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NUEVAS GEOMETRÍAS EN LA COOPERACIÓN PARA EL DESARROLLO: EL CASO DE BRASIL E INDIA EN ENERGÍAS RENOVABLES

NEW GEOMETRIES IN DEVELOPMENT COOPERATION: THE CASE OF BRAZIL AND INDIA IN RENEWABLE ENERGY

NOVAS GEOMETRIAS NA COOPERAÇÃO PARA O DESENVOLVIMENTO: O CASO DO BRASIL E DA ÍNDIA EM ENERGIAS RENOVÁVEIS

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Resumen: La cooperación internacional es una manera eficiente de alcanzar el desarrollo, pero exige que los países adopten políticas claras y estrategias de largo plazo. Brasil e India están insertos en la economía como países em desarrollo contemplando la cooperación Sur-Sur en tiempos de poder nacional y de sustentabilidad. El objetivo de este artículo es discutir la cooperación para el desarrollo en el campo de las energías renovables entre Brasil e India, abordando como un tema innovador, sus respectivos antecedentes, semejanzas y abordajes políticos de la cooperación internacional. La metodología utilizada se basa en revisión de documentos y literatura. Con base en el análisis de las acciones y de las políticas establecidas a lo largo de los años, es posible afirmar que la cooperación Sur – Sur sólo ganó relevancia en las últimas dos décadas. Sin embargo, una de las contribuciones de este artículo muestra que ella puede ser promovida no solo mediante inversiones en energía renovable, sino también por las habilidades políticas de esos dos países de compartir conocimientos científicos y tecnológicos y de crear una agenda común de cooperación en el área energética.

Palabras clave:

Cooperación para el Desarrollo.

Cooperación Sur-Sur.

Energías Renovables.

Brasil.

India.

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Abstract: International cooperation is an efficient way to achieve development, but it requires that countries adopt clear policies and long-term strategies. Brazil and India are embedded in the global economy as developing countries, viewing South-South cooperation both in terms of national power and sustainability. The objective of this paper is to discuss cooperation for development in the renewable energy field between Brazil and India, addressing their respective backgrounds, similarities and political approaches to international cooperation. The methodology was founded on documents and literature review. Based on the analysis of actions and policies established over the years, South-South cooperation only increased in relevance during the last two decades. Nevertheless, one of the contributions of this paper shows it can be promoted not only through investments in renewable energy, but also through the political abilities of these two countries under study to share scientific and technological expertise and to build a common agenda for cooperation in the area.

Keywords:

Development Cooperation.

South-South Cooperation.

Renewable Energy.

Brazil.

India.

Resumo: A cooperação internacional é uma maneira eficiente de alcançar o desenvolvimento, mas exige que os países adotem políticas claras e estratégias de longo prazo. O Brasil e a Índia estão inseridos na economia global como países em desenvolvimento, contemplando a cooperação Sul-Sul em termos de poder nacional e de sustentabilidade. O objetivo deste artigo é discutir a cooperação para o desenvolvimento no campo das energias renováveis entre o Brasil e a Índia, abordando como um tema inovador, seus respectivos antecedentes, semelhanças e abordagens políticas à cooperação internacional. A metodologia foi fundamentada na revisão de literatura. Com base na análise das ações e das políticas estabelecidas ao longo dos anos, a cooperação Sul-Sul só ganhou relevância nas últimas duas décadas. No entanto, uma das contribuições desse artigo mostra que ela pode ser promovida não apenas por meio de investimentos em energia renovável, mas também pelas habilidades políticas desses dois países em estudo de compartilhar conhecimentos científicos e tecnológicos e de criar uma agenda comum de cooperação na área energética.

Palavras-chave:

Cooperação para o Desenvolvimento.

Cooperação Sul-Sul.

Energias Renováveis.

Brasil.

Índia.

Introduction

The aim of this paper is to fill an important gap in the literature of international cooperation with regard to the potential of Southern countries to forge renewable energy partnerships. The case of Brazil and India illustrates the need for a closer look into their similarities and differences in order to assess the rationale of their rapprochement in the post-Cold War era. This work particularly focuses its analysis on the period between 2000 and 2016, when Southern coalitions reached their highest relevance in global politics so far and the MOUs in Renewables were signed between the countries under study. Despite stronger diplomatic and trade relations, countries like Brazil and India also missed an opportunity to introduce a truly strategic component to their partnership. In this sense, an analysis of the underlying socioeconomic and political constraints and opportunities presents an important picture of the true potential for an Indo-Brazilian partnership in renewables.

The last couple of decades have been marked by two underlying dynamics in global politics: the rise of developing countries, associated with a relative decline of traditional powers; and a new technological revolution based on digitalization. These dynamics are also changing traditional ways of international cooperation and its associated hierarchy of power between the developed North and the developing South.

International cooperation for development (ICD) has been traditionally associated with North-South economic aid. In political terms, ICD was mostly a tool for developed countries and international organizations to assist and shape global policies, ranging from issues such as poverty reduction, education and health to domestic governance. Even when technology transfer is involved, there is a strong component of North-South hierarchy in exploring comparative advantages of low and middle-income countries while high-technologies are circumscribed to the developed world.

Over the last decades, there is an increasing scope for ICD to expand into new areas, currently symbolized by the United Nations' Sustainable Development Goals (SDGs). Besides traditional areas, the SDGs also provide new inputs to the discussion on how to foster economic growth and technological innovation while improving labor and environmental conditions. Following the rise of emerging powers since the 2000's, international regimes have also adapted to a new reality, where countries represented by coalitions such as the G20 and BRICS (Brazil, India, Russia, China and South Africa) have greater diplomatic and economic power to provide different models of development.

