

Chapter **1**

Background

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Chapter 1

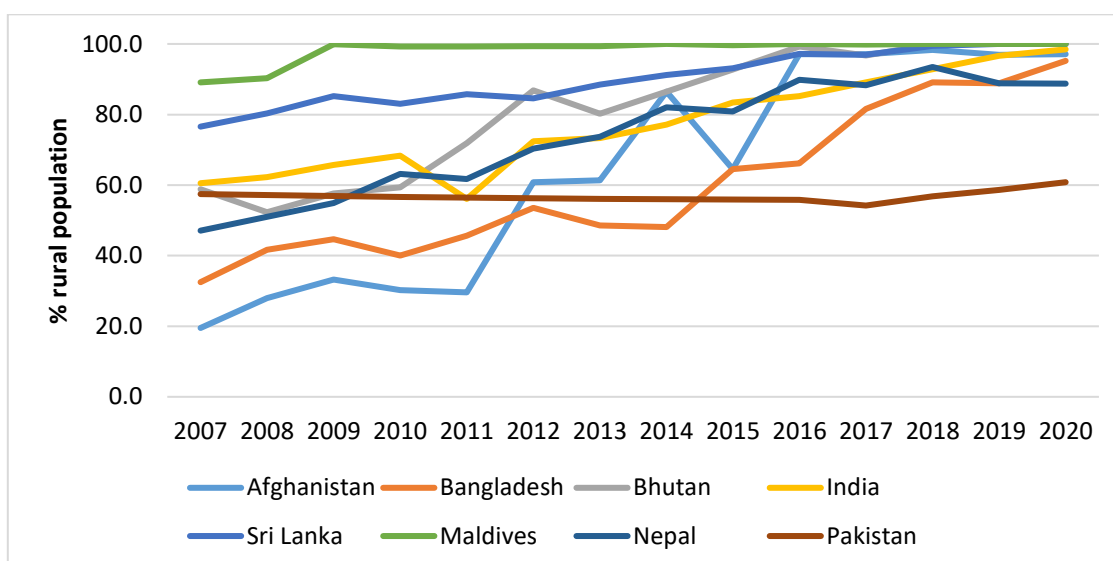
Background

Many South Asian countries, including Afghanistan, Bhutan, Bangladesh, India, Maldives, Nepal, Pakistan, and Sri Lanka, are dependent on fossil fuel energy sources to drive economic growth. However, with the increasing need to limit emissions as emphasized in the Paris Agreement, these countries have committed to decarbonising their economy along with setting their nationally determined contributions (NDCs). In this context, all South Asian countries are reducing their fossil fuel usage and moving toward renewable energy through a faster and more inclusive energy transition.

The South Asian region, one of the fastest growing regions in Asia, is aiming to meet most of its energy requirements through renewable energy (IEA, 2019). With diverse geographical features such as glaciers, deserts, grasslands, and varying climates and proximity to seacoasts, the region has large avenues for growth in renewable energy.

It is also one of the most populated regions in the world with 1.7 billion people and has shown consistent economic growth of 7% (approx.) before the coronavirus disease (COVID-19) pandemic (World Bank, 2020b). However, despite the consistent economic growth, the countries in this region have remained energy-constrained (Murshed, 2021). Though in recent years these countries have witnessed significant improvement in energy access, they are yet to achieve 100% access to electricity in rural areas and access to clean cooking fuel (as indicated in Figure 1.1). As per the same study, most of these countries have failed to meet their energy demand with domestic supply and depend significantly on imports. When increasing energy requirements are met through imports, these cause high dependency that impinges on government budgets, especially if the volume of energy import is very large. Moreover, import dependency for energy products (for example, India's import dependency of coal from Bangladesh) also compromises the energy security of a country on account of various geopolitical and economic factors (Milina, 2007). Despite the South Asian region having enormous intra-regional trade potential both in energy and in manufacturing products and services, the actual trade in manufacturing products is only one-third of its potential (Kathuria, 2018; Shah, 2020). The energy trade is also abysmally low owing to various regional issues including inappropriate tariff measures, high costs of intra-regional connectivity, geopolitical tension, and lack of infrastructure. Moreover, intra-regional trade in manufacturing goods and energy technology is very low compared to the international trade volume of this region (Kaushik, 2015).

