

## Chapter 1

# Climate, infrastructure and finance: An agenda for transformation

*Aligning financial flows with low-emission, resilient infrastructure is essential to deliver climate and development objectives. Infrastructure underpins economic growth, productivity and well-being. A fundamental transformation of existing infrastructure systems is needed to meet the scale and urgency of climate action. Getting investment and climate policy right is a necessary condition of success, but it is not enough. Existing policy frameworks, institutions and economic incentives encourage incremental changes. Only systemic change will disrupt institutional inertia and vested interests that slow the pace of change in climate and development policy. This chapter contains an extended synthesis of the report, laying out the agenda for governments to move away from incremental progress on climate change to deliver the transformation needed. It highlights why and how action across six transformative areas – planning, innovation, public budgeting, financial systems, development finance and cities – can help align financial flows with climate and development goals.*

### Key messages

Infrastructure sits at the very centre of climate and development pathways. It underpins the development of societies, economic growth, productivity and well-being. Yet current energy, transport, buildings and water infrastructure make up more than 60% of greenhouse gas emissions, and infrastructure worldwide has suffered from chronic underinvestment for decades. A fundamental transformation of existing infrastructure systems is needed to meet the scale and the urgency of climate action.

Aligning public and private investments in low-emission and resilient infrastructure has now become critical to increase resilience, avoid further emissions lock-in, and deliver on climate and the Sustainable Development Goals. Getting investment and climate policy right is a necessary condition of success in meeting the climate challenge, but it is not enough. Existing policy frameworks, institutions and economic incentives encourage incremental changes when a rapid transformation is needed. Only systemic change will disrupt the roots of institutional inertia and vested interests that serve to frustrate and slow the pace of change in climate and development policy.

This report lays out the agenda for a low-emission, resilient transformation that governments, the private sector and civil society need to focus on in order to move beyond an incremental approach to the climate challenge and pursue a truly transformative agenda. It requires action across six areas: planning, innovation, budgeting, financial systems, development and cities, and a whole-of-government, whole-of-society approach to the climate challenge.

## 1.1. A fundamental transformation of existing infrastructure systems is needed

### ***The climate challenge calls for rapid and far-reaching transformations in energy, land-use, transport and urban systems***

A pathway compatible with the objective of the Paris Agreement to limit global temperature increase to well-below 2°C and towards 1.5°C above pre-industrial levels requires a radical change to infrastructure, technologies and behaviours. Significant greenhouse gas emissions are embedded in the vast majority of human activities and preferences. The world's energy, transport, buildings and water systems emit more than 60% of current greenhouse gases. Emissions are increasing as a result of several trends: an increased appetite for mobility and ownership of individual cars; a growing population that is expected to move towards meat-intensive food diets, which puts more pressure on agricultural productivity; use of cement and aluminium in house construction; and increasing reliance on heating and cooling systems.

The urgency and scale of the infrastructure challenge was starkly laid out in the Intergovernmental Panel on Climate Change (IPCC)'s special report on the impacts of global warming of 1.5°C above pre-industrial levels (IPCC, 2018<sup>[1]</sup>). To limit warming to 1.5°C, CO<sub>2</sub> emissions must fall by about 45% by 2030 compared to 2010 levels, and would need to reach net-zero around 2050. The report concludes that “rapid and far-reaching transitions in energy, land, urban and infrastructure (including transport and buildings) and industrial systems” are required in order to limit global warming to 1.5°C. It highlights the need for an

unprecedented transition across these systems, and a significant increase in investments in mitigation options: Annual investment in low-carbon energy and energy efficiency would need to increase by a factor of five by 2050.

While there are many different pathways to achieve carbon neutrality, all require action across the following systems (IPCC, 2018<sup>[1]</sup>):

- **Energy.** Today's energy systems rely heavily on centralised power generation based on fossil fuels. Tomorrow's energy systems will need to see a substantial reduction in demand through energy efficiency, a decline in the carbon intensity of electricity to zero by mid-century, and an increase in electrification of energy uses. In a pathway consistent with 1.5°C warming, renewables supply 70-85% of the electricity in 2050, while coal disappears from the electricity mix by 2050 (IPCC, 2018<sup>[1]</sup>).
- **Land use.** A sustainable intensification of land-use practices, enhanced agricultural productivity and potentially a change in dietary preferences will be necessary in order to meet the goals of poverty reduction, access to food, biodiversity conservation, and climate and development objectives. Changes in urban planning are also essential. Limiting urban sprawl is particularly important in the context of cities in developing countries, which are projected to grow rapidly in the coming decades.
- **Heavy industries.** Cement, aluminium, chemicals and steel are essential to the built environment and to manufacturing, and will remain so for decades to come. Yet their production is extremely energy- and emissions-intensive. A significant transformation of such energy-intensive industries is needed, going beyond energy efficiency measures to more innovative business models and technologies.
- **Transport and buildings.** Current transport systems rely largely on fossil fuels and impose a very high environmental cost (air pollution, noise and congestion). Improving the energy efficiency of transport and buildings is a key step, with more efficient vehicles or appliances, insulation of existing buildings and electrification of vehicles. Demand measures are also required to reduce the need for mobility through more efficient public transport and a better integration of land-use planning and transport policies.

Getting the infrastructure investment right in these systems is one of the key success factors to achieving the goals of the Paris Agreement and delivering on development and growth objectives. Given its long life span, infrastructure could also lock in emissions-intensive behaviours for decades to come. The new demand for infrastructure in a low-emission world is an opportunity for emerging and developing countries to “leapfrog” the emissions-intensive, fossil-fuel oriented infrastructure systems of the past (New Climate Economy, 2016<sup>[2]</sup>). Better infrastructure is also needed to enhance the resilience of economic systems, social structures and communities as a certain amount of climate change is already locked into the system. There is a unique opportunity in the coming years to develop infrastructure systems that deliver better services while protecting the environment.

