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ENVIRONMENTAL PERFORMANCE IN ASIA: OVERVIEW, DRIVERS, AND POLICY IMPLICATIONS

Bihong Huang and Yining Xu

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Bihong Huang is a research fellow at the Asian Development Bank Institute. Yining Xu is a graduate student researcher at Columbia University.

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Please contact the authors for information about this paper.

Email: bihuang@adbi.org

Asian Development Bank Institute
Kasumigaseki Building, 8th Floor
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

Abstract

As accompaniments to fast-growing economies, the effects of environmental degradation such as deteriorating water quality, land deforestation and pollution, and frequent atmospheric haze are gaining increasing attention from both policymakers and the public across countries in Asia. This paper overviews the environmental performance, disentangles its drivers, and finally advances preliminary policy recommendations for more effective environmental governance in the region.

Keywords: environment, environmental performance, governance, Asia

JEL Classification: Q5, Q56, Q58

Contents

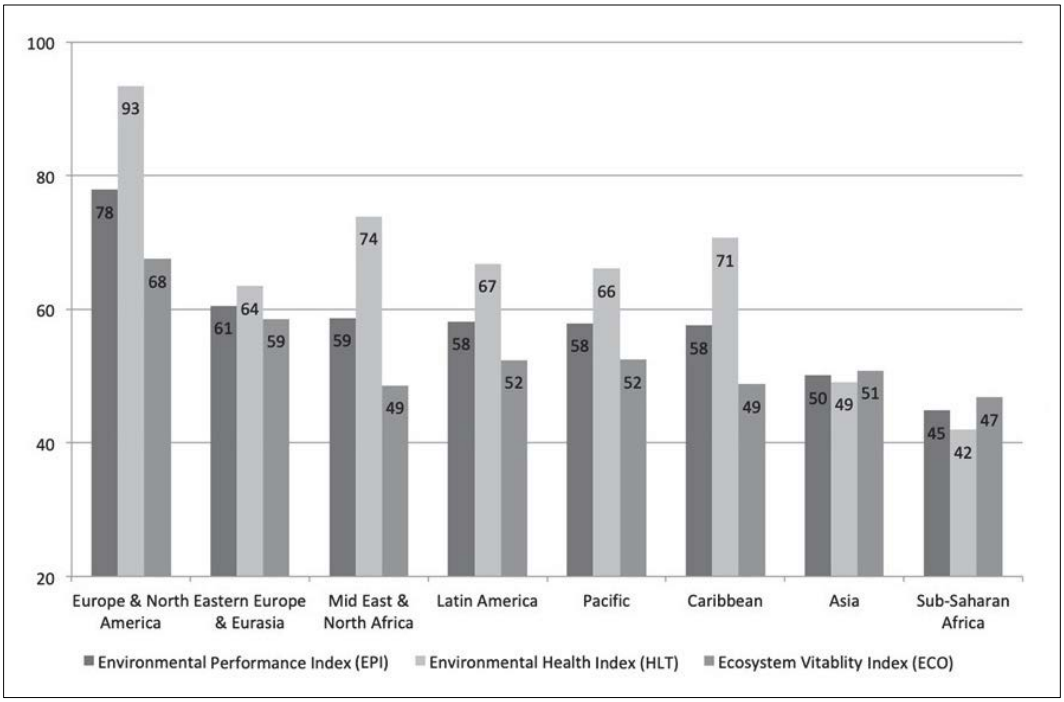
Environmental issues are gaining increasing attention from both policy makers and the public across countries in Asia. Visible environmental challenges ranging from air quality deterioration to global climate change undermine people's standard of living and impose irreversible damages on the ecosystem. For countries in Asia, decades of rapid economic growth have borne mixed fruit in terms of environmental implications. On the one hand, the accumulation of national wealth through unchecked industrialization and natural resource exploitation has compromised ecosystem vitality and brought about health hazards such as air and water pollution. On the other hand, Asia's early-starter countries in economic growth, such as Japan and the Republic of Korea, are devoting more resources to environmental governance with greater regulatory efficiency, hence boosting environmental performance. This twofold effect highlights both the wide regional variances among different states in Asia and the complex nature of drivers behind environmental performance, as growth could either deteriorate or remediate the environment. Along this vein, this paper intends to provide an overview of environmental performance in Asia, disentangle its drivers, and finally advance preliminary policy recommendations for more effective environmental governance in the region.

1. PROFILE OF ENVIRONMENTAL PERFORMANCE IN ASIA

This section examines the overall state of environmental performance in Asia using the Environmental Performance Index (EPI). The EPI was developed jointly by Yale University and Columbia University in collaboration with the World Economic Forum, to provide a relatively comprehensive measurement of national environmental performance. Given the wide array of issue areas covered by this indicator, the EPI serves well the purpose of this paper to develop a high-level overview of countries' performances. Specifically, the EPI examines 10 issue areas categorized under the two sub-indicators of environmental health and ecosystem vitality, which respectively indicate the risks imposed on human health by environmental pollution and the impacts levied on the ecosystem through environmental degradation. In the 2018 EPI framework, for instance, the Environmental Health Index (HLT) measures air quality, water quality, and heavy metal exposure, while the Ecosystem Vitality Index (ECO) covers issue areas such as biodiversity and climate change. The weighted average of these two sub-indicators gives rise to the EPI as an overall assessment of a country's environmental status (Wendling et al. 2018).

