack legal and regulatory push	Variable due to reasons such as the cost of the intervention, and the particularities of the operations. Clients favour a maximum payback period of 6 years.

Material suppliers

Green materials are certified by the Green Building Council through their GREENSL labelling system. Currently there are 34 products that have obtained this green label. A significant number paints and cement, and both product categories have received public attention for their levels of unsafe chemicals. This greater awareness among the public drove up demand for safer building materials and customers seem willing to pay a premium for the products according to material representatives. In practice, price differences appear modest or non-existent between green and standard products.

Most suppliers claim that they have enough supply to provide for the current demand of green construction products and are willing to expand their supply if a higher demand was to develop. Representatives from suppliers that provide green products stated that 10% to 15% of all products produced are green products by volume. Overall, manufacturers and suppliers believe that the demand for green products is low and producing more green products would not yield more returns

One of the biggest issues for green material suppliers is the development, testing and verification of their products to comply with the green certification standards. Most product manufacturers (such as paints, cement etc.) import the raw materials to Sri Lanka and formulate (mix/produce) the product locally. The facilities and funding required to research and develop new products that comply with green certification standards is often lacking within firms in Sri Lanka. There are also limited resources for testing the final product. Amongst many manufacturers, particularly smaller firms, there is concern that green products are more expensive to manufacturer due to the material inputs.

Appendix 2—Green premium literature review summaries

Table A.4: Summary of literature review, higher asset values of green property

Study reference and name	Location and market	Summary of findings
Aydin et al. (2020) Capitalization of Energy Efficiency in the Housing Market	Netherlands, residential market	This study assembles a very large data set by examining sales prices post the 1973–74 oil crisis which had the effect of a) generating consumer awareness of energy costs and efficiency benefits, and b) spurring policy action on building energy codes for successively more stringent performance requirements. It finds that a 10% increase in energy efficiency leads to an increase in the transaction price of about 2.2% for an average home. Somewhat contrary to expectations, the authors find that energy efficiency capitalisation is not significantly affected when information asymmetry is reduced through the presence of an energy performance certificate (EPC). The presumption is that the market is otherwise pricing energy performance, cautioning on the need for costly certification programs.
Phillbrick et al (2016) Moving the Market: Energy Cost Disclosure in Residential Real Estate Listings	United States, residential market	In 2013, Chicago became the first US municipality to enable listing agents to disclose residential energy costs in single-family home sale listings. Preliminary analysis shows that homes disclosing energy costs sold at a higher percentage of the asking price than those that did not disclose energy costs at the time of listing.

Study reference and name	Location and market	Summary of findings
Northwest Energy Efficiency Alliance (2015) Market Valuation of Energy Efficient and Green Certified Northwest Homes	United States (Oregon, Washington, Idaho), residential market	This is a market assessment of newly built certified homes in seven specific metro areas in three states. It uses a statistical methodology based on a comparable sales approach drawn from observed sales prices and other listing and transaction characteristics. Four of the seven geographic areas show premiums ranging from 2.8% to 8.0%; the three others are slightly positive but statistically insignificant. The study also suggests that premiums are higher in flat or depreciating markets rather than strongly appreciating ones.[40] It also follows up 117 properties from a single subdivision assessed in a similar 2009 study that showed an initial sales premium. There were 10 resale transactions in the intervening period and the result indicated that the value premium persisted over time.
Copenhagen Economics (2015) Danish house prices and the effects of energy standards: Econometric approach	Denmark, residential market	In Denmark, reporting a home energy rating (A-G scale) is mandatory when selling a house. The study assesses whether buyers' willingness to pay for higher energy standards relates to the value of the future energy savings. Three different types of statistical models were applied to data on all 300,000 single family homes sold from 2006 to 2014. Using the expected energy consumption of houses in each energy label (A-to-G) as well as the average energy price, the authors could calculate the expected yearly energy savings in kr. per sq. m. For a 100 sq. m. house, a price premium of 149,000 kr. (US$21,000) for every 10 MWh in yearly energy savings was found (i.e., the difference in average energy consumption between a E-labelled and B-labelled house). The authors note that when moving from a B to A rating, the estimated price difference is not statistically significant. The value premiums achieved are below the author's theoretical expectations, perhaps indicating that market barriers remain.
Hoen et al (2015) Selling Into the Sun: Price Premium Analysis of a Multi-State Dataset of Solar Homes	United States, residential market	This study focuses specifically on solar PV. It analyses over 21,000 home sales, 4,000 of which contained PV systems in eight states from 1999 to 2013. It shows home buyers have been willing to pay more for a property with PV across a variety of states, housing and PV markets, and home types—on average, a 0.92% increase in value for each kW of PV installed over the average price of a non-PV home.