One of the key aspects in this process is the energy transition from fossil fuel sources towards renewable energy, which may reduce environmental impact while maximizing cost effectiveness in the long run. The energy debate is particularly relevant for large, densely populated emerging countries such as Brazil and India. Both have experienced growth in energy consumption and have tried to diversify their sources by investing in renewable technologies. While their traditional partners are located in the North, there is growing

awareness of South-South cooperation (SSC) as an alternative for investments and co-development of new technologies.

This paper argues that the partnership between Brazil and India certainly evolved over the last decades, but it has lacked a clear strategic direction. In this sense, it is necessary to discuss South-South Cooperation as a critical tool for mutual economic development and technological innovation. The case for stronger Indo-Brazilian cooperation is presented in the field of renewable energy. Innovation in green technologies enhances the potential for economic modernization while reducing the environmental impact of industrialization and increased consumption.

The study is divided into another four sections. The first section analyzes the process that brought developing countries together in the context of South-South cooperation. The second section discusses the domestic logic behind Indo-Brazilian cooperation, taking into account their socioeconomic similarities and their backgrounds in the energy field. The third section outlines the convergences of Brazilian and Indian foreign policies, focusing on the transformative potential of renewable energy in the bilateral agenda. The study's closing remarks summarize domestic and external impacts of energy cooperation for Brazil and India, underlining the benefits of renewable energy as a tool of technological progress and geopolitical clout.

South-South Cooperation: power, development and sustainability

Traditional interpretations of realist and liberal theories of international relations have provided little insight into the analysis of South-South cooperation. Realism focuses on anarchy and the quest for material power (economic and military), claiming that cooperation is often hampered by conflicting national interests. Liberal institutionalism argues that inter-state competition can be mitigated by the autonomous role of international organizations and – to some liberals – also by domestic political similarities (democracy and capitalism).

Constructivist and radical theories have provided alternative explanations, pointing out the perceptions of different domestic groups of interest as drivers of conflict and cooperation. Constructivists have drawn on the concept of soft power – coined by the institutionalist Joseph Nye – and other forms of symbolic power (e.g. leadership, solidarity) as the means of influencing state action. In turn, radicals have theorized the same dynamics in terms of political economy: international cooperation reproduces the interests of the core capitalist countries in national economic and political elites. In this perspective, partnerships would be made on the basis of hegemonic and counter-hegemonic class coalitions (Birn; Muntaner; Afzal, 2017).

Since the 2000s, the rise of emerging powers opened a new debate on international cooperation and its power dynamics. Regarding the rise of the rest, analyses have generally fallen into two categories: the optimists view emerging powers as drivers of global change, promoting a more equitable political and economic order in the long term. The skeptics argue that emerging powers are too embedded in the capitalist development paradigm to provide a meaningful alternative. Thus, the skeptics argue that these powers are set to reproduce the

same capitalist dynamics of core-periphery in their South-South relations, which would also accelerate the current path towards environmental collapse (Gray; Gills, 2016).

A critical aspect of Southern countries is their shared path of late development, which increases incentives for South-South cooperation as a tool of national interest. First, it is clear that emerging powers are not following the neoliberal path prescribed by the developed world and neither could replicate the exact same developmental formulas that led to its rise (Ban; Blyth, 2013; Mielniczuk, 2013). Second, with the possible exception of China, these powers require greater external cooperation to rise in the global economic order. Third, late-development countries are more prone to suffer from inequality and environmental issues due to the larger gap between modern and traditional structures. Fourth, according to the theory of Uneven and Combined Development, late-development countries could skip entire technological cycles by replicating modern practices already discovered and diffused in the North.

Following the analysis of Mielniczuk (2012), this study argues that economic and technological emancipation from hierarchical North-South relations is a key variable to ensure a state's political survival in the international order. In this context, South-South cooperation is a crucial factor for collective and individual emancipation of developing countries. It can either be formed in the lens of a counter-hegemonic coalition, or simply as a tool of national interest toward a sustainable model of development. To cite a few examples of the role of SSC, the participating countries increase their material and non-material aspects of power by means of diplomatic coordination in multilateral organizations, co-development of technologies and joint funding of infrastructure projects. The potential of SSC is even greater when the concept of social technology is adopted, taking into consideration particular socioeconomic and environmental vulnerabilities while formulating and implementing policies.

South-South cooperation is not a new activity. It has been through four defining historical moments since the Cold War: 1) SSC originated in the context of Third World solidarity during the Bandung Conference[1] (1955); 2) it evolved towards a political coalition with the Non-Aligned Movement[2] (1961); 3) SSC became institutionalized with the Buenos Aires Plan[3] (1978) of cooperation among developing countries within the UN framework; 4) in the 21st century, coalitions of emerging powers led to new geometries of diplomatic and economic interactions in the international order.

The following table summarizes the key events in the context of South-South cooperation at the global level.

