



# Economic Premise

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## Sharing Prosperity by Closing South Asia's Infrastructure Gap

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*While South Asia's average gross domestic product (GDP) growth in the past decade was only slightly lower than in East Asia and the Pacific, the region significantly lags behind in terms of infrastructure access. In some cases, South Asia's access levels are more similar to sub-Saharan Africa, although considerable heterogeneity exists across the South Asia region (SAR)—some provinces, infrastructure types, and countries have much higher access levels than others. If SAR can't close its US\$1.7 trillion to US\$2.5 trillion infrastructure gap, its growth performance is likely to stall. This note examines the type and magnitude of the infrastructure gap, and also looks at inequality of access to infrastructure across physical, poverty, and income spaces. Keeping in mind five key principles, there are several options for policy makers to consider for closing the infrastructure gap while also improving the equality of access.*

Despite recent rapid growth and poverty reduction, many people living in SAR remain unconnected to a reliable electrical grid, a safe water supply, a sanitary sewerage disposal system, and reliable roads and transportation networks. Furthermore, the region requires significant infrastructure investment (roads, rails, power, water supply, sanitation, and telecommunications) not only to ensure basic service delivery and enhance the quality of life of its growing population, but also to avoid a possible binding constraint on economic growth.

The infrastructure gap is compounded by the fact that the SAR's population suffers from unequal access to infrastructure. It is commonly asserted that the poor have less access to infrastructure than the rich, similar to the case of private assets. In effect, a nonregressive access to infrastructure services would mean no correlation between actual access and different poverty-related measures (such as households below poverty lines and certain income and consumption levels). Whereas this may be desirable theoretically—especially for infrastructures with high public good characteristics—the choice

between infrastructure access for all, regardless of where individual households are located, and quality access to where most households are located, is a real policy challenge in its extreme case. Yet, are there countries in South Asia that do a better job of providing infrastructure access to their poor? Are there infrastructure sectors that tend to be more regressive than others? What is happening with access to infrastructure services at the household and individual levels?

In an effort to answer these questions, this note, based on substantial research, critically reviews the status of infrastructure in SAR compared to other regions, as well as among and within SAR countries. Several analyses then explore inequality of access to infrastructure services across South Asia's space (namely physical space, poverty space, and income space) and across time (how access of the young will influence future opportunities). These analyses help provide an estimate of the total cost of regional infrastructure needs, along with the infrastructure investment trends in SAR countries. Finally, this note examines ways to better use existing resources by rethinking infrastructure service provision—including the role

**Table 1. SAR Lags Behind All But SSA in Access to Infrastructure Services**

Region	Average GDP growth (2000–2012, %) <sup>a</sup>	Urbanization rate (2012)	Telecommunication access (per 100 people; 2011) <sup>b</sup>	Electricity access (% of population; 2010) <sup>c</sup>	Access to improved sanitation (% of population; 2011) <sup>d</sup>	Access to improved water (% of population; 2011) <sup>e</sup>
EAP	8.9	50	98	92	67	91
ECA	4.4	60	157	100	94	95
LAC	3.1	79	125	94	81	94
MNA	4.2	60	105	94	89	89
SAR	6.7	31	72	71	39	90
SSA	4.7	37	54	35	30	63
World	2.5	53	103	78	64	89

Source: World Development Indicators, unless otherwise noted.

a. The average GDP growth for MNA is for the period 2000–2009.

b. Telecommunications access is defined as the number of fixed and mobile lines.

c. *World Energy Outlook 2010*, International Energy Association.

d. Improved sanitation is defined as connection to a public sewer, a septic system, pour-flush latrine, simple pit latrine, or ventilated improved pit latrine.

e. Improved water is defined as household connection, public standpipe, borehole, protected dug well, protected spring, or rainwater collection.

of the private sector—as well as policy options to help the poorest gain better access to infrastructure.

### How South Asia Compares to Other Regions

Structural change in South Asian countries has been relatively slow compared to that of East Asian countries. In 1990, they had similar urbanization rates (SAR, 25 percent; East Asia and the Pacific [EAP], 28 percent) and were close in terms of infrastructure service provision. But while they both enjoyed high growth rates over the next two decades, EAP has seen rapid urbanization (50 percent in 2012), while SAR has remained the least urbanized region in the world (31 percent, compared to the world urbanization rate of 53 percent).

