IFM Investors

Zero time to spare

A perspective on how infrastructure investors can contribute to global temperature goals

November 2023

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About IFM Investors

We are a global asset manager driven to make a positive difference. IFM Investors has US$ 139 billion under management as at September 2023. Owned by pension funds, inspired by their members. We prioritise the interests of like-minded investors worldwide who aim to build a real and lasting impact by focusing on assets that combine excellent long-term risk/reward characteristics with broad economic, environmental and social benefits to the community. As a responsible long-term investor IFM actively engages with the companies in which we invest on issues we care about, with the aim of improving their net performance while minimising investment risk. Operating globally from offices in Melbourne, Sydney, London, Berlin, Zurich, Amsterdam, New York, Hong Kong, Seoul, Tokyo, Milan and Houston, IFM manages investments across infrastructure, debt, listed equities and private equity assets. For more information, visit ifminvestors.com.

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Introduction

There is a rapidly narrowing window of opportunity to limit warming to 1.5°C and secure a stable climate.

Infrastructure plays an important and multi-faceted role in the decarbonisation of economies and societies and climate resilient development. Infrastructure is comprised of facilities, services, and networks many of which play an essential role supporting the quality of life and wellbeing of our communities – such as water treatment and electricity. Infrastructure also enables trade and development, by facilitating the transport of goods and information.

Infrastructure investors and operators can meaningfully contribute to global temperature goals across three pillars: (1) asset-level transition that supports sectoral decarbonisation (2) action to ensure a 'just transition' and (3) collaboration with government, other investors, and operating firms to fill the net zero investment gap and to support healthy environmental and social systems.

A large part of the net zero transition involves replacing high emitting assets, production processes and products with low-emissions ones. But the ways in which infrastructure investors and operators can contribute to this vary. Some infrastructure needs to be phased out (such as coal-fired electricity generation) or repurposed. Some needs to expand significantly, such as renewable generation and grid firming infrastructure. And some, like transport infrastructure, needs to facilitate sectoral transformation – supporting the decarbonisation of the aviation, maritime, and inland transport sectors.

In this paper, we focus on transport infrastructure, and the ways in which operators of airports, seaports and road infrastructure can support the decarbonisation of their respective sectors (aviation, shipping, and road transport) – recognising that decarbonisation will involve efforts from actors across each sector e.g. shipping companies, manufacturers, port operators, stevedores, regulators, customers, trade unions, end users, and others. Insofar as most sector emissions are by transport operators, a focus for infrastructure companies in the transport sector is how to help their customers decarbonise their operations.

For each sector, we outline the main decarbonisation levers in their sector pathways, and how infrastructure can contribute to each of those levers. We also discuss technology change, and how the significant capital expenditure associated with infrastructure assets supports innovation, and the deployment of new solutions – together with some examples.

While capital formation and operational change are important, they are not sufficient. Investors should engage in and support social dialogue among workers, unions, policy makers, portfolio companies, and employer groups, encouraging a just transition.

Moreover, systemic change led by governments is required for private financial flows to resemble what is required to achieve net zero by 2050.

Climate change is the greatest market failure the world has ever seen,[1] yet actions and commitments by governments so far are not consistent with achieving the Paris Agreement temperature goal.[2]

Action by governments to correct market failures, improve policy and regulation, and increase blended finance, is essential to bring the investments needed for net zero by 2050 into the risk-return preferences of more institutional investors, and thereby accelerate and scale-up private capital flows.

Decarbonisation at the scale and speed needed will require mutually reinforcing actions by governments, the private sector and civil society to advance "climate resilient development"[3] and a just transition.[4]

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The importance of stabilising the climate

COP28 will convene in what is virtually certain to be the hottest year on record,[5] and temperatures are expected to continue to increase.

Climate change is hitting the planet faster than scientists originally expected. In consecutive IPCC assessment reports (AR5 and AR6), risk levels across the board were revised upwards. But global emissions still have not peaked. 1.5°C is still possible but there is a rapidly closing window to limit global warming to relatively safe levels.

1.5°C pathways require deep and sustained emissions cuts in the very near-term – roughly halving emissions by 2030. Rapid decarbonisation is needed this decade, and next, to put us on a path to net zero CO_2e emissions by 2050.

BOX 1:

Climate change costs and financial risks

Climate change is already causing substantial costs. In the 1980s, there were about three natural disasters per year in the United States that had costs above one billion dollars, with aggregate costs that decade of around USD 213 billion. In just the first three years of the 2020s, the U.S. has experienced around 20 of these 'billion-dollar disasters' per year, with aggregate costs of USD 454 billion.[6]

And the total costs of climate change far exceed the costs of natural disasters.

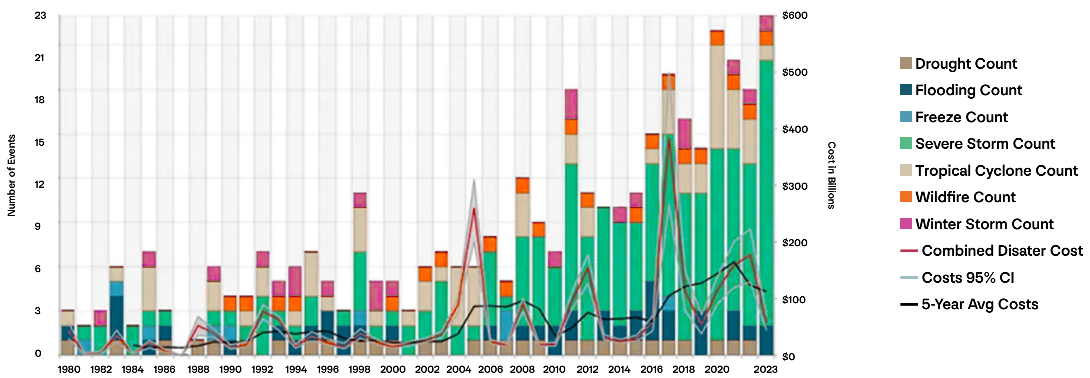
As noted in the sixth IPCC assessment report with high to very high confidence, globally climate change has already reduced food and water security; extreme heat events have resulted in human mortality and morbidity; and economic damages from climate change have been detected in climate-exposed sectors, such as agriculture, forestry, fishery, energy, and tourism.[7]

