RSiS S. RAJARATNAM SCHOOL OF INTERNATIONAL STUDIES
Nanyang Technological University, Singapore

NTS INSIGHT

NTS Insight, no. IN20-01, April 2020

Domestic Coal: A Hindrance to Renewable Energy Development?

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Low carbon transition is an important climate change mitigation measure. It entails a switch from fossil fuels to renewable sources. The presence of cost-competitive domestic coal in coal-producing countries like Indonesia is often cited as a major stumbling block to renewable energy development. This article aims to probe the cheap domestic coal argument. It does so by examining the changing share of renewable energy sources in electricity production over a certain timeframe. The study finds mixed observations across important coal-producing countries. It thus argues that there is a need to go beyond the low-cost domestic coal axiom and examine deeper underlying factors that support or hinder renewable energy development in coal-producing countries.

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Recommended citation: Margareth Sembiring, **'Domestic Coal: A Hindrance to Renewable Energy Development?'**, NTS Insight, No. IN_20-01 (Singapore: RSIS Centre for Non-Traditional Security Studies (NTS Centre), Nanyang Technological University Singapore 2020).

Introduction

The world today is getting all the more anxious of the effects of climate change than ever before. The clock is fast ticking for the race to keep the planet warming below two degrees Celsius by the end of the century. Among the various options available, low carbon transition has been lauded as an important climate mitigation measure. Low carbon transition entails a switch from fossil fuels to renewable sources. When the idea to adopt environmentally sound technologies was first formally expressed in the 1992 United Nations Framework Convention on Climate Change, developed and developing countries reconciled their then contrasting positions through the principle of common but differentiated responsibilities. In practical terms, the principle requires developed countries to reduce their greenhouse gas emissions and extend assistance to developing countries to build their capacity for environmentally sound technologies. The situation has changed dramatically ever since. At present, virtually all countries, developed and developing alike, have expressed interest in incorporating renewable sources in their national energy mix. Many developing countries no longer rely on foreign assistance to acquire renewable technologies.

Although adopting renewable technologies is on the agenda of many countries, low carbon transition has seen varying levels of progress to date. Coal has been widely regarded as among the cheapest energy sources in the world, and it is often perceived as the primary reason why countries find it difficult to transition. This is even more so in coal-producing countries like Indonesia where renewable energy development is indeed lagging behind. While this looks logical, there has been little attempt to examine whether this holds true in other countries where coal is economically important. The assumption is that coal holds certain cost-competitiveness advantage in coal-producing countries.

Against this backdrop, this article provides a preliminary assessment of low carbon transition in major coal-producing countries like Indonesia, China, India, the United States, Poland, Germany, Russia and Australia. As renewable sources like hydropower, geothermal, solar, and wind commonly find their applications in electricity generation, this study thus focuses on low carbon transition in the power sector. It particularly looks at the changing share of renewable energy vis-à-vis coal in electricity production within a certain timeframe. If the common wisdom about cheap domestic coal is true, then coal-producing countries should not see renewable sources taking an increasing share over the years. This study, however, finds mixed results across these countries. It thus suggests that there is a need to go beyond the convenient attribution to cheap domestic coal as stumbling block to low energy transition. It recommends a more careful examination of other factors that may affect low carbon transition such as institutional arrangements in the political and the energy sectors.

Reference Case: Coal and Low Carbon Transition Trend in Indonesia

Commercial coal-mining activities in Indonesia dated back to the late 19th century during the Dutch colonial time.[1] Coal was used extensively to power up ships and trains and to generate electricity. Its functions then got replaced by oil throughout the years. The oil price shock in the late 1970s provided a window of opportunity for coal to make a comeback. Following the global trend that saw an increasing use of coal[2] and a decreasing use of oil[3] in electricity production, Indonesia too experienced a substantive increase in coal use in mid-1980s.[4] The growing demands for coal worldwide made it an important commodity especially for coal-producing countries like Indonesia. Indeed in 2018, Indonesia produced 8.3% of world's coal.[5] This was the third largest after China and Russia.[6] During the same period, Indonesia was the ninth biggest coal consumer in the world.[7] By the end of 2018, Indonesia had 3.5% of global proven coal reserves, which ranked sixth in the world.[8]