At this point, SAR’s access to infrastructure services closely resembles sub-Saharan Africa (SSA), even though its economic growth is second only to EAP (table 1).

### How Access to Infrastructure Varies within South Asia

So *who* has access to each type of infrastructure? The analysis starts with a look at inequality of access across SAR, weighing

physical (“spatial”), poverty, and income spaces—an assessment that has never been conducted for this region.<sup>1</sup> Mapping access to infrastructure with characteristics of households provides a better understanding of issues that limit access for some population groups, and allows for a better design and targeting of policies to expand access to infrastructure services.

#### Inequality across physical space

One way of measuring inequality is to analyze whether some countries in South Asia are better at making access to infrastructure more spatially equal in-country than others. This can be measured by zooming in to a lower administrative level (such as a district or province) and measuring inequality with Gini coefficients (a Gini coefficient of zero represents perfect equality, while a coefficient of one represents maximal inequality). The goal is to come up with a country-level measure of spatial inequality of infrastructure access adjusted by household spatial distribution, which is presented in table 2.

The results show quite a varied picture, with Maldives having the lowest—and Afghanistan the highest—inequality of access to infrastructure services in the region. These results are not surprising, especially in the case of Afghanistan, given

**Table 2. Gini Coefficients of Access to Infrastructure in South Asia Highlight Tremendous Inequality (Gini coefficients for access, adjusted by household distribution)**

Service	Afghanistan	Bangladesh	Nepal	Sri Lanka	India	Bhutan	Pakistan	Maldives
Improved water	0.12	0.01	0.04	0.01	0.06	0.00	0.02	-0.10
Improved sanitation	—	-0.01	0.06	0.01	0.29	0.18	0.02	0.01
Electricity	0.49	0.11	0.04	0.04	0.15	0.10	—	0.00
Cooking gas	0.50	0.49	0.24	0.33	0.35	0.22	0.00	0.01
Phone	0.28	0.15	0.05	0.03	0.20	0.19	0.03	0.00

Source: Authors’ calculations based on surveys presented in Andrés, Biller, and Herrera Dappe (2013).

Note: The Gini coefficients are estimated over a sample of administrative subdivisions selected on each country.

its level of development and years of conflict. What is surprising, however, is Pakistan's relatively low levels of spatial inequality. One possible explanation is the country's higher urbanization rate, with access to infrastructure services more skewed to its cities relative to other countries in the region.

Are some infrastructure services better than others in how they are distributed within countries to households? Again, the results show big variations. The most unequally distributed service throughout SAR is cooking gas (LPG). Heavy use of biomass for cooking rather than the cleaner LPG implies an intergenerational and intragender trade-off because the significant pollution risks of indoor air contamination affect mostly children and women. The most equally distributed service throughout SAR is improved water, which is of course important in terms of welfare impacts such as health and hygiene. The other sectors—improved sanitation, electricity, and phones—fall somewhere in between the two extremes.

### **Inequality across poverty space**

Another way of judging inequality is to analyze how pockets of poverty fit into the picture, in effect, introducing a socioeconomic variable. The analysis assumes that a country with a higher poverty rate will have worse access to infrastructure services than a country with a lower poverty rate. But how strong is that link? To ascertain whether this hypothesis holds, the district poverty rate (percentage of people in each district that live under the poverty line) is correlated with the district rate of access to infrastructure (percentage of households that have infrastructure in each district) for India, Afghanistan, and Sri Lanka. In this analysis, high regressivity means that poor districts typically have less access compared to richer districts, whereas low regressivity means access is more equitably distributed among poor and rich districts alike.

Results show that, overall, the link is regressive, but the strength of that link varies greatly among the countries and among sectors.

- *India* shows strong regressivity of infrastructure service access except in water. The water exception applies in the other countries as well.
- *Sri Lanka* shows relatively weak regressivity for infrastructure service access. The exceptions to this trend are cooking gas and phones, which show a much stronger link.
- *Afghanistan* shows relatively strong regressivity, except in water and in Kabul (its capital), an area with one of the country's lowest poverty rates. Cooking gas seems less regressive in Afghanistan than in India or Sri Lanka.

### **Inequality across physical and poverty space**

Yet another question to be explored—this time by bringing together poverty data and physical access data for India and

Sri Lanka—is: do poorer regions within a country have less access to key public services as a whole? This can be answered by constructing two infrastructure indexes that encompass only the basic infrastructure services that have the highest impact on welfare (such as water, sanitation, and electricity) and then using these to generate maps identifying where poverty and the location of infrastructure services intersect.