40 Lenders can consider this as an asset quality 'hedge', which will be explored further in this chapter.

Study reference and name	Location and market	Summary of findings
Kahn and Kok (2014) The capitalization of green labels in the California housing market	United States (California), residential market	The paper looks at the effect of energy efficiency and green features on consumer choice, using a hedonic pricing analysis of all single-family home sales in California from 2007 to 2012 and concludes green labelled homes transact at a small premium. Adding an incremental value of 2.1% for a certified dwelling (the most conservative estimate) to an average non-labelled transaction price of $400,000 generates some $8,400.This is compared against the estimated cost to reach a modelled efficiency level of 15% and 35% above California's 2008 energy code (between 1,600 and 10,000). Thus on average the value exceeds the input cost for the developer. The paper also models the 'income generating' aspect of a green home (discussed in the next section), and finds a simple payback period of 12 years to repay the investment through energy savings. The authors conclude that based on this length of payback, some homeowners seem to attribute non-financial utility to a green label, explaining part of the premium paid for green homes.
WGBC (2013) The Business Case for Green Building: A Review of the Costs and Benefits for Developers, Investors and Occupants	Singapore, residential and commercial market	A summary of data from Singapore on Green Mark certification shows that the highest level, Platinum, gives a noticeable increase in sale price premiums when compared to Green Mark certified level (27.7% and 13%, respectively). Analysis also found that Green Mark Gold/Gold plus properties do not follow the trend and actually show smaller sale price premiums (9.6%) than that of Green Mark certified buildings. This may indicate a lack of knowledge by the market as to the difference between the various levels of certification. If so, developers will see better returns at the highest and lowest levels than the intermediate—at least until market awareness increases.
UK DECC (2013) Final Project Report: An investigation of the effect of EPC ratings on house prices	United Kingdom, residential market	An evaluation of sales premiums resulting from a home's Energy Performance Certificate (EPC) (A-G scale), from a 300,000 home data set across England between 1995 and 2011. Using Hedonic regression modelling, UK average premiums are found to be 14% (A-B), 10% (C), 8% (D), 7% (E), and 6% (F) (all increases are against a base EPC rating of G).

Study reference and name	Location and market	Summary of findings
Eichholtz et al (2011) The Economics of Green Building	United States, office market	The study uses a sample of 21,000 rental and 6,000 sale buildings. Those with green ratings in 2009 commanded higher rental rates and occupancy rates, and transaction prices that are substantially higher (i.e., 13%) than those of otherwise identical office buildings, after distinguishing among contractual arrangements for the provision of services and utilities, and after controlling explicitly for the quality and the specific location of the buildings. The rental and sales premiums are not strictly comparable but the results suggest that the risk-lowering features of green property (stable tenancies, hedge against future regulations or energy price increases, etc.) are of greater value to investors than additional present property income via higher rents. The timing of the study (2011) finds no evidence that tenant demand for green space weakened during the global recession. Note, too, that tenants of green buildings seem to be indifferent between the types of rental contract, though the economic benefits of a green rating come through somewhat stronger for buildings with a "triple net" lease suggesting tenants prefer incurring utility costs separately.
Brounan and Kok (2010) On the Economics of Energy Labels in the Housing Market	Netherlands, residential market	The authors reviewed a data set of 31,000 homes sold between 2008 and 2009 that had high/above average energy performance rating (i.e., an A, B, or C rating of the EU Energy Performance Certificate protocol). Labelled homes sold for an average premium of 3.7%, over non-labelled homes. "A" rated homes sold for a 10.2% premium, while "D" labelled homes (below the "green" threshold) sold for an average of 5.1% less than non-labelled homes.
Australian Dept. of Water, Environment, Heritage and the Arts (2008) Energy Efficiency Rating and House Price in the ACT	Australia, Australia Capital Territory, residential market	Approximately 5,000 homes are reviewed that had received an energy efficiency rating under the Australian Energy Efficiency Rating (EER) system (a 10-point rating scale of 1 to 5 stars at 0.5 star increments). 2,385 homes garnered an average price premium of 1.23% for each 0.5 EER star in 2005, and 2,719 homes sold for a 1.9% premium for each 0.5 EER star in 2006.
Fuerst and McAllister (2009) New Evidence on the Green Building Rent and Price Premium	United States, office market	Using a data set of nearly 1,300 ENERGY STAR rating buildings and 626 LEED green certified buildings and controlling for specific submarkets, the study shows rental premiums of 6% and 5% for LEED Gold and ENERGY STAR certification, respectively, and sales premiums of 35% and 31% respectively.