For investors, these wider-ranging costs are expected to adversely affect the long-term performance of diversified portfolios.[8] Effective climate risk management involves actions including minimising sectoral and geographical concentration risk.[9] But even with risk management in place, failing to stabilise the climate will likely result in a reduction in overall investment outcomes for institutional investors and their beneficiaries.[10]

Institutional investors will share the benefits of successful collective action on climate change, but will also share the adverse effects of collective inaction on long-term portfolio performance, irrespective of any individual investor's contribution to decarbonisation.

FIGURE 1: LARGE CLIMATE-RELATED DISASTERS, UNITED STATES, 1980-2023

UNITED STATES BILLION-DOLLAR DISASTER EVENTS 1980-2023 (CPI-ADJUSTED)



Source: U.S. National Oceanic Atmospheric Administration (2023)

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Climate change and infrastructure

The Intergovernmental Panel on Climate Change (IPCC) recognises that infrastructure and the services it provides are a key enabler of a sustainable net zero future,[11] but also that infrastructure faces significant physical risk – amplified by immobility and interdependencies among transport, energy, and communications.

The IPCC's report on key infrastructure stresses that mitigation and adaptation must occur simultaneously, employing a more community-centred approach to determining where infrastructure is built, and how it serves the relevant population.[12]

For practitioners, the IPCC advise (and we agree) that proactive adaptation can substantially reduce the overall costs of climate change,[14,15] and that successful adaptation to climate change requires strategies to be context-specific and responsive to local needs.[16] Adaptation investment can help build more resilient infrastructure, while also providing the potential for attractive long-term returns for investors.

Enhanced international cooperation, public policy, and well-targeted public finance can help private investors to finance a broader range of projects and regions, support technology and capacity-building, including in vulnerable regions.[17,18]

Decarbonisation and adaptation costs are ultimately borne by the users of the infrastructure and/or taxpayers. Governments can help minimise those costs by accelerating changes to policy and regulation, and fairly and efficiently structuring the allocation of costs, encouraging infrastructure companies to implement changes in a timely manner.

IPCC:
Integrated transport and energy infrastructure planning and operations can together reduce the environmental, social, and economic impacts of decarbonising the transport and energy sectors.[13]

3.1 How infrastructure investors can contribute to sector decarbonisation

Being part of the global push to net zero as an infrastructure investor involves different kinds of actions depending upon the nature of the infrastructure asset. (Figure 2). In section 3 of this paper, we focus on the role of infrastructure in facilitating technology and operational change.

FIGURE 2

INFRASTRUCTURE ACTIVE OWNERSHIP

Nature of asset transition needed for net zero by 2050					
	Direct technology and operational change	Declining role to 2050	Facilitate technology and operational change	Opportunity capture and solutions	Limited change needed
Example	Coal-fired energy generation, and district heating.	Fossil fuel pipelines, midstream	Transport infrastructure, such as airports, seaports, and toll roads.	Electricity transmission and distribution, renewable generation, zero emissions firming, e-fuels, water.	Social infrastructure, such as schools and aged care facilities.
Characteristic	High operational emissions Low emission substitutes often available	High supply network emissions	High supply network emissions in ongoing services	Low operational emissions and support displacement of higher emitting activities	Low operational emissions and limited supply network effects
Considerations	These assets are exposed to transition risks due to carbon pricing and regulatory change.	Although scientifically credible net zero pathways have a role for refined petroleum products in the 2040s, the International Energy Agency estimates consumption of all fossil fuels will be in decline by 2030 under existing policy settings.[19] These assets generally will be substantially repurposed or decommissioned.	These assets have a role to play in a net zero future, but are exposed to moderate transition risks from reduced trade and technology change by transport operators is critical for decarbonisation.	These assets present a significant transition opportunity, as they enable the net zero economy.	No significant transition risk in these assets because their role in a net zero future will not change materially, and they have low emissions.
Active ownership goals	Rapidly and responsibly change generation technology (e.g., transition district heating power from coal to bio or e-fuels).	Refit assets and business models that can serve other purposes, make investments to redeploy expertise in new economy businesses; responsibly manage down physical assets that cannot be repurposed.	Facilitate decarbonisation of customers by, among other things, investing in physical delivery of sustainable fuels, charging infrastructure, and updating operations to support initiatives by airlines and shipping companies.	Coordinate closely with policy makers and energy system participants to expand capacity and integrate into supply chains.	Make investments in electrification and efficiency, and support behavioural change of communities in consultation with policy makers and other stakeholders.

Source: IFM

3.2 How transport infrastructure can contribute to sector decarbonisation

Transport accounts for approximately one quarter of all energy related greenhouse gas (GHG) emissions (or around 15% of global GHG emissions). (Figure 3).

Transport is the largest emitting sector in many developed countries,[20] with emissions from transport rising due to population and domestic product growth. Transport emissions grew at an annual average rate of 1.7% from 1990 to 2022, equal to industry and faster than any other end-use sector.[21] Emissions from road transport make up the majority of transport-related emissions.

