



# BEYOND THE GAP

How Countries Can Afford the Infrastructure They Need while Protecting the Planet

Policy Note 6/6

## Full Decarbonization Need Not Cost More Than Polluting Alternatives

In low- and middle-income countries, infrastructure—defined here as water and sanitation, electricity, transport, irrigation, and flood protection—falls short of what is needed to address public health and individual welfare, environmental considerations, and climate change risks, let alone achieve economic prosperity or middle-class aspirations. How can this situation be reversed? This policy note is drawn from *Beyond the Gap: How Countries Can Afford the Infrastructure They Need while Protecting the Planet*, edited by Julie Rozenberg and Marianne Fay, Sustainable Infrastructure Series (Washington, DC: World Bank, 2019). The report not only contends that the focus should be on the service gap—not the investment gap as is typically the case—but also offers a careful and systematic approach to estimating the funding needs (capital and operations and maintenance) to close the service gap. The results presented here were developed specifically for this report, based on clearly specified access and climate goals and using numerous scenarios to explore both uncertainty and the consequences of policy choices.

Policy Note 6—one of six drawn from *Beyond the Gap*—discusses the impact of climate change mitigation on infrastructure needs. Policy Note 1 provides an overview of the report, Policy Note 2 focuses on water and irrigation, Policy Note 3 focuses on the power sector, Policy Note 4 focuses on transport, and Policy Note 5 focuses on flood protection.

The international community has agreed to limit climate change to 2°C, which will entail all sectors—water and sanitation, transportation, electricity, irrigation, and flood protection—to be decarbonized by the second half of the century. *Beyond the Gap* offers a careful and systematic approach to estimating the infrastructure funding needs (capital as well as operations and maintenance) to close the service gap in low- and middle-income countries (LMICs), while limiting climate change to 2°C warming.

The report builds numerous scenarios to explore the many paths through which decarbonization could potentially be achieved for transport and power, which together account for the majority of emissions. It also examines the cost implications of low-carbon pathways compared with “business-as-usual” ones. This policy note highlights the key findings on climate policy.

### Low-carbon infrastructure investment pathways can cost less than traditional, more polluting, ones

The key is in the planning and the policies that accompany the investments. To keep costs down, early on countries will have to (a) direct all electricity investments toward renewable energy and improve their energy efficiency; (b) plan for compact cities organized around mass transit, nonmotorized modes, and shared electric mobility; and (c) make sure their rail systems are reliable and attractive to passengers and freight. Only with such prompt action can countries be on the right path for full decarbonization by the second half of the century, while limiting investments to

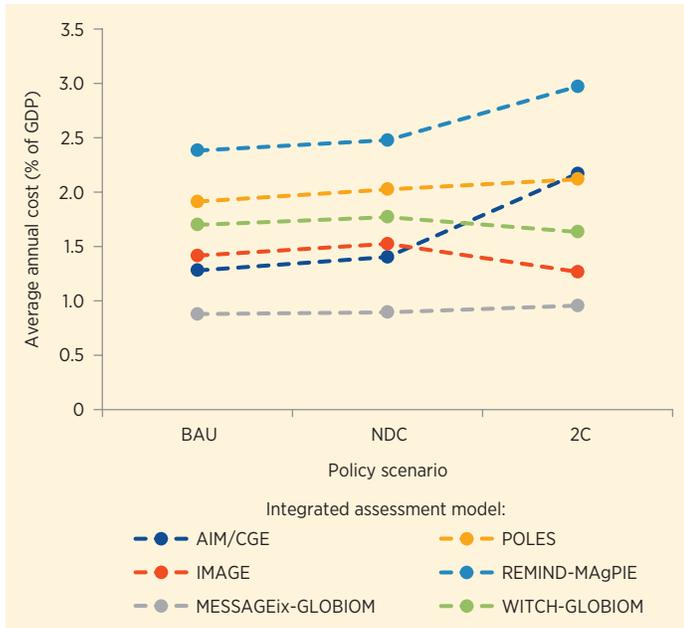
3.3 percent of gross domestic product (GDP) annually in new electricity and transport infrastructure and 4.5 percent of GDP for all sectors together.

*In the power sector*, LMICs can move toward CO<sub>2</sub>-free power supply and reach universal access to electricity by investing an average of 2.2 percent of GDP annually by 2030. This goal can be achieved by relying on solar minigrids and microgrids in rural areas and investing early in renewable electricity to avoid having to strand assets later on. Costs can be reduced even further (possibly as low as 1 percent of LMICs’ GDP per year, on average) if countries invest in energy efficiency and demand management (figure 1). Conversely, if countries keep investing in fossil fuels up to 2025 before stranding their coal assets by 2030, or if they fail to manage a growing demand for electricity, a decarbonized power system would cost much more, possibly up to 3 percent of GDP per year for new investments.