Table A.5: Summary of literature review, income generation potential of green property

Study reference and name	Location and market	Summary of findings
Bond and Devine (2016) Certification Matters: Is Green Talk Cheap Talk	United States, multifamily residential market	The study examines the evidence for rental rate premiums associated with green certified real estate, specifically the rental rates achieved by green multifamily properties—a property type considered a gap in the existing evidence base. The authors find an approximate 8.9 % rental rate premium associated with LEED apartments.
US EPA and DOE (2016) Cost & Savings Estimates ENERGY STAR Certified Homes, Version 3.1	United states, residential market	The report summarises the annual purchased energy volumes and costs for a selection of baseline and ENERGY STAR certified homes with different climate and HVAC variables; and the resulting monthly purchased energy savings, monthly mortgage upgrade cost for ENERGY STAR homes, and net cash flow. The monthly mortgage upgrade cost was calculated assuming a 30-year fixed mortgage with a 5.0% interest rate, and purchased energy costs using a national average rate. Energy savings ranged from 19%-25%, and net monthly cash flow (savings over added mortgage costs) from US$23–51.
Devine and Kok (2015) Green Certification and Building Performance: Implications for Tangibles and Intangibles	North America, commercial market	The study looks at 300 commercial real estate assets in US and Canada, and firstly corroborates earlier findings on rental and sales premium for Green labelled buildings between 2004 and 2013. It adds findings on "intangible" tenant satisfaction, lease renewal rates, and utility consumption data. Reported levels of increased tenant satisfaction range between 4% and 20% depending on green label; and likelihood of lease renewal are significantly higher and rent concessions lower—7% average rent concessions in green buildings versus 11% in non-green. Utility consumption data was mixed: water consumption was lower for all labels; energy use was lower is some certified properties but higher in others.
Jasimin and Ali (2014) The Impact of Sustainability on the Value of Commercial Office Buildings in Malaysia: Russian-Doll Model Approach	Malaysia, office market	A study of commercial office buildings in Malaysia shows that differences in rental rates between green and non-green buildings are rather small. The authors suggest the difference is more to supply and demand factors within the specific location rather than green features.
Moore et al (2014) Cost efficient low-emission housing: implications for household cash-flows in Melbourne	Australia (Melbourne), residential market	This research shows net-negative costs for housing designed to an extremely high performance target—a zero emission home. Delivering such a house exacted an additional capital cost of $25,637, or an extra yearly mortgage repayment of $2,117 at an interest rate of 7.89% across 25 years. Energy efficiency cost savings of $1,547 a year were calculated, leaving a gap of $570/year in additional mortgage repayments (all figures $ AUD).

Study reference and name	Location and market	Summary of findings
McGrath (2013) The effects of eco-certification on office properties: a cap rates-based analysis	United States, office market	The study looks at capitalisation rates (lower cap rates are a proxy for low perceived investment risk, reflecting an increasing demand for the product or higher expected income growth rates), suggesting that the value of green properties is derived from factors in addition to current income relative to non-certified peer properties. The results from hedonic pricing analysis suggest that eco-certified buildings exhibit excess capitalisation rates that are roughly 0.365 lower than their non-certified counterparts. The author hypothesises that that there is some expected future increase in net operating income, be it through increased rent potential, decreasing relative utilities expenses, reputational benefits, or risk reduction; and that the risk mitigation related to energy considerations is important to property investors
Enterprise (2012) Enterprise Green Communities Criteria: Incremental Cost, Measurable Savings Update	United States, multifamily residential market	An analysis of 52 affordable housing developments (28% of which were rehabs) with a total of 3,677 dwelling units from across the United States that were built using either the 2005 or the 2008 versions of the Enterprise Green Communities Criteria found that the 20-year lifetime utility savings exceed the cost (a circa 2% premium). The value of energy efficiency/generation was modelled using a 6% discount rate and year 1 energy prices (no future escalation). The median simple payback with all measures is 8.9 years; excluding renewable energy and special systems, such as ground source, thermal mass, etc., the median payback period drops to 3.4 years.
Zalejska-Jonsson et al (2012) Low-energy versus conventional residential buildings: cost and profit	Europe, residential market	The paper studies whether increased investment costs of green buildings are profitable via the reduction in operating costs, based on data obtained by surveys and personal interviews. Sentiment was that low energy buildings were sound investments. Using respondent cost premium indicators (the large majority stated a premium of less than 10%), the author's model shows that if extra investment costs exceed 6% (with assumptions on energy prices) the potential energy savings are insufficient to cover extra initial investment.
Fuerst and McAllister (2011). Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values	United States, office market	The author's hypothesis is that green building investors' holding costs should be lower due to attractiveness to occupiers and that this can lead to a rental premium and/or lower vacancy rates. The results from a sample of 197 LEED and 834 ENERGY STAR against 15,000 benchmark buildings confirm these expectations, with certified buildings having an average rental premium of 4–5%. They also cite evidence from other studies showing that present value of reduced operating costs alone cover incremental construction costs to build green.

Study reference and name	Location and market	Summary of findings
Eichholtz et al (2009) Doing Well by Doing Good? Green Office Buildings	United States, office market	The study assesses over 1,000 ENERGY STAR certified large office buildings that sold or rented between 2004 and 2007. Certified buildings deliver average rent premiums of 3% per square foot and in effective rents (i.e., rents adjusted for building occupancy levels) even higher—above 7%. Average sales price premiums are 16% (all comparisons are between green and standard buildings located within 0.25 miles). Also revealed is that a 10% decrease in energy consumption leads to an increase in value of about 1%, over and above the rent and Value premium for a labelled building. Assessing if premiums are based on energy savings only or whether intangibles also play a role was inconclusive, though the latter appears meaningful.