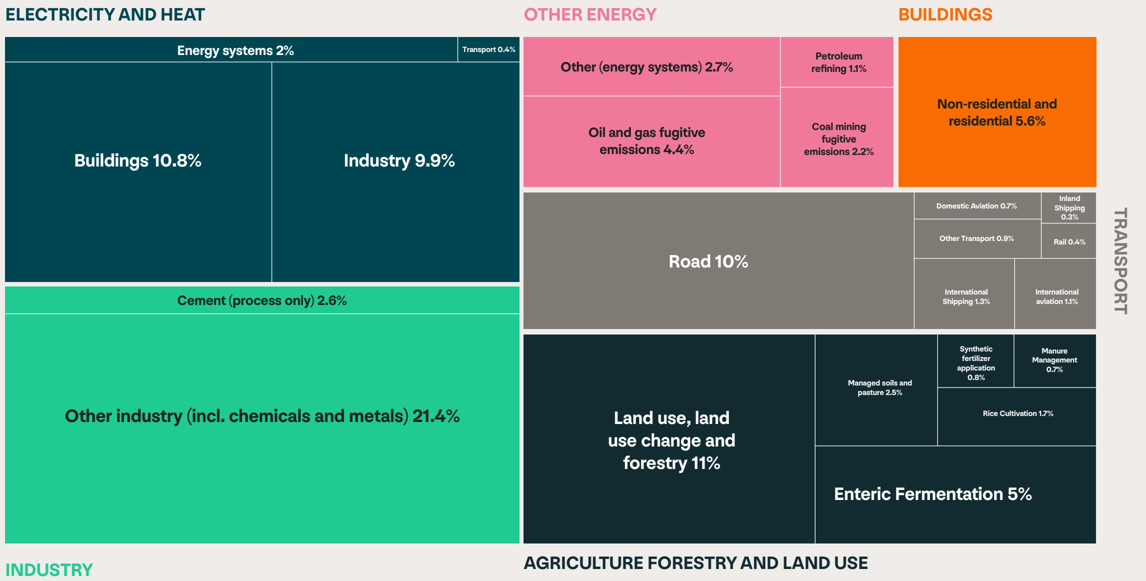
While decarbonisation of the energy sector is under way globally, and largely possible with existing technologies, decarbonisation of transport sub-sectors including airports and seaports are more challenging. Innovation and rapid scale up and deployment of new technologies is essential to accelerate the shift towards net zero in transport infrastructure.

This section discusses the sectoral decarbonisation levers for aviation, marine shipping, and road transport, and how active ownership in transport infrastructure – airports, seaports, and toll roads – can help accelerate sectoral decarbonisation.

We also provide some examples of these steps being undertaken by infrastructure assets, including some in which IFM invests.

FIGURE 3

SPLIT OF DIRECT GHG EMISSIONS BY SECTOR FOR THE YEAR 2019 (59 GTCO2-EQ)



Source: Adapted from IPCC (2022) Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Note: Direct emissions estimates assign emissions to the sector in which they arise (Scope 1 reporting). There is no reallocation of emissions from electricity and heat to the sector of final use in this figure (Scope 2 reporting). A lack of data prevents further disaggregation of direct emissions in the industry sector. Emissions are converted into CO2-equivalents based on global warming potentials with a 100-year time horizon. Percentages may not add up to 100 due to rounding.

3.2.1 Aviation and airports

Aviation is an important sector in the global push to achieve the Paris Agreement temperature goals

Aviation contributes around 2% of annual anthropogenic greenhouse gas (GHG) emissions, and about 4% of anthropogenic global warming.[22] The vast majority of emissions and other factors affecting radiative forcing are the result of the combustion of jet fuel.[23]

Reducing emissions and other climate change drivers attributable to aviation is important. While alternative modes of transport can replace some domestic and short-haul routes, flying will continue to be the only viable means to connect many global destinations for both passenger and freight purposes.[24] If unmitigated, aviation could contribute over 20% of global GHG emissions by 2050.[25]

Progress is happening, but the sector is not on track
IInternational aviation is considered a 'hard to abate' sector.[26]

Industry and multilateral organisations, along with major individual airlines, have set out decarbonisation aspirations.[27]

However, the most recent assessment by the International Energy Agency (IEA) indicates the sector is not on track with a decarbonisation pathway consistent with limiting average temperature increases to 1.5°C.[28]

Decarbonisation of the industry – what needs to happen

Decarbonising aviation[29] will involve a number of levers, a critical one being the replacement of existing fossil fuels with sustainable aviation fuels. In Figure 4, these levers are set out, alongside an indication of the role that airports can play in support, and some examples of activities being undertaken, including at assets in which IFM invests.

Manchester Airport Group partnership to support the development and delivery of SAF from a new waste to fuels bio-refinery, delivered via an existing pipeline.[33]

