A COMPREHENSIVE ECONOMIC COAL TRANSITION IN SOUTH ASIA

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Acronyms and Abbreviations

ACT	Accelerating Coal Transition Investment Program
AQLI	Air Quality Life Index
CCS	Carbon capture and storage
CIF	Climate Investment Funds
CO_2	Carbon dioxide
COP26	The 2021 United Nations Climate Change Conference of Parties / the 26th Conference of Parties to the United Nations Framework Convention on Climate Change
COVID-19	2019 coronavirus pandemic
EIA	United States Energy Information Administration
GW	Gigawatt
IEA	International Energy Agency
IEEFA	Institute for Energy Economics and Financial Analysis
IRENA	International Renewable Energy Agency
ISA	International Solar Alliance
ktce	Kiloton of coal equivalent
kWh	Kilowatt-hour
LCOE	Levelized cost of electricity
Mtoe	Megaton of oil equivalent
MW	Megawatt
NOx	Nitrogen oxides (relevant for air pollution)
OECD	Organisation for Economic Co-operation and Development
PJ	Petajoule
$PM_{2.5}$	Fine particulate matter
PV	Photovoltaics
SAGE	South Asia Group for Energy
SO_2	Sulfur dioxide
TPES	Total primary energy supply
UN	United Nations

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1.0 Executive Summary

Many countries are considering accelerating their coal transition. A coal transition refers to an energy sector's shift from a reliance on coal toward an energy mix largely based on cleaner fuels and renewable energy sources. Such a transition is not just related to greenhouse gas emissions, but also encompasses a range of benefits, recognizing that global energy costs and options are changing. Since 2015, proposed new coal power capacity has dropped by three-quarters globally, leaving only a few countries that develop coal-fired power plants at scale (Littlecott et al., 2021). Historic steps were taken at the United Nations Climate Change 26th Conference of Parties (COP26) in Glasgow, as countries pledged to stop new coal builds, end international coal financing, phase down and phase out unabated coal use, and transition to clean energy.

In South Asia, there have been several indicators suggesting that countries may be open to moving toward a coal transition.[1] For example, the number of coal power plants under development across South Asia has decreased by 87% since 2015 (Littlecott et al., 2021). However, the challenges of assuring a just transition are substantial. Because coal plays a critical role in the energy and economic systems in South Asia, especially India, moving away from coal means realizing a broader country-wide economic and social transition. A comprehensive, integrated transition strategy for each state is thus needed urgently.

This report briefly reviews the current trends and policies on coal in South Asian countries, develops a framework for a comprehensive economic coal transition, and assesses the opportunities and challenges of the transition in key countries. Several important findings emerge from the analysis.

First, a coal transition can support overall economic growth and stability. Financial advantages to a well-planned coal transition include mitigating the risk of stranded assets and taking advantage of low-cost renewables. As a global coal transition proceeds, funds are being diverted from new unabated coal power plants, and utilization rates are declining. The likelihood that coal assets will become stranded is increasing, and the potential for future losses therefore increases as well.

Second, coal imports in South Asia are rising. Of the coal consumed in Bangladesh, India, Nepal, and Sri Lanka, 32% is imported; this number increases to 94% when excluding India (International Energy Agency [IEA], 2021d). This illustrates a serious energy security risk. One example is the recent increase in coal prices in South Asia, to be discussed in Section 2.2.1. A diverse energy portfolio that incorporates local renewable energy can provide resilience in the face of changing commodity prices and availability.

Third, the social benefits of a coal transition include positive health impacts and broader economic improvements in job creation, although assuring a just transition may be a challenge. Phasing out or phasing down coal can significantly reduce air pollutant emissions and therefore minimize associated premature mortality and improve life expectancy. Additional societal benefits of a coal transition include the high economy-wide potential for job creation, although it creates challenges in terms of reintegration and resettlement for coal miners and their communities.

[1] For the purposes of this report, South Asia includes Bangladesh, Bhutan, India, the Maldives, Nepal, and Sri Lanka.

2.0 Introduction

South Asian countries vary significantly in their levels of coal use. This section provides brief overviews of countries and details on coal use in addition to key metrics. For more detailed country information, please reference Appendix A. For COP26 commitments, please reference Appendix B.

2.1 Coal Metrics in South Asia

Table 1 displays several metrics related to coal in a country's economy. General trends indicate that coal imports have been increasing over the past 10 years. Aside from India, other countries import nearly all of the coal used in their total primary energy supply (TPES), creating a major energy security concern. Even India, with large domestic coal reserves, imports about a third of its coal. Coal provided 45% of the country's primary energy supply in 2019, the highest in the region, and coal contributed to 72% of electricity generation. Sri Lanka used the second most coal as of 2019, with 12% of its primary energy and 33% of its electricity supplied by coal, although the country has committed to building no new coal-fired power plants (Jayasinghe, 2021).

Table 1. Key coal metrics for South Asia Group for Energy countries.[2]

Country	Coal reliance (% of TPES in 2019)	% of electricity generation (2019)	% of final industrial energy demand (2019)	Import growth rate 2009 to 2019	% of coal in TPES that is imported (2019)	Does the country produce coal?
Bangladesh	5%	1%	33%	775%	88%	Yes
Bhutan	5%	No data	No data	No data	No data	No
India	45%	72%	39%	131%	32%	Yes
The Maldives	0%	No data	No data	No data	No data	No
Nepal	6%	0%	74%	403%	98%	No
Sri Lanka	12%	33%	2%	2288%	108%	No

[2] Estimates of coal use in the South Asia Group for Energy (SAGE) focus countries are based on the IEA World Energy Balances 2021, which includes data for four SAGE countries: Bangladesh, India, Nepal, and Sri Lanka (IEA, 2021a; IEA, 2021d). Additional data from the U.S. Energy Information Administration's [EIA] Country Overviews and the International Renewable Energy Agency's [IRENA] Energy Profiles is used to assess coal use in Bhutan and the Maldives, although detailed data is limited (EIA, 2019; IRENA, 2021a).

Figure 1 displays primary energy supply by fuel for India, Bangladesh, Nepal, and Sri Lanka. Coal is most dominant in India, although all four countries show nominal increasing trends in coal use. Still, the rate of increase in coal use has slowed across the region. Regarding where coal is consumed in economies, the power sector dominates coal consumption in India and Sri Lanka, whereas industry uses the most coal in Bangladesh and Nepal. This breakdown helps identify opportunities within each country for an energy transition. Because of the sheer size of the Indian power system, the largest regional reductions in coal consumption could come from this sector (Figure 5; please reference Appendix A).

