

# Meeting the Challenge of **SUSTAINABLE INFRASTRUCTURE:** The Role of Public Policy

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This paper was produced as part of the “Better Finance, Better Development, Better Climate” project, which was made possible with support from, among others: U.K. Aid from the U.K. government, the government of Norway, the government of Sweden, the [Children’s Investment Fund Foundation](#), and [Bloomberg Philanthropies](#). The views expressed here do not necessarily reflect the opinions or official policies of these institutions. Brookings and the New Climate Economy recognize that the value they provide is in their absolute commitment to quality, independence, and impact. Activities supported by donors reflect this commitment and the analysis and recommendations are not determined or influenced by any donation.

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# Executive SUMMARY

The adoption of the Sustainable Development Goals (SDGs) and the Paris agreement on climate action present a unique opportunity to set the world on a path towards better and more sustainable development outcomes. Delivering sustainable infrastructure at scale lies at the heart of this agenda. Infrastructure is a major driver of growth and inclusive development. Delivered in more sustainable ways, it is also key to tackling climate change, as it currently accounts for around 60 percent of the world's greenhouse gas (GHG) emissions. This means investing more, and better, in renewable energy, cleaner transport, efficient and resilient water systems, and smarter cities.

The world will need to invest upwards of \$6 trillion annually in sustainable infrastructure in the next 15 years, more than double the current level. As much as three-quarters of the incremental investment will need to take place in emerging and developing economies, with the largest part in middle-income countries. This presents a great challenge in mobilizing resources and better integrating climate sustainability in infrastructure. Strong and concerted actions will be needed across public and private sectors, and at national and international levels, including important transformations in the way infrastructure investment is developed, financed, and implemented. More than half of the financing will need to be mobilized from the private sector.

Public policy has a central role to play in meeting this challenge, both because the public sector itself is a major investor in infrastructure and because public policy provides signals and sets the regulatory and institutional framework that influence the actions of private investors and consumers. Soundness, clarity, and credibility of public policy are especially important for infrastructure investments, given their longevity, public good characteristics, associated externalities, and inevitable and intimate links to government policies. There are four key roles for public policy:

- *Articulating national strategies for sustainable infrastructure.* Sustainability must be fully integrated in national strategies and plans; addressing one group of projects at a time will not do. The G-20 can

provide leadership in setting out clear and coherent national strategies for sustainable infrastructure, linked to intended nationally determined contributions (INDCs) announced ahead of the Paris meeting. National infrastructure strategies should in turn be embedded in overall national investment and growth strategies and macroeconomic frameworks.

- *Improving the policy environment.* In getting prices right to shift incentive structures towards low-carbon infrastructure, the highest priority attaches to removal of fossil-fuel subsidies and implementation of carbon pricing. To attract more private investment, policy risk and costs of doing business must be reduced. Improvement of policy frameworks and financing mechanisms for public-private partnerships (PPPs) needs particular attention, as this will be an increasingly important investment modality.
- *Strengthening public investment management.* Public investment has in general been on a declining trend, exacerbating infrastructure gaps. This trend must be reversed. Also, public investment in research and development (R&D) in sustainable infrastructure should be boosted. Public investment management capacities will need

substantial enhancement. Strengthening project pipelines is a priority, including incorporating sustainability criteria in project preparation, public procurement, and PPPs.

- *Mobilizing financing.* Governments must expand their own fiscal space, through tax and expenditure reform and better use of balance sheets, as well as find innovative ways to leverage more private finance and lower its cost. Carbon pricing and improved property taxation in particular have the potential to raise substantial revenue as well as improve the tax structure. With the large role of urban areas in sustainable infrastructure, subnational fiscal reform should empower cities. Through risk mitigation and other instruments, development capital (both traditional development assistance and new climate finance) should be used in ways to achieve more leverage. Multilateral development banks (MDBs) have a key role in this regard and their capacities will need to be boosted. Promoting infrastructure as an asset class will help unlock financing from the large pools of savings held by institutional investors. Middle-income countries in particular should step up efforts to develop domestic capital markets.

# I. *A Historic* OPPORTUNITY

Infrastructure, economic growth, and sustainable and inclusive development are intimately related. Infrastructure is a key driver of economic growth. In the current context of increasing concerns about prospects for global growth, infrastructure investment can play an especially important role, by boosting global aggregate demand today and laying stronger foundations for future growth. Infrastructure is also a key element of the agenda to combat climate change and promote sustainable growth and development. Done badly, it is a major part of the problem; infrastructure accounts for around 60 percent of the world's greenhouse gas emissions. Done right, it is a major part of the solution, vital to both climate change mitigation and adaptation. Adequacy, affordability, sustainability, and resilience of infrastructure matter greatly for inclusive growth and poverty reduction.

Today the world has an unprecedented opportunity to move forward vigorously on this interconnected agenda. Important recent developments have laid a strong foundation to build on. The Sustainable Development Goals (SDGs) adopted by the international community in September 2015 incorporate climate sustainability integrally into the global development agenda. Infrastructure cuts across this agenda. The world has been underinvesting in infrastructure—in energy systems, cities, transport, and water. But the need to substantially scale up investment in infrastructure and address related policy agenda is now receiving attention at major international fora, such as the G-20, resulting in notable initiatives to improve the investment and financing framework. There is also progress on both country-level commitments and global collective action to combat climate change, spurred by growing recognition that climate action is not only urgent but also not at odds with economic growth. A culmination of this was the historic agreement reached by nearly 200 countries at the 21st Conference of the Parties (COP21) in Paris to step up climate action to hold the increase in global average temperature to well below 2 degrees Celsius above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5 degrees Celsius. At the same time, technological breakthroughs are opening new avenues for action and lowering costs. There is at present a momentum for change that policymakers can tap to advance on this mutually supportive agenda.

Globally, investment needed in sustainable infrastructure over the next 15 years (2015-2030) is estimated at about \$93 trillion (GCEC 2014). On an annual basis, investment in infrastructure will need to more than double from \$2.5-3 trillion currently to above \$6 trillion to fill existing gaps and meet growing demand. As much as three-quarters of the increase in investment will need to take place in the developing world, particularly in middle-income economies, reflecting their growth needs, rapid urbanization, and sizable infrastructure backlogs. The largest part of the investment needs, around 45 percent, relates to energy. The scale of the challenge is brought home by the fact that the assessed infrastructure investment needs over the next 15 years are almost twice as large as the value of the entire current infrastructure stock (estimated at about \$50 trillion). This also presents a major opportunity to remake our physical environment in a way that better supports future economic growth and at the same time protects the climate (Bhattacharya et al. 2015).

How these infrastructure investments are made will be crucial. Infrastructure assets are long-lasting. There is a great danger of locking in high-carbon, polluting, and wasteful pathways if we build the new infrastructure in much the same way as in the past, such as continuing to rely heavily on fossil fuels in meeting the future energy demand. Currently, more than 80 percent of the world's primary energy supply and more than two-thirds of its electricity are derived from fossil fuels (IEA 2015a). The world can ill-afford to lock in this pattern of meeting its energy needs. If the new investments in energy and other infrastructure are done

well and factor in climate risks, they can not only bridge the infrastructure gap to support economic growth and development but do so in a way that helps manage climate change. This means investing more, and better, in renewable energy, cleaner transport, more efficient and resilient water systems, and smarter cities to meet future needs. Sustainable infrastructure mitigates carbon emissions as well as builds resilience for adaptation to climate change.

Encouragingly, recent trends in investment show that a shift towards sustainable infrastructure is beginning to take shape, laying the ground for a scale-up of such investment with more supportive policy and financial frameworks. For example, global investment in clean, renewable energy reached a record level of \$329 billion in 2015, almost four times its level 10 years ago (excluding large hydroelectric projects). About half of this investment was in emerging and developing economies (up from their 15 percent share a decade ago), ranging from \$110 billion in China alone to \$5 billion in sub-Saharan Africa. Wind and solar power made up about half of the new electricity generating capacity installed in 2015 globally, indicating the improving cost-competitiveness of these technologies (BNEF 2016).

The confluence of the need for a major boost in infrastructure investment and the urgency of climate action makes this a critical moment. The ambitious global compact on climate change reached in Paris can help in imparting a strong impetus for sustainable infrastructure as the model for the future.

## *II. Four Key*

# PUBLIC POLICY ROLES

Public policy has a central role to play in the agenda to promote sustainable development and manage climate change through provision of better infrastructure. This is in part because the public sector itself is a major investor in infrastructure and its investment decisions and institutional capacities directly affect the quantity and quality of infrastructure that is provided and how it supports growth, inclusiveness, and sustainability. But, more importantly, public policy provides signals and sets the regulatory and institutional framework that influence the actions of all actors, including private investors and consumers. Given the magnitude of the infrastructure challenge, private investment and finance will need to play a much greater role than before. Success in mobilizing private investment at scale and channeling it to sustainable infrastructure will depend crucially on incentives and enabling environment provided by public policy—at national and international levels.

There is a range of policy, institutional, and market failures that undermine the adequacy, efficiency, affordability, and sustainability of infrastructure. These failures raise costs and lower returns, increase risks, limit institutional capabilities, and drive a wedge between social and private costs and returns. The role of public policy is to address these failures. Soundness, clarity, and credibility of public policy are especially important for infrastructure investments, given the longevity of these investments, the public good nature of much of infrastructure, important associated externalities, and the inevitable and intimate links to government policies. Large up-front costs with returns flowing only much later, and constraints on long-term financing, make the funding of infrastructure particularly challenging.

Infrastructure development presents a governance challenge, even more so given the scale of future needs (OECD 2015a). Better integrating climate sustainability in infrastructure calls for important transformations in the way infrastructure investment is developed, financed, and implemented, which add to the governance challenge. There are four key roles that public policy needs to play: first, providing coherent overarching strategies for sustainable infrastructure linked to national growth and sustainable development

objectives; second, reforming the policy framework governing the actions of investors and consumers; third, improving the public sector's own investment management; and, fourth, mobilizing financing through strengthening public finances and promoting innovations to spur more private financing and lower its cost.

## 1. Articulating National Strategies for Sustainable Infrastructure

Countries need to articulate clear and comprehensive strategies for sustainable infrastructure and embed them in overall strategies for sustainable and inclusive growth and development. Addressing one group of projects at a time will not do. Sustainability is not just about individual projects; it is about reflection of the sustainability dimension in the overall strategic, policy, and investment framework. There is a need for a broader articulation of national strategies on the direction of change and plans to address policy and market failures and other constraints to sustainable infrastructure development. National strategies need to inform, and be supported by, strategies in key infrastructure sectors and subnational jurisdictions that are important providers of infrastructure. Only such integrated strategic frameworks will ensure coherence across public policy actions and investments, facilitate coordination across sectors and levels of government, and provide the clarity and confidence to private investors to do their part.

Sustainable infrastructure measures, to varying degrees, form part of the INDCs countries announced in the lead-up to the Paris meeting. More than 180 countries submitted such national climate action plans. The commitments countries have made are more ambitious than their past commitments, but they collectively fall short of the goal to limit global warming to well below 2 degrees Celsius above pre-industrial levels. So the collective level of ambition will need to be raised. An important outcome of the Paris meeting, therefore, is an agreed process

to verify progress on implementation and review action plans every five years with a view to strengthening them to achieve the climate goals. It will also be important for countries to reflect and integrate their action plans—or INDCs—in overall national growth and development strategies.

The G-20 group of major economies can provide leadership on this effort. Together, these economies account for around 80 percent of global carbon emissions. As part of G-20 processes, all G-20 countries have prepared and peer-reviewed national growth and investment strategies over the past two years. These are important initiatives, as they consolidate different elements of country policies and G-20 work streams in growth and investment frameworks that permit a more integrated and strategic consideration of policy linkages and priorities at the national level as well as areas for coordination at the international level. However, climate sustainability so far has received very limited attention in these strategies. The strategies are also insufficiently linked to collective G-20 work on some important elements of the sustainability agenda, such as reform of fossil-fuel subsidies, energy policy, and climate finance.

The G-20 growth strategies address the agenda to achieve strong, sustainable, and balanced growth, but sustainability is approached mainly in terms of macroeconomic and fiscal sustainability. Longer-term sustainability of growth related to environmental stress and climate change is at best only weakly incorporated in the growth strategies. The G-20 investment strategies focus on boosting investment as a key element of the agenda to lift economic growth, with particular attention to ramping up infrastructure investment. While country investment plans include specific investments in areas such as renewable energy and disaster resilience, climate sustainability is not integrated in the investment strategies as a cross-cutting theme and imperative that informs the investment agenda as a whole (Box 1). The Paris agreement and the INDC process provide an opportunity to better integrate climate sustainability, and related

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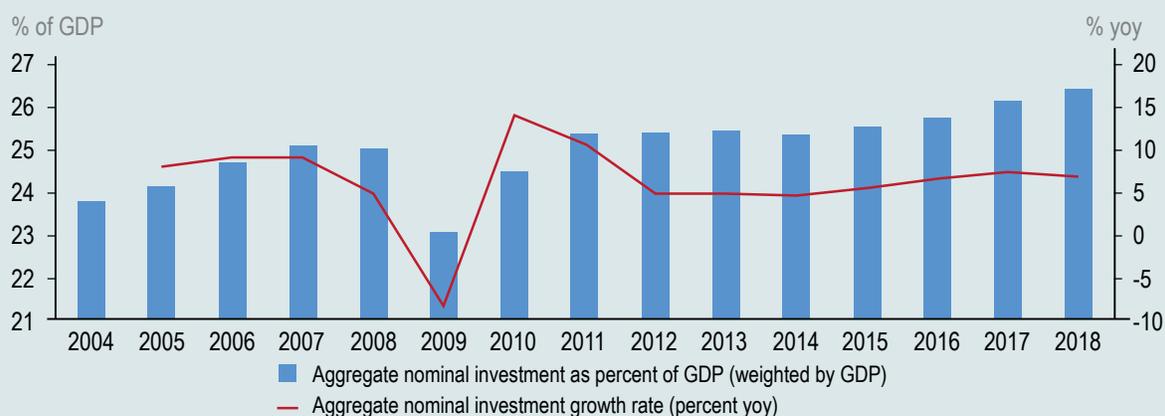
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### Box 1: Need to better integrate sustainability in G-20 investment strategies

Growth strategies prepared by all G-20 countries in 2014 called for boosting investment and addressing infrastructure shortfalls as crucial to lifting growth and job creation. To flesh out the investment agenda, G-20 countries subsequently prepared investment strategies that were assessed and peer-reviewed in the G-20's Investment and Infrastructure Working Group and eventually discussed by G-20 Leaders at their summit in November 2015.

Based on estimates provided by G-20 countries, total G-20 investment is projected to exceed GDP growth in the period ahead, with the investment to GDP ratio rising in most G-20 countries relative to current and pre-crisis levels. For G-20 countries collectively, the investment to GDP ratios rises by about 1 percentage point during 2015-18 to reach 26.4 percent (see chart). There is a large variance in G-20 investment ratios at the level of individual countries; in 2014, they ranged from about 17 percent (Argentina, Italy, U.K.) to 46 percent (China).

**G-20 investment/GDP ratio and investment growth rate**



Source: OECD (2015b)  
Note: Projections for 2015 and beyond.