FIGURE 4

DECARBONISATION LEVERS AND AIRPORT CONTRIBUTION

Lever	Indicative contribution to 2030 emission reduction goals	Airport support	Example
Cabin densification	Minor	Amenity for higher peak passenger volumes	Since 2020, Melbourne Airport completed over 60 construction projects that have added new infrastructure and amenities to the airport to support the overall passenger experience while also improving sustainability.[30]
Load factor increase	Minor		
Ground power and climate control	Minor	Reliable and cost-effective connections Zero emissions power supply	It is increasingly common for airports to provide fixed power and air-condition systems. Early adopters include: Nice Côte d'Azur, Barcelona El Prat, and Hong Kong Airport.[31]
Fleet turnover acceleration	Large	Compatibility updates for new designs and supporting mixed fleets with a range of propulsion technologies	
Air traffic flow and capacity management	Minor	Engage with authorities and implement enhanced air traffic policy and optimisation to reduce taxiing time and unnecessary fuel consumption in flight	Four different taxiing strategies were implemented and studied at in Italian airport.[32]
Air traffic route optimisations	Large		
Operational weight reduction	Minor	Not apparent	
Structural weight reduction	Minor	Not apparent	
Pilot behaviour	Minor	Not apparent	
Flight planning and dispatch procedures	Minor	Support as reasonably requested by airlines	Ordinary course
Drag/friction reduction (riblet films, advanced winglets, etc.)	Minor	Not apparent	
Sustainable Aviation fuels	Large	Facilitate supply of SAF Promote uptake among passengers and partners	Manchester Airport Group partnership to support the development and delivery of SAF from a new waste to fuels bio-refinery, delivered via an existing pipeline.[33]
Airport operations	Minor	Electrification of ground transport and low carbon construction materials Behind-the-meter renewable power.	Vienna Airport aims to operate on a carbon-neutral basis by the end of 2023, with district heating connections and the completion of Austria's largest solar plant achieved in May 2022. The airport vehicle fleet will gradually be converted to electromobility, with residual emissions offset in the interim.[34] The Port Authority of New York and New Jersey (La Guardia, JFK, and Newark Liberty airports) has (1) converted its airport bus fleet to all electric,[35] and (2) intends to have net zero ground support equipment by 2030, beginning with the phase-out of diesel baggage tugs and aircraft positioning tractors.[36]
Better integration with rail	Minor	Integrate rail during major renovations	The Melbourne Airport Rail link is expected to reduce emissions.[37]

Minor | Moderate | Large

Source: McKinsey & Company (2023), IFM

In addition to the steps that airports can take, institutional investors can support the development and commercialisation of new technology. This includes investing in increasing the supply of sustainable aviation fuels, as well as facilities that can support the uptake of technological improvements to aircraft.

The roll out of sustainable aviation fuels is a critical medium-term step for the aviation sector, including the expansion of feedstock and supply. Biomass based SAF is currently the most impactful and economically viable solution for decarbonising aviation, and carbon intensity may be able to be reduced further through improved land use. Longer term, there is a significant opportunity for e-fuels if costs and production scale challenges can be addressed.

Public policy can support the uptake of SAF, and deployment of other abatement strategies in airports.

For example, public authorities can require fuel suppliers to include minimum levels of SAF,[38] or provide tax credits for the production of SAF that meets minimum lifecycle greenhouse gas emissions reduction targets.[39]

3.2.2 Marine shipping and seaports

Shipping contributes around 2% of annual global greenhouse gas emissions.[40] It is considered a 'hard to abate' sector.

The shipping industry has been developing and refining decarbonisation plans through several initiatives and its multilateral, the International Maritime Organization.

Last July, the International Maritime Organization member states set a net-zero greenhouse gas emissions target "by or around" 2050, with interim targets of at least 20% lower emissions by 2030 and 70% by 2040 versus 2008 levels.[41] In 2023, shipping companies have significantly increased methanol-capable vessels (Figure 5).

Despite these efforts to date, the sector is not on track for net zero by 2050.[44]

Replacement of fossil fuels with low or zero carbon e-fuels and biofuels is a key lever in the decarbonisation of the sector (Figure 6).

As with aviation, significantly increasing the supply of alternative fuels is a critical medium-term step for the maritime sector.

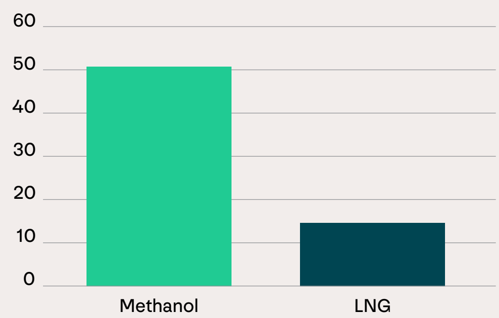
The availability of biofuel feedstock or hydrogen for e-fuels (ammonia and methanol) is an important underlying enabler.

Public policy can support the uptake of alternative fuels, and deployment of cold ironing and other abatement strategies in seaports.

For example, the U.S. Inflation Reduction Act includes a $3 billion rebate and grant program at the Environmental Protection Agency to provide funding for zero-emission port equipment or technology.53 The U.S. Department of Transportation has announced more than $703 million to fund 41 projects in 22 states and one territory that will improve port facilities through the Maritime Administration's Port Infrastructure Development Program.[54]

FIGURE 5

METHANOL- AND LNG-CAPABLE CONTAINERSHIPS ORDERED, 2023



Source: BNEF 2023[42,43]

FIGURE 6

MARITIME DECARBONISATION LEVERS AND SEAPORT CONTRIBUTION

Lever	Indicative contribution to 2030 emission reduction goals	Seaport support	Example
Vessel refit	Minor	Not apparent	
Fleet turnover	Minor	Not apparent	
Hull management (biofouling)	Minor	Not apparent	
Fleet management, voyage optimisation, and logistics	Moderate	Not apparent	
Shore power	Minor	Reliable and cost-effective cold ironing plugs Zero emissions power supply	Shore power is provided at one of the berths of Deltaport.[45] NSW Ports is designing a pilot study on the provision of shore-based electrical power.[46] All container, cruise, and refrigerated cargo vessels are required to use shore power or another emission control technology while at-berth in California ports.[47]
Speed reductions	Moderate [48]	Specific programs not apparent	The Port Authority of New York and New Jersey Clean Vessel Incentive Program provides financial incentives to encourage operators, charters, and agents of ocean-going vessels make voluntary engine, fuel, and technology enhancements beyond those set by the IMO. This includes speed reductions.[49]
Scalable zero emission fuels	Large	Bunkering, storage Promote uptake	Port of Rotterdam has supplied green methanol.[50] Port of Melbourne has signed an MOU to establish green methanol bunkering.[51]
Routing and new corridors	Moderate	Not apparent	
Wind-assisted propulsion	Moderate	Not apparent	
Port operations	Minor	Electrification or greening of tugs and cranes	The Maritime and Port Authority of Singapore has solicited proposals to design and support adoption of full-electric harbour craft.[52]

Minor Moderate Large

Source: International Maritime Organisation (2018, 2023), McKinsey & Company (2022), IFM

3.2.3 Road transport and road operators

Road transport emissions were about 5.9 Gt of CO2-e in 2019, or around 10% of total global greenhouse gas emissions.[55] Road transport generates about 75% of all transport sector greenhouse gas emissions.[56] The vast majority of this is tailpipe emissions from light and heavy vehicles.