Figure 1.1. Access to Electricity in South Asian Countries, 2007–2020



Source: World Bank, 2022.

All South Asian countries have infrastructure bottlenecks in the energy sector, which in turn threaten their reliable supply of energy and economic growth potential, as well as achieving United Nations Sustainable Development Goal-7 (affordable and clean energy) (Murshed, 2021; Zhang, 2019). Additionally, fossil fuel dependency for power generation and energy consumption adversely affects the physical environment. In this context, cross-border energy trade, especially renewable energy trade (in terms of electricity), can play an important role in addressing these challenges given there is a demand–supply complementarity and the presence of suitable infrastructure. At present, some progress has been made in bilateral interconnection and power trade among selected countries in the region. The World Bank in June 2022 furnished \$1.03 billion to boost trade (in electricity) connectivity in South Asia in two phases to replace the lengthy paper-based trade processes with automated solutions in Bangladesh and Nepal in Phase I and extending to Bhutan in Phase II. However, inducing further collaboration among South Asian economies will not only promote individual interests but also extend spill-over benefits across the entire region. Regional development of infrastructure to promote cross-border trade in South Asia can generate greater returns when it comes to fulfilling the collective interests of the entire region to meet energy needs.

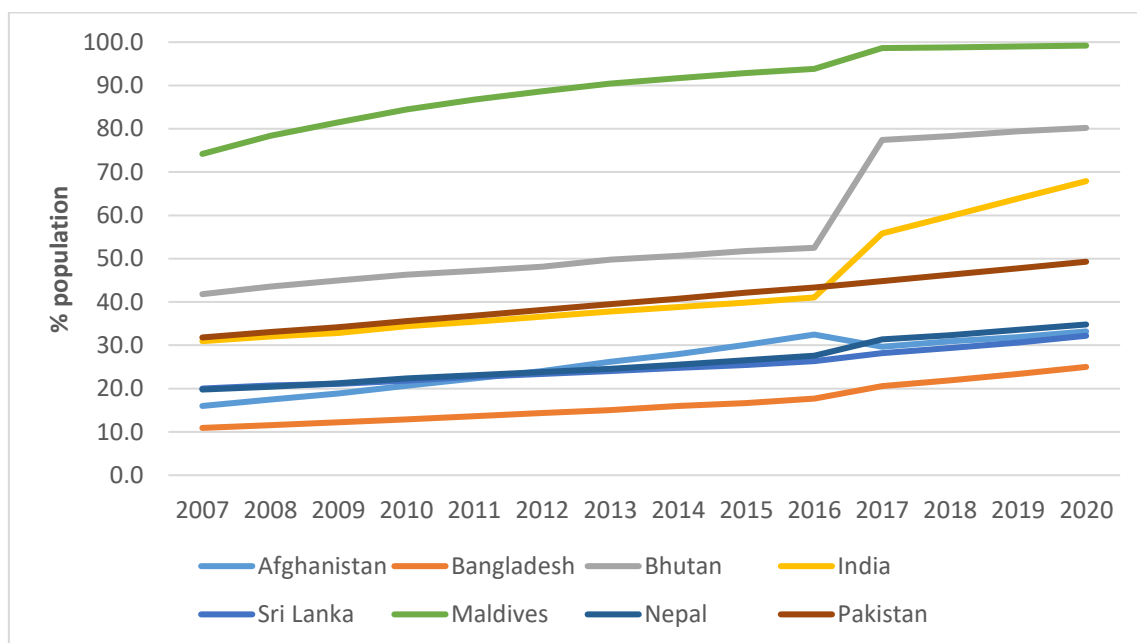
Several pieces of literature like Effendi and Resosudarmo (2020) have analysed the socio-economic and environmental impact of increasing the generation of renewable energy in the context of Association of Southeast Asian Nations (ASEAN) countries using an Inter-Regional Social Accounting Matrix. Based on the empirical analysis, the study concluded that the use of renewable energy not only promotes higher economic growth but also can reduce adverse environmental impact compared to the usage of fossil fuel for power generation in the region. The success story of the ASEAN region in the context of energy cooperation is presented in the annex (Annex 1) along with a few other case studies of regional energy cooperation across the world. Another study by Abrell and Rausch (2016) measured the impact of the expansion of

