BRICS Energy Policies and Strategies in Response to Climate Change

Milena Megre*
Researcher, Moscow State Institute of International Relations (MGIMO), Moscow, Russia.

***Correspondence:** megremilena@gmail.com

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Abstract

The paper focuses on BRICS countries' energy policies, as they are promising emerging economies and also some of the largest countries in the world, which together account for almost 40% of the world's population. In addition, the energy sector has a strong importance for these countries. BRICS countries are an intrinsic part of the global efforts and the overall result of 2030 and beyond. This paper will analyze: How have BRICS nations been addressing environmental issues in their energy policies and strategies? What are their goals and pledges? To what extent have they met their established goals? And how much further – within possible – have they yet to go?

Keywords: BRICS; Climate Change; Energy Policies.

1. INTRODUCTION

The United Nations Conference on Environment and Development (UNCED) in 1992 in Rio de Janeiro, Brazil, and the Kyoto Protocol in 1997, was responsible for opening the doors to a series of other conferences on environmental matters, and one of the most important of them was the Paris Agreement (or COP21) – which is an international treaty adopted almost universally by 197 countries, in December 2015. In short, the Paris Agreement established a long-term temperature goal, and countries were allowed to set their targets to be met by 2030 and to present their initial plans by submitting their Intended Nationally Determined Contributions (INDCs), and every five years to present their Nationally Determined Contributions (NDC), namely, their results from their INDCs, with new strategies and adjustments. The paper investigates BRICS countries' energy policies in relation to Climate Change.

2. MITIGATION GOALS AND ENERGY DATA

All countries are required to choose one base year to be used as a reference to measure their progress in the following year. For this reason, it is important to present some data related to their energy sector, mostly by analyzing the country's Electricity mix (Figure 2) and Energy mix (or Total Primary Energy Supply [TPES]) (Figure 1) in the year of 2017, also the greenhouse gas emissions rates and by sector (not including Land Use Change and Forestry [LUCF] or Land use, land-use change, and forestry [LULUCF]), and in some cases the consumption mix, and use of a certain fuel by source.

Figure 1: BRICS Energy Mix in percentage (%).

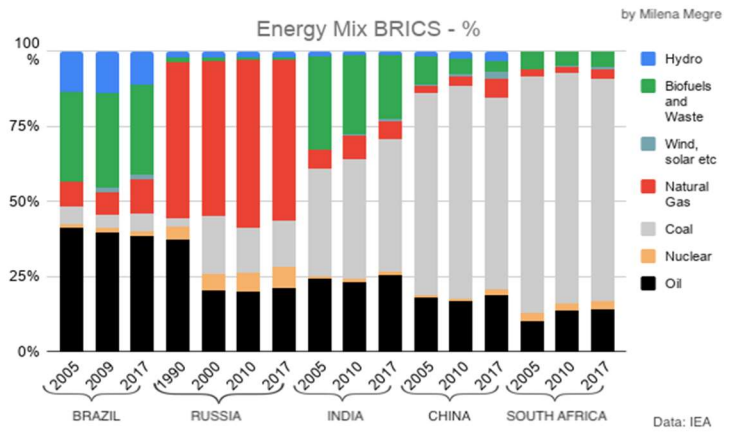


Figure 2: BRICS Electricity Mix in percentage (%).