The uptake of electric vehicles has been rapid, and is considered by the IEA as "on track" for net zero by 2050: if the growth in EV sales experienced in recent years is sustained, CO2 emissions from cars can by 2030 be put on an aligned pathway.[57]

Although the transition in light vehicles is reasonably apparent, for heavy road transport the picture is only emerging. There are early signals of the kind of uptake seen in passenger EVs, such as a tripling in the sales of medium and heavy-duty trucks in Europe in the first half of 2023.[58]

FIGURE 7

ROAD TRANSPORT DECARBONISATION LEVERS AND ROAD OPERATOR CONTRIBUTION

Lever	Indicative contribution to 2030 emission reduction goals	Road transport support	Example
Replace ICE with electric and other zero emissions vehicles	Large	Charging infrastructure	Indiana Toll Road has deployed Level 3 fast-charging infrastructure at each of its Travel Plazas.[59] Aleatica has rolled out EV charging at certain assets.[60]
		Differential tolling	Aleatica offers a 20% discount on its urban road network to customers who drive electric or hybrid vehicles. In 2022, over 475,000 discounted trips were registered, 36% more than the previous year. Brebemi offers a 30% discount on its A35 highway toll for electric and hybrid vehicles.[61]
Road lighting	Minor	Install LEDs	Queensland Department of Transport and Main Roads[62] and Transurban have installed LED lighting upgrades.
Reduce embedded carbon in materials	Minor	Upstream procurement programs	Lendlease included a 20% embedded carbon reduction target in a road project.[63] In 2016, The British Standards Institution issued Publicly Available Specification (PAS) 2080: Carbon Management in Infrastructure, specifying requirements for the management of whole-life-carbon in buildings and infrastructure.
Support driver efficiency	Minor	Traffic data collection and distribution to support efficient routing and driving	Transurban partnered with a technology company to undertake a pilot, providing data and driving behaviour guidance.[64]

Minor Moderate Large

Source: McKinsey & Company (2023); IFM (2022); IFM

3.3 Infrastructure and technological change

A number of the decarbonisation levers for transport involve the deployment of new technology.

Infrastructure operators have a role to play in the development and practical application of new technology.

At a high level, technological change has long been recognised as a key underpinning of economic growth and improvements to living standards.[65] Capital formation[66] is strongly associated with driving technological change. When companies design and build new fixed capital, they will generally incorporate new technology, not old technology, and integrate updated methods of organising production and inputs.

Infrastructure is characterised by high capital intensity, and relatively large capital expenditures. In addition, infrastructure generally has a long operating life, and usage rates, meaning investments in improved technology have time and opportunity to deliver good value. For these reasons, infrastructure is a very strong platform for the consideration and application of new technology.

This is apparent in practice, and we can see that in infrastructure managed by responsible parties regularly deploying new technology.

Investment catalyzes the development of new technology, and this is particularly apparent in green investments.[67]

The substantial capital investment programs of infrastructure investors is an opportunity to both reduce emissions and improve resilience by deploying new technology, and an opportunity to show demand for and spur the development of technological change over the long term.

3.3.1 Deployment of new technology in infrastructure

For institutional investors and infrastructure operators, helping transportation infrastructure to play its part in sectoral decarbonisation is partly about understanding the current and emerging technologies, but it is also about mindset – including

> **The substantial capital investment programs of infrastructure investors is an opportunity to both reduce emissions and improve resilience by deploying new technology**

a willingness to collaborate with cross-sector partners and to pilot the unproven.

Some examples illustrate why this is the case, noting that these examples are at the early stage of development.

Dynamic wireless power technology for road transport
Dynamic Wireless Power Technology (DWPT) uses coils positioned under asphalt to transfer energy directly to electric cars, trucks and buses. If proven viable, it could represent a sea change for electric vehicles.

The long-term potential for DWPT would see EVs being charged as they drive on a roadway. Through a special receiver, EVs would receive energy from the road infrastructure directly to their electric motor – a revolutionary change for EVs.

If successful, this technology could extend the EV's range and conserve its battery. Tests have shown an EV can travel at normal speeds on the circuit without using its battery energy storage, and that the rate of energy transfer is comparable to that from fast-charging stations.

DWPT is an example of the kind of second round innovations that the energy transition permits.

Electric vehicles do not operate like traditional internal combustion vehicles. Nonetheless, the model for EV power supply so far has been in the form of a charging "station", which is arguably only an evolution of a gasoline or petrol refuelling station.

DWPT could provide theoretically unlimited range, which could address the battery-range anxiety that is limiting EV uptake by some consumers.

DWPT is being trialled in a few pilots, including in Italy through a collaboration involving Aleatica at the 'Arena del Futuro', a 1050-metre-long circuit built on the A35 Brebemi highway.

The technology used in this project was named by Time magazine as being among the 100 most important inventions of 2021 for its contribution to sustainable mobility.[68]

This particular pilot involves over a dozen organisations in collaboration, and requires a long-term outlook. Not only does new technology need to be piloted and proven, but deploying DWPT would involve significant investment over time to replace existing asphalt on roads and introduce it to new projects.

Hydrogen-powered aviation

Sustainable aviation fuels are a key lever to reduce emissions from air transport, and will likely contribute the bulk of sectoral decarbonisation over the medium term. But replacing fossil jet fuel with SAF has limitations. When SAF is combusted it produces greenhouse gas emissions, as well as nitrogen oxides and black carbon soot – it remains a carbon-based energy source.