The need to address infrastructure gaps is a major driver of the projected increases in investment. While aiming to boost the quantity of investment, the G-20 investment strategies also emphasize measures to ensure quality. These include improvements in policies in key infrastructure sectors, investment planning, and project preparation and implementation. Improvements in fiscal management to underpin increases in public investment also receive attention. Other areas of emphasis

are improvement of PPP frameworks and promotion of modalities to leverage more private financing. The strategies also address the agenda to improve the climate for investment in countries more broadly through policy and institutional reforms.

The investment strategies include a variety of sustainable infrastructure projects. This is especially the case with the energy sector, where many strategies include projects for clean/renewable energy generation and improved efficiency in energy use. Several strategies include projects to address disaster risks. A few strategies also mention policy reforms such as carbon taxes and incentives for sustainable investments and research and development. However, for the most part, attention to climate sustainability and resilience is fragmentary, limited to a few discrete investments and policy initiatives. The sustainability dimension is not incorporated in the investment strategies as an overarching concern to be reflected in the design of the overall investment program and across the policy and investment choices that are made. This is a missed opportunity. Climate protection requires a deeper, systemic integration of sustainability in country investment and infrastructure development programs and policies. This need should receive more attention as the G-20 investment strategies are further developed and implemented.

## 2. Improving the Policy Environment

A central element of national strategies for sustainable infrastructure development must be the improvement of the broad policy environment that determines the incentives and enabling conditions facing investors and consumers. This includes addressing key price distortions and improving the regulatory and institutional framework governing investment.

### 2.1. Addressing Fundamental Price Distortions

Correcting pervasive distortions in the pricing of natural resources and infrastructure services is key to improving the public policy environment for sustainable infrastructure. The biggest distortions are fossil fuel subsidies and the lack of carbon pricing, which strongly bias infrastructure investment towards high-carbon sources of energy, discourage the development of cleaner energy technologies, undermine efficiency in energy use, and cause seriously harmful environmental impacts. The magnitude of the distortions is huge.

#### 2.1.1. *Removing fossil-fuel subsidies*

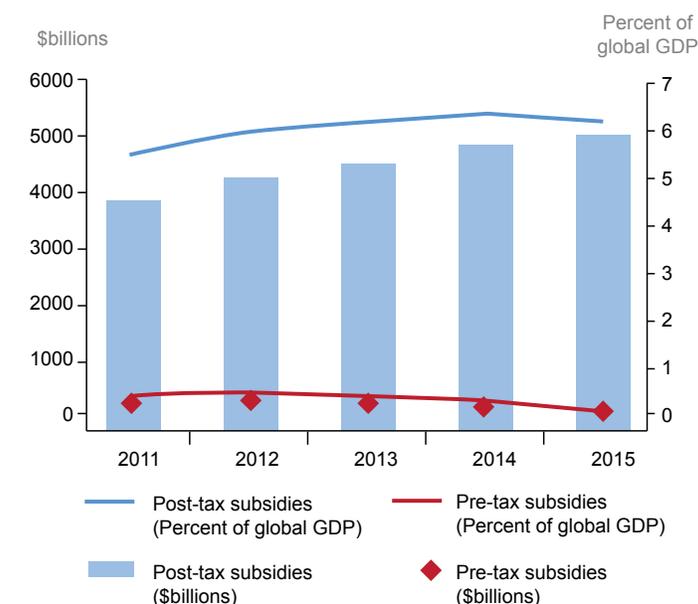
The International Monetary Fund (IMF) has estimated that the total cost of energy subsidies, including the failure to price in negative externalities

in terms of pollution and climate change impacts, was \$5.3 trillion in 2015, or 6.5 percent of world GDP (Figure 1). Fossil fuels account for as much as 97 percent of the estimated total. The largest component of these subsidies is associated with coal, followed by petroleum. The subsidies are pervasive across countries. Emerging Asia accounts for about half of the total subsidies, while advanced economies account for about a quarter.

Elimination of fossil-fuel subsidies would reduce global CO<sub>2</sub> emissions by an estimated 20 percent or more. About three-quarters of the subsidies are related to local environmental damages, notably pollution, and fiscal losses. Removal of the subsidies could cut premature deaths from air pollution by more than half (The World Health Organization estimates that outdoor air pollution causes more than 3 million premature deaths a year). It could also generate substantial fiscal gains, estimated at \$2.9 trillion (3.6 percent of world GDP) in 2015. These fiscal gains could be channeled to better uses, such as improving government finances, investing in sustainable infrastructure, bolstering R&D in green technologies, and supporting social safety nets that are better targeted than fuel subsidies that tend to be highly regressive. Most of the benefits of energy subsidies, typically more than 90 percent, accrue to non-poor, higher-income groups (Arze del Granado et al. 2012, IEA 2014a). More effective in helping the poor are targeted measures such as adjustments to the tax and benefit system, which

**Figure 1: High cost of global energy subsidies**

*Global Energy Subsidies*



Source: Coady et al. (2015)

may require only a small fraction of the savings from the removal of the subsidies (Dinan 2015).

In many countries, just the fiscal losses from fossil-fuel subsidies (without factoring in failure to charge for environmental damages) are a multiple of total spending on health. This is the case even with some poor countries in sub-Saharan Africa that can ill-afford such misallocation of resources, for example, Cameroon, Congo, Côte d'Ivoire, Mozambique, and Zambia. In some major oil producers, such as Angola, fiscal losses from fossil-fuel subsidies exceeded spending on health and education combined (Whitley and van der Burg 2015a).

While the removal of fossil-fuel subsidies would have global benefits by reducing carbon emissions, the bulk of the gains would accrue locally through environmental and fiscal benefits. It is, therefore, in the own interest of countries to move ahead unilaterally with fossil-fuel pricing reform. Also, evidence shows that concerns about large negative impacts on firms' competitiveness and carbon leakage—companies moving their activities to other jurisdictions with lower carbon costs—are

exaggerated (World Bank & ECOFYS 2015, Arlinghaus 2015, Fischer et al. 2015). Where the potential impacts may be more significant, as in more carbon-intensive industries, they can be addressed through complementary policies to facilitate adjustment by firms and workers, such as transition relief and retraining programs. Evidence suggests that the cost of such transition support measures is likely to be small compared to revenue mobilized from fossil-fuel pricing reform, say around 15 percent (Rydge 2015, Goulder 2013). Longer-term, countries that make quicker adjustment to efficient energy pricing will be at a competitive advantage. So the case for unilateral action by countries to reform fossil-fuel pricing is strong. Nonetheless, global coordination can certainly help strengthen national reform efforts—and help achieve collective outcomes more efficiently. A promising step in this direction occurred in late May 2016, when G-7 leaders meeting in Ise-Shima, Japan, pledged to end fossil-fuel subsidies by 2025.

A number of countries are taking steps to remove or reduce fossil-fuel subsidies, especially taking advantage of the prevailing low petroleum price

es. More than 30 countries have taken action to phase-out these subsidies since 2013. This diverse group of countries includes both some major consumers and producers of fossil fuels, such as Angola, Egypt, Ghana, India, Indonesia, Iran, and Mexico—and most recently Saudi Arabia. These reforms are encouraging, though many do not go far enough and in some cases the reform was partially reversed later, such as in Nigeria. Analysis of these reform episodes shows that reforms have a better chance of being deeper and more durable if they are part of a broader and longer-term reform effort rather than isolated actions in response to short-term exigencies (Whitley and van der Burg 2015b). Overall, fossil-fuel pricing reform needs to go much further, not only to remove explicit fiscal subsidies but also to begin to address implicit subsidies relating to the damages caused by pollution and carbon emission (Arezki and Obstfeld 2015).

### 2.1.2. *Instituting carbon pricing*

The single most important action public policy can take to shift the incentive structure towards lower-carbon investment and development trajectories is to put a price on carbon emissions. Carbon pricing is the most efficient way to reduce carbon emissions, aligning the price paid by carbon users with the true social opportunity cost of carbon and using the market mechanism to influence the behavior of producers and consumers. It can reach, and promote the full range of mitigation responses across, all sectors. It also raises revenue.

Regulation can also play a role, such as through instituting environmental standards in energy and transport, but pricing is more efficient than a patchwork of regulations covering a discrete number of activities (Farid et al. 2016). Regulatory approaches do not provide the clear, uniform price signals needed to redirect investment and innovation. They are also administratively more complex, and do not raise revenue. Where used, regulations should be applied to promote a broad range of mitigation responses and harmonize (explicit or implicit) carbon prices across programs and sectors

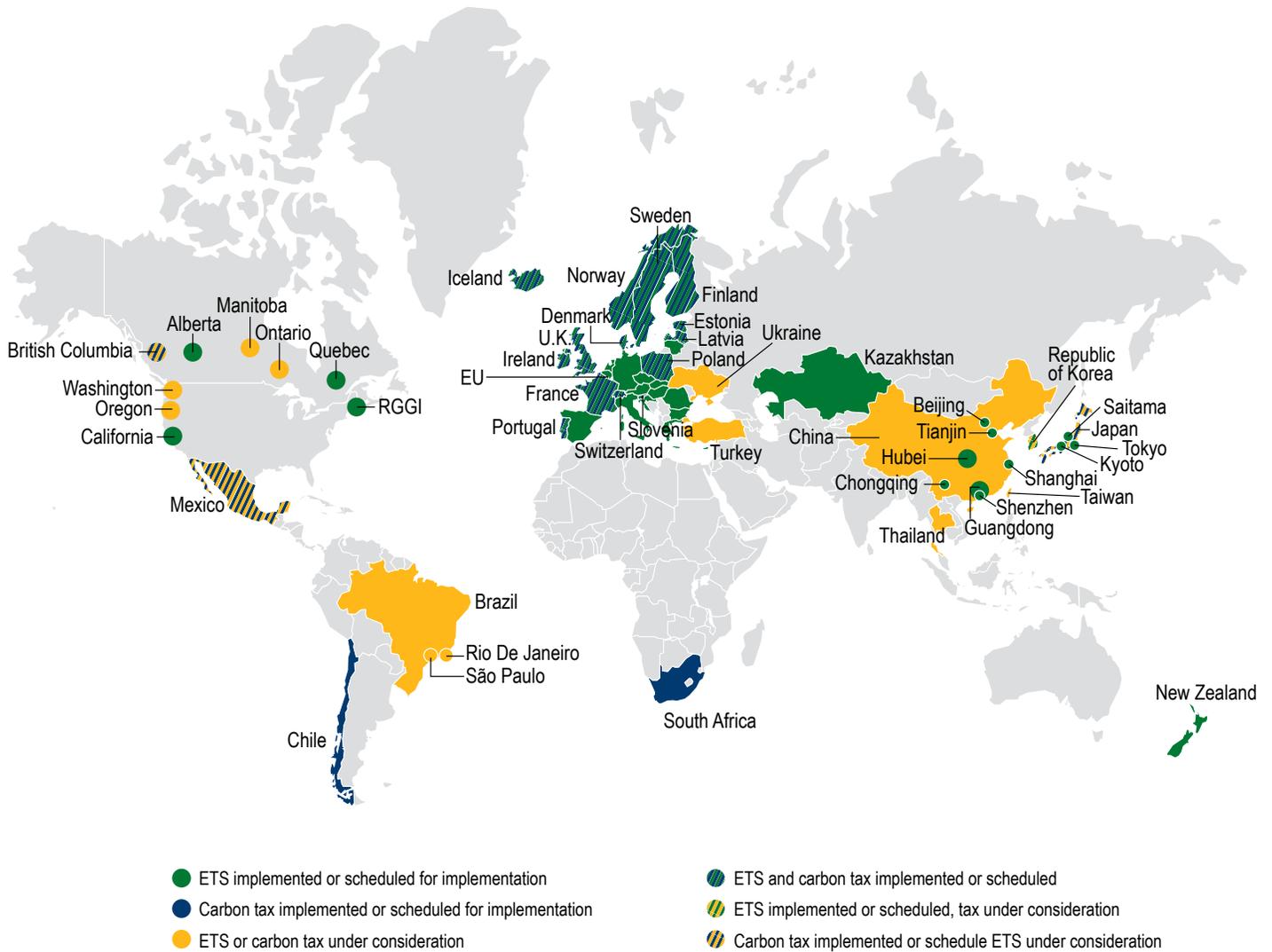
as much as possible. They could also be designed to have price-like features, such as combining energy efficiency and emission standards with tax/subsidy schemes with fees/rebates for those falling short of /exceeding the standards.

Emission taxes and emission trading systems are the main instruments for implementing carbon pricing. Since 2012, the number of carbon pricing arrangements implemented or scheduled for implementation has almost doubled, rising from 20 to 38, with arrangements in the EU, China, and the U.S. being the most notable in terms of their coverage of emissions. Using a mix of carbon taxes and emission trading schemes, there is now some form of carbon pricing at the national level in almost 40 countries (including 28 in the EU's emission trading system), and there are more than 20 pricing arrangements at the subnational level. But these pricing arrangements collectively cover only about 12 percent of global GHG emissions (Figure 2a/b).

Carbon prices in existing arrangements vary considerably, ranging from less than \$1 to \$130 per ton of CO<sub>2</sub> equivalent (tCO<sub>2</sub>e). The majority of emissions—around 85 percent—are priced at less than \$10 per tCO<sub>2</sub>e, well below the price that economic models estimate is needed to meet the goal of keeping global average temperature to well below 2 degrees Celsius above pre-industrial levels (Figure 3). A transition to a greater coverage of emissions, and at higher prices, will be needed.

Looking ahead, more than 90 countries included some form of carbon-pricing schemes among the actions they intend to take as part of their INDCs submitted in Paris. This is a welcome development. The OECD and the World Bank have developed a set of principles that can help guide future carbon pricing arrangements. The FASTER principles are based on fairness, alignment of policies and objectives, stability and predictability, transparency, efficiency and cost-effectiveness, and reliability and environmental integrity (OECD and World Bank 2015a).