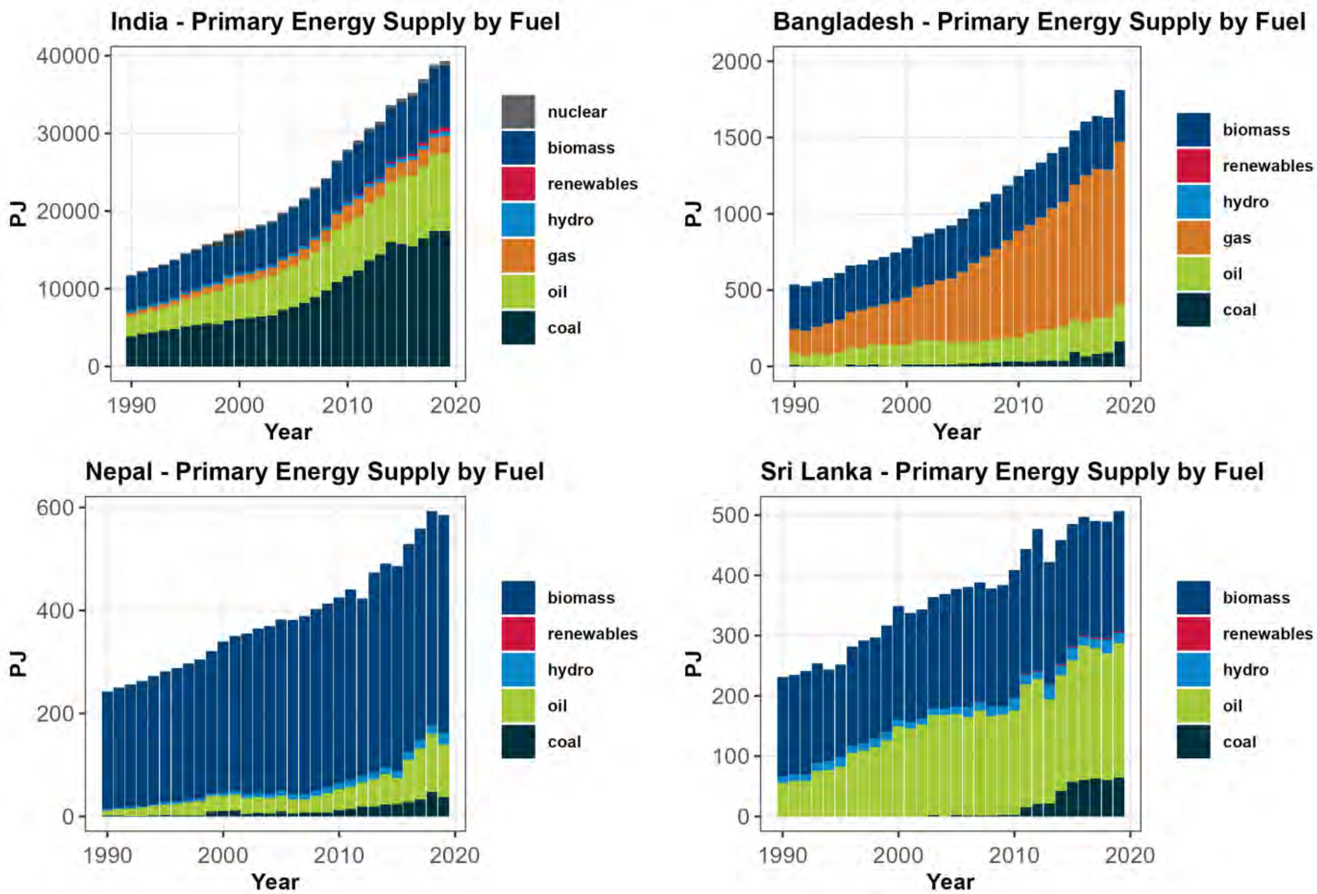

Figure 1. Primary energy supply for South Asian countries.

2.2 Bangladesh, India, and Sri Lanka

Bangladesh, India, and Sri Lanka are the predominant coal users in South Asia and therefore face different challenges to a coal transition than non-coal-intensive countries. Going forward, in light of recent COP26 commitments, these countries may capitalize on the global momentum for a coal transition and have the opportunity to become leaders in ending new unabated coal builds. Note that unabated coal refers to the consumption of fuel in facilities without carbon capture and storage (CCS) technologies (IEA, 2021c).

Regarding coal capacity, Bangladesh has two existing coal-fired power plants. In 2020, the government announced that they would be building 18 new coal-fired power plants, although 10 were cancelled in early 2021. This was due to a combination of pressure from activists and the rising price of coal (Ellichipuram, 2021). Among the wave of cancellations, Bangladesh synchronized the Payra power plant with its national grid in 2020, adding 1,320 MW of capacity (NS Energy, 2020). Bangladesh was only utilizing 43% of its power plants' capacity in the 2018–19 fiscal year, and demand has since decreased due to COVID-19. If this pattern continues, subsidies for underutilized plants and power tariffs will increase, leading to very expensive overcapacity payments (ICSC, 2020).

Coal is an abundant domestic resource in India. India is the second-largest coal-producing country and has the fifth-largest coal reserves globally (IEA, 2021b). India currently has an operating coal power capacity of 233 GW (GEM, 2021). Coal is deeply intertwined with the Indian economy not only in terms of power generation but with implications for jobs and economic development as well. Coal accounted for 45% of India's primary energy supply in 2019 and for 72% of electricity generated as of 2020, a level that has been fairly steady since 1990. As of 2019, coal imports were equal to 46% of domestic production and have been increasing since 1990. Since 2013, import numbers have remained between 40% and 50% of those of coal production. Regarding consumption by sector, the power sector uses 78% of coal consumed, with industry levels at 19%. Primary industries in India include steel, cement, and fertilizer; there are unique challenges with reducing coal use in industry because it can be difficult to continue operations without coal power (IEA, 2021d); for more information, please reference Box 1.

Sri Lanka's sole coal-fired power plant in Puttalam incorporates three 300 MW units. Sri Lanka had multiple coal plants planned to avoid capacity shortages and blackouts, although in a September 2021 address to the United Nations (UN) International Energy Forum, President Rajapaksa announced that Sri Lanka will not build any additional coal-fired power plants. The country will also aim to achieve net-zero emissions by 2050 and will source 70% of all energy requirements from renewables by 2030 (Jayasinghe, 2021).

2.3 Bhutan, the Maldives, and Nepal

Bhutan, the Maldives, and Nepal do not use much coal because they have limited domestic coal resources that have not been integrated into their energy systems. Therefore, these countries do not have the same needs when it comes to an energy transition. Rather, there are other issues within their energy systems that countries are focusing on, including challenges with shifting toward renewables.

As of 2016, coal composed 15% of final energy consumption in Bhutan, while biomass and electricity were responsible for 36% and 28%, respectively (IRENA, 2019). Bhutan is highly reliant on hydropower, which is becoming less reliable in the face of climate change. Therefore, the country is working to diversify and expand other renewable energy sources to improve grid stability (ADB, 2020b; ADB, 2021).

The Maldives does not produce or consume significant amounts of coal, and there is limited data on energy patterns. The country is currently dependent on fossil fuel imports (ADB, 2020b).

In Nepal, coal is responsible for 6% of the country's primary energy supply, all of which is imported. As in Bhutan, nearly 100% of Nepal's electricity is generated via hydropower (IEA, 2021d). However, the demand in Nepal often exceeds existing capacity, leading to frequent blackouts. The country has the potential to further develop hydropower, although this would require concerted investment. There are also risks to hydropower because of changing snowpack in the Himalayas and seasonal variability in river flow. In 2016, Nepal prepared an action plan called the National Energy Crisis Reduction and Electricity Development Decades targeting legal reform provisions, policy decisions, administrative decisions and procedural reforms, and structural provisions and reforms (ADB, 2017).

3.0 Coal Transitions: A Comprehensive Economic Perspective

Within South Asia, there are many opportunities to reduce coal use and facilitate a comprehensive economic coal transition. This section will discuss such a transition in a three-dimensional framework, focusing on financial motivators, energy security, and social benefits and challenges. The financial benefits of a transition include minimizing the risk of stranded assets and taking advantage of the low regional costs of renewable energy. Reducing coal imports will increase energy security, and lessening coal consumption will improve air pollution and decrease premature mortalities. However, policy support is necessary to assure a just transition. These framework elements and corresponding policy recommendations (Figure 2) were developed through a comprehensive literature review.

Comprehensive economic coal transition in South Asia	Financial	Employ innovative financing measures to avoid stranded assets by discouraging future coal investments.
	Energy security	Reduce reliance on international coal to enhance energy security by diversifying energy portfolios with alternative domestic resources and leveraging regional and international cooperation.
	Social dimensions	Recognizing the near-term opportunities for societal gains, early retirement is necessary, keeping in mind principles of a just transition.
		While experiencing the positive benefits of early retirement, provide policy support to affected communities to achieve a just transition.

Figure 2. A diagram illustrating the flow of this report, from each element of a comprehensive economic coal transition to its corresponding policy recommendation.

3.1 Financial

The following section will discuss financial matters related to a comprehensive economic coal transition in South Asia including stranded assets, government support, low-cost renewable energy, and international climate financing.

3.1.1 Stranded Assets

A major driver for not building new coal plants is the risk of stranded assets. According to the IEA, stranded assets are those that cease to provide economic returns significantly before the end of their lifetime (Sarma, 2020). As the global coal transition proceeds, coal plants will likely be retired early or otherwise incapacitated before their lifetime limits for several reasons. These include the prevalence of underutilized and non-performing assets, a lack of global financing, a slowdown of coal capacity growth, and compliance with the warming targets outlined in the Paris Agreement. The following sections also discuss how coal-fired power plants grow increasingly uncompetitive in the face of low-cost renewables and the importance of international climate financing.

