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Cities under threat: real estate investment and climate change

Key takeaways

- Building and construction accounts for a large share of global energy use and emissions.
- Cities will have to adapt to protect themselves and mitigate their climate change effects.
- New financing models will feature public/private partnerships, targeting and philanthropy.

01 Introduction

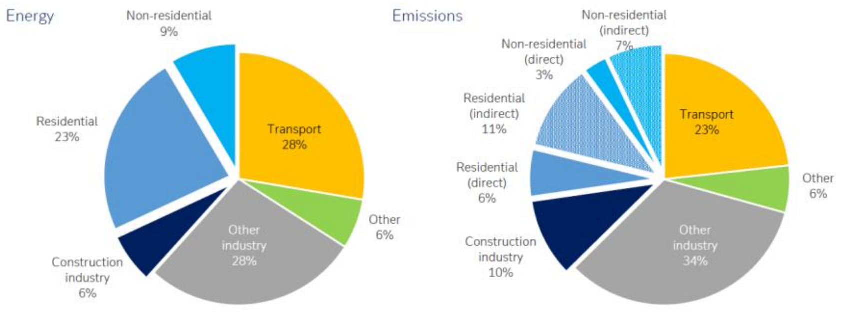
Cities both exacerbate climate change and suffer from its consequences. They account for a significant share of global CO2 emissions (over 70%, by one estimate[1]) but are also very exposed to the impact of climate change – e.g. through flooding, excess heat, extreme weather in general or changing patterns of disease.

Real estate is a key issue here. Regulations in many cities aim to reduce the emissions of individual buildings and address other sustainability issues. But the scope of city responses to climate change is likely to broaden and deepen, and this will have an impact on real estate investment and how we assess it.

02 Global warming and urban threats

Building and construction (including non-urban) is estimated to account for 36% of global final energy use and 37% of energy-related CO2 emissions.[2] Building emissions fell in 2020, after rising in the past ten years, but achieving the 2030 net zero target will require substantial further declines.[3] Multiple choices will be needed to achieve this, e.g. between new buildings and retrofitting old ones. A major headwind is the increasing urbanisation of many emerging market economies.

Figure 1: Sectoral contributions to energy-related CO2 emissions



Source: IEA and Global Alliance for Buildings and Construction, Deutsche Bank AG. Data as of October 2021.

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People have to live in cities to find work, and well-functioning cities are essential to global prosperity: they generate over 80% of the world's GDP.[4] Cities are poised for further growth: the global city population is forecast by the UN to grow by a further 2.5bn by 2050.[5]

But the impact of climate change means that the difficulties of urban life are increasing. Urban residents have long been exposed to higher levels of air pollution and the "heat island" effect: one U.S. study[6] estimates that this heat island effect results in daytime temperatures in urban areas about 0.6-3.9 °C higher than temperatures in outlying areas and nighttime temperatures about 1.1 – 2.8 °C higher. Cities with larger and denser populations experience the greatest temperature differences.

This heat island effect is expected to increase in future as the structure, spatial extent, and population density of urban areas change and grow. The frequency of extreme weather events (e.g. high temperatures or flooding) also appears to be increasing and the cost of these is already high (one study[7] puts the economic costs of extreme weather events in the EU at around EUR12bn a year).

Cities both contribute to and suffer the consequences of a deteriorating environment. The rise in the number of very hot days in many cities is, for example, causing problems in terms of water supply, transport system disruption and health (because of the heat directly, or indirectly e.g. rising risks of tropical infectious diseases). Inadequate infrastructure and healthcare, combined with risks such as flooding, can particularly impact poorer urban migrants in slums on city outskirts.

03 Policy responses

One response to climate change has been building regulation – to impose CO2 emission controls or other sustainability criteria. This can be done at a national or local level. Some are well established (e.g. Germany) and have had an appreciable impact on emissions but around two-thirds of countries still lack mandatory energy building codes. The IEA estimates that high-performance buildings (e.g. net-zero energy buildings) still account for less than 5% of construction in most markets. Building regulation also creates some difficult choices and better data may result in some counter-intuitive solutions: retrofitting old buildings may be better than building new buildings from scratch (the carbon effects of a new building may not be neutralised for 10-80 years[8]).

Building regulation has been accompanied by other attempts at adaptation to mitigate the effects of climate change.

