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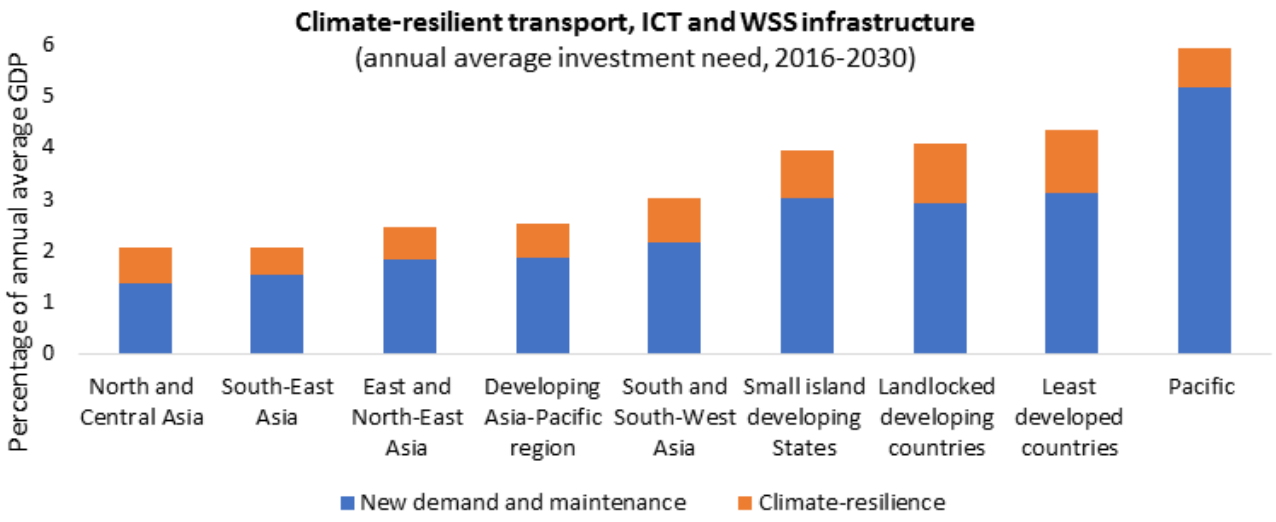
Investing in sustainable infrastructure for all

Infrastructure is critical to the achievement of the Sustainable Development Goals. It is represented in Goal 9 along with industrialization and innovation, but also implicit in many other Goals including food security, health, decent jobs and cities and human settlements. Among infrastructure sectors, progress on Goal 7 on clean energy would be critical for limiting global warming to well below two degrees Celsius. ESCAP's Economic and Social Survey 2019 estimates that developing countries in the Asia-Pacific region would have to invest an additional $196 billion per year in transport, ICT and water and sanitation infrastructure, and new investments of $434 billion to achieve Goal 7 on affordable and clean energy for all.

Transport, ICT and water and sanitation

Infrastructure investment needs are large in Asia and the Pacific, which is home to four in every seven people in the world and whose economies are growing at a rapid pace. ESCAP's Survey estimates that developing countries in the region would have to invest 2.5 per cent of GDP, on average, every year through 2030 in transport, ICT and water and sanitation infrastructure (figure 1). Three-quarters of that would be to meet new demand arising from higher income, population and urbanization, and for maintenance of new and existing infrastructure. A quarter would be for climate-resilience, both to build better and for post-disaster recovery.[1] For a region as large and diverse as Asia and the Pacific, the magnitude of investment needs vary considerably across sub-regions, rising to 5.9 per cent of GDP in the Pacific island developing States.[2]

Figure 1. Climate-resilient transport, ICT and WSS infrastructure



Source: ESCAP (2019). Economic and Social Survey of Asia and the Pacific 2019: Ambitions beyond growth.

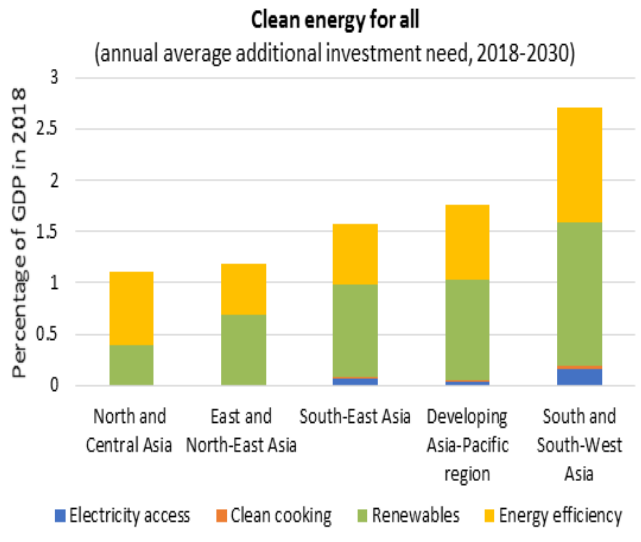
In terms of the investment gap – that is, the difference between investment needs and current funding levels[3] – ESCAP's Survey estimates an annual gap of $196 billion, or 1.3 per cent of GDP, on average, for developing countries in the region.[4] For landlocked developing countries and least developed countries, this gap is as large as large as 3–3.3 per cent of GDP, while members of the South Asian Association for Regional Cooperation (SAARC) will face a gap of 2.5 per cent of GDP annually. In terms of sectors, transport accounts for 64 per cent of

the investment gap, ICT for 29 per cent and water and sanitation for 7 per cent.