Regardless of its coal assets, Indonesia is aware of its renewable energy potentials. Indonesia plans to develop them for energy security and environmental reasons. This vision is expressed in Law No. 30 Year 2007 on Energy. Subsequent Government Regulation No. 79 of 2014 on National Energy Policy spells out new and renewable energy targets that will make up 23% of national energy mix by 2025 and 31% by 2050.[9]

One thing that often gets overlooked in the discussion about renewable energy in Indonesia is the fact that the country has developed renewable capacities, particularly geothermal and hydropower, long before the 1992 United Nations Framework Convention on Climate Change was signed. Hydropower was first installed during the Dutch colonial era in the early 20th century[10] whereas geothermal has been in operation since the early 1980s.[11] It is of little surprise, therefore, that these two technologies have been dominating renewable energy shares in electricity production in the country. In 2015, hydropower and geothermal made up of respectively 56% and 17% of electricity production from renewable sources.[12] Despite the relatively long history, however, Indonesia had only used about 4.9% of its geothermal potential and 6.4% of its hydropower potential by 2015.[13]

With the vision to increase renewable energy share in the national energy mix, one may think that Indonesia will prioritise the utilisation of the huge untapped energy potential using the technologies it is already familiar with. A closer look at Indonesia's national energy plan, however, reveals a different strategy. While Indonesia indeed envisions further development of hydropower and geothermal, it plans to reduce their shares in renewable-powered electricity production

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[1] Government Coal Mining in the Dutch East Indies, (1921), The Far-Eastern Review, vol. XVII, no. 4, pp. 258-259, extracted from Nineteenth Century Collections Online, http://tinyurl.galegroup.com/tinyurl/AttKG5
[2] The World Bank, (2019), Electricity Production from Coal Sources (% of total), https://data.worldbank.org/indicator/eg.elc.coal.zs
[3] The World Bank, (2019), Electricity Production from Oil Sources (% of total), https://data.worldbank.org/indicator/EG.ELC.PETR.ZS
[4] The World Bank, (2019), Electricity Production from Coal Sources (% of total) - Indonesia, https://data.worldbank.org/indicator/EG.ELC.COAL.ZS?locations=ID
[5] BP, (2019), BP Statistical Review of World Energy 68th edition, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf
[6] *Ibid*.
[7] *Ibid*.
[8] *Ibid*.
[9] Government of Indonesia, (2014), Government Regulation No. 79 of 2014 on National Energy Policy https://www.esdm.go.id/assets/media/content/content-rencana-umum-energi-nasional-ruen.pdf
[10] McCawley, Peter (1971), The Indonesian Electric Supply Industry, Doctoral Dissertation, Canberra: Australian National University.
[11] Mansoer, W. Resmiasih and Idral, Alanda, (2015), Geothermal Resources Development in Indonesia: A History, Proceedings World Geothermal Congress, 19-25 April, Melbourne, Australia https://www.geothermal-energy.org/pdf/IGAstandard/WGC/2015/06011.pdf
[12] *Ibid*.
[13] *Ibid*.

from 56% and 17% respectively in 2015 to 23% and 10% by 2050.[14] At the same time, Indonesia hopes to increase the shares of its 207,898 MW solar potential and its 60,647MW wind potential[15] from virtually nothing in 2015 to 27% and 17% respectively in 2050.[16]

The ambitious plan to increase solar and wind shares while reducing the portion of existing geothermal and hydropower technologies signifies Indonesia's keenness to develop new technological capability. This is in line with the global trend that will see wind and solar photovoltaic making up of 75% of the increase in electricity supply.[17]

Despite its vision for solar and wind, Indonesia has made only a little progress to date. By 2018, the contribution from solar and wind in electricity generation continued to be insignificant compared to other energy sources. Coal share, on the other hand, showed an upward trend from 41% in 2008 to 56% in 2018.[18]