Figure 1 presents the 2018 regional average EPI and sub-indexes. Asia as a whole shows a rather unsatisfactory performance—the second lowest EPI score among all regions. While slightly higher than the level of sub-Saharan Africa, Asia's EPI assessed at 50 is noticeably lower than the world average EPI of 56. Poor performance in environmental health is a major reason behind Asia's laggard status. The HLT level of Asia is assessed to be 49, which is 21% lower than the world average level of 62. In comparison, the region of Europe and North America, where a large number of developed nations are located, has achieved an HLT of 93, nearly double that of Asia. Low performance in environmental health indicates the greater risks that the population in Asia is exposed to on average in terms of polluted air, water, and excessive heavy metal exposure. On the other hand, countries in Asia received a relatively better assessment on ecosystem vitality, as the regional average ECO score of 51 is only slightly lower than the world average level of 53. Despite the much smaller gap with leading countries, Asia is still ranked the third lowest region in terms of ecosystem vitality, which indicates considerable room for continuing regional sustainability endeavors.

Figure 1: 2018 Environmental Performance Index (EPI) and Sub-indexes by Regions



Source: Yale University, Center for Environmental Law & Policy; Columbia University, Center for International Earth Science Information Network.

Despite Asia's poor environmental performance on average, country-level indices reveal strong regional variances. Indeed, the spread in rankings among Asian countries is larger than for any other regions in the world (Wendling et al. 2018). Table 1 shows the 2018 environmental performance index and sub-indexes for 24 Asian countries, along with the rankings and 10-year change in their performances. Japan and Singapore, as regional leaders, entered the top 50 with their rankings at 20th and 49th. In contrast, out of the five bottom-ranking countries in the world, three are from South Asia: Bangladesh at 179th, India at 177th, and Nepal at 176th. Besides absolute ranking, countries' trends of change also illustrate a broad distribution. Nine out of the 24 Asian countries have experienced a decline in environmental performance over the last decade, including both the best-performing states Singapore and Japan and some of the bottom-ranking countries such as Nepal and Cambodia. In contrast, Uzbekistan, Viet Nam, and the Lao People's Democratic Republic (Lao PDR) are among the economies that have significantly improved their environmental performance. The broad spectrum of rankings among Asian economies and their uneven progress over the last decade suggest the need to tailor different states' environmental policy solutions with careful considerations of country specificities.

Table 1: Environmental Performance Index (EPI) and Sub-indexes by Countries in Asia

	Environmental Performance Index (EPI)			Environmental Health (HLT)		Ecosystem Vitality (ECO)	
	2018	10-year Change	World Ranking	2018	10-year Change	2018	10-year Change
Central Asia							
Azerbaijan	62.33	0.36%	59	48.55	0.57%	71.52	0.27%
Georgia	55.69	–0.42%	94	57.10	0.67%	54.75	–1.11%
Kazakhstan	54.56	–0.33%	101	66.70	0.91%	46.46	–1.37%
Kyrgyz Republic	54.86	0.09%	99	54.78	1.02%	54.92	–0.48%
Tajikistan	47.85	–0.03%	129	26.26	1.82%	62.24	–0.49%
Uzbekistan	45.88	1.72%	136	50.67	0.70%	42.69	2.62%
East Asia							
People's Republic of China	50.74	1.18%	120	31.72	3.67%	63.42	0.48%
Japan	74.69	–0.28%	20	92.99	–0.06%	62.48	–0.49%
Republic of Korea	62.30	–0.55%	60	73.30	–0.47%	54.96	–0.61%
Mongolia	57.51	0.85%	83	61.97	0.55%	54.54	1.09%
South Asia							
Bangladesh	29.56	0.67%	179	11.96	5.19%	41.29	0.01%
India	30.57	–0.01%	177	9.32	5.69%	44.74	–0.58%
Nepal	31.44	–0.18%	176	10.54	6.53%	45.38	–0.89%
Pakistan	37.50	1.06%	169	16.80	1.51%	51.30	0.97%
Sri Lanka	60.61	1.24%	70	64.70	0.76%	57.88	1.61%
Southeast Asia							
Cambodia	43.23	–1.11%	150	39.81	0.78%	45.51	–2.05%
Indonesia	46.92	0.31%	133	45.44	–0.64%	47.90	0.96%
Philippines	57.65	0.10%	82	55.64	0.66%	58.99	–0.23%
Singapore	64.23	–1.36%	49	72.14	–2.30%	58.96	–0.51%
Thailand	49.88	0.45%	121	46.21	1.27%	52.33	–0.01%
Viet Nam	46.96	1.48%	132	47.12	1.66%	46.86	1.37%
Malaysia	59.22	0.38%	75	66.63	–0.18%	54.28	0.86%
Lao PDR	42.94	1.44%	153	25.15	0.35%	54.80	1.80%
Myanmar	45.32	0.10%	138	35.60	1.15%	51.80	–0.34%

Source: Yale University, Center for Environmental Law & Policy; Columbia University, Center for International Earth Science Information Network.