With the current trend of declining coal plant utilization in India and elsewhere in the world, coal assets grow increasingly unviable. India's average utilization rate has fallen to a "financially unsustainable low of 53%" in fiscal year 2020–21, down from a high of 78% in fiscal year 2011–12, according to the Institute for Energy Economics and Financial Analysis (IEEFA) (Shah, 2021b). The financial stress of debt servicing underutilized coal assets can spill over to the rest of the power sector and India's financial institutions. Additionally, as of September 2020, 11% of power sector loans in India were tied to non-performing assets, most of them coal-related (Singh and Sharma, 2021). An already strained financial system cannot sustain further investments in coal because they are likely to lead to future losses; the IEA has estimated that current policies in India will reduce coal from 70% of India's electricity mix to 30% by 2040, and further investments in clean energy could reduce coal demand by 36% by 2030 (Ward et al., 2021; Viswanathan et al., 2021). Both the IEA and the IEEFA have predicted that coal-fired power generation will peak in India before 2025. Furthermore, 55% of India's coal-fired power plants are young, meaning that they have been constructed within the last decade. This further increases the risk of stranded assets (Shah, 2021a).

Regarding a lack of global financing, 40% of major global banks and 20% of global insurers divested from coal investments between 2013 and 2020. Global investments in coal projects have declined by 75% since 2017. Investors in India specifically are reluctant to finance new coal plants as it is likely that plants built between 2022 and 2027 will become stranded assets due to a shifting energy and electricity mix, as discussed above (Vishwanathan et al., 2018). As another example, China announced in February 2021 that it would phase out coal investments in Bangladesh and would not finance new coal mines or coal-fired power plants (Han and Nedopil Wang, 2021). Following a September 2021 announcement that China would not invest in any new coal-fired power projects internationally, Sri Lanka pledged to stop building new coal-fired power plants (Jayasinghe, 2021). However, that is not to say that coal demand has stopped increasing, or that it will not continue to dominate over the next several years. The heightened risk of stranded assets may catalyze a divestment from new coal investments, despite increasing power demand (Sarma, 2020).

A slowdown in coal-fired capacity growth has already begun to occur in India. The IEEFA reported that between June 2020 and June 2021, there were no new coal power plants announced and there was no movement in the 29 GW of pre-construction plants (Shah, 2021a). Coal-fired power capacity in India has been nearly flat in recent years, while the percentage of plants under development (announced, pre-permit, permitted) and plants under construction has drastically declined (Figure 3). Virtually all potential new plants have been cancelled, and there have been many fewer additions since 2017 than in years prior (GEM, 2021). This could reflect either a lack of financing for new coal projects or that coal-fired power is no longer competitive, further amplifying the concept that new coal investments will not yield high returns (Shah, 2021a).

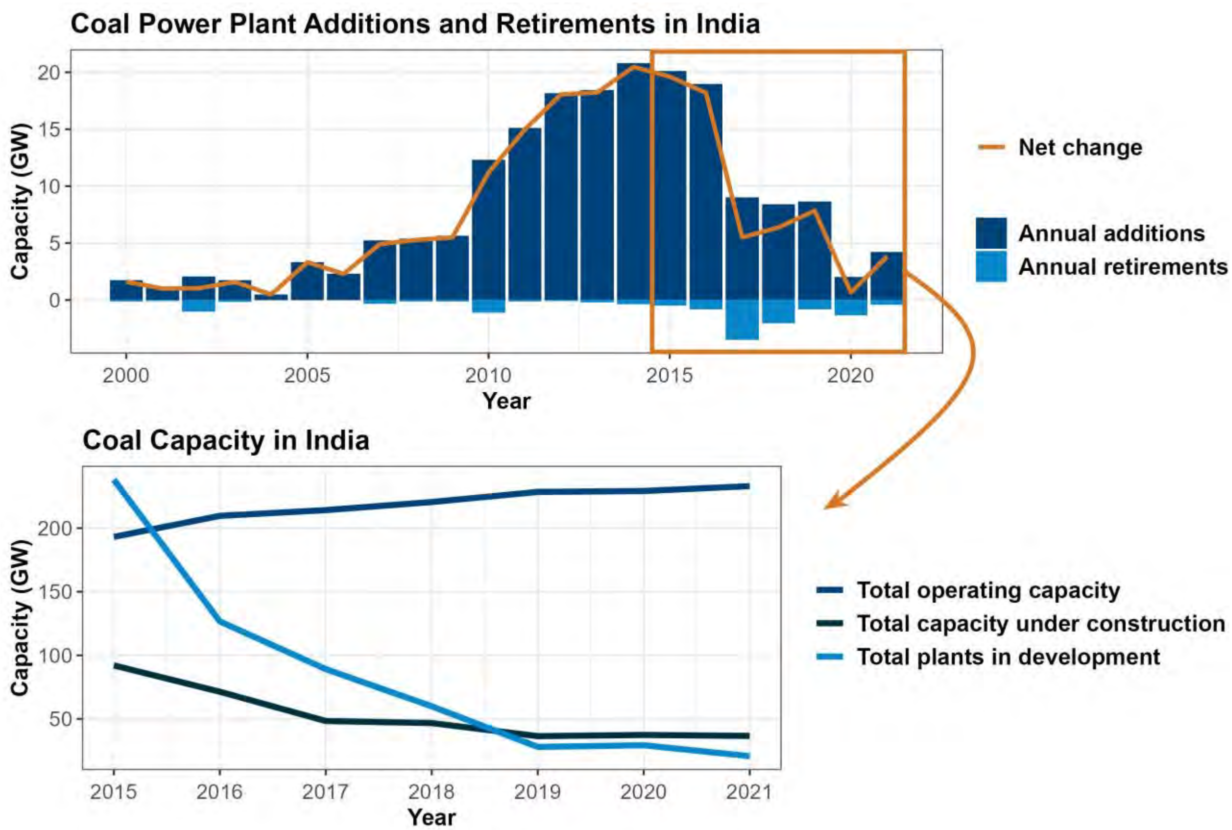

Figure 3. A summary of coal capacity in India using data from the Global Energy Monitor's Global Coal Plant Tracker.

Another element to consider when discussing stranded assets is compliance with the warming targets outlined in the Paris Agreement. Retiring coal-fired power plants globally at 35 years instead of the historical average lifetime of 50 years could limit warming to 2° C, the upper bound detailed in the Paris Agreement. With the lower bound of 1.5° C, the maximum acceptable lifetime becomes 20 years. Therefore, if countries align with the targets of the Paris Agreement, coal plants could be operating for less than half of their potential lifetime and become stranded assets. Lifetime limits will be further reduced by five years if plants that are currently under construction are allowed to be completed and even further if plants in the early development stage are finished (Table 2) (Cui et al., 2019). The possibility of early retirement therefore generates concern over the financial viability of new coal investments, again highlighting the issue of stranded assets.

Table 2. Paris Agreement scenarios and maximum acceptable lifetimes.

	2° C	1.5° C
Retire current coal plants, no new builds	35 years	20 years
Retire current plants and halt construction	30 years	15 years
Retire current plants, halt construction and development	25 years	10 years

3.1.1.1 Government Support

Governments in South Asia, notably India and Bangladesh, support the coal industry, worsening the financial risk of continued investments in coal assets. Across the coal value chain in 2020, India provided $2.1 billion in support for coal; this number has remained relatively stable since 2018. Contributions include the cross-subsidization of passenger transport through Indian Railways in addition to federal and state revenues from coal. Taxes are weighed against social costs. By these estimates, coal contributed approximately $10.6 billion in 2018. Social costs totaled $60.7 billion based on the value of mortality and morbidity from coal-produced air pollution and low-range estimates of the costs of coal-related greenhouse gas emissions (Viswanathan et al., 2021).

Major subsidies include a concessional 5% sales tax under India's Goods and Services Tax, compared to 18% for other minerals, as well as other policies targeted toward conservation of coal mines, exploration for future coal mines, and special employee benefits.[3] In 2021, the central government allowed for the privatization of coal mines for commercial purposes and provided multiple incentives to encourage private investment. There is not yet an estimate of the financial value of such incentives. It is important to note that coal subsidies have remained steady in nominal terms but have declined 30% between 2014 and 2020 when adjusting for inflation (Viswanathan et al., 2021).