Table 1. Main events in the South-South cooperation at the global level

Year	Event
1955	Bandung Conference (Indonesia)
1964	1st Conference of the United Nations on Trade and Development (Switzerland)
1974	29th Session of the United Nations Assembly (USA)
1975	Creation of the Latin America Economic System (Panama)
1976	5th Conference of Heads of States or Government of the Non-Aligned Countries (Sri Lanka)
1976	Conference on Economic Cooperation among Developing Countries (Mexico).
1976	31st Session of the United Nations Assembly (USA)

1977	32nd Session of the United Nations Assembly (USA)
1978	Conference on Technical Cooperation among Developing Countries (Argentina)
1979	1st High-Level Committee on Review of Technical Cooperation among Developing Countries (USA)
1979	XVIII Session of the Economic Commission for Latin America and the Caribbean (Bolivia)
1981	High-Level Conference on Economic Cooperation among Developing Countries (Venezuela)
1995	9th High-Level Committee on the Review of Technical Cooperation among Developing Countries (USA).
1996	XI Meeting of Directors of International Technical Cooperation of Latin America and Caribe (Mexico)
1997	Pivot Countries Meeting for TCDC, Santiago de Chile (Chile)
1998	Forum on experiences on cooperation (Japan)
2000	1st South Summit – G77 (Cuba)
2002	International Conference on Financing for Development (Mexico)
2002	XV Meeting of directors of international cooperation of Latin America and the Caribbean (Uruguay)
2003	High-level Conference on South-South Cooperation (Morocco)
2004	20th Session of the Committee on Cooperation among Developing Countries and Regions
2005	2nd South Summit – G77 (Qatar)
2006	XIV Non-Aligned Movement Summit (Cuba)
2007	62º Session of the United Nations Assembly (EUA)
2007	XVII Ibero-American Summit (Chile)
2009	1st BRIC Summit (Russia)
2010	2nd BRIC Summit (Brazil)
2011	3rd BRICS Summit (China)
2011	Global Exhibit of the South-South Development (Italy)
2012	4th BRICS Summit (India)
2013	5th BRICS Summit (South Africa)
2013	Global South-South Development Expo (Nairobi).
2014	6th BRICS Summit (Brazil)
2015	7th BRICS Summit (Russia)
2016	8th BRICS Summit (India)
2018	10th BRICS Summit (Brazil)

Source: MOUSINHO (2018).

After a long period of economic crisis in the 1980's and the momentary illusion with unrestrained globalization in the 1990's, South-South cooperation has reemerged in the last two decades with a different face. International cooperation for development has become multi-polarized and multifaceted, with several emerging powers setting up and empowering their own agencies and policies[4]. The disorganized process of globalization, restrictions to a fairer trade in WTO regulations and the lack of attention to post-Cold War political realities from the IMF and the WB have opened space for parallel cooperative arrangements in the South-South axis (Rodrigues, 2010).

The complementarities of Southern countries mitigate, *a priori*, the competition factors among them. Emerging powers have, in their territories, a dynamic and complex modernization process with their own particularities, standing out in sectors ranging from high to low technological intensity. At the same time, most of them have basic infrastructure and human development problems that are common to poor countries. In conformity with Lima (2005), the characteristics shared by these countries enable the existence of a different kind of cooperation in comparison with the cooperation between the North and the South.

Since the 2000's, emerging power and Southern coalitions have actively pursued the reform of international regimes (e.g. UN Security Council, WTO, climate, IMF, WB) and have also created their own financial institutions, such as the BRICS New Development Bank (NDB) and the Asian Infrastructure Investment Bank (AIIB). These movements have been accompanied by new trade and investment patterns, led by China, India and East Asian countries. This parallel order has supported the collective rise of emerging powers and has increased their autonomy in bargaining with the traditional powers (Stuenkel, 2017). Despite the relative political success of Southern coalitions, evidence shows that the BRICS countries, for example, have not been able to mutually diversify their intra-group trade and investment patterns. On the contrary, there has been an increase of asymmetrical economic relations in favor of China, which mostly exports manufactured goods and imports raw materials from the BRICS countries (Gusarova, 2019; Milan, Santos, 2020).

The underlying dynamics of energy transition are also closely related to each country's domestic political economy. As Espen Moe (2015) argues, national attempts at transforming the energy matrix essentially create winners and losers. Looking at the examples of six developed countries, Moe points out that abundance of renewable resources or unresolved energetic issues are not the main drivers of renewable energy policies. Rather, it is the state's ability to control vested interests (e.g. fossil fuel, nuclear and electric utility companies) that determines a country's success in promoting the transition towards renewables (MOE, 2015). In the case of BRICS countries, Carlos Santana (2015) points out that the national control over energy has decreased since the 1990s, following policies of decentralization, privatization and deregulation of production and distribution networks. He also states the relevance of institutional arrangements and finance (e.g. bank credit) as critical instruments for developing energy infrastructure (Santana, 2015).

Collectively, the BRICS countries have an immense potential for driving global efforts in transitioning towards a green economy, especially because three of its members are among the top five emitters of CO_2. Over the last decades, China has jumped ahead in annual investments in renewables, although Brazil and India have proportionally invested more in the field relative to their total electricity generation. Despite their potential to lead energy transition, the BRICS countries face problems of funding in renewable projects, especially for small and medium enterprises (Zeng; Y. Liu; C. Liu; Nan, 2017). There is a need for concerted policies in the field, including the participation of national financial institutions and the NDB as facilitators (Pathak; Shah, 2019; Martins, 2019). Considering this background, the study analyzes the potential for Brazil-India cooperation in the renewable field and the challenges against a shared energy transition.

An overview: Brazilian and Indian socioeconomic challenges and energy panorama

Brazil and India are two leaders of the Global South. Both their unique characteristics and similarities have turned them into a benchmark of North-South relations, which provides an overview of their economic and political status in the international order. A few characteristics have been deemed as natural conditions for closer Brazil-India relations: they are culturally

diverse democracies and regional leaders; they have large territories and populations; modern and traditional socioeconomic issues; and proactivity in international politics, with similar viewpoints on several issues (Indian Embassy, 2017a; MRE, 2016a; CIA, 2017a; 2017b; Visentini, 2010; Albuquerque, 2016).