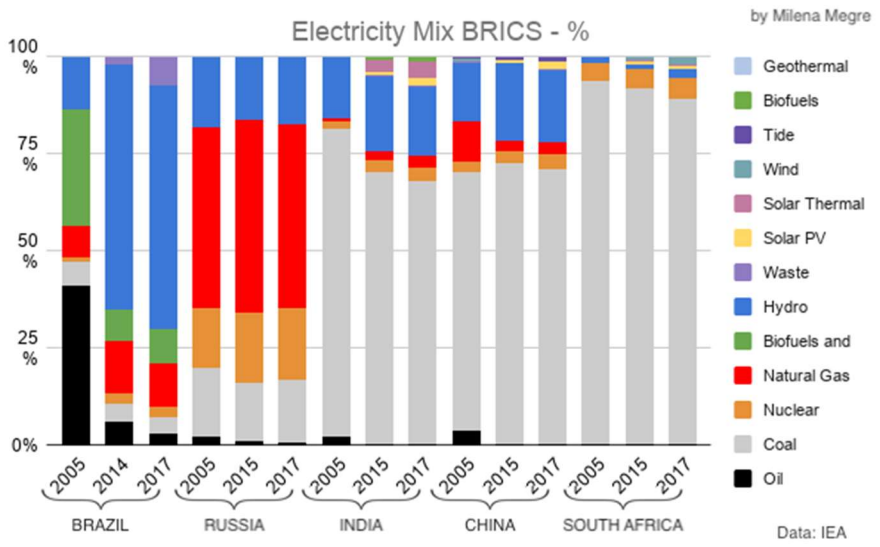


Table 1: Greenhouse Gases (GHG) emissions without LUCF in percentage (%).

GHG Emissions by Sector ($MtCO_2e$) 2016 in percentage *withouth LUCF					
	AGRICULTURE	ENERGY	BUNKER FUEL	INDUSTRIAL PI	WASTE
BRAZIL	47%	42%	2%	3%	6%
RUSSIA	4%	87%	2%	2%	5%
INDIA	22%	70%	1%	4%	3%
CHINA	1%	87%	1%	10%	2%
SOUTH AFRICA	6%	83%	3%	4%	5%

Table 2: Greenhouse Gases (GHG) emissions with LUCF in percentage (%).

GHG Emissions by Sector ($MtCO_2e$) 2016 in percentage *with LUCF						
	AGRICULTURE	ENERGY	BUNKER FUELS	INDUSTRIAL PR	WASTE	LUCF
BRAZIL	21%	18%	1%	1%	3%	56%
RUSSIA	2%	44%	1%	1%	2%	49%
INDIA	11%	34%	0%	2%	1%	51%
CHINA	0%	43%	0%	5%	1%	51%
SOUTH AFRICA	3%	42%	1%	2%	2%	49%

2.1. Brazil

Brazil submitted its first INDC report (Federative Republic of Brazil, 2016) with plans, strategies, and goals. The year 2005 is used as the basis to establish its goals for 2030. Along with its INDC report, Brazil also formulated the National Adaptation Plan (NAP). The document involves several stakeholders – from the government to the population, private initiative, and academia – and has as its main goal implementing knowledge management systems, research, technology, actions, and processes to conduct climate adaptation planning (Federative Republic of Brazil, 2016). Besides, the Government of Brazil has also created the Renovabio, which is a national policy whose objective is to expand the production of biofuels in Brazil (Federative Republic of Brazil, 2017). Moreover, differently from other BRICS countries, Brazil is the only one that has most of its GHG emissions originating from Agriculture (47%), rather than Energy (42%) (Table 1) – if not considering Land Use and Forestry (LUCF) (Table 2).

With regards to the energy data, the two predominant sources in Brazil's Energy Mix are Oil (38%) and Biofuels (30%), followed by Natural Gas and Hydro (11%), and others (Figure 1 and Table 3). It is worth mentioning that Oil is mostly used for transport (50% ±) (International Energy Agency [IEA], 2019) and that Crude Oil plays an important role in the country's economy, accounting for 7.9% of its exports (The Observatory of Economic Complexity [OEC], 2018 and 2018a). As for its Electricity Mix (Figure 2 and Table 4), Hydropower has been the main dominant source, responsible for 63% of it, then

followed by Natural Gas (11%), Biofuels, Wind, Coal, Oil, and Nuclear, respectively. In short, it can be said that while the Energy Mix is mostly dominated by fossil-fuels (57% ±) rather than renewables (42% ±), the share of renewables is still quite large. As for the Electricity Mix, there is no doubt that it is predominantly renewable (79%), owing to Hydropower.

Table 3: Energy Mix Brazil in percentage (%).

