INVESTMENT REPORT

BUILDING A MORE SUSTAINABLE FUTURE

The construction industry's vital role in fighting climate change

RATHBONES

CONTENTS

Cover illustration
Michael Driver, Folio Art

FOREWORD

FROM THE MATERIALS USED TO MAKE THEM TO THE ENERGY USED TO KEEP THEM COOL IN SUMMER AND WARM IN WINTER, THE PLACES WHERE WE LIVE AND WORK ARE RESPONSIBLE FOR A HUGE PORTION OF GLOBAL EMISSIONS. THIS PAPER EXPLORES THE CRUCIAL ROLE THEY THEREFORE HAVE TO PLAY IN BUILDING A MORE SUSTAINABLE FUTURE.

We start with the major building blocks (cement and steel), why producing them generates such huge emissions and some of the developing technologies for decarbonising these processes.

We then take a close look at some of the ways the cement industry is working to reduce the intensity of its emissions, and alternative materials like laminated wood that are starting to replace concrete in some structures like stairwells, balconies and lift shafts.

Turning to the steel industry, we look at how coal is an essential ingredient in the blast furnaces used to produce this indispensable material, and the significant contribution to global C02 emissions from these processes. One possibility we explore is the use of 'green hydrogen', a zero-carbon alternative that is getting cheaper, though still a long way from widespread adoption.

We also explore how building homes to ensure their longevity can help with energy efficiency. The quest for all homes to be energy efficient is bound to be a long-term process, however, involving retrofitting existing stock and greater costs than most people can afford. But there are some interesting developments, giving hope for a future world of zero-carbon homes.

Lastly, we look at how rising demand for air conditioning, particularly in the developing world, presents a conundrum. Can humanity as a whole successfully combat climate change without unfairly disadvantaging developing economies?

The future looks set to be one of big changes for our buildings, with risks and opportunities for the companies involved in making them. We hope you enjoy taking a look with us at what this future may hold.

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BUILDING A MORE SUSTAINABLE FUTURE

BUILDINGS MATTER. WE SPEND THE VAST MAJORITY OF OUR LIVES IN THEM WHETHER THAT'S IN OUR HOMES, WHEN WE GO OUT, IN THE OFFICE OR ON THE FACTORY FLOOR. VAST RESOURCES ARE SPENT MAKING BUILDINGS, POWERING THEM, SUSTAINING THEM AND KEEPING THEM COMFORTABLE. THAT CREATES A HUGE CARBON FOOTPRINT.

If you were to imagine a future in which the fight against climate change was won, a cityscape probably doesn't feature in your mind. You're more likely to imagine something like a shiny motorway full of Teslas, winding their way through a verdant landscape dotted with sparkling rows of solar panels and distant forests of tall wind turbines. We need to reimagine that future landscape. For humanity to win the fight against climate change, buildings and the way they're made have to change dramatically.

In equal measure, investors will need to be aware of the climate-related risks to companies in these sectors and some of the compelling opportunities this challenge presents for long-term, sustainable returns.

Building a carbon footprint

Combining the direct emissions from buildings and the indirect emissions from the energy used to power them, buildings represented 37% of global emissions in 2020.[1] A key contributor was the production of building materials – such as steel, cement and glass – which produced 10% of total global carbon emissions in 2020.

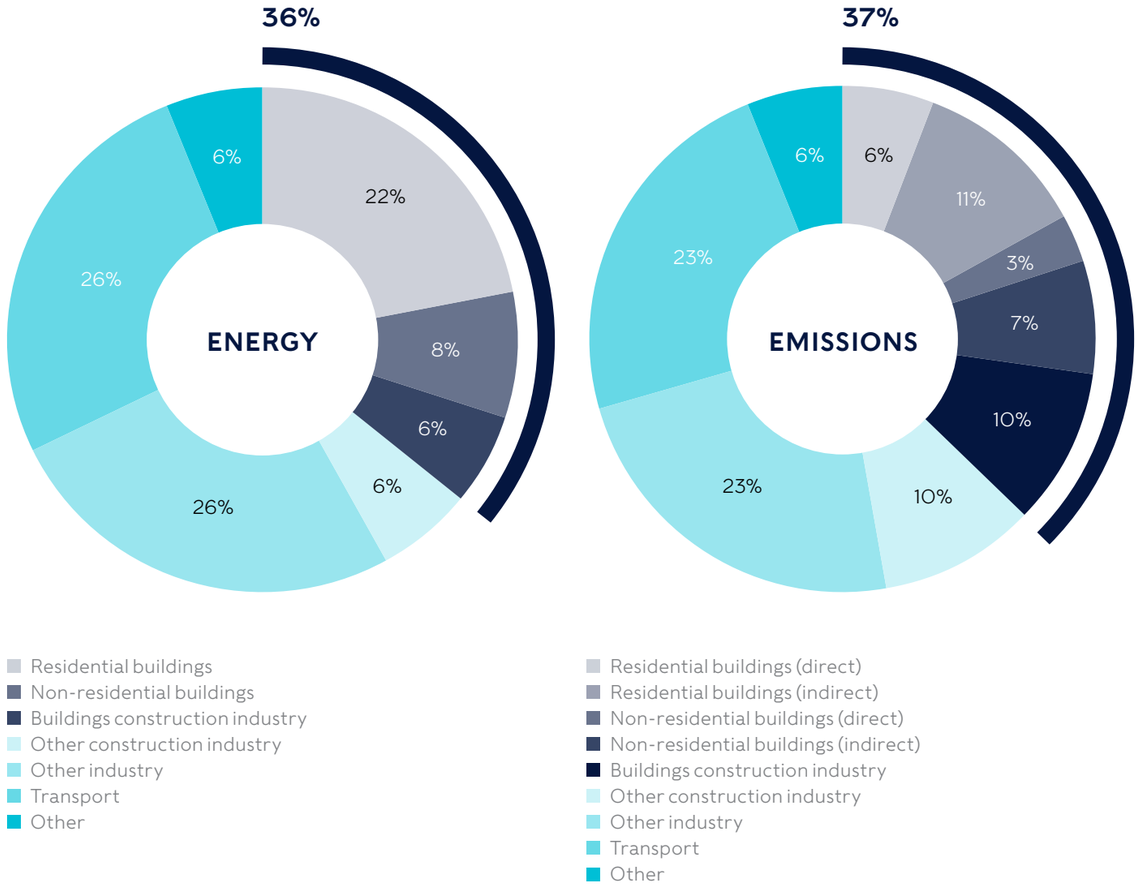
Building materials are a commodity industry where production techniques have changed relatively little in recent decades. Some 40–50% of all the resources extracted from the globe are used for housing, construction and infrastructure.[2] The most prevalent materials used are concrete (where the relevant ingredient with regard to climate change is cement) and steel, both of which are very energy intensive to produce using current techniques.