**Figure 2: Growing but still limited coverage of carbon pricing**  
 (2a): Regional and country distribution of carbon pricing arrangements

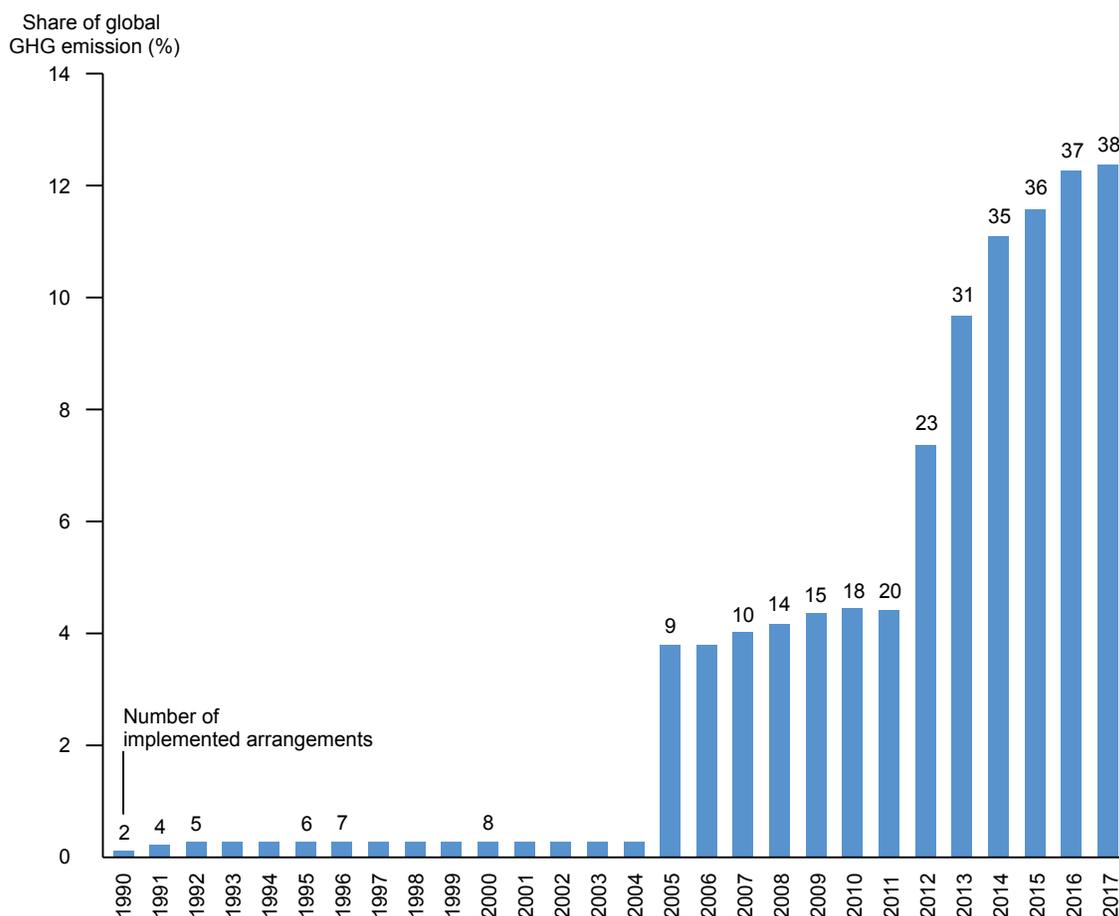


The circles represent subnational jurisdictions. The circles are not representative of the size of the carbon pricing instrument, but show the subnational regions (large circles) and cities (small circles).

Note: Carbon pricing instruments are considered "scheduled for implementation" once they have been formally adopted through legislation and have an official, planned start date.

Source: World Bank Group and ECOFYS (2015)

(2b): Number of regional, national, and subnational carbon pricing arrangements and percentage of global GHG emissions covered



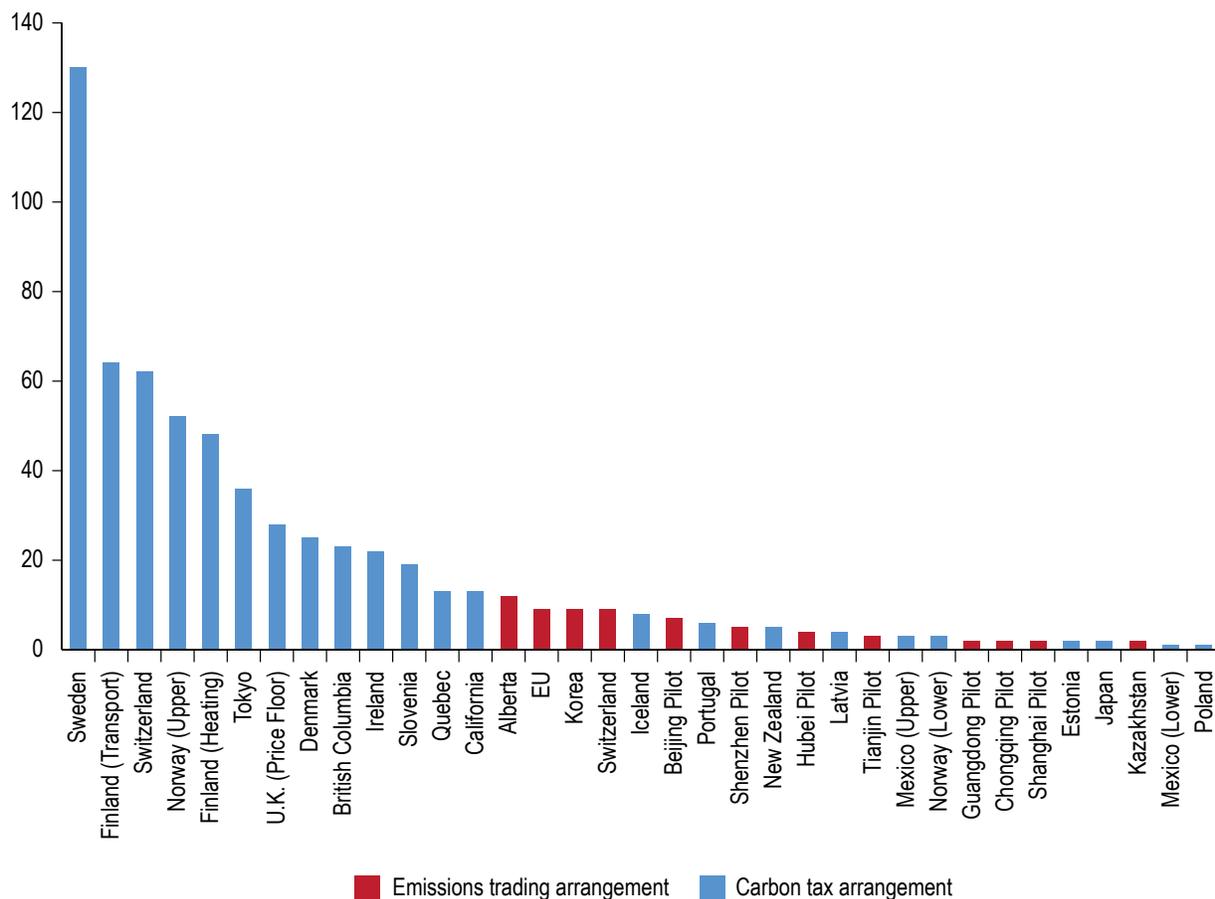
Source: World Bank Group and ECOFYS (2015)

The momentum for mitigation action following the Paris agreement provides an opportunity to develop stronger consensus, support, and coordination across countries on instituting carbon pricing, including progress towards establishing a carbon pricing corridor with a price floor and a rising price over time. An approach combining a price floor coupled with commitment to progressive increases towards full optimal pricing would provide clarity and credibility on price signals as well as appropriate gradualism to allow time for consequent economic adjustments and actions to mitigate the impact on vulnerable segments of the population. Gradual and tailored adjustment is particularly important for low-income developing countries (Gillingham and Keen 2012).

A concerted push is now needed to translate the policy momentum from Paris into tangible and timely progress on carbon pricing. International forums such as the G-20 and the Carbon Pricing Panel recently convened by the IMF and the World Bank can provide political leadership and complement the United Nations Framework Convention on Climate Change process by establishing a focused platform to address and provide guidance on technical, administrative, and economic cooperation aspects of carbon pricing—such as assessment of the environmental and economic impacts of alternative levels and trajectories of carbon taxes, issues in the design and administration of tax and trading schemes, methodology for comparing different national level approaches, links with other fiscal

**Figure 3: Low level of prices in most existing carbon pricing arrangements**

Existing carbon pricing arrangements, (\$/tCO<sub>2</sub>-e)



Source: World Bank Group and ECOFYS (2015)

reforms, implementation of carbon pricing in large and complex federal systems, harmonization of tax administration across countries, aspects relating to international trade, and feasibility of including non-CO<sub>2</sub> GHG emissions (McKibbin et al. 2015).

### 2.1.3. Other pricing reform

Pricing reform is not limited to the energy sector, although the distortions there and related implications are especially significant. Distortions are widespread in the pricing of other natural resources and infrastructure services. Governments need to review pricing across sectors to align them better with economic fundamentals, including

externalities, and use more efficient targeting mechanisms to achieve equity objectives.

In water supply, for example, subsidies provided through public utilities are estimated at more than \$450 billion or 0.6 percent of global GDP annually, encouraging both inefficient and unsustainable resource use and causing fiscal losses. As in energy, these subsidies are also inequitable; for example, Cabo Verde, India, Nepal, and Nicaragua provide the richest households with \$3 worth of subsidized water, on average, for every \$1 worth provided to the poorest households (Kochhar et al. 2015). Getting prices right would create incentives for more efficient water use, check negative externalities such as groundwater depletion, improve cost recovery

and enable better operation and maintenance of existing assets, encourage new investment in sustainable water infrastructure, and reduce fiscal burdens. Poorer households can be protected more efficiently through better targeted arrangements, such as well-designed lifeline rates or income support channeled through social safety nets.

## 2.2. Improving the Private Investment Climate

Promotion of higher private investment will be crucial to meeting the sustainable infrastructure challenge. Given the scale of the investment needed, and the constraints on fiscal space in many countries, the contribution of the private sector will have to increase substantially. Of the estimated additional investment in sustainable infrastructure of more than \$3 trillion per annum required over the next 15 years, more than a half will need to come from the private sector (Bielenberg et al. 2016). The case for a stronger promotion of private investment rests not only on the need to mobilize more financing; increased private participation can spur efficiency and innovation.

### 2.2.1. *Reducing policy risk and costs of doing business*

Boosting private sector investment will be especially important in developing countries, where the infrastructure needs are large but private involvement in infrastructure is relatively low. In many of these countries, risks relating to public policy and transaction costs of business are a major impediment to private investment in infrastructure. Such risks and costs depress risk-adjusted returns and keep the price of capital for infrastructure investment high, even when long-term interest rates are low. Private investment in infrastructure is especially sensitive to country-level policy risk, more than foreign direct investment overall. A World Bank study found that an improvement in country risk ratings by one standard deviation is associated with a 27 percent higher chance of having a private

participation in infrastructure commitment and a 41 percent higher level of investment in dollar terms (Araya et al. 2013). Reform of infrastructure and carbon pricing, as discussed above, would improve price signals and predictability, addressing one major source of policy risk and distortion of investment decisions. Countries also need to improve the enabling environment for investment through broader regulatory and institutional reforms.

One broad area for attention is the framework of regulations and institutions that influence the ease of doing business within the country. These include business entry and exit regulations, competition policies, regulations and structures affecting access to finance, foreign investment rules, laws governing investor and property rights, tax policies, and anti-corruption laws. At the level of individual infrastructure sectors, clarity on overall sector investment strategy and the role envisioned for private and foreign participation, sector policies on user charges/cost recovery and environmental standards, consistency and credibility of incentives such as feed-in tariffs, and sectoral institutional arrangements and capabilities for investment planning and project development matter greatly for the enabling environment that investors face. Government policy has a key role in providing long-term direction on sector pricing, such as in electricity markets. On the side of financing, regulatory and institutional frameworks enabling the development of capital markets that provide long-term financing and risk mitigation instruments are especially important for infrastructure investments given their longevity and risk-return characteristics.

### 2.2.2. *Improving the regulatory and institutional framework for PPPs*

More specifically for infrastructure, a sound legal and institutional framework governing private participation in infrastructure through PPPs is key to attracting more investment and ensuring

its effectiveness. Transparency and credibility of processes for selection of projects and delivery models, negotiation, and risk sharing are crucial. Investors' confidence in consistency of policy and implementation is helped by standardizing contracts and concessions, purchase agreements, and bidding documents as much as possible.

Appropriately structuring PPPs in terms of distribution of risks and returns and supporting regulation is vital to maximizing value for money—to benefit not only from the additional financing that private participation brings but also from its expertise to produce efficiency gains and capacity to innovate (Buckberg et al. 2015). Poor contract designs can thwart these potential benefits, producing inefficient project outcomes and saddling governments with large fiscal costs and liabilities. Maximizing benefits and minimizing risks requires specialized skills in developing and contracting PPPs. Related capacities in governments will need enhancement, which may require setting up dedicated units. Countries and local governments that have established strong institutional mechanisms, in terms of legal frameworks and capacities, tend to be more successful in tapping the potential of PPPs.

With increased emphasis on sustainable infrastructure, consistent treatment of climate risk in PPP frameworks will be important, complemented by broader policies (such as carbon pricing) that affect incentives towards sustainability. Sustainability criteria could be reflected in requests for and evaluations of PPP proposals, and applied in a consistent manner. These could include, for example, evaluation of projects over their entire life cycle to fully capture downstream costs and benefits, carbon emissions, and water use intensity. The use of such criteria can add to the technical complexity of project design and evaluation. Such criteria are being used in many advanced economies, such as those in the EU, and have been applied to projects in some middle-income countries as well, for example, Brazil and South Africa. More knowledge sharing of best practice and standardization

would help advance their use and foster consistency. Also, the increasing private investor interest in sustainable infrastructure would help promote sustainable approaches. This is reflected in the changing composition of PPP investments. Of the \$40 billion of investment in electricity generation PPP projects in developing countries in 2014, \$22 billion was in renewable energy, with onshore wind and solar photovoltaic as the most common technologies for renewable energy projects (World Bank 2015a). More than 1,000 major companies and investors have endorsed carbon pricing and around 450 now use an internal carbon price to guide investment decisions (CDP 2015).

Improving the policy frameworks and institutional capacities to effectively promote and manage PPPs will be particularly important for middle-income countries in meeting their infrastructure investment requirements. Of the total investment of more than \$6 trillion per annum in sustainable infrastructure that is needed globally in the next 15 years, around two-thirds, or \$4 trillion, will need to take place in these countries. This is well over double their current level of investment. PPP projects will be a key modality for meeting the incremental investment requirements. Private participation in infrastructure in developing countries has been rising over the past decade and averaged around \$150 billion annually in the past three years (Figure 4). This will need to be scaled up by an order of magnitude. In 2014, as much as three-quarters of the total private participation was accounted for by five middle-income countries, namely, Brazil, Turkey, Peru, Colombia, and India (in that order). More middle-income countries will need to improve their enabling environments to attract private participation. Private participation is much more limited in low-income countries, as reflected in the small share of sub-Saharan Africa in the total flows. However, these countries over time can also aim to mobilize more private investment through strengthening their policy and institutional frameworks, as some lower-income African countries have shown, such as Ghana, Kenya, and Tanzania.