ENERGY MIX BRICS %			
BRAZIL			
Fuels / Years	2005	2009	2017
Oil	41,04%	39,58%	38,58%
Nuclear	1,21%	1,40%	1,43%
Coal	6,12%	4,55%	5,85%
Natural Gas	8,10%	7,25%	11,33%
Wind, solar etc	0,05%	1,71%	1,58%
Biofuels and Waste	29,82%	31,56%	30,12%
Hydro	13,67%	13,94%	11,11%
Data: IEA. By: Milena Megre			

Table 4: Electricity Mix Brazil in percentage (%).

ELECTRICITY MIX %				
BRAZIL				
FUELS	2005	2014	2017	2017 - 2005
Oil	41,0%	6%	3%	-38,3%
Coal	6,1%	5%	4%	-1,8%
Nuclear	1,2%	3%	3%	1,5%
Natural Gas	8,1%	14%	11%	3,0%
Biofuels and W	29,8%	8%	9%	-21,0%
Hydro	13,7%	63%	63%	49,3%
Wind	0,1%	2%	7%	7,1%
Solar PV	0,0%	0%	0%	0,1%
Others		0%	0%	0,1%
Data: IEA by Milena Megre				

2.2. Russian Federation

Although Russia only ratified the Paris Agreement in September 2019 (Luhn, 2019), it submitted its first INDC report in 2015 (The Russian Federation, 2015).

Table 5: Energy Mix Russia in percentage (%).

ENERGY MIX BRICS %				
RUSSIA				
Fuels / Years	1990	2000	2010	2017
Oil	37,26%	20,32%	20,00%	21,00%
Nuclear	4,42%	5,55%	6,00%	7,00%
Coal	2,70%	19,34%	15,00%	15,00%
Natural Gas	51,89%	51,40%	56,00%	53,00%
Wind, solar etc	0,00%	0,01%	0,00%	0,00%
Biofuels and Was	1,72%	1,11%	1,00%	1,00%
Hydro	2,01%	2,27%	2,00%	2,00%
Data: IEA. By: Milena Megre				

Table 6: Electricity Mix Russia in percentage (%).

ELECTRICITY MIX %				
RUSSIA				
FUELS	2005	2015	2017	2017 - 2005
Oil	2,2%	0,95%	0,64%	1,6%
Coal	17,4%	14,85%	15,95%	1,5%
Nuclear	15,7%	18,31%	18,57%	-2,8%
Natural Gas	46,2%	49,62%	47,40%	-1,2%
Biofuels and W	0,0%	0,02%	0,01%	0,0%
Hydro	18,4%	15,91%	17,10%	1,3%
Waste	0,0%	0,26%	0,24%	-0,2%
Solar PV		0,03%	0,05%	-0,1%
Geothermal	0,0%	0,04%	0,04%	0,0%
		Data: IEA	by Milena Megre	

Russia's Energy Mix (Figure 1 and Table 5) more than half of it consists of Natural Gas (53%), followed by Oil (21%) and Coal (15%), and others. As for its Electricity Mix (Figure 2 and Table 6), again Natural Gas is the main source, followed by Nuclear, Hydro, and Coal which account for 15-20%± each, and others. Moreover, if speaking of GHG emissions, the Energy sector is the main responsible for GHG emissions — a total of 87% (if not including LUCF) (Table 1). In conclusion, in both Energy and Electricity Mix, fossil-fuels are overly predominant in comparison to renewables, accounting for 90%± while renewables are less than 4% (Figures 3 and 4).

Figure 3: Share of Renewables and Fossil-fuels in BRICS Energy Mix in percentage (%).