Brazil and India have shared an unspoken alliance in multilateral organizations, where both gathered the support of Southern coalitions to challenge the dominance of developed countries. In the United Nations, they have been strategically autonomous, but also viewed most of the political agenda in a similar fashion. Between 1994 and 2004, in all voting processes in the UN General Assembly, these two countries agreed in 88.5% of the cases (Rodrigues, 2010).

Brazil and India have risen to center stage in the WTO due to their ability to mobilize and lead developing country coalitions, effectively exerting veto power in the Doha Round. Indo-Brazilian cooperation led to a joint proposal on agriculture trade, which was later backed by several developing countries. Despite having opposite approaches to the liberalization of agriculture, Brazil and India realized that only a coalition would shift the agenda from the Quad (US, European Union, Canada and Japan) toward the inclusion of the South. Later on, this tactical alliance became the basis of the "developing G-20" and the IBSA group (Hopewell, 2014).

A comparison of socioeconomic indicators in Brazil and India presents similar challenges of large semi-peripheral countries. Although Indian GDP is higher, its product *per capita* in puchase power parity (PPP) is about 47% of Brazil's. As a reference of underdevelopment, the population below the poverty line in India is almost four times as large as the Brazil's. The Human Development Index (HDI), which partially reflects economic and social inequality, ranks India in the 129st position, which is categorized as "medium human development" level. In contrast, Brazil is ranked 78th, positioned in the category of "high human development" (UNDP, 2019). Table 2 presents some of the Brazilian and Indian challenges supported by economic and social indicators.

Table 2. Socioeconomic indicators of Brazil and India

Indicators	Brazil	India
Population	211.7 (million)	1,326 (billion)
GDP	2,055 (US$ trillion)	2,602 (US$ trillion)
GDP *per capita* (PPP)	15,600 (US$ thousand)	7,200 (US$ thousand)
Exports	217.2 (billion)	304.1 (billion)
Imports	153.2 (billion)	452.2 (billion)
Labor Force	104.2 (million)	521.9 (million)
Unemployment rate	12.8 %	8.5 %
Population below poverty line	4.2 %	21.9 %
Human Development Index	78	129
World Competitiveness Ranking	71	68

Source: CIA (2020); UNDP (2019); WEF (2019).

Even though Brazil is in a more privileged position than India in terms of HDI, India has become more competitive than Brazil. Between 2014-15 and 2015-16, Brazil fell 18 positions, while India went up 20 positions. (WEF, 2014; 2015). The competitiveness indicator may vary due to a number of factors related to education, infrastructure, the ability to conduct business and the political-economic situation.

Undoubtedly, sustaining growth while improving life quality standards is the greatest challenge for developing countries. One of the main tasks is to ensure equal access to basic infrastructure, such as sanitation and electricity. Considering energy as priority for society to meet its needs, the access to energy or to the means to make its use more efficient is essential is crucial.

Despite the increasing global use of energy, there are millions of households without access to basic services. The International Energy Agency (IEA, 2016a) has estimated that 16% of the world's population has no access to electricity and that 38% of it relies on traditional use of biomass for cooking. Regarding the traditional use of biomass, it can be highlighted that approximately 3.5 million people in the world die prematurely every year because of household exposure to air pollution, whether using wood or other solid fuel for cooking, or kerosene as a lighting fuel. Out of this total, one million cases are located in India, where average life expectancy is reduced by 23 months due to this issue (IEA, 2016b).

Access to more modern sources of power generation is still a goal to be reached by Brazil and especially by India, where the number of people without reliable access to electricity is the highest among all nations (REN, 2016). The electrification rate in India was 55.5% in 2005, increasing to 81% in 2014. However, lack of access to electricity still affects 244 million people in India, almost half the total count in Asia. In Brazil, a country with 204 million inhabitants, the number of people without electricity is 1 million and the electrification rate is 99% (IEA, 2006; REN, 2014; 2017).

In terms of energy demand, India is the third largest energy consumer in the world, and Brazil is the eighth (EIA, 2016a; 2016b). Over the decades, the increase in Brazil and India is significant, particularly the demand for fossil fuels, which will continue to grow until at least until 2030. Meanwhile, renewable energy sources are expected to increase twice in Brazil and nine times in India in the same period (IEA, 2006; 2007; EIA 2016a; 2016b). Among the BRICS, after China, India is the second country in energy demand; Brazil is the fourth, just after Russia (MME, 2016a).

In Brazil, fossil fuels account for 56.9% of the energy matrix and for 21.4% of the electricity matrix. In India, this percentage is higher: they account for 73.4% of the energy matrix and for 87% of the electricity matrix (MME, 2016b). The energy matrix of the BRICS, for example, with the exception of Brazil, depends on about 80% of fossil fuels, with coal being the main source of energy in China, India and South Africa. In Brazil, oil is the most used fossil fuel (MME, 2016a).

The political economies of energy transition in Brazil and India bear their own specific challenges. Due to political clientelism and bureaucratic fiefdom, Brazil and India have faced difficulties in coordinating national energy policies, which impact on the transition and support

for a viable institutional arrangement, including a clear agenda on renewables. In terms of policy-making, the Union establishes the regulations and shares the task of electricity generation with the federated states, which control most of this activity. All transmission lines are also controlled by government corporations in a nation-wide network, but the Indian grid has only limited inter-regional connectivity. Distribution in both countries has been progressively privatized since the 1990s, with mixed impacts on governance and pricing. While in Brazil the energy agenda became more politicized in the last few decades, the issue is a central object of Indian electoral politics, particularly at the regional level. A significant difference in both models is that Brazil generally lacks the financial capacity to invest in energy infrastructure; the Indian fiscal policies and its public banking system have been less constrained in this area. However, the Indian energy's business model frequently runs in deficit and is heavily reliant on subsidies to cater for the expansion of access (Santana, 2015; Ebinger, 2016).