Appendix 3—Green finance case studies

Green mortgages in Mexico

There are several activities within the Mexican housing development and finance sector with impact on green building practices, particularly in the middle- and lower-income market segments. The Green Mortgage program of Infonavit is the most well-known of these. Other initiatives by SHF, CONAVI, and individual commercial banks have also added to the results achieved.

Infonavit—also known as the National Workers' Housing Fund (Instituto del Fondo Nacional de la Vivienda para los Trabajadores) was established in 1972. It is a private-sector worker's pension fund. Employers are obligated to make it available to all workers, who make 5% payroll contributions to the Fund. Thus capitalised, it originates mortgage loans directly to contributors without intermediation of banks, financing companies or brokers. It originates approximately 70% of all Mexican mortgages.

CONAVI—National Housing Commission (Comisión Nacional de Vivienda). The housing regulator in Mexico, and source of home buying and mortgage subsidies for low-income Mexicans.

SHF—Sociedad Hipotecaria Federal. A National Credit Corporation which operates as a second tier (wholesale) bank with the mandate to develop the primary and secondary markets for mortgage financing consistent with societal needs (i.e., affordability, security of tenure, etc.). Amongst other functions, it provides project finance to developers and retail credit solutions to potential buyers unaffiliated with Infonavit.

Infonavit Hipoteca Verde (Green mortgage)

Infonavit began a green mortgage pilot project in 2007 to help its borrowers incorporate cost-effective energy efficiency features into their homes. At the end of the pilot in 2011, over 630,000 green mortgage loans had been approved, yielding energy reductions of 30–50% compared to homes taking standard Infonavit mortgages. The programme has since become permanent and available nationally to all Infonavit borrowers. Between 2007 and 2014, nearly 1.8 million green mortgages were originated through the initiative.

Hipoteca Verde is structured as generally prescriptive, that is, based on technology and building element options chosen by customers, rather than green building rating or certification based. Homebuyers are granted additional borrowing capacity beyond the standard income and equity ratios to add a 'green mortgage' to finance a range of pre-approved energy, water, and carbon saving features and technologies that can be added to the newly constructed home they intend to purchase.[41] The amount of extra borrowing relates to the borrower's income which is predictive of energy expenditure. A formula is used to scale the amount of the credit they are eligible for to ensure that the borrower's extra repayment does not exceed the energy savings achieved. As lower-income buyers use less energy, they will have less 'income' from energy savings to repay the green mortgage. Thus the amount they are eligible to borrow is smaller compared to a higher-income borrower. The graphic shows this scale, with the third column (Green Mortgage Amount) being the amount of the extra borrowing that is added to the home purchase price/borrowed amount.

Graphic A.1: Minimum savings amounts required for a green mortgage

Income: Times Minimum Wage (TMW)	Minimum monthly savings amount required	Green Mortgage Amount in TMW	
1.00 - 1.59	US$ 7.4	Up to 2	**US$ 302.5**
1.60 - 3.99	US$ 15.9	Up to 10	**US$ 1,512.3**
4.99 - 6.99	US$ 18.5	Up to 10	**US$ 1,512.3**
7.00 - 11.00	US$ 21.4	Up to 15	**US$ 2,268.5**
From 11.00	US$ 29.6	Up to 20	**US$ 3,024.6**

Source: BSHF Building & Social Housing Foundation (2015)