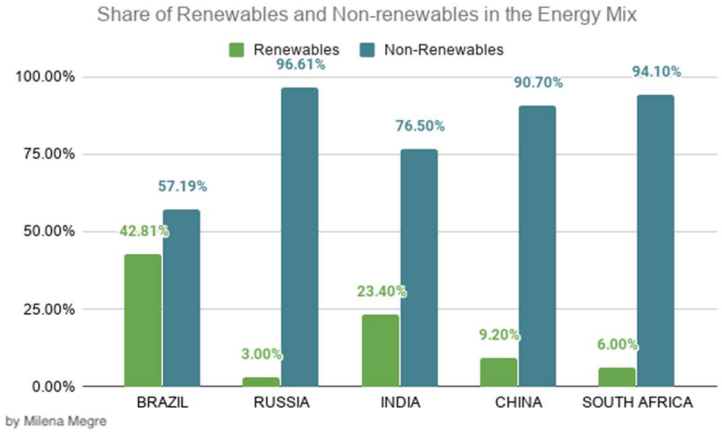
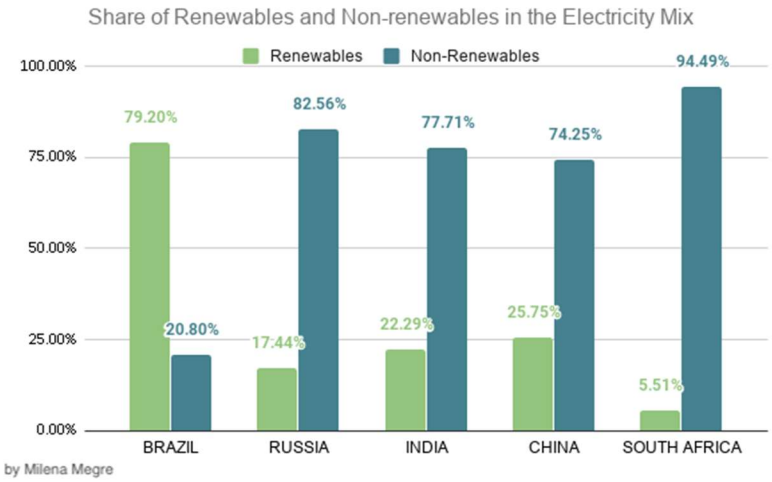


Figure 4: Share of Renewables and Fossil-fuels in BRICS Electricity Mix in percentage (%).



2.3. India

Table 7: Electricity Mix India in percentage (%).

ELECTRICITY MIX %				
INDIA				
FUELS	2005	2015	2017	2017 - 2005
Oil	4%	0%	0,16%	-3,4%
Coal	67%	73%	70,75%	3,9%
Nuclear	2%	3%	3,91%	1,5%
Natural Gas	11%	3%	2,89%	-7,7%
Biofuels	1%	1%	1,25%	0,6%
Hydro	15%	20%	18,77%	3,7%
Waste	0%	0%	0,21%	0,2%
Solar PV	0%	1%	2,06%	2,1%
Wind	1%	0%	0,00%	-0,9%
Data: IEA			by Milena Megre	

Table 8: Energy Mix India in percentage (%).

ENERGY MIX BRICS %			
INDIA			
Fuels / Years	2005	2010	2017
Oil	24,30%	23,10%	25,30%
Nuclear	0,90%	1,00%	1,10%
Coal	35,80%	39,80%	44,30%
Natural Gas	6,20%	7,80%	5,80%
Wind, solar etc	0,10%	0,30%	0,80%
Biofuels and Was	31,00%	26,40%	21,20%
Hydro	1,80%	1,50%	1,40%
Data: IEA. By: Milena Megre			

India's Energy (Figure 1 and Table 7) and Electricity Mix (Figure 2 and Table 8) have Coal as its main source, namely 44% for the Energy Mix, and more than 60% for the generation of Electricity. The other two second largest are Oil (25%) and Biofuels and Waste (21%) in the Energy Mix, and Hydro (18%) in the Electricity Mix. Other fuels are also present, but their share is considerably small in comparison to the main ones in each mix. As for India's GHG emissions, 70% of it comes from the Energy sector, and its impact is quite significant, given the fact that India is the third-largest emitter of CO_2 in the world (Wang, 2020).

2.4. People's Republic of China

As one of the strongest emerging economies of our times and one of the most important economies in BRICS (Iqbal *et al*., 2020). This is supported by the fact that geopolitical projects of China such as One Belt One Road, Belt and Road Initiative are game-changers for the world (Iqbal *et al*., 2019; Rahman and Rahman, 2019), China's INDC targets are of ultimate importance.

