



Green buildings and climate

Profit, regulation and technology drive efficiency gains

- ▶ **Greening the building stock extends the carbon budget**
- ▶ **Green buildings are achieving rental and resale premiums, lower opex and better occupancy rates**
- ▶ **Green bonds fund energy efficiency improvements and future proof buildings against the risk of stranding**

Buildings consume energy throughout their life cycle. During occupancy alone, demand for primary (heating and cooling) and secondary (electricity for appliances) energy led to 27% of global CO₂ emissions in 2012.

This report illustrates how retrofitting the existing building stock and greening new build can achieve substantial reductions in CO₂. We expect regulation, profitability and technology to be drivers, green bonds can provide the finance.

HSBC estimates annual potential CO₂ saving of 2.84 to 6.21 of GtCO₂ by 2020

Our analysis captures the potential energy savings, and therefore CO₂ savings, from retrofitting the existing building stock and greening new build. We look at two scenarios. First, an ambitious goal of retrofitting the entire global building stock by 2020 whilst greening new build. Second, a more pragmatic approach which takes a much lower annual retrofit rate (3% of the building stock), whilst greening new build. These gains are potentially significant because scientists estimate a gap of 8-10 GtCO₂e between the CO₂ reductions delivered by policy and what needs to be achieved to keep on track for a 2°C world. The scenarios extend the time available to spend the carbon budget by 4 - 5 years.

We think regs, enhanced profitability and technology can catalyse green buildings

Climate regulation is the *stick*, with policies already driving efficiency and pledges to the Universal Climate Agreement likely to provide future catalysts. Enhanced profitability is the *carrot* for developers and occupiers, as green buildings achieve lower operating costs of up to 37%, rental premiums up to 24.9%, occupancy rates up to 23.1% higher and sale premiums up to 31%, and given higher building costs of up to just 7% vs non-green. Technology can be *disruptive* to emissions as cheaper renewables and batteries mean buildings can act as power stations.

Green bonds provide the finance to mitigate emissions and avoid stranding risks

USD45bn has been issued by corporates and public institutions to fund energy efficiency gains and embed resilience in buildings. The Green Bond Principles and Real Estate Guidelines will improve investor confidence, in our view. Investors seeking fixed income investments in green buildings would, until recently, have been limited to investments in the debt of real estate and green building materials companies, but now green bonds are another option - an enabler of green buildings and a way to invest in the theme.

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Summary

- ▶ Retrofitting old buildings and greening new build can make a material contribution to lowering energy use and GHG emissions
- ▶ Climate regulation, enhanced profitability and technology are in place to catalyse the transition to green buildings
- ▶ Green bonds are being issued to fund efficiency, on-site renewables and adaptation, supported by industry principles

In this report, we focus on the energy use and generation of greenhouse gases (GHGs) emissions during the occupancy stage – i.e. when buildings are used or inhabited as opposed to during construction or demolition - where improvements made to buildings can lead to dramatic reductions. The majority of energy consumed by buildings, during occupancy, comes from fossil fuels – coal, oil and gas. This is consumed directly for heating, cooking and hot water, and indirectly, via electricity which was generated by power stations burning fossil fuels.

The first chapter considers how buildings produce GHG emissions during the occupancy phase, within the conceptual framework of the carbon budget. We have constructed two Buildings Transition Scenarios, with different rates of retrofitting, to show the contribution that green buildings can make to emissions mitigation. Our analysis, based on data from the International Energy Agency, leads us to conclude that material savings can be made during occupancy and that this would have the effect of extending the time available to spend the carbon budget by 4-5 years, with emissions savings from our two buildings transition scenarios as per table 1.

Table 1: HSBC's Building Transition Scenarios close the emissions gap

Year	UNEP Emissions Gap in Gt CO ₂	Building Transition 5Y Scenario, savings in Gt CO ₂	Savings on IEA Current Policies Scenario	The Buildings Transition 3% Scenario, savings in Gt CO ₂	Savings on IEA Current Policies Scenario in %
2020	8-10.	6.21	17.5%	2.84	8.0%
2025		7.36	19.3%	5.13	13.4%
2030		8.02	19.6%	6.93	17.0%
2040		9.81	21.4%	10.63	23.1%

Source: Source: HSBC, UNEP, IEA data

The second chapter considers thematic drivers which can catalyse green buildings. We see climate regulation, favourable underlying economics and technological advancements as the supportive drivers. Lastly, we look at how green bonds can ensure that green buildings can be financed to increase efficiency and adapt to the consequences of climate change. The Green Bond Principles and the GRESB Real Estate Guidelines bring consistency and transparency, supporting growth in the sector in our view.

Closing the emissions gap

- ▶ Buildings were responsible for 27% of global CO₂ emissions during occupancy in 2012, providing a major opportunity for mitigation
- ▶ Better glazing, insulation, building materials, heating equipment and appliances mean green buildings achieve lower emissions
- ▶ We estimate retrofitting and low-carbon newbuild could cut total global emissions in 2020 by between 8% and 17.5%

Improving building efficiency cuts CO₂

Buildings consume energy throughout the life cycle, from resource extraction through construction and occupancy to demolition as shown in figure 1 below. According to the IEA energy technology perspectives data, the building sector consumed 33.4% of total final energy consumption during occupancy in 2012. While some efficiency improvements can be made during the extraction, manufacturing and construction phases of the life cycle (by optimising processes in the mining, cement and steel industries for example), we think that energy efficiency measures implemented to optimise energy use during the occupancy phase offer a significant greenhouse gas (GHG) emission reduction potential. We estimate that energy consumed during occupancy of buildings equates to 27% of global CO₂ annually.

Figure 1: Life cycle of a Building



Source: Life Cycle Assessment and Green Buildings - American Wood Council

How do buildings fit in to the energy economy?

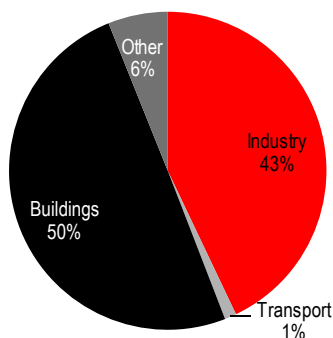
The level of anthropogenic (caused by human activity) CO₂ in the atmosphere is influenced by a variety of factors. Figure 2 on page 7 highlights how buildings fit within the energy system. It shows that buildings consume 14% of primary energy. However, this only tells part of the story. This calculation is based on primary energy use for heating and cooling, which comes mainly from gas, whereas in addition there is also a 'secondary' demand for energy from buildings which is the electricity *supply* required to power lighting, appliances and electric heating. Within secondary energy data, losses through transmission and also through the process of conversion of primary energy sources to power are included. Around half of the electricity generated by the power sector is supplied to buildings for these items, as illustrated by Chart 1. When the 'primary' and 'secondary' demands are added together, buildings account for 33.4% of total global energy use. Figure 2 shows the split of redistribution of energy from the power sector.

Why is this important for climate change?

The global consensus is to aim to keep temperature rises below 2°C versus pre-industrial times. In the Intergovernmental panel on climate change (IPCC) fifth assessment report (AR5), scientists set out a carbon budget that highlighted the likelihood of staying within a 2°C goal (see [Keeping it cool: Oil, CO₂ and the carbon budget](#), March 2015). The IPCC's AR5 concludes that on current political ambition for emissions reduction, global mean surface temperature rises by 2100 will be between 3.7°C and 4.8°C versus pre-industrial times. On current annual CO₂ trends, the carbon budget consistent with a 50% likelihood of staying below 2°C will run out around 2040.

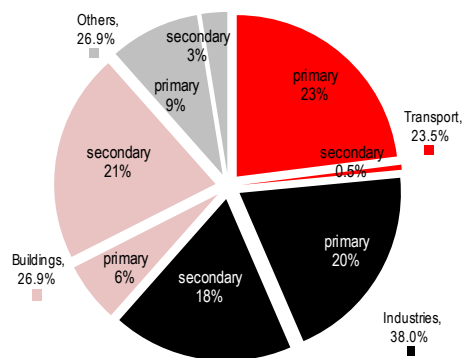
Chart 2 shows that taking emissions from primary energy sources (e.g. heating) and secondary energy use (e.g. electrical appliances), buildings are responsible for 27% of CO₂ from energy use. Therefore reducing energy use in buildings – i.e. increasing their energy efficiency – is important for mitigating CO₂ and extending the time available to spend the carbon budget, thus providing more time to transition the energy system towards low carbon, and finding breakthrough clean technologies.

Chart 1: Buildings use half of secondary energy from the power sector



Source: Energy Technology Perspectives 2014 - IEA

Chart 2: Primary and secondary CO₂ demands by sector



Source: CO₂ emissions from fuel combustion, Highlights (2014 Edition) - IEA

COP 21 (the UN framework convention on climate change conference of the parties) will take place in December in Paris, with the aim of delivering a universal climate agreement (UCA). Countries are already putting forward pledges for emission reduction commitments, but these are shaping the

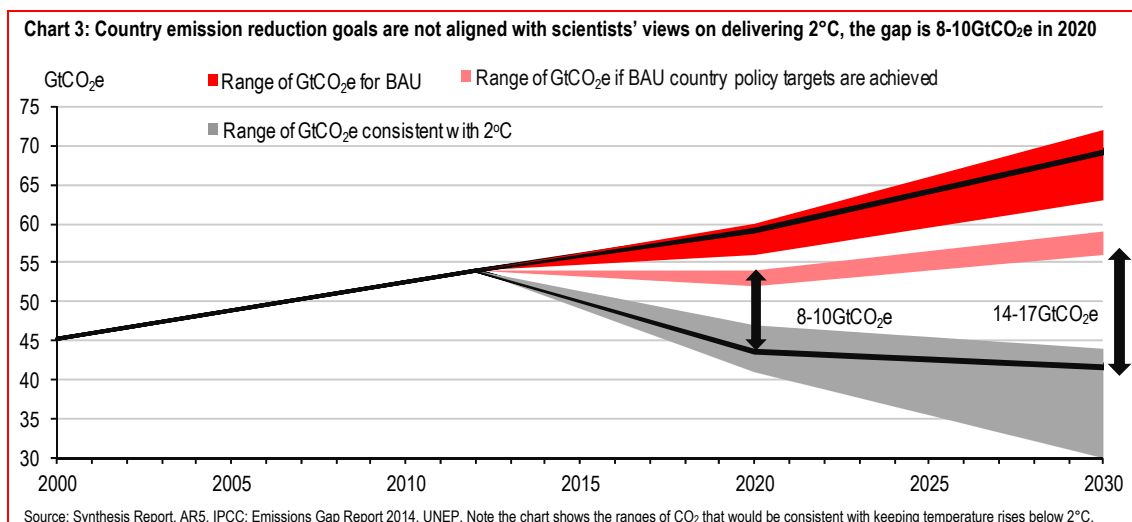
framework for emission reduction goals from 2020 onwards. Between now and then there is a shortfall of ambition versus an emissions trajectory consistent with the 2°C goal.