### ***Greater infrastructure investment is required to support development***

Infrastructure worldwide has suffered from chronic underinvestment for decades, leading to a lack of infrastructure services. Climate-related requirements regarding infrastructure quality come on top of this pre-existing infrastructure investment gap. The urgent need to address this issue presents a unique opportunity in the coming years to move the climate and development agendas forward and develop infrastructure systems that deliver better services

while also achieving climate and development goals. Which infrastructure projects receive financing will shape not only development patterns but will also determine future emissions pathways. Recent OECD estimates indicate that around USD 6.3 trillion of infrastructure investment is needed each year to 2030 to meet the Sustainable Development Goals (SDGs), increasing to USD 6.9 trillion a year over the same period to make this investment compatible with the goals of the Paris Agreement (OECD, 2017<sup>[3]</sup>). The current spending on infrastructure is between USD 3.4-4.4 trillion, depending on the measurement metrics used.

In developing economies, significant levels of investment are needed to upgrade current infrastructure systems and to develop new infrastructure projects to deliver on the Sustainable Development Goals (SDGs). A decisive transition towards a low-emission, resilient future can serve to safeguard the significant gains made in improving human development in past decades.

The latest progress report by the UN Secretary General on the achievement of the SDGs shows that global poverty<sup>1</sup> has declined rapidly, dropping to one-third of 1990 levels in 2013, but that 783 million people still lived in poverty in 2013 (UN Economic and Social Council, 2018<sup>[4]</sup>). But poorer populations and communities are often the most vulnerable to the impacts of a changing climate and without decisive action, increasing climate impacts could drive more than 100 million people into poverty by 2030 (Hallegatte et al., 2016<sup>[5]</sup>). Solving the refugee crisis has been a defining development issue for both developed and developing countries in recent years, and climate change could exacerbate this further. A World Bank Group analysis shows that climate change could induce over 143 million people from three regions – sub-Saharan Africa, South Asia, and Latin America – to migrate out of their own countries (Rigaud et al., 2018<sup>[6]</sup>).

The infrastructure gap is no less a serious concern for developed economies. These economies are at a different stage of the infrastructure cycle, but significant levels of infrastructure investment are needed to maintain and upgrade ageing infrastructure. Public investment in advanced G20 economies fell from 5% of GDP in the late 1960s to 3% in the mid-2000s (OECD, 2017<sup>[3]</sup>). Despite increased infrastructure investment following the recent financial crisis, spending remains at a historic low, resulting in ageing and poorly maintained infrastructure stock in many developed economies.

### ***A greater role for natural infrastructure and the land-use sectors***

Natural infrastructure has a significant role to play in filling the infrastructure gap, both in terms of increasing the efficiency of delivering essential ecosystem-based services and of reducing the cost of infrastructure. Healthy, functional ecosystems can provide services that complement or provide a cost-effective alternative to those provided by grey (civil-engineered) infrastructure. Restoring wetlands and protecting watersheds, for example, can help filter water and regulate water flow, ensuring continued access to clean water and protecting communities and infrastructure from flooding (see Chapter 2).

Similarly, land-use sectors hold considerable potential to deliver mitigation and adaptation benefits, and they are also highly sensitive to climate change. Increasing temperatures are projected to affect – and in some cases have already affected – the ability of land to store carbon, the productivity of land (particularly due to changes in precipitation levels) and the resilience of ecosystems. Measures are needed to enhance the resilience of ecosystems and help adapt agriculture to climate change (e.g. climate-resilient crop varieties, advanced irrigation technologies).

### ***Rapid changes in technologies and business models lie ahead***

Rapid technological, economic and societal changes are generating high uncertainty around a number of variables that could impact climate change mitigation and adaptation efforts in the coming decades. These potential changes and disruptions could radically change the demand for infrastructure, creating new opportunities and challenges for achieving climate goals that must be taken into account in making infrastructure investment decisions today.

Such disruptive technologies include:

- Enabling technologies, such as the Internet of Things (IoT), blockchain, artificial intelligence, machine learning, 3D printing and large powerful batteries;
- Sector-specific technologies, such as autonomous vehicles and electric vehicles;
- Business models that change the demand for infrastructure supply, such as sharing economy and circular economy models; and
- Digital finance instruments such as pay-as-you-go systems that create new opportunities for financing infrastructure services and influencing behaviours.

Innovation in technologies, business models and financing tools creates new opportunities for climate and development. Sharing economy business models could reduce the demand for mobility and housing infrastructure. Disruptive technologies and business models could also reduce oil demand by a third compared to a business-as-usual scenario (Thomä, Dupré and Fulton, 2018<sup>[7]</sup>).

Advances in digitalisation present transformative opportunities to decarbonise and decentralise energy systems: Smart charging technologies for electric vehicles could help address intermittency in renewable energy supply, which could reduce infrastructure investment needs by between USD 100 billion and USD 280 billion in the next two decades. Smart demand response could contribute a further USD 270 billion to infrastructure investment savings (IEA, 2017<sup>[8]</sup>). Digital finance is also transforming the infrastructure-investment value chain, enabling citizens to participate more directly in investments and unlocking new sources of finance for infrastructure (see Chapter 3).

The importance of the disruption created by those innovations lies not only in the existence or availability of such technologies or business models, but also in the ability for developed and developing countries alike to widely adopt and diffuse such innovations and practices. This is highly dependent on the ability of policy makers, regulators and planning authorities to create appropriate enabling policy and regulatory frameworks, as well as incentive structures that are conducive to the emergence of new technologies. These technologies also need to be widely available in order to ensure that they do not in turn exacerbate inequalities between and within societies (see Chapter 3).