*In the transport sector*, LMICs can move toward a CO<sub>2</sub>-free transport system and improve mobility services by investing an average of 1.3 percent of GDP per year by 2030. This goal can be achieved by adopting land-use planning and policies to make rail more attractive. In cities, transit-oriented development—the combination of land-use planning and transport planning to create compact cities organized around reliable mass transit—can deliver low-carbon transport systems at an infrastructure cost 20 percent lower than traditional car-based transport systems. The development of electric shared mobility also helps to reduce emissions and lowers the need for parking infrastructure. For the overall transport system, a shift toward more rail can be achieved at a reasonable cost, but only if accompanied by an increase in

### FIGURE 1 A 2C world may cost less than the business-as-usual one—or a lot more

Average annual cost of investment in the power sector in LMICs, by policy scenario and integrated assessment model used, 2015-30



Source: See figure 3.9 in the full report.

Note: BAU = investment needed if countries follow a business-as-usual trajectory; LMICs = low- and middle-income countries; NDC = cost of implementing measures announced by countries in their nationally determined contribution to the Paris Agreement on Climate Change; 2C = measures needed for an emissions trajectory consistent with keeping climate warming below 2°C.

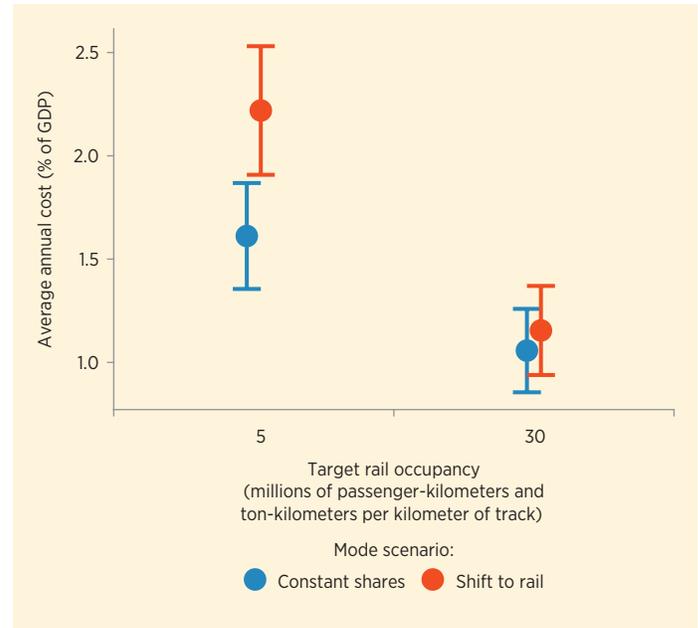
operational efficiency of the infrastructure—for example, if LMICs reach the rail occupancy rates prevalent in China or the Republic of Korea (figure 2). Failure to increase the efficiency of rail systems could increase the cost to between 2 percent and 2.5 percent of GDP per year to deliver the same mobility service.

### The international community and climate finance should focus on helping countries achieve decarbonization objectives at the lowest possible cost by supporting better planning and policies

Low-carbon infrastructure pathways can be reached at low or high cost depending on the effectiveness of the planning process and the policies in place to ensure that the investments will deliver services efficiently. The additional cost that may exist at the individual investment level—for example, an electric bus versus a diesel bus—can often be offset by better planning or more

### FIGURE 2 The choice of terrestrial mode and rail occupancy drive transport investment costs

Average annual cost of capital investment in transport in LMICs, by choice of terrestrial mode and rail occupancy, 2015-30



Source: See figure 4.12 in the full report.

Note: The bars represent the range of estimates, generated by hundreds of scenarios, while the central dots represent the median value across estimates. LMICs = low- and middle-income countries.

compact cities. Moreover, given the scale of the transformations needed to have zero-carbon electricity and transport systems, a strategy that relies on technology as the sole lever to reduce emissions would be unaffordable.

Climate finance will be needed for some projects, to help finance the extra cost of the low-carbon option compared with the polluting alternative. There may also be significant financing needs for those low-carbon options that have higher upfront costs that pay off over time. But focusing on an incremental cost of climate change mitigation is the wrong way of looking at the problem.

Further, effective infrastructure services require a careful allocation of resources across planning, capital, maintenance, and operations. In the case of low-carbon pathways, the key to spending better and minimizing the capital investments required is to spend more on policies and planning.

The point, therefore, is that low-carbon pathways may end up costing less than high-carbon ones if international resources are used to help countries plan better and put in place policies that increase the efficiency of infrastructure investments.