Additionally, many coal-related investments to offset the social costs of coal have been deferred. As an example, India delayed the implementation of a 2017 policy set by the Central Pollution Control Board that would have required coal power plants to invest in a range of technologies dedicated to reducing air

[3] This report uses the term "subsidy" to refer to a government policy or program that generates a financial contribution to a nongovernment actor. The definition of a subsidy is based on the Agreement on Subsidies and Countervailing Measures of the World Trade Organization. This includes direct and indirect transfers of funds or liabilities, foregone government revenue, provision of goods and services below market value, and income or price support through market regulations, including non-enforcement. For more details, please reference Viswanathan et al., 2021.

pollution. This was done to avoid subjecting plants to non-compliance charges (Beaton et al., 2019). In 2020 alone, this saved coal producers $144 million. Furthermore, the timeline for compliance with air pollution regulations has been further delayed by an additional three years, moving the deadline to 2025 (Viswanathan et al., 2021).

In Bangladesh, the government overestimated power demand between 2010 and 2016 and built more capacity than needed without diversifying the power grid; there was a far greater investment in generation than distribution and transmission (Tachev, 2021). As a result, installed power capacity increased while the actual power generation growth rate remained stagnant. By 2020, the total capacity utilization rate settled at 40.0%, with coal assets at 29.6%. The Bangladesh Power Development Board pays subsidies in the form of capacity payments to the underutilized power plants; from 2018 to 2019, the government paid $1.1 billion. Should coal capacity continue to increase, so will the financial burden (Han and Nedopil Wang, 2021).

3.1.2 Low-Cost Renewables

Renewable energy costs have declined globally, making renewable energy a more affordable option than coal. Costs have declined due to technology improvements, economies of scale, competition in supply chains, and increased industry experience (UN ESCAP, 2021). Solar photovoltaics (PV) in particular have become very inexpensive, especially relative to coal. Between 2010 and 2020, the levelized cost of electricity (LCOE) worldwide fell by 85%, and 40% of new solar PV installations were less expensive than the cheapest fossil fuel alternatives in 2019. The LCOE of onshore wind dropped 56% between 2010 and 2020 and offshore wind dropped by 48%, meaning both sources are less expensive than fossil fuel generation. These trends are expected to continue, making renewable energy competitive in the market, which will incentivize shifting away from coal (IRENA, 2021b; Climate Analytics, 2021). India has some of the lowest costs of solar and wind energy in the world. When adjusted to a levelized cost basis, the weighted average price from auction and power purchase agreements for solar PV is $0.033/kWh and is $0.032/kWh, respectively, for onshore wind. In India specifically, between 87% and 91% of existing coal-fired capacity has operating costs greater than the estimated costs of new solar or wind capacity. This illustrates one reason why coal capacity is underutilized and why loans are not performing. India stands to gain $6.4 billion per year if the uncompetitive coal capacity is replaced entirely with new solar and wind power (IRENA, 2021b). In Bangladesh, utility-scale solar PV is competitive with supercritical coal plants at $0.054/kWh, although the LCOE for conventional technologies is expected to increase by 2050 while solar is expected to decrease. In Sri Lanka, onshore wind is expected to be the cheapest source of electricity generation in 2021, and utility-scale solar will be the least expensive source by 2025 (Chauhan et al., 2021). Simply put, renewables are cheaper, and it is becoming less and less profitable to invest in coal (IRENA, 2021b).

3.1.3 International Climate Financing

As discussed at COP26, international financing to aid a transition will be crucial in assisting developing countries. One recent effort by the Climate Investment Funds (CIF) was launched in November 2021. CIF initiated a $2.5 billion Accelerating Coal Transition (ACT) Investment Program targeting a transition from unabated coal capacity to clean power in emerging economies, namely South Africa, India, Indonesia, and the Philippines. In the next phase of its program, ACT will expand to include other countries as well (Andrews, 2021). Such financing efforts are crucial in facilitating a coal transition and can stem from both public and private sources. To attract investments, countries need strong legal and regulatory systems in place, as well as favorable market conditions. In general, a stable regulatory framework and a conducive environment for market reform would be the most beneficial conditions for private investment. Contract development and enforcement are a priority. Leveraging private funds could prove highly beneficial, but the investors must be attracted to the region. More research could be conducted into the suitability of economies for public or private investment into renewable energy development and deployment.

3.2 Energy Security

The next section will discuss matters related to energy security, focusing on the prevalence of high import rates across the region.

3.2.1 High Import Rates

Due to high import rates, growth in coal consumption will worsen energy security. Across South Asia, coal imports are rising (Figure 4) at generally increasing rates (Table 3). Excluding India, 94% of coal used in total primary energy supply was imported in the region in 2019, and even India with its massive domestic coal reserves has been importing between a quarter and a third of coal consumed in its primary energy supply since 2010. In 2019, India imported an amount of coal equivalent to 46% of total domestic coal production, a number that has remained fairly constant since 2013 (IEA, 2021d). In particular, the steel industry imports high-quality coking coal to meet its needs that domestic production does not satisfy (Russell, 2019). For more details on the unique challenges industry faces with a coal transition, please reference Box 1. As another example, one study estimates that in 2025, 96% of coal demand in Bangladesh will be met by imported coal (Gulagi et al., 2020; Zaman et al., 2018). Continuing to rely on coal may contradict national goals of strengthening energy security for many countries and expose countries to financial risk (Roy and Schaffartzik, 2021; Gulagi et al., 2020; Zaman et al., 2018; ADB, 2019; ADB, 2020a).

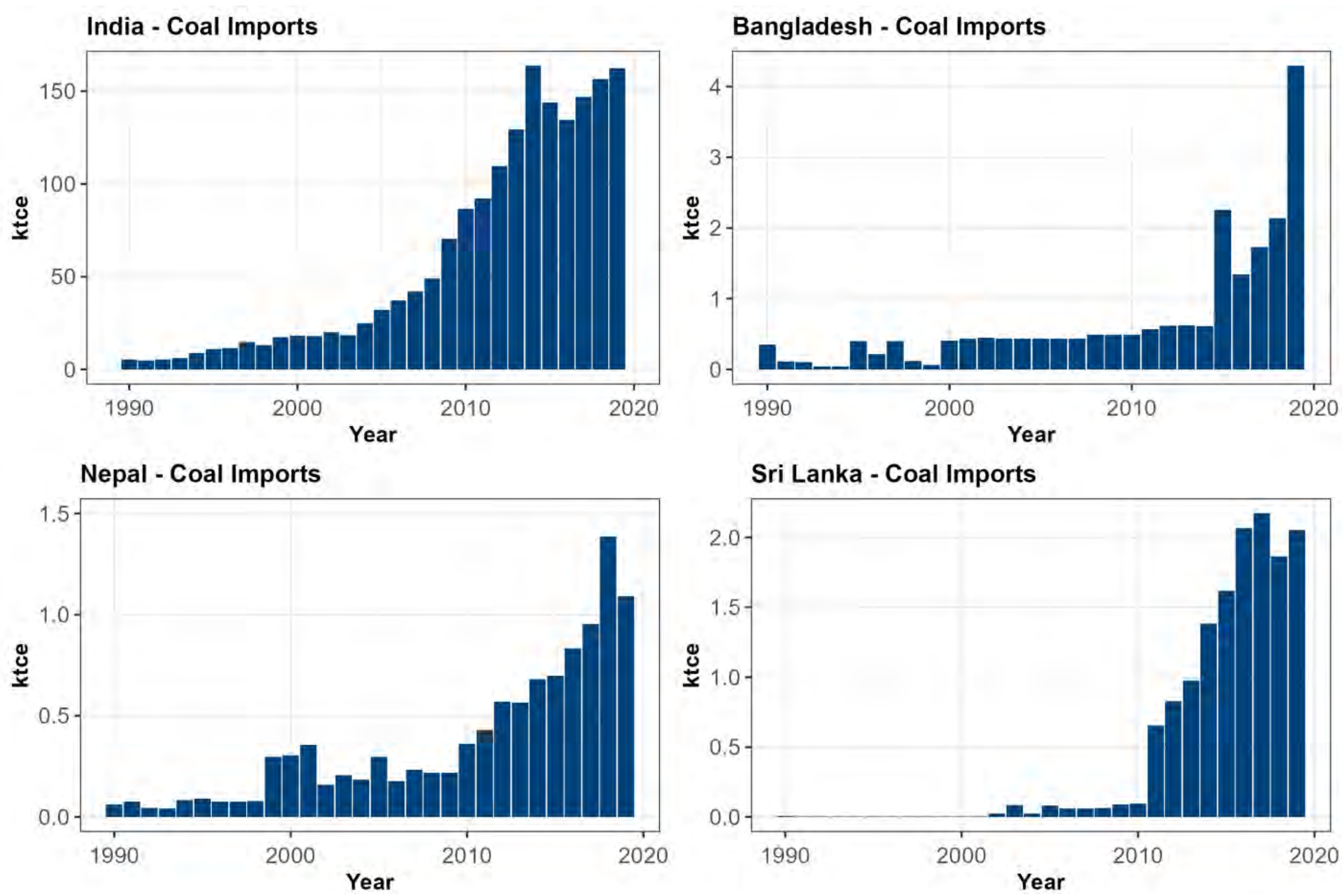

Figure 4. Coal imports for South Asian countries.