## **1.2. Moving beyond an incremental policy approach to climate, infrastructure and finance**

### ***Current policies tend to foster an incremental approach towards climate goals***

While there is clearly some progress in developing and implementing policies in support of sustainable infrastructure, it has proven to be challenging to move beyond relatively marginal or incremental changes to policies and behaviours. On the positive side, more countries are implementing carbon pricing policies and instruments, removing fossil fuel subsidies, carrying out regulatory interventions for energy efficiency and providing

targeted support to low-emission innovation. The number of carbon-pricing initiatives has more than tripled in the last 10 years at the national and subnational level (World Bank and Ecofys, 2018<sup>[9]</sup>). Countries' efforts in supporting low-emission technologies resulted in a significant decrease of the cost of low-emission technologies, which are increasingly competitive with emissions-intensive alternatives, even in the absence of policy support. Global investments in renewable electricity technologies have grown from USD 226 billion in 2000 to USD 298 billion in 2017, and are now more than double the annual investments in fossil fuel generation (IEA, 2018<sup>[10]</sup>) (see Chapter 4).

There is also momentum for change in the financial system. Public and private financial actors are increasingly aware of the role that finance can play in delivering on sustainable development and climate goals, beyond a relatively narrow focus on corporate social responsibility. Since 2013, the number of subnational and national policy and regulatory measures to promote sustainable finance doubled; notable examples include China's 2016 "Guidelines for Establishing a Green Financial System" and the 2018 European Commission Action Plan on Financing Sustainable Growth (European Commission, 2018<sup>[11]</sup>).

At the international level, the number of initiatives focusing on the incorporation of sustainability into the international financial rules quadrupled since 2013 (UNEP Inquiry, 2018<sup>[12]</sup>). There are encouraging developments in the G20 on sustainable infrastructure, with work on new metrics, definitions, standards and financial products as part of the Sustainable Finance Study Group and the Sustainable Insurance Forum. The report of the Financial Stability Board's Task Force on Climate-related Financial Risk Disclosure (TCFD) has been a game-changer in improved awareness, risk analysis and reporting in the corporate sector (TCFD, 2017<sup>[13]</sup>) (see Chapter 5).

Yet progress to date remains incremental across the board – on emissions reductions, policy ambitions and capital re-allocation. Since 1990, world GDP has more than doubled while CO<sub>2</sub> emissions from fossil fuels increased by 60% (OECD, 2017<sup>[3]</sup>). Climate action planned or currently underway, while heading in the right direction, has proven insufficient to deliver the transition required. While the rate of emissions growth slowed considerably and energy emissions were flat for three years up until 2016, global emissions rose again in 2017, driven in particular by strong economic growth and a slowdown in energy efficiency improvement (IEA, 2018<sup>[14]</sup>). Far greater efforts are needed to both reverse that trend, bring about an early global peaking of CO<sub>2</sub> emissions and avoid lock-in to emissions-intensive development pathways.

The combined emissions abatement that governments have pledged to achieve by 2030 in the latest nationally determined contributions (NDCs) still lead to emission levels incompatible with the goals of the Paris Agreement. Even if all abatement targets in the 2030 NDCs were met, global emissions would still be off track by an amount equal to between a fifth and a quarter of total annual emissions globally (UNEP, 2017<sup>[15]</sup>). To get on a least cost pathway compatible with a well-below 2°C target, governments would need to approximately triple current commitments to emissions reductions in their 2030 Nationally Determined Contributions (NDCs). Continuing with business-as-usual, countries' emissions will already have surpassed levels consistent with 1.5°C by 2030 and consume about 80% of the remaining carbon budget consistent with 2°C (UNEP, 2017<sup>[15]</sup>).

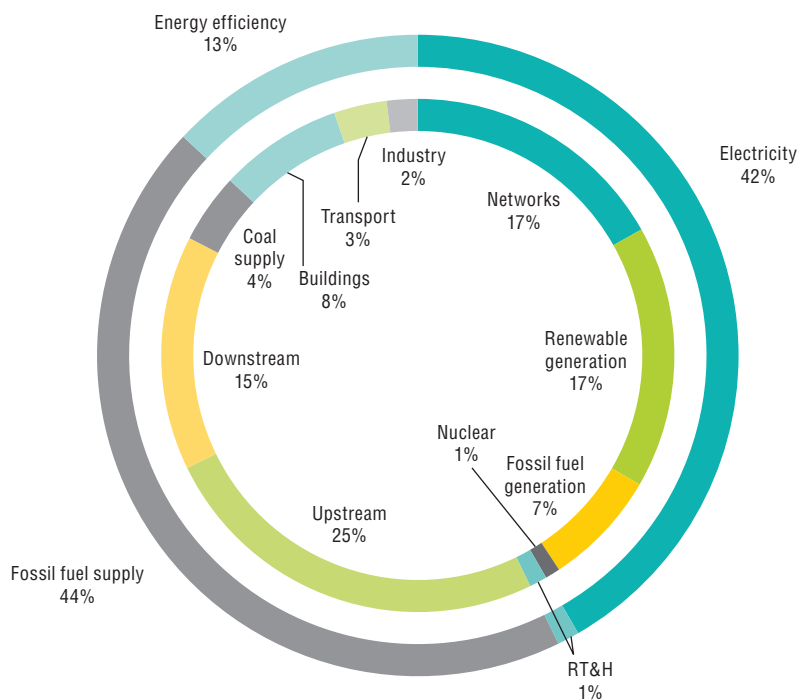
Progress in developing the necessary policy frameworks is also insufficient. Carbon pricing policies are not ambitious enough. Close to half of emissions are not priced at all: Only 12% of carbon emissions are priced at EUR 30 per tonne of CO<sub>2</sub> or higher, a low-end

estimate of the damage that carbon emissions cause and close to half of emissions are not priced at all (OECD, 2018<sup>[16]</sup>). This figure is even higher in sectors such as agriculture and industry. More efforts are needed to remove fossil fuel subsidies, as estimates of support to fossil fuels range between USD 373 billion and USD 617 billion over the period 2010-2015<sup>2</sup> (OECD, 2018<sup>[17]</sup>).