Building construction accounts for about half of the demand for cement and roughly a third of the demand for steel.[3] These materials contribute significantly to climate change and yet demand for them is set to rise as a result of emerging-market urbanisation. But it's not all bad. Steel and concrete used in blades and foundations of wind turbines will help to mitigate climate change.

Major cement and steel manufacturers are investing to a certain degree in decarbonisation measures. These include energy efficiency, substituting fossil fuels and piloting so-called 'carbon-capture' projects, whereby CO_2 is trapped at source and not emitted into the atmosphere. But they will only really ramp up this investment once the economic incentives to do so are more compelling – the most likely driver of this would be increasing costs of carbon emissions mechanisms like the EU Emissions Trading System.

BUILDING MATERIALS ARE A COMMODITY INDUSTRY WHERE PRODUCTION TECHNIQUES HAVE CHANGED RELATIVELY LITTLE IN RECENT DECADES.

Figure 1: Building, construction and the environment
The industry's share of global final energy and energy-related CO_2 emissions, 2020



Note: 'Buildings construction industry' is the portion (estimated) of overall industry devoted to manufacturing building construction materials such as steel, cement and glass. Indirect emissions are emissions from power generation for electricity and commercial heat. Figures may not add to 100 due to rounding.

A CONCRETE EXAMPLE

CONCRETE, WHICH HAS BEEN MADE IN VARIOUS FORMS FOR THOUSANDS OF YEARS, IS HUMANITY'S SECOND MOST USED SUBSTANCE AFTER WATER.

It's made by mixing a paste and aggregates or rocks. The paste typically consists of roughly 10–15% of Portland cement and a similar proportion of water, which coats the surface of the aggregate pieces remaining. Through a chemical reaction called hydration this mixture then hardens and strengthens to form the rock-like mass that is concrete. The malleability of newly mixed concrete before it hardens and its durability thereafter make it highly suitable for a wide range of applications across buildings and infrastructure, from homes to roads and bridges.

The water-cement ratio is key to the character of the concrete formed – a lower ratio (in other words, less water) means higher strength and durability but a mix which is less malleable and harder to work with, and to which plasticisers must be added. Too much water can make concrete porous, weaker and liable to cracking.

The cement industry is the third largest industrial energy consumer and the second largest emitter of CO_2, dominating the overall carbon footprint for concrete and accounting for c.7% of global CO_2 emissions.[4] Cement production involves heating limestone (calcium carbonate) and other materials such as clay, iron ore and silica sand to extreme temperatures (550–1150°C) in a huge rotary kiln. This process, called calcination, forms a rock-like substance called clinker which is then ground along with smaller amounts of limestone and gypsum to form cement powder. Significant amounts of CO_2 are generated in the process, about 30–40% from the energy required to generate the high temperatures in the kiln[5] (currently largely supplied by fossil fuels, with only 3% from bioenergy and biomass as of 2018[6]). The other 60–70% comes from the calcination process itself, as CO_2 stored within the limestone is released.

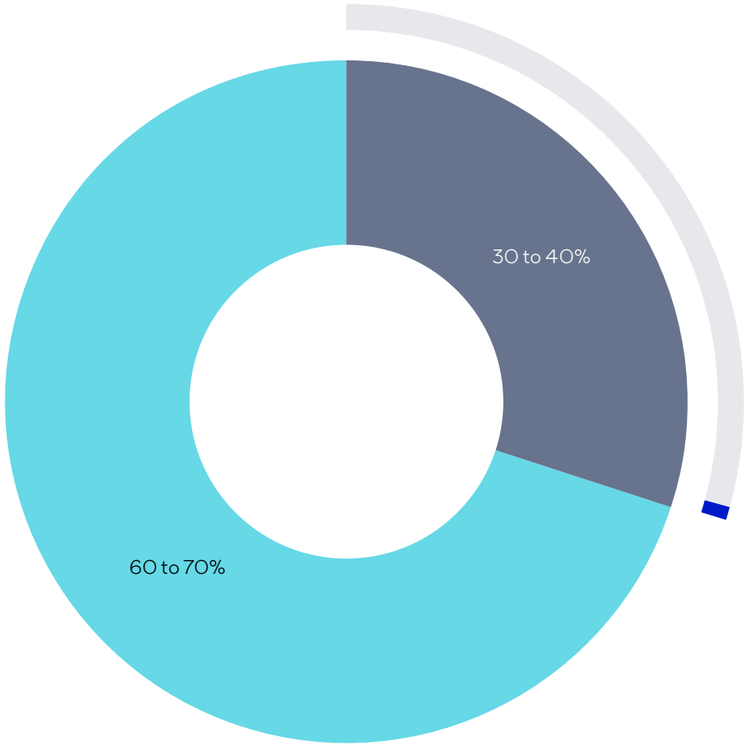
Cement makers have been working on reducing the intensity of their CO_2 emissions for a number of years – through using more biofuels and municipal waste instead of fossil fuels (Breedon is a leader in this area, although its overall ESG rating lags some of its peers), making kilns more energy efficient, reducing clinker content, and switching to 'dry' clinker production ('wet' production consumes more energy as moisture involved needs to evaporate). In the future these efforts must continue, while green hydrogen could ultimately be used to more fully replace fossil fuels in powering cement kilns (this is being trialled by Cemex and Hanson, for example).

Another means of reducing the CO_2 emissions from concrete could be to produce less of it, as the construction industry substitutes new materials for concrete, such as cross-laminated timber (CLT) and new building approaches (modular construction, lean design etc). However, it's difficult to envisage a world without concrete – certainly in the next 20–30 years; it's unlikely that the required reduction in emissions can be achieved through diverting demand away from concrete and making the basic chemical process cleaner. Hence a large proportion of emissions reduction will rely on the development of new technologies such as carbon capture, use and storage (CCUS) and carbon-cured concrete. More detail on these technologies is set out next in "A concrete future".