There is a rich body of assessments and indicators of countries' investment climate that can help in identifying the most serious deficiencies and priorities for reform. For example, the World Bank's Doing Business reports assess key regulatory and institutional aspects of overall business environment in a country (World Bank 2015b). The INFRASCOPE assessments developed by a group of MDBs (with EIU) focus on country policies and capacities for infrastructure PPPs (MDBs 2015a). The CLIMATESCOPE assessments initially developed by the Inter-American Development Bank (IDB) with Bloomberg for Latin America and later expanded to cover countries in other regions focus more specifically on the investment climate for clean energy projects (BNEF 2015). Moreover, substantial work has recently been done in the G-20—under the auspices of the G-20 Investment and Infrastructure Working Group and

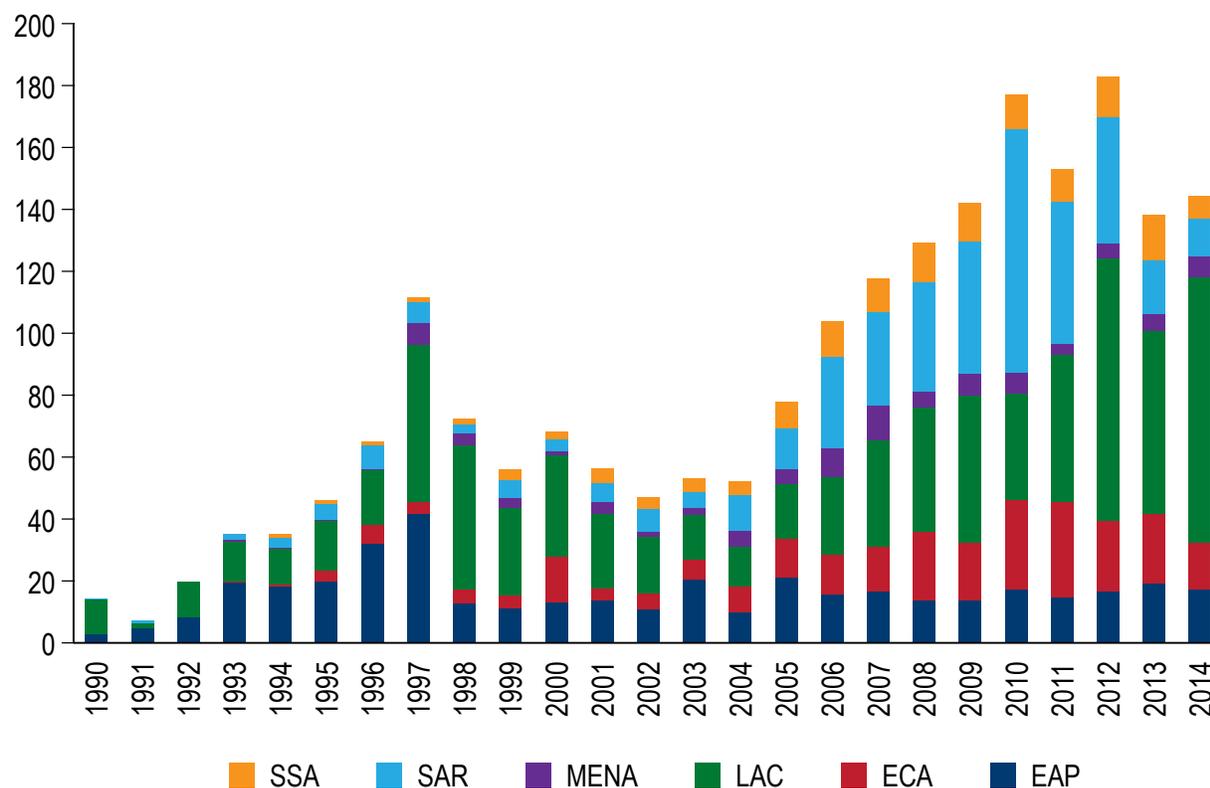
Development Working Group and with the support of the World Bank, other MDBs, and the OECD—on specific policies and best practices to improve the enabling environment for investment in infrastructure and promote private participation (OECD and World Bank 2015b/c). A PPP Knowledge Lab has been set up jointly by the MDBs to provide a comprehensive online resource (MDBs 2016). Country case studies provide useful lessons from actual experience in a variety of regional and institutional settings (Box 2).

### 3. Strengthening Public Investment Management

Together with improving the environment to mobilize more private investment, public investment

**Figure 4: Private investment in infrastructure rising but much further to go**

*Investment commitments in projects with private participation in emerging and developing economies by region (2014 \$billion)*



Source: World Bank PPIAF Database (2014) using World Bank regional classifications.

## Box 2: Lessons from PPP case studies

**The Philippines: a PPP market with momentum.** Thanks to a clear overall investment strategy and supporting regulatory and institutional reforms, PPP activity has picked up considerably in recent years. A National PPP Program was launched in 2010, with the creation of the Philippines PPP Center (PPPC), which functions under the control of the President's office. In parallel, the original BOT Law and implementing regulations have undergone an overhaul, and a new PPP Act is being introduced. As of May 2015, the PPPC had a pipeline of 61 projects across energy, transport and other sectors. Other factors contributing to success include: strengthening project preparation with a well-staffed PPPC functioning as a central unit and engaging with line agencies, and with coordinated support under a Project Development and Monitoring Facility led by the ADB; developing risk mitigation instruments, including the creation of a national "PPP contingent liability fund"; and improving the enabling environment for domestic financial institutions to provide longer-term financing.

**Turkey: a growing PPP market.** Private sector involvement in infrastructure started in the early 1990s with a number of projects in energy and transport and has grown steadily since, bolstered also by Turkey's privatization program in the early 2000s covering a substantial portfolio of infrastructure assets. There are three key reasons for the success of PPPs in Turkey: a strong political will, reflected in improvements in the legal framework and guarantee mechanisms; development of a strong pipeline of projects through capacity enhancements; and strengthening of domestic markets for long-term finance. Still, challenges remain. The enabling environment could be further improved by enhancing consistency, transparency, and competition in project development and procurement. A central PPP unit could be beneficial for consistency, transfer of know-how, and alignment of PPP contracts with international best practice.

**Colombia: paving the way for PPPs for better roads.** Colombia was disappointed when it received few bids for the first three rounds of its road program. To do better for the Fourth Generation (4G) program—40 projects expected to bring in up to \$25 billion—it took steps to improve the enabling environment and provision of project financing. It worked: 4G has already seen a record number of bids. Enabling environment improvements included the creation of a stronger National Infrastructure Agency, improvement of the legal framework for PPPs, and passage of laws that improved land acquisition and streamlined the environment licensing process. On the financing side, a state development Bank (Financiera de Desarrollo Nacional) was established to provide loans and guarantees to PPP projects to complement commercial bank loans and capital market offerings, helping to mitigate risk and catalyze more project financing.

**Brazil: the largest PPP market.** Brazil is the largest PPP market in the developing world. It accounted for around 40 percent of all private investment in infrastructure in developing countries in 2014. Two recent sustainable urban transport PPP projects illustrate some of the reasons for Brazil's success. The first is the Linha 4 metro line that adds critical capacity to Sao Paulo's transit network and connects poor suburban communities. The second is a bus transit-oriented development in a working-class neighborhood in Belo Horizonte. At the national level, clearer policy and legal frameworks for private participation in infrastructure have been established, combined with efforts to develop the domestic capital market. At the subnational level, local governments have been empowered, together with capacity building to structure PPP projects.

**Chile: a mature PPP market.** Chile is the most mature infrastructure investment market in Latin America. Starting with transport projects in the 1990s and followed by facilities management PPPs in the mid-2000s, Chile raised about \$12 billion in investment. The country attracts strong investor interest and has an active secondary PPP market. The foundation was laid by broad improvements in the regulatory environment for private investment and development of the domestic capital market, including institutional investors. The Central Concessions Unit has played a key role, having developed strong capacity in preparation and management of PPPs. Project pipeline development was accompanied by improvements in policy frameworks in concerned sectors. The procuring agency also made effective use of risk mitigation mechanisms, through provision of explicit contractual guarantees.

Sources: EBRD (2015), Leipziger and Lefevre (2016), and Bielenberg et al. (2016).

will need to be ramped up to meet the projected large growth in infrastructure demand and address the challenge of sustainability. Increased investment will need to be supported by substantial enhancement of investment management capacities to ensure efficiency and impact and integrate sustainability objectives in investment programs and projects. This is particularly a challenge in emerging and developing economies that will see the largest increases in infrastructure demand but have weaker institutional capacities.

### 3.1. Boosting Public Investment

The public sector continues to dominate the provision of infrastructure in emerging and developing economies, though the private sector role has been increasing, as noted above. In these economies, the public sector typically accounts for two-thirds to three-quarters of infrastructure investment. In India, for example, the public sector accounts for about 70 percent of infrastructure investment. In low-income countries, this share tends to be still higher. By contrast, the private sector typically accounts for about two-thirds of infrastructure

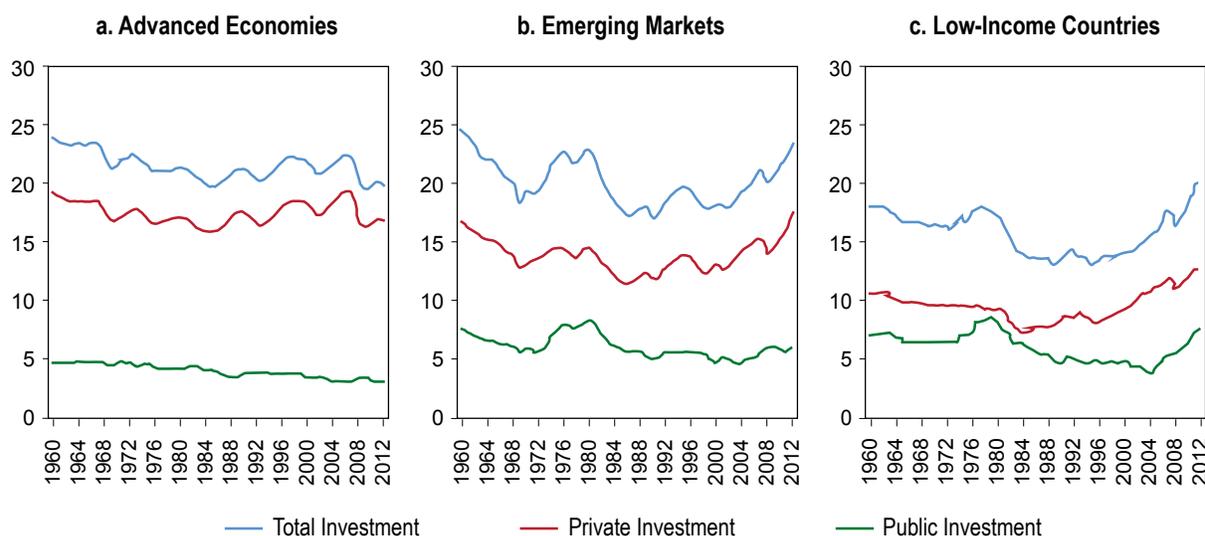
investment in advanced economies, as, for example, is the case with the U.K. The public sector role extends beyond its direct investment, given the catalytic role of its engagement. The latter role of public investment will be particularly important in leading and supporting the transition from traditional to sustainable infrastructure models.

#### 3.1.1. Reversing the decline in public investment

Public investment rates have been on a declining trend in most economies for much of the past three decades. In emerging and developing economies, public investment peaked at over 8 percent of GDP in the late 1970s/early 1980s and then declined to around 4-5 percent of GDP in the mid-2000s. It has since recovered to 6-7 percent of GDP. In advanced economies, public investment has fallen steadily from a high of just under 5 percent of GDP in the late 1960s to a historic low of just over 3 percent of GDP in 2012 (Figure 5). With infrastructure forming a major part of public investment, the decline in public investment rates has resulted in growing infrastructure gaps. This is reflected in a substantial decline in the stock

**Figure 5: Need to reverse the decline in public investment**

*Trends in public investment by country income categories (percent of GDP)*



Source: IMF (2015)

of public capital relative to GDP across advanced and emerging economies over the past three decades—by an average of around 15 percent—as accumulation of capital stock lagged behind growth in economic activity (IMF 2014a). Even in those economies where measures of the quantity of infrastructure appear relatively high, deficiencies in the quality of infrastructure have increased.

The decline in public investment must be reversed if the public sector is to play its due role in addressing existing infrastructure gaps and future infrastructure development needs, including investments and R&D in climate change mitigation and adaptation. This is particularly the case where public investment levels were relatively low to begin with. In countries with high investment levels, notably China, aggregate investment may need to decline as part of the broader process of economic transformation. The main issue in these cases is the allocation, quality, and sustainability of investment.

### 3.1.2. *Managing a more decentralized pattern of investment*

Public investment is generally a shared responsibility across levels of government. This is particularly true in advanced economies and some large emerging economies, where regional and local governments typically undertake well over half of public investment. Subnational governments accounted for 72 percent of total public investment in OECD countries in 2013, with the share as high as 80 percent or more in some countries, for example, Canada and Japan (OECD 2015a). Among large emerging economies with federal structures, the subnational share of public investment is 75 percent or more in Brazil, India, and South Africa (Frank and Martínez-Vázquez 2016). Of Brazil's 75 percent subnational share in 2014, 55 percent was funded from subnational governments' own sources and 20 percent from federal transfers (García-Escribano et al. 2015). Investment is generally much more centralized in lower-income developing countries.

With rapid urbanization, the role of cities and municipal governments in infrastructure provision in emerging and developing economies will increase. The role of local governments will also increase because sustainable infrastructure opens more avenues for decentralized provision, such as small-grid or off-grid supply of renewable energy compared to the traditional model of a centralized grid. Cities consume more than two-thirds of the world's energy and release at least the same proportion of energy-related GHG emissions. In the next 15 years, the world's urban population will grow by 70 million people a year. Urban areas will account for more than 70 percent of total investment in sustainable infrastructure over the same period (CCFLA 2015). Empowering cities and local governments, within a framework of clear accountabilities, will be crucial to meeting the challenge of scaling up infrastructure while ensuring sustainability.

### 3.1.3. *Increasing investment in R&D*

The role of public investment in R&D to support innovation and new technologies for sustainable infrastructure, such as in clean and renewable energy and carbon capture, will be key. Such investment is currently very low. In OECD countries, it has slowed appreciably since the global financial crisis. Encouragingly, public R&D activities in emerging economies have been growing and their share in the global total has risen from 10 percent to 30 percent over the past 10 years (OECD 2014). Globally, governments spend orders of magnitude more on harmful fossil-fuel subsidies than on supporting new renewable energy technologies, and support for transformational R&D is even less. There is a strong rationale for increased government investment in low-carbon research, supported by clear targets such as cutting within 10 years the cost of clean electricity to below that of electricity from fossil fuels. Some have called for a Global Apollo Project on low-carbon research (Layard 2015).

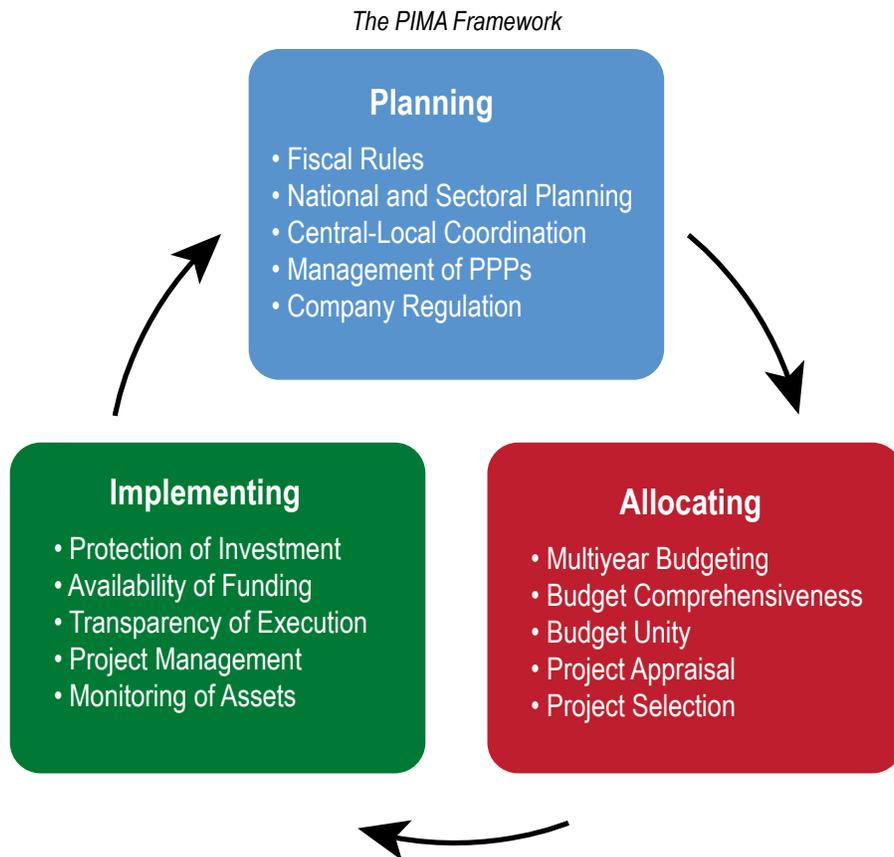
Global investment in renewable energy R&D was estimated at \$11.7 billion in 2014, of which \$5.1 billion was public investment. The International

Energy Agency (IEA) has assessed that global public investment in energy R&D should at least triple to match the aspirations for low-carbon technologies (IEA 2015b). In addition to boosting their own investment in R&D, governments can encourage more private investment through partnerships, public procurement arrangements, and well-designed fiscal incentives. R&D tax incentives exist in 28 OECD countries and also in some major emerging economies, such as Brazil, China, and South Africa. The impact of these incentives would be greatly enhanced if backed up by progress on carbon pricing. Some promising R&D initiatives involving public-private partnership were announced at the Paris meeting, such as Mission Innovation, Breakthrough Energy Coalition, and Global Solar Alliance. Governments now need to lay out clear implementation plans to realize the increased investments.