What is the emissions gap?

The UN Environment Programme (UNEP) examines whether government pledges for emission reductions are consistent with the 2°C goal. The most recent 'Emissions Gap Report' from November 2014, found that there is a gap between the reductions delivered by policy and what will need to be achieved to stay within the 2°C goal of around 8-10 GtCO₂e for 2020. This is a level roughly equivalent to China's total CO₂ emissions from energy use in 2013. In other words, we are on track to overshoot the 2020 emissions levels consistent with the 2°C goal by 8-10GtCO₂e. The various trajectories for business as-usual versus what is consistent with keeping temperatures down are shown in chart 3.

There is an urgency to scale-up ambition on emission reduction between now and 2020 since scaling up in the short term means less cost over the long term, both in terms of additional mitigation required and the costs from the resulting impacts. Put another way, being "off-track" by 2020 would mean even harder work in the post-2020 years to get back "on-track" and to close the emissions gap by 2030 or other future dates.

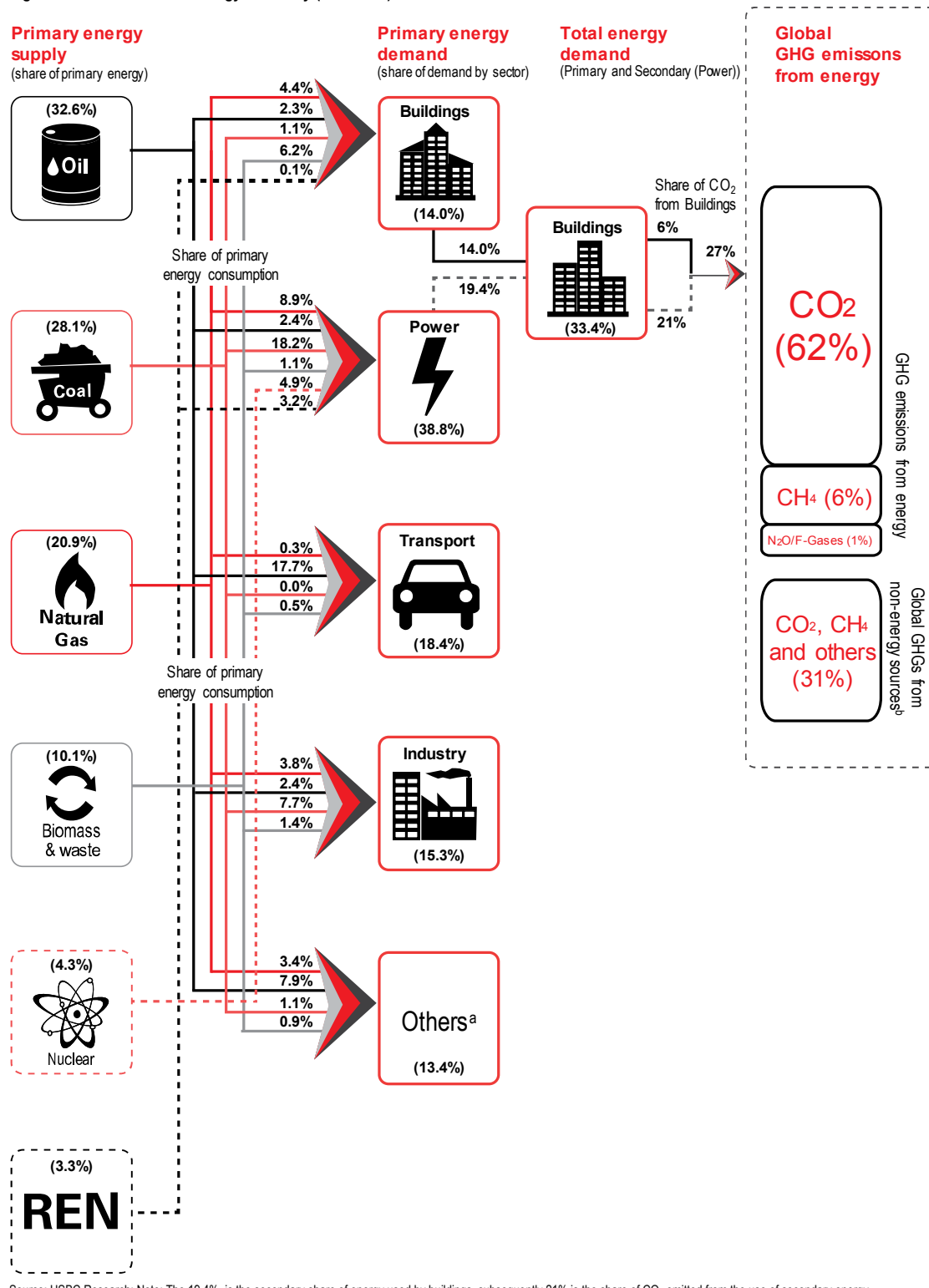
The UNEP report provides a reminder that energy efficiency is a cost efficient way of closing the gap, and estimates that between 2015 and 2030 energy efficiency improvements worldwide could save up to 22-24Gt CO₂ (however, their analysis assumes a carbon price of USD70 per tonne, which seems ambitious in our view). **We believe the real estate sector can help close the emissions gap.**



Greening guidelines are already in place

The US Environmental Protection Agency (EPA) defines a green building as a structure that is environmentally responsible and resource-efficient throughout its life cycle. They estimate that green buildings consume up to 50% less energy, emit 33% to 39% less CO₂, use 40% less water and produce 70% less waste. The UNEP gap report estimates that new energy efficient buildings use 60-90% less energy than conventional buildings of a similar type and configuration because of advances in materials and know how.

Figure 2: The Climate and Energy Economy (2012 data)



Energy efficiency measures for buildings can be introduced from first principles at the design and construction phase and by retrofitting the existing building stock. The major opportunities for efficiency gains exist in the following three areas:

- 1 The buildings envelope (façade, roof, insulation and glass).
- 2 Heating equipment (condensing boilers, air-to air heat pumps and ground-sourced heat pumps).
- 3 Appliances including refrigerators/freezers, washing machines, dishwashers, tumble driers (heat pump) and air conditioners.

If best practices across these categories are implemented at the build stage, the emissions profile of the building would be fixed at a lower rate than would have otherwise been achieved throughout its occupancy (which could be even better if there was a change to a lower-carbon power mix). Thus emissions lock-in is achieved – i.e. a low-carbon asset is likely to be a low emitter for its multi-decadal lifetime. When the differences are accumulated across the world, over a long time frame, the incremental emissions saved can be very large. A European Commission evaluation of retrofitting public buildings found that the average energy savings were 41% per year, with the highest efficiency gains achieved in commercial and leisure centres (55%) and the lowest in healthcare facilities (32%). The potential efficiency levels that can be achieved depend on the location, aspect, condition and physical attributes of property.

The Green Building Programme's 2006-2009 Evaluation studied 286 commercial buildings, retrofitted with low-cost improvements to increase efficiency (predominantly with improvements to heating, air conditioning, the building envelope and lighting). It is possible that in other countries there may be greater or lesser gains than 41% available through similar measures which can be financed through cost savings. We have used this Programme to benchmark efficiency gains achievable through retrofitting because the sample is large, the range of ages and types of buildings included is broad and because efficiency saving improvements in the study were financed through achieved future cost savings, the latter removing a barrier to their wider replication.

Categories of buildings envelope efficiency

Building envelope efficiency is typically measured by a kWh/m² figure, which indicates the amount of energy that a floor will transmit. For buildings this represents how much heat/ cold from the inside will be lost to the outside and how much cold/heat will be let in. Therefore a high figure indicates poor efficiency. Four categories of building envelope efficiency can be defined, as follows (the numbers in brackets are only applicable to temperate climate zones):

- ▶ Standard non-insulated buildings (>150kWh/m²): Dwellings without façade or roof insulation and basic (non-insulated) windows.
- ▶ Basic performance (75 – 150 kWh/m²): Dwellings with basic insulation and simple double glazing.
- ▶ Improved performance (20-75 kWh/m²): These dwellings have significant façade and roof insulation and well-insulated glazing.
- ▶ Near zero performance (<20 kWh/m²): These dwellings are very energy efficient and built according to strict requirements for insulation of façade, roof and windows - sometimes called 'passive houses'.

These guidelines help set a framework for what is best practice. However, the developments of building certification schemes, which are continuously evolving, as shown in table 2, help to provide comparability between properties, which is useful for developers and landlords in maximising the price per m² during rental or sale negotiations. The US green building council estimate that more than 3.6bn ft² of building space was LEED certified in total in January 2015, and that there were more than 69,000 LEED building projects in over 150 countries and territories at that time.