Table 9: Energy Mix China in percentage (%).

ENERGY MIX BRICS %			
CHINA			
Fuels / Years	2005	2010	2017
Oil	17,80%	16,90%	18,50%
Nuclear	0,80%	0,80%	2,10%
Coal	67,50%	70,60%	63,70%
Natural Gas	2,20%	3,50%	6,40%
Wind, solar etc	0,30%	0,60%	2,30%
Biofuels and Was	9,40%	5,30%	3,70%
Hydro	1,90%	2,40%	3,20%
Data: IEA. By: Milena Megre			

Table 10: Electricity Mix China in percentage (%).

ELECTRICITY MIX %				
CHINA				
FUELS	2005	2015	2017	2017 - 2005
Oil	2%	0%	0%	-2%
Coal	79%	70%	68%	-12%
Nuclear	2%	3%	4%	2%
Natural Gas	0%	2%	3%	2%
Biofuels	0%	1%	1%	1%
Hydro	16%	19%	18%	2%
Waste	0%	0%	0%	0%
Solar PV	0%	1%	2%	2%
Solar Thermal	0%	3%	4%	4%
Wind	0%	0%	0%	0%
Tide	0%	0%	0%	0%
Geothermal	0%	0%	0%	0%
Data: IEA			by Milena Megre	

It is natural that most of China's strategies are related to GHG emissions since China is the largest emitter in the world. This fact proves how important it is for China to develop, improve, and implement national policies related to the energy sector, given the fact that 87% of its emissions come from it (excl. LUCF) (Table 1 and 2). Similar to India, both China's Energy and Electricity Mix rely heavily on Coal (Figures 1 and 2, and Table 9 and 10). For instance, Coal represents 63% of the Energy Mix and around 70%± of the Electricity Mix. The other sources account for less than 4%, with the exception of Oil (18,5%) for Energy, and Hydro (20%±) for Electricity. As a result, China's Energy Mix consists of less than 10% of clean energy, and 90%± of fossil fuels (Figure 3 and 4).

2.5. South Africa

Table 11: Energy Mix South Africa in percentage (%).

ENERGY MIX BRICS %			
SOUTH AFRICA			
Fuels / Years	2005	2010	2017
Oil	10,10%	13,50%	14,10%
Nuclear	2,50%	2,40%	2,80%
Coal	78,90%	76,70%	74,00%
Natural Gas	2,40%	2,20%	3,20%
Wind, solar etc	0,00%	0,10%	0,80%
Biofuels and Waste	5,90%	5,00%	5,10%
Hydro	0,10%	0,10%	0,10%
Data: IEA. By: Milena Megre			

Table 12: Electricity Mix South Africa in percentage (%).

ELECTRICITY MIX %				
SOUTH AFRICA				
FUELS	2005	2015	2017	2017 - 2005
Oil	0%	0%	0%	0,0%
Coal	94%	92%	89%	-4,8%
Nuclear	5%	5%	6%	0,9%
Biofuels	0%	0%	0%	0,1%
Hydro	2%	1%	2%	0,4%
Solar PV	0%	1%	1%	1,0%
Solar Thermal	0%	0%	0%	0,3%
Wind	0%	1%	2%	2,0%
Data: IEA			by Milena Megre	

Similar to China and India, South Africa also strongly relies on coal for both energy and electricity generation. Its Energy Mix

Coal accounts for 74% (Figure 1 and Table 11), and in the Electricity Mix· around 90%± (Figure 2 and Table 12). The other largest sources of Energy are Oil (14%) and Biofuels (5%±), and the second-largest source of Electricity is Nuclear (6%). As for its GHG emissions, among the BRICS countries, South Africa is the one with lower emission levels, corresponding to 3% of the emissions of the BRICS countries (inc. and excl. LUCF). However, its energy sector is responsible for 83% of its greenhouse gas emissions.