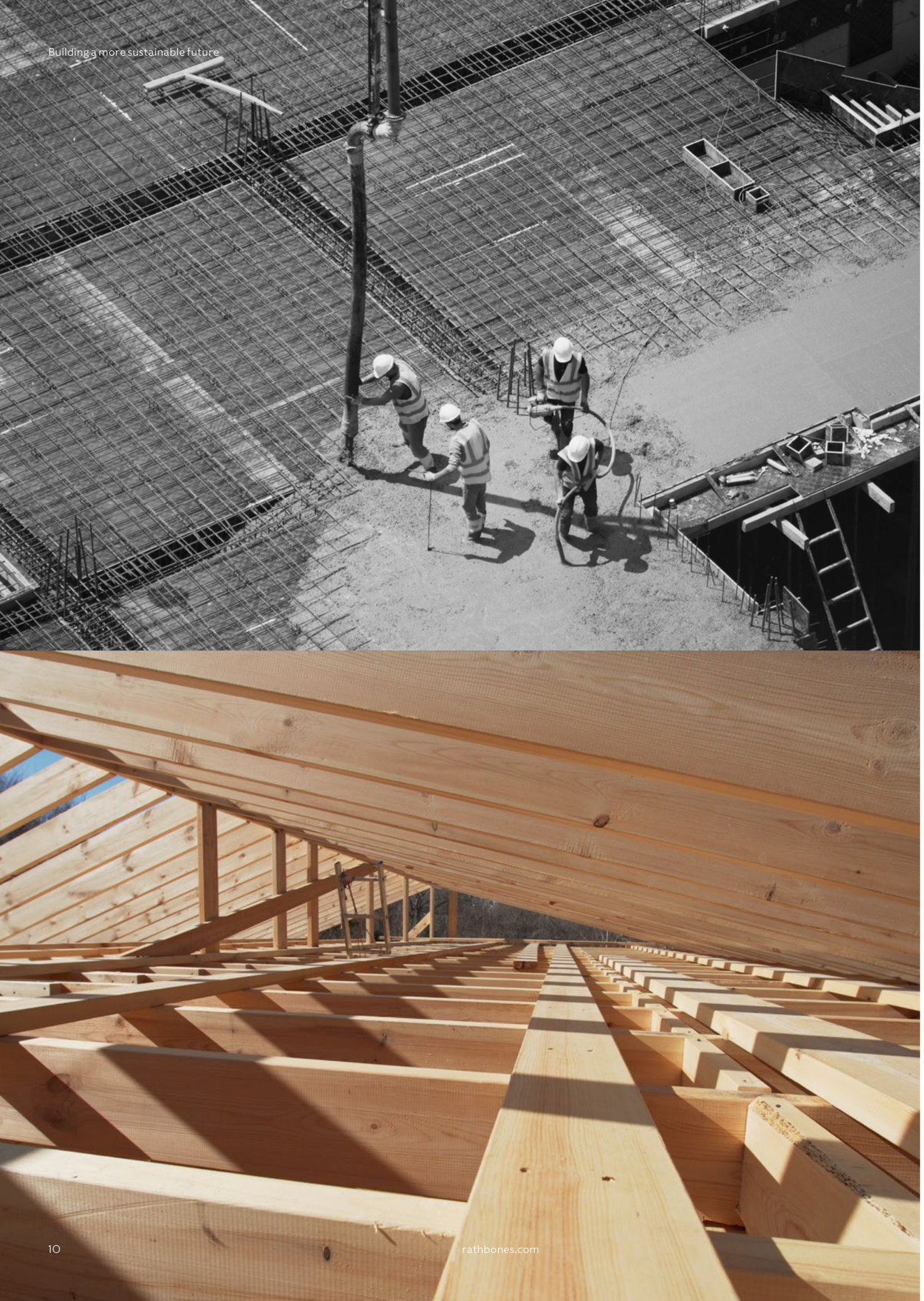
THE CEMENT INDUSTRY IS THE THIRD LARGEST INDUSTRIAL ENERGY CONSUMER AND THE SECOND LARGEST EMITTER OF CO_2, DOMINATING THE OVERALL CARBON FOOTPRINT FOR CONCRETE AND ACCOUNTING FOR C.7% OF GLOBAL CO_2 EMISSIONS.

ANOTHER MEANS OF REDUCING THE CO_2 EMISSIONS FROM CONCRETE COULD BE TO PRODUCE LESS OF IT, AS THE CONSTRUCTION INDUSTRY SUBSTITUTES NEW MATERIALS FOR CONCRETE.

Figure 2: Cement production
Where do the CO_2 emissions come from?
Source: IEA



3%
of energy supplied comes from renewable sources



A CONCRETE FUTURE

Carbon–curing cement
After concrete is laid, the hydration process – called curing – typically lasts a month or so. As it cures, the calcium hydroxide in the concrete reacts with CO_2 in the air to form calcium carbonate and water – thus concrete absorbs some CO_2. Several companies are working on tweaking the composition of cement in order to improve the resulting concrete's CO_2 absorption capability. For example Solidia (whose investors include Holcim Group, BASF, Total, Air Liquide and BP), has developed a process which uses more clay and less limestone to produce a cement which requires less kiln heating, produces less CO_2 from the calcination process, and then absorbs 240kg of CO_2 for every 1000kg of cement used in the mixture; over its lifecycle it produces 70% lower emissions than Portland cement, at a similar cost.[7]

Other similar early stage private companies include CarbonCure and CarbonBuilt. These companies can potentially sequester a large proportion of the CO_2 generated in cement production.

Cement additives
Swiss chemicals company Sika is developing concrete admixtures which use a different formula that can replace up to 50% of clinker in cement, thereby significantly lowering the CO_2 generated.[8] Sika's existing cement additives have enabled the increasing use of clinker alternatives such as fly ash and slag (by-products of coal combustion – while coal is still being used – and steel production) in cement, and also produce a stronger concrete so that up to 20% less volume is required in applications.[9]

Sika has also developed a new process called reCO_2ver which aids the recycling of old concrete – a Sika additive is added to pulverised concrete waste and CO_2 so that the aggregates are separated from the cement, with CO_2 re-embedded into the reclaimed carbonised powder, which can then be made into high quality new concrete.[10]

Cross–laminated timber
Cross-laminated timber (CLT) is a renewable material (planks of sawn lumber which are glued together in perpendicular layers) that can be substituted for cement and concrete in certain contexts. The world's tallest timber building, Mjostarnet in Brumunddal, Norway, uses CLT for stairwells, lift shafts and balconies. Completed in March 2019, it stands 18 storeys and 280 feet tall, with 122,000 square feet of floor space. Forestry companies such as Stora Enso and Sumitomo Forestry have invested in CLT production, while building materials company Boise Cascade produces engineered wood for buildings. Another advantage of this wood-based alternative in the fight against climate change is that wood is a natural carbon sink through photosynthesis of CO_2. This is true of bamboo as well, which when laminated can be tougher than soft steel. Another niche area is composite decking, using recycled plastic, scrap wood and sawdust from factories and retailers which would otherwise be destined for landfill. The two leading US suppliers here are Trex and AZEK.