### 3.2. Enhancing Institutional Capacities

Boosting infrastructure investment at scale and with the quality needed will require a substantial strengthening of capacities for investment planning and project preparation and implementation. While the infrastructure development needs are huge, the capacity to translate those needs into sound investment plans and projects and manage them effectively is often limited. Weaknesses in public investment management capacities can greatly undermine the efficiency and impact of investments that are undertaken. Potential efficiency gains in infrastructure investment from improved investment management could be as high as \$1 trillion a year globally, equivalent to roughly one-third of total current annual investment in infrastructure (McKinsey 2013).

**Figure 6: Elements of public investment management framework**



Source: IMF (2015)

### 3.2.1. *Public investment management*

The IMF recently developed a framework that provides a useful tool for assessing public investment management capacities and diagnosing areas for improvement (Figure 6). The Public Investment Management Assessment (PIMA) framework complements diagnostic tools developed by the World Bank and the OECD, which have a more project cycle and governance focus, respectively. The PIMA is more comprehensive, as it brings in elements related to integration of investment planning with fiscal frameworks, coordination of public investment across levels of government, and private participation in infrastructure provision. Assessment scores across the 15 elements of PIMA show much larger gaps in capacity in developing countries compared to the more developed ones, but they also identify important areas for improvement in the latter group.

Differences in PIM capabilities are mirrored in large differences in public investment efficiency across countries. The analysis finds that moving from the lowest quartile to the highest quartile in public investment efficiency could double the impact of investment on growth (IMF 2015). It also finds that strengthening PIM institutions can close more than two-thirds of the public investment efficiency gap in countries relative to the best performers. The largest payoff is in emerging economies and, notably, low-income countries, with typically weaker PIM capacities; estimates of potential gains from public investment that are lost due to PIM weaknesses range from an average of 13 percent in advanced economies to 40 percent in low-income countries.

Priorities for strengthening PIM institutions and capacities identified by PIMA and complementary diagnostic frameworks vary across country groups. In general, priorities for action relate more to the planning stage of the PIM cycle in countries at a higher level of development, whereas the implementation and delivery stage also needs to be a focus in countries at a lower level of development. Advanced economies need to strengthen central-local coordination, enhance medium-term

budget frameworks and integrate them with national and sectoral strategic planning. Emerging market economies need to adopt more rigorous and transparent arrangements for project appraisal, selection, and management. Low-income countries need to strengthen both project development and the institutions and processes related to project implementation and monitoring, including improving procurement processes that can be especially prone to corruption. Most countries, but especially emerging and developing economies, would benefit from strengthening institutional capacities to develop, appraise, negotiate, and manage PPPs—to catalyze more private investment while ensuring value for money and minimizing fiscal risks. Improvements are also needed in fiscal frameworks for accounting for and managing related contingent liabilities.

### 3.2.2. *Strengthening project preparation and incorporating sustainability*

In many emerging and developing economies, weak project pipelines are a particularly important—often a binding—constraint to boosting public infrastructure investment and attracting more private participation. Taking climate risks and sustainability into account in a systematic way magnifies the challenges for investment planning and project development and management. This requires incorporating environmental sustainability as an integral, cross-cutting element of government investment programs and policies; capturing environmental externalities systematically in project appraisal and ensuring their proper valuation; and applying environmental safeguards to investments, such as those relating to carbon emissions and pollution or energy efficiency, in a coherent and consistent manner.

Using shadow prices to fully capture environmental externalities in project appraisal is a growing practice in public investment agencies and parts of the private sector, but it needs to go much further in terms of coverage and consistency of application (Smith and Braathen 2015). Governments have a leadership opportunity here, by using

shadow pricing of carbon in their own projects and catalyzing its broader use (Morris 2015). Relatedly, governments need to review the use of discount rates in project evaluation, to ensure they are not resulting in a bias against low-carbon, climate-resilient infrastructure investments whose positive externalities typically materialize in the long term. Together with improved project analysis, governments should establish clear investment planning frameworks and standards for integrating sustain-

ability in the prioritization and selection of projects (Box 3).

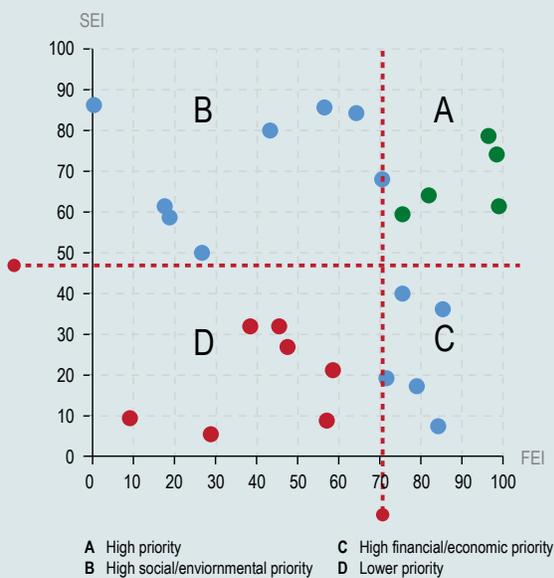
Governments need to develop and implement procurement processes that incorporate sustainability criteria. Public procurement averages around 15 percent of GDP in OECD countries and typically accounts for a higher proportion in developing countries (OECD 2015c). In India, for example, it is variously estimated between 20-30

### Box 3: Prioritization of infrastructure projects

Large infrastructure investment requirements coupled with tighter fiscal constraints have sharpened the need for careful prioritization of infrastructure projects to make the best use of available budgetary space. Another challenge is to integrate environmental risks and sustainability into project assessment and selection. The World Bank has recently developed and pilot-tested an Infrastructure Prioritization Framework (IPF) that planning agencies may find useful as part of the toolkit to respond to these challenges in a systematic way.

As illustrated in the chart below, the IPF is a quantitative approach that synthesizes financial, economic, social, and environmental indicators and considers these alongside the public budget constraint. The key output is a graphical display of projects' performance along two axes, defined by financial-economic index (FEI) and social environmental index (SEI) composite scores. Policymakers determine the specific indicators or criteria comprising each index and associated weights based on government policy goals and stakeholder consultation. Indicators may include such financial-economic indicators as financial rates of return and multiplier effects and such social-environmental indicators as the number of targeted beneficiaries/jobs created and carbon footprint. The IPF can incorporate the outputs of cost-benefit analysis as inputs to a multi-criteria model.

**Infrastructure prioritization framework – integrating sustainability**



Source: Marcelo et al. (2015).

In the chart, each dot represents the estimated scores of a proposed infrastructure project. The red dashed lines represent the budget constraint. In the example shown, from an FEI perspective, resources would be sufficient to finance only those projects with an FEI score above 70. From an SEI perspective, resources would be enough to finance only those projects with an SEI score above 45. Quadrant A contains high-priority projects that score high on both FEI and SEI. Projects falling in Quadrant D may be classified as low priority as they score low on both FEI and SEI. Projects in Quadrant B and C score relatively high on either FEI or SEI but not both. All projects in either quadrant B or C, or a mix of projects within each, could be implemented with available resources. Identification of these medium-priority projects leaves space for expert review and informed political debate.

The framework is designed to allow flexibility to adapt to local contexts, in terms of the criteria included, weighing of trade-offs, and demands on data and technical capacity. It recognizes that decisions on projects involve political judgment. Its main contribution is to bring the multidimensionality of infrastructure projects systematically into project assessment and provide a structured and transparent platform for decision-making.

percent of GDP (CUTS 2012). So incorporating sustainability criteria in procurement provides an important avenue to governments to promote sustainable approaches to project development and management. Such criteria could include elements such as use of shadow prices for carbon in project evaluation, total cost of ownership analyses, output-based specifications, and climate risk mitigation and resilience standards (UNEP 2013). In addition to incorporating sustainability criteria in procurement for public sector infrastructure projects, such as bid-build and design-build projects, governments can incorporate them in requests for and evaluations of PPP proposals, as discussed earlier. A number of countries have put in place elements of sustainable procurement; there is a need to develop more systematic and consistent approaches and disseminate good practice (Box 4).

Efforts to build capacities for project preparation and investment management will need to reach beyond central government agencies to cover sub-national and local-level entities that will have a major role in ramping up investment in sustainable infrastructure. City-related infrastructure accounts for the bulk of total infrastructure investment, but investment planning and management capacities are often the weakest at municipal levels. Only about 20 percent of the world's largest cities have the basic analytics necessary for low-carbon planning (World Bank 2013a). Also, intergovernmental investment coordination mechanisms and fiscal relations will need more attention.

Governments and their development partners, especially the multilateral development banks, will need to scale up investment in building institutional

#### Box 4: Sustainable procurement: challenges and good practices

Today, almost three-quarters of OECD countries have some policies encouraging sustainable public procurement (SPP) at the central government level. Some developing countries also are adopting SPP practices. A review of current practices reveals a set of challenges and corresponding good practices.

- **Establishing clear legal and policy framework.** Some OECD countries such as Germany, Japan, and the U.S. have established clear legal frameworks, allowing them to direct purchasing activities to achieve set sustainability goals. Among developing economies, China and Colombia, for example, are putting SPP policy frameworks in place.
- **Assessing value for money over asset's life cycle.** While 79 percent of OECD countries identify the cost of sustainable projects as a key barrier to expanding the use of SPP, only 16 percent implement life-cycle cost evaluation systematically. Such evaluation, incorporating and properly valuing life-cycle costs and benefits, should be mainstreamed into procurement practices. The EU has put in place a directive that now requires that project tenders be evaluated on whole-life value and total cost of ownership.
- **Including environmental standards in design, selection, and award of projects and contract performance.** In 2010, 24 OECD countries included environmental considerations in technical specifications for products and 18 in the award criteria for contracts, but only 13 in contract performance.
- **Building professional, multidisciplinary teams.** Teams need to include multidisciplinary professionals—procurement officials, lawyers, and professionals with technical SPP capacity, such as engineers. Capacity building should be supported through focused SPP training, especially in developing economies.
- **Raising stakeholder awareness.** Communication strategies to raise awareness of buyers, the market, and citizens about SPP solutions and benefits can help promote SPP visibility and uptake.
- **Monitoring impact.** Mechanisms should be put in place to evaluate if SPP policies are achieving their goals and to disseminate good practice.

Source: OECD (2015d)

capacities to develop and manage stronger pipelines of infrastructure projects that are both bankable and sustainable. The primary responsibility for capacity building and project pipeline development lies with governments, but project preparation facilities (PPFs) supported by MDBs and bilateral donor agencies can help by mobilizing technical expertise and financing. The requisite technical skills are often scarce in developing countries. Moreover, project preparation costs in these countries can reach as high as 10 percent of total project investment (World Bank 2013b).

A review of PPFs conducted by the G-20's Development Working Group called for significantly increasing the resources devoted to project preparation (G-20-DWG 2014, with supporting studies ASI 2014 and CEPA 2012). It also called for rationalizing and consolidating PPFs to achieve scale and focus and for improving coordination among them. The review of PPFs in Africa found much fragmentation and diffusion of focus, with upwards of 60 such facilities in the region. Another recommendation was to strengthen support to building governments' upstream capacities (such as diagnostics, prioritization, pre-appraisal) to ensure that the most meritorious projects enter the downstream project preparation process. Upstream capacities can be especially important for sustainable infrastructure projects, to instill sustainability into project planning and preparation from the outset.

Multilateral development banks will have a key role in supporting national efforts to boost capacities for sustainable project preparation and pipeline development, through stronger and more effective PPFs and knowledge sharing (tools, standardized formats, best practice, knowledge platforms). Addressing sustainability, promoting harmonized approaches, and improving coordination, including through joint initiatives, should receive particular attention as they step up project preparation support to countries in scaling up infrastructure investment. Multilateral develop-

ment banks also need to incorporate sustainability more consistently in their own analytical and investment frameworks. In their current individual and collective efforts, MDBs are responding to this agenda (MDBs 2015b). Complementing stronger and better coordinated MDB support, part of the climate funds stemming from the Paris Agreement could be usefully deployed to help build capacities in countries to integrate sustainability in investment policies and project preparation.

The private sector can also help more with preparation of projects that potentially involve private participation. With appropriate safeguards to reduce risks of conflict of interest, early engagement of private investors augments project preparation capacities and strengthens links with financing (Arezki et al. 2016). Increasingly, interested private investors, including institutional investors, are becoming engaged in early stages of project preparation. For example, InfraCo, a privately managed early-stage financier of projects in developing countries, has been so engaged successfully in Kenya, Uganda, and Zambia (Bielenberg et al. 2016). The private sector arms of MDBs can step up support, at both upstream and downstream stages. For example, the International Finance Corporation provides upstream support on the enabling environment for private participation through its Public-Private Infrastructure Advisory Facility and downstream support to project development through its InfraVentures program.

## 4. Mobilizing Financing

Boosting investment in infrastructure to more than twice current levels will present a major financing challenge. It will require strong, concerted mobilization of both public and private finance, especially through new and innovative mechanisms. Given the constraints on public sector budgets, more than a half of the additional investment will need to come from the private sector. But public policy, through national and global collective actions, will have to play a key role in making this happen.