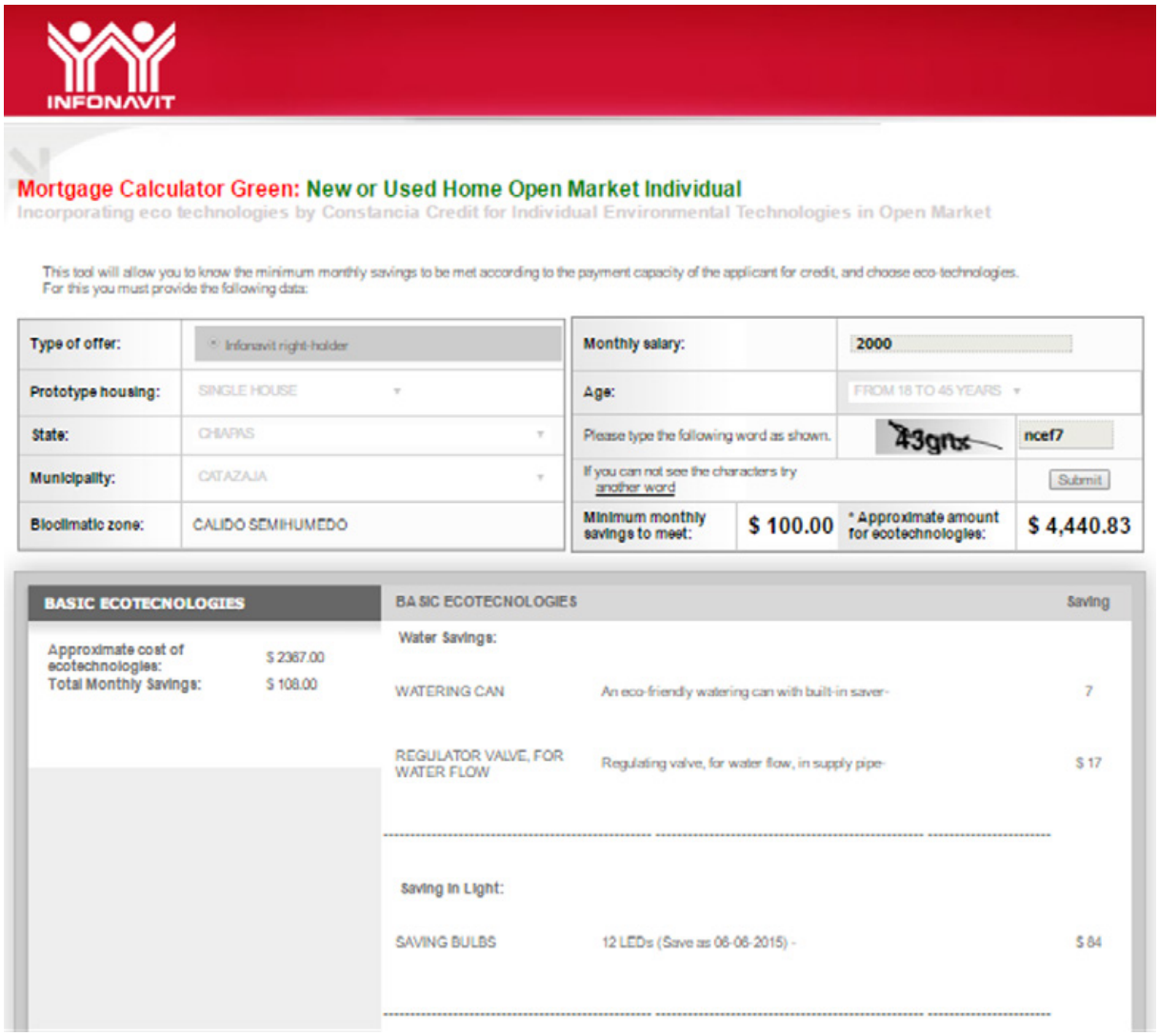
These energy saving calculations are validated through modelling and empirical evidence, which is undertaken every 6 months by external experts. The pre-approved technologies include items such as solar hot water systems, LED lighting, roof and wall thermal insulation, double-glazed windows, water saving taps, flow-control valves, and more. Most families realise savings between US$15–30 per month, which is the net gain over the additional mortgage payment.

Management and evaluation tools have been developed to support the programme as it has grown. An evaluation system (SISEViVe-Ecocasa is its acronym in Spanish) is used to model and measure the energy performance and environmental impact of green-mortgaged dwellings. It uses co-variates such as location and bio-climatic factors, building type, and usage for measuring energy demand, and water and energy consumption. The approved technology list thus accounts for climate variables so that only technologies appropriate to the location (e.g., need for mechanical heating or cooling) are

41 To clarify, it is a single loan taking out by the customer, not two separate loans (i.e., a 'base' mortgage and additional 'green' mortgage).

approved. Infonavit have also created an on-line green mortgage calculator so that individual buyers can see the amount of the green mortgage they qualify for and select the applicable technologies based on their location and borrowing capacity.

Graphic A.2: Screenshot, green mortgage calculator



Source: Infonavit

Infonavit is also responsible for administering subsidies such as downpayment grants that are made available from CONAVI (National Housing Commission) through the National Housing Fund. Interest rates are also below market. Since 2009, all housing receiving CONAVI subsidies must incorporate eco-technologies via Infonavit's green mortgage. Rates start at 4% for CONAVI beneficiaries.[42]

42 Lower-income borrowers who do not qualify for the CONAVI subsidy may also pay below market interest rates on Infonavit loans. With Infonavit's access to low-cost capital via worker contributions, and through fees and repayment income, high-income borrowers cross-subsidise mortgage rates for lower-income borrower. Rate ranges are from 4–10%.

The reach of Infonavit has been a significant factor in the programme's success. With nearly three-quarters of the origination market, it has the leverage to push technology suppliers and developers to lower prices and provide the types of products and technologies it deems needed to meet the green mortgage objectives. At the outset, Infonavit and its industry partners struggled with the lack of standards to regulate the quality and efficiency of the new green products. In response, it worked in partnership with regulatory bodies on appropriate quality standards and auditing protocols, and with the construction sector for training on the correct installation. Awareness-raising initiatives targeting consumers have also featured. This has both built demand for the products and technologies; and also generated better understanding of environmental and financial benefits from green buildings, and post-installation use and maintenance for the efficiency gains to continue.