STEEL AND ITS ALTERNATIVES

THE STEEL INDUSTRY IS ANOTHER SIGNIFICANT CONTRIBUTOR TO GLOBAL CO2 EMISSIONS, JUST A TAD ABOVE CONCRETE AT 8% OF THE TOTAL, THOUGH NOT ALL OF IT RELATES TO BUILDINGS AND CONSTRUCTION.

A key element of carbon emissions from steel is the use of metallurgical, or coking, coal. This is a grade of coal that can be used to produce what is known as coke, an essential fuel and reactant for blast furnaces used in the steel production process. Many major steel companies have plans to shift to zero carbon steel through substituting 'green' hydrogen produced with renewable electricity for coking coal. Two years ago zero-carbon steel was theoretically 20–30% more expensive than conventionally produced steel. Since then the carbon price has risen sharply along with the price of coal, making conventional steel more expensive to produce. However, renewable electricity prices – a key input for green hydrogen – have also risen as a function of higher costs of steel for turbines and polysilicon for solar panels. Over the long term, the European Green Deal and the US Inflation Reduction Act are expected to encourage increased investment in renewable electricity and green hydrogen, which should help push down the cost of green hydrogen and make the cost of zero carbon steel competitive with conventional steel. Analysis cited in a June 2020 article by management consultancy McKinsey estimated that on a cash basis (excluding depreciation of assets used in production) this cost competitiveness for hydrogen-based steel production would be reached sometime between 2030 and 2040 in Europe.[11]

HYBRIT, a joint venture owned by Swedish steelmaker SSAB, utility Vattenfall and miner LKAB, has begun test operations at a pilot 'fossil-free' steelmaking plant.[12] But so far only 9 (including SSAB) of the 107 steel companies around the world have a commitment to net-zero emissions.[13] Decarbonising steel will also require investment to shift towards electric arc furnaces and away from blast furnaces which are more reliant on coal. Other methods of reducing emissions include improving the energy efficiency of existing steel plants, increasing the recycling of scrap steel and capturing, using or storing carbon (CCUS, described above on page 8). For example, Toledo-based building materials company Owens Corning produces composites that can be used as lighter and more durable alternatives to steel for reinforcing concrete, as well as a composite for dealing with cracks in concrete to lengthen its life.

EXISTING BUILDINGS WILL NEED TO BE RETROFITTED TO MEET 'NET-ZERO' GREENHOUSE GAS EMISSIONS TARGETS BY 2050.

BUILD TO LAST

ONE OBVIOUS WAY TO SLOW THE GROWTH IN DEMAND FOR BUILDING MATERIALS IS TO DESIGN BUILDINGS TO LAST LONGER.

Alongside this is the development of a circular economy where materials from old buildings are recycled or reused, further reducing the need for new materials. This is common in metals, where the economic return on recycling has made it worthwhile, and new processes are being developed for recycling and reusing cement and concrete.

Plastic pipes are a source for potential good. They are much better for the environment than other traditional materials such as copper pipes. There are several reasons for this: they can be made with recycled plastic (which can itself be recycled), they are easier and cheaper to transport and they have a longer life. Plastic-pipe specialist Genuit Group, for example, makes about 50% of its pipes from recycled plastics and also has a number of other products that enable more energy-efficient heating, cooling, and ventilation of buildings. The Future Homes Standard in the UK, which is designed to significantly reduce emissions in new homes, should help drive demand for these kinds of products and services.

Modular homes are another emerging solution. According to UK modular home builder TopHat, building houses in a factory allows greater precision, which makes them more energy efficient compared to homes built onsite using traditional methods.[14] Factory production is more efficient, with less waste, adding to the environmental benefit of modular versus traditional house building. And with labour and materials prices rising, there is also potential to lower costs.

UK government proposals to raise energy efficiency standards could help fuel demand for these factory-built homes. However, of the 200,000 homes built in the UK every year, only about 15,000 are modular, or about 7.5%, according to a 2021 study by Mordor Intelligence.[15] And UK modular home builders are so far operating at a loss. Still, major home builders such as Barratt Homes and Berkeley Homes are investing in modular home building, seeing growth and potential cost-savings ahead. In Germany, where modular home building is more established, 23% of housing stock is now pre-fabricated, up from 15% ten years ago.[16]

To be sure, longer-lasting and more efficient homes and offices, and using recycled materials in the process, can make a big difference. But the reality is that for much of the developed world existing building stock will still represent the majority of floor space in 2050.[17] Therefore, if 'net-zero' targets for reducing global greenhouse emissions by 2050 are to be met, this existing stock will need to be retrofitted to higher energy efficiency standards.

To take the UK as an example, today only 29% of homes meet the Energy Performance Certificate (EPC) band-C standard (A being the most energy efficient and G the least). To meet its emission reduction targets, the UK government has an ambition to retrofit all homes to EPC band-C standard by 2035.[18] But this will be expensive. Doing the required renovations with a traditional approach can often cost as much as if you were to demolish the old building and put up a new one. In order to make renovations more attractive as a solution, a mass industrialisation of the process is needed.

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Building a more sustainable future

DEMAND FOR AIR CONDITIONING LOOKS SET TO BOOM, ESPECIALLY IN DEVELOPING NATIONS.

A giant leap for retrofitting

The Netherlands' "Energiesprong" movement (Dutch for "energy leap") has responded to this challenge by enabling renovations to be financed by future cost savings from energy and planned maintenance and repairs. To enable these cost savings, demand for renovations is aggregated, creating efficiencies of scale. This is achieved through a combination of less labour-intensive processes, with off-site fabrication removing the need for some construction site infrastructure such as scaffolding, economies of scale from the manufacturing process and reduced costs for logistics such as transportation.[19]

As an example of these 'deep retrofit' processes, Netherlands-based factories building parts for Energiesprong projects have improved the labour productivity of construction by 75% and reduced waste by 90%. In contrast, the UK construction sector's productivity has been flat since 1994.[20] The Energiesprong model makes mass renovation financially viable and much more effective than enforcing compliance with building regulations. The early results are positive, with projects in the Netherlands showing a potential cost decrease of nearly half. Operations are now also being launched in the UK, through work with the social housing sector, with the aim of extending this to the private sector.