## 4.1. Expanding Public Finance Envelope

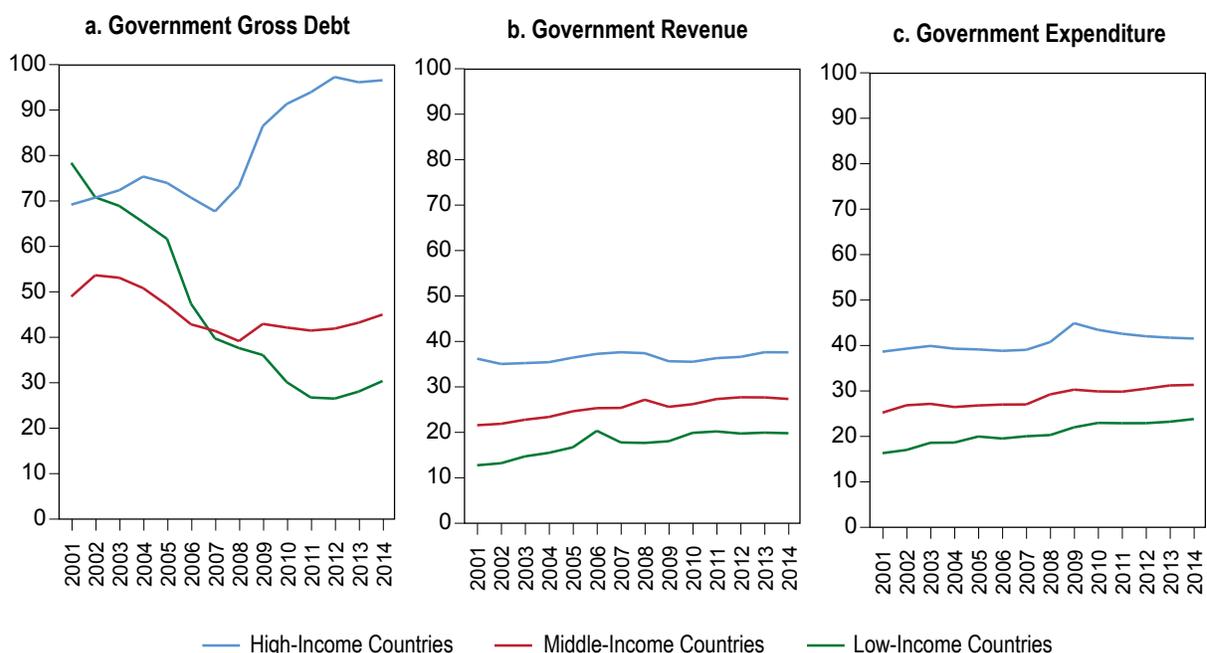
Across advanced and emerging economies, fiscal positions in many cases are under strain. In advanced economies, public debt/GDP ratios rose sharply in the aftermath of the global financial crisis and many of these economies are engaged in fiscal consolidation efforts. In emerging economies, fiscal balances and debt positions improved appreciably in the decade preceding the crisis, but in a number of them part of that improvement has been reversed in post-crisis years (Figure 7). Finding the fiscal space to meet the large sustainable infrastructure needs will require determined efforts to tap available scope for additional resource mobilization through tax and expenditure policies. It will also require better use of government balance sheets. Countries will need to expand fiscal space not only to meet the public sector's own investment financing needs but also to underpin its ability to catalyze private financing.

### 4.1.1. Expanding fiscal space through tax and expenditure measures

Advanced economies in general already raise substantial revenue relative to GDP but many have scope to raise more while also improving the revenue structure. Removing excessive and regressive tax exemptions, taxing negative environmental externalities, and making fuller use of property taxes are some options. Recent improvements in international tax rules, in relation to Base Erosion and Profit Shifting and Exchange of Information, can also help by reducing losses through tax avoidance and evasion—this would benefit both advanced and emerging economies. There is scope for rationalizing spending, such as on subsidies, pensions and social security. Aging populations make the rationalization of pension and health spending especially important in advanced economies. Subsidies and social benefits are often poorly targeted. Only one-fifth of total spending on family

**Figure 7: Fiscal landscape: challenges and opportunities for reform**

*Trends in government gross debt, revenue, and expenditure (percent of GDP)*



Source: IMF WEO Database (October, 2015) using World Bank WDI country income group classification.

benefits in advanced economies was means-tested in 2011 (IMF 2014b). More than half of the advanced economies in the G-20 can improve their primary fiscal balance by more than 3 percent of GDP through tax and expenditure measures that minimize potential adverse effects on growth and equity (IMF and OECD 2015).

Revenues relative to GDP are much lower in emerging and developing economies and there is typically more scope for greater revenue mobilization through tax reform and tighter tax administration. About half of these economies have tax/GDP ratios below 15 percent. As part of their efforts to support the Financing for Development agenda adopted at the conference in Addis Ababa in July 2015, the IMF and the World Bank have launched an initiative to help developing countries increase their tax/GDP ratios by at least 2-4 percent (IMF and World Bank 2015). Recurrent spending on public sector wages, subsidies, and social benefits typically account for as much as three-quarters of total government spending in these countries. In many cases, there is sizable scope for expenditure savings through rationalizing public sector employment and improving the efficiency of service delivery. For example, an estimated 20-40 percent of health spending is typically wasted (Grigoli and Kapsoli 2013). There is also scope for improved efficiency in investment spending; an average developing country loses about 30 percent of the value of its public investment to inefficiencies in the investment process (IMF 2015, Gupta et al. 2014). Capturing the potentially sizable savings in spending and reallocating resources to better uses requires stronger efforts to improve public financial management systems, institutional capacities, and the quality of governance.

#### 4.1.2. *Carbon taxation: an environmental and fiscal win-win*

In some areas, notably energy, reform of tax and expenditure policies can both generate sizable fiscal gains and improve policy alignment with climate sustainability. The high cost of fossil-fuel

subsidies was noted in an earlier section. Globally, direct spending on these subsidies, reflecting domestic prices below international supply costs, has declined from its peak of around \$540 billion in 2013 because of the fall in petroleum prices and reform actions by a number of countries, but it still amounted to more than \$330 billion in 2015 (Coady et al. 2015). In addition, revenue lost from tax expenditures related to fossil fuels amounted to about \$315 billion in 2015. Almost half of the OECD countries, for example, charge lower VAT rates on energy products. Also, energy taxes, when expressed on a per-ton-of CO<sub>2</sub> basis, vary significantly across fuels and end-users. Of the 34 OECD countries, 30 have lower tax rates on diesel than on gasoline (OECD et al. 2015, OECD 2015e). Removing these subsidies and tax expenditures and correcting distortive tax differentials would both save valuable fiscal resources and shift incentives towards cleaner, sustainable energy and more efficient energy use. Equity objectives of such policies can be met through more effective means and at much lower cost (Flues and Thomas 2015).

The largest distortion in terms of impact on the climate as well as loss of potential fiscal revenue results for the subsidies implicit in the absence of a charge for the damages caused by carbon emissions from fossil fuels. These subsidies amounted to \$4.6 trillion in 2015 (Coady et al. 2015). Putting a price on emitting carbon is a central element of an efficient strategy to reduce carbon emissions and shift the incentive structure towards sustainable infrastructure, but it can also raise substantial revenues that can in turn help fund large infrastructure investments. Mechanisms that can be used include levying taxes on carbon emissions or auctioning carbon allowances under emission trading schemes. As an illustration, a low initial carbon tax of \$30 per tCO<sub>2</sub>e, could generate fiscal revenue amounting to more than 1 percent of GDP on average in large emitting countries (Figure 8). Charging more fully for environmental damages can raise substantially more revenue. Calibrating the tax rate to charge for domestic environmental damages alone could raise revenues of almost 2 percent of GDP

on average among the 20 largest emitters—and more than 5 percent in China (Parry et al. 2014). A simple and practical way to levy the carbon tax would be to build it into existing fuel excise taxes—which are well established in many countries and are among the easiest taxes to collect—and apply similar charges to coal, natural gas, and other petroleum products. Underpinned by a clear and credible commitment to pricing carbon, increases in the carbon tax rate could be phased in to allow economies time to adjust (Calder 2015).

Carbon taxes can be designed to be revenue neutral as well. Depending upon their circumstances and objectives, countries could opt to raise more revenue from carbon taxes and less from other taxes that can negatively impact economic performance, such as taxes on capital and labor. For example, revenue gains from pricing reform to eliminate fossil-fuel subsidies would allow advanced economies to halve corporate income tax. In emerging economies, the gain would be worth double their corporate tax revenues. So pricing carbon can be about smarter, more efficient tax systems, and not

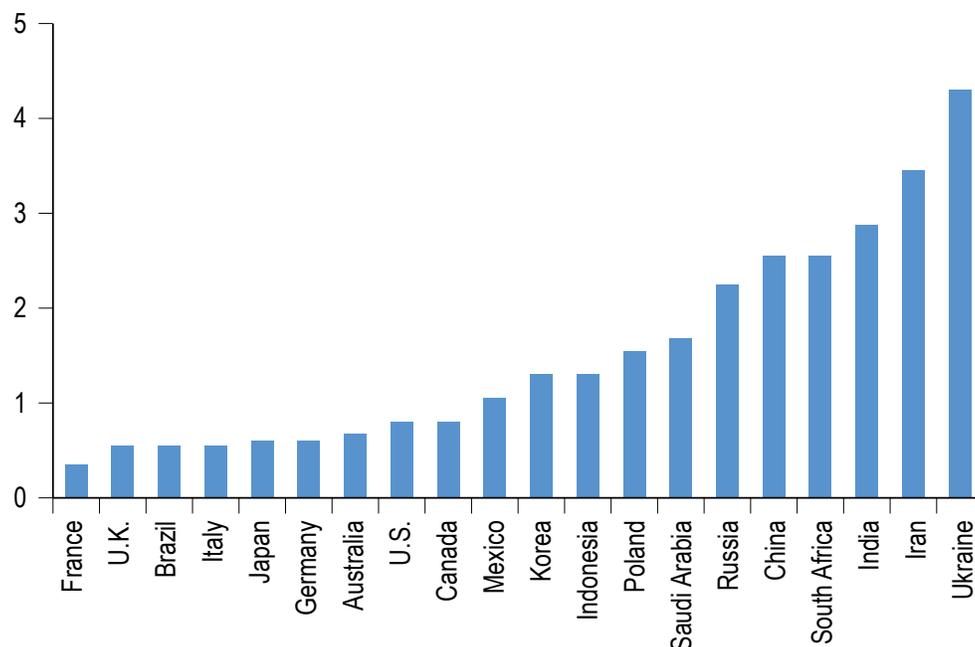
necessarily higher taxes (Lagarde 2015). The fiscal and administrative case for carbon taxes may be particularly strong in developing economies, where large informal sectors may be difficult to reach through broader tax instruments such as those on income or profits (Farid et al. 2016)

#### 4.1.3. Strengthening subnational finance and empowering cities

Of the estimated \$6 trillion plus of needed investment in sustainable infrastructure annually over the next 15 years, upwards of \$4.5 trillion will be related to urban areas. Urban finance will thus form a core part of the financing challenge (Box 5). Municipal governments must improve their fiscal health. This will be important, both in terms of their ability to expand their own fiscal envelope and raise more private financing. Of the 500 largest cities in emerging economies, only 4 percent are deemed creditworthy in international financial markets and 20 percent in local markets (World Bank 2013a).

**Figure 8: Large revenue potential from carbon emission taxation**

*Potential payoff from a \$30/tCO<sub>2</sub>-e carbon tax (percent of GDP)*



Source: Parry (2015)

Strengthening fiscal capacities at local levels to finance and catalyze increased investment in sustainable infrastructure will require action on two key fronts. First, local governments need to boost their own-source revenues, which are typically low in developing economies. Own-revenue generation anchors local government finances, including the capacity to borrow, but is also important from the perspective of accountability for investment. Second, intergovernmental fiscal relations should be reviewed to financially empower cities and local governments commensurately with

their central role in meeting the sustainable infrastructure challenge (Ahmad 2015).

Two local revenue sources that are generally inadequately tapped but can raise sizable additional revenue are property taxes and user charges. Even among developed economies, property taxes in many cases are underutilized. Among OECD countries, revenue raised from property taxes ranges from above 4 percent of GDP to well below 0.5 percent (Figure 9). Besides contributing to local government general revenues, property

### Box 5: Meeting the challenge of financing sustainable infrastructure in cities

Cities are at the center of the sustainable infrastructure development challenge. The urban investment needs are massive and financing gaps are large. Meeting the urban infrastructure financing challenge requires strong, coordinated actions across levels of government as well as with the private sector and external partners both to mobilize more public financing and attract more private investment. Cities have emerged as an important focus of the infrastructure and climate finance agenda, including collaborative efforts among the world's major cities to find solutions and share knowledge, such as through the C40 and Compact of Mayors. A report released during the COP21 meeting in Paris by the Cities Climate Finance Leadership Alliance—a coalition of cities, governments, multilateral institutions, banks, and civil society organizations—proposed a five-pronged framework to meet the challenge cities face in financing needed investments in sustainable infrastructure.

**Adopt a financial policy environment that supports and encourages cities to invest in sustainable infrastructure.**

Cities are insufficiently empowered financially to play the key role they ought to in developing low-emission, climate-resilient infrastructure. National governments should help local governments improve their own-revenue mobilization and also increase the flow of funding from the national to local level in support of sound investments through instruments such as grants, matching funds, tax transfers, and preferential loan rates. For example, in Brazil, a fiscal transfer mechanism known as ICMS-Ecológico allows participating states to transfer part of their sales revenue to cities based on the creation of protected conservation areas. Rwanda's Environment and Climate Change Fund targets 10 percent of its funding to go to districts and cities.

**Support cities in pricing climate externalities.** National governments and donors can provide financial and technical support to cities in developing schemes to price climate externalities, which would help achieve sustainability goals as well as raise revenues. As of September 2015, 23 cities, states, and provinces had employed carbon-pricing instruments. Tokyo's successful cap-and-trade program was instrumental in reducing carbon emissions by 23 percent by the fourth year of its implementation.

**Improve support for urban project preparation.** Enhancing local government capacities to prepare investment-worthy projects could significantly increase their ability to attract funding. Project preparation facilities should develop a stronger focus on supporting cities and incorporating sustainability in projects. As an example, the Cities Development Initiative for Asia, led by the Asian Development Bank with a number of donors, has conducted 85 project preparation studies for medium-sized cities in Asia and 49 of the projects have already attracted almost \$6 billion in financing.