The limited existing evidence suggests that progress on capital reallocation and in greening the financial system remains marginal. Low-emission infrastructure investment remains less than 1% of the overall portfolios of institutional investors (G20 Green Finance Study Group, 2016<sup>[18]</sup>). Current green bonds have been estimated to exceed USD 1 trillion, yet this new asset class makes up less than 1% of the global USD 100 trillion bond market.

In the energy sector, infrastructure investment patterns fail to demonstrate the shift of capital required for the low-emission transition (see Figure 1.1). In 2017, investments in infrastructure for electricity generation from renewable sources were comparable to investments in electricity networks and more than double those of fossil fuel-based electricity generation. But investments in extraction and transport of fossil fuels, oil refining and construction of fossil fuels power plants still represented 57.1% of global investment in energy supply in 2017 (IEA, 2018<sup>[10]</sup>).

Figure 1.1. **Global energy investments, 2017**



Notes: RT&H = Renewable Transport & Heating. Networks includes battery storage.

Source: IEA (2018<sup>[10]</sup>), *World Energy Investment 2018*, International Energy Agency, Paris, <https://www.iea.org/wei2018/>  
 StatLink  <https://doi.org/10.1787/888933856359>

### ***Accelerating efforts to re-direct finance flows has now become critical***

Addressing the sustainable infrastructure challenge requires mobilising actors across the financial spectrum, from public finance institutions to banks, institutional investors, corporations and capital markets. The importance of finance in climate action is recognised

in Article 2.1c of the Paris Agreement, which calls for “making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development” (UNFCCC, 2015<sup>[20]</sup>).

The scale of this transformation is such that government budgets are insufficient to generate the trillions of dollars required and must be supplemented by private resources. Mobilising private investment towards the transition is therefore essential. While private finance must play an expanded role, it will be limited to infrastructure projects with clear revenue streams. The public sector will need to continue to support infrastructure, especially in developing countries.

Low-emission, resilient infrastructure investment faces different types of barriers in attracting financing. In addition to the broad barriers linked to attracting financing in long-term infrastructure, particularly in developing countries, there are specific barriers to investments in low-emission infrastructure. These include higher upfront costs, higher technology risks, higher regulatory risks as returns often rely on government subsidies and policies and different risk perceptions. These barriers result in a high degree of status quo bias in the financial system.

Overcoming barriers to mobilise private sector investment at scale requires action across three core areas in a co-ordinated way (Fay et al., 2015<sup>[21]</sup>). First, governments should make greater efforts to improve the overall business environment and the investment climate. This means, amongst other things, implementing clear and predictable regulations, enforcing property rights and the rule of law, growing local financial markets, and developing options to mitigate regulatory, corruption and currency risks. In the case of developing countries, this imperative needs to be balanced with the political and economic reality of the institutional environment and the urgency of action that needs to happen despite weak investment conditions and immature capital markets in many of these countries.

Second, developing a strong and stable climate policy framework to orient the economy away from emissions-intensive activities is essential to level the playing field with low-emission alternatives. Core climate policies are an essential component of such a framework, including measures such as a robust and credible price on emissions, regulatory measures when pricing is not efficient or too low, fossil fuel subsidy reform and specific measures to bring low-emission technologies to commercialisation.

Third, aligning the overall policy framework with climate goals is essential (OECD, 2015<sup>[22]</sup>). For instance, a number of obstacles embedded in current financial systems and regulations that are hindering the allocation of finance to long-term low-emission infrastructure investments need to be addressed. Such barriers range from the lack of definitions, information, data and capacities on low-emission, resilient infrastructure investment, to the governance of financial institutions and the financial system as a whole, including financial incentives across the system that favour short-termism (UNEP Inquiry, 2015<sup>[23]</sup>; Maimbo et al., 2017<sup>[24]</sup>).

### **Systemic change is needed to address the underlying problems of institutional inertia and vested interests**

Levelling the playing field and adjusting the risk-return profile of low-emission investments is an important element to re-orient flows to low-emission infrastructure, but it is not enough. Infrastructure investment decisions are taking place in an increasingly complex environment. Rapid technological, economic and societal changes are generating uncertainty around a number of variables that could affect the nature of demand for future infrastructure, as well as altering the climate change mitigation and adaptation challenges in coming decades (UN Environment, 2018<sup>[25]</sup>).

The rapid and disruptive advances in technologies also underscore the significant range and scale of uncertainties confronting decision makers today as they grapple with issues that will have long-term impacts on emissions pathways and resilience. Given the likely breadth and depth of change that societies are facing, the world in 2050 is likely to look significantly different in many ways to the world today. Looking ahead using existing models could hamper decision making in an increasingly non-linear world. Tools such as strategic foresight can serve to highlight the “critical uncertainties” that today’s decision makers need to be aware of in order to ensure that current institutional, planning and infrastructure systems can adequately and robustly take such uncertainties into account (see Box 1.1).