We believe both conventional and industrialised retrofitting have good potential for growth in the decades ahead, along with the ancillary products and services that support both approaches. In particular, we see three areas that are in the early stages of such a growth trend, with scope for widespread demand for their products and services: environmental building audit services, window coverings for energy conservation and building fabric insulation. However, they are only a small part of the operations of the publicly listed companies providing these goods and services, and there are currently only a few ways to gain 'direct exposure'. Widespread adoption of retrofit approaches is highly dependent on government policy making it more conducive. Even where comprehensive policy frameworks are established – with financial support and incentives and ambitious regulatory standards – practical constraints such as material and labour shortages may make timely and widespread adoption more difficult.

DOING THE REQUIRED RENOVATIONS WITH A TRADITIONAL APPROACH CAN OFTEN COST AS MUCH AS IF YOU WERE TO DEMOLISH THE OLD BUILDING AND PUT UP A NEW ONE.

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AIR CONDITIONING: A BLIND SPOT

AS GLOBAL TEMPERATURES RISE AND MORE AND MORE PEOPLE MOVE INTO URBAN CENTRES, DEMAND FOR AIR CONDITIONING LOOKS SET TO BOOM, ESPECIALLY IN THE DEVELOPING WORLD.

The International Energy Agency (IEA, an energy policy think tank), believes this is creating one of the biggest blind spots in global climate policy. The IEA estimates that 5% of global energy consumption is for cooling buildings, generating 3% of global carbon emissions, and it predicts significant growth in the sale of air conditioning units.[21] The largest demand is expected to come from developing countries where disposable incomes are increasing, especially China and India. In the major developed nations like the US, demand is expected to remain stable (see figure 3).[22]

Several factors have combined to strengthen demand for air conditioning in developing countries. As workers move into cities to find more productive work, prosperity is on the rise. This has boosted demand for cooling buildings; more comfortable temperatures make more productive workers. And the population density of these cities can make them very uncomfortable places to live without air conditioning.

A growing middle class is also eating more meat, as people follow a more Western diet. And this meat needs to be kept refrigerated during the journey from the abattoir to the table. And as populations increase in the tropics, the need for refrigerating crops will increase along with them.

To run the world's cooling machines it takes 2,000 terawatt-hours (TWh, one TWh being equal to a trillion watts of output for one hour) of electricity per year. Without drastic improvement the IEA predicts this will treble to 6,000 TWhs per year by 2050.[23] Associated CO_2 emissions could rise significantly because air conditioning units are primarily powered by coal-fired power stations (see figure 4). Another problem is that in the countries with the highest use, air conditioning units create a power spike, as most homes typically turn them on in the early evening. This means that the power grid needs to be able to ramp up energy production to meet this spike in demand. The time of the spike inhibits the use of renewables such as solar. The quality of the buildings in a number of the tropical countries has also resulted in much higher demand for cooling, as chilled air escapes due to poor insulation.

The unfairness of F-gases

One area of particular concern is that older air-conditioners use "F-gases" (such as hydrofluorocarbons, or HFCs) as refrigerants. These gases have been replaced in more modern air conditioning (AC) units, and an international agreement was created in 2016 to remove HFCs from them, but concessions were made to get tropical countries to sign, giving them a decade to comply. Given typical lifespans of AC units, they are expected to be around until 2038. The concern is that if these units are not properly maintained and disposed of, HFCs will leak into the atmosphere. HFCs trap between 1,000 and 9,000 times as much heat as the same amount of CO_2.[24] This also highlights one of the fundamental issues regarding climate change – for humanity as a whole to successfully combat rising temperatures, developing economies will have to sacrifice future improvements to their living standards compared to more developed nations.

As is the case with retrofitting, some of the innovation in AC technology represents a small part of the overall operations of much bigger conglomerates. However, there are a number of specialist HVAC (heating, ventilation and air conditioning) products and services companies, such as Trane Technologies, Carrier, Johnson Controls and Daikin. The technology for new air conditioning systems that are much better for the environment has in fact existed for a number of years, and new HVAC systems are a quick win for emissions reduction in buildings (see the case study on page 18). As a consequence, companies in this sector are generally seen as having positive environmental credentials, and we believe demand for new air conditioning and HVAC systems should be underpinned by the drive toward net-zero emissions.

OLDER AIR-CONDITIONERS USE HYDROFLUROCARBONS, WHICH TRAP BETWEEN 1,000 AND 9,000 TIMES AS MUCH HEAT AS THE SAME AMOUNT OF CARBON DIOXIDE.

Figure 3: Global air conditioner stock (1990—2050)
Millions of units
Source: IEA, The Future of Cooling (2018)

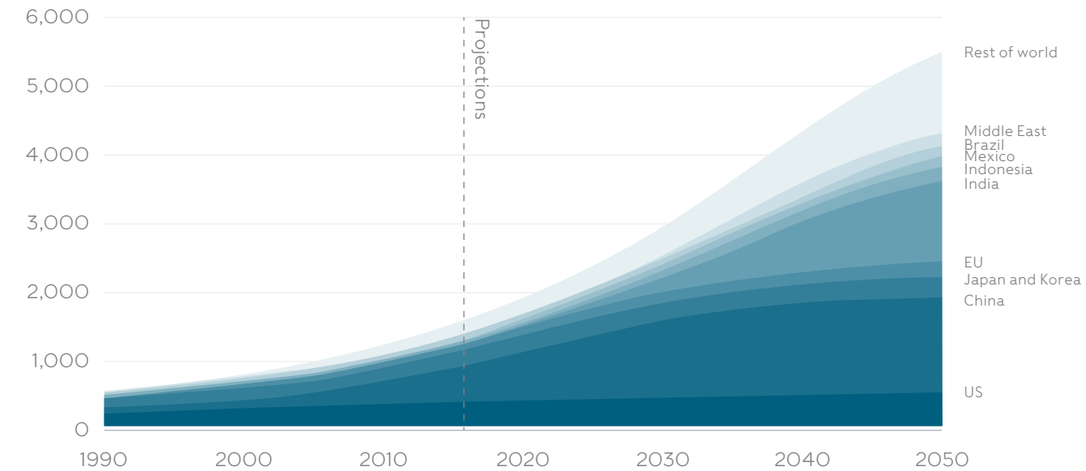
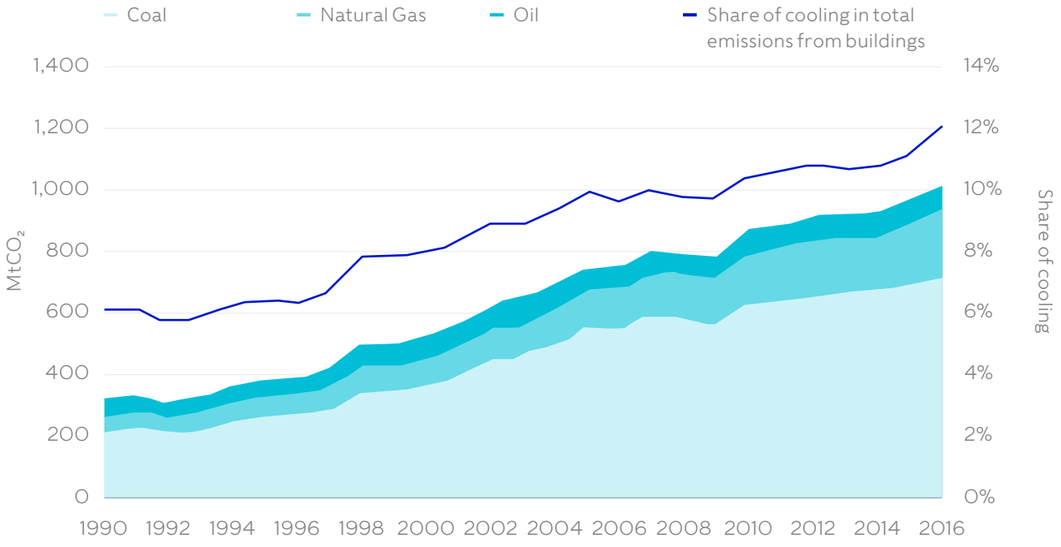