Transport: An additional investment of $126 billion per year is required in the region, with paved and unpaved roads accounting for the bulk, although railways account for a relatively large share in North and Central Asia. In practice, transport needs are very country-specific and largely influenced by challenges in such areas as population density, proximity to opportunities and services, affordability and the initial starting point in terms of the existing level and quality of infrastructure provision. Moreover, the transport sector is the area where resource optimization holds a high promise. Future mobility demand could be supplied at lower cost and with fewer externalities if implementation strategies capitalize on promoting a greater integration between transport and land-use policies and a more balanced modal split between transport modes. While ESCAP cost calculations are based on generally accepted long-term projections and country-specific unit costs, such limitations should be kept in mind.

ICT: An additional investment of $56 billion per year is required in the region, with fixed-broadband infrastructure accounting for the bulk, compared to infrastructure needed to provide mobile phone subscriptions. Such ICT investments could catalyse the achievement of several Sustainable Development Goals, offering wider access to health and education services and supporting the transition to more resource-efficient systems of production and consumption. Given the need for upgrading to cater to new and emerging technologies, such as next generation networks (5G and higher), ESCAP cost calculations also provide for a high-cost scenario based on ITU data at the country-level.

Figure 2. Clean energy for all



Source: ESCAP (2019). Economic and Social Survey of Asia and the Pacific 2019: Ambitions beyond growth.

Water and sanitation: An additional investment of $14 billion per year is required in the region, to deliver a "safely managed" level of service where water and sanitation infrastructure is within the premises, readily accessible and free from contamination. In practice, investment needs could be considerably higher, when considering rapid urbanization in the region as well as the challenges of water stress and water-related ecosystems. Least developed countries and countries in South and South-West Asia face relatively higher investment needs, to provide safe drinking water and to end open defecation.

Clean energy for all

Unlike previous studies on infrastructure investment needs, the ESCAP Survey calculates the energy sector separately using a scenario-based approach. Based on the World Energy Model of the IEA, it is estimated that for 42 developing countries in Asia-Pacific region, new investment of $434 billion would be needed every year through 2030 to achieve the Goal 7 targets: 7.1 (universal access to electricity and clean cooking), 7.2 (substantially increase the share of renewable energy in the energy mix) and 7.3 (double the rate of improvement in energy efficiency).

Renewable energy and energy efficiency (in the transport, industry and building sectors) would account for $242 billion and $180 billion, respectively, and universal access to electricity and clean cooking about $12 billion. While the latter is in part due to the already high levels of access to electricity achieved in the region, it should be noted that 100 per cent access could look very different from one country to another, as powering a single light bulb for few hours a day could qualify as having access to electricity.

Investment need would vary considerably across the region. East and North-East Asia including China accounts for $255 billion of the regional total, followed by South and South-West Asia and South-East Asia, at $74 billion and $54 billion respectively. However, in terms of GDP, South and South-West Asia would face the steepest funding requirement, at 2.7 per cent, compared to the regional average of 1.8 per cent (figure 2).

Making the most out of infrastructure investment

Given the sheer scale of infrastructure investment needed to achieve the Sustainable Development Goals, the sound planning, execution and management of infrastructure investment would be of paramount importance to ensure that the overall allocation of finance is efficient and that every dollar spared from other sustainable development spending areas for infrastructure delivers its expected impact.

The recent accumulation of infrastructure-related debt in some Asia-Pacific developing countries also points to the urgency of paying greater attention to infrastructure investment efficiency. Strengthened investment would only be economically and fiscally sustainable if it generates real economic impetus and contributes to tangible improvements on social-environmental fronts.

There is significant space for Asia-Pacific developing countries to achieve more in their infrastructure development ambitions. We estimate that if they were to achieve the efficiency of their best-performing peers, on average they could save up to 59 per cent[5] in total infrastructure investment to deliver the same results. This estimation is based on data envelopment analysis[6] covering thirteen indicators [7] on infrastructure quantity and quality in four sectors: namely transport, ICT, energy, as well as water and sanitation.