With regard to electric and energy matrices, Brazil has mostly transitioned to cleaner sources such as hydroelectricity and biofuels, although not without problems. First, growing deforestation and the increased use of natural gas may negatively impact the country's emissions of CO_2. According to Santana (2015), the Brazilian reliance on hydro as its main source is likely to decline due to environmental and logistic issues with exploring the Amazon's water resources, opening space for other sources (thermal and biofuels). Second, Brazil is also more likely to depend on foreign investment for the exploration of its Pre-Salt oil and gas reserves. Third, the ethanol industry has also been through a financial crisis over the last decade due to climate variations and to the Brazilian government's subsidies on gasoline, which lowered the competitivity of hydrous ethanol. At the same time, there are incentives towards the use of anhydrous ethanol in the gasoline mix and of ethanol as an innovative power generating source (Santos et al, 2015). In any case, the Brazilian energy transition has been a gradual process with fluctuations between renewable and traditional sources.

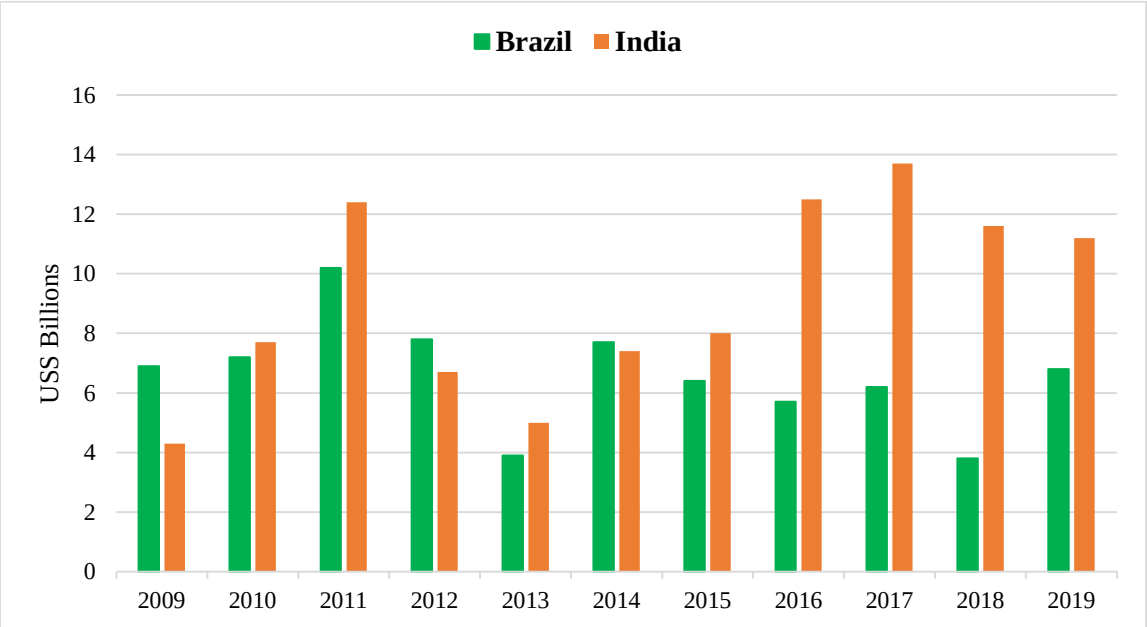
India still heavily relies on fossil fuels, particularly coal and oil, which may be an incentive for diversification of its sources towards renewables. The unreliable supply of electricity from the centralized grid makes it easier for industrial and commercial users to shift towards renewable energy (e.g. solar and wind). However, this transition would severely affect the current system of cross-subsidies sponsored by the government, which enables the supply of low-cost electricity and fuel to agriculture and low-income households. This pressure also impacts the goal of providing full electricity access to all and the subsidies to the railway transport system (Dubash et al, 2019).

At the same time, due to the disruptive effects of energy transition in India, many stakeholders – from politicians and bureaucrats to oligopolies and vulnerable populations – are relatively losing economic and political power in this process. The coal industry, for example, is dominated by Coal Industry Ltd (CIL) and has a high political and socioeconomic relevance. Coal is a critical asset in at least five major Indian states, providing the direct and indirect means of livelihood to at least 10 million people concentrated around its mines. Likewise, only a few state-owned and private corporations in India are involved in the businesses of oil and gas production, import and distribution. Some of these activities have also been subsidized by

the Indian government, hindering domestic energy investments, while favoring fossil fuel imports (Ebinger, 2016; Dubash et al, 2019).

With respect to renewable energy, Brazil and India have sought to close the gap between the leading developed and developing countries. In 2015, for the first time, investments in developing countries surpassed those of the developed world. China, Brazil and India, which are among the top ten investors in renewables, represent 70% of these investments made by developing countries (REN, 2016; 2020). Figure 1 shows the investments on renewable energy made by Brazil and India in the last years:

Graph 1. Brazilian and Indian investments on renewable energy



Source: REN, 2020.

In 2019, Brazilian investments reached US$ 6.8 billion while Indian investments reached US$ 11,2 billion. Over the analyzed decade, Brazil and India have followed somewhat contradictory tendencies in renewables' investments followed by peaks and decreasing. Undoubtedly, India has been invested more in renewables then Brazil especially from 2016. The most relevant renewable energy sources for Brazil and India, which place these countries in the top five in the global ranking of annual investments and net capacity additions, are hydropower, wind power and solar water heating. India excels in photovoltaic (PV) solar capacity and Brazil excels in biodiesel and ethanol (REN, 2016, 2017, 2020).