This slow progress stands in sharp contrast to the rapid development of solar and wind in the Philippines. Like Indonesia, the Philippines has long been relying on hydropower and geothermal as renewable sources. These two technologies had been the dominant renewable technologies in the Philippines from 1990 to 2016.[19] Although the Philippines plans to become the largest geothermal producer in the world and double its hydropower capacity,[20] it also plans to aggressively develop wind power. Similar to Indonesia, the Philippines expects to see reduced shares of hydropower and geothermal from 62.5% and 36.2% respectively in 2010 to 57% and 22.6% in 2030. [21] At the same time, it aims to increase wind and solar installed capacity from virtually none in 2010 to 15.5% and 1.9% respectively in 2030.[22]

Although both countries had insignificant solar and wind capacity in the early 2010s, the situations varied remarkably within a decade. In 2018, the Philippines had installed 886MW solar capacity whereas Indonesia only had 61MW.[23] In the same year, the Philippines' solar generation grew by 4% while Indonesia's dropping by 36.8%.[24] Similarly, while the Philippines had installed 427MW wind capacity in 2018, Indonesia only had 76MW.[25] In the same period, the Philippines' wind generation increased by 5.4% while Indonesia's wind generation made no progress.[26]

Between 2007 and 2017, Indonesia consumed more renewables compared to the Philippines. Indonesia's consumption grew at the rate of 6.6% per year whereas the Philippines' grew at 2.8% per annum during the same period.[27] While Indonesia appears to consume more renewable energy, this does not reflect its relative share compared to coal use. The more accurate data that reflects the significance of renewable sources is arguably their share in electricity production. This

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[14] *Ibid*.
[15] *Ibid*.
[16] *Ibid*.
[17] International Energy Agency, (2019), World Energy Outlook 2019, https://www.iea.org/reports/world-energy-outlook-2019
[18] Ministry of Energy and Mineral Resources (MEMR) Republic of Indonesia, (2019), Handbook of Energy & Economic Statistics of Indonesia 2018, Jakarta: MEMR, https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia-2018-final-edition.pdf
[19] Asian Development Bank (ADB), (2018), Mineral Resources Energy Sector Assessment, Strategy, and Roadmap, Metro Manila: ADB, https://www.adb.org/sites/default/files/publication/463306/philippines-energy-assessment-strategy-road-map.pdf
[20] Delos Santos, Angelica, S. A., (2016), Renewable Energy in the Philippines, A presentation delivered at the East and Southeast Asia Renewable Energy Statistics Workshop, 12-14 December 2016 in Bangkok, Thailand https://www.irena.org/-/media/Files/IRENA/Agency/Events/2016/Dec/12/Philippines-presentation.pdf?la=en&hash=DEC515661934EE45D38FB632E6985581802CF3C7
[21] Department of Energy Republic of the Philippines, (n.d.), Renewable Energy Plans and Programs (2011-2030), https://www.doe.gov.ph/sites/default/files/pdf/nrep/nrep_books_021-087_re_plans_programs.pdf
[22] *Ibid*.
[23] BP, (2019), BP Statistical Review of World Energy 68th edition, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf
[24] *Ibid.*
[25] *Ibid*.
[26] *Ibid*.
[27] *Ibid*.

shows how renewable energy is developing in comparison to other energy sources including coal.

Following this argument, this study examines relevant data from years 2010 and 2017 as depicted in Figure 1 and Figure 2 below. The data show two key observations. First, coal shares in both countries had increased within the stated period. Second, although coal share in the Philippines had grown, the Philippines had been making more room for renewable sources than Indonesia. Newer types of renewable energy such as biofuels, solar and wind had visible increased shares in the Philippines in 2017 whereas they remained unaccounted for in Indonesia.