Figure 4: Cooling the world
Millions of units
Source: IEA, The Future of Cooling (2018)



COMBINING COOLING AND HEATING CAN CHANGE AN INDUSTRY WITH AN EXPONENTIAL INCREASE IN EFFICIENCY AND REDUCTION IN GHG EMISSIONS

Trane Technologies opportunity
Trane Sintesis™ Balance
Fully Electric Heating & Cooling Unit

Electric single unit to heat and cool buildings increasing accessible market $1bn+ in Europe

Flexibility to meet comfort needs across climates, seasons, use and occupancy

Major step on the path to electrification and decarbonisation of buildings

Service opportunity removes existing seasonality with installed base

Benefits include

350%
greater energy efficiency than typical gas boilers

0
direct emissions

Source: Trane Technologies

Pumping heat, not CO_2
Just as the methods for cooling buildings are crucial to combating rising global temperatures, so too are the ways they are heated. Heating and hot water production in buildings resulted in 4.3 gigatons of CO_2 emissions in 2019 or 13% of total global CO_2 emissions, according to research by the IEA.[25] Heat pumps are one potentially underutilised alternative to gas boilers. The general logic is that the pump uses the temperature differential between two regions to transfer energy in order to heat water. This is effectively the reverse of the way a fridge works, which means that heat pump units can also be used to cool homes. There are two broad categories of heat pumps, 'ground source' and 'air source'.

As the name suggests, an air source heat pump uses the ambient air temperature outside to provide the temperature gradient for exchange. These are not very efficient in the UK where there is little differential between air temperatures inside and outside buildings, and therefore greater reliance on solar panels to heat water and sometimes electrical heating systems as well.

Ground source heat pumps are more efficient and less affected by seasonal variations, as they bore up to a depth of 150m into the ground to tap into geothermal effects. Their long, looped pipe systems (called ground collectors) of approximately 1.2m in depth gradually transfer heat from the ground to the fluid inside the pipe. These ground source pumps cost much more to install and need large areas for the ground collectors, and therefore are not ideal for retrofitting. However, they can be used for new builds, particularly on large sites. If water sources are available this can significantly increase efficiency.[26]

VARIOUS PROVIDERS INCLUDING CENTRICA OFFER HOLISTIC POWER PLANNING ARRANGEMENTS FOR COMMERCIAL ENTERPRISES WHICH CAN INCLUDE SUCH FACILITIES AS HEAT PUMPS.

Fit for purpose?
Though rarely available to be considered as part of retrofitting arrangements, their greater efficiency makes ground source heat pumps very desirable for large-scale projects, such as city or regional grids and commercial enterprises.

Companies like Vattenfall seek to manage 'decentralised' electricity grids whereby homes and businesses can generate their own power, with any excess being returned to the grid, for others to use when required.

Various providers including Centrica offer holistic power planning arrangements for commercial enterprises which can include such facilities as heat pumps.

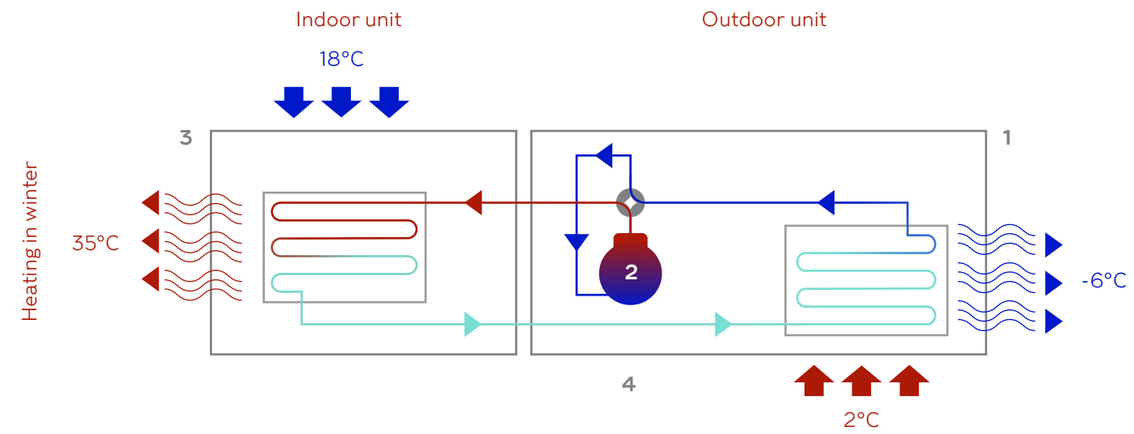
JUST AS THE METHODS FOR COOLING BUILDINGS ARE CRUCIAL TO COMBATING RISING GLOBAL TEMPERATURES, SO TOO ARE THE WAYS THEY ARE HEATED.