In the global energy transition agenda, Brazil and India have become relevant not only because of socioeconomic characteristics and domestic demand, but especially due their impacts before the international community. In the last few years, both countries have presented

initiatives in the field of renewable energy. Brazil has created the BioFuture Platform to leverage the biofuels market, which has been ratified by 20 countries, including India. The Indian government, in turn, has launched a Solar Alliance alongside 120 countries (including Brazil), with a scope to promote solar energy in developing countries (Indian Embassy, 2017b; Brasil, 2016a; Biofuture Plataform, 2016; UNFCCC, 2015).

In the background of climate change discussions, Brazil and India also shaped the global debate. The disappointing results of the Kyoto Protocol and the failure of the UN Copenhagen Summit in 2009 underlined the need for a new framework. The BASIC group (Brazil, South Africa, India and China) has mediated the contrasting agendas of the G-77 coalition of developing countries, the United States and the European Union. These efforts by the BASIC group led to a new viable regime: the Paris Agreement (2016), established within the UN Framework Convention on Climate Change (Bueno; Pascual, 2016).

The intricate international disputes related to climate change, coupled with Brazilian and Indian energy demands clearly show the need for a transition towards renewable energy. Diversifying the energy matrix is important not only because it relates to energy security, but also because it means democratizing energy access, dynamizing the economy through technology transfer, and meeting the demands originated in environmental issues.

All these issues are critical to Brazil and India. Therefore, cooperation can be an effective strategy to face the challenges posed by international and domestic realities. According to the United Nations (2016), one of the goals established by the SDGs is to enhance international cooperation by 2030 in order to facilitate access to clean energy research and technology, renewable energy, energy efficiency, and advanced fossil-fuel technology for cleaner energy and in order to promote investment in energy infrastructure and clean energy technology.

It is important to highlight that, according to the World Bank, in 40 years, CO_2 emissions have increased approximately four times in Brazil and six times in India. Even though CO_2 emissions in India are higher, Brazil is ahead in metric tons *per capita* (World Bank, 2017a; 2017b). This data indicates a number of issues to be debated in these two countries, such as deforestation, land use, production and use of energy and the development and promotion of renewable energy.

Brazil and India: instigating renewable energy cooperation

Brazil–India relations go back to the Portuguese colonial era, when Indian ships docked in Brazil to trade with the settlers. Despite this ancient connection, Brazil and India only shared limited interactions during the Cold War. Only during the 2000s international coalitions and bilateral trade became a significant part of their shared interests (Vieira, 2007). In fact, between 2000 and 2015, Brazilian exports to India increased from US$ 217 million to over US$ 3.3 billion and Indian exports to Brazil increased from US$ 271 million to over US$ 2.5 billion. However, bilateral trade has recently fallen due to fluctuation in commodity prices and to the Brazilian economic recession. Still, India has become the seventh largest export partner to Brazil and the eighth largest importer of Brazilian products (MDIC, 2017; Indian Embassy, 2016).

According to Reginaldo Reis (2010), the geopolitical forces of the contemporary world present, even to geographically distant countries, a situation of interdependence and the propagation of events in a way never seen before, thanks to the process of globalization and new technologies. Reis (2010, p. 115) asserts that, in the case of Brazil and India, the "non-existence of geopolitical frictions" between these countries makes cooperation in the scientific and technological fields feasible. Undoubtedly, the integration of Brazil and India into the IBSA and the BRICS has brought them expertise in joint political coordination by strengthening ties between these nations and by facilitating a common diplomatic parlance.

Renewable energy is one of the most promising areas of cooperation between Brazil and India. In 1997, Rajendra Pachauri, writing about the two countries' strategic perspectives, saw with enthusiasm the various fields of possible cooperation between these two countries. He believes that it would be very important for Brazil and India to cooperate in the environmental areas, focusing, for example, on climate change, on biodiversity related to the mapping or genetic characterization of species, and on deforestation, and in the areas of biotechnology and energy. According to Pachauri (1997), energy is a frontline area in which Brazil and India could cooperate effectively in the future and, in addition to the non-renewable area (petroleum), biofuels, biogas and wind energy are relevant opportunities for cooperation. The author argues that collaboration between these two countries would only have strategic value if it included research and development and energy technologies in the same project and, furthermore, if "during any scientific research work ... the project provides the meeting of physical and social scientists" (Pachauri, 1997, p. 328).

As discussed before, Brazil-India relations were strengthened by the participation of these countries in the early 2000s in "coalitions created to coordinate positions and strategies among emerging countries" (Abdenur, 2014). One of those groups is IBSA, a dialogue forum between Brazil, India and South Africa created in 2003. IBSA was considered a milestone for South-South cooperation, with the objective of stimulating interactions in sixteen areas, including defense, energy, trade and investment and poverty alleviation (MRE, 2017a). Within the IBSA framework, annual ministerial-level meetings were held from 2004 to 2011. The IBSA group also contributed to the affirmation of developing countries' shared interests in building a non-hegemonic and multipolar order (Visentini, 2010).

Despite the initial excitement, IBSA lost its momentum after the 2008 global crisis due to the lack of sustained budgetary and human resource commitments by the member countries. IBSA's shortcomings also stemmed from low economic complementarity, especially in trade. There was also political skepticism with regard to sharing technologies in long-term projects without a clear strategic view that goes beyond the coalition of Southern democracies (Flemes, 2011; Stuenkel, 2014). Another issue has been the faltering regional roles of Brazil, India and South Africa, which have further limited the potential for coalition building and economic integration led by IBSA (Vieira, Alden, 2011).