electricity transmission infrastructure and penetration of renewable energy on gains from trade and emissions from power generation in the context of European Union member countries. The study concluded that the expansion of transmission infrastructure leads to significant gains from trade, with the scale depending on renewable energy penetration. Moreover, the expansion of transmission infrastructure along with an increase in renewable energy share ensures more equitable benefit sharing in the region. A similar analysis has not been done for South Asia to date. Thus, it would be interesting to evaluate the relative benefits that can accrue across this region.

1.1. Overview of the current energy sector in South Asia

South Asia continues to depend on fossil fuels to meet its energy demand and electricity generation (as indicated in Figure 1.2). The share of renewables in electricity generation has increased in these countries in recent years, but, due to the increase in the overall demand, the dependency on fossil fuel has not reduced to a large extent. Integration of renewable energy resources into the national energy mix is important for energy sustainability and energy security. This will complement the limited availability of fossil fuel and also address environmental sustainability. But technological backwardness and poor existing networks are the major challenges in the context of switching to renewable energy in South Asian countries. Regional integration including renewable energy trade can facilitate renewable energy transition in the South Asian region.

Figure 1.2. Access to Clean Cooking Fuel in South Asian Countries, 2007–2020



Source: World Bank, 2022.

South Asia has witnessed a growth in energy demand over the past 2 decades, increasing by over 50% since 2000. In particular, electricity demand in Bangladesh, Bhutan, India, Nepal, and Sri Lanka has grown on average by more than 5% annually over the past 2 decades and is expected to more than double by 2050 (World Bank, 2022b).

Approximately two-thirds of the energy usage in South Asia is imported (World Bank, 2022b). The region is still heavily dependent on fossil fuels, which account for about 80% of total primary energy production in the region. Unsurprisingly, greenhouse gas (GHG) emissions from power generation in South Asia are the largest (68%) compared to emissions from other sectors (World Bank, 2022b). All the nations in South Asia, particularly Bangladesh, Afghanistan, India, Maldives, and Sri Lanka, fulfil their energy requirements through oil imports. India is the largest importer after China and the US, and imports 82% of its needs. Moreover, India and Pakistan (the two major economies in South Asia) heavily depend on imports of natural gas from Persian Gulf nations including Qatar and Iran.

Apart from importing oil, the entire South Asian region is also heavily dependent on refined petroleum imports. Some South Asian countries, including Nepal, Bhutan, Afghanistan, and Maldives, depend entirely on importing refined petroleum products as they do not have adequate refining capacity. Most of the countries in South Asia primarily depend on fossil fuels (refer to Table 1.1) to meet their energy demands (IEA, 2021). The exception is Bhutan as its energy supply is largely based on renewable sources. Owing to the country-level decarbonisation strategies, the overall (at the region level) dependency on fossil fuels has reduced in the region (as indicated in Table 1.2). However, the primary energy gap has been increasing sharply (except in Bhutan) due to recent success in rural electrification, increasing urbanisation, increasing penetration of electrical appliances, and increased population. Meeting this energy gap is a big concern for the countries in the region.

Table 1.1. Primary Energy Consumption and Share of Fossil Fuel, 2021

Country	Primary energy consumption (Quad BTU)	Fossil fuel dependency (%)
Afghanistan	0.09	73.61
Bangladesh	1.71	97.99
Bhutan	0.07	16.97
India	31.96	88.95
Maldives	0.03	98.58
Nepal	0.16	61.69
Pakistan	3.35	82.81
Sri Lanka	0.35	84.75

BTU = British thermal units.

Source: Energy Information Administration, 2022.