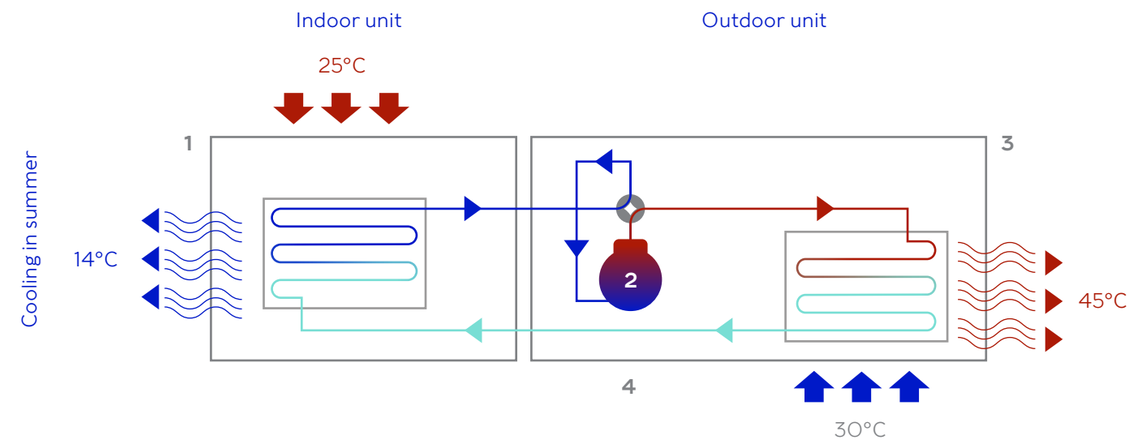
DAIKIN EXPLANATION

A heat pump controls the temperature by transferring heat. There are three essential components to a heat pump: the outdoor unit (evaporator), the indoor unit(s) (condenser) and the refrigerant. The refrigerant transfers the heat as it circulates between the outdoor and indoor unit(s).

1. The evaporator extracts energy from the renewable source (air, water, geothermal or solar) by forcing the liquid to transform into a gas.
2. The compressor compresses the gas, which raises its temperature.
3. The condenser exchanges the heat from the gas to the heating system, and the gas returns to a liquid state.
4. The expansion valve lowers the pressure of the refrigerant, which triggers evaporation and the cycle begins all over again.

Simply reverse this cycle to cool your home.





Source: Daikin

Support is lacking

The EU and UK governments have recognised the importance of retrofitting existing buildings as a priority in infrastructure planning in order to achieve net-zero emissions objectives. But so far, plans to address the issue have fallen far short of the mark, and provided little direction for commercial property developers.[27]

For example, the UK's Green Homes Grant voucher scheme was scrapped in March 2021, after only having been introduced in 2020 and significantly reduced by £1.5bn in 2021. Though the closure was blamed on a lack of demand, several of the suppliers noted that the administration of the scheme made it very difficult and time consuming to get the vouchers in the first place, as well as to pay the suppliers after installation. A new scheme will provide £300m to local authorities to encourage similar developments.[28]

Green lending can help

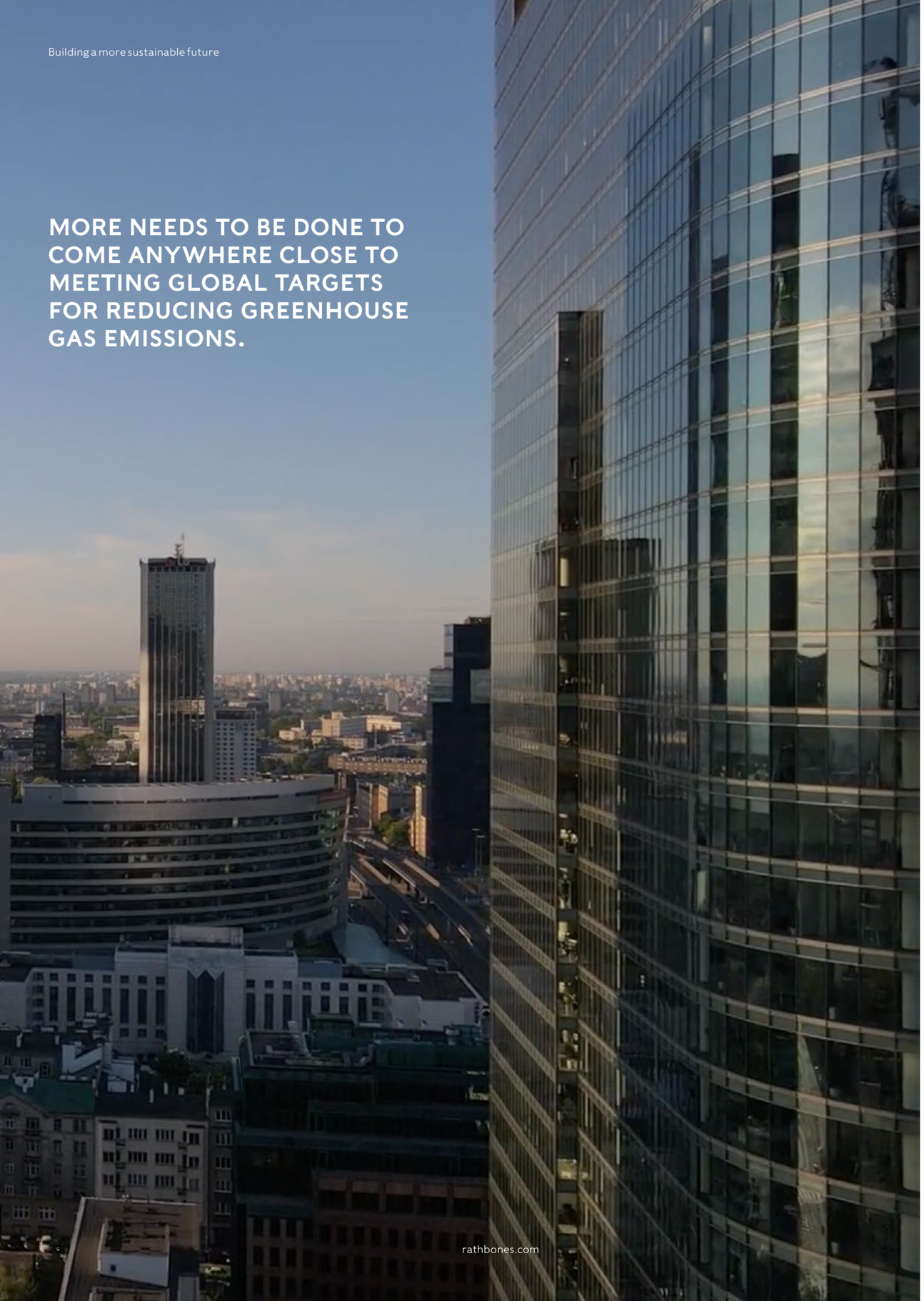
A number of lenders are now offering Green Mortgage products, which reward borrowers for buying or living in properties with better energy efficiency.