Breaking down the EPI into HLT and ECO provides more information on countries' status in regard to various environmental issue categories, which drive their overall performance. As shown in Table 1, low performance in environmental health is a major contributor to the laggard countries' bottom ranking, most notably in South Asia. The HLT index for Bangladesh, India, and Nepal were all assessed to be around 10, which is over 80% lower than the world average at 62. The EPI report highlights air quality as a particularly problematic issue area in several Asian countries with low HLT performance (Wendling et al. 2018). In India, it is estimated that exposure to air pollution caused 1.24 million deaths in 2017, which were 12.5% of the total deaths (Balakrishnan et al. 2019). In this sense, air quality deterioration is triggering a severe public health crisis that demands urgent actions. Nevertheless, performance in environmental health has been steadily improving across Asia over the last 10 years, except for several countries that experienced mild decline. Nepal, India, and Bangladesh all demonstrate a

leap forward of over 5% in environmental health performance compared to a decade ago. If the trend continues, the future holds a more positive outlook for healthy and sustainable living across Asia.

Table 2: CO_2 Emissions per Capita by Economies in Asia

	CO2 Emissions per Capita (tons)				**Annualized Growth Rate**			
	1980s	**1990s**	**2000s**	**2010s**	**1980s**	**1990s**	**2000s**	**2010s**
Central Asia								
Azerbaijan	9.73	4.63	3.32	3.11	0.9%	–8.6%	–2.0%	4.5%
Georgia	6.84	2.66	1.05	1.66	–1.5%	–18.4%	3.1%	6.2%
Kazakhstan	14.59	12.27	12.14	15.58	–2.1%	–5.9%	5.2%	–0.1%
Kyrgyz Republic	5.40	2.27	0.93	1.12	–3.0%	–17.1%	–2.5%	5.5%
Tajikistan	2.56	1.01	0.47	0.50	–1.6%	–15.8%	0.9%	2.6%
Uzbekistan	5.22	5.10	4.62	3.81	1.0%	–2.0%	–2.4%	–0.8%
East Asia								
People's Republic of China	1.82	2.44	4.46	7.45	2.6%	3.3%	8.9%	2.9%
Hong Kong, China	4.44	6.48	6.39	6.55	7.7%	1.5%	1.1%	0.7%
Japan	8.68	9.69	9.98	10.00	0.3%	0.5%	–1.0%	0.7%
Democratic People's Republic of Korea	7.20	4.46	3.16	2.45	0.2%	–8.4%	–0.8%	–2.3%
Republic of Korea	4.53	8.26	10.91	12.32	4.7%	4.3%	1.0%	0.1%
Mongolia	5.72	4.76	4.07	5.18	3.0%	–5.5%	2.1%	2.9%
South Asia								
Bangladesh	0.10	0.15	0.27	0.41	3.5%	4.3%	7.0%	2.2%
India	0.58	0.88	1.14	1.69	5.4%	3.4%	4.0%	4.5%
Nepal	0.04	0.09	0.13	0.22	0.2%	10.7%	0.9%	6.5%
Pakistan	0.47	0.68	0.87	0.89	4.8%	3.3%	2.3%	0.4%
Sri Lanka	0.27	0.37	0.66	0.72	–1.5%	9.1%	0.9%	–0.2%
Southeast Asia								
Cambodia	0.10	0.12	0.21	0.32	0.2%	5.1%	6.7%	3.4%
Indonesia	0.64	1.14	1.59	1.83	2.6%	5.3%	2.4%	2.2%
Philippines	0.65	0.85	0.91	0.99	–1.9%	4.1%	–1.1%	4.0%
Singapore	6.52	11.70	10.13	8.58	3.2%	2.6%	–4.1%	–0.6%
Thailand	0.93	2.42	3.23	3.90	6.4%	5.9%	2.7%	2.4%
Viet Nam	0.33	0.44	1.11	1.91	0.2%	8.7%	9.8%	4.7%
Malaysia	2.23	4.11	6.51	7.67	3.5%	5.7%	3.0%	2.1%
Lao PDR	0.35	0.29	0.28	0.53	–2.8%	–0.8%	5.4%	6.0%
Myanmar	0.15	0.15	0.19	0.19	–3.5%	7.1%	–3.8%	6.0%
Timor–Leste	0.10	0.10	0.24	0.38	–1.7%	12.2%	–2.8%	7.5%
Brunei Darussalam	14.08	14.89	16.93	18.36	–3.3%	0.9%	3.8%	1.0%

Source: Emissions Database for Global Atmospheric Research (EDGAR).

In contrast to the steadily improving environmental health condition, more than half of the Asian countries in Table 1 have seen their ECO decline or remain stagnant. Rapid industrialization and economic growth in Asia over the past decade could be a major reason behind this trend. Increasing production activities, resource extraction, transportation, and consumption all invariably impose burdens on the ecosystem and reduce its vitality. To better illustrate this phenomenon, this section takes a closer look at the carbon dioxide (CO_2) emission profile of countries in Asia (Table 2). Atmospheric