Our current institutional settings, processes and institutions are simply not fit to achieve the transformation needed. Governments need to move away from a sectoral approach to infrastructure planning and financing, and move towards a more systemic, forward-looking and whole-of-government approach to infrastructure decisions. Current infrastructure planning practices, decision-making processes and institutional settings inherited from the last century reflect a status quo based on conventional practices and a continued “silo mentality”. Innovation and transformation depend on the engagement of parts of governments that so far have not been sufficiently mobilised in the development of climate response strategies, notably ministries of finance, planning and economy, to ensure a good connection between the real economy and the financial system. New approaches to planning need to complement traditional approaches. Foresight methodology provides a complementary perspective by constructing multiple plausible futures to inform decision making under uncertainty (see Chapter 2).

Overcoming this institutional inertia means addressing a series of barriers inherent to our processes, practices and institutions that are preventing more ambitious climate action, including:

- Behavioural and data biases that encourage choices based on conventional practices rather than forward-looking potential;
- Misaligned incentives and capacity gaps along the investment value chain, from procurement to investment decisions; and
- Political economy factors, such as employment in the fossil fuel industry, government rents from fossil fuel-based activities, short time horizons, as well as citizens and incumbent market interests (Röttgers and Anderson, 2018<sup>[26]</sup>; Maimbo et al., 2017<sup>[24]</sup>)

### ***A just and inclusive transition is essential for a transformative agenda***

The push for greater climate action is accompanied by a need for policies that address inequalities and provide the same opportunities for all. Across the OECD, the top 10% of the income distribution earn around 10 times more than the bottom 10%, up from just 7 times more 30 years ago. Climate change threatens to increase the effects of structural inequalities worldwide. Even though wealthier populations may have more assets at risk of climate change impacts, disadvantaged populations tend to be more vulnerable and suffer disproportionately from a changing climate (UNDESA, 2015<sup>[27]</sup>; Hallegatte et al., 2016<sup>[5]</sup>). This is because they often live in areas more exposed to climate risks with poor quality housing that is not equipped to resist extreme weather events or lack access to air conditioning in the case of heat waves, for example. They may also be less equipped to recover from a disaster, with reduced access to safety nets like unemployment or insurance systems.

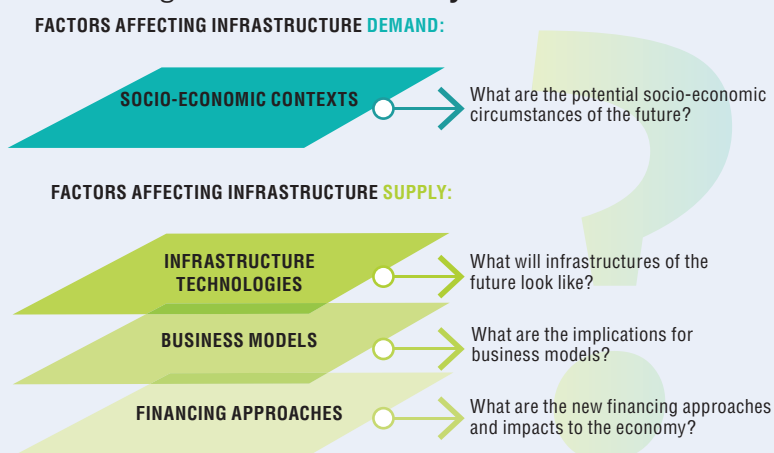
Box 1.1. **Shifting the Lens**

As a component of the Financing Climate Futures initiative, the *Shifting the Lens* report has explored how foresight methodologies and scenario development can better inform infrastructure investment decisions today in order to align financial flows with a low-emission, resilient future (see Figure 1.2).

Figure 1.2. **Foresight and scenario development**

In general, infrastructure decisions today do not take adequate account of critical socioeconomic and technological uncertainties that will shape future infrastructure supply and demand. Scenarios can improve current infrastructure decisions by examining them against an “organised” set of uncertain, plausible futures. Through such a lens, distortions in decision making can be revealed, and adjustments made. Such distortions may arise from a combination of biases embedded in habits and norms, prevalent incentives, incumbent interests, or a lack of competencies.

*Shifting the Lens* has used a simple analytic framework to identify a number of critical uncertainties that affect future infrastructure demand and supply (see Figure 1.3)

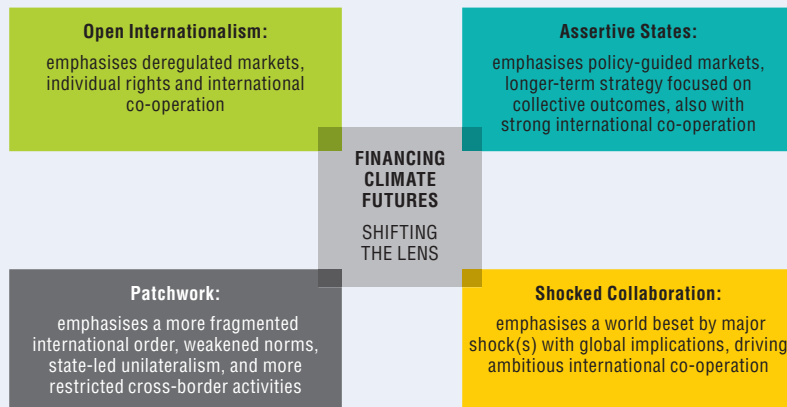
Figure 1.3. **Four-tier analytic framework**

Building on this framework, a number of critical uncertainties have been identified that influence the selection, design, procurement, deployment and related financing decisions regarding low-emission, resilient infrastructure. These include: (1) climate change itself; (2) shifts in the economic and geopolitical features of globalisation; (3) the technological intensification of infrastructure; (4) new economic, business and financing models such as the shared and circular economy; (5) new forms of citizen engagement; (6) changes to the financial system; and (7) economic downturns and external shocks.