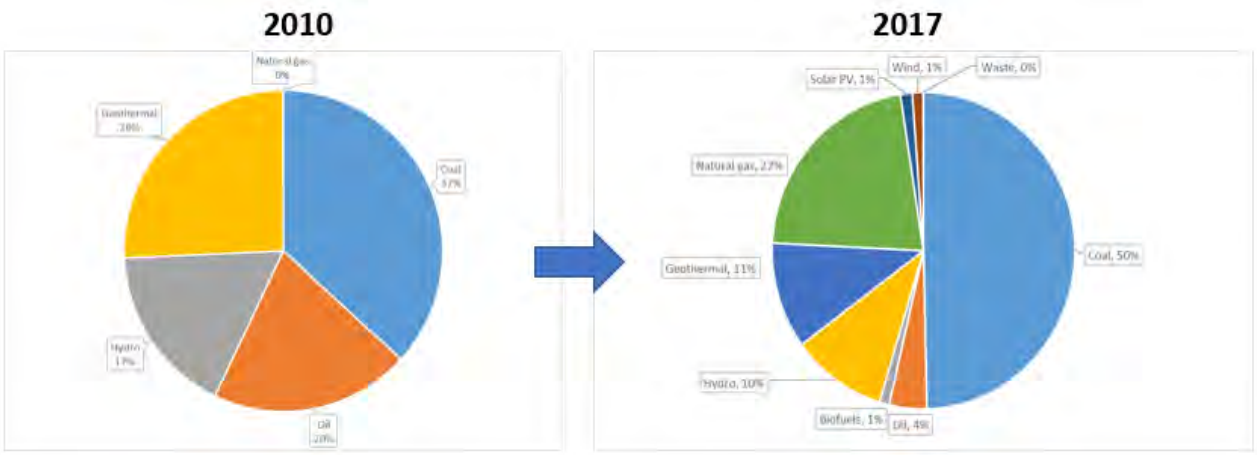

Figure 1: The Philippines' Electricity Generation by Source[28]

Figure 2: Indonesia's Electricity Generation by Source[29]

Given that the Philippines is a coal-importer, is the cheap domestic coal argument the main reason behind Indonesia's lack of progress in solar and wind development compared to the Philippines? Data shows that just like in coal-producing Indonesia, coal was among the most economic energy sources in coal-importing Philippines.[30] This could also be the reason why the Philippines' coal share increased from 37% in 2010 to 50% in 2017 as shown in Figure 1 above. Thus, if

[28] International Energy Agency, (2020), Data and Statistics for the Philippines, https://www.iea.org/data-and-statistics?country=PHILIPPINE&fuel=Electricity%20and%20heat&indicator=Electricity%20generation%20by%20source
[29] *Ibid.*
[30] Kuang, Maggie, (2014), H2 2014 APAC LCOE Update: A Race between Renewable Penetration and Fuel Prices, 12 August, https://first.bloomberglp.com/documents/93517_LevelisedCostofElectricityUpdate.pdf

cost was indeed the main determining factor,[31] Indonesia and the Philippines should have had the same incentive to cling on coal and neglect renewable energy development. However, since the Philippines was still making meaningful progress in renewable energy regardless of coal's cost-competitiveness in the country, the cheap domestic coal argument that is often loosely associated with Indonesia's lack of progress in renewables[32] may need further examination.

Additionally, there are different realities observed in other coal-producing countries like Poland, Australia, Germany, the United States, India, China, and Russia that likewise calls the common cheap domestic coal wisdom into question. The following sections provide insights to the various observations made on these countries.

#1: Constant Coal Share and No Significant Progress in Renewable Energy Share

The first case is Russia. Russia is an important coal player in the world. By the end of 2018, Russia possessed 15.2% of global proven coal reserve, which was the second biggest in the world after China.[33] Russia ranked sixth in coal production with a share of 5.6% of world's total, and its consumption also ranked sixth in the same year.[34] Although coal is available in abundance, it is not the dominant source of electricity generation. Coal had only been making up 15% to 16% of electricity production between 1990 and 2017.[35] Instead, natural gas had been the major source in the country with a constant share of about 50% during the same period.[36]

Russia's vision for renewable energy is enshrined in Russia's Energy Strategy to 2030 that was approved by Government Decree No. 1715-r of 13 November 2009.[37] It aims to increase renewable energy share in electricity production to 4.5% by 2020, excluding large hydropower. Hydropower had been contributing approximately 15% in electricity generation, about the same portion as coal, between 1990 and 2017.[38] Renewable energy share in electricity generation remains insignificant to date. Whether or not the slow progress in increasing renewable energy share is caused by cheap domestic coal, or cheap domestic natural gas for that matter, is inconclusive and needs to be further investigated.

#2: Decreasing Coal Share and Increasing Renewable Energy Share

The second observation is decreasing coal and increasing renewable source shares over the years. This is observed in Poland, Australia, Germany, China, and the United States.