A second axis of Brazil-India cooperation has evolved from the BRICS group. According to the Brazilian Ministry of Foreign Affairs (2017), the association between Brazil, Russia, India and China (BRIC) began informally in 2006 on the sidelines of the United Nations General

Assembly. Three years later, the BRIC countries formally met for the first time in Yekaterinburg (Russia). In 2010, South Africa became part of the BRIC group in order to incorporate a regional African leader in the coalition. China was the main interested party in this expansion, also lobbying to dissolve IBSA because of the unnecessary overlap with BRICS. However, the introduction of South Africa into the BRIC gives a comparative ideological advantage to India (and Brazil) over China, potentially creating an IBSA block within the BRICS (Mancheri; Santanu, 2011).

The BRICS' activities revolve around two main areas: diplomatic coordination in reforming the international order and the construction of a multisectoral cooperation agenda. In 2014, the New Development Bank (NDB) constituent agreements were signed, with a reserve contingent of US$ 100 billion. The NDB aims to promote sustainable projects within the BRICS and in selected developing countries (MRE, 2017b). The Goa Declaration, fruit of the BRICS Summit 2016, highlights the relevance of intra-group cooperation. It is no wonder then that the word "cooperation" appears 63 times in the declaration, which has twenty-one pages. Renewable energy was evoked in the energy projects promoted by the New Development Bank. It was recognized that it is necessary to invest in order to scale up renewable energy solutions to achieve the Sustainable Development Goals. According to the Goa Declaration, international cooperation in the field of renewable energy has to be focused particularly on the access to clean energy technology and finance. The BRICS countries underlined that energy access and energy security are critical to the shared prosperity and to the sustainable future of the planet (MRE, 2016b).

The dialogue between Brazil and India is also evolving in strategic issues like maritime governance. According to Renato Flores Jr. (2014), a revolution will occur in sea routes and both Brazil and India are interested in the subject: "at some point in the not so distant future […] there will be a radical restructuring of the ocean governance" and "along the Pacific-Indian continuum, China and India will be the major players as Brazil will be in the South Atlantic". As it is in every business nation's interest that access to routes is safe, Brazilian and Indian navies' preparation, according to a concept of security and defense, are already evident. In addition, it is necessary to make a joint effort within intelligence bodies and commercial energy routes in order to program the needs and adaptations that the new reality will bring (Flores, 2014, p.30).

In this context, joint maritime exercises between the navies of Brazil and India together with the South African navy are evidence of the interest of these countries in increasing the geostrategic articulation in the Southern Hemisphere. This initiative, known as IBSAMAR, has been carried out biannually since 2008 and the more robust Brazilian and Indian seaports may play a major role of geo-economic coordination in the future (Khurana, 2008). The scope and complexity of IBSAMAR's operations have intensified in 2016. The main scope of this military exercise is to increase interoperability between the three navies and to develop common understandings and procedures for maritime safety (Indian Navy, 2017). It is clear that the primary interest of these countries lies in the area of "immense energy resources" and major sea lines of communication passing through the South Atlantic and the Indian Ocean (Visentini, 2010).

With respect to renewable energy, Brazil and India have been developing policies for decades. In 1975, Brazil created the National Alcohol Program (Proálcool), initially presented as an alternative to the oil crisis, which eventually made the country one of the global leaders in ethanol and biofuels. More than two decades later, India created its first policy in the area of renewable energy, the Electricity Act. The table 3 shows the main policies in Brazil and India in the area of renewable energy.

Table 3. Summary of the main policies in renewable energy from Brazil and India

Brazil		India	
Year	**Policy**	**Year**	**Policy**
1975	National Alcohol Program	**2003**	Eletricity Act
1985	National Electrical Energy Conservation Program	**2003**	National Auto Fuel Policy
1991	Rational Use of Oil Products and Natural Gas Program	**2005**	National Electricity Policy
2000	Energy Efficiency Program of Distribution Companies	**2006**	Integrated Energy Policy
2001	Wind Energy Emergency Program	**2006**	Rural Eletrification Policy
2002	Incentive Program for Alternative Electric Energy Sources	**2006**	Tariff Policy
2003	Light for All Program	**2007**	Energy Conservation Building Code.
2004	National Biodiesel Production and Use Program	**2008**	National Action Plan on Climate Change
2005	Law nr. 11.097 ruling on biodiesel	**2009**	National Policy on Biofuels
2007	Decree No. 6.048 ruling on electricity auctions	**2010**	The Finance Bill
2009	Law nr. 12.187 (National Policy on Climate Change)		
2012	Resolution nr. 482	**2011**	Strategic Plan for the New and Renewable Electric Sector
2014	Law nr. 13.033 ruling on biodiesel addition	**2012**	National Eletricity Plan
2015	Resolution nr. 1 of March 4th	**2015**	National Offshore Wind Energy Policy
2016	Law nr. 13.263		

Source: Mousinho, 2018.

Brazilian and Indian policies for the promotion of renewable energy have many similarities. For example, both countries have taken the initiative to promote electricity in less-developed communities. They have also created national standards to guide consumers choosing the most efficient products in terms of energy and have adopted policies to reduce vehicle emissions. It is worth noting their common interest in biofuels: in 2002, they signed a

memorandum of understanding (MoU) for technology cooperation regarding the mixture of ethanol in the transportation sector. This memorandum was reiterated in 2006 to facilitate technology transfer, the production and the consumption of biofuels, and the promotion of the global market in this area.