Table 1.2. Fossil Fuel Dependency Trend in South Asian Countries, 2010–2021
(%)

Country	2010	2015	2016	2017	2018	2019	2020	2021
Afghanistan	88.84	79.83	75.90	74.46	77.70	76.13	74.78	73.61
Bangladesh	99.16	98.57	98.29	98.12	98.07	97.92	97.81	97.99
Bhutan	10.72	13.72	15.50	18.19	20.97	17.23	16.69	16.97
India	92.13	91.62	91.08	90.63	90.31	89.84	88.87	88.95
Maldives	99.87	99.63	99.50	99.33	99.14	99.08	98.79	98.58
Nepal	58.66	58.65	65.80	66.36	67.88	63.39	61.36	61.69
Pakistan	86.53	86.57	87.61	88.22	84.85	85.45	84.50	82.81
Sri Lanka	77.41	82.61	88.04	88.31	82.80	86.55	84.81	84.75

Note: Share of primary energy consumption.

Source: Energy Information Administration, 2022.

Table 1.3. Primary Energy Gap Trend in South Asia, 2009–2021
(Quad BTU)

Country	2009	2010	2015	2016	2017	2018	2019	2020	2021
Afghanistan	-0.07	-0.09	-0.07	-0.05	-0.04	-0.05	-0.05	-0.08	-0.05
Bangladesh	-0.16	-0.19	-0.31	-0.31	-0.40	-0.42	-0.53	-0.57	-0.78
Bhutan	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
India	-7.92	-8.18	-11.69	-11.75	-12.52	-13.35	-13.43	-11.99	-12.97
Maldives	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03
Nepal	-0.05	-0.05	-0.06	-0.10	-0.11	-0.12	-0.11	-0.11	-0.11
Pakistan	-0.82	-0.84	-1.10	-1.38	-1.57	-1.37	-1.39	-1.37	-1.42
Sri Lanka	-0.17	-0.19	-0.28	-0.32	-0.31	-0.31	-0.32	-0.29	-0.29

BTU = British thermal units.

Source: Energy Information Administration, 2022.

As far as the trends in the electricity generation capacity of the region are concerned, Nepal and Bhutan almost entirely depend on renewable sources while most of the other countries are still dependent on fossil fuels and other non-renewable sources (as indicated in Table 1.4). In recent years, overall renewable energy generation has increased significantly (as indicated in Table 1.5) in all South Asian countries (except Afghanistan, due to political turmoil). In spite of existing fossil fuel dependency, all South Asian countries aspire to increase their renewable (non-fossil fuel-based) power generation in their NDCs as indicated in Table 1.6.

Table 1.4. Electricity Generation and Share of Renewables, 2021

Country	Electricity generation	% Non-fossil fuel
Afghanistan	0.83	84.05
Bangladesh	80.57	1.69
Bhutan	9.00	100.00
India	1,702.09	22.59
Maldives	0.66	7.67
Nepal	6.12	100.00
Pakistan	150.17	41.12
Sri Lanka	16.35	36.74

Source: Energy Information Administration, 2022.

Table 1.5. Renewable Energy Generation Trend (Including Hydro), 2010–2021
(Billion kWh)

Country	2010	2015	2016	2017	2018	2019	2020	2021
Afghanistan	0.31	0.59	0.64	0.75	0.54	0.78	0.75	0.60
Bangladesh	0.94	1.29	1.39	0.76	0.96	0.47	0.83	0.98
Bhutan	1.79	2.62	4.47	6.49	6.89	6.93	7.26	6.98
India	76.75	114.98	130.90	127.33	139.15	142.82	148.12	174.54
Maldives	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nepal	1.62	2.49	2.71	2.76	2.79	3.08	3.18	3.47
Pakistan	17.02	30.55	31.63	28.42	27.51	29.09	32.77	29.68
Sri Lanka	3.18	3.43	3.87	3.93	4.12	3.91	5.68	4.71

Source: Energy Information Administration, 2022.

Table 1.6. NDC Target for South Asian Countries

Country	% of renewable energy generation
Bangladesh	10
Bhutan	100
India	50
Maldives	21
Nepal	100
Pakistan	60
Sri Lanka	70

NDC = nationally determined contribution.

Source: Compilation from country-level government websites, 2022.