To highlight the central role of uncertainty in investment decisions, scenarios were developed to identify clusters of the selected critical uncertainties. It should be emphasised that the scenarios are neither prescriptive nor are they projections. Furthermore, they do not necessarily reflect the views of the organisations involved in preparing this report. They were developed by drawing on the outcomes of dialogue with key stakeholders through workshops and interviews.

Box 1.1. **Shifting the Lens** (cont.)

Each scenario has a core characterisation (see Figure 1.4) and seeks to highlight how combinations of critical uncertainties can lead to quite different directions and sensitivities for today's decision makers. Adequate investment in climate-compatible infrastructure is required under all scenarios. These scenarios are intended to highlight possible aspects of a future within which climate goals need to be attained, not to predict or indicate any preference of one over other scenarios. Scenarios therefore help to “stress test” today's policies, financing decisions and civil actions.

Figure 1.4. **Scenarios**

The key insights from this exercise focus on:

- **Long-term time horizon:** There is no substitute for explicit, long-term planning; governments and their agents, and less so market actors, are likely to be at the core of such long-termism.
- **Policy-guided finance:** Significant policy guidance and support to ensure that private financial markets can fulfil their key role in investing in climate-compatible infrastructure.
- **Citizen action:** Citizens can impact the financing of climate-compatible infrastructure but, going forward, are as likely to constrain as to enable progress, given their varied priorities and time horizons.
- **Resilient investment:** Strong government- and policy-directed finance will be required in the face of economic downturns and external shocks, which are inevitable over the period in question.
- **Shifting globalisation:** The combined effects of automation, climate, business model innovation and reinforcing policy may drive us towards higher fragmentation of the global economy, reshaping the demand for infrastructure, and increasing the importance of local financing solutions.
- **International co-operation:** International co-operation is key, but may become more effective when faced with significant shocks to the global economy.

Scenarios reinforce the importance of examining political will and the institutional and behavioural norms that inform investment decisions in climate-compatible infrastructure by governments, market actors and civil society. Overcoming distortions in decision making will likely make a significant difference to the pace and form of investment in climate-compatible infrastructure:

- Risk pricing needs to be more sensitised to complex and critical uncertainties, including through the use of scenario planning rather than exclusively singular, probability analysis.
- Capabilities need to be enhanced to better handle decision making under uncertainty all along the investment value chain, including investors through to procurement.
- Incentives need to be shifted, together with institutional norms, to increase the rate of adoption of a new generation of technologically intensive infrastructure and associated business and financing approaches.

Source: UN Environment (2018<sub>[25]</sub>), *Shifting the Lens*.

Moving away from our historic reliance on fossil fuels is necessary to anticipate any negative impacts from climate change, but implies also profound changes to the shape of our economies. Our societies, economies, policies and infrastructure have been hard-wired in the past decades to a growth model based on fossil fuels (OECD, 2015<sup>[22]</sup>). Inevitably, an economy-wide transformation is likely to generate tension among those who benefit from these changes and those who consider themselves worse off (OECD, 2017<sup>[3]</sup>).

An inclusive approach to the low-emission transition needs to be managed at two-levels (Fay et al., 2015<sup>[21]</sup>). First, it is essential that the transition benefits everyone, and does not impact the poor disproportionately. National and local policies that aim to reduce emissions and adapt to climate change have a range of economic and distributional consequences on households. In the absence of compensation policies, core climate policies have the potential to affect household spending and the affordability of energy, transport services, and housing, particularly for low-income households (OECD, 2018<sup>[29]</sup>) (see Chapter 7).

Second, it is also necessary to support and manage the transition for those individuals and communities that may be particularly affected as economies shift away from fossil fuels, such as those in heavy industrial regions and energy-intensive activities facing unemployment like coal workers. Ensuring that there are no stranded communities is as important to the transition as minimising the risk and cost of stranded assets. From historic examples like the coal mine closures of the 1980s in the United Kingdom, the delocalisation of heavy industry sectors such as steel production in the United States and shipbuilding in Japan, to the digitalisation of today, structural changes with competitiveness and employment impacts have raised concerns and resistance on the part of affected industries and workers (Botta, 2018<sup>[30]</sup>). There are also lessons to be learnt from recent transitions in sectors such as coal mining, where much of the transition has been driven by economic realities as much as by environmental considerations (Spencer, Sartor and Caldecott, 2017<sup>[31]</sup>).

For many industrial regions, managing a just transition requires developing strategies to support the reorientation of existing industries in order to increase their efficiency and lessen dependence on fossil fuels. For policy makers it also requires minimising the destruction of asset value and ensuring an orderly evolution. Targeted support is needed to compensate for economic loss. Structural reforms such as ensuring flexible labour markets and strengthening social protection schemes could also be instrumental in facilitating the transition, and overcoming political economy issues (see Chapter 4).

### 1.3. An agenda for transformation

This report lays out the agenda for a low-emission, resilient transformation that requires action across six areas: planning, innovation, budgeting, finance, development and cities. Different country contexts, resource endowments and capabilities will determine the priority areas for individual countries. In all countries, however, it is critical that a whole-of-government and whole-of-society approach is employed, with a central role to be played by ministries of finance and economy. This will help to ensure that the planning, investment and finance systems in place are “fit for the future” and able to smooth the path towards low-emission, resilient economies.