Results show that leading regions (those with a lower poverty level) generally have better access, but lagging regions (those with a higher poverty level) do not necessarily have less access. As expected, in India, the lagging states have lower access to basic infrastructure in contrast with the leading states. This is intuitively expected. The curious exception is the northeast area bordering Bangladesh, Bhutan, China, and Myanmar. The exception found in India is more prevalent in *Sri Lanka*, where basic infrastructure seems to be more inclusive. Access is widely spread, and the quality of these services in the country is generally good. It is clear that the leading region—the Western Province—enjoys better access and a lower poverty rate. Yet, for the lagging provinces, the story is more mixed, except for those areas more affected by Sri Lanka's 30-year conflict.<sup>2</sup>

### **Inequality across income space**

How equitably is access distributed across different income levels—that is, for those with access, is it the richer individuals who have the bulk of the access, or do richer and poorer individuals tend to have more similar access? This matters because it enables policy makers to better target policies to expand access. The answer can be found by comparing income quintiles and access rates for Afghanistan and Sri Lanka.

Results show that in Sri Lanka and Afghanistan, the rich enjoy better access than the poor, but the countries differ greatly in how equal that access is across incomes. In Sri Lanka, the difference in access across quintiles is small—all quintiles are close to the mean—meaning that there is an almost equal share of access to infrastructure regardless of income quintile. The opposite story is true in Afghanistan. However, some services (like water) are more equitably distributed than others (like cooking gas) among those with access. In fact, in Afghanistan, the equality of access across income quintiles for improved water is particularly striking.

## **How Access to Infrastructure Affects Opportunities for Youth**

So, how unequal is access to infrastructure among children? After all, infrastructure investment choices made today to fill the gap affect current and future generations. Moreover, not addressing the infrastructure gap threatens both welfare and economic growth in the medium and long term.

## The Human Opportunity Index: Access to infrastructure as opportunity

The main instrument for measuring the inequality of access to infrastructure across time is the Human Opportunity Index (HOI). It essentially measures how personal circumstances impact a child's probability of accessing the services that are necessary to succeed in life. This is critical because the opportunities a child gets throughout life are determined directly by the circumstances related to access to infrastructure services during their formative years—not necessarily to their personal decisions or level of effort.

The analysis calculates an HOI that is focused on basic infrastructure as opportunities and the importance of both improving overall access to it and ensuring its equitable allocation to achieve key socioeconomic outcomes—such as early childhood development, education level, good health, and access to information. It can be interpreted as a composite indicator of two elements: (i) the level of coverage of basic opportunities necessary for human development (such as access to primary education, water and sanitation, or electricity); and (ii) the degree to which the distribution of those opportunities is conditional on circumstances children are born into (such as gender, income, or household characteristics). This study looks at four circumstances: (i) household size, (ii) location (urban versus rural), (iii) education of household head, and (iv) gender of household head.<sup>3</sup>

### Inequality of opportunity in the access to infrastructure services

South Asian countries with better infrastructure coverage typically also provide more equitable access for households with children under age 15, thereby producing higher HOIs.

For example, in the case of *improved sanitation* (table 3), as expected, countries with the highest coverage (Maldives and Sri Lanka) feature the lowest dissimilarity index, and therefore, the HOI is very close to the coverage. In contrast, countries with low levels of coverage (such as Bangladesh) are associated with higher discount rates, and thus lower HOIs. However, if two similar access rates, such as in the case of India (36 percent) and Nepal (37 percent) are considered, there is a significant difference in how that access to sanitation is distributed, with Nepal (0.14) being more even than in India (0.24)—which results in India having a lower HOI (0.27) than Nepal (0.32). Also, a country with higher coverage, like Pakistan (44 percent), but featuring the same dissimilarity index as India (and thus higher than for Nepal), still ends up with a higher HOI than India, but similar to that of Nepal. In the case of access to *improved water*, rates are high enough to guarantee a low dissimilarity index. *Electricity* also follows the pattern of decreasing dissimilarity index as coverage is higher.