Poland possessed 2.5% of world's proven coal reserve and ranked ninth in the global ranking by the end of 2018.[39] It is the ninth and tenth biggest coal producer and consumer respectively in 2018. The importance of coal in its domestic

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[31] Aside from cost, the need to reduce dependence on coal import may serve as a driving factor behind the Philippines' greater enthusiasm for renewable sources. Since the analysis focuses on cheap coal argument, the discussion about reducing import dependence for energy security purposes is beyond the scope of this study.

[32] See for example, Secretariat General National Energy Council, (2019), Indonesia Energy Outlook 2019, https://www.esdm.go.id/assets/media/content/content-indonesia-energy-outlook-2019-english-version.pdf

[33] BP, (2019), BP Statistical Review of World Energy 68th edition, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf

[34] *Ibid*.

[35] International Energy Agency, (2020), Data and Statistics for Russian Federation, https://www.iea.org/data-and-statistics?country=RUSSIA&fuel=Electricity%20and%20heat&indicator=Electricity%20generation%20by%20source

[36] *Ibid*.

[37] IRENA, (2017), REmap 2030 Renewable Energy Prospects for Russian Federation, Abu Dhabi: IRENA https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Apr/IRENA_REmap_Russia_paper_2017.pdf

[38] International Energy Agency, (2020), Data and Statistics for Russian Federation, https://www.iea.org/data-and-statistics?country=RUSSIA&fuel=Electricity%20and%20heat&indicator=Electricity%20generation%20by%20source

[39] BP, (2019), BP Statistical Review of World Energy 68th edition, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf

electricity generation is near absolute with about 96% in 1990.[40] Like Indonesia, Poland envisions the reduction of coal use. Polish Energy Policy to 2040 stipulates a reduction of coal share to 60% by 2030 and an increase of renewable portion to 21% in final energy consumption.[41] In 2019, Poland revised the policy and envisioned additional reduction of coal share to 56%-60% while further increasing renewables share to 21%-23% by 2030.[42]

Although coal continues to disproportionately dominate Poland's electricity production, its share has been dropping from 96% in 1990 to 78% in 2018.[43] At the same time, renewable energy has been taking up a greater share from 2% in 1990 to 13% in 2018.[44] Wind source in particular has been developing rapidly in the last five years.

Australia also exhibited a similar trend despite the heavy presence of coal in the country. Australia was the fifth largest coal producer in the world and it ranked third with 14% of global coal reserve by the end of 2018.[45] It has much to exploit, and thus suggests that it may be even more reluctant to reduce coal use compared to other countries that have lesser amount of reserve. Nonetheless, Australia has plans to increase the use of renewable sources in its electricity production. Australia's vision for renewable energy is reflected in the Renewable Energy (Electricity) Act 2000, Renewable Energy (Electricity) Regulations 2001 and Renewable Energy (Electricity) Amendment Act 2015. Australia's Renewable Energy Target passed in 2015 aims at building renewable capacity up to 33,000 GWh by 2020, which is about 23.5% of total electricity production.[46]

Like Poland, Australia too has made progress in increasing its renewable energy share in its electricity generation. In early 1990s, coal made up of close to 80% of electricity production sources.[47] In 2018, coal share had dropped to about 60%.[48] Conversely, renewable energy constituted of less than 10% in early 1990s, but its share had grown close to 17% in 2018.[49]

A closer look into Australia's renewable energy development shows that just like in Indonesia and the Philippines, hydropower has been an important source of renewable energy in Australia for a long time. In the early 1980s, hydropower had the biggest share of renewables, and it contributed about 10% share to the total electricity generation.[50] Hydropower's share, however, had been decreasing throughout the years with only 6% in 2017-2018. On the other hand, wind and solar had risen from nothing in the early 1990s to a noticeable share in the last decade.[51] In 2017-2018, wind and solar had 3% and 2% shares respectively.[52] This shows Australia's priority for wind and solar in its renewable energy development.