3. DATA AND PROGRESS ANALYSIS

3.1. Brazil

The two main goals of Brazil's INDC were related to its Energy Mix, therefore it is possible to see whether the country has been working on implementing its targets or not. For its Goal I, Brazil has not made large progress: by comparing its Energy Mix of 2017 and 2005, there was only a 0.3% increase in Biofuels (Table 13). As for its Goal II, Brazil has decreased almost 3% of its share of Hydropower, and slightly increased the shares of 'Wind, solar, etc.' and 'Biofuels and Waste', by 1.5% and 0.3%, respectively. Even though the shares are small, those two fuels now account for 31.7% of the mix. Indeed, out of all BRICS countries, Brazil is the one which has the largest share of clean energy in its Electricity and Energy Mix, even though still the majority of its Energy Mix consists of fossil-fuels (57%±). Besides, even if it has decreased its predominant share of Oil by 3%, it increased this share in Natural Gas, rather than on more renewables.

Table 13: Changes in Energy Mix BRICS in percentage (%).

	CHANGES IN ENERGY MIX %						
Fuels / Countries	BRAZIL	RUSSIA			INDIA	CHINA	SOUTH AFRICA
Years Compared	2017 - 2005	2017 - 1990	2017 - 2000	2000 - 1990	2017 - 2005	2017 - 2005	2017 - 2005
Oil	-2,46%	-16,26%	0,68%	-16,94%	-1,00%	-0,70%	4%
Nuclear	0,22%	2,58%	1,45%	1,13%	-0,20%	-1,30%	0%
Coal	-0,27%	12,30%	-4,34%	16,64%	-8,50%	3,80%	-5%
Natural Gas	3,23%	1,11%	1,60%	-0,49%	0,40%	-4,20%	1%
Wind, solar etc	1,53%	0,00%	-0,01%	0,01%	-0,70%	-2,00%	1%
Biofuels and Waste	0,30%	-0,72%	-0,11%	-0,61%	9,80%	5,70%	-1%
Hydro	-2,56%	-0,01%	-0,27%	0,26%	0,40%	-1,30%	0%
						Data: IEA	*Milena Megre*

Also, it should be pointed out that despite Brazil's ambitious pledge of reducing greenhouse gases emissions (37%-43%) (Federative Republic of Brazil, 2016), the year 2005 registered particularly high levels of emissions (Sistema de Estimativas de Emissões e Remoções de Gases de Efeito Estufa [SEEG], 2018). Thus. comparing the following years and the pledges made by Brazil under the Paris Agreement of reducing its emissions, it does not require a great effort to achieve it by 2030. Considering these facts, Brazil's commitments were rated as "Insufficient" by Climate Action Tracker (CAT).

3.2. Russian Federation

For Russia's first goal, according to a report by the United Nations Framework Convention on Climate Change (UNFCCC, 2019), if comparing the levels of GHG emissions (excl. LULUCF) of 1990 and 2017, there was a decrease of 32.36% in its emissions. As for Goal II, energy consumption in 2017 has decreased by 21.9%± in comparison to the base year. The third Goal does not show a decrease like the previous ones, Russia's dependence on its energy exports has experienced an increase from 51%± in 2016 to 60.3%± in 2018 (OEC, 2018); as for the change in the energy complex, if comparing 1990-2017, indeed there was a great change in the Energy Mix, such as an exponential decrease of Oil (-16%), and an increase of Coal (12%), Nuclear (2.6%), and Natural Gas (1.1%). Lastly, for its fourth Goal, Russia has not introduced any national plan or policy regarding the implementation of renewables in the country, although some research institutions did analyze and have made suggestions concerning the issue (Makarov, 2019).