Table 2: A sample of building certification schemes

Rating system	Launch date	Developer	Coverage
Building Research Establishment Environmental Assessment Method (BREEAM)	1990	UK's Building Research Establishment	Education, office, retail, industrial, healthcare, communities, residential, other buildings
Leadership in Energy and Environmental Design (LEED)	2000	US Green Building Council	Education, office, retail, healthcare, communities, residential, core and shell, commercial interiors
Green Star	2003	Green Building Council of Australia	Education, healthcare, industrial, residential, office, retail
Green Mark	2005	Singapore's Building and Construction Authority	Commercial, residential, industrial, hotel, institutional, office, park and public housing
Comprehensive Assessment System for Built Environment Efficiency (CASBEE)	2001	Japan's Institute for Building Environment and Energy Conservation	Residential, office, education, retail, healthcare, industrial, urban blocks, cities
Energy Star (US)	1999	Environmental Protection Agency and the Department of Energy	Residential, office, education, retail, hotel, healthcare, industrial
Energy Performance Certificate (EPC)	2003	European Union (EU)	Residential office, retail, education, healthcare
Association for High Quality Environments (ASSOHQE)	1992	France	Residential office, retail, education, healthcare
German Sustainable Building Council (DGNB)	2007	German Federal Ministry of Transport, Building and Urban Affairs	Residential office, retail, education, healthcare
Standard 5281	2005	Israel Ministry of environmental Protection	Residential, office, educational institution, commercial building, public health building

Source: UN PRI, European Commission, IPEEC

We estimate 2.84 to 6.21 Gt of potential CO₂ savings by 2020

Table 2 above shows a long history of initiatives to deliver environmental gains in buildings which have already been beneficial for energy use, and consequently CO₂, but we believe that scaling up energy efficiency efforts in the buildings sector in the short term could make a significant contribution to closing the emissions gap. As a reminder, the pledges that are being put forward for a universal climate agreement by countries are a framework for GHG emission reduction post 2020. The UNEP analysis calculates an emissions gap, given current policy goals, of 8-10Gt CO₂e in 2020. To estimate the CO₂ savings potential from 2015 to 2040, we have modelled two scenarios incorporating several factors:

- ▶ The volume of the existing global building stock and growth trajectory (in m²)
- ▶ Potential energy saved from retrofitting and in new build
- ▶ Replacement rates for the building stock
- ▶ CO₂ emissions from the building stock
- ▶ Rates of potential retrofitting per annum of the existing building stock

Our analysis aims to show the magnitude of the CO₂ reduction that could be achieved if maximum ambition was employed and what could more realistically be achieved with modest ambition. Below we set out our assumptions and methodology.

1) Volume and growth forecasts of the existing building stock

We have used data from energy focused market research and consultant Navigant as our starting point for estimates of the global building stock. Navigant estimates that buildings represented 138.2bn m² in 2013, which will increase to 171.3bn m² by 2023, equating to an annualised growth rate of 2.17%. To put this into context, a UK terraced house is typically around 100 m², so this growth rate suggests an increase of over 33 million such houses each year, equating to around 1.23x the current UK housing stock, each year.

We have extrapolated the global building stock growth rate from 2023 to 2040 by comparing the 2013 to 2023 ratio of Navigant's 2.17% estimated growth to average annual population growth according to the UN over the same period, which is 1.05%. We have used this methodology, instead of using GDP forecasts for instance, because we believe population growth forecasts are likely to be more accurate in the post 2023 time frame than GDP.

2) Estimates for energy savings from retrofitting and green newbuild

Retrofits: we have used an energy savings rate of 41% for achievable efficiency gains from retrofitting. This is taken from the results of the Green Building Programme, a programme designed by the European Commission's Institute for Energy and Transport to inform energy efficiency policy and drive efficiency gains in Europe. In our view it is a comprehensive assessment of the energy saving potential from retrofitting.

Green newbuild: We have used an energy savings rate of 75% for new green buildings, which is the mid-point of an estimated range of efficiency potential from the United Nations Environment Programme (UNEP). Efficiency gains of 75% are unlikely to be targeted universally since for some countries the potential may be lower, while for other countries some zero carbon buildings might be built. However, 75% is in line with UNEP's estimations for what is achievable. This figure is broadly supported by the differential between standard non-insulated performance for buildings and improved performance, as described on pages 8-9.

3) Estimates on the replacement cycle of buildings

As well as retrofitting and new build, the volume of the building stock will change because some buildings are destroyed and rebuilt. For example, buildings may be replaced when rebuilt for a different purpose, for example a factory may be replaced with an apartment or office building. Larger buildings may be built on plots requiring demolition of smaller buildings, particularly where land prices are a large component of real estate costs. In some cases, health and safety or other social factors may drive replacement. We assume an ongoing replacement rate of 1.5% per year, which is the mid-point of the 1-2% range of the conclusion by a European Commission study on energy-efficient buildings.

We have used the above inputs on volume and growth of the buildings stock estimates, energy savings from retrofit and new build, and building stock replacement rates as the basis of our assumptions for how much CO₂ can be saved. We translate this data into what it means for the carbon budget by building two scenarios for a potential building transition.

1) Building Transition Scenario 5Y: An ambitious five-year building transition programme where the entire global building stock is ‘greened’ in the period to 2020, either by replacement, new build or retrofit. This is rapid, but the idea is to show what could be achieved in CO₂ terms if buildings efficiency was scaled up between now and 2020, the point at which the country goals under a universal climate agreement would come into effect.

2) Business Transition Scenario 3%: A modest building transition scenario whereby we assume that 3% of the global building stock is retrofitted each year, 1.5% of the building stock is replaced per annum, and all new buildings are built to green standards. This is in line with the requirement of the European Union’s Energy Efficiency Directive, which requires that 3% of the public building stock is retrofitted each year in member states. In our analysis, we apply the 3% to the entire building stock because we don’t have granularity of data on the splits between public and private sector buildings at the global level.

At this point in an ideal world we would calculate the energy savings from the two scenarios, look at the types of fuel that power the primary and secondary needs of buildings and use conversion factors to calculate the resulting CO₂ saving. In reality, we don’t have enough data around the regional split of buildings or the energy supply that is fuelling them to do this, so we assume no change in the feedstock mix to the power sector. In other words, the proportions of different fossil fuels and low-carbon energies as feedstocks to the power sector are held constant throughout the forecasting period. (In reality, the power mix is likely to reduce in carbon intensity as the shares of both renewables and gas in the energy mix increase and coal decreases, driven by climate regulation, lower costs and advances in technology.) This makes our results conservative – i.e. greater overall CO₂ gains would be achieved if the primary energy mix is decarbonised throughout the period. Instead, we’ve used CO₂ data for the building stock from the current policy scenario (CPS) from the International Energy Agency’s World Energy Outlook publication as a baseline for the emission reduction calculations. We’ve used the CPS data rather than the new policies scenario data to avoid the double counting of IEA’s policy assumptions on regulatory drivers which apply to buildings versus our own inputs on the rates of retrofit and replacement.

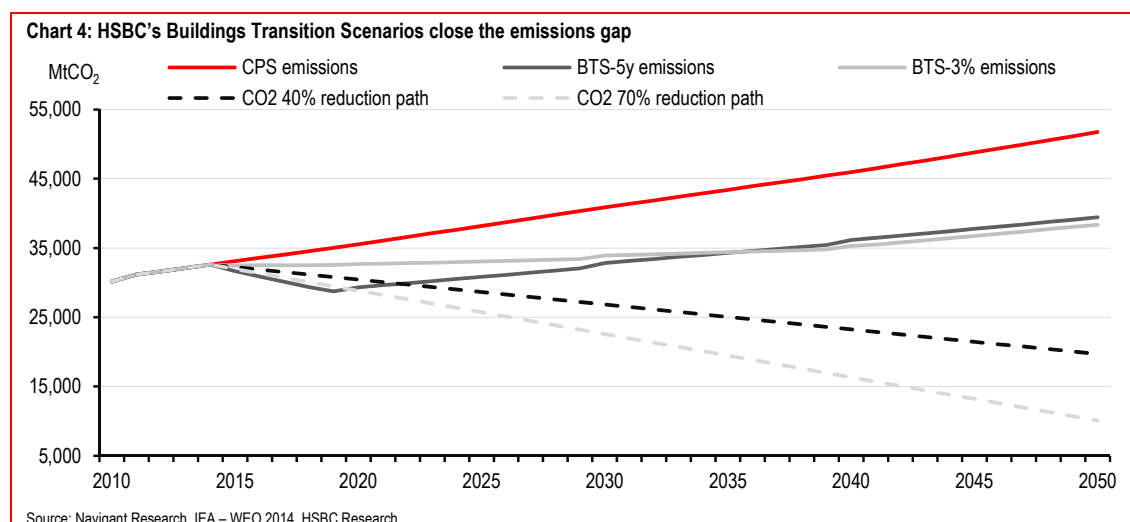
Both scenarios contribute to closing the total emissions gap

We have used the IEA’s ‘Current Policies Scenario’ (CPS) for CO₂ from total energy as a baseline to estimate the CO₂ savings potential which is represented in Chart 4 by the solid red line. It shows that according to the IEA, CO₂ from energy will increase 41% between 2014 and 2040, the end of the forecasting period in the IEA WEO 2015. This conflicts with the IPCC’s guidelines on the scale of emissions cuts required to maintain global warming to below 2°C, which are represented in the two charts below by the two dotted lines.