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[40] International Energy Agency, (2020), Data and Statistics for Poland, https://www.iea.org/data-and-statistics?country=POLAND&fuel=Electricity%20and%20heat&indicator=Electricity%20generation%20by%20sourcex
[41] Ministry of Energy, (2018), Extract from Draft Energy Policy of Poland until 2040, https://www.gov.pl/attachment/376a6254-2b6d-4406-a3a5-a0435d18be0f
[42] Evans, Edwardes Henry and Easton, Adam, (2019), Poland Revises Draft Energy Policy to 2040, S&P Global Platts, https://www.spglobal.com/platts/en/market-insights/latest-news/electric-power/110819-poland-revises-draft-energy-policy-to-2040
[43] International Energy Agency, (2020), Data and Statistics for Poland, https://www.iea.org/data-and-statistics?country=POLAND&fuel=Electricity%20and%20heat&indicator=Electricity%20generation%20by%20sourcex
[44] *Ibid*.
[45] BP, (2019), BP Statistical Review of World Energy 68th edition, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf
[46] Department of Agriculture, Water and the Environment, Australian Government, (n.d.), The Renewable Energy Target (RET) Scheme, https://www.environment.gov.au/climate-change/government/renewable-energy-target-scheme
[47] Department of the Environment and Energy, Australian Energy Statistics, (2019), Table O: Australian Electricity Generation by Fuel Type, Physical Units, https://www.energy.gov.au/sites/default/files/australian_energy_statistics_2019_table_o.xlsx
[48] *Ibid*.
[49] *Ibid*.
[50] *Ibid*.
[51] *Ibid*.
[52] *Ibid*.

The third country that experiences a similar phenomenon is Germany. Germany is known as the global champion of renewable initiatives. Its achievements in *energiewende*, or energy transition, often render coal's importance in the country less noticeable. Possessing 3.4% of global coal reserve by the end of 2018, Germany ranked seventh in that category.[53] Additionally, it was the tenth largest coal producer in the world and the eighth bigger coal consumer in 2018.[54] The Renewable Energy Act (EEG) and the Energy Industry Act (EnWG) are among the most important energy laws,[55] and Germany aims to increase renewable share in electricity generation to a minimum of 80 percent by the middle of the century.[56]

Although Germany is a big coal player at the global level, it has successfully reduced coal share from close to 60% in 1990 to below 40% in 2018. [57] It has likewise incorporated various renewable energy sources like biofuels, waste, wind, and solar in its energy mix over the years.[58] In 1990, renewable sources made up of 32% of electricity production, and in 2018 the share had gone up to 49%.[59] It is important to note that these renewable sources also include nuclear which share had decreased significantly from 28% in 1990 to 12% in 2018. [60] Conversely, wind and solar had made remarkable strides in the last 15 to 20 years. [61] Germany only began to see wind contribution in its electricity generation in the year 2000, but its share has reached 17% in 2018. [62] Similarly, solar was largely non-existent by 2010, but it had taken 7% share in eight years. [63] The case of Germany further reflects that strong determination for renewables makes meaningful progress possible despite coal's significant presence in the country.

China likewise experienced a similar reality. In 2018, China was by far the single largest coal producer and consumer in the world. It produced 46.7% of world's coal, and it consumed 50.5% of it.[64] By the end of 2018, it was home to 13.2% of global proven coal reserve, which ranked fourth in the world.[65] Coal has been the dominating source that made up of about 70% in electricity generation in 1990.[66] Its huge coal reserve suggests that it may continue to use coal to power up its growing economy.

China's Strategic Energy Action Plan (2014-2020), however, envisions a reduction of coal share in primary energy consumption to 62% by 2020 and an increase of renewable share to 15%.[67] In the last 15 years, coal share in electricity generation has been showing a downward trend, and its share was recorded at 68% in 2017.[68] While hydropower has been around for long and has been the most important renewable source in China, other renewable sources like nuclear,