Having said that, it is important to mention that choosing the year 1990 as the base year for Russia was followed by substantial criticism (Luhn, 2019) since this year was particularly high on energy production, consumption, supply, and greenhouse gases emissions; and therefore, if compared to any other year that followed, the levels will always show a decrease (European Commission, 2012). This can be proved in all the Goals mentioned, by comparing the years of 1990, 2000, and 2017. For example, in Goal I if looking into the abovementioned report of the United Nations, it can be seen that the emissions of 1990 were 1.6 times higher than in 2000 (i.e., 40.35%) and 1.4 times higher than 2017 (i.e., 32.36%). Meanwhile, if comparing 2000-2017, there is an increase of 13.40% of emissions, even though the year 2000 had the lowest amount of GHG out of all those three years. The same applies to Goal II, even though Russia experienced a decrease in its consumption, the base year had the larger quantity of the total final consumption (TFC) of energy by source and sector (except residential) if comparing to 2000 and 2017 (IEA, 2019). The third Goal also follows this pattern, if comparing the changes in Russia's Energy Mix between 2017-2000, instead of 2017-1990, it is possible to say that there were quite small changes in almost 20 years (Table 13).

3.3. India

The first three goals of India are related to its Electricity Mix, in this way, it can be seen that for Goal I, Renewables now account for 264GWh± (incl. Hydro) and 122GWh± (excl. Hydro). As for Goal II, in 2017 Solar energy was responsible for 26,035 GWh and Wind for 51,061 GWh of electricity generation (IEA, 2019). With regards to the third goal, currently, renewables account for 22% of its Electricity Mix (Figure 4). And finally, for its fourth Goal, the Green Energy Corridor has been in progress, and it has made remarkable advances, such as 64% of Intra-State Transmission System, and 80% of the ISTS Line Details were already constructed . In addition, in 2018 the investment in Solar PV for electricity generation was larger than in fossil-fuels (IEA, 2020). As a result, one could argue that India has been making great progress towards its goals for 2030, being the BRICS country with the best rating by CAT as “2°C Compatible”.

3.4. People’s Republic of China

Having in mind the pledges made by the country, its first Goal seems to still be in process, since China’s CO^2 emissions have been continuously rising, and they still have not experienced a decrease (Wong, 2020), which proves that the peak has not been reached yet. As for Goal II, Hydropower consists of 99 GWh capacity, Wind and Solar are considered together in the mix and consists of 70GW capacity — which makes it difficult to know their shares separately — and the same applies to Biomass, which is included in Biofuel and has a total of 113GW capacity. Lastly, for its third Goal, from 2005 until 2017, the share of renewables in the Energy Mix have had a small increase of 3% combining Hydro (1%) and ‘Wind, solar, etc.’ (2%) (Table 13). At the same time, ‘Biofuels and Waste’ had a decrease of 6%. Nowadays, non-fossil energy sources account for less than 10% of the mix (Figure 3), however, it can be said that China has indeed made efforts to lower its share of Coal since there was a decrease of 4% in its Energy Mix since 2005 and a 3% decrease between 2015-2017 in the Electricity Mix. Nevertheless, as already mentioned above, other fossil-fuels such as Nuclear, Natural Gas, and Oil combined have shown an increase of 6% in the same period.

Besides, Chinese financial institutions and companies are financing the construction of new fossil-fuel infrastructures in other countries, and are responsible for ¼ of all current coal plants under construction in the world (Clean Coal Centre, 2019). At the same time, China is also the largest investor in renewables in the world (Loran and Osani, 2019), being responsible for financing and building new renewables infrastructures abroad, and for domestic investments. Due to this duality, China’s INDC was rated as “Highly Insufficient” by CAT, however, it was mentioned that the current national policies seem to be headed in a better direction towards an "Insufficient" rating, which could be achieved with some changes and improvements in its NDC.