In creating the programme, Infonavit benefited from donor/IFI support for various project development and management elements such as product and technology assessment, the SISEViVe evaluation system, and sector/supply chain capacity building.

SHF Ecocasa

Ecocasa grew out of a NAMA[43] project to measure the potential of energy efficient/low-carbon housing to cost-effectively meet Mexico's carbon emission reduction targets. The NAMA project designed, built, and assessed three housing prototypes in various Mexico climatic zones: Ecocasa I, Ecocasa II and PassivHaus Level—the latter being the most demanding, based on the German Passivhaus design standard. The Ecocasa Program takes its name from this initial activity

Whereas Infonavit's Hipoteca Verde is based on technology lists, the NAMA concept and subsequent Ecocasa programme is based on whole-house design and performance. This leaves the designer or developer with more flexibility to mix passive approaches and active technologies to meet pre-determined environmental performance metrics—in this case, a minimum 20% GHG reduction from a standard social/low-cost home. Experience internationally shows performance-based systems are more cost-effective than prescriptive/technology-based approaches. It is supported by grants and loans from KfW (German Development Bank) and the Inter-American Development Bank.

Amongst other functions, SHF provides short-term construction finance for Ecocasa projects. Thus the supply of energy-efficient housing is targeted through a 264 basis points interest rate concession to developers.[44] It contracted with five construction companies selected via a tendering process to deliver nearly 28,000 homes in its first phase (end of 2016). The programme includes extensive monitoring during the design, construction, and post-construction stages. Findings from the evaluations show energy bill savings of up to 28%, and an improvement in occupier quality of life and in the thermal comfort to the interior of the homes. The original goal of the program was to build 32,450 EcoCasas by 2023, a number that was easily surpassed several years ahead of schedule. Tallies from 2019 showed that EcoCasa had financed 79 developers to build 66,864 energy efficient homes.

43 Nationally Appropriate Mitigation Actions for greenhouse gas emission reductions, as per the Kyoto Protocol.

44 SHF is also arranging end-mortgages for the Ecocasa homebuyers.

The experience with the programme thus far suggests that most large developer have access to reasonably low-cost credit so the concession is not that meaningful to those companies. Mid-sized developers, however, are more attracted to the concession and the programme has made a point of working with companies of that size. The opportunity to use a green brand/label on marketing the homes has been equally as meaningful to the participants as the concessional loan.

IFI direct investment in lenders and builders

There are several examples in Mexico where IFI credit has been extended to commercial banks and developers for green property project finance. Examples include:

- An IFC term loan (US$22.5 million) to VINTE, a private developer of low- and middle-income housing that builds homes targeting the Infonavit green mortgage market. This focus on green design has resulted in faster sales for VINTE of their units.
- IFC provided the mortgage lender Vertice with a revolving loan equivalent to US$25 million. The loan supports mortgage origination activities to people buying homes that incorporate energy efficiency and other green features.
- For the nationwide homebuilder Urbi Desarrollos Urbanos, IFC and the Canadian Government provided low-cost financing of up to US$105 million to build energy efficient homes for low-income people. The goal is for Urbi Desarrollos Urbanos to construct nearly 36,000 affordable green units annually by 2017.

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IFC/World Bank: EDGE and Green Buildings Finance

International Finance Corporation, the private sector lending arm of the World Bank, provides credit for housing production through finance to developers and commercial banks worldwide. IFC's Green Buildings Market Transformation Program is supported by its own green building assessment and certification tool called **EDGE—Excellence in Design for Greater Efficiencies**.

Graphic A.3: IFC four-part green buildings strategy

Source: IFC

EDGE was launched in 2014. While there are many green building assessment and rating tools in use globally, EDGE offers three significant points of difference from those most commonly used:

- it has a narrower focus for environmental measurement, with certification based on performance in just three key areas: energy, water, and materials;
- it was designed specifically for middle-income and emerging market countries; and
- certification costs and processes are minimised to ensure compatibility with a wide range of market segments, including affordable housing.

EDGE is a web-based software tool accessible from edgebuildings.com/software/. The assessment methodology uses the projects' climate conditions, building type, orientation and design, and product and technical specifications to calculate environmental impact. EDGE offers three certification levels:

- EDGE Certified: buildings that achieve a 20% improvement over a 'standard' greenfield property in the same location in the three impact categories (energy, water, materials).

- EDGE Advanced: as above, but with a 40% energy improvement threshold.
- EDGE Zero Carbon: same as EDGE Advanced, but with 100% renewables on-site or off-site, or purchased carbon offsets to top off at 100%. All energy must be accounted for, including diesel and LPG.