CO_2 is the largest contributor to human-induced climate change (Canadell et al. 2007) and is also the most heavily weighted component in calculating the ECO. The contributing effect of economic growth to CO_2 emissions has been heavily studied and proved by scholars (Narayan and Narayan 2009; Canadell et al. 2007; Niu et al. 2011). Consistent with the trend of declining ecosystem vitality, CO_2 emissions per capita has been on a constant rise for most Asian countries in the last 40 years, as shown in Table 2. Central Asia as an exception experienced a sharp decline starting from the 1990s due to economic contraction after the collapse of the Soviet Union (Karakaya and Ozcag 2005). It is important to note that despite the overall trend toward heavier CO2 emissions, the annualized growth rate of emissions has been declining for many countries in Asia, especially between the 2000s and the 2010s. The slowed down and even negative growth shows the increasing effectiveness in emissions governance. As many developed states in Europe have witnessed a steady decrease in CO_2 emissions per capita since the 1980s,[1] several Asian states could soon join their ranks if the trend of declining growth continues. In order to realize this future prospect, sophisticated policy design and efficient environmental governance are imperatives, which will be further explored in the rest of this paper.

2. DRIVERS OF ENVIRONMENTAL PERFORMANCE

The impact of human activities on the environment could advance in various directions. On the one hand, excessive and irresponsible industrial production results in pollution, natural resource depletion, and ecosystem deterioration. On the other hand, effective environmental governance and eco-friendly technologies alleviate the burden on the ecosystem, reduce environmental risks to human health, and promote sustainable growth. The driving factors that affect environmental performance can be divided into two broad categories. The first set encompasses socioeconomic factors including national economic achievement and the advancement in production technologies. The second category is concerned with regulatory effectiveness, relevant to issues such as government fiscal commitment to environmental governance and the stringency of environmental regulation. This section examines the relationship between these factors and environmental performance, with statistics that profile countries in Asia along with these drivers.

To start with, whether rising income level and economic growth improve or deteriorate the environmental performance of a country has been a topic of controversy. The two components of the EPI, indeed, demonstrate contrary responses to economic achievements. Environmental health is found to be positively associated with economic growth and prosperity, while ecosystem vitality comes under strain from industrialization and urbanization (Wendling et al. 2018; Gallego-Alvarez et al. 2014). Besides the diverging effects on various dimensions of environmental performance, different stages of economic development are also found to sway a country's environmental status in contrasting directions. In fact, this phenomenon is well established as the Environmental Kuznets Curve and has been empirically proven by a number of scholars (Grossman and Krueger 1991; Selden and Song 1994; Dinda 2004). The theory essentially posits an inverted-U relationship between pollution and economic development: pollution grows rapidly in the early stage of industrialization when clean air and water are not priorities compared to jobs and growth, and then as an economy becomes wealthier and more concerned with environmental quality, pollution gradually falls to the pre-industrial level.

[1] Source: Emissions Database for Global Atmospheric Research (EDGAR).

For Asia specifically, it is more often found that GDP growth has been accompanied by the deterioration of environmental quality (Jalal and Rogers 2002), which can be considered indicative of Asian countries' positioning in the left half of the Environmental Kuznets Curve (Chang, Dong, and Liu 2019). In other words, the majority of countries in Asia are currently located in an earlier development stage where resources, attention, and regulatory capacity devoted to environmental governance are insufficient. Despite the lack of consensus on the exact way through which higher income affects environmental performance, eco-responsible growth and effective green governance remain imperatives for sustainable development. As countries in Asia continue to pursue growth, finding the right balance between growth and sustainability through effective policies and institutions will be an important theme in policy making in the coming decades.

One promising solution to tackle environmental crisis without compromising economic growth is to advance green technology and production efficiency. As another driver of environmental performance, boosting productivity through eco-innovation is considered a win–win solution that reduces the environmental burden and increases GDP at the same time (Janicke 2012). As an example, Hou et al. (2018) found that the People's Republic of China's industrial green transformation from 2010 to 2015 significantly contributed to a reduction in carbon emissions intensity, especially when in the context of weak environmental regulation. Similarly, evidence from the US manufacturing sector suggests that the adoption of lean production, as an eco-innovation in industrial processes, is associated with better compliance to environmental management standards and is complementary to pollution reduction (King and Lenox 2001). In this sense, green technologies that improve production eco-efficiency amplify the positive effect of environmental governance, to make green production a viable and attractive option for the industry.

Energy intensity can be used as a rough indicator of production eco-efficiency. While by itself a crucial dimension of environmental performance in terms of resource conservation, lower energy intensity is empirically found to correlate with lower CO_2 emissions (Anshasy and Katsaiti 2016; Sinha 2016). Therefore, improvement in production eco-efficiency potentially leads to multiple positive outcomes including energy savings and emissions reduction. Figure 2 presents the energy intensity performance for 22 Asian countries from 1990 to 2014. Nearly all countries have realized a gradual decline in energy use per unit of production, despite some fluctuations, which indicates a steady increase in energy efficiency across Asia.