Hydrogen power, by contrast, emits only water vapor. Although water vapor is a greenhouse gas, it has vastly lower long-term radiative forcing – and therefore climate change implications – than those produced in the combustion of SAF and traditional jet fuel.

Hydrogen-powered flight faces significant technological and engineering challenges.

To help work through these challenges, the Hydrogen Flight Alliance was launched in June 2023 involving Brisbane Airport, Gladstone Airport Corporation, and seven other organisations, including universities and industry partners.

A key focus of the Alliance is execution of a green hydrogen powered flight between Brisbane and Gladstone Airport in 2026. If successful, a 15-seater Stralis B1900D-HE aircraft, designed and built in Brisbane, and powered by hydrogen fuel cell, would make the 430-kilometer journey.

Testing by the Alliance will provide real-time experience of operating and refuelling hydrogen-powered aircraft between Brisbane and Gladstone airports. If successful, the project could also support Queensland's goal for the 2032 Olympics and Paralympics to be climate-positive events.

Both Brisbane and Gladstone have green hydrogen projects, and the state of Queensland in Australia is seeking to position itself as a significant green hydrogen trading partner.

Seaports as offshore wind catalysts

Offshore wind has a complementary role to play in the net zero energy system of the future. It has been growing rapidly from a low base, from about 3.1 GW in 2010 to 34.4 GW in 2020.[69] Capacity is expected to continue to grow, with 2030 offshore wind generation targets issued by several jurisdictions.[70]

Ports can provide critical support for offshore wind development, operation, and maintenance. This involves activities such as: aggregating and staging components and serving as a manufacturing hubs; providing a base for operations and maintenance; or integration with energy systems (depending on distance from offshore wind generation, and electricity grid linkages, this could be a throughput for HVDC or hydrogen pipelines).

Ports, including in Europe[71] and Australia,[72] are laying plans to support offshore wind developments.

4

Just transition

The net zero transition is unprecedented in its scale and will involve far-reaching changes likely to have a profound social impact around the world. The Paris Agreement calls for a transition that is fast and fair. A just transition for the workforce should involve the creation of decent work and quality jobs in accordance with nationally defined development priorities. Institutions financing the transition have an important role to play in incorporating just transition principles into their decisions and operations.

A just transition to a low carbon economy will help minimise the economic and social costs of climate change and produce the best long-term investment outcomes for working people. A just transition would contribute to:

- More accessible energy systems, poverty alleviation, job creation, and the opportunity to address social and environmental justice concerns within and across nations.[73,74]
- A greater chance that the transition succeeds, by reducing barriers and integrating talent.[75]

While evidence shows that net employment impacts of the green transition are likely to be modest,[76,77] it is widely acknowledged there will be challenges, costs, and frictions for firms, occupations, and regions as economic activity shifts from high-emitting to low-emitting sectors. Those workers and communities most affected tend to be concentrated in specific locations and communities (for example, coal mining and/or coal-fired power workers and their communities). A just transition means ensuring workers in emissions-intensive industries are supported and experience a fair transition with access to safe, secure and quality jobs in new and transitioning industries. At a regional and community level, this involves creating new opportunities – by creating new jobs, facilitating new investment, developing new industries, and supporting place-based economic diversification.[78]

IFM is a signatory to the UN Principles for Responsible Investment (PRI) Statement of Investor Commitment to Support a Just Transition on Climate Change (PRI Statement).[79]

IFM Investors will continue to develop its commitments to a just transition to ensure it meets investor and community expectations, reflects changing policy environments, and protects and enhances value over the long term for investors and their beneficiaries.

BOX 2:

Australia's Net Zero Economy Agency

In March 2023, the Australian Council of Trade Unions coordinated with IFM and many of its owners and other stakeholders, including AustralianSuper, CBUS and the Australian Industry Group, to urge the Australian Prime Minister to establish a new tripartite authority to facilitate a just transition in Australia.

In July 2023 Australia's new National Net Zero Economy Agency was created to support a positive economic transformation associated with achieving net zero emissions. The Hon Greg Combet AM (former chair of IFM Investors) has been appointed as Chair of the Agency. The Agency has commenced work, and is anticipated to become a legislated Authority before the next Federal election.

The Agency's work so far includes:

1. **Helping investors and companies to engage with net zero transformation opportunities.**
2. **Coordinating programs and policies across government to support regions and communities to attract and take advantage of new clean energy industries and set those industries up for success.**
3. **Supporting workers in emissions-intensive sectors to access new employment, skills and support as the net zero transformation continues.**

Source: Australian Department of Prime Minister & Cabinet (2023)[83]

5

Climate change and institutional investors

An unstable climate adversely affects the long-term performance of diversified portfolios. For this reason, failure to achieve the Paris Agreement temperature goals would undermine the purpose of long-term investors that seek to deliver benefits to broad populations of beneficiaries.

All institutions who seek to provide financial benefits based on the long-term performance of investment portfolios and understand the systemic risks of climate change have a strong incentive to support the Paris Agreement goals.

Many institutional investors are structurally well-placed to help finance sustainable energy and transition projects because they have a long-term horizon and sophisticated capabilities. Despite this, market failures in the real economy interact with their investment objectives in ways that are currently frustrating this outcome.

Climate change is considered a major market failure because companies that produce greenhouse-gas emissions are bringing about climate change, thereby imposing costs on the world and on future generations, but – in the absence of policy and regulation, such as emission trading schemes – they do not face the full consequences of the costs of their actions.[84]

To date, while many institutional investors like insurance companies and pension funds have taken steps to address climate change through their investments, in the aggregate they are still a relatively small part of the financing of climate change mitigation and adaptation.