Table 3. Annual import growth rates across South Asia						
	2009–2019	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019
Bangladesh	775%	271%	−40%	29%	24%	101%
India	131%	−12%	−7%	9%	7%	4%
Nepal	403%	3%	19%	15%	45%	−21%
Sri Lanka	2288%	17%	28%	5%	−14%	10%

As evidenced by recent increases in the global cost of coal, reliance on imports can have drastic consequences in the face of market uncertainty. Coal prices in Asia hit record highs in the second half of 2021 partially because of an increase in global demand for power generation fuels as economies began opening up in the wake of COVID-19 (Varadhan, 2021). Due to high import prices, India relied heavily on domestic coal, reducing reserves to a few days' worth of consumption (Pande and Nath, 2021). In a coal transition, it is imperative to reduce reliance on international coal to mitigate the impacts of market uncertainty and high global prices. In general, diversifying a country's energy portfolio can alleviate energy security concerns, especially because most South Asian countries have a high potential for domestic renewable energy as opposed to a high potential for coal.

Box 1. Industrial coal transition challenges and next steps

One challenge for an industrial coal transition includes that industrial processes require high temperatures (around 500 °C), which are difficult to achieve with renewable energy. Another challenge is that processes are highly integrated, making structural changes and retrofits complicated without early retirement. Other barriers include that industries must remain globally competitive and investing in decarbonization will initially raise costs. In India, the steel and cement industries are highly privatized and will respond to market reform more quickly than through command-and-control policies. The Perform, Achieve, and Trade scheme regulated by the Bureau of Energy Efficiency aims to reduce energy consumption in energy-intensive industries via market-based mechanisms. In general, it is important to include a mix of market controls to initiate a response from industry. A clear road map toward decarbonization with sector-specific targets alongside technological investments for energy efficiency and waste reduction will assist in a transition (Deore et al., 2021).

3.3 Social Dimensions

This section will discuss the social implications of an economic coal transition, namely associated health benefits, and the importance of a just transition. India will have the greatest challenge with a coal transition because of the high use of coal in its economy. For countries that do not produce coal, a just transition will require less intensive social protections.

3.3.1 Health Benefits

One societal benefit of a coal transition is that phasing out coal can significantly reduce air pollutant emissions and improve health outcomes. While there are many contributors to air pollution, coal burning is responsible for about half of sulfur dioxide (SO_2) emissions, 30% of NOx, and 20% of particulate matter (Busby et al., 2021). SO_2 is one of the main contributors to secondary fine particulate matter ($PM_{2.5}$), the most hazardous pollutant for human health. Between 2010 and 2020, Sampedro et al. (2020) modeled five scenarios to estimate the health co-benefits of cancelling coal plants under different mitigation strategies. The authors estimate that poor air quality caused by coal-fired power plants led to 6 to 8% of total premature deaths attributable to air pollution globally. These mortalities are heavily concentrated in India, with 36 to 49% of those deaths occurring in the country. Cancelling new projects under development and replacing coal with clean energy sources can reduce $PM_{2.5}$ concentrations by 13% in India. This could then reduce premature mortality by 3 to 17% in 2050. The study also shows that health benefits achieved from improved air quality by cancelling coal plants are comparable globally to the co-benefits that would be gained by full implementation of the Nationally Determined Contribution targets outlined under the Paris Agreement (Sampedro et al., 2020).

Additional studies also demonstrate the health benefits of a coal transition. Cropper et al. (2021) state that deaths in India due to ambient particulate matter in 2018 totaled approximately 846,000 and that coal plants were responsible for about 9% of those deaths. Assuming a 40-year plant life, cancelling currently planned plants can reduce the number of future deaths by about 844,000 (Cropper et al., 2021). With a shorter plant life, this number is reduced but still remains substantial. Saha et al. (2017) estimate a rule of thumb that 10 deaths occur per 1,000 metric tons of SO_2 emitted and nine deaths occur per 1,000 metric tons of NOx emitted from coal-fired power plants in India.

Other negative effects of poor air quality include a decline in life expectancy and the associated economic losses. The University of Chicago's Air Quality Life Index (AQLI) reports an average particulate matter concentration of 70.3 $\mu g/m^3$ in India, which is the highest in the world and around seven times the World Health Organization's recommended target of 10 $\mu g/m^3$. The AQLI estimates that poor air quality has reduced average life expectancy in India by 5.9 years, with Delhi residents losing up to 10 years of life expectancy (Lee and Greenstone, 2021). As of 2019, Bangladesh is losing 5.4 years of life expectancy on average due to poor air quality, Nepal is losing 5.0 years, Bhutan is losing 2.4 years, and Sri Lanka is losing 0.9 years (AQLI, 2021). In 2019, the IEA stated that there were over one million deaths in India due to ambient and household air pollution. Another study placed this number closer to 1.67 million premature deaths and estimated that air pollution caused $36.8 billion in economic losses (nearly 1.4% of GDP. An additional study estimated a total of 980,000 annual premature deaths for a total economic cost of $28.8 billion per year (IRENA, 2021b). Based on the results of these studies, the connection between coal-fired power, air pollution, and health detriments is clear. A coal transition can reduce premature mortality by improving air quality and therefore quality of life for citizens.

3.3.2 A Just Transition

A just transition refers to prioritizing equity when phasing out coal. This could include areas of environmental justice, climate sustainability, social inclusion, and distributional impacts. To assure that communities are not disproportionately affected by the impacts of a coal phase-out, meaningful stakeholder mapping and engagement can have significant positive impacts. For all of South Asia, a truly just transition will require regional planning because each state faces unique challenges with a transition. It is crucial to recognize the affected stakeholders and assure meaningful participation at the local, state, and national levels. Institutional structures for this kind of participation may be lacking. An additional social issue in India specifically is that coal-rich states are primarily in the east and are among the poorest in India, whereas wealthier states in the south and west have a high potential for solar power. Care should be taken that already impoverished areas in coal-rich locations are re-employed, reintegrated, and resettled if necessary (Ward et al., 2021).

During a coal transition, job loss and creation will not be an even one-for-one exchange, although research has shown the high potential for job creation with the use of renewables. For example, one study showed that on average, for every $1 million in investments, renewables would create 7.49 jobs, the energy efficiency industry would create 7.72 jobs, and fossil fuels would create 2.65 jobs. This implies that every million dollars moved from investing in conventional energy resources to renewables creates a net increase of about five jobs (Garrett-Peltier, 2017). The International Renewable Energy Agency estimates worldwide renewable energy employment, including direct and indirect, at 12 million in 2020, up half a million jobs from 2019. Additionally, under different scenarios, renewable energy and energy efficiency jobs could make up over 50 to 78% of jobs in the energy sector by 2030, depending on levels of investments (IRENA, 2021c). Research from Ram et al. (2020) suggests that the number of jobs created by new renewable energy capacity are significantly higher than that of jobs created by fossil fuels and nuclear power. The authors estimate that by 2020–25, renewable energy will compose about 70% of jobs in the energy sector; by 2050, this increases to 80% (Ram et al., 2020). Other studies show that in general, clean energy options create more jobs per unit of electricity generation. The majority consensus is that jobs gained in renewable energy and related fields will be greater than job losses in fossil fuels.