Besides economic growth and production technology advancement, public-sector governance is another crucial contributing factor to environmental performance. Given the nature of environmental protection as a public good with shared benefits and minimum exclusion, theories of public finance suggest that reliance on free-market forces would result in inefficient and insufficient actions to combat environmental challenges (Zhou 2004; Pearce and Palmer 2001). Therefore, the state plays a critical role in driving and regulating environmental protection endeavors. A number of scholars have found that stronger public-sector commitment, measured by government expenditures on environmental protection, is positively correlated with better environmental performance (Ercolano and Romano 2018; Halkos and Paizanos 2013). Chang, Dong, and Liu (2019) showed that a higher ratio of government expenditures on environmental protection to GDP significantly contributes to a reduction of CO_2 emissions and the promotion of energy efficiency. Notably, this effect is more significant among countries in Asia than in Europe, potentially given the stronger reliance on central government regulations in Asian countries and the lack of hybrid partnerships with non-state stakeholders on environmental actions. On a country level, Huang (2018) examined a sample of 30

provinces in the People's Republic of China between 2008 and 2013, and found that higher government spending on environmental protection effectively reduces SO_2 emissions.

Figure 2: Energy Use (kg of Oil Equivalent) **per $1,000 GDP (Constant 2011 PPP)**

Figure 2a

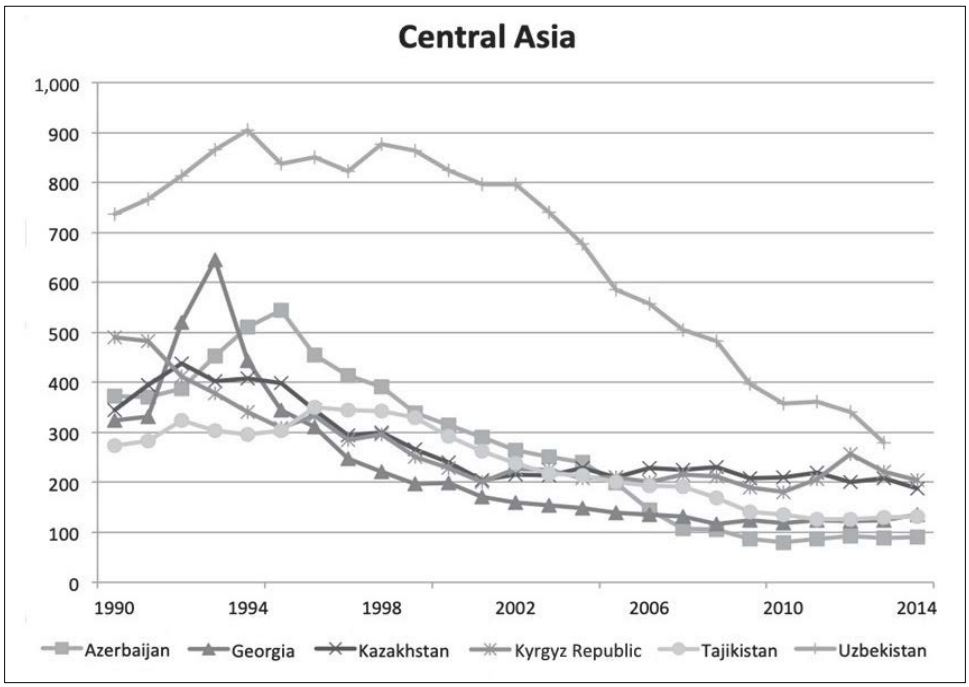


Figure 2b

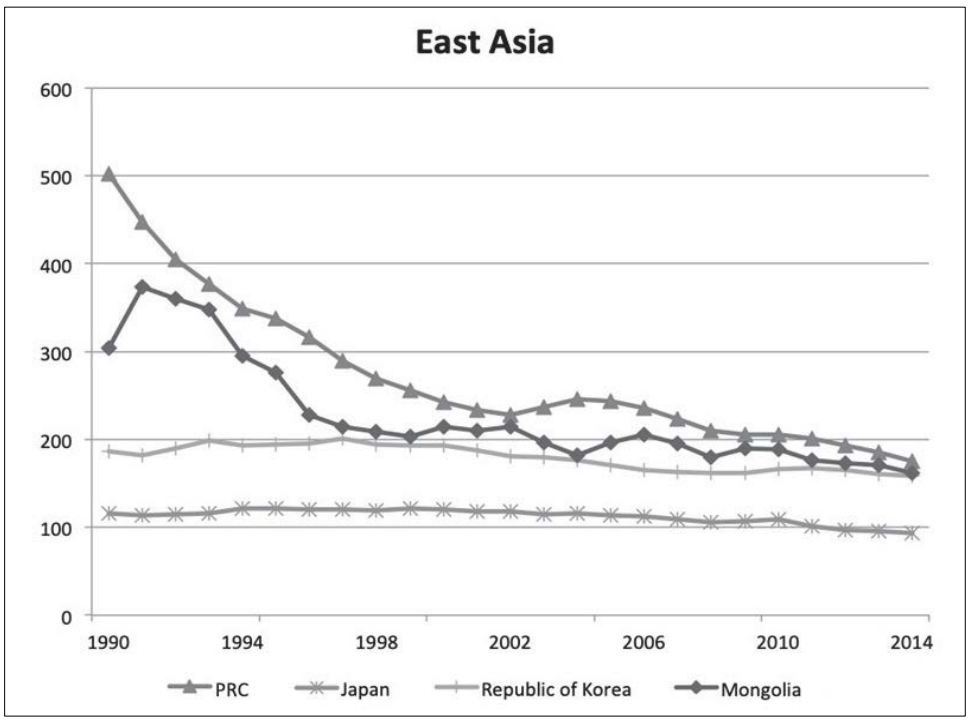


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Figure 2 *continued*

Figure 2c

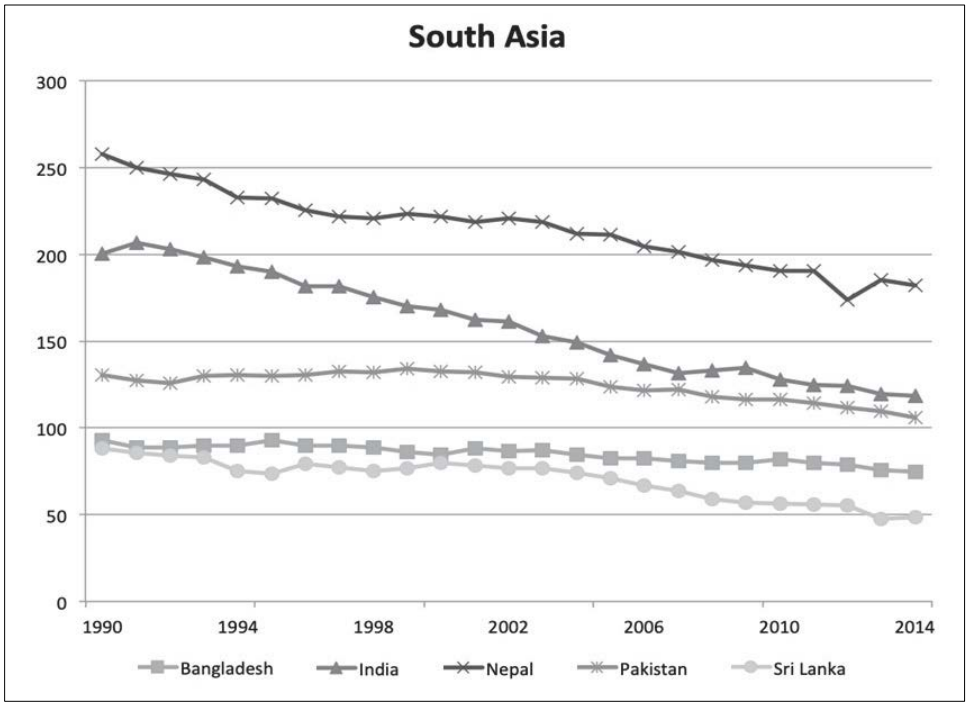
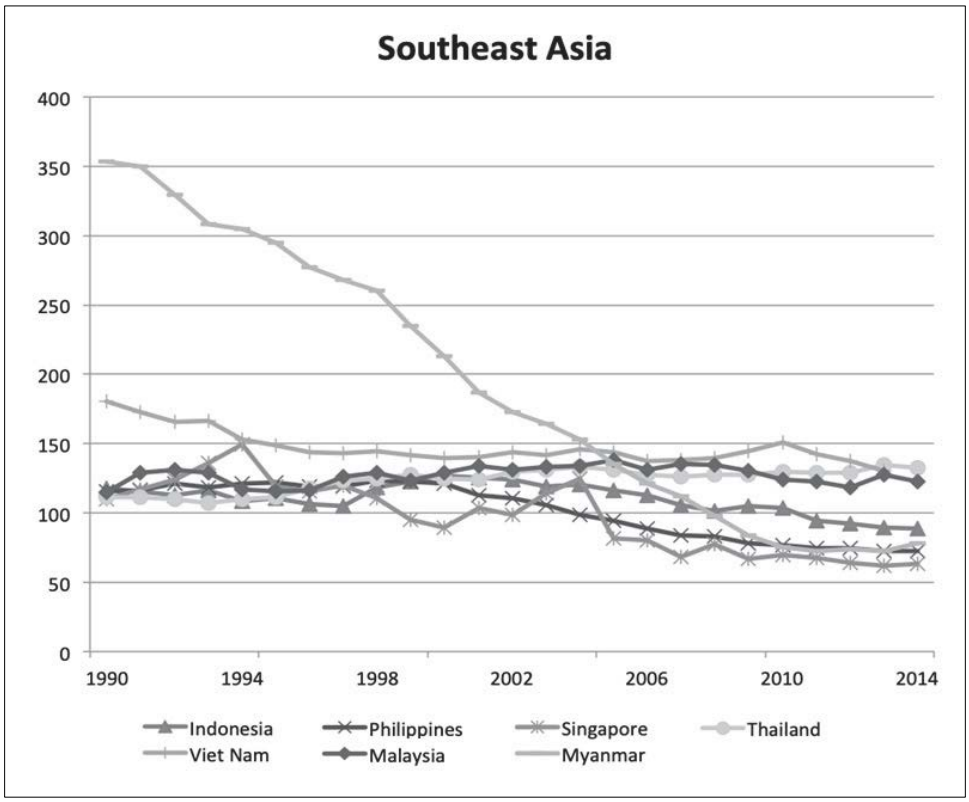