Better public policy is needed to help private investments in climate change mitigation and adaptation to scale up (Box 3).

In addition to working with portfolio companies to decarbonise their operations and value chains (Section 3), institutional investors can further of the global temperature goals in a number of ways, including (i) filling the investment gap to achieve net zero in partnership with governments and multilaterals, and (ii) contributing to improvements in the systems of investment.

BOX 3:

Climate change investment and public policy

For institutional investors and other commercial financial providers to participate optimally in the net zero transition, partnership with governments and significant public policy change consistent with 1.5°C is required.

Commercial finance providers include both public and private sources – for example investment by publicly or privately owned pension funds, insurance companies, banks and businesses.

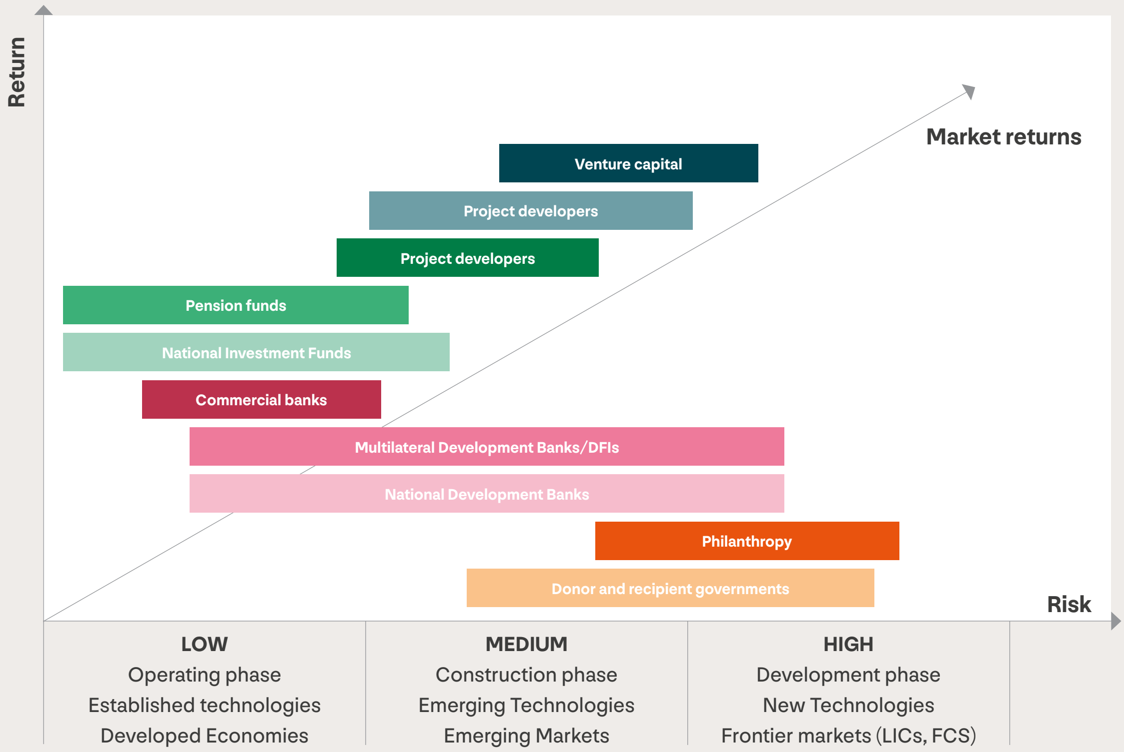
In general, these providers seek market rates of return or higher, and incorporate sustainability outcomes in investment strategy only to the extent doing so contributes to risk-adjusted financial outcomes over relevant time periods and is otherwise consistent with their purpose. This affects the role they can play in development finance (Figure 8).

Significant market failures in the real economy act as a barrier to the alignment of commercial investment returns and socially optimal outcomes. In the context of development and blended finance, it is well-understood that non-commercial providers and governments need to do more to catalyse private investments at socially optimal levels.

As the long-term portfolio-level risks of climate change are increasingly understood, and the benefits of systemic climate change risk mitigation are incorporated into investment models, investment conventions of institutional investors and financial regulation will continue to shift in favor of sustainable investment.

However, for so long as significant market failures continue to exist and drive capital allocation that contributes to climate change, institutional investors cannot invest at the levels needed to stabilise the climate. Government action through change to policy and regulation, as well as blended finance, is needed.

FIGURE 8: STYLISED RISK-RETURN PROFILES



Source: OECD (2020)[85]

5.1 Filling the investment gap through deployment

Private sector investment and finance are fundamental enablers of the transition to net zero and achieving the temperature goals of the Paris Agreement. The world is set to invest a record USD 1.8 trillion in clean energy in 2023, but the IEA estimates this needs to climb to around USD 4.5 trillion a year by the early 2030s to be in line with a 1.5C pathway, with the majority of that to be met by private sector investment.[88]

Long-term institutional investors are an integral part of the flow of funds. Pension funds, for example, convert contributions from employers and workers into financing for business activity and capital formation.

To date, institutional investors have played a relatively small role in the financing of climate change mitigation and adaptation – directly providing only around USD 12 billion in 2021-22, about 2% of total private sector climate financing that year,[89] representing about 0.01% of institutional investor capital.[90,91]

Changes that could enable institutional investors to significantly increase their direct investment in climate change mitigation and adaptation include:

- **Public policy** reform (laws, regulations, blended finance, and novel risk-transfer mechanisms[92]) is needed to bring the risk-return profile of potential investments within the target range of institutional investors and other commercial finance providers (Box 3, above). Without policy change and other forms of public support, the appetite among institutional investors for investments in emerging markets,[93] emerging technologies, and greenfield projects will almost certainly not match what is needed to achieve net zero by 2050.