However, there are still two major concerns with a just transition. These are most applicable in India with its large coal economy, although the principles are true for any coal transition. There is also limited employment data available outside of India. The first concern is that coal mining communities are often semi-isolated and that reducing the income coming from mining activities can cripple the economies of these towns. Additionally, there is a strong sense of identity among coal miners that may make some resistant to a transition. These communities need to be supported through a coal transition if it is to be just. The second concern relates to jobs. Reemployment of miners can be difficult because of the wage disparity between mining and other professions, and job losses resulting from indirect activities must be considered. While the economy-wide job potential for renewable energy is high and will be beneficial, it is important to assure a smooth transition and manage potential job losses appropriately as well (Stanley et al., 2018). In terms of employment numbers, over 700,000 citizens in India are directly employed within the coal mining industry, and that number can increase up to 4 million when including indirect employment (Pai and Zerriffi, 2021; Busby et al., 2021; Ward et al., 2021). Additionally, coal accounts for around 30% of the railroad sector's revenue, and the rail network employs 1.3 million people; in a coal transition, there will be job losses here as well (Beaton et al., 2019).

Further research could be conducted in this area to explore the impacts of a just transition on employment and other economic effects, resettlement, and migration patterns. In particular, it is important to note that while a transition will be beneficial economy-wide in terms of net job production, it creates a socioeconomic challenge for coal workers, particularly miners and their families. Skills may not be transferable, or coal workers may not wish to abandon their livelihood due to cultural or personal significance. These issues must be handled with care and require policy support — please see the following section on policy recommendations for further insight.

4.0 Policy Recommendations

Below are several targeted policy recommendations corresponding to the key challenges of a coal transition. This section will discuss employing innovative financing measures to discourage future coal investments, leveraging regional and international cooperation to diversify energy portfolios, and strategies for a just transition. Policy recommendations themselves are bolded and are followed by a brief discussion.

4.1 Financial

Employ innovative financing measures to avoid stranded assets by discouraging future coal investments.

Avoiding the risk of stranded assets means that construction of new coal plants and infrastructure should be avoided. To facilitate a smooth transition, countries can leverage innovative financing methods. These include carbon policies and taxation strategies, reduction of fossil fuel subsidies, using green bonds, and mixing public and private financing to diversify capital sources.

Introducing a carbon pricing system would discourage further investment in coal assets. Whether it is in the form of a carbon tax, emissions trading system, or another method will depend on the political economy of the country and other economic factors. It is possible to start with a small monetary amount initially and gradually increase, or countries could introduce an excise tax. Sri Lanka does not have an explicit carbon tax or emissions trading system, although it does collect excise taxes on gasoline and diesel. The Organisation for Economic Co-operation and Development has estimated potential revenue from a carbon price reform in Sri Lanka: if the effective carbon rate was 30 euros per ton of CO_2 for all fossil fuels, Sri Lanka could earn as much as 0.5% of GDP in revenue (OECD, 2021a). India has an excise tax on petroleum and diesel that could be extended to coal (Viswanathan et al., 2021). India also has a cess on coal production called the Goods and Services Tax Compensation Cess, where a cess is a fee levied to raise funds for a particular need. Originally called the Clean Energy Cess, funds were initially directed toward research in clean energy although were repurposed for various regional development needs. The remaining revenues from the cess could be used to accelerate a write-down of loans owed to public sector banks by developers of coal-fired power plants with the condition that they cannot finance new, unabated coal capacity. This would both alleviate pressure in the financial sector and impede future unabated coal development, protecting against stranded asset risk (Singh, 2020; Gerasimchuk et al., 2018).

An additional measure to further prevent future unabated coal investments and therefore mitigate the risk of stranded assets would be to end fossil fuel subsidies. India subsidizes oil, gas, and coal and Bangladesh subsidizes electricity and gas (IEA, 2020). Sri Lanka currently spends more on fossil fuel subsidies than it earns in tax revenues (OECD, 2021b). Indian subsidies for coal are almost double those of renewables, and in general, fossil fuel subsidies total more than seven times the support for renewable energy (Viswanathan et al., 2021). To prevent the entrenchment of fossil fuels into the future economy, thereby exposing a country to financial risk, it would be economically beneficial to reduce or eliminate subsidies.

Another pathway for introducing innovative financing measures is the use of green bonds, whose proceeds are designated for green end uses only. Green bonds would incentivize investments in renewable technologies as opposed to coal, driving economies toward low-cost energy sources and away from stranded asset risks. This route could diversify capital sources and move countries away from national banks; India in particular would benefit because its banks are heavily involved in the coal industry and its renewable targets require substantial investment. Additionally, mixing public and private financing could attract private investors to the region as another financing method (Carey, 2021). Given that developing countries do not often have expendable revenue, the private sector can be key in financing renewable energy projects, again moving economies away from stranded assets and towards inexpensive alternatives. The private sector accounted for over 90% of global renewable energy investments in 2016 with conventional debt and equity as the most prominent financing tools (IRENA, 2019; IRENA and CPI, 2018). Based on the success of the World Bank Solar Home Systems in Bangladesh (to be discussed further in the following section), it may be possible to engage the World Bank or other investors such as the Asian Development Bank in similar off-grid projects.

4.2 Energy Security

Reduce reliance on international coal to enhance energy security by diversifying energy portfolios with alternative domestic resources and leveraging regional and international cooperation.

One option to support energy security that would also assist in a coal transition is to invest in domestic renewable energy, avoiding the need to import. This can be facilitated through regional and international cooperation. India chairs the International Solar Alliance (ISA), a coalition of solar-rich countries dedicated to increasing the use and quality of solar power. The ISA is open to all UN members; Bangladesh, India, the Maldives, and Sri Lanka are all member countries. Utilizing common resources of the ISA may prove useful in encouraging investment in domestic solar power across the region (ISA, 2020). Solar power also does not strictly need to be grid solar. The World Bank Solar Home Systems program in Bangladesh is the largest off-grid solar power program in the world and provided 20 million citizens access to electricity in rural areas (The World Bank, 2021). This program can be used as an example for South Asia going forward, both in terms of innovative financing and investing in domestic resources. Implementing widespread off-grid solar would be beneficial in terms of avoiding the need to connect all consumers to the grid, something countries like Nepal struggle with in isolated areas. Such a program would promote self-sufficiency because countries in South Asia have a high potential for solar. Climate Analytics estimates that solar and wind could meet the needs of South and Southeast Asia four times over, although resources are distributed unevenly. Regional cooperation could help with the uneven distribution of renewables with cross-border power interconnections and leveraging the diverse portfolios of each country. This could allow for energy trading and create new export opportunities for countries with excess renewable energy potential (Climate Analytics, 2021). In general, investing in domestic renewables strengthens energy security and reduces market risk for South Asia.

4.3 Social Dimensions

Recognizing the near-term opportunities for societal gains, early retirement is necessary, keeping in mind the principles of a just transition.

Early retirement is a critical component of a comprehensive coal transition but is socially and economically sensitive. Benefits to early retirement include reduced air pollution and therefore decreased premature mortalities and increased life expectancy. Sector-specific policies to target larger emitters as low-hanging fruit without neglecting lower emitters that may increase with time may prove to be an efficient approach to early retirement (Deore et al., 2021). For example, the power sector in India consumes the most coal in the region and therefore presents many opportunities to reduce emissions in economically positive ways. When considering closures in the power sector, plants could be categorized on suitability for early retirement by several metrics such as plant efficiency, technical attributes like age or size, profitability metrics, stranded asset risk level, environmental impacts, or just transition matters like employment/retirement speed and workforce-related payouts (Singh and Sharma, 2021; Cui et al., 2021a). These categories can create benchmarks for implementing an early retirement policy, similar to implementing emissions standards.[4] Assigning mandatory targets to improve energy efficiency in newer power plants and strict emissions standards in older power plants is another way to encourage industry to prioritize which plants to close (Vishwanathan et al., 2018). In lieu of closures, the IEA has recommended using CCS technologies to reduce industrial emissions (Deore et al., 2021).

While experiencing the positive benefits of early retirement, provide policy support to affected communities to achieve a just transition.

To facilitate a just transition, policymakers must understand which communities will be affected by a coal phase-out and to what extent. It is important to engage with stakeholders early in the process so that groups are not excluded and can raise issues important to them before the implementation of any plan. Inclusive, continuous dialogue is imperative. These engagements will be most valuable if they occur on the local, state, and national levels as needs differ with scale. Stakeholders will also vary from community members to public authorities.

Two components of a just transition include working toward creating funds to support the transition and assuring social protections. Funds could come out of existing fossil fuel subsidies or through other fundraising mechanisms, although this is a challenge. Involving representatives from a variety of departments such as labor, health, and finance in addition to environmental stakeholders can allow for resource pooling and comprehensive planning (Conway, 2017). The process is less likely to succeed if it is exclusively top-down or bottom-up.