Adaptation strategies can come in many forms. Engineered solutions may attempt to radically restructure cities to improve efficiency, e.g. through creating more self-contained neighbourhoods to reduce transport-related emissions, as in Paris's "15 minute city". Or they can protect the city from the impact of climate change – e.g. built walls against flooding threats, or enhanced sewerage systems to deal with excess water from flooding or rain. These solutions may need to be substantial (Shanghai has built 520km of seawalls[9]) and often do not come cheap: Tokyo's flood control system cost USD2bn – but was estimated to have stopped USD1bn in damages (in the years up to 2019).[10]

Nature-based solutions (NbS) offer a different way of approaching the adaptation problem. Preservation or development of natural coastal protection (e.g. mangroves) may make coastal cities more resilient, for example. NbS and engineered solutions can of course be combined. China's Sponge City Initiative, launched in 2015, aimed to increase the ability of cities to increase excess rain – a major problem around the world, as ground has been increasingly covered by concrete or asphalt (and addressed by other cities' climate resilience strategies, for example Rotterdam). Sponge city strategies try to both make existing hard surfaces (e.g. roads and pavements) more permeable and make it easier to the store the water collected: Chinese methods include green roofs, underground water storage chambers and rain gardens and sinks.[11]

All this can yield good results: one estimate is that adopting porous bricks and porous concrete could lower pavement surface temperature by 12 and 20°C, respectively and the air temperature by up to 1°C[12], with beneficial knock-on effects for both long-term carbon emissions and immediate individual well-being.

But it is usually not cheap: China is thought to have invested about USD3bn between 2015 and 2017 into 16 sponge cities. Good data is necessary to enable correct prioritisation of initiatives: to this end, a multi-institutional project, "Cooling Singapore", will build a computer model – referred to as a "digital urban climate twin" – to analyse the effectiveness of different heat mitigation strategies.[13]

Cities will also look at how best to provide services (for example, of energy) to cities. Energy cooperatives may encourage the use of more sustainable energy sources. As cities heat up due to climate change, we may also need to see changes in other energy systems: Vienna, for example, is considering a district cooling approach to reduce depend on individual air conditioning systems.

Transport is another urban service of great importance. Initiatives to reduce traffic have been underway for many decades. One recent focus has been on electric vehicles (e.g. the Biden administration's pledge to provide finance electric car charging infrastructure[14]) but technology has already made a meaningful contribution to improving traffic flow. Non-car alternatives (public transport systems, walking, cycling) remain key.

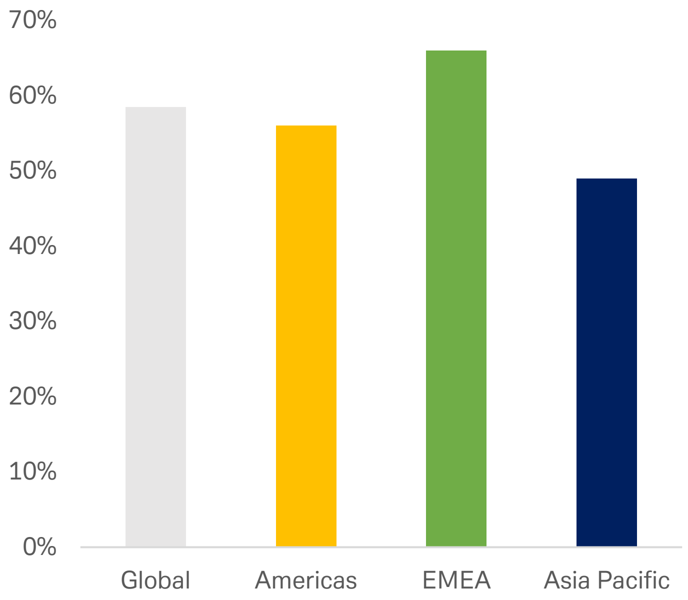
Looking beyond services, climate change provides much broader social challenges to cities. These will be faced by booth poor and rich citizens. In many emerging market cities, urban migrants do not settle in the city, but tend to settle in (illegal/tolerated) slums on the outskirts of the city with little space, increased risk of flooding, poor infrastructure, inadequate water and food supplies, poor health care and increased susceptibility to disease. There are spill-over effects from negative aspects of urbanization on the rest of a city's residents. We need to pay greater attention to the housing of residents (particularly in rapidly-developing cities), manage public transport and investment in human capital (education, health, nutrition, vaccinations, drinking water supply, improvement of maternal health). Real estate investment will be part of this process, working with local governments and non-governmental organisations (NGOs).

If city adaptation fails – or is simply of too big a task – the ultimate alternative is relocation. This is of particular relevance for coastal cities. Indonesia has a long-standing plan to move its capital Jakarta in land by 2029, at a cost of around USD30bn.[15]

04 Investment implications

We know that real estate investors already pay attention to ESG factors. 60% of respondents to CBRE's 2021 Global Investor Intentions Survey[16] stated that they had already adopted ESG criteria as part of their investment strategies, with the Americas, EMEA and Asia-Pacific all recording a stronger focus on ESG issues than in previous survey years.

Figure 2: Real Estate investors increasingly incorporating ESG factors



Source: CBRE Global Investment Intentions Survey 2021, Deutsche Bank AG. Data as of June 2021.