The tool guides decision-making during the design and construction process and quantifies performance on the basis of lower energy and water consumption, and reduced embodied carbon of materials. It also creates a fast reporting mechanism for primary lenders or developers accessing IFC funds as per conditions of the IFC agreement, as well as for other external purposes, e.g., product marketing and corporate sustainability reporting. Note that certification and renewal stages vary by certification level, with details available at: edgebuildings.com/certify/.

Tying the use of EDGE to loan agreements with individual developers, IFC have the means to push borrowers toward better practices that are cost-effective within the terms of the finance agreement. At a country level, IFC and the EDGE team have developed information sharing and capacity building relationships with institutions that can influence the property design, development, and finance sectors. It has initially focused on a handful of target countries (e.g., Mexico, Viet Nam, Philippines, South Africa, Peru, Colombia, and more), but the tool is available for project-level use anywhere.[45]

South Africa

The **Green Building Council of South Africa** (GBCSA), in collaboration with IFC, has designated EDGE as the standard assessment tool for the South African residential market. GBCSA set a seven-year target to certify 20% of the homes brought to market with EDGE by 2022. EDGE certification has also been linked to programmes for lower cost construction finance. Examples include:

- **Absa Bank** and developer **Balwin Properties** have teamed up to offer a reduced-rate 'Eco Home Loans' mortgage on properties that have been certified through EDGE. The loans are available for units at several Balwin developments in Cape Town and Johannesburg.
- **International Housing Solutions** (IHS), a South African private equity firm that partners with financial institutions, real estate developers, private capital groups, and local government authorities to provide equity finance for affordable housing projects. IFC has been one of its institutional investors and has utilised EDGE to certify more than 3,000 housing units.

India

Value and Budget Housing Corporation (VHBC) is an Indian property developer established in 2008, with a focus on the affordable and entry level housing market. In 2012, IFC took an US$11 million equity stake in VHBC for a new development in Bangalore, providing long term equity capital which is not readily available for the affordable housing segment. The subsequent development achieved EDGE certification in 2014, and

45 Summary information on individual EDGE projects can be seen at their website: edgebuildings.com/project-studies/

was awarded the "Best Green Building Project" prize at India's 12th National Convention and Real Estate Awards. The project produced savings of 33% (energy), 39% (water), and 23% (material efficiency) as compared to baseline practices for the locality. Key energy savings features included reduced window to wall ratio; reflective paint for external walls; external shading devices; energy-efficient ceiling fans; energy-saving light bulbs in internal spaces, commons areas, and external spaces; and solar hot water collectors. The project also featured use of insulated form construction technology to shorten delivery times as well as improve material efficiency.

Graphic A.4: Vaibhava Bangalore, developed by VHBC.

Source: IFC EDGE project database

PNB Housing Finance Ltd, a division of Punjab National Bank, received a US$75 million investment in 2015 from IFC via a secured fixed/floating rate 5-year corporate bond. The proceeds from the issuance are being used to finance construction of EDGE-certified residential apartments/buildings. PNB Housing Finance on-lends to housing finance companies who develop the residences.

Colombia

In 2016, **Bancolombia**—Colombia's largest commercial bank—issued a green bond worth US$117 million with IFC as the sole investor. The bond proceeds are used to finance green property development and construction. Bancolombia blends its broader capital resources with capital from the green bond to offer construction debt for green projects at rates between 0.5 and 2% lower than conventional market rates. The higher the environmental aspirations of the project, the lower the rate. More than 25 projects were financed in the first year following the bond's issuance, and a second local currency green bond was issued following the success of the first.

Ecuador

Two of Ecuador's lenders are utilising EDGE (and/or other certification tools) to incentive borrowers to construct or buy green buildings. **Banco Pichincha** offers developers free EDGE certification for smaller projects and free EDGE Expert, EDGE Auditor, and EDGE certification for larger projects as a means to build the project pipeline for green buildings. **Banco ProCredit** is providing developers both discounted rates (circa 0.5% below typical costs) and longer tenor loans for properties built to international green standards. It also offers free technical assistance by an EDGE Expert during the certification process, and may cover up to 80% of EDGE certification costs.