### Pinning Down the “Infrastructure Gap”

Over time, societies inherit man-made infrastructure stock from previous generations. Yet different factors influence demand and supply, and, as countries grow, these needs—both the type of infrastructure and the quality of service provision—are likely to evolve. The infrastructure gap can be assessed using a framework with a five-step process (figure 1). The framework shows where a country is today (1); where a country would like to be at a given point in time (2, the difference between the two points is the infrastructure gap); how far business-as-usual scenarios (shown by the dotted blue line) will take the country toward its goal (3); how far

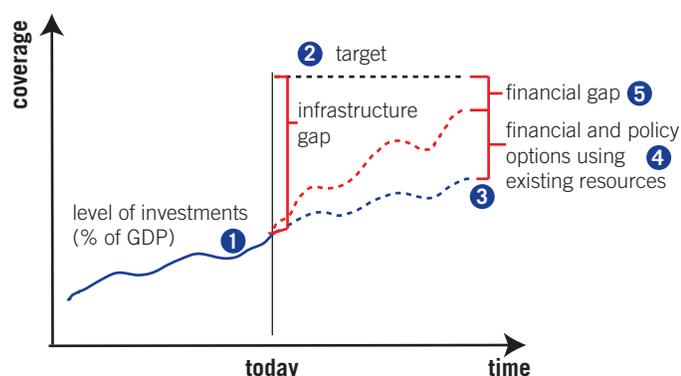
**Table 3. Better Coverage, More Equitable Access, and Thus Higher HOIs**

(access to infrastructure services and HOI for households with children under age 15)

Country/year	Afghanistan 2008	Bangladesh 2006	Bhutan 2007	India 2007	Maldives 2009	Nepal 2011	Pakistan 2006	Sri Lanka 2010
<i>Improved sanitation</i>								
Coverage	—	45%	38%	36%	94%	37%	44%	90%
Dissimilarity Index	—	0.15	0.24	0.24	0.01	0.14	0.23	0.03
HOI	—	0.38	0.29	0.27	0.93	0.32	0.34	0.87
<i>Improved water</i>								
Coverage	46%	98%	96%	83%	86%	88%	92%	88%
Dissimilarity Index	0.11	0.00	0.01	0.03	0.09	0.02	0.01	0.02
HOI	0.41	0.97	0.95	0.80	0.78	0.86	0.91	0.86
<i>Electricity</i>								
Coverage	17%	50%	72%	68%	100%	75%	.	85%
Dissimilarity Index	0.58	0.20	0.12	0.12	0.00	0.08	.	0.05
HOI	0.07	0.40	0.63	0.60	1.00	0.69	.	0.81

Source: Authors' calculations based on IRACSO (2008) for Afghanistan; BBS and UNICEF (2007); BNSB (2007) for Bhutan, Institute for Population Sciences (2007–8) for India; MOHF (2009) for Maldives; MOHP (2012) for Nepal; NIPS (2008) for Pakistan; and Department of Census and Statistics (2009–10) for Sri Lanka. All estimations represent the proportion of access in the sample with children below 15 years of age.

**Figure 1. A Framework for Assessing Infrastructure Needs**



Source: Authors' illustration.

financial and policy options using existing resources (shown by the dotted red line) could take the country toward its goal (4); and the remaining financial gap (5) that will need to be bridged.

At this point, most governments in SAR have some estimates of the investments required to reach certain targets, such as for 24/7 electricity supply and the Millennium Development Goals for water and sanitation, but those estimates are not consistent across the region. That is why different methodologies were developed for different sectors. These models also allow analyses to calculate and compare the costs of different sets of targets.

So how much money will be needed to close the infrastructure gap? SAR needs to invest approximately US\$1.7 trillion to US\$2.5 trillion in infrastructure until 2020—equivalent to US\$1.4 to US\$2.1 trillion at 2010 prices (table 4).<sup>4</sup> Going forward, a mix of investment in infrastructure stock and implementation of supportive reforms will enable SAR to close its infrastructure gap. In GDP terms, if investments are spread evenly over the years until 2020, SAR needs to invest between 6.6 and 9.9 percent of 2010 GDP per year—

an increase of up to 3 percentage points from the 6.9 percent of GDP invested 2009 (table 5).<sup>5</sup>

As expected, these overall patterns have been largely driven by India, which accounts for the biggest share of total infrastructure investment in South Asia during 1973–2009. In fact, infrastructure investment in India accounts for, on average, 79 percent of total investment in the region. The second largest contributor—Pakistan—merely has an average share of 12 percent, and is followed by Bangladesh with 7.9 percent, Nepal with 1.0 percent, and Bhutan with 0.2 percent.