But we expect analysis by real estate (and other investors) now to get more detailed and broader in scope. As the scale of potential climate change impacts becomes fully appreciated, it will become increasingly accepted that this is no longer just a matter of assessing the carbon footprint of individual buildings. Getting related investment right requires found components. To keep cities functioning well and to reduce their overall environmental impact, we need three developments:

- **Better understanding** of the overall impact of investment
- **Improved methodologies** for classifying ESG investment
- **New financial approaches** to channel relevant investment

All these three factors are ultimately intertwined – the credibility of ESG methodologies is dependent on understanding of likely investment impacts, for example. But we are starting to see range of parallel developments in each area.

Better understanding of the overall environmental impact of different investment decisions, on a case- by-case basis, is obviously first dependent on improved scientific data and modelling (e.g. on the impact of city development on CO2 emissions).

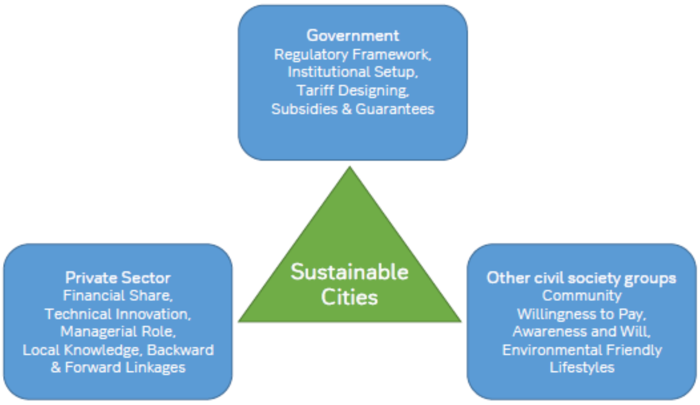
But to move from this to prioritisation of investment decisions, we need an additional framework that moves beyond specific scientific predictions (e.g. on temperature change) to an overall accounting framework for the environmental and economic impact. This is now starting to emerge through natural capital accounting systems. Individual projects (real estate or other) are already usually not considered in purely economic terms, with some attention paid to other issues such carbon emissions, impact on the surrounding natural environment etc.) But viewing nature as a capital stock which needs to be carefully maintained to deliver essential ecosystem services forces a rather different approach, taking our assessment of external impacts to a whole new level and a much more holistic way of choosing between different options.

Natural capital accounting has advanced in recent years (e.g. via the UN's SEEA – System of Environmental Economic Accounting) but may take some time before it is fully accepted. In the interim, the emphasis is likely to fall on ESG methodologies to provide an investment roadmap for real estate and climate change.

New financial approaches will be made easier with better data, but the surrounding institutional framework will be very important too. International financial incentives to encourage countries to move to more sustainable level, for example from the World Bank[17] and United Nations[18]. These are complemented by new internationally-agreed financing mechanisms, often targeting the natural world (e.g. the REDD+ sovereign carbon scheme and the forests). Finance for city development may not sit easily in such schemes, in part due the wide range of parties involved and making sustainable cities involves getting some consensus on "who does what", so we can move onto the underlying issue of **who pays for what.**

The approach of the UN[19] and others is to see a triangle of responsibilities between government, private sector and other civil society groups (see chart below for their suggested division). In reality, of course, "government" will itself have many different components, with obvious financial battles between national and local governments (e.g. over the financing of city transport and other infrastructure).

Figure 3: Contributors to sustainable cities



Source: United Nations Environment Programme, Deutsche Bank AG. Data as of October 31, 2022.

What this implies is the necessity of public-private finance partnerships to improve investment levels and make cities work better. Innovative financing models should also allow better **targeting of private finance** on infrastructure.

Given the importance of social issues as noted above, there also seems increased scope for financing with a **philanthropy** component, designed to generate commercial returns. (This is not new: philanthropists played a large part in improving housing on a commercial basis in rapidly growing 19th century cities such as London and New York.)

There is no perfect solution here: cities have varying problems and are likely to use different mixes of policy responses. But the overall economic and environmental threat posed by the cities, and the scale of the problem, means that real estate and infrastructure investment in cities may now enter a period of considerable change.

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Glossary

Carbon dioxide (CO_2) is a colorless, odorless, and non-poisonous gas produced by the burning of carbon and in the respiration of living things.

ESG investing pursues environmental, social and corporate governance goals.

Gross domestic product (GDP) is the monetary value of all the finished goods and services produced within a country's borders in a specific time period.

The International Energy Agency (IEA) is an intergovernmental agency studying energy-related issues.

Natural capital refers to the elements of the natural environment including assets like forests, water, fish stocks, minerals, biodiversity and land.

Nature-based solutions according to the International Union for Conservation of Nature (IUCN) definition are “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits”.

Net zero refers to reducing greenhouse gas (GHG) emissions to as close to zero as possible.

NGO stands for non-governmental organization, bodies operating independently of government and usually focused on social or political issues.

The System of Environmental Economic Accounting (SEEA) is a framework that tries to integrate economic and environmental data.

UN stands for United Nations and is an international non-profit organisation to increase political and economic cooperation among its member countries.

U.S. is the United States.

USD is the currency code for the U.S. Dollar.

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