[53] BP, (2019), BP Statistical Review of World Energy 68th edition, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf
[54] *Ibid*.
[55] Wettengel, Julian, (2018), From Ideas to Laws - How Energiewende Policy is Shaped, Clean Energy Wire, 28 August, https://www.cleanenergywire.org/factsheets/ideas-laws-how-energiewende-policy-shaped
[56] Appunn, Kerstine and Wettengel, Julian, (2020), Germany's Greenhouse Gas Emissions and Climate Targets, Clean Energy Wire, 23 January, https://www.cleanenergywire.org/factsheets/germanys-greenhouse-gas-emissions-and-climate-targets
[57] International Energy Agency, (2020), Data and Statistics for Germany, https://www.iea.org/data-and-statistics?country=GERMANY&fuel=Electricity%20and%20heat&indicator=Electricity%20generation%20by%20source
[58] *Ibid*.
[59] *Ibid*.
[60] *Ibid*.
[61] *Ibid*.
[62] *Ibid*.
[63] *Ibid*.
[64] BP, (2019), BP Statistical Review of World Energy 68th edition, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf
[65] *Ibid*.
[66] International Energy Agency, (2020), Data and Statistics for People's Republic of China, https://www.iea.org/data-and-statistics?country=CHINA&fuel=Electricity%20and%20heat&indicator=Electricity%20generation%20by%20source
[67] Ma, Tianjie, (2016), China's 5 Year Plan for Energy, The Diplomat, 6 August, https://thediplomat.com/2016/08/chinas-5-year-plan-for-energy/
[68] International Energy Agency, (2020), Data and Statistics for China, https://www.iea.org/data-and-statistics?country=CHINAREG&fuel=Electricity%20and%20heat&indicator=Electricity%20generation%20by%20source

biofuels, wind, and solar have been taking a greater share in China's electricity production.[69] The share of these renewable sources, excluding hydropower, have grown from virtually none in 1990 to 11% in 2017.[70] This phenomenon again shows that the presence of cheap domestic coal in a coal producing country does not necessarily hinder the increasing share of renewable energy in electricity generation.

The last case study in this category is the United States. The United States was home to 23.7% of global coal reserve, the biggest in the world by the end of 2018.[71] It supplied 9.3% of global coal production in 2018 and was second only to China.[72] In the same year, the United States was the third largest consumer of coal in the world with 8.4% share.[73]

The United States' stance towards renewable energy has been volatile. During Obama's presidency, the United States was openly in favour of renewable energy development. The president's New Energy for America plan envisions renewables to make up of 10% of electricity production by 2012, and to further rise to 25% by 2025.[74] The current Trump administration is less supportive of renewables.[75] Regardless of a lack of enthusiasm at the federal level, some states continue with their own renewable energy targets.[76]

The United States has seen a decreasing share of coal in its net electricity generation from about 46% in 1950 to 27% in 2018.[77] Just like other countries discussed earlier, hydropower has been contributing to electricity generation for a long period of time. In 1950, it made up of about 30% of net electricity generation.[78] Hydropower share has been on a downward trend over the years, and constituted of only 7% in 2018.[79]

Because of hydropower's decreasing share, renewable energy's overall portion had gone up only slightly from approximately 30% in 1950 to about 36% in 2018.[80] These renewable sources included nuclear which share had grown from 1% in 1970 to 17% in 2018.[81] Other forms of renewable technology showed mixed trends. Wind and solar have been on the rise, from a negligible share in electricity production in 1985 to 6.5% and 1.5% respectively in 2018.[82] Wood and geothermal, on the other hand, have seen decreasing shares from 1.1% and 0.5% respectively in 1990 to 0.98% and 0.38% respectively in 2018.[83] Waste share has been generally constant at about 0.4% to 0.5% from 1990 to 2018.[84]

The United States' experience again shows that certain types of renewable sources can have an increasing share in electricity production despite coal's significant presence in the country.

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[69] *Ibid*.

[70] *Ibid*.

[71] BP, (2019), BP Statistical Review of World Energy 68th edition, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf

[72] *Ibid*.

[73] *Ibid*.

[74] Barack Obama and Joe Biden: New Energy for America, https://www.energy.gov/sites/prod/files/edg/media/Obama_New_Energy_0804.pdf

[75] Natter, Ari, (2019), Trump Again Seeks Deep Cuts in Renewable Energy Funding, Bloomberg, 7 March, https://www.bloomberg.com/news/articles/2019-03-07/trump-said-to-again-seek-deep-cuts-in-renewable-energy-funding

[76] Quinton, Sophie, (2019), To Counteract Trump on Climate, States Set Clean Energy Targets, The Pew Charitable Trusts, 2 August, https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2019/08/02/to-counteract-trump-on-climate-states-set-clean-energy-targets

[77] U.S. Energy Information Administration, (2020), Monthly Energy Review February 2020, Washington, D.C.: EIA, https://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf

[78] *Ibid*.