## Policy Options to Provide Better Infrastructure Services

Which policy options should SAR policy makers focus on to improve the level and quality of service provision for their diverse populations?

**First, rehabilitate and maintain existing assets.** South Asian governments should invest in rehabilitating and maintaining infrastructure assets to deliver services efficiently and sustainably, moving away from the build, neglect, and rebuild mindset. Inadequate maintenance triggers progressive deterioration in the quality of the infrastructure services, which hurts users (for example, higher costs because of imperfect and costly substitutes and worse social outcomes in health and education) and development outcomes. In India, the National Transport Development Policy Committee estimates that poor road maintenance costs the country about Rs. 350 billion annually. While funds for new construction are sometimes easier to obtain and implement, obtaining funding for maintenance is more difficult because it is needed on a regular basis. However, there are mechanisms appropriate to each sector that can be implemented to improve maintenance. In the road sector, for example, some governments have adopted or considered a “road fund” type of arrangement to support

**Table 4. SAR's Total Investment Could Reach US\$2 Trillion (investment requirements 2011–20, total, in 2010 US\$ billions)**

Sector	India		Bangladesh		Pakistan		Nepal		Sri Lanka		SAR (5)		SAR (8)	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Transport	340.0	595.0	36.0	45.0	17.2	21.5	3.7	5.5	10.8	18.0	408	685	411	691
Power	375.0	468.8	11.0	16.5	64.0	96.0	5.3	7.0	4.8	9.0	460	597	464	603
WSS	95.0	162.0	12.0	18.0	9.3	14.0	1.7	2.6	0.6	1.8	119	198	120	200
Solid waste	32.5	65.0	2.1	4.2	3.3	6.7	0.4	0.5	0.2	1.3	39	78	39	78
Telecommunications	150.0	225.0	5.0	5.0	12.4	12.4	0.4	0.6	2.0	2.5	170	246	171	248
Irrigation	140.0	210.0	7.7	11.6	9.7	14.6	1.6	2.3	2.5	3.1	161	242	163	244
Total	1,133	1,726	74	100	116	165	13	18	21	36	1,356	2,045	1,369	2,064

Source: Andrés, Biller, and Herrera Dappe (2013).

Note: Estimations based on the technical models as well as extrapolations from other sectors where the models were not run. WSS = Water and Sanitation Sector.

**Table 5. Closing SAR's Infrastructure Gap Requires Higher Share of GDP Investment (investment requirements 2011–20, % of GDP, per year)**

Sector	India		Bangladesh		Pakistan		Nepal		Sri Lanka		SAR (5)	
	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
Transport	1.97	3.44	3.60	4.50	0.98	1.23	2.32	3.49	2.17	3.64	1.97	3.31
Power	2.17	2.71	1.10	1.65	3.66	5.49	3.34	4.46	0.97	1.82	2.22	2.89
WSS	0.55	0.94	1.20	1.80	0.53	0.80	1.08	1.62	0.12	0.37	0.57	0.96
Solid waste	0.19	0.38	0.21	0.42	0.19	0.38	0.24	0.30	0.04	0.27	0.19	0.38
Telecommunications	0.87	1.30	0.50	0.50	0.71	0.71	0.27	0.40	0.40	0.50	0.82	1.19
Irrigation	0.81	1.21	0.77	1.15	0.55	0.83	0.99	1.48	0.50	0.63	0.78	1.17
Total	6.55	9.98	7.38	10.02	6.63	9.44	8.24	11.75	4.21	7.23	6.55	9.89

Source: Andrés, Biller, and Herrera Dappe (2013).

Note: These percentages are based on investment requirements at 2010 prices and on the technical models as well as extrapolations from the other sectors where the models were not run. WSS = Water and Sanitation Sector.

maintenance. Under such arrangements, maintenance funds are assured from a mandated tax on gasoline and diesel and are deposited into an assured and independently operated fund, overseen by a board that includes either the public or private sector, or both.

**Second, reform service providers and ensure financial/operational sustainability.** Service providers should be financially viable, able to plan and implement sound investment strategies, and improve operational performance for the long term. This requires: (i) reliable, steady, and adequate revenue streams to fund operations and investment; (ii) capacity and independence without threat of political interference; and (iii) appropriate incentives for becoming more efficient and remaining so.