Clearly, how cost-effectively a country can build and maintain infrastructure depends not only on human factors such as policy and capacity but also on endowment factors such as geography and climate, and not all the estimated efficiency gains could be realized. As with other methods of system-wide spending/investment efficiency analysis, the data envelopment method is also subject to limitations and caveats. However, the fact that Asia-Pacific developing countries underperform the world average in the efficiency scores by almost a third and underperform developed countries by an even greater margin indicates that substantial savings or, if the total infrastructure investment level is kept the same, much improved results in infrastructure supply and quality, are not beyond the reach of these countries.

Measures on three fronts could be taken to reap the efficiency gains in infrastructure investment. First, improve the management of infrastructure investment and eliminate wasteful spending through better planning and coordination, better project selection and more efficient implementation. Sound governance anchoring on accountability, transparency and administrative efficiency would be key in this process. Effective coordination among different government branches for construction permits, environmental clearance and land acquisition is particularly important, as these often lead to project delays.

Second, pay due attention to infrastructure maintenance cost. While mega projects with large greenfield investments tend to attract the greatest attention, maintenance cost of infrastructure could actually be the fastest growing component of the total infrastructure investment need, given continuing expansion of infrastructure stock. McKinney (2013) [8] estimates that optimized maintenance alone could contribute one-tenth of the total infrastructure savings globally. Poor maintenance is also a major source of extra cost for infrastructure in developing countries.

Last but not least, put greater emphasis on the ultimate goal of infrastructure investment, that is the actual usage and service for the people. Infrastructure built and maintained with high quality would still be a waste if it is not reaching the target beneficiaries. And delivering the physical infrastructure should not be end of the story or the yardstick for success. Instead, the benefits and efficiency of infrastructure investment need to be measured by its actual social, economic or environmental impacts. Often better understanding of the rationales and habits of the target beneficiaries and complementary social-cultural measures to change mindset and behaviors could be vital for the ultimate success.

Estimated efficiency of infrastructure investment

	Developing Asia-Pacific	World	Developed countries
Number of observations	15	63	23
Input efficiency (input required to achieve the same performance)			
average	41%	59%	72%
median	46%	56%	72%

Source: ESCAP estimation based on data from UNdata, the World Development Indicators database, the Global Competitiveness Index database, and the CIA World Factbook database.

Endnotes

[1] ESCAP Survey calculations are broadly in line with previous studies. For instance, ADB's 2017 Meeting Asia's Infrastructure Needs estimated an annual infrastructure need of 5 per cent of GDP, of which half was in the energy sector. ESCAP estimates the needs in the energy sector separately, using scenarios developed by the IEA in the context of meeting Sustainable Development Goal 7 targets.

[2] The ESCAP calculation is based on a wide geographical coverage of about 40-45 countries in Asia and the Pacific, spanning small island States such as Vanuatu to major economies such as China, India and Indonesia. The results are only shown for developing countries, excluding Australia, Japan and New Zealand.

[3] In the ESCAP Survey, current investment is estimated based on: (a) gross fixed capital formation for general government, adjusted to account for non-infrastructure elements; (b) share of PPPs in infrastructure coming from the private sector; (c) greenfield FDI; and (d) the relevant ODA flows, including from multilateral development banks.

[4] Following the literature, this calculation excludes countries with a negative aggregate investment gap, namely China, the Republic of Korea and Singapore.

[5] Studies using different methods report similar estimations. For example, McKinsey (2013) estimates a 40 per cent potential efficiency improvement globally.

[6] In this method, the efficiency scores are estimated by plotting different countries in the input-output charge and establishing an efficiency frontier based on the observed input-output patterns. The efficiency of a country is then measured based on its distance to the efficiency frontier.v

[7] Transport: Mileage of roadways per 1 million people, Mileage of railways per 1 million people, Number of airports per 1 million people, Quality of roads, Quality of railroad infrastructure, Quality of air transport infrastructure, Quality of port infrastructure

ICT: Fixed broadband subscriptions (per 100 people), Mobile cellular subscriptions (per 100 people), Secure Internet servers (per 1 million people)

Energy: Energy use (kg of oil equivalent per capita), Perception on electricity supply

Water & sanitation: Per cent of population having access to defecation facilities

[8] McKinsey 2013. Infrastructure productivity: How to save $1 trillion a year. Available at https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/infrastructure-productivity.

The MPFD Policy Briefs aim at generating a forward-looking discussion among policymakers, researchers and other stakeholders to help forge political will and build a regional consensus on needed policy actions and pressing reforms. Policy Briefs are issued without formal editing. This issue was prepared by Daniel Jeongdae Lee, Shuvojit Banerjee and Zheng Jian (MPFD). It benefitted from inputs and comments by Sweta Saxena, Zhenqian Huang, Kiatkanid Pongpanich, Achara Jantarasaengaram (MPFD); Candice Branchoux and Yong Yoon. For further information on this issue, please contact Hamza Ali Malik, Director, Macroeconomic Policy and Financing for Development Division, ESCAP (escap-mpdd@un.org).

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