In terms of social protections, Olson et al. (2021) created a just transition framework of international best practices. They identify the tools and policy areas that contribute to a successful just transition as workforce development (policy strategies and tools helping people, including social protections), reclamation (the environment), and economic development (the economy). These categories are broken down into policy strategies, policy tools used to accomplish the strategies, and common stakeholders engaged under each strategy. Workforce development involves education, training, and unemployment or relocation funding alongside enhanced social benefits (Olson et al., 2021). Implementing labor policies to incentivize the employment of former coal workers could minimize losses, and pre- and post-closure

[4] Note that Cui et al. (2021b) details a plant-by-plant strategy for early retirement of coal plants in China. While there is limited data on early retirement globally, such a framework could be applied to the power sector in India to identify straightforward opportunities and guide policy.

assistance for affected workers and families can greatly assist in a transition (Stanley et al., 2018). Engaging with unions, universities, and coal mine workers can provide insight into local workforce demographics. Reclamation projects involve reclaiming coal brownfields, retrofitting existing coal-fired power plants, or repurposing coal power plants sometimes to alternative fuel power plants. Projects are more successful if state or local governments are engaged. Economic development policies are directed toward stimulating new business through small business loans, resource access, or subsidies for sustainable business. Alternatively, community development strategies, including infrastructure updates, can provide pathways to disassociate from the coal industry. Please reference Olson et al. (2021) for more details and case studies.[5]

An additional issue is shutting down or repurposing mines; this is related to both funding concerns and supporting communities in a just transition. One path could be creating a special purpose entity for closing coal mines created by the central government that could help coordinate matters on the administrative side, depending on the scale and complexity of the transition. With the right policies, mines can be safely decommissioned and potentially repurposed for either economically or socially valuable purposes (Islam and Sheldon, 2021). The World Bank also suggests that a beneficial solution may be employing a range of government agencies to work together to manage social and labor impacts while a specific mine closure agency handles the details of decommissioning mines (Stanley et al., 2018). As mentioned, mining communities can be isolated and have a strong sense of identity, so engaging with local stakeholders will be key.

[5] The World Bank has also developed a Coal Sector Transition framework that has been applied in other countries that could serve as a resource; see Stanley et al. (2018).

5.0 Conclusions

A comprehensive, economic, just coal transition in South Asia will be beneficial for countries' finances, energy security, and overall health and well-being. Given a shifting global focus on the phase-down and phase-out of unabated coal power, South Asia has the potential to be a leader in just coal transitions.

By moving toward low-cost renewables, South Asia can avoid the risk of coal infrastructure becoming stranded assets. The process of potentially halting new coal builds can be eased by employing innovative financing methods. These include but are not limited to a carbon pricing system, green bonds, public–private partnerships, and international climate financing.

To avoid market volatility and enhance energy security, countries can invest in domestic resources. South Asian countries overall have a high potential for renewable energy capacity and can leverage international and regional cooperation to further renewable energy development. Engaging with the ISA or participating in initiatives such as the World Bank Solar Home Systems or the Climate Investment Funds' ACT Investment Program combines alternate financing methods with international cooperation.

Societal benefits to a coal transition include the health impacts of improving air quality, which are tied to economic gains. Doing so may involve retiring coal plants early, which can be done systematically. CCS technologies can play a role here as well. A coal transition also has a high potential for net job creation, although a just transition will involve comprehensive policy support and stakeholder engagement for the communities who will be most affected during a coal phase-out.

India in particular will face the largest challenges with a coal transition because other South Asian economies do not use as much coal. The country is in a unique position where it can shift its support toward its high potential for renewable energy as an alternative to coal. However, because of the large number of people involved in the coal industry, a just transition will require concerted attention. Elements that will promote a just transition include stakeholder engagement at the local, regional, and national levels as well as pre- and post-closure assistance. Because India has the highest levels of coal use in the region, the country stands to gain the most from a comprehensive economic coal transition relative to other South Asian countries. Health benefits will also be tremendous because India has the worst air quality levels in the world. Further research could be conducted into more specific next steps in a coal transition as well as examining each of the framework elements in more detail. Future work on a just transition will also be critical.

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Appendix A – Energy and Policy Overview for SAGE Countries

The following section contains supplementary information on the general energy and policy spheres in South Asia Group for Energy countries as they pertain to a coal transition, as well as basic energy statistics and figures.

Figure 5 depicts where coal is consumed within South Asian economies. The power sector dominates coal consumption in India and Sri Lanka, whereas industry uses the most coal in Bangladesh and Nepal. This breakdown helps identify accessible opportunities within each country for an energy transition. Because of the sheer size of the Indian power system, the largest reductions in coal consumption could come from this sector.

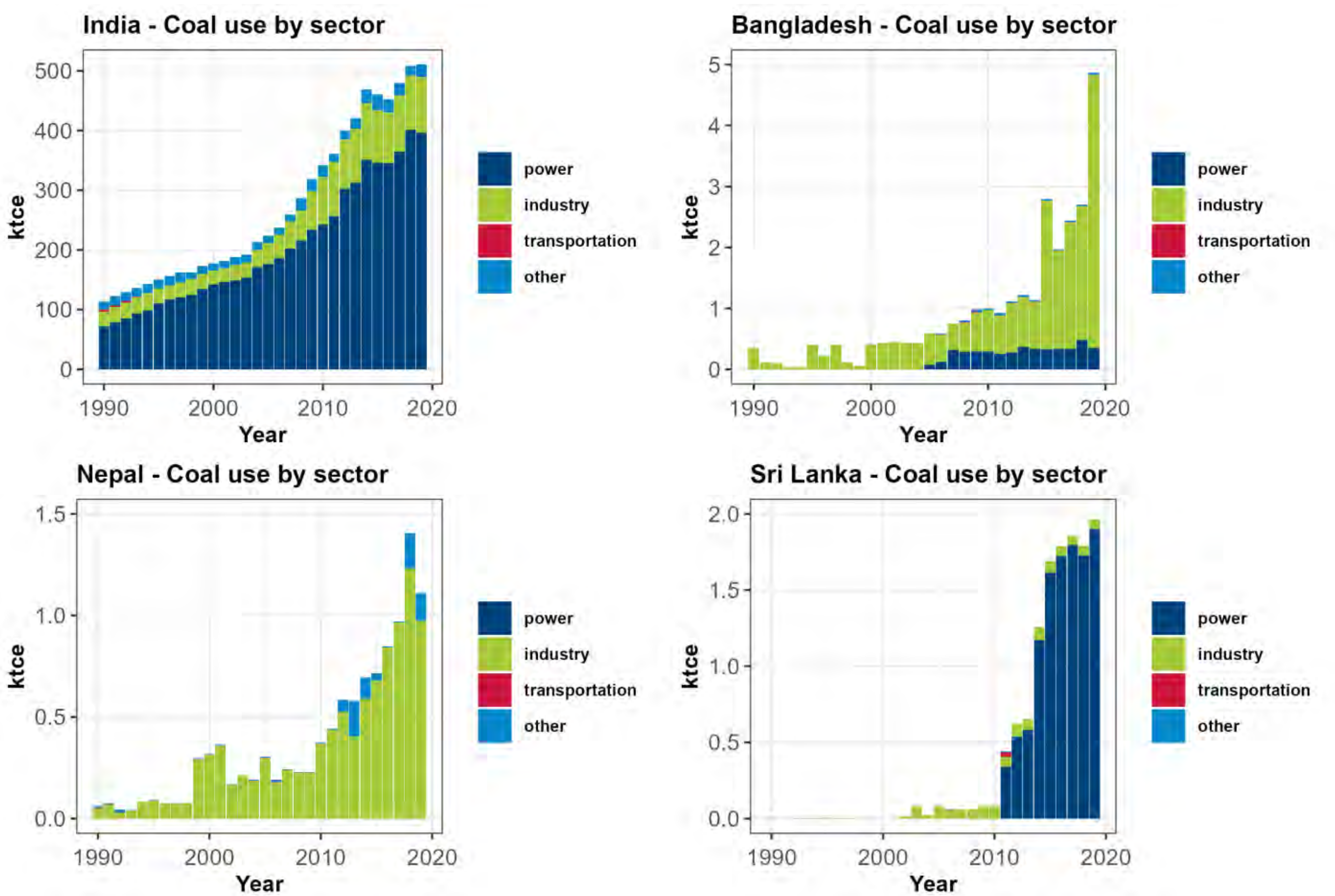

Figure 5. Primary coal use by sector for South Asian countries

A.1 Bangladesh

As of 2019, coal accounted for just 5% of total primary energy supply in Bangladesh, with natural gas dominating at 55%, followed by biomass at 23%. Most of this coal is consumed in industry. In 2020, gas generated 81% of electricity. Bangladesh began to use coal for electricity in 2005, but it represents a very small share of total generation (IEA, 2021d). Electricity imports are expected to increase to 15–25% of total power generation until 2041, with imports coming from India, Bhutan, Myanmar, and Nepal according to the country's 2016 Power System Master Plan. Local renewables will contribute marginally (Gulagi et al., 2020). Further investments in coal may worsen the overcapacity problem. Instead, focusing on improving energy efficiency with domestic resources has the potential to shield the country from further risk.