**Third, establish solid legal, policy, and regulatory frameworks.** South Asian governments need to have solid legal and policy frameworks as well as a transparent and well-designed and implemented regulatory framework for both public and private operators to attract private investment in line with the best organizational form for each service. For example, governments across the region need to set the conditions for an even bigger role for the private sector in a service, such as power generation, which is better suited for liberalization than public-private partnerships (PPPs), and shift the public resources and efforts toward other services where the public sector has the comparative advantage. Fortunately, when the private sector invests in infrastructure in SAR, it tends to choose the optimal organizational forms. These frameworks provide clarity to the private sector, increasing the attractiveness of private participation in infrastructure projects. They also allow the public sector to clearly define responsibilities and manage the risks associated with private sector participation. A stable yet dynamic regulatory framework for infrastructure services is particularly critical for: (i) attracting and supporting desired levels of investment; (ii) ensuring service sustainability; (iii) protecting customers; and (iv) guarding the public interest.

**Fourth, decentralize service provision in an appropriate manner.** SAR countries should be rethinking how much to decentralize—that is, distribute the administrative powers or functions of a central authority over a less concentrated area—as a means of improving service delivery for the smallest units of society (households and individuals). As the World Bank's 2004 *World Development Report* puts it:

Decentralization...can strengthen the links and accountability between policy makers and citizens—local governments are potentially more accountable to local demands. It can also strengthen them between policy makers and providers—local governments are potentially more able to monitor providers.

In practice, the experience with trying to decentralize infrastructure service delivery is mixed—the biggest problem often being a mismatch (typically financial or fiscal in nature) between responsibilities in infrastructure service delivery and the ability to execute such responsibilities. But when decentralization succeeds, it is the result of: (i) a fully democratic, transparent, and inclusive (of the beneficiaries) local decision process; (ii) the cost of local decisions fully borne by local government; and (iii) no spillover of benefits to other jurisdictions.

### Policy Options to Help the Poorest Gain Better Access

While South Asian governments are moving to improve the overall level and quality of infrastructure services, they must also take deliberate steps to improve the access of the poor—keeping in mind the following five principles.

**Access is fundamental, but usage determines impact.** That is why policy makers should complement access to infrastructure with policies to incentivize the use of services, or make potential benefits more obvious or attainable. One way to do this is to focus on subsidizing (implicitly or explicitly and with sunset clauses) the infrastructures that provide the

greatest public benefit (public good) in contrast to those that provide large private benefits. This should be true across infrastructure sectors as well as within sectors. Another way is to focus on improving women's access to services, because improvements in household outcomes are larger when women's access is increased.

***Ability-to-pay for access to infrastructure services cannot be the only instrument to determine provision.*** Infrastructure services have strong market failure characteristics, underscoring the need for adequate regulation. Some infrastructure sectors are still close to natural monopolies (such as piped water and off-site sanitation services). Many are associated with strong externalities (negative and positive) and public goods (and bads) characteristics, as in the cases of lack of pollution treatment or lack of access to cooking gas. Information issues also abound. Moreover, since infrastructure can spur growth, relying on the ability-to-pay criterion might undercut efforts to reduce poverty and share prosperity.

***Some infrastructure programs are too costly to be sustainably implemented without cost-recovery mechanisms that allow them to be self-supporting.*** Balancing the trade-off between providing access to infrastructure services and fully charging for these services is seldom easy. It involves understanding the economic characteristics of particular infrastructure sectors and the technology available for provision under different physical, political, and socioeconomic conditions. Take the case of piped water provision, which is a private good. It has important market failures associated with it, but essentially individual households have clear incentives to pay for a superior service compared to other forms of getting water in an urban environment. Yet, the fees for piped water are rarely enough to achieve full cost recovery and often rely on direct or indirect subsidies that burden public budgets. Nonetheless, the expansion of piped water provision is often part of political manifestos during election campaigns. Now take the case of flood control, which is a public good. Direct cost-recovery mechanisms like tariffs are difficult to design, but inadequate flood control in a locality can cause households to incur large costs through the loss of private assets and even lives. Budgetary allocation for flood control is often inadequate and the service is underprovided.

***Usually the aim of the policy maker is to balance infrastructure access (especially basic infrastructure), while allowing wealthier populations to shoulder most of the burden of improving coverage for all.*** Given the equality achieved in improved water access in South Asia, one would be tempted to conclude that this objective is present as the service expands. But this conclusion might conceal rent-seeking behavior, where the wealthier capture proportionally larger amounts of rents that otherwise could be used for expansion and quality improvement for all, and not just a few. The litera-

ture also argues that infrastructure service expansion is closely linked to rent seeking, since richer districts are better able to lobby the government for infrastructure provision (Cadot, Röller, and Stephan 1999).