#### 1. Plan infrastructure for a low-emission and resilient future

Long-term strategies can be formidable tools for governments and non-state actors to create consensus on their economic trajectories, provide long-term signals to markets and inform near-term policy and investment decisions. Infrastructure planning must be improved

at all levels of government to create pipelines of sustainable infrastructure projects aligned with long-term climate and development objectives. Priority actions include:

- Develop new institutional configurations to align infrastructure plans with a long-term low-emission, resilient development vision.
- Make resilience the norm to limit vulnerability to climate damages, mainstream nature-based solutions and demand-management tools into planning to ensure a resilient future.
- Future-proof infrastructure investment decisions through approaches such as strategic foresight to monitor emerging socioeconomic and technological changes and regularly adjust long-term strategies.

## **2. Unleash innovation to accelerate the transition**

To deliver the economic transformation required to address climate change, governments must accelerate the deployment of existing technologies, business models and services, and swiftly move the next generation of climate solutions from the lab to the market. To scale up climate solutions, governments should:

- Deploy targeted innovation policies to create and shape markets for climate innovations.
- Scale up public investment in research and development to create the next generation of climate solutions.
- Overcome the financial barriers to demonstration and early-stage commercialisation to bring existing technologies to scale.
- Promote international technology diffusion to ensure innovation benefits all.

## **3. Ensure fiscal sustainability for a low-emission, resilient future**

The power and influence of public budgets, if channelled towards climate objectives, can provide significant momentum towards building a low-emission, resilient economic future. In order to make meaningful progress on climate, there are four priority policy actions:

- Diversify government revenue streams to prepare for carbon neutrality in the long run, and reduce governments' exposure to incumbents and vested interests in fossil fuel technologies.
- Align fiscal and budgetary incentives with climate objectives to discourage emissions-intensive behaviours or investments by economic actors.
- Leverage public procurement practices and indirect spending through state-owned enterprises, development finance institutions, export credit agencies and public investments to align with climate objectives.
- Ensure an inclusive transition along the way, fostering public support for raising climate ambition.

## **4. Reset the financial system in line with long-term climate risks and opportunities**

There is an urgent need to mobilise all sources of private finance to scale up and shift infrastructure investment towards low-emission, resilient projects. An array of rules governing the financial system favours the status quo and stands in the way of the necessary reallocation of capital. Decision-making processes are distorted by inadequate climate risk pricing, capabilities and biased incentives in the investment value chain. The following actions will help move sustainable finance from momentum to transformation:

- Encourage the integration of climate impact into investment decisions and strategies to improve climate-risk management strategies.

- Incentivise the disclosure of climate-related risks and opportunities for investors to increase transparency in financial markets.
- Support financial supervisory authority to better assess and manage climate-related risks that could threaten the financial stability of the system in the short and long term.

### **5. Rethink development finance for climate**

While many different actors will need to be mobilised to help address the sustainable infrastructure challenge, development banks and development finance institutions are critical, particularly in developing country contexts. But for these banks to play a transformational role, they need to do more to integrate climate into underlying development objectives, better align overall portfolios with the Paris Agreement and scale up efforts to unlock commercial investment. Development banks cannot do this alone – their activities are dependent on, and strongly influenced by shareholder and client governments. Scaling up climate action requires governments and development banks to make three key changes:

- Strengthen development banks' mandates and incentives to deliver transformative climate action.
- Bring new investors and sources of finance to investments to create new climate markets.
- Use concessional finance to enable development banks to drive the transformation.

### **6. Empower city governments to build low-emission and resilient urban societies**

Empowering local and city governments to plan and finance low-emission, resilient infrastructure is an essential part of achieving climate and development goals. The way cities expand and develop will determine the emissions of 70% of the world's population in the 2050. Cities are particularly vulnerable to climate risks and must develop strategies that ensure urban resilience. The failure to invest in the right urban forms will put residents, the local economy and social cohesion at risk, potentially exacerbating existing inequalities. National and local governments should work together to pursue the following transformative actions:

- Rethink institutional configurations to integrate land-use and transport strategies and seize the immediate development benefits of low-emission, resilient planning.
- Align national and local fiscal policies to encourage and enable low-emission, resilient investments and behaviours.
- Build climate-related and project finance capacity in cities to efficiently finance and deliver complex low-emission, resilient infrastructure projects.
- Seize the social and economic benefits of low-emission, resilient planning to deliver inclusive urban growth.

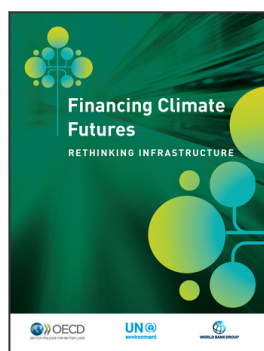
### **Notes**

1. As measured using the international poverty line, i.e. USD 1.90 a day at 2011 purchasing power parity.
2. The combined dataset covers 76 national economies that collectively contribute 94% of global CO<sub>2</sub> emissions.