Building Transition Scenario 5Y: According to our calculations, this ambitious transition programme would result in a CO₂ saving of Gt6.21 by 2020e, Gt7.36 by 2025e and Gt8.02 by 2030e. This is depicted on chart 4 by the solid light grey line. The results are so dramatic because retrofitting is front loaded to upgrade the building stock in its entirety over five years to be completed by 2020. Five years is a rapid timeframe, but demonstrates what could be achieved through such ambition, as it would deliver material savings in the immediate future, and would keep the global emissions trajectory on track with the IPCC guidelines. In this scenario, the emission savings are Gt9.81 CO₂ per annum in 2040 (21.4% lower than the IEA CPS in 2040). According to our calculations, this building transition scenario would extend the time available to spend the carbon budget by 5 years.

Buildings Transition scenario 3%: Under our second scenario where buildings are retrofitted at a 3% rate per annum, substantial emissions are also made as shown in chart 4 by the solid dark grey line. According to our calculations, the CO₂ savings would be Gt2.84 by 2020e, Gt5.13 by 2025e and Gt6.93 by 2030e. The savings from this scenario become greater than the savings in the BTS 5Y in 2036e. This is because in this scenario there are more un-retrofitted properties that become subject to replacement, which has a larger efficiency gain than retrofitting when they are replaced with green new-build. In this scenario, the long-term (2040) emission saving is 10.63 Gt (23.1% lower than the IEA 2040 current policy scenario estimates). In this scenario, the time available to spend the carbon budget would be extended by 4 years.

Our analysis shows that implementing energy efficiency measures to tackle the occupancy stage can make a significant contribution to closing the emissions gap of 8-10 Gt in 2020 and 14-17 in 2030 set out by UNEP. We believe this is a solid step on the way to achieving the cuts needed for a 2⁰C world.



The negotiations this year towards a UCA are focussed on reduction aims starting in 2020, but given the multi-decadal life expectancies of most buildings, investment now will ‘lock-in’ the carbon intensity of the real estate sector in our view. This means that failing to improve the efficiency of the sector means overspending the carbon budget and increasing the likelihood of the unpalatable effects of climate changes, such as droughts and floods (see our report [Scoring Climate Change Risk](#), 24 September 2013). The short term emissions savings achievable by retrofitting over the next five years keep global emissions below even the 70% reduction path until 2020, buying time for other policies to come into force and achieve gains in efficiency.

Data challenges

One issue that we have omitted from our scenario analysis is the level of the building stock that is already green and therefore would not need to be retrofitted or replaced. If we had included this value, the CO₂ savings would have been slightly lower, but to incorporate this we would have needed to make assumptions on how many buildings have recently been built, for instance in the last five years. There is very little data on this however. The most comprehensive data is a LEED publication which found that approximately 330 million m² of US commercial office space is under its schemes. However we don’t

have regional splits, or a breakdown between commercial and residential building stock. On a global basis, the proportion of buildings which are green is likely to be less than in the US, in our view, as buildings in many countries are not built to efficiency criteria or accredited.

Conclusion

The carbon budget is an important tool to monitor whether the world is on or off track to have a good chance of keeping temperature rises under 2°C. A net reduction in emissions is positive because it extends the time available to decarbonise anthropogenic activities. Our buildings transition scenarios incorporate retrofitting for energy efficiency and building new green buildings and extend the time left to spend the carbon budget by approximately four to five years.

Our scenario analysis shows that there is a lot of scope for using energy efficiency in real estate to deliver emission reduction goals. The idea of this analysis was to show what could be achieved if maximum ambition was deployed during the occupancy part of the buildings life cycle. Our analysis showed that on this basis Gt6.21 CO₂ are saved per annum by 2020, and even on a lower retrofit basis, providing new build is green, a saving of Gt2.84 CO₂ is achieved, also a meaningful saving in our view since it equates to between 27% and 35% of the emission gap set out by UNEP. These are the contributions from greening the building stock alone. If these were combined with low-carbon improvements in other sectors, such as the power sector there would be even more meaningful savings.

Sectors and industries that would be most impacted by ambitious retrofitting aims such as these are glass, insulation and efficient building products.

HSBC's buildings transition scenarios show what can be achieved. In the following chapter, we look at the catalysts that can scale up ambition in real estate. We expect climate regulation, favourable underlying economics and technological advancements to be supportive of buildings transition.

Catalysts for change

- ▶ Environmental regulation has already made buildings more efficient, climate goals provide a further boost
- ▶ More efficient buildings are achieving rental and resale premiums, lower operating costs and better occupancy rates
- ▶ Buildings are smarter and cleaner, cheaper renewables and batteries allow low-carbon power generation and energy saving

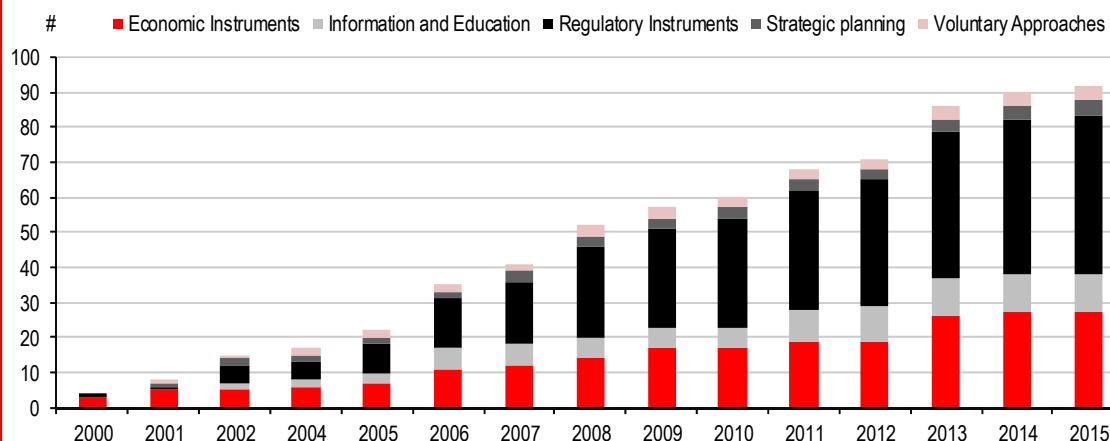
Regulation, profitability, technology

In the last chapter we showed that a shift to greener buildings can make a material contribution to saving CO₂, therefore lengthening the time available to spend the carbon budget. In this chapter, we demonstrate why the climate regulation, enhanced profitability, and technological advances are supportive drivers for the green real estate.

Regulation to provide long term guidance

Environmental considerations have driven standards in the building sector for the last twenty years, as shown in table 3 on page 15. However, we expect an uptick in regulation for energy efficiency more broadly, as countries step up their focus on climate change policy in the run up to a climate agreement in Paris in December. A natural policy decision would be to apply higher building standards in for the real estate sectors in our view given the CO₂ savings potential demonstrated in chapter 1. Although new materials, innovation and technology have provided some of the gains already, in the previous chapter we showed that if retrofit rates were stepped up the energy and CO₂ gains (assuming limited change in the primary energy mix in the short term) would be significant. Momentum in energy regulation for buildings and lighting has continued in the last 14 years as shown in chart 5. Some policies are based around specific standard setting regulation (e.g. energy use per m²) and others have economic incentives such as subsidies, and regulation can be introduced for both the existing building stock and new build. Retrofitting efficiencies are achieved via improvements to the buildings envelope (façade, roof, insulation and glass), of the existing building stock and to heating equipment and appliances. For new build, higher performing standards could be installed at the construction stage which would reduce emissions throughout occupancy.

Chart 5: Cumulative count of energy efficient regulations pertaining to buildings and lighting



Source: IEA - Policy and Measures Database

Table 3: Energy efficiency policies in force since 2000 pertaining to Buildings and Lighting (regulation)

Title	Country	Year	Policy Type	Policy Target
Building energy requirements	Hungary	2015	Regulation	Buildings
National Building Energy Strategy 2015 - 2020	Hungary	2015	Strategic planning	New buildings
Distributed generation	Italy	2014	Economic	New buildings
Energy Efficiency Act 321/2014	Slovakia	2014	Regulation	Cross-industry, Energy Utilities, Multi-Sectoral Policy
3rd National Energy Efficiency Action Plan (NEEAP3)	Czech Republic	2014	Strategic planning	Buildings, Commercial/Industrial Equipment
3rd National Energy Efficiency Action Plan (NEEAP)	Germany	2014	Regulation	Industrial equipment, Residential Appliances
Energy Company Obligation	United Kingdom	2013	Regulation	Energy Utilities, Buildings>Existing buildings, Buildings
Energy savings and renewable energy in housing	Luxembourg	2013	Economic	Energy performance
Green Deal	United Kingdom	2013	Economic	Residential
Building codes	Denmark	2013	Regulation	Building Code
NABERSNZ	New Zealand	2013	Voluntary Approaches	Non-residential
JESSICA	Czech Republic	2013	Economic	Existing buildings
Accreditation of Italian Energy Certifiers	Italy	2013	Regulation	Existing buildings
Warm Up New Zealand: Healthy Homes	New Zealand	2013	Economic	Water heating, Energy Utilities
Certification of energy efficiency of buildings	Spain	2013	Information and Education	Existing buildings
PIMA SOL	Spain	2013	Economic	Existing buildings
PAREER Programme	Spain	2013	Economic	Existing buildings
Energy efficient street lighting	Poland	2013	Economic	Lighting
Qualification of experts in Buildings	Portugal	2013	Regulation	Buildings
System for Energy Certification of Buildings (SCE)	Portugal	2013	Regulation	Energy performance
Licensing of Energy Certification of Buildings (SCE)	Portugal	2013	Regulation	Buildings
Jakarta Regulation No. 38/2012 on Green Buildings	Indonesia	2012	Regulation	Buildings
Amendment 11 to the Energy Efficiency Regulations	Canada	2012	Regulation	Water heating, Residential Appliances
Electricity Saving Initiative	Germany	2012	Information and Education	Residential
Commercial Building Disclosure Program	Australia	2011	Regulation	Non-residential, Lighting
Standby Power Standards	Canada	2011	Regulation	Residential Appliances
Urban Lighting	Germany	2011	Economic	Lighting
ecoENERGY Efficiency for Buildings	Canada	2011	Information and Education	New buildings
ecoENERGY Efficiency for Equipment and Labelling	Canada	2011	Regulation	Residential Appliances, Commercial Equipment, Lighting
Community Energy Efficiency Program	Australia	2011	Information and Education	Existing buildings
ecoENERGY Efficiency for Housing	Canada	2011	Information and Education	Residential Appliances
Low Income Energy Efficiency Program	Australia	2011	Economic	Residential Appliances
Energy Performance of Non Residential Buildings	Luxembourg	2010	Regulation	Building Code, Energy Utilities
6 Star NatHERS Rating for Buildings	Australia	2010	Regulation	New buildings
GreenHouse Gas(GHG) Target Management system	Korea	2010	Regulation	Buildings