***Although subsidies may improve affordability among underprivileged groups, they can also increase income inequality.*** Subsidies tend to be captured by those who have political connections, which, at least among unconnected households, tend to be the more middle class households. Ajwad and Wodon (2002) found that, in Bolivia and Paraguay, the marginal benefit of improved access to a service tended to be two to three times higher among the upper two quartiles. Thus, while all income quartiles benefited from decentralization, the richer 50 percent benefited more than the poorer 50 percent, a net effect that would tend to increase income inequality. Estache (2005) points out that, in Latin America, as much as 60 to 80 percent of cross-subsidy schemes “were aimed at households well above the poverty threshold, while as much as 80 percent of poor households failed to benefit.” Thus, it is not surprising that even as absolute levels of connection increase, regressivity in access to infrastructure may still prevail.

#### **Potential instruments**

Keeping in mind the five principles, several instruments have the potential to help policy makers improve infrastructure access.

##### ***Subsidies for connection rather than service consumption.***

To avoid some of the drawbacks of subsidies, policy makers can adopt measures that reduce the cost of providing network services or improve the ability of poor households to pay for service at a given cost (Komives et al. 2005). These would be available only to unconnected households, reducing or eliminating the price customers have to pay to connect to the system. Alternatively, policy makers can subsidize lower service levels that the more affluent find less attractive, such as social connections.

***Targeted interventions.*** Usually these instruments focus narrowly on a certain district or group that is perceived as underserved. This approach has the advantage of fewer spillovers—that is, it is less likely that the intervention will end up benefitting unintended beneficiaries. In Mexico, this instrument is being piloted in a program that provides conditional cash transfers to the poorest segments of the population, *Oportunidades* (Opportunities). Under this program, energy subsidies are targeted using mechanisms that ensure they reach the poorest residents. A note of caution here, however, is that because these interventions are operating only within impoverished and underserved areas, they may face issues such as inadequate staffing, funding, technical capacity, and lack of political will (Menéndez 1991).

***Institutional groups.*** There are also a number of options for designing programs to reduce elite capture and increase

the power of impoverished groups to allocate resources toward their priorities. These include:

- *Institutional re-centering.* Organizations can be created that have a primary purpose of reducing poverty through infrastructure provision. For example, Bolivia's Emergency Social Fund was a temporary organization that was created to finance infrastructure projects in underserved communities.
- *Community participation.* Incorporating transparent mechanisms for underserved people to easily provide input into the design and decision-making process of infrastructure projects could potentially allow them to compete with the more informal mechanisms that richer populations use to influence decision making (Menéndez 1991).
- *Innovative mechanisms.* Service delivery mechanisms need to evolve to respond to the challenges of coverage, affordability, use, and sustainability. This is particularly important given that poor households tend to pay more for services when they have to obtain them through non-network solutions. For example, community-based organizations and user groups can contribute to planning and operations; nongovernmental organizations can help with monitoring and evaluation, promoting social accountability and raising awareness; and the private sector can get involved with investment and delivery (Andrés and Naithani 2013). As they are tested and mainstreamed, these context-specific alternative mechanisms are becoming part of the policy toolkit.

## Conclusions

If South Asia hopes to meet its development goals and avoid the risk of slowing—or even halting—growth, poverty alleviation, and shared prosperity, it is essential to make closing its huge infrastructure gap a priority. Even though SAR's economic growth follows that of EAP, its access to infrastructure rates (sanitation, electricity, telecommunications, and transport) are closer to that of SSA—the one exception being water, where SAR is comparable to EAP and the Latin America and Caribbean region. According to businesses in South Asia, infrastructure is a major or severe hindrance to their growth, and electricity is the largest problem, with transport also an obstacle for regional and international trade. The good news is that policy makers do not have to choose between growth and welfare, as there is enormous potential for them to be mutually supportive.

The cost to close this gap by 2020 is estimated at US\$1.7 trillion to US\$2.5 trillion. If investments are spread evenly over these years, SAR needs to invest between 6.6 and 9.9 percent of 2010 GDP per year—an increase of 3 percentage points over the current 6.9 percent invested by SAR countries in 2009, up from 4.7 percent in 1973. The past in-

crease was mainly due to the region's large investment in electricity generation.