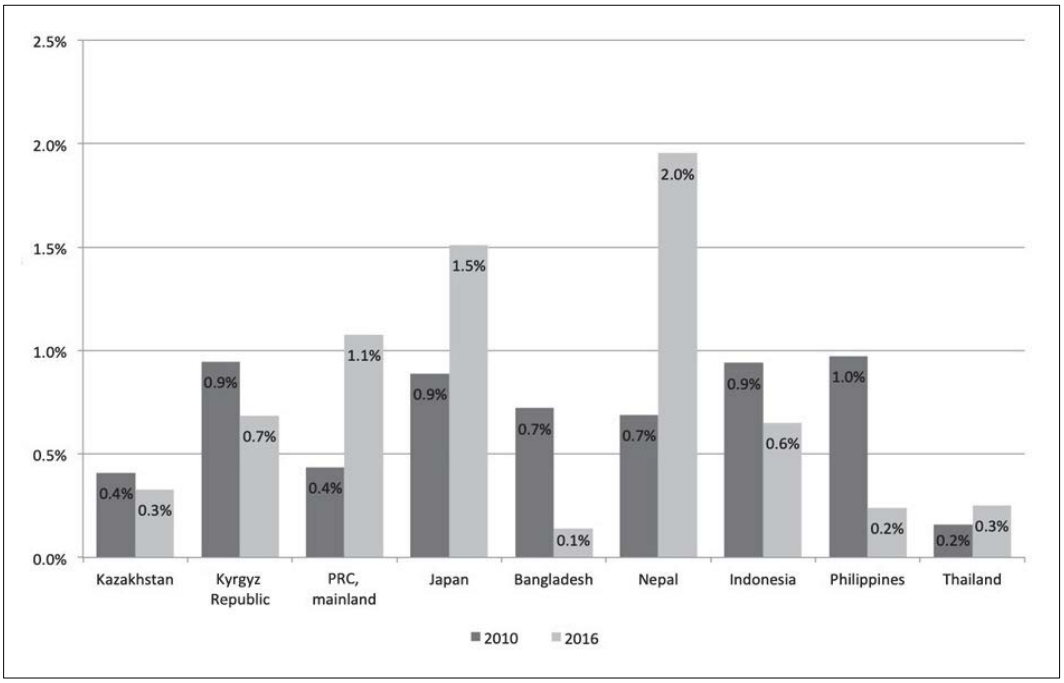
Figure 2d



Source: World Bank Development Indicators.

In addition to government fiscal commitment, the quality of environmental governance constitutes another dimension of its effectiveness. Regulatory stringency, policy mechanisms, the volume of environmental legislation, and a number of other indicators are reflective of environmental governance quality. To start with, empirical evidence suggests that the policy-stringency effect is a significant source of CO_2 emissions reduction, based on either data from the OECD countries (Hille and Shahbaz 2019) or the country-specific case of the People's Republic of China (Ahmed and Ahmed 2018). While little doubt can be raised about the positive environmental effect of stringent policy, controversies are more often concerned with the economic costs of environmental regulation compliance, which could potentially sacrifice competitiveness. However, a strand of the literature has shown a positive overall effect on competitive performance, starting with Porter and Linde (1995), who pointed out that environmental regulation could stimulate innovation and raise resource productivity. Kozluk and Timiliotis (2016) also found that more stringent domestic environmental policies have no negative effect on overall trade, but could enhance a country's comparative advantage in "cleaner" industries. Besides regulatory stringency, carefully designed policy mechanisms could also boost the effectiveness of environmental governance. Evidence from Malaysia suggests that market-based policies such as carbon taxes are more effective in CO_2 abatement than sectorial emission standards. Production of renewable energy also increases strongly under a carbon tax policy, while no substantial negative effects on the Malaysian economy were observed as a result of emission regulations (Yahoo and Othman 2017).

Figure 3: Central Government Expenditures on Environmental Protection as Percentage of Total Government Outlays