**Stream more finance through local institutions.** Channeling more financing through local financial institutions will help build local capacity and take advantage of local knowledge. Local financial institutions are often better placed to assess the creditworthiness of a city. Local institutions can also deal better with the more decentralized nature of some sustainable infrastructure investments, such as investment in solar panels by households and small businesses. Take Mexico's Ecocasa program. Supported by the Clean Technology Fund, Inter-American Development Bank, and Germany's KfW, Ecocasa is

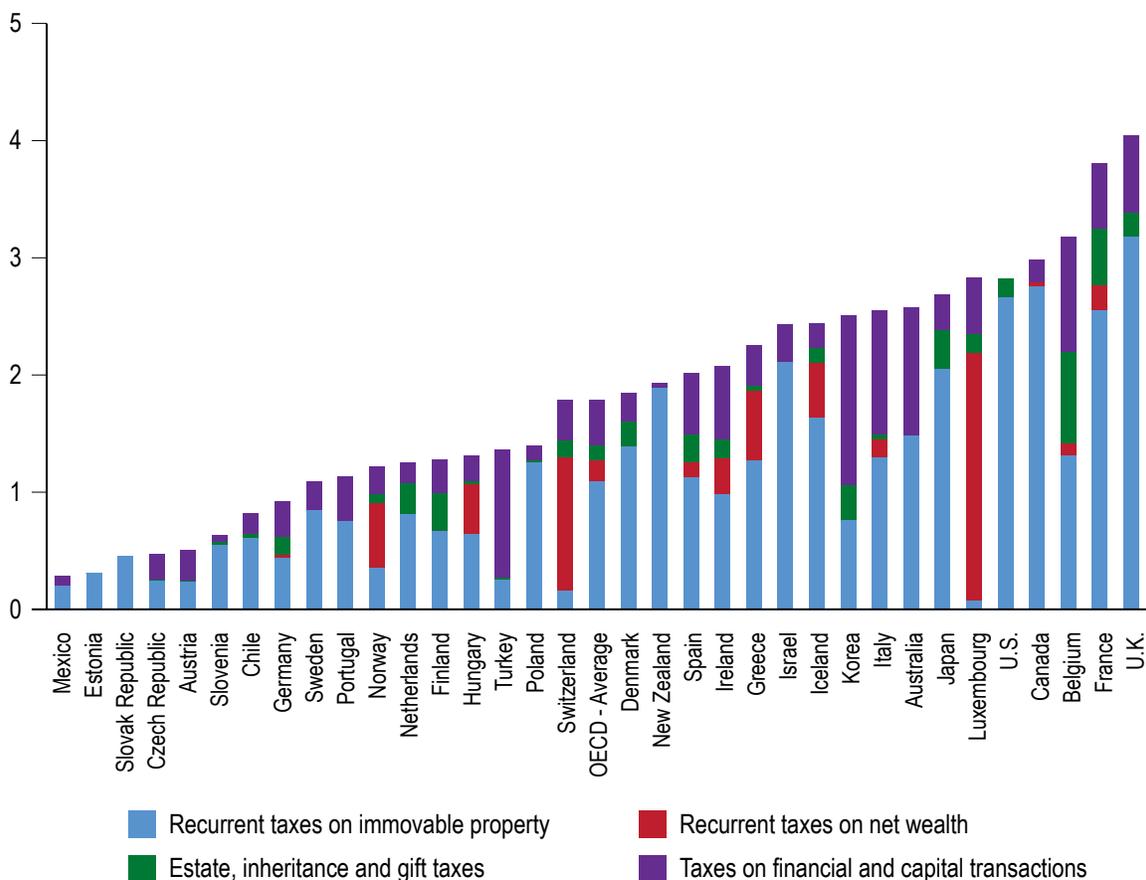
channeling funds through a local financial intermediary to local housing developers to use energy efficient and renewable technologies.

**Promote innovation in financial instruments and funding models.** Development-bank and concessionary capital could support an expanded urban lab network to identify and pilot new urban climate finance mechanisms. Some labs already exist, such as Climate-KIC's Low Carbon City Lab and the Global Innovation Lab for Climate Finance supported by a group of donors with private sector participation. Labs can also help establish standards and lend credibility to new instruments, as, for example, the Climate Bonds Initiative, the World Bank and other MDBs are doing to promote green bonds and prepare cities for use of this instrument.

Source: Cities Climate Finance Leadership Alliance (2015).

**Figure 9: More can be raised from property taxation to finance large city infrastructure needs**

OECD Property Tax Collections, 2013 (percent of GDP)



Source: OECD Revenue Statistics Database, 2015

taxes can more directly contribute to infrastructure financing, such as through levies to capture improved land values as a result of a transport or adaptation project. In addition to their revenue potential, and administrative ease compared to some other tax bases, property taxes can be in-

strumental in promoting equity in public finance. They can also improve the tax structure by reducing the need for more distortive taxes.

User charges on infrastructure services such as electricity, transport, and water and sanitation, are

often kept well below cost recovery levels, draining public resources, undermining the proper operation and maintenance and efficient use of infrastructure assets, and discouraging new investment. Inadequate funding for maintenance often associated with low user charges can seriously undermine the efficiency and sustainability of infrastructure investments. According to one estimate, every \$1 spent on preventive pavement maintenance reduces future repair costs by \$4-10 (Baladi et al. 2002). Cities and local governments in many cases can raise much more revenue from better charging for infrastructure services, while structuring the charges in a way that protects poor customers.

Intergovernmental tax-sharing arrangements in developing economies typically have a high degree of centralization, with subnational governments heavily dependent on transfers from national governments, which complicates fiscal management, constrains creditworthiness, and undermines accountability at the subnational level. Tax-sharing arrangements should be reviewed to align them better with the increasingly important expenditure responsibilities at the subnational level. Also, intergovernmental transfers can be designed in ways that enhance incentives at the local level to bolster own-resource mobilization for investment and produce results, such as through matching and performance-based grants. South Africa, for example, is using grants from its Green Fund along these lines (SSI 2012). In the U.S., the President's fiscal year 2017 budget proposes a Climate Smart Fund to reward states that leverage federal funding to cut carbon pollution and improve efficiency in the transport sector (CEA 2016).

National governments can also support local government capacity to borrow and mobilize private financing. In the U.S., for example, the federal government uses preferential tax treatment of municipal bonds and subsidies and guarantees on qualified state and local borrowing to boost access to capital markets at these levels of government. Managed well, such incentives can produce savings

in borrowing costs at local levels that can substantially exceed the net cost to the national government (CEA 2016). Increased fiscal empowerment at the local level needs to be underpinned with efforts to strengthen local institutional capacities and public financial management systems, including fiscal responsibility frameworks for sustainable subnational borrowing.

#### 4.1.4. *Better use of government balance sheets*

Strengthening fiscal positions through tax and expenditure reforms also enhances the scope for using government balance sheets to finance investment, by expanding fiscal space for borrowing and improving access to financing and lowering its cost. Countries with lower public debt/GDP ratios have more scope to use the government balance sheet than those with a high degree of indebtedness. But the scope for borrowing also depends on what it is used for. Even where the current level of indebtedness is high, as is the case currently with many advanced economies as well as emerging economies, additional borrowing to finance high-return investments, such as in infrastructure, could be contemplated.

Research shows that higher, well-managed infrastructure investment can have multiplier effects on output of 2-3 times the size of investment, with the impact likely stronger in developing economies with large infrastructure gaps (IMF 2014a, Calderón et al. 2015, Leduc and Wilson 2012, Standard and Poor's 2015). Besides boosting short-run demand, investing in infrastructure bolsters productivity and long-run supply (Bom and Ligthart 2014). Good infrastructure investment may therefore be self-financing, as the public debt/GDP ratio may not rise as a result of investment—or even decline, with the government balance sheet improving rather than worsening. Also, the scope for more public investment, and its impact on economic output, may be greater currently with interest rates at low levels and with many economies experiencing sizable slack (Christiano

et al. 2011, Eggertsson 2011). Investing in infrastructure would offer benefits that “under current circumstances would outweigh the costs of its financing” (Fischer 2015).

Countries must exercise great care in managing their borrowing (as well as contingent liabilities) and ensuring debt sustainability, especially in the current period of fiscal stress in many countries. Debt sustainability assessments need to take into account longer-term economic impacts of the debt-financed expenditures and implications for government balance sheets. With the large investments needed in sustainable infrastructure in the years ahead, with potentially high long-term returns in terms of growth and environmental outcomes, reflecting this perspective in policymaking will be increasingly important (Derviş 2015). Stronger guidance on these issues from international financial institutions, both through their own practice and advice to countries, would be helpful. The IMF’s role is particularly important in this context.

#### 4.1.5. *Transforming development finance: from billions to trillions*

To meet the challenge of financing sustainable infrastructure, and the SDGs more broadly, official flows to developing countries in support of development and climate action will need to increase. Official concessional assistance is especially important for lower-income countries that have limited access to private financial markets. But a paradigm shift is needed in how development finance is used. Rather than simply filling financing gaps, development finance will need to be used in innovative ways that leverage much larger pools of financing. Even in the best-case scenario, official flows will measure in the hundreds of billions. But the financing requirements measure in the trillions. Going from the billions to the trillions will require a much stronger mobilization of domestic resources and private flows (DC 2015). The bulk of the financing needed will come from these two

sources. The key role of development finance will be to support countries in unlocking and catalyzing more financing from these sources. Both traditional official development assistance, and climate finance commitments made in Paris, will have a much larger impact if used in such catalytic ways.

The role of multilateral development banks will be especially important in this paradigm of catalytic development and climate finance. With their combination of technical and policy support, low-cost long-term financing, and risk mitigation services, these institutions can be instrumental in leveraging substantial increases in flows of private finance to sustainable infrastructure and lowering their cost. This leveraging role will be in high demand especially in middle-income developing countries, where the financing needs are large and private capital will have to play a major role in meeting those needs. The type of finance provided by the MDBs and their supporting services are well-suited to funding and leveraging investment in sustainable infrastructure. But the capacities of these institutions will need to be substantially expanded to enable them to provide and catalyze finance on the scale needed.

## 4.2. Leveraging Private Finance

Together with increased public resource mobilization, private financing of infrastructure investment will need to be scaled up substantially. Increasing the contribution of the private sector will be particularly important in meeting the investment requirements in developing countries. Leveraging private financing for sustainable infrastructure and lowering its cost will require much innovation in finance, to tap large pools of private savings held by the financial system. Technological innovation expands possibilities for sustainable development; financial innovation will be important to capturing those (Pisani-Ferry 2015). Public policy can help mobilize more private financing in two important ways: by supporting the development of domestic capital markets; and by addressing specific constraints to private financing of infrastructure, and

especially sustainable infrastructure, including through promotion of innovative finance.

#### 4.2.1. *Developing domestic capital markets*

Long-term private finance of the kind that supports infrastructure investment is relatively scarce in developing countries. This reflects both limited long-term lending by the banking system and a lack of development of other capital market institutions such as markets for bonds, equity and asset-backed securities, insurance and investment companies, and pension funds. Long-term financing is particularly scarce for smaller companies. In the median developing country, small firms' long-term debt-to-asset ratios are 1 percent, compared to 7 percent in high-income countries (World Bank 2015c). Domestic markets for long-term capital are relatively more developed in middle-income countries. Further development of domestic capital markets will be pivotal in meeting the infrastructure financing requirements in these countries. Domestic capital markets will need to provide well over half of all private financing for infrastructure in middle-income countries (Bielenberg et al. 2016). Investment in sustainable infrastructure, such as renewable energy, will involve a more diverse range of domestic investors, with more engagement of local governments and smaller investors. Domestic capital markets will need to play a larger role in meeting the needs of these investors.

Countries have taken different approaches to promoting the development of domestic capital markets and infrastructure finance, ranging from centralized approaches involving heavy reliance on large official development banks and direct measures such as directed and subsidized credit to more decentralized approaches seeking to foster development of a broader range of public and private capital market institutions. A key lesson of experience is that while capital market structures may differ, success fundamentally depends on a common set of reforms that address underlying market, policy, and governance failures (see Box

6 contrasting Brazilian and Indian experiences). Such reforms include policies that promote macrofinancial stability, a contestable banking system with sound regulation, a legal and contractual environment that protects investor and property rights, financial infrastructures that limit information asymmetries, and institutions that counter political capture and other ill-effects of weak governance. Underpinned by a solid policy and governance framework, state-owned development banks can play a useful role in addressing financial market institutional and financing gaps—and complement rather than hamper the growth of other financial institutions (World Bank 2012). Also, governments can facilitate the development of long-term corporate securities markets by developing the market for long-term sovereign debt. Policies that promote foreign investment can help as well, both in developing the domestic capital market and in boosting capital inflows.

Broad-based development of capital markets will be essential to meeting the infrastructure financing needs, to enable matching different pools of capital with the different risk-return characteristics of infrastructure investments and stages of the infrastructure project cycle (OECD 2015f). The special characteristics of infrastructure investment make its financing more challenging. Infrastructure investment typically involves large upfront costs and long payback periods, with risks highest in the initial construction phase of the project. Financing sustainable infrastructure projects can be still more challenging, as they can require higher upfront capital and longer payoff periods. Given these risk-return characteristics, equity capital from project sponsors and lending by banks (which have the necessary expertise and can structure financing more flexibly) can be expected to play a larger role in financing greenfield infrastructure investments and the construction phases of projects. Bonds and especially institutional investors that seek lower risk and stable long-term returns can contribute more in financing brown-field infrastructure investments and the operational phases of projects. Projects at an operational

stage, when they begin to generate positive cash flows and there is greater certainty about costs and returns, also offer opportunities for recycling the initial equity and debt financing and for securitization (Bhattacharya et al. 2012).

Much of the responsibility for developing domestic capital markets rests with national authorities but international cooperation and collective action can help. Multilateral development banks have an important role in providing support, through advice on policy and institutional reform and through structuring financial support and credit enhancement for long-term projects such as infrastructure in ways that promote participation by private and institutional investors. The G-20 also has taken initiatives to promote markets for long-term finance, with a focus especially on boosting finance for infrastructure. It has endorsed an action plan to support the development of local currency bond markets. In implementation of that plan, multilateral institutions (including the IMF, OECD, and MDBs) have prepared a shared diagnostic framework for advice to countries and mechanisms to coordinate their technical assistance (G-20 2013). The G-20 has also endorsed a set of high-level principles prepared by the OECD designed to promote long-term investment financing by institutional investors (pension funds, insurance companies, investment companies/funds) (OECD 2015g). Globally, pension funds hold around \$35 trillion in assets but only 1 percent of those are allocated to direct investment in infrastructure (OECD 2015h, Inderst and Stewart 2014). Governments, particularly in many middle-income countries (such as Chile, Colombia, and Mexico), heavily regulate investments by pension funds, which often have the effect of discouraging long-term and cross-border investment in assets such as infrastructure. The G-20/OECD principles aim to assist countries in addressing tax, regulatory, project pipeline, and other institutional constraints to long-term domestic and international investment by these investors.

It is important to ensure that financial market regulatory reform in the wake of the global financial

crisis does not have the unintended effect of limiting long-term financing for investment and cross-border flows to developing countries—and exacerbating a reduction in such financing already occurring as a result of banks' post-crisis deleveraging. For example, there is concern that Basel III regulation of bank capital, leverage, and liquidity discourages long-term corporate and project finance loans by making such lending costlier for banks compared to short-term loans and mortgages. Lending to riskier sectors, such as infrastructure and green technologies, and locations, such as developing countries, could be impacted more (G30 2013). There are similar concerns with aspects of EU's new Solvency II rules regulating insurance companies. The G-20 has recognized the need to address such potential implications in its further work on financial sector reform, supported by relevant international organizations.

#### *4.2.2. Specific areas of action to mobilize financing for sustainable infrastructure*

Underpinned by an enabling policy and institutional environment to promote sound and broad-based development of capital markets providing long-term finance, complementary policies can aim to address specific constraints to boosting private financing of sustainable infrastructure. Globally, assets under management by banks and institutional investors amount to more than \$120 trillion, of which a little over 5 percent is invested in infrastructure. While more than four-fifths of these assets are held by institutions in advanced economies, the share of emerging economies is rising and this trend could accelerate with stronger efforts to promote domestic capital markets in these economies. Channeling more of this large and expanding pool of capital to sustainable infrastructure, and to emerging economies where the investment needs will be the greatest, can go a long way towards meeting the overall financing requirements. Currently, \$300-400 billion from this pool of capital is invested annually in infrastructure. This could rise to an average of \$1-1.5 trillion annually over the next 15 years, sufficient to meet

## Box 6: Developing domestic markets for infrastructure finance: models and supporting policies

What models should countries employ in developing domestic markets for infrastructure finance? A recent study by Climate Policy Initiative examines this question by reviewing the experience of Brazil and India, two middle-income countries where strengthening domestic capital markets will be key to meeting their large infrastructure financing needs. Brazil has a highly centralized model with a strong development bank (BNDES). India has used a more decentralized model, with a diverse set of public and private institutions. The study reviews experience with wind energy projects in the two countries to examine how the different models performed.