Furthermore, Brazil and India have complementarities in wind power, solar power and hydropower which could be explored in the near future. Wind power accounted for the highest percentage of investments in Brazil and in India in 2014, followed by biofuels in Brazil and solar energy in India (REN, 2015). In the area of wind power and solar energy, Brazil and India have signed two memoranda of understanding with South Africa in order to stimulate cooperation between them (SIC, 2007; IBSA, 2010). In 2013, during the meeting of the Joint Commission of Political, Economic, Scientific, Technological and Cultural Cooperation, Brazil and India agreed to try to strengthen the cooperation in technology in the areas of hydropower, biomass, wind power and solar energy (MRE, 2013). However, a solid framework is still pending for the involvement of national agencies and specification of joint research projects.

In 2010, the Renewable Energy and Energy Efficiency Partnership sponsored a survey on renewable energy development and energy efficiency in Brazil, South Africa, India and China in the business sector. One of the conclusions reached from the survey was that Brazilian and Indian organizations have been actively participating in renewable energy development and energy efficiency processes. Another conclusion was that the main reasons for companies to invest in these areas are: reduction of energy costs, regulatory issues, environmental domestic policies and energy security. In addition, the survey found that high-level political guidance in these countries is essential to influence investments and to support the development of renewable energy (Carbon Disclosure Project, 2010).

The increase of bilateral visits by high-ranking officials from both governments intensified from 2000 onwards (Vieira, 2007; Indian Embassy, 2017a). Similarly, the signing of MoUs and the intensification of trade between Brazil and India are examples of the real intention of strengthening their ties. Nevertheless, a common barrier to the expansion of bilateral relations has been the lack of mutual knowledge between societies from cultural, academic and business perspectives.

While assessing the prospects for Indo-Brazilian cooperation in renewables, it is also important to analyze domestic stakeholders in this process. On the Brazilian side, the agribusiness sector has shown interest in turning ethanol into a global commodity. A partnership with India in biofuels could open its market to Brazilian ethanol production and technology transfer, while making the case for entering global markets. This would largely benefit Indian industries supplied by ethanol, from the fuel and chemical sectors to potable alcohol (liquor). In 2020, there are early signs of progress in this field, with Brazil and India signing a MoU with the aim to establish a nodal research agency responsible for transfering ethanol technologies. The two institutions involved in the project are the Indian Oil Corporation Ltd and the Brazilian Centro Nacional de Pesquisa em Energia e Materiais. Whether this agreement will reach fruition remains to be seen over the next couple years.

The bilateral facilitation of investments and spread of technologies and practices would also facilitate economies of scale and reduction of prices for the Brazilian biomass and wind sector and the Indian solar and wind sectors. So far, both Brazil and India have given the first steps towards promoting domestic manufacturing in renewable energy technologies, with some success and many challenges to the entry of infant industries in a highly price-sensitive market.

In both cases of Brazil and India, most investments in renewable energy (power generation and manufacturing) have been driven by domestic and foreign private companies, with support from government bidding, public banking credit and targeted policies. In the successful case of Brazilian wind energy, the institutional arrangement of government programs (CT-Energia and Inova Energia) was complemented by the BNDES program (Proinfa), engendering a complex participation of 20 foreign companies and 22 national companies. On the Indian side, government incentives to investments in solar energy have spurred high growth in installed capacity and power generation, although not without dilemmas. First, the focus on capacity and generation incentivized solar energy developers at the expense of the infant manufacturing industry of solar cells and panels. Later, the raise of tariffs against Chinese and Malaysian solar manufactured products had the effect of stalling the auction process due to low price competitivity. Similarly, Brazilian investments in solar energy have also been hampered by the high entry costs of local manufacturers. However, the maturing of second-generation solar technologies based on thin film (TF) could potentially create another scramble for manufacturing beyond tradition silicon PV panels – a market already dominated by China (Losekan, Hallack, 2018; Behuria, 2020; Kumar; Majid, 2020).

A potential facilitator for some of these connections is trilateral cooperation, both within the South or involving a common partner in the North. For example, Brazil and India have solid partnerships with developed countries' development agencies, like Germany, France and Japan (Rodrigues, 2010). In addition, several possibilities of cooperation between the two States and the other BRICS countries can be envisioned. As two core energy markets in the world, India and China would benefit from this arrangement, while Brazil and Russia could become key stakeholders in their national development programs. On the other hand, recent geopolitical realignments have weakened BRICS, especially with regard to China-India competition in Asia and Brazilian automatic alignment to the United States. In this sense, larger coalitions carry the burden of collective action, which is more pronounced in long-term projects of research and development.

Interestingly, Brazil and India also face similar institutional and technological challenges and proposed solutions for their efforts at promoting renewable energy. First, both countries should establish a more comprehensive action plan and regulatory framework for the sector, drawing on the experiences of well-established competitors and adapting to national realities. The issues of grid integration, transmission capacity and distribution incentives are some of the infrastructure and regulatory challenges to be addressed. Brazilian and Indian cases, so far, indicate that facilitating credit for joint ventures could be more successful than demanding higher shares of domestic components in renewable projects (Losekan, Hallack, 2018; Kumar; Majid, 2020).

There is also an issue of prioritization between renewable sources, weighing the dilemmas of competing in cutting edge technologies for innovation or investing in more mature practices with a higher degree of endogenous manufacturing. Another way of improving competitiveness and innovation from domestic R&D is to partner industry, academia and policymakers in research projects. On a conceptual basis, the easiest way of introducing new energy sources is to couple them with traditional power or with each other. For example, there are various ways of exploring the seasonal/daily complementarities of hydro-wind, solar-wind and biomass-wind energies and the practicality of hybrid systems with a traditional source (diesel generators, fuel cells and batteries) (Losekan, Hallack, 2018; Kumar