Source: IEA - Policy and Measures Database

Broader climate regulation will add to existing efficiency regulations

Implementing policy to tackle energy efficiency as a climate goal will likely affect a broader range of sectors than just real estate (e.g. industry and transport), but implementing energy standards and targets to retrofit the existing building stock are sensible ‘easy win’ approaches, in our view. Talks are in progress for a UCA to be signed in Paris in December 2015, to come into force from 2020 (see our reports [2015: Dissect, Debate, Deliver](#), 7 January 2015 and [Geneva climate talks deliver](#), 18 February 2015). We believe this is the main regulatory event risk on the immediate horizon.

Climate pledges as a catalyst

45 countries, representing 61% of emissions, have so far released Intended Nationally Determined Contributions (INDCs). These are proposals which detail the aims of how each country will tackle climate change post-2020. INDCs set out what countries plan to achieve through national legislation in terms of emission reduction and embedding resilience to the consequences of warmer temperatures, and will all be inputted into the Paris discussions for a universal climate agreement. Table 4 lists the key points of the INDCs released to date. So far, most commitments made have been a positive surprise from a climate standpoint.

Further details on the specifics of country INDCs can be found in our recent notes ([EU: No surprise en route to Paris](#), 12 March 2015, [Switzerland: a good opener](#), 4 March 2015, [Norway and Mexico set out aims](#), 31 March 2015 and [US and Russia set climate aims](#), 1 April 2015, [Minnows maintain momentum](#), 8 May 2015, [Canada sets out pledge for Paris](#), 20 May 2015, [Morocco pledges for Paris](#), 8 June 2015, [Ethiopia first LDC to pledge](#), 11 June 2015, [Korea pledges for Paris](#), 1 July 2015, [China's ambitious climate pledge](#), 1 July 2015, [Singapore signs up to Paris](#), 6 July 2015 and [New Zealand's provisional pledge](#), 8 July 2015).

In many cases, delivering the aims of the INDC will mean transitioning the power sector to low-carbon, but for some countries, such as Switzerland, France and Sweden, which already have very low-carbon power mixes, we expect energy efficiency gains achieved in other sectors to achieve emissions reductions, including buildings.

We continue to believe that countries will deliver a UCA in Paris in December, but that the individual goals will not be ambitious enough at the aggregate level to keep temperature rises below 2°C. Therefore, beyond the INDCs, green buildings would make a significant contribution, as illustrated by our scenario analysis.

Table 4: Summary of INDCs (Intended Nationally Determined Contributions) submissions to date (in order of first to submit to most recent)

Country	Pledge	Target year	Base year	Long-term pledge	Comments
Switzerland	50%	2030	1990	Reduce emissions by 2050 by 70-85% from 1990	Carbon credits from international mechanisms will partly be used
EU	40%	2030	1990	Reduce per capita emissions to 1–1.5 t CO ₂ eq	The INDC is subject to approval by Parliament
Norway	40%	2030	1990	Reduce its emissions by 80-95% by 2050 from 1990	No contribution from international credits
				To become a low emission society by 2050	Target is to be met through collective delivery with the EU
					International market credits will not be used to achieve the target, however it will continue to use CDM and JI
Mexico	25%	2030	2013	Reduce 50% of emissions by 2050, from 2000	Net emissions to peak around 2026, reducing GHG intensity of GDP by 40% by 2030
					Ambition could increase to 40%, subject to a global agreement
					Mexico also highlights adaptation goals in its INDC
USA	26-28%	2025	2005	Reductions of 80% or more by 2050	Will aim to reduce emissions by 28%.
					No contribution from international credits
Russia	25-30%	2030	1990	Russia aims to use the 2030 target as a stepping stone towards developing a low-carbon long-term objective	Commitment to the INDC will be based on the outcome of Paris
					Emission reduction will be subject to the absorption capacity of the Russian boreal forests
Gabon	50%	2025	BAU	Scenarios show >50% is possible. Gabon's forests absorb 4x its emissions, but forest carbon store will not be included in calculations	Adaptation plans focus on the two main coastal towns - Libreville and Port Gentil - incorporating flood defences, biodiversity protection and boosting economic activity
Liechtenstein	40%	2030	1990	None	Absolute emissions down since 1990, against population and economic growth
					Use of international credits permitted under INDC
Andorra	37%	2030	BAU	None	Low emissions intensity and falling emissions over past decade
					98.5% of emissions from power and waste in 2011
					No use of credits allowed under INDC
Canada	30%	2030	2005	None	Intends to account for the land sector using a net-net approach.
					Canada will exclude emissions from natural disturbances.
					May use international mechanisms to achieve its 2030 target
Morocco	32%	2030	BAU	None	Target - 13% - unconditional; 19% - conditional; (Total 32%)
					Target requires USD45bn to implement and is conditional upon USD35bn of int'l finance, and a climate agreement
					Only covers 3 GHGs – CO ₂ , CH ₄ , N ₂ O
Ethiopia	64%	2030	BAU	Long-term vision to become carbon neutral	Equivalent to an absolute decline of 3% by 2030 from 2010.
					Per capita emissions to fall to 1.1tCO ₂ e in 2030.
					Intends to sell carbon credits
					Only covers 3 GHGs – CO ₂ , CH ₄ , N ₂ O
Serbia	9.8%	2030	1990	None	Climate change strategy & action plan to be finalised by 2017
Iceland	40%	2030	1990	Foresees it to be similar to that of the EU	Intends to be a full member of the EU in the future, and hence aims fulfil its fair share of the EU's 40% target
China	Peak	2030	N/A	None	Cut carbon intensity of GDP by 60-65% by 2030 from 2005.
					Non-fossil fuels to be 20% of primary energy by 2030
Korea	37%	2030	BAU	None	Unclear whether target includes land use change and forestry
Singapore	Peak	2030	N/A	None	Aims to cut emission intensity of GDP by 36% by 2030 (vs 2005)
New Zealand	30%	2030	2005	50% below 1990 by 2050	Its 30% target is comparable to a 11% reduction by 1990
					Intends to use global carbon market to meet emissions target

Source: HSBC

Profitability is greater for green buildings than non-green

Regulation acts as a *stick* to drive the growth of green buildings, but we believe the improved profitability of green buildings also provides a carrot, both to landlords to pay for retrofitting and for business to select more energy efficient properties to rent. Increased profitability of green over conventional can be derived from lower operating costs, higher occupancy rates and a valuation premium on sale.

Lower operating costs

The monetary value of lower operating costs that can be achieved from greening buildings is clearly dependent on the amount of energy and water saved and how expensive electricity is to the consumer in the region. According to the World Green Building Council (WGBC) operating costs for green buildings were between 18% and 37% lower for LEED certified to LEED Gold buildings, with better performance achieved overall in relation to energy use, water and waste. Lower energy use also reduces the proportion of outgoings for energy in relation to total cash flows, making outgoings and net yields more predictable for the occupier. Developers are, for these reasons, likely to build green if they believe the building will be more attractive to buyers or tenants given lower operating costs. For similar reasons, owner occupiers are motivated to pursue retrofits as they will benefit from lower, more predictable outgoings.

Higher rent and better occupancy rate

Green buildings can also achieve higher rents. The world green building council find that BREEAM certified properties can achieve rental premiums of up to 24.9%, and that Energy star properties enjoy occupancy rates of as much as 23.1% higher than conventional code-compliant buildings. In 'Why companies rent green: CSR and the role of real estate', Eichholtz et al found that energy efficient buildings can attract 6-8% higher rents than conventional buildings. Real estate companies which lease buildings out are therefore motivated to pursue energy efficiency retrofits to directly lower operating expenses, making buildings more attractive to potential tenants or purchasers.

Occupancy rate characteristics are a key metric for investors in real estate, as periods when buildings are empty – 'void periods' – hit margins directly and can bring yields down below the cost of capital. In weak real estate markets, when demand for property is low, less desirable buildings can be hard to rent at all and so void periods can become very long-term. Eichholtz et al also found that better occupancy rates and higher rents associated with green buildings may be partially due to public relations benefits experienced by occupiers, particularly in the commercial sector, in addition to the favourable fundamentals. In [Seismic Shifts](#), November 2014, HSBC real estate analyst Steven Bramley-Jackson highlighted that investors and tenants are increasingly seeking energy efficiency, green building attributes and greater disclosure of environmental, social and governance (ESG) performance.

Sale premium for green buildings

The World Green Building Council (WGBC) find that premiums in market value range from 0-30% for accredited green buildings in the UK, the Netherlands, Australia, the United States, Singapore and Japan, and that they depreciate less quickly. Eichholtz et al found resale values up to 18% higher, whereas a study from Fuerst and McAllister on the effects of environmental certification on office values found a range of 10-31% higher resale prices from a sample of 292 Energy Star and 30 LEED-certified buildings.