The study finds that while theory suggests certain potential benefits and drawbacks of each model, the extent to which these actually materialize depends greatly on the broader policy, regulatory, and governance context. In both countries, potential and actual outcomes differ significantly (see table). The choice of the financing model matters but the model needs to be supported with policies and governance to optimize benefits and minimize drawbacks. It is largely because of deficiencies in these supporting frameworks that the two countries have similar outcomes in some important respects despite the differences in their financing models: for example, the public sector dominates infrastructure finance in both countries, and leverage and financial innovation are low.

The development bank model can do more than has been observed in Brazil. Complementary policies identified by the study that can improve the model include: focusing BNDES support on projects that provide large social and environmental benefits and require its funding for economic viability; introducing guarantee instruments to better allocate construction risks; easing regulatory restrictions on proceeds from refinancing to promote a refinancing market; and improving sector policy frameworks, especially in sectors other than power that have seen less reform (e.g., water companies in Brazil have a regulatory risk premium of 5 percent due to uncertain concession policies).

A key challenge facing India is the high cost of financing, which raises the cost of renewable energy by up to a third compared to advanced economies. Some policy improvements identified to lower costs include: having the public sector absorb more of the risks it is better-positioned to take on, e.g., off-take risks; and improving facilities for construction finance, refinancing, and hedging foreign exchange risks. Actions in these areas need to be underpinned by broader improvements in the regulatory and institutional framework governing investment and finance.

BRAZIL: National Development Bank Driven		INDIA: Multiple State-Owned and Private Institutions	
<p><b>Potential Benefits</b></p> <ul style="list-style-type: none"> <li>• Greater financial and administrative efficiency - scale economies</li> <li>• Effective contribution to multiple government policy objectives</li> <li>• Improved financial system liquidity</li> </ul>	<p><b>Observed Benefits</b></p> <ul style="list-style-type: none"> <li>• Centralized model fell short of realizing full potential benefits</li> <li>• Some financial and administrative efficiency gains, including clarity in roles and eligibility criteria and access to low-cost financing, but these do not appear to have reduced credit risk and overall cost of infrastructure</li> </ul>	<p><b>Potential Benefits</b></p> <ul style="list-style-type: none"> <li>• Greater financial innovation</li> <li>• Participation by more financial institutions and private investors</li> <li>• Reduced government interference and other governance issues</li> <li>• Smoother integration of international development finance</li> </ul>	<p><b>Observed Benefits</b></p> <ul style="list-style-type: none"> <li>• Limited but improving impact on financial innovation</li> <li>• More investors participate in infrastructure finance, but many are state-owned, so relatively limited gains in diversity</li> <li>• Unclear evidence on reduced government interference</li> <li>• Stronger role of international development finance but may primarily reflect greater need</li> </ul>
<p><b>Potential Drawbacks</b></p> <ul style="list-style-type: none"> <li>• Reduced investment due to crowding out</li> <li>• Prolonged high interest rate environment</li> <li>• Governance issues due to concentration of decision-making</li> </ul>	<p><b>Observed Drawbacks</b></p> <ul style="list-style-type: none"> <li>• Low BNDES interest rates limited opportunities for international investors, long-term commercial bank lending, and financial innovation</li> <li>• Inconclusive evidence on prolongation of high interest rates</li> <li>• Concentration of authority increased potential for governance failures and suboptimal investments</li> </ul>	<p><b>Potential Drawbacks</b></p> <ul style="list-style-type: none"> <li>• Higher cost to the system</li> <li>• Uneven investment across sectors</li> <li>• Restricted use of pure project finance models</li> <li>• Reduced leverage of projects leading to more risk seeking by investors</li> </ul>	<p><b>Observed Drawbacks</b></p> <ul style="list-style-type: none"> <li>• Relatively high-cost system; examples of high administrative costs affecting projects</li> <li>• In general, evidence finds that potential drawbacks are actually likely in Indian context</li> </ul>

Source: Sahoo et al. (2015).

one-third or more of the total incremental financing required over that period (Bielenberg et al. 2016). Making this happen will require actions to remove key constraints to the mobilization of this financing, including innovation in instruments and mechanisms to reduce investor risk and lower the cost of financing for sustainable infrastructure projects.

#### ◇ *Develop infrastructure as an asset class*

First, to better tap the large pools of capital held by institutional investors, infrastructure needs to be better developed and promoted as an asset class. The steady long-term returns and risk diversification opportunities offered by infrastructure assets are features that should be attractive to these investors. Yet, their commitment has been low, and also narrow in terms of investment modalities, mostly taking the form of equity (typically unlisted equity) on a project basis. The untapped potential for bond financing by these investors is large, especially when projects reach an operational phase (Ehlers 2014). Developing a strong pipeline of sound and bankable projects, standardizing project templates where possible, and improving the flow of information on projects to investors are essential to enhancing the profile of infrastructure as an asset class. So are regulatory and institutional frameworks for private investment in infrastructure that provide policy clarity and reduce risk. This underscores the importance of strengthening project preparation and improving the private investment climate, including upgrading frameworks governing PPPs and public procurement and reflecting sustainability criteria in projects and these frameworks, as discussed in earlier sections of this paper. Multilateral development banks have an important role in supporting countries in these efforts. The new Global Infrastructure Hub established by the G-20 can also help, especially as a platform for knowledge and information sharing on project preparation and project pipelines and connecting potential investors with opportunities.

With stronger capital market structures, and as investment in infrastructure bonds grows, trading in

these bonds can enhance their liquidity and lower risk. Issuance of asset-backed securities for infrastructure assets could further develop the market for infrastructure as an asset class. Securitization could help diversify and pool risks better, create instruments to match the different risk appetites of investors, and increase liquidity. The European Investment Bank has recently launched a renewable energy platform for institutional investors (REPIN) to offer repackaged renewable energy assets in standardized, liquid forms to institutional investors (CPI 2015). Improved underlying policy and institutional frameworks, greater clarity on the risk-return profile of sustainable infrastructure projects, and financial innovation could position infrastructure assets better in assessments by rating agencies.

#### ◇ *Promote innovation in investment instruments*

Innovations in financial instruments could expand the range of investment options, improve risk-return profiles, help reach a wider investor base, and channel more resources to sustainable infrastructure. Green bonds and YieldCos already have shown a promising uptake. Debuted in 2007, the green bond market has grown rapidly in recent years, with outstanding issues estimated at more than \$65 billion in mid-2015 (CBI 2015). The year 2014 saw the first issuance of a green bond by an emerging economy at the municipal level, by the city of Johannesburg. Strengthening the institutional structure underpinning the sustainable infrastructure-linked-instruments such as green bonds, YieldCos, and green exchange-traded funds can help promote their further growth, including platforms for their listing on exchanges and market value indices.

Innovation will also be needed to finance a more diverse set of investors in sustainable infrastructure compared to traditional infrastructure, including many smaller and often less creditworthy investors, such as in solar energy. In rural Kenya and Tanzania, for example, a significant share of new

rural electrification is being financed by low-income households. New models will be needed that contain transaction costs and offer adequate risk-adjusted returns for investing in small distributed assets, including possibly bundling multiple projects to achieve scale (Perera et al. 2015).

#### ◇ *Scale up risk mitigation instruments*

Well-designed risk mitigation and credit enhancement instruments can be effective in catalyzing private capital by reducing risk and cost. Sustainable infrastructure projects can face higher policy risks. According to one estimate, changes in policy support can add up to 15 percent to a project's financing costs (CPI 2013). Projects employing new technologies can also face higher risk premia. Multilateral development banks in particular are well-positioned to leverage private finance by extending risk mitigation guarantees, such as partial risk and credit guarantees. However, the use of these instruments to date has been well below potential. For example, IBRD guarantees outstanding in mid-2015 amounted to only \$1.4 billion, compared to outstanding IBRD loans of \$155 billion (IBRD 2015). Of the total climate finance provided by MDBs in 2014, only 5 percent was in the form of guarantees (MDBs 2015c). This is notwithstanding evidence showing that guarantees can leverage multiples in private capital for every dollar committed. On 28 World Bank guarantee operations, the estimated leverage ratio was as high as 8.6 (World Bank 2010). There is potentially a high payoff to current MDB efforts to devise better and more replicable models that can be used to scale up the use of risk mitigation instruments.

#### ◇ *Expand use of loan syndications and pooling vehicles*

Multilateral development banks, and where applicable national development banks, can also catalyze more private capital in support of sustainable infrastructure through increasing syndication of loans with commercial banks and other financial institutions. Syndications attract private capital by

reducing risk and transaction costs and increasing investment optionality. They can be a powerful means for development banks to increase leverage; based on experience, MDBs can mobilize from other sources as much as 4-5 times the size of their own investment. Development banks can also securitize a selection of their loans and offer them to other investors, thereby helping to develop a secondary market for infrastructure-related securities and recycling their own scarce capital.

More use could be made of MDB-supported pooling vehicles or co-investment platforms to crowd in private capital and promote PPPs (Arezki et al. 2016). These vehicles help catalyze private capital by reducing individual investor costs for project preparation and execution, strengthening project pipelines, facilitating joint financing, providing credit enhancements, and allowing risks to be shared. The Global Infrastructure Facility and Climate Investment Funds administered by the World Bank and the Equity Participation Fund managed by the European Bank for Reconstruction and Development (EBRD) are examples.

#### ◇ *Blend concessional and private capital to finance sustainability premiums*

As noted, low-carbon, sustainable investments often entail higher upfront costs while their benefits materialize much later in the project cycle. Lower-cost official financing could be used to attract private capital by financing the upfront cost premiums associated with making traditional infrastructure projects sustainable. Given the positive externalities from these investments, there is a good case for using concessional finance. Such development capital could come from multilateral, bilateral, or national sources, and would be a good use of some of the climate funds flowing from the Paris agreement. The reliance on concessional finance would be reduced over time as models are strengthened to repay sustainability premiums by capturing total cost of ownership (TCO) savings over the project's life, and as the success of the initial set of projects demonstrates to the private sector the business case for investment in sustainable infrastructure.

Funding models incorporating TCO savings are in use in advanced economies, especially in energy efficiency projects in which downstream energy efficiency gains are used to repay the upfront investment in capital improvements. Development capital can be used to pilot this model in developing countries, especially middle-income countries. Allocating \$10 billion to \$15 billion of development capital a year to finance sustainability premiums for energy efficiency could catalyze \$118 billion to \$176 billion a year of investment in energy efficient infrastructure (Bielenberg et al. 2016). The impact would be greater if the model is extended beyond energy efficiency to other sectors, such as water and waste.

◇ ***Incorporate climate risk in financial sector management***

The financial system plays a central role in the allocation of capital. Its allocation decisions need to be informed by the risks and opportunities created by climate change. This requires information on the climate attributes of different assets and investment options, such as carbon intensity and exposure to climate risk. Availability of such information, combined with clearer signals on carbon pricing, can have a powerful effect on how financial institutions evaluate and decide on competing investments, altering perspectives and incentives favorably towards financing of sustainable infrastructure. Better

information on climate exposures and risks will also matter for financial sector stability.

In the energy sector alone, more than \$300 billion in investment can become stranded by 2035 under a scenario compatible with the 2 degrees Celsius objective (IEA 2014b). An estimated 60-80 percent of coal, oil and gas reserves of publicly listed companies may be “unburnable” if the world is to keep global warming below 2 degrees Celsius (CTI 2013). Shifts in market sentiment induced by awareness of future climate risks, especially if they were to occur suddenly, could potentially seriously destabilize financial markets, causing losses in investment portfolios approaching 50 percent (CISL 2015).

Existing schemes requiring companies and investors to disclose their carbon exposures are fragmentary and lack consistency. There is a need to develop more consistent, comparable, reliable, and clear standards for disclosure of the carbon intensity of different assets (Carney 2015). The G-20 can provide leadership on this matter and has asked the Financial Stability Board (FSB) to review how the financial sector can take account of climate-related issues. At COP21, the FSB announced the formation of a Climate Disclosure Task Force to develop climate-related financial risk disclosures for use by companies in providing information to lenders, insurers, investors, rating agencies, and other stakeholders.

## III. Conclusion

Sustainable infrastructure is at the nexus of economic growth, inclusive development, and environmental sustainability. A major boost in investment will be needed to deliver infrastructure at scale to meet global growth and development objectives over the next 15 years. The world's infrastructure stock will need to be more than doubled. This presents a big challenge, but it also presents a big opportunity. Developing the new infrastructure capacity in sustainable ways can be a game changer in the fight against climate change, as infrastructure currently is the largest contributor of GHG emissions. Major international agreements reached in 2015 on the SDGs and climate action provide the political momentum to scale up investment in sustainable infrastructure. The world must capture this opportunity.

Public policy, at national and international levels, will have a crucial role to play in scaling up sustainable infrastructure development. The agenda involves change and important transformations in the way infrastructure is developed and financed. This paper has addressed some key elements of the public policy role, highlighting issues and options for policy response, and focusing in particular on emerging and developing economies where the bulk of new infrastructure investment will take place. Specific public policy interventions will need to be designed and calibrated to reflect individual country circumstances, requiring more detailed and country-specific analysis. The precise agenda, and the priorities and sequencing, will therefore vary across countries. Nonetheless, the discussion in this paper highlights some common themes for public policy as it seeks to boost sustainable infrastructure development.

First, public policy for sustainable infrastructure should be developed within a holistic framework, which integrates sustainability not just in individual projects but in overall country investment and growth strategies and related macroeconomic and sectoral policy frameworks. The INDC process can be instrumental in bringing about this shift towards a more systemic integration of sustainability.

Second, while the public policy agenda is rich in detail and wide ranging, its main thematic elements can be captured under four “I”s: investment, incentives, institutions, and innovation. Boosting *investment* in infrastructure to more than twice current levels will require substantial increases in public sector’s own investment and public policies to encourage and catalyze a major scale-up of private investment. To ensure that new investment is oriented towards sustainable infrastructure, policymakers must also adjust market *incentives*. The removal of fossil-fuel subsidies and the implementation of carbon pricing are particularly important. Getting prices right and correcting other incentive distortions put markets to work in support of public policy goals. The feasibility, quality, and impact of higher levels of investment will depend crucially on the strength of public *institutions* and fiscal capacities at national and subnational levels. This includes, in particular, capacities to develop and manage stronger pipelines of sustainable infrastructure projects and to improve regulatory

and institutional frameworks for PPPs. *Innovation*, technological and financial, is part and parcel of the transformational nature of the sustainable infrastructure agenda and public policy has an important role in fostering it. Mobilizing financing at scale will require enhancing and creatively utilizing fiscal space to maximize catalytic impact and leveraging private finance through innovative capital market mechanisms and instruments to mitigate risk and promote investor interest.

The public policy agenda is primarily the responsibility of national authorities. But there is an important role for international cooperation through collective policy actions and technical and financial support. For emerging and developing economies, multilateral development banks in particular will be a key partner in building capacities and catalyzing financing. The scale of the sustainable infrastructure challenge will require enhancements of the capabilities of these institutions.

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