The challenge of increasing access to infrastructure services across South Asia is compounded by the inequality in the distribution of existing access for households and individuals. That is why providing some level of access is a start—even if those services are not of the highest quality. At the same time, policy makers should consider which types of services best fit each population's needs (such as septic tanks for a mountainous region, but sewerage lines for more accessible urban areas). This study sheds light on *who* has access in terms of space (a current framework) and over time (future generations). Countries with higher per capita income (like the Maldives and Sri Lanka) enjoy better access to infrastructure services both spatially (geographically within the country) and based on income—even though conflict-ridden areas are clearly worse off. Among sectors in SAR countries, some, such as water, tend to be more equally distributed than others, such as sanitation, energy, and phones—with the widespread use of firewood for cooking, especially among the poor, somewhat surprising. Moreover, within SAR countries, some states and districts have better access than others. Leading regions within a country typically have better access, but lagging regions do not necessarily have worse access. But if a poorer country or a poorer state has better access to a given infrastructure service than a richer country or a richer state, there is then hope that policy makers can adopt measures that will improve access in a manner that increases shared prosperity.

There is no simple explanation for these inequalities, although certainly geography matters, policy intent matters, and some household characteristics matter. At the country level, household characteristics like location and education are the main explanatory factors. Location seems obvious, but education does not—unless it is linked to income poverty and remoteness of household location (even among rural areas). At the state level, education actually starts to become a bigger factor than at the country level. And while the contribution of gender of the household head seems negligible at the country level, there are a number of states (and districts within them) where access is clearly biased toward male-headed households.

SAR also needs to rethink the infrastructure service paradigm to bring in the private sector and decentralize administrative power functions. The sheer size of the gap and the macroeconomic situation in South Asia dictate that the region taps other funding sources. However, this situation should also be seen as an opportunity to rethink and improve how infrastructure services are delivered. One way to do this is by broadening service provision to give the private sector a bigger role—whether through PPPs or regulated privatization and market liberalization. Another way is by giving greater administrative powers and functions to lower levels of govern-

ments, although the degree to which such decentralization is desirable will depend on the nature of the investment, the reason it is being provided, how it is being financed, and where it is located.

Policy choices should be aimed at increased shared prosperity. Key principles to keep in mind are: (i) access is fundamental, but usage determines impact; (ii) ability-to-pay for access cannot be the only factor to determine provision; (iii) some infrastructure programs are too costly to be sustainably implemented without cost-recovery mechanisms that enable them to be self-supporting; (iv) market failures need to be corrected to avoid rent-seeking behavior; and (v) subsidies should be designed so that they do not exacerbate income inequality. The choice of possible instruments includes subsidizing connections (rather than service consumption), adopting targeted interventions, creating organizations dedicated to reducing poverty through infrastructure provision, and asking NGOs to help with monitoring and evaluation, promoting social accountability, and raising awareness.

If shared prosperity is one of the ultimate goals of policy makers, it is important to get accurate infrastructure data. Existing data have enabled creation of a baseline to help track progress toward closing the infrastructure gap and have answered some questions about who has access to infrastructure services now and how that is likely to affect future generations—and thus the equality of opportunities across the region. This work can be expanded and improved by considering more circumstances, along with exploring alternative indicators of access, use, and quality of infrastructure services. But to continue, better data are needed. Without comprehensive data, private and public investments may miss their targets of leveling the playing field and actually end up increasing the inequality of infrastructure service provision.

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## Notes

1. See Biller, Andrés, and Herrera Dappe (2013) for a detailed discussion about the methodology in this section.
2. See Biller, Andrés, and Herrera Dappe (2013) for further discussion on this issue.

3. These circumstances reflect previous inequality of opportunities studies and are in line with similar analyses that are part of Biller, Andrés, and Herrera Dappe (2013).

4. See Andrés, Biller, and Herrera Dappe (2013) for the description on the methodology for computing these estimates.

5. *The Economist* (2014a,b) reckons that the gap amounts to US\$57 trillion in 2010 prices worldwide for 2013–30. It also estimates that annual infrastructure spending currently amounts to US\$2.7 trillion, when US\$3.7 trillion is needed. These estimates don’t include solid waste and irrigation. While not perfectly comparable, these global figures, when compared with South Asian figures, provide a scale of the problem in the region.

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