McGraw Hill, which runs real estate indices, found increased resale prices from data covering 62 countries, of 5% for green newbuild and 4% for retrofitted properties. Higher resale values increase the incentive that real estate companies will decide to develop green buildings rather than non-green. As with higher rents values, higher resale values make it more likely that real estate companies will decide to develop green buildings.

Investment payback on energy efficient new build is 7 to 8 years

The economics are favourable for owning, running and selling a green building vs a conventional building, but currently there is a slight increase in build costs. Table 5 contains evidence from McGraw Hill showing that increased building costs of 7% for new build and 5% for retrofitting saw payback over eight and seven years respectively from reduced operating costs.

Table 5: Operating gains from retrofit and new builds

Benefit	New Green Building	Green Retrofit
Decreased operating cost over 1 yr.	8%	9%
Decreased operating cost over 5 yrs.	15%	13%
Additional building costs for green vs. non-green buildings	7%	5%
Increased asset value for green vs. non-green on resale	5%	4%
Payback time for green investments	8 yrs.	7 yrs.

Source: McGraw-Hill Construction, 2013; Note: the statistics are based on data from 62 countries

The WGBE study found that new buildings compliant with green industry accreditations, specifically BREEAM in the UK, LEED/Energy Star in the US, Green Mark in Singapore, Green Star in Australia and Standard 5281 in Israel (described in table 2 on page 9), experience additional costs for design and construction ranging between 0% and 10%, depending on the accreditation and building sector. The same study found that Zero Carbon Homes were 12.5% more expensive.

The combination of higher resale price, higher rent, better occupancy and lower operating costs which offset any additional building costs in a relatively short time period mean that the economic case for green buildings instead of conventional is strong, in our view. Put simply, green buildings are more profitable.

Technological advances facilitate the green buildings transition

In our view, advances in renewable power generation and battery storage increasingly mean buildings can act as mini-power stations at cost-effective levels of investment. Since 78% of emissions from buildings are through secondary energy use, i.e. via electricity used in buildings, the emissions profile of buildings can thus be reduced materially through adoption of these technologies.

Owners can benefit from these advances whether they are off-grid or on-grid. Buildings can generate zero-carbon electricity for their own consumption, storing it for use at later times and potentially selling it via grids to other users.

Feed-in tariffs catalyse property as power station

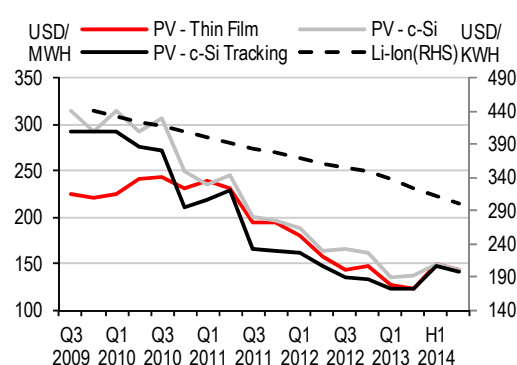
Many countries have established feed-in tariffs: a guaranteed minimum price per unit of power sold back into the grid, often over a fixed-term period. This offers owners of renewables technologies an incentive to sell back into the grid when more power is generated than consumed, in turn providing an economic incentive for buildings to deploy renewable micro-generation.

Battery storage is a game-changer

The fluctuation in power from the main sources of small-scale renewable energy – solar and, to a lesser extent, wind - have typically meant that buildings still need to be connected to the grid in order to maintain a 24-hour, reliable power supply for when their renewables source is not generating power (the sun only shines in the daytime and the wind does not blow consistently or reliably, particularly onshore).

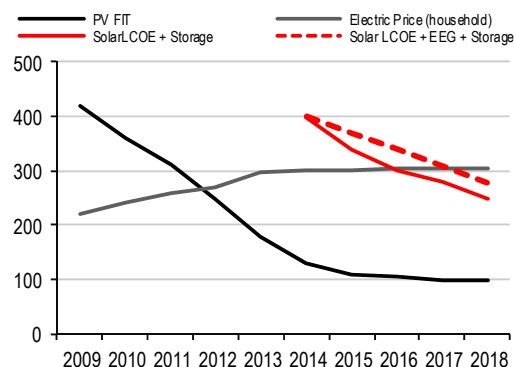
Remote residential and commercial buildings may not be connected to the grid and create their own energy in certain circumstances. Historically, off-grid small-scale generation has been via generators and furnaces, mostly run on fossil fuels. With the development and cost reduction of renewable energies – see chart 6 for the rapid recent reductions in solar costs - off-grid buildings have had greater choices in powering their own buildings.

Chart 6: Costs of solar PV and batteries fall in tandem



Source: BNEF, Global LCOE xls, 14 August 2014; nature Climate Change - Rapidly falling cost of battery packs for electric vehicles, 2015

Chart 7: Cost of solar electricity with storage in Germany is on its way to being lower than the residential electricity price



Source: EUPD, BNEF, Eurostat, E.ON, Federal Network Agency and HSBC Research; Note: PV Fit to decline by 0.5% from Sept 2014 onwards, From 2015 electricity prices are estimated to increase by 1% Y-O-Y

Continued progress in achieving cost reductions in battery storage technologies brings greater opportunities for buildings to be off-grid, as power generated can be stored when generated. Chart 6 also shows how prices have come down for battery storage. This provides a significant catalyst for uptake of renewable energies, in our view, as energy generated can be saved for use when required.

Reducing the demand from the grid for electricity and replacing it with new zero-carbon, localised supply presents an opportunity for emissions from buildings to be further reduced. Furthermore, it lowers energy market exposure from the cost equation for buildings – chart 9 shows how prices have moved over three decades in US natural gas and electricity (the major energy sources for buildings in the US, as per chart 8). Over the last 16 years, gas prices rose by 79% from 1999 before falling 25%. Sufficient battery storage on site would mean no requirement for a grid connection and therefore provide the potential to decarbonise power use in buildings, helping to close the emissions gap. Not needing to pay connection fees and standing charges for a grid connection is also a cost-saving opportunity for developers and owners of buildings.

In [Energy Storage: Evolution in Europe – not revolution](#), 15 May 2015, HSBC Utilities equity research team described the embryonic market for residential battery storage. Chart 7 above shows that the cost of solar and storage in combination is projected to decrease at a rate in Germany such that it becomes cheaper than the residential electricity price (from the grid) as early as next year. Tesla, the automotive and energy storage company, recently launched the Powerwall home battery storage system in the US which has focussed global attention on residential storage.

Chart 8: Natural gas and electricity dominate energy consumption in US buildings

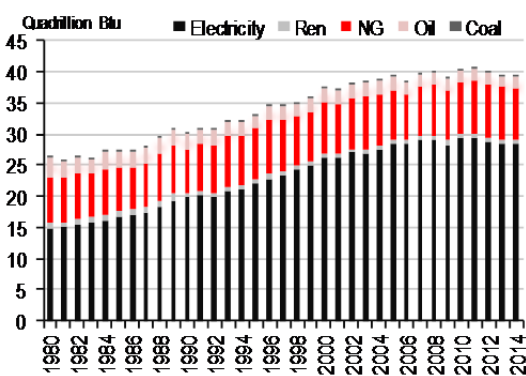
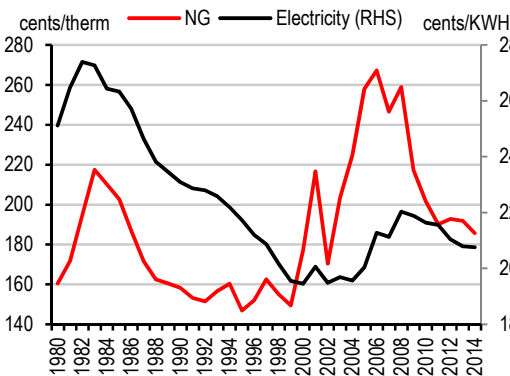


Chart 9: US natural gas and electricity prices paid by buildings



We believe that the proportion of localised power generation facilities using storage will grow strongly as Tesla and other companies, such as Saft (the French battery manufacturer), provide more cost efficient batteries, and that this will provide a further boost to the amount of energy that can be saved, thus making buildings more efficient.

Looking ahead, we believe that advancements in technology and cost reductions will continue to catalyse many parts of the energy economy, on both the supply and demand sides, including in relation to buildings, lowering CO₂ emissions in the process.

Conclusion

In this chapter, we demonstrate that several supportive drivers are serving to catalyse a transition to green buildings.

We believe climate regulation is resulting in efficiency improvements in existing and new buildings, and that this will continue. Regulation will continue to drive efficiency, this year through broader climate principles that countries are pledging to in INDCs ahead of the Paris Conference.

Enhanced profitability offers an incentive to businesses, as green buildings achieve lower operating costs of up to 37%, rental premiums up to 24.9%, occupancy rates up to 23.1% higher and sale premiums up to 31%, set against greater building costs up to just 7%. Such metrics should attract companies and investors to commit capital to green buildings.

Technological advances mean that cheaper renewables and batteries can act as power stations, which is disruptive in that it increases the ability of buildings to contribute to CO₂ reductions. Buildings which generate low-carbon power can use it locally or sell it back to the grid.

In the next chapter, we examine the growth in green bonds as a means to finance green buildings, both new build and via retrofitting, which also gives an opportunity for investors to gain exposure to the green buildings theme.