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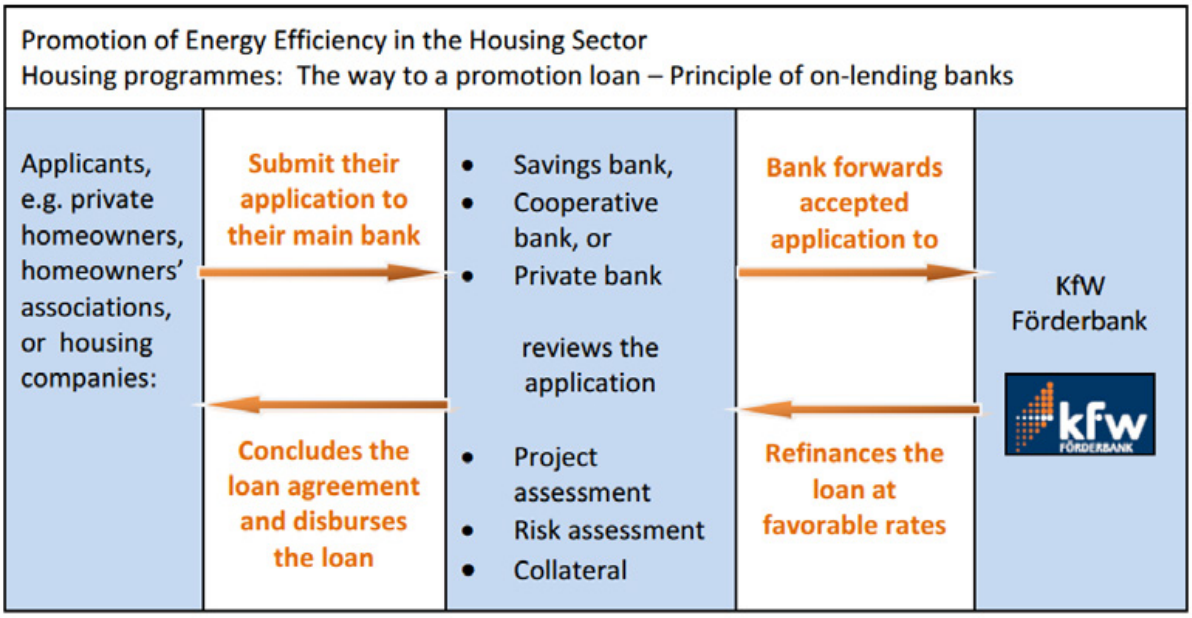
KfW Energy Efficiency Mortgage (Germany)

KfW is the development bank of Germany. Parts of its national mandate include providing housing finance, and credit for projects and initiatives that reduce carbon emissions. To promote energy efficient housing that exceeds German building code requirements, KfW lends a portion of the total mortgage amount at a preferential rate for purchase of new build or existing housing. Exceeding the already stringent standard codes typically requires the use of renewable energy and additional insulation. It is this added cost compared to a code-compliant house that the interest rate subsidy targets. Loans of EUR 100,000 per housing unit are available at lower than commercial interest rates. The concession can be scaled so that the better the energy standard, the more favourable the terms.

The loan is organised through the primary lender so that the borrower is taking a single loan for the property. The borrower sees a single blended rate that combines the lower interest KfW portion with the larger commercial bank portion. Loan servicing rests with the primary lender. Loan underwriting utilises an energy performance assessment tool developed by KfW.

Graphic A.5 KfW energy efficiency loan structure



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Rabobank Groep Obvion NV Green Bond (Netherlands)

Green bonds are a relatively new class of investment instruments and sit within the existing national, subnational, and institutional/corporate bond market. Capital raised from green bonds is designated for investments in sustainable projects or assets. As with standard bonds, issuances can be tied to general revenue, or specific income or asset backed revenues.

Rabobank Groep Obvion is a Dutch mortgage lender. It has a solid history of issuing mortgage-backed notes to investors, typically with five year maturities. The green bond will be a subset of its current STORM bond programme, with properties segregated based on the home energy rating. The first Green STORM bond was floated in middle 2016 and raised EUR500 million. The bond was more than 2x oversubscribed, demonstrating the market demand for green securities. It was the world's first green residential mortgage backed issuance. Groep Obvion has since issued GREEN Storm notes in 2017, 2018, 2019, and 2021.

The 2016 proceeds were used to refinance 2,500 existing mortgage loans originated and serviced by Groep Obvion. The portfolio of securitised assets is comprised of 39 month loans for properties in the top 15% of the Dutch residential mortgage market in terms of energy efficiency, or those that have shown at least a 30% improvement in energy efficiency from time of initial purchase. The most recent issuance in 2021 uses the following standards through which to identify loans for inclusion in the securitised pool:

- residential buildings built before 2021 that have a definitive or provisional Energy Performance Certificate (EPC) of at least A by the Netherlands Enterprise Agency and which are amongst the top 15% of most energy efficient properties in the Netherlands, or;
- residential buildings built as of 2021 that have an EPC Label of at least A++++ to ensure a net primary energy demand which is at least 20% lower than the requirement for Nearly Zero Emissions Buildings (NZEB), or;
- residential buildings that have obtained a definitive Energy Performance Certificate of B or C by the Netherlands Enterprise Agency and that have realised at least a two-step label improvement in energy efficiency compared to the average house built within the same period.

Green STORM bond have been certified under the Climate Bond Standard from a leading NGO in this market space, the Climate Bonds Initiative (CBI). This has created a level of rigour and objective certainty on the use of proceeds and contribution of the funds to meeting climate aims. Obvion also engaged a services consultancy to provide a third-party assurance to review the sustainability criteria and provide investors fuller information on the green label.

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