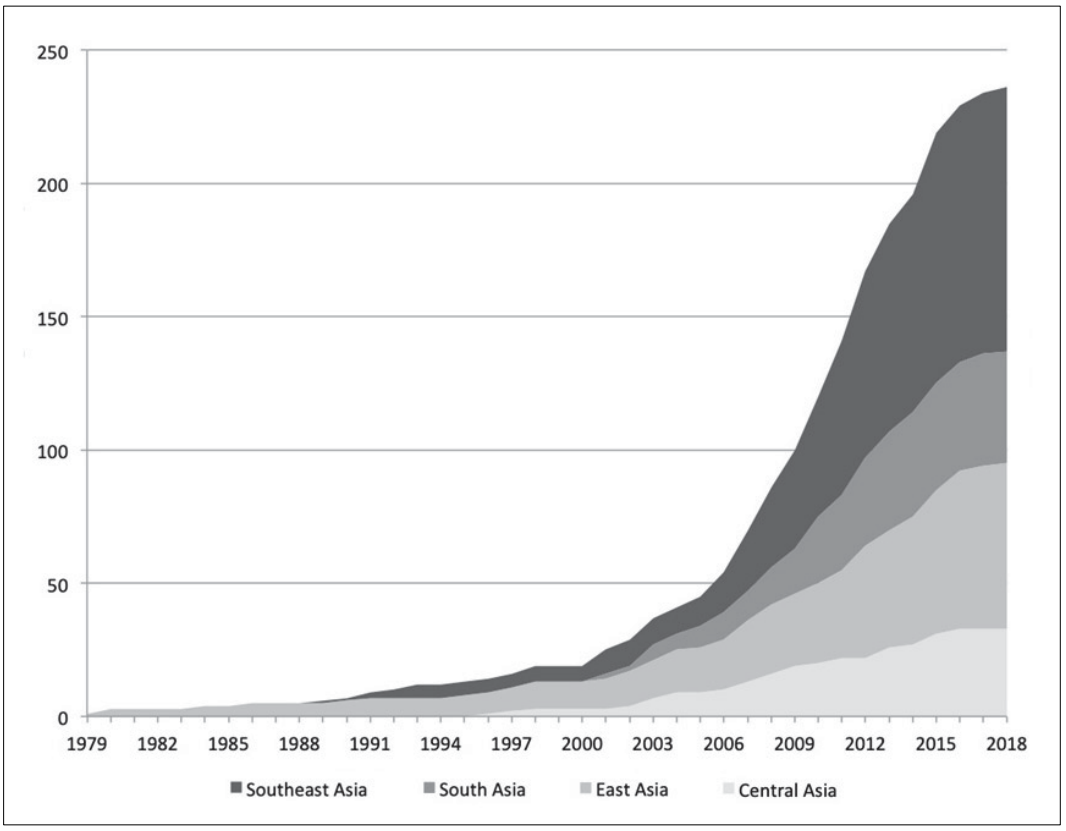


Source: Food and Agriculture Organization of the United Nations; IMF Government Finance Statistics.

Given the significant linkages between environmental governance and green performance, it is helpful to examine Asian countries' regulatory commitment and quality. Figure 3 presents the central government expenditures on environmental protection as a percentage of total government outlays for nine countries. From 2010 to 2016, four out

of nine countries experienced a rise in the share of environmental expenditures, with Nepal, Japan, and the People's Republic of China showing relatively high commitment. The strong fluctuation among countries and over the years, however, suggests the absence of a consistent trend toward greater government attention to environmental protection across Asia. Figure 4 shows the accumulative number of climate change laws and legislation by regions in Asia, as a proxy for regulatory stringency. Asia as a whole is experiencing an increasing volume of environmental laws with an accelerating pace of growth. While East Asia had been the major contributor until 2006, Southeast Asia overtook it as the region with the biggest number of climate change regulations launched each year. The growth and shift over the years signify the gradual establishment and maturation of environmental regulatory frameworks in Asia.

Figure 4: Number of Climate Change Laws by Regions in Asia



Source: Grantham Research Institute on Climate Change, The London School of Economics and Political Science; the Environment and Sabin Center for Climate Change Law, Columbia Law School.

3. POLICY RECOMMENDATIONS

For policy makers in Asia, environmental governance is embedded with challenges in the age of economic takeoff. The potential trade-off between growth and green stewardship as well as the economic burden of stringent regulations have been sources of resistance against devoted environmental efforts. At the same time, a substantial number of studies have been undertaken to show the positive economic impacts of effective environmental governance, in terms of encouraging innovations, increasing productivity, and enhancing competitiveness, as examined in the last section. This research, on the one hand, highlights the benefits of consistent regulatory commitment

to environmental protection. On the other hand, it underscores the fact that economically and socially effective environmental governance is contingent upon well-designed policies and efficient regulatory frameworks. Therefore, countries in Asia would benefit from a scientific approach to policy design that improves the quality of environmental governance, in addition to the continuous commitment of resources. Based on the overview of Asia's environmental performance and its drivers, several principles can be advanced for more effective environmental governance in Asia:

Market-oriented regulations to incentivize stakeholders. Environmental regulation throughout the world is experiencing a transition from the conventional "command-and-control" regulation, for instance emission standards, to the market-oriented approach, which includes a series of measures such as eco-taxes and subsidies, voluntary agreements, eco-labeling, and emission trading (Lemos and Agrawal 2006; Chang, Dong, and Liu 2019). Market-oriented policies have the benefits of greater flexibility, less compliance cost, and more importantly incentivizing stakeholders to raise productivity and undertake innovations. Given that many developing states in Asia lack sufficient government capacity for regulation enforcement, the market-oriented approach could set in a self-regulating mechanism, as the industry starts to reap the benefits of environmental protection efforts.

Technology-driven production upgrade. The majority of countries in Asia are located in a development stage where economic growth often compromises environmental quality (Jalal and Rogers 2002). Eco-innovation in production technologies can be a key solution to help countries transcend the trap of growth-driven environmental degradation, by achieving higher productivity and eco-efficiency at the same time. In order to realize technological advancement in this regard, policy makers need to signal and engage research at universities, research institutions, and corporations, and to encourage applications in both public and private sectors.

Hybrid partnership with non-state actors. The complexity of environmental issues nowadays increasingly demands society-wide participation from various non-state actors such as business institutions, markets, the public, and nongovernmental organizations. Beyond regulatory capacity of the state, self-regulation and mutual supervision are helpful in order to balance the interests of various stakeholders with the overall environmental protection agenda. Scholars also point out that non-state actors are no longer merely the subjects of environmental regulation, but increasingly play a crucial role in the decision-making and policy-making processes (Bulkeley and Mol 2003; Armitage, de Loë, and Plummer 2012). In this sense, hybrid partnerships in Asia could become a new source of sustainable growth that harnesses society-wide actions.

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