Financed by green bonds

- ▶ USD3.6bn of green bonds have been issued by real estate companies, USD8.9bn by other sectors and USD33.17bn by public institutions for energy efficiency improvements to date
- ▶ Green bonds can be used to fund energy efficiency improvements, on-site renewables and also adaptation
- ▶ The Green Bond Principles and GRESB Real Estate Guidelines bring consistency and transparency, supporting growth

Green bonds can finance the transition to green buildings

In the first chapter, we calculated the potential CO₂ savings from green buildings as a means to close the emissions gap. In the second chapter we highlighted climate regulation, favourable economics and technological advances as the current catalysts for growth in green buildings. In this chapter, we look at the use of green bonds as a mechanism to finance green buildings and build in resilience to the consequences of climate change.

Green bonds are a relatively new fixed income category. In [Green Bonds: More to come](#), 08 May, 2015, we explained how green bonds provide a robust mechanism for entities to raise finance aligned with sustainable growth. More broadly, green bonds are an important means of scaling up the amount of finance required to stay within the carbon budget and continue to aim for a 2°C world.

Implementing the energy efficiency improvements to the building stock requires finance. A 2013 study from Wharton Business School estimated that the investment requirement for green buildings in the US alone is likely to rise from USD85bn in 2012 to USD200bn by 2016, including both new and retrofits. This provides scope for substantial green bond issuance as green bonds can unlock potential for municipal authorities, supranationals and real estate companies to raise funds to develop and retrofit buildings, make them more efficient and improve environmental performance.

Green bonds are now embedded in capital markets as a means to finance low-carbon sectors of the economy. In 2014, total issuance was c.USD38bn, up from c.USD11bn in 2013, with the number of issuers tripling to around 70 with a fivefold increase in capital raised by corporates. Some real estate companies have already issued green bonds, with larger issues from Regency Centres, Unibail-Rodamco and Vornado as shown in table 6. Chart 10 shows that, in aggregate, Unibail-Rodamco is the largest real estate company issuer to date, accounting for 44% of the total issuances. Many real estate green bonds address climate change via energy efficiency measures and renewable energy – i.e. by seeking to mitigate emissions and therefore climate change.

Table 6: Green Bonds Issued by real estate companies to date [why is there a column with currency and why does the “amount issued” column say USDm?]

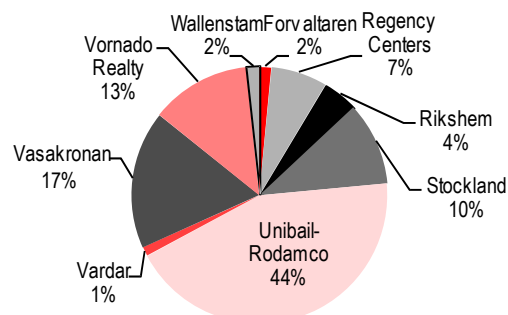
Issuer Name	Currency	Amount issued (USDm)	Maturity Date	Coupon	Use of proceeds
Forvaltaren	SEK	55	2019	0.36%	Green building LEED accreditation BREEAM accreditation Reduce energy use by 25%
Regency Centers, L.P	USD	250	2024	3.75%	Sustainable Sites Water Efficiency Energy & Atmosphere Materials & Resources Indoor Environmental Quality Innovation & Design Process
Rikshem AB	SEK	15	2016	0.49%	Green property renovation
	SEK	33	2017	0.48%	
	SEK	27	2016	0.43%	
	SEK	42.35	2018	0.25%	
	SEK	42.35	2018	0.40%	
Stockland	EUR	378	2021	1.50%	Achieve 4, 5 or 6 Green star rating Capital projects - energy efficiency, waste and water management
Unibail-Rodamco	EUR	1,014	2024	2.50%	Uplift human rights and governance
	EUR	530.94	2025	1.00%	Promote development and the well-being of communities Monitor the environmental impact Promote responsible relationships with tenants and visitors Maintain relationships (ESG) with suppliers
Vardar AS	NOK	41	2019	3.55%	Green activities
Vasakronan AB	SEK	45.65	2016	1.77%	LEED accreditation
	SEK	47.83	2018	0.37%	BREEAM accreditation
	SEK	68	2019	0.32%	Green building
	SEK	152	2016	0.20%	Investments in energy efficiency
	SEK	152.18	2016	0.17%	Green IT
	SEK	155	2019	0.72%	Renewable onsite energy
	SEK	55.08	2019	2.47%	Water management Infrastructure for electric cars Building resilience to climate change
Vornado Realty	USD	450	2019	2.58%	New building developments LEED accreditation Capital projects
Wallenstam AB	SEK	58.93	2019	1.03%	Renewable energy
Total Issued		3,613			

Source: Bloomberg, Company Websites

Investors seeking fixed income investments in green buildings would, until recently, have been limited to investments in the debt of real estate companies and building materials companies adjudged to be green or materially exposed to the theme. Green bonds bring another option - they are both an enabler of green buildings and a means of investing in the theme.

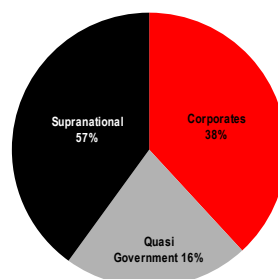
As the market grows and issues become more liquid, green bonds will become an increasingly viable means of raising finance for green buildings, in our view, whether new-build or through retrofitting. Table 7 lists government and supranational issuers (development banks) which have raised capital in 2014 and 2015 to fund improvements to water, waste and energy efficiency, including in publicly owned

Chart 10: Share of the total amount outstanding from issues made by real estate companies



Source: Bloomberg, Company Websites

Chart 11: Green buildings and energy efficiency issues by issuer category, USD equivalent



Source: Bloomberg, Company Websites

Table 7: Governments and supranationals to have issued energy efficiency / real estate green bonds in 2014-2015

Issuer Name	Industry Group	Amount issued (USDm)	Renewables	Fuel switching	CCS	Waste-to-energy	Energy efficiency & management	Environment & land use management
Region Ile de France	Government	1,363	✓				✓	✓
African Development Bank	Supranational	310	✓		✓	✓	✓	✓
Agence Francaise de Developpement (AFD)	Government	1,314	✓				✓	✓
Asian Development Bank	Supranational	123	✓		✓	✓	✓	✓
British Columbia	Government	217					✓	
City of Gothenburg	Government	269					✓	✓
City of Orebro	Government	104	✓				✓	
Commonwealth of Massachusetts	Government	350					✓	✓
Department De L'essonne	Government	50					✓	
European Bank for Reconstruction & Dev	Supranational	615	✓	✓	✓	✓	✓	✓
EIB	Supranational	7,499	✓				✓	
World Bank	Supranational	3,824	✓	✓	✓	✓	✓	✓
International Finance Corporation (IFC)	Supranational	357	✓				✓	
Johannesburg	Government	137	✓			✓	✓	✓
Kommunalbanken AS (KBN)	Government	500	✓	✓	✓	✓	✓	✓
FMO	Government	537					✓	
Nordic Investment Bank (NIB)	Supranational	669	✓				✓	✓
NRW.BANK	Government	629					✓	
Ontario	Government	460					✓	
Overseas Private Investment Corporation	Government	126	✓	✓	✓	✓	✓	✓
State of North Rhine-Westphalia	Government	28		✓		✓	✓	✓
Stockholms läns landsting	Government	154					✓	
Transport for London (TfL)	Government	603					✓	✓
Total Issued		20,238						

Source: Bloomberg, Company Websites

buildings and facilities. Government issues have all been at the sub-national level, totalling USD7.14bn and the development banks have issued bonds to the value of USD26.03bn. Chart 11 shows the percentage shares for categories of issuers – supranational are the largest in this space to date. Looking ahead, we expect ECB QE buying and future regulatory drivers, such as preferential treatment of green bonds from certain issuers under the Basel III Liquidity Coverage Ratio rules, to boost demand for green bonds. The nascent market is also underpinned by the Green Bond Principles, discussed later in this chapter.

Future-proofing buildings against climate stranding risks

We believe that climate change puts buildings at risk of becoming stranded assets. Green bonds can raise the finance needed to adapt building and mitigate this risk.

Stranded assets can be defined as those which have suffered from devaluations or conversion to liabilities prior to the end of their economic life. In [Stranded Assets: what next](#), 16 April 2015, we looked at how fossil fuel companies, or some of their assets, may become non-viable or ‘unburnable’ because of a number of factors: a significantly increased cost of carbon, driven by regulation; the dramatic fall in energy commodities, in particular oil benchmarks, and; efficiency gains and technology drivers.

We think this is relevant for the global building stock because much of it was built before the consequences of warmer temperatures were either predicted or understood, meaning resilience to more extreme weather may be insufficient. Buildings which suffer damage from extreme weather events or climatic changes linked with global warming, such as sea level rise, as well as those which are at greater risk of such damages, may also become uneconomical to repair, physically stranding them. Some buildings facing climate-related risks may also be refused insurance, meaning buildings are no longer tenanted or maintained. These are also effectively stranded assets, where demolition or abandonment may again be cheaper than continued ownership.

In the UK, for instance, where flooding has increased in recent years, the government has stepped in to ensure flood insurance is provided to high risk properties via a new mechanism, Flood Re, as the market would be unable to guarantee cover. This scheme pools high risk properties and places a levy on every home insurance policy, amounting to approximately 2% per premium, to spread the risks across insurers.