[79] *Ibid*.

[80] *Ibid*.

[81] *Ibid*.

[82] *Ibid*.

[83] *Ibid*.

[84] *Ibid*.

#3: Increasing Coal Share and Increasing Share of Newer Types of Renewable Energy

The third phenomenon is an increased share in newer types of renewable that is accompanied by growing coal share as observed in India. This was made possible by a significant decrease in hydropower contribution over the years that then allowed coal and newer types of renewable energy to have bigger portions in electricity production.

India is an important global coal player. It ranked fifth in coal proven reserve with 9.6% of world's total.[85] It consumed 12% of world's coal in 2018 and this was second only to China.[86] Additionally, it was the fourth largest coal producer in the world, producing 7.9% of world's total. Coal has been an important source of electricity generation, making up about 40% in 1974.[87] Just like in other countries, hydropower has long been in operation, constituting of more than 50% of India's electricity generation in 1974.[88]

Since 1974, India has seen an increasing share of coal and a decreasing share of hydropower in its electricity production. During financial year 2017-2018, coal share has risen to about 75% whereas hydropower's has dropped to less than 10%.[89] With the exception of hydropower, India's ambitious renewable targets have seen renewable consumption grow at an annual rate of 17.5% between 2007 and 2017.[90] These renewable energy sources have grown from virtually nothing in the early 1990s to about 8% by 2018.[91] India's experience thus is rather unique compared to other countries discussed so far because its coal share increased at the same time as its renewables'. In any case, the presence of cheap domestic coal does not seem to stop newer forms of renewable energy from having a greater share in India's electricity production.

Discussion and Conclusion

This article shows that the presence of cost-competitive domestic coal does not necessarily hinder renewable energy development. The study finds that there are mixed phenomena in the way major coal-producing countries incorporate renewable energy sources in their electricity production. Indonesia has yet to show meaningful progress in renewable development to date; on the contrary, its coal share remained dominant and even increased in the last decade. Likewise, Russia has not seen a significant increase in its renewable energy share although its coal portion remained constant throughout the years. Poland, Australia, Germany, China and the United States have managed to reduce coal share while increasing renewable energy portion in electricity production. India increased its renewable share, but coal was taking a larger portion at the same time. This was made possible because its hydropower contribution decreased significantly over the years thereby making room for more coal and other types of renewable energy to be used.

The increasing share of renewable sources despite long-standing coal dominance in some countries suggest that cheap domestic coal argument, though logical, may not necessarily be the main factor behind a lack of renewable progress in

[85] BP, (2019), BP Statistical Review of World Energy 68th edition, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf
[86] *Ibid*.
[87] Central Electricity Authority (CEA), Ministry of Power, Government of India, (2018), Growth of Electricity Sector in India from 1947-2018, New Delhi: CEA, http://www.cea.nic.in/reports/others/planning/pdm/growth_2018.pdf
[88] *Ibid*.
[89] *Ibid*.
[90] BP, (2019), BP Statistical Review of World Energy 68th edition, https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf
[91] Central Electricity Authority (CEA), Ministry of Power, Government of India, (2018), Growth of Electricity Sector in India from 1947-2018, New Delhi: CEA, http://www.cea.nic.in/reports/others/planning/pdm/growth_2018.pdf

some coal-producing countries like Indonesia. While keeping an eye on it, there is a need to go beyond the argument and examine underlying factors that may affect cost and pricing in the first place. These may include institutional arrangements in the political and energy systems of each country that may either support or hinder renewable energy development. The extent to which these apply in coal-producing countries like Indonesia needs to be further investigated.

The next challenge in low carbon transition is to see whether countries that have managed to increase renewable shares will stay committed to reduce their reliance on coal. Ultimately, the most critical question that countries need to face and answer honestly is whether the renewable targets they have set, and are working towards, are indeed sufficient to avert the Earth from hitting the two degrees Celsius increase by the end of the century. This is the key to save the planet from climate change catastrophic consequences.

About the Author

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