- **Investment convention** changes whereby institutional investors' approach to investment strategy and portfolio construction would increasingly consider real economy capital formation outcomes (i.e., the degree to which investments help create the capital assets required in a net zero economy), and the long-term portfolio-level financial benefits of systemic climate change risk mitigation.

Were such changes to occur, institutional investors who pursue competitive risk-adjusted rates of return would change how they allocate capital. And investor portfolios could look different from today. They would very likely hold more green infrastructure and project finance instruments, more greenfield assets, more emerging markets exposure, and more emerging technology. The portfolio construction of asset owners and the "supply chains" of the investment industry would need to shift rapidly.

The IEA provides high-level information about of the nature of investment needed to deliver its Net Zero by 2050 scenario,[94] These investment needs can be classified into three groups of assets (Figure 9):

- **Green assets**, such as biofuels, biogas, renewables, hydrogen, electric vehicle chargers, battery storage, energy efficiency, carbon capture and electrification.

- **Brown assets**, such as unabated fossil fuels.

- **Brown-to-green assets**, which include electricity networks and fossil fuels with carbon capture and storage.

FIGURE 9

GLOBAL AVERAGE ANNUAL ENERGY INVESTMENT BY TYPE IN THE IEA NZE SCENARIO ($2021 TRILLION)

	Baseline	NZE2050		
	2017-21	2022-30	2031-40	2041-50
Fuels	0.83	0.68	0.37	0.27
Fossil fuels	0.82	0.45	0.23	0.11
Low emissions fuels	0.01	0.23	0.14	0.17
Power	0.56	1.54	1.09	1.08
Fossil fuels without CCUS	0.13	0.03	0.01	0.01
Fossil fuels with CCUS	0.00	0.01	0.01	0.00
Nuclear	0.04	0.12	0.09	0.09
Renewables	0.39	1.28	0.82	0.83
Battery storage	0.01	0.10	0.15	0.15
Other	0.00	0.01	0.00	0.00
Infrastructure	0.30	0.76	1.20	0.93
Electricity networks	0.30	0.70	1.03	0.70
EV chargers	0.00	0.04	0.12	0.17
Hydrogen infrastructure	0.00	0.01	0.02	0.04
Direct air capture	0.00	0.01	0.02	0.01
Total end use	0.41	1.74	2.03	2.17
Energy efficiency	0.29	0.77	0.67	0.68
Renewables and other	0.06	0.17	0.21	0.21
Hydrogen	0.00	0.05	0.08	0.13
Electrification	0.06	0.75	1.04	1.13
CCUS	0.00	0.01	0.02	0.02
Total investment	2.10	4.72	4.68	4.45

Brown Green Brown-to-green

Source: IEA World Energy Outlook (2022), Climate Insights, IFM

The investment dynamics to deliver the IEA net zero scenario include:

- An overall level of average annual investment in green assets to 2030 of $3.4 trillion, with an additional $700 billion in brown-to-green assets.
- Of this, over $2 trillion is for energy infrastructure and renewable generation.
- The steepest increase in investment in green assets takes place in the period to 2030. The rate of increase in investment flattens from 2030 to 2050. This means the need for low carbon transition investment is greatest in the next few years to align with net zero by 2050.
- The greatest increase in investment in brown-to-green assets is needed in the period to 2040.
- Average annual investment in brown assets (e.g., unabated fossil fuels) declines across every decade to 2050.

In addition to scaling up investments in climate solutions, existing fossil fuel assets will need to be transitioned (repurposed, decommissioned, etc.) responsibly, and this would require funding. Future CO2 emissions from existing fossil fuel infrastructures without additional abatement already exceed the remaining carbon budget for limiting warming to 1.5°C.[95]

For the transition to occur as outlined by the IEA, institutional investors will need government action, updated investment conventions, and a high degree of flexibility and forward-thinking – embedded in a culture that can manage rapid and ongoing change – to find opportunities and deploy.

5.2 Contributing to better systems

Institutional investors can contribute to healthy environmental, social, and financial systems through a number of channels, including (i) public policy advocacy, (ii) participating in the development of better industry practice, and (iii) undertaking active ownership and stewardship initiatives.

Institutional investors can do these things as independent institutions but have their greatest effectiveness when collaborating.

Industry leaders,[96] including IFM's Dave Neal[97] and Luba Nikulina,[98] are highlighting the need for greater collaboration among institutional investors, especially considering the need for urgent action on climate change.

Collective action by investors is on the rise, and, with competition regulators becoming more favourable to operating company cooperation in pursuit of climate goals,[99] portfolio company opportunities should increase as well.

COP26 was a catalyst for significant private sector collective action on climate change, including the formation of the Glasgow Financial Alliance for Net Zero (GFANZ), which is itself a global coalition of sector-specific alliances that brings together over 600 financial institutions.[100] The eight sector-specific alliances participating in GFANZ includes the Net Zero Asset Manager Initiative, of which IFM was a founding signatory.

Since COP26, GFANZ and other collective endeavours, like The Investor Agenda,[101] and PRI[102] have been increasing efforts on public policy advocacy.[103]

Yet, the timelines and level of investment needed to achieve net zero by 2050 may require further evolution of how government, investors, civil society, scientific organisations, and industry interact.

A deepened integration of government and private actors would not be easy –with risk of corruption and conflicts of interest,[104] and potential friction with some aspects of the bureaucracy.[105]

However, with asset owners observing that the financial risks of climate change are "existential risks to the core business functions of ensuring retirement security and/or providing affordable insurance products", an openness to new approaches is needed.[106]

Looking ahead to future COPs, investors – especially those who see themselves as universal asset owners – could collaborate with governments to develop new models of genuine partnership. Such partnerships might be the key to not only effective public policy making, but also delivering on country-level net zero roadmaps.

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