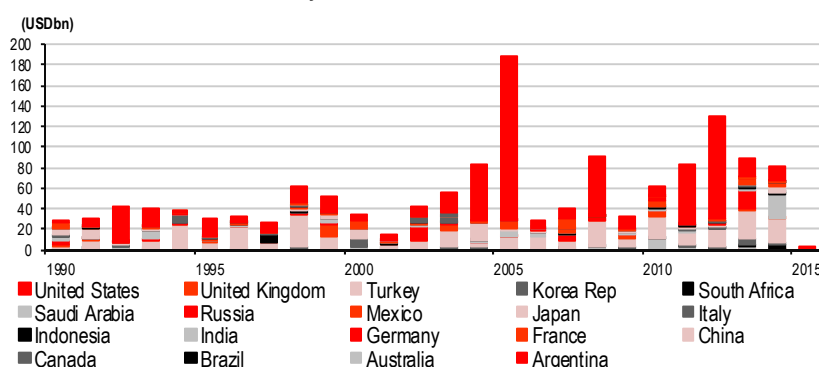
Financing adaptation with green bonds

Buildings which are more expensive to run and/or which have relatively poor environmental performance may be harder to let and could sit empty during economic downturns when demand for many types of property decreases. In Chapter 2, we cited studies which showed occupancy rates to be worse at non-green buildings. Empty properties can be more expensive to insure and may become dilapidated. Such buildings which are not occupied could also be described as effectively ‘stranded assets’, where continued ownership is no longer economical.

Rikshem and Vasakronan are the first issuing real estate companies to include adaptation of buildings to climate change amongst the uses of proceeds. Green bonds hereby enable real estate owners and developers to cope with climate change, as well as making a material contribution to closing the emissions gap and extending the time to spend the carbon budget.

For issuers, raising the capital is about future-proofing portfolios against physical manifestations of climate change, including a higher frequency and severity of extreme weather events. Chart 12 shows the cost of natural disasters incurred by the G20. Further illustrating the scale of the risk, figures from insurer, Munich Re, show insured losses from natural catastrophes of c.USD31bn in 2014 (previous year USD39bn), out of total losses of USD110bn (previous year USD140bn).

Chart 12: Rising costs of natural disasters incurred by the G20



Source: International Disaster Database, Centre for Research on the Epidemiology of Disasters (CRED); Note: 2015 YTD data is till 15th May 2015; Disaster types: Drought, Extreme temperature, Flood, Wildfire, Storm

Buildings adapted to meet the challenges of climate change must therefore be improved to withstand extreme weather – floods, droughts, storms, extreme heat, heavy snowfall, extreme cold – particularly in areas where such events are more likely to occur in the future. Even more modest temperature variation will bring new heating and cooling requirements to buildings and therefore different energy profiles. A secondary effect of extreme weather events may be disruption to services. Resilience to power blackouts is also therefore part of adapting buildings to climate change, which may mean local or backup generation.

We believe green bonds provide a means of capitalising necessary improvements to buildings and in the future more issuers will include adaptation amongst eligible project categories for their use of proceeds. In our view, such improvements mean buildings are more likely to be occupied, more likely to be insurable and therefore face lower risks of becoming stranded assets.

Green bond principles and real estate sector guidelines are supportive

The Green Bond Principles (GBPs) were launched in early 2014 and updated in 2015. Shortly after their launch, the Global Real Estate Sustainability Benchmark (GRESB) released the Green Bond Guidelines for the Real Estate Sector (GRESB Guidelines)

The GBPs are an important element of the successful growth of this market, in our view. An Executive Committee composed of investors, issuers and underwriters oversees the GBPs and seeks to ensure transparency, disclosure and integrity. The GBPs were updated to provide greater clarity on what can be expected from issuers. Green bonds must follow principles relating to Use of Proceeds, Process for Project Evaluation and Selection, Management of Proceeds and Reporting in order to qualify (all discussed in greater detail in [Green Bonds: More to Come](#), 11 May 2015).

The GRESB Guidelines provided sector specific guidance for issuers and investors by providing a framework which: (1) identified green project eligibility, (2) implemented and managed investment proceeds and (3) communicated outcomes.

Green building certification schemes, such as those described in table 2, are considered by GRESB to be suitably well-established to act as a framework for addressing necessary attributes. The GBPs describe a list of Eligible Green Project categories. Specific to real estate, the GRESB Guidelines cite eligible green projects as including new development projects, land preservation easements, retrofitting underperforming buildings and refinancing existing high performance buildings.

GREEN BOND CASE STUDY – Vasakronan

Swedish commercial property company Vasakronan is the most frequent issuer of green bonds in the real estate sector to date, with seven green bonds between 2013 and 2015 and values between SEK300m and SEK1bn (USD36m-120m). These issues display a range of financeable climate-related investments.

Vasakronan operates with broader environmental policies which support a lower-carbon transition for its buildings, incorporate a life-cycle analysis of raw materials and look at impacts along the supply chain. The company issues green bonds under a Green Bond Framework which lists eligible mitigation and adaptation projects to support low-carbon, climate resilient growth.

Eligible projects - Amongst eligible project types, Vasakronan includes new construction and retrofitting to high levels of accreditation, specifically LEED Gold, BREEAM *very good* and Milijobyggnad silver (a Swedish scheme). Specific areas for improvement include energy efficiency and renewable onsite energy.

The company includes infrastructure for electric cars amongst its eligible project types. Sweden has a low carbon power mix (48% Hydro, 39% nuclear, 11% renewables). Therefore, achieving meaningful GHG emission reductions requires a focus on sectors other than power. In Sweden, 46.3% of emissions came from the transport sector in 2011, and so this is supportive of meaningful emissions reductions.

Vasakronan also includes adaptation as an eligible project type. Buildings may be adapted to cope with future weather impacts of climate change, including heavier snow loads and storm water.

Accordance with principles - In accordance with the Green Bond Principles for the Real Estate Sector, the company communicated to investors via a 2014 bondholders report how investment proceeds are managed, how much of the capital authorised under its Green Bond Framework has so far been raised and reinvested, as well as how energy use and carbon emissions have been reduced. A case study of an individual project is also given: a mixed use building in Stockholm is undergoing renovation to a level expected to attain LEED-Platinum, the highest LEED certification. Specific improvements include a green roof to lower energy demand, increase biodiversity and absorb stormwater runoff. The company also installed solar cells at every building in its portfolio. Along the supply chain, pre-cut plasterboards are delivered to site, lowering transport needs and waste product. In total, the expectation across the company's assets is 50% lower energy use than before renovation and 30% lower water consumption. Going forward, we believe the company may find that benchmarking environmental credentials against an external mechanism, such as GRESB, the Global Reporting Initiative or the Carbon Disclosure Project, in accordance with Green Bond Guidelines for the Real Estate Sector, may also be beneficial to investors. Overall, we think the project categories are in line with the Green Bond Principles. We believe it would be useful to see quantitative data on emissions reductions achievable through various measures and costs savings through these and adaptation measures at the issue stage.

Assurance – The company's Framework, policies and a Code of Conduct based on the UN Global Compact are designed, in our view, to demonstrate transparency and robustness. The assurance of Cicero, a not-for-profit provider of second opinions on issuing entities and frameworks for assessing and selecting projects, concludes that Vasakronan's "policies and environmental frameworks provide a progressive, clear and sound framework for climate-friendly investments", giving further comfort to potential investors that proceeds will be used in environmentally beneficial projects.

Table 8 gives more detail of how GRESB has linked real estate projects into the GBPs.

Table 8: Eligible categories under the 2015 Green Bond Principles and GRESB Guidelines for Real Estate

2015 Green Bond Principles Category	Relevance to real estate projects identified in GRESB Guidelines
Renewable Energy	Onsite renewable energy generation powering the building and/or distributed to the grid
Energy Efficiency	Offsite renewable energy purchase Buildings that demonstrate energy efficiency metrics at above market performance Peak load demand reduction Building energy retrofits
Sustainable Waste Management	Buildings that demonstrate waste management metrics above prevailing building codes and/or standard market practices
Sustainable Land Use	Real estate investments that demonstrate sustainable land use attributes regarded as conservation and/or preservation
Biodiversity Conservation	Real estate investments that demonstrate attributes regarded as preserving habitat biodiversity and/or cultural resources
Clean Transportation	Support multiple types of transit modes Incorporate clean transportation infrastructure
Sustainable Water Management	Minimize potable water consumption / disposal
Climate Change Adaptation	Asset Resilience

Source: International Capital Market Association

The GRESB Guidelines suggest that green real estate can be judged at the corporate level, as well as the asset level. Hereby, ESG policies and disclosure can give broader investor guidance. GRESB suggest that corporate issuers can seek to communicate ESG credentials through established frameworks, such as the Global Real Estate Sustainability Benchmark (GRESB), the Global Reporting Initiative (GRI) or the Carbon Disclosure Project (CDP).

As part of annual reporting on green bond issues, impact assessments are an optional component which GRESB suggest would provide underwriters and investors with greater transparency around areas such as renewable energy generation, GHG emissions, water consumption, waste management and stakeholder engagement.

In our view, GRESB Guidelines are very supportive to the continued growth in real estate specific green bonds. This should help investors gain confidence from the consistency of disclosure, guidance for eligible project categories and transparency which the Guidelines bring, meaning more capital is likely to be deployed to this nascent asset class.

Conclusion

In this chapter, we have examined the burgeoning green bond market and green issuance by real estate companies. Companies from other sectors, governments and supranationals have also issued green bonds to fund energy efficiency in their building stocks.

The Green Bond Principles and the GRESB Guidelines for the Real Estate Sector bring transparency and consistency, which help improve investor confidence. We believe these principles and guidelines are also supportive of the continued growth of the market.

In our view, green bonds associated with green buildings will help facilitate the transition of the sector to mitigate greenhouse gas emissions, by reducing energy use and decarbonising energy supply, as well as to adapt to the consequences of climate change.

In the second chapter, we saw financial metrics which supported the enhanced profitability of green buildings, in terms of rent, occupancy rates, operating costs and resale prices. Regulation and technology also supportive of green buildings. Green bonds can provide the finance to turn our buildings transition scenarios, which demonstrate the climate benefits that can be realised from changes to the buildings stock, into a reality. This would close the emissions gap and extending the time available to spend the carbon budget, while also providing investors with exposure to this theme.

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Notes

Disclosure appendix

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