3.5. South Africa

Given the current scenario in South Africa, its large dependence on Coal, and the emissions from it, the targets in its INDC are mostly focused on reducing these shares and impacts, which is the case of Goal I and II. It can be said that South Africa did experience a decrease in Coal of 5%± in both its Energy (Figure 1 and Table 11) and Electricity Mix (Figure 2 and Table 12); and it was also the largest contributor to the rise in investment in Africa and the Middle East in 2018 (UN Environment, Frankfurt School-UNEP, 2019). Nevertheless, due to a series of continuous blackouts that took place in the country by the end of 2019, the South African government responded by declaring that there would be an increase in coal-fired energy (France 24, 2019). This decision seems to be in accordance with the national priorities and challenges presented in its INDC, since it was mentioned that the country is more focused on eradicating poverty and inequality, and in this case that would be ensuring reliable energy supply for all, regardless if it is by using a clean or pollutant energy source. Another factor that contributes to the shift in national priorities of South Africa is the changes in political leadership and parties. According to the report of the UN Environment, these changes influence the country’s approach towards its INDC pledges and targets (UN Environment, Frankfurt School-UNEP, 2019). For instance, as a response to the current scenario, in September 2019 the President Ramaphosa announced that South Africa will update its NDC and enhance its mitigation NDC by 2020 and that the government would finalize a ‘Just Transition Plan’, which would include defining a vision compatible with the 1.5-degree Paris temperature goal (Department of Foreign Affairs and The Republic of South Africa, 2019).

4. CONCLUSION

Though BRICS countries have failed to outperform EU, OECD, and non-OECD countries, it can be said that BRICS countries are addressing climate change and reiterating their commitments through several agreements and policies (Rahman and Turay, 2018). For instance, in the case of Brazil, it should decrease the number of fossil-fuels, especially Oil. Besides, it has decreased its dependence on Hydropower, especially in its Energy Mix, to guarantee energy security (Megre, 2019) and reduce its LUCF emissions. For Russia, it must continue to move further with its targets and additional measures, such as the drafted bill on state regulation of emissions and absorption of greenhouse gases (Soldatova, 2019).

As for India, China, and South Africa, they must strongly commit to fully phasing out coal-fired power generation, or at least reduce it significantly. On the one hand, India seems to have the most successful results in pursuing and achieving its INDC targets – since it had the best rating by CAT out of all BRICS countries. As for China, it should focus on decreasing its fossil-fuel consumption if it hopes to peak its emissions between 2020-2030. It is suggested that China should substantially decrease its investments in the construction of new coal-fired plants nationally and abroad, and completely focus on investing in renewables. Nonetheless, China should strengthen the control of coal consumption, by reinstating its previous ban on new coal-fired power stations. Last but foremost, South Africa needs to adopt more ambitious goals beyond the IRP2019, such as

strategies for increasing renewable shares, and to peak its emissions per its PPD target. It is vital for it to diversity its Energy and Electricity mix, because even though China and India produce considerably more Coal than South Africa (Table 14), in both its Energy and Electricity mix South Africa has the largest shares of Coal (Figures 1 and 2) out of all those three countries, and it has the smallest share of Renewables out of all Electricity Mix (Figure 4).

Table 14: Energy Mix of China, India, South Africa in Gigawatt hours (GWh).

CHINA: Energy Mix (in GWh)				
Fuels / Years	2000	2005	2010	2017
Oil	220810	317821	427596	568082
Biofuels and Waste	198171	168394	133301	113841
Hydro	19124	34137	61168	99492
Natural Gas	20759	38790	89382	195191
Coal	664720	1203693	1790421	1953296
Wind, solar etc	2646	5282	15887	70018
Nuclear	4361	13833	19250	64637
TOTAL	1130591	1781950	2537005	3064557
INDIA: Energy Mix (in GWh)				
Fuels / Years	2005	2010	2017	
Oil	124830	162069	223316	
Biofuels and Waste	159344	185231	187183	
Hydro	9297	10741	12193	
Natural Gas	31810	54402	51021	
Coal	184224	279027	390944	
Wind, solar etc	631	1993	7479	
Nuclear	4514	6844	9991	
TOTAL	514650	700307	882127	
SOUTH AFRICA: Energy Mix (in GWh)				
Fuels / Years	2005	2010	2017	
Oil	11793	17652	18765	
Biofuels and Waste	6892	6611	6730	
Hydro	115	182	75	
Natural Gas	2759	2874	4268	
Coal	91937	100495	98228	
Wind, solar etc	19	69	999	
Nuclear	2942	3153	3698	
TOTAL	116457	131036	132763	
Data: IEA. By: Milena Megre				

Conflict of Interest
None.

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