A.2 India

In India, the central government heavily supports coal and owns three coal companies: (1) Coal India Limited, which produces 81% of domestic coal and is the largest coal company worldwide; (2) Singareni Collieries Company Limited, and (3) Neyveli Lignite Corporation. Together, the three companies produced 93% of Indian coal in the 2018–19 fiscal year (Ward et al., 2021). India currently has an operating coal power capacity of 233 GW, where 69% of installed capacity is sub-critical and 28% of capacity are supercritical plants. There is a small amount of ultra-supercritical technology under construction or planned (GEM, 2021). Sub-critical technology means that plants are not operating as efficiently as possible. Related to climate, lower-efficiency coal plants must use more coal and produce more emissions than high-efficiency plants to generate similar amounts of electricity.

In addition to continued support for coal, the Indian government has laid out climate actions, particularly significant renewable energy goals, and is looking toward clean energy sources such as solar and wind power. The government is encouraging businesses to shift to renewables and will expand its renewable energy capacity almost fivefold to meet decarbonization targets (Chaudhary and Ghosh, 2021). Additionally, Prime Minister Modi announced in August 2021 that India will be energy independent in the next 25 years by investing in green hydrogen and is also aiming for the railroads to be net-zero carbon emitters by 2030 (Madhok, 2021). India recently achieved 100 GW of installed renewable capacity, although to achieve the newly established target of 500 GW by 2030, current install rates would need to increase dramatically. Serious action and capital investments must be on the horizon to accomplish this (Trivedi, 2021).

A.3 Sri Lanka

As of 2019, coal was responsible for 12% of primary energy supply in Sri Lanka and was used primarily for power. Oil accounted for 43% of primary energy supply, followed by biomass at 40%. Coal consumption jumped in 2014 after the Puttalam power plant opened. As of 2020, hydro, oil, and coal each accounted for about a third of power generation in Sri Lanka (IEA, 2021d). Sri Lanka is utilizing almost all of its hydropower potential and has further development potential for solar, wind, and biomass. In 2016, the government pledged to establish approximately 910 MW of renewable power plants by 2030. Issues that the country is facing include capacity shortages, delays in the implementation of power plants, and slow growth in renewables development, in addition to a severe financial crisis. Challenges in the electricity sector specifically include high generation costs that drive up costs of supply and electricity prices, political and technological constraints to renewable energy development such as grid capacity and reliability issues, and limited financial resources (ADB, 2019).

A.4 Bhutan

As of 2016, coal composed 15% of final energy consumption in Bhutan, while biomass and electricity were responsible for 36% and 28%, respectively. Net domestic consumption of coal was 97.6 Mtoe; 58.0 Mtoe was imported and 15.4 Mtoe were exported (IRENA, 2019). Bhutan is actually a net carbon sink with an estimated annual natural sequestration capacity of 6.3 million tons of CO_2 with average annual emissions of 2.1 million tons of CO_2. In the government's most recent five-year plan document, coal is not mentioned once (Gross National Happiness Commission, 2019). One national priority includes grid stability through diversifying the energy portfolio with other renewables, so the country is exploring solar and wind possibilities (ADB, 2020b; ADB, 2021). These technologies are in the initial stages of development and are limited to pilot projects and small-scale deployment (IRENA, 2019).

A.5 The Maldives

The Maldives does not produce or consume significant amounts of coal, and there is limited data on energy patterns. The country is currently dependent on fossil fuel imports. Energy demand is increasing because of tourism, fisheries, sea transport, and construction. The country relies on diesel for electricity supply, which is expensive because the diesel is imported in small amounts. In addition, the Maldives is looking at importing or designing a liquified natural gas power plant to supplement its energy supply (ADB, 2020b). Overall, the government aims to improve energy efficiency, increase use of renewables, and integrate innovative technologies like floating solar photovoltaic (PV) platforms, ocean energy, and hydrogen storage. The Maldives has a high potential for solar power and is installing solar PV technology on several inhabited islands (Islam et al., 2011). A challenge for these goals is a limited capacity for public sector financing; increased global climate financing could be highly beneficial (ADB, 2020a).

A.6 Nepal

In Nepal, coal is responsible for 6% of primary energy supply. Biomass dominates energy consumption at 72% as of 2017, although it has been declining with a rise in oil, which settled at 19% in 2017 and has been increasing fairly steadily over time. Nearly 100% of electricity is generated via hydropower; in terms of generation by source, hydropower has remained over 99% since 2001. Coal is not responsible for any electricity generation (IEA, 2021c). Nepal has no domestic coal and must import all coal consumed. The country is rich in hydropower, but there has been slow development due to inadequate planning and investments in generation, transmission, and distribution as well as other legal and regulatory inadequacies. As a result, Nepal is using less than 2% of its hydropower generation potential, and the country frequently suffers load shedding because of a large supply–demand gap. Electricity is fully generated by hydropower, and because most plants are run-of-the-river type, electricity fluctuates and is highly seasonal. In 2008, the government passed the National Electricity Crisis Resolution Action Plan with short- and long-term strategies, including importing power from India, building thermal power plants, expanding transmission capacity, and addressing electricity theft. In 2016, the government released an additional plan that outlined medium- and long-term actions to develop the electricity sector (ADB, 2017). Nepal is still heavily reliant on traditional fuels in rural areas. Linking the grid is a challenge because of geographic constraints, scattered consumers, high costs of energy supply and maintenance, low energy consumption, and low levels of household income (Pokharel and Rijal, 2021).

Appendix B – COP26 Commitment Summaries

At COP26, Bangladesh committed to obtaining 30% of its energy supply from renewables by 2030 and called for a climate prosperity plan (Ahmed, 2021).

Prime Minister Modi outlined future climate actions for India, including pledging to achieve net-zero emissions by 2070. He also discussed expanding India's renewable energy target of 175 GW by 2022 to 500 GW by 2030 and asserted that half of power-generating capacity would be based on renewables by the same year (Vaidyanathan, 2021). Prime Minister Modi also announced that by 2030, India will reduce projected carbon emissions by one billion tons and that the country will meet half of its energy requirements with renewables. By 2070, the country committed to reaching net-zero emissions (Colman et al., 2021).

Sri Lanka made several commitments related to coal transitions. It pledged to reach carbon-neutral electricity generation by 2050, to have 70% of electricity generated by renewable energy by 2030, and to achieve carbon sequestration of 7% by 2030, along with other steps to phase out fossil fuels like co-leading the "No New Coal Compact" (Colombo Gazette, 2021).

Bhutan signed a formal alliance with Suriname and Panama, aligning the three countries in the Coalition of Carbon-Negative Countries (Goering, 2021; Udasin, 2021). The Minister of Agriculture and Forests called on developed countries to scale up climate finance and emphasized the risk Bhutan faces from climate disasters (Subba, 2021).

The Maldives' Special Envoy for Climate Change said that for the Maldives to have a realistic chance of survival, global emissions must be halved within 98 months; in general, the Maldives emphasized the dangers it faces as a highly vulnerable country and its focused efforts on protecting biodiversity ("Maldives at COP26," 2021).

Nepal committed to emitting no net carbon between 2022 and 2045 and to become carbon negative after 2045, as well as halting deforestation and increasing forest cover to 45%. The country will also assure that all vulnerable citizens are protected from the effects of climate change by 2030 (Ghimire, 2021).

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