In the UK, an EPC rating of A or B (the top two ratings, see page 13 for a description of EPCs) will typically earn a reduction in interest rates or cash back for such products. Gateway Bank in Australia is offering discounts for having specific energy efficient properties in a home such as having 75%-plus of LED bulbs, solar power or heating systems, insulation, double glazing etc. They also offer very low rate 'Eco Loans' for such home improvements.[29]

A survey conducted by Vattenfall Heat UK brought out the conflicting priorities of tackling climate change and protecting our wallets. Of the respondents, 61% believed greener homes should have cheaper mortgages, but only 32% agreed it should be more difficult to secure a mortgage on a less environmentally friendly property. And only 23% were confident they would be able to afford low carbon heating systems for their home.[30]

ONLY 23% WERE CONFIDENT THEY WOULD BE ABLE TO AFFORD LOW CARBON HEATING SYSTEMS FOR THEIR HOME.

Building a more sustainable future



MORE NEEDS TO BE DONE TO COME ANYWHERE CLOSE TO MEETING GLOBAL TARGETS FOR REDUCING GREENHOUSE GAS EMISSIONS.

SOMEONE HAS TO PAY BUT THERE WILL BE BENEFITS

ALTHOUGH THE BUILDINGS AND CONSTRUCTION INDUSTRIES ARE NOT ALWAYS FRONT AND CENTRE IN PUBLIC DISCUSSIONS ABOUT CLIMATE CHANGE, THEY HAVE ONE OF THE BIGGEST ROLES TO PLAY IN TACKLING IT.

As we've noted, the recognition of this challenge and nascent technological developments to address it are a helpful start. But much more needs to be done to come anywhere close to meeting global targets for reducing greenhouse gas emissions to net-zero by 2050.

For governments and consumers a key question will be who pays, and how, for all of the change and transformation that will be needed. The implications are significant for our lifestyles, the kinds of buildings we live and work in, how they are heated and cooled, our nation's infrastructure, and the list goes on. And there is clearly a cost of not doing enough to weigh against this.

For investors, the crucial thing to consider is that without a dramatic contribution to emissions reductions from the buildings and construction industries, it is clear that net-zero targets won't be met. The risks to the companies in these sectors over the coming decades are significant. But so are the opportunities for good investment returns for those that do embrace positive change and technological innovation to provide the solutions.

FOR GOVERNMENTS AND CONSUMERS A KEY QUESTION WILL BE WHO PAYS, AND HOW, FOR ALL OF THE CHANGE AND TRANSFORMATION THAT WILL BE NEEDED.

ENDNOTES

1 2021 Global Status Report for Buildings and Construction, Global Alliance for Buildings & Construction (GABC)/UN Environment Programme, p.15, citing IEA

2 The Circularity Gap Report, Circle Economy, Amsterdam (de Wit, Rumjumar, Friedl and Douma, 2018), cited in 2020 Global Status Report for Buildings and Construction

3 2022 Global Status Report, p.23

4 International Energy Agency 'Technology Roadmap: Low-Carbon Transition in the Cement Industry' April 2018

5 International Energy Agency 'Technology Roadmap: Low-Carbon Transition in the Cement Industry' April 2018

6 International Energy Agency https://www.iea.org/reports/cement

7 The material that built the modern world is also destroying it. Here's a fix' — Akshat Rathi, Quartz, December 2017 https://qz.com/1123875/the-material-that-built-the-modern-world-is-also-destroying-it-heres-a-fix/

8 https://www.sika.com/en/media/media-releases/2021/sika-develops-low-co2-emission-admixture-product-range.html

9 https://www.sika.com/en/annual-report/annual-report-2020/sika-as-enabler/enabling-co2-reduction.html

10 https://www.sika.com/en/annual-report/annual-report-2020/sika-as-enabler/concrete-recycling.html

11 https://www.mckinsey.com/industries/metals-and-mining/our-insights/decarbonization-challenge-for-steel (June 2020)

12 https://www.forbes.com/sites/scottcarpenter/2020/08/31/swedish-steelmaker-uses-hydrogen-instead-of-coal-to-make-fossil-free-steel/?sh=484ab6202c8b

13 https://www.ft.com/content/e75eef5d-7d19-4a77-be16-5387b7c9a13f

14 Modular Homes Prepare for Lift-off, The Times, 27 June 2022 (https://www.thetimes.co.uk/article/modular-homes-prepare-for-lift-off-f75k9bxsk)

15 United Kingdom Prefabricated Buildings Industry Study — Growth, Trends, Covid-19 Impact, And Forecasts (2022 — 2027), Mordor Intelligence (https://www.mordorintelligence.com/industry-reports/united-kingdom-prefabricated-buildings-market)

16 Modular Homes Prepare for Lift-off, The Times, 27 June 2022 (https://www.thetimes.co.uk/article/modular-homes-prepare-for-lift-off-f75k9bxsk)

17 2020 Global Status Report for Buildings and Construction, Global Alliance for Buildings & Construction, p. 18

18 Reinventing Retrofit: How to Scale Up Home Energy Efficiency in the UK, Green Alliance, 2019, p.1

19 https://www.energiesprong.uk/about

20 Reinventing Retrofit: How to Scale Up Home Energy Efficiency in the UK, Green Alliance, 2019, p. 13

21 International Energy Agency 2021 Global Status report, p. 79 (https://globalabc.org/resources/publications/2021-global-status-report-buildings-and-construction)

22 https://www.iea.org/reports/the-future-of-cooling May 2018

23 https://www.iea.org/reports/the-future-of-cooling May 2018

24 https://www.iea.org/reports/the-future-of-cooling May 2018

25 https://www.iea.org/commentaries/is-cooling-the-future-of-heating, December 2020

26 https://www.betterplanet.co.uk/ground-source-heat-pumps-4

27 Energy efficiency: building towards net zero — Business, Energy and Industrial Strategy Committee — House of Commons (parliament.uk)

28 Green homes sector calls for £1bn funding to be restored | Financial Times (ft.com)

29 The Review | In the news: Making homes greener (cisi.org)

30 Vattenfall: 61% believe greener homes should have cheaper mortgages | Mortgage Introducer

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