## References

- Botta, E. (2018), “A Review of “Transition Management” Strategies: Lessons for Advancing the Green Low-carbon Transition”, *Green Growth and Sustainable Development Forum 2018 Issue Notes*, OECD Publishing, Paris, <http://www.oecd.org/greengrowth/ggsd-2018/>. [30]
- European Commission (2018), Press release - Frequently asked questions: Commission proposals on financing sustainable growth, [http://europa.eu/rapid/press-release\\_MEMO-18-3730\\_en.htm](http://europa.eu/rapid/press-release_MEMO-18-3730_en.htm) (accessed on 12 September 2018). [11]
- Fay, M. et al. (2015), *Decarbonizing Development: Three Steps to a Zero-Carbon Future*, World Bank, <https://openknowledge.worldbank.org/handle/10986/21842>. [21]
- G20 Green Finance Study Group (2016), *G20 Green Finance Synthesis Report*, G20 Green Finance Study Group, <http://www.g20.utoronto.ca/2016/green-finance-synthesis.pdf> (accessed on 12 September 2018). [18]
- Hallegatte, S. et al. (2016), *Shock Waves: Climate Change and Development Series Managing the Impacts of Climate Change on Poverty*, World Bank, Washington, DC, <https://openknowledge.worldbank.org/bitstream/handle/10986/22787/9781464806735.pdf> (accessed on 27 September 2018). [5]
- IEA (2018), *Global Energy and CO2 Status Report 2017*, International Energy Agency, Paris, <http://www.iea.org/publications/freepublications/publication/GECO2017.pdf>. [14]
- IEA (2018), *World Energy Investment 2018*, International Energy Agency, Paris, <https://www.iea.org/wei2018/>. [10]
- IEA (2017), *Digitalization and Energy*, International Energy Agency, Paris, <http://www.iea.org/publications/freepublications/publication/DigitalizationandEnergy3.pdf> (accessed on 05 July 2018). [8]
- IPCC (2018), *Global Warming of 1.5 degrees C*, Intergovernmental Panel on Climate Change, Geneva, <http://www.ipcc.ch/report/sr15/>. [1]
- Maimbo, S. et al. (2017), “Roadmap for a Sustainable Financial System”, No. 121283, World Bank Group and UNEP Inquiry, Washington, DC, <http://documents.worldbank.org/curated/en/903601510548466486/Roadmap-for-a-sustainable-financial-system>. [24]
- New Climate Economy (2016), *The Sustainable Infrastructure Imperative: Financing for Better Growth and Development*, The New Climate Economy, Washington, DC and London, [http://newclimateeconomy.report/2016/wp-content/uploads/sites/4/2014/08/NCE\\_2016Report.pdf](http://newclimateeconomy.report/2016/wp-content/uploads/sites/4/2014/08/NCE_2016Report.pdf) (accessed on 17 October 2018). [2]
- OECD (2018), *Effective Carbon Rates 2018*, OECD Publishing, Paris, [https://one.oecd.org/document/COM/ENV/EPOC/CTPA/CFA\(2018\)1/REV1/en/pdf](https://one.oecd.org/document/COM/ENV/EPOC/CTPA/CFA(2018)1/REV1/en/pdf) (accessed on 19 July 2018). [16]
- OECD (2018), *Inclusive Growth in Seoul, Korea*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264290198-en>. [29]
- OECD (2018), *OECD Companion to the Inventory of Support Measures for Fossil Fuels 2018*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264286061-en>. [17]
- OECD (2017), *Investing in Climate, Investing in Growth*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264273528-en>. [3]
- OECD (2015), *Aligning Policies for a Low-carbon Economy*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264233294-en>. [22]
- Rigaud, K. et al. (2018), *Groundswell: Preparing for Internal Climate Migration*, World Bank, Washington, DC, <http://hdl.handle.net/10986/29461> (accessed on 19 October 2018). [6]
- Röttgers, D. and B. Anderson (2018), “Drivers and barriers to the decarbonisation of the electricity sector (forthcoming)”, *OECD Environment Working Papers*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/19970900>. [26]
- Spencer, T., O. Sartor and B. Caldecott (2017), *Lessons from previous ‘coal transitions’*, IDDRI, Paris, <https://www.iddri.org/en/publications-and-events/report/lessons-previous-coal-transitions> (accessed on 26 October 2018). [31]
- TCFD (2017), *Recommendations of the Task Force on Climate-related Financial Disclosures*, <https://www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf> (accessed on 12 September 2018). [13]

- Thomä, J., S. Dupré and M. Fulton (2018), “The Bigger Picture: The Impact of Automation, AI, Shared Economy... On Oil Demand”, No. 2018/2, 2 Degrees Investing Initiative, [https://2degrees-investing.org/wp-content/uploads/2018/05/2dii\\_Disruption\\_v1.pdf](https://2degrees-investing.org/wp-content/uploads/2018/05/2dii_Disruption_v1.pdf) (accessed on 17 July 2018). [7]
- UN Economic and Social Council (2018), *Progress towards the Sustainable Development Goals*, UN Economic and Social Council, New York City, <http://undocs.org/E/2018/64> (accessed on 19 October 2018). [4]
- UN Environment (2018), *Shifting the Lens (forthcoming)*, UN Environment, <https://www.unepinquiry.org>. [25]
- UNDESA (2015), “Risks of Exposure and Vulnerability to Natural Disasters at the City Level: A Global Overview”, <https://esa.un.org/Unpd/Wup/Publications/Files/WUP2014-TechnicalPaper-NaturalDisaster.pdf> (accessed on 25 July 2018). [27]
- UNEP (2017), *The Emissions Gap Report 2017*, UN Environment Programme (UNEP), Nairobi, [https://wedocs.unep.org/bitstream/handle/20.500.11822/22070/EGR\\_2017.pdf](https://wedocs.unep.org/bitstream/handle/20.500.11822/22070/EGR_2017.pdf). [15]
- UNEP Inquiry (2018), *Making Waves: Aligning the Financial System with Sustainable Development*, UN Environment, Geneva, <http://unepinquiry.org/making-waves/>. [12]
- UNEP Inquiry (2015), *The Financial System We Need: Aligning the Financial System with Sustainable Development*, UN Environment, <http://www.unep.org/inquiry> (accessed on 12 September 2018). [23]
- UNFCCC (2015), *The Paris Agreement*, <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement> (accessed on 08 June 2018). [20]
- World Bank and Ecofys (2018), *State and Trends of Carbon Pricing 2018*, World Bank, Washington, DC, <https://openknowledge.worldbank.org/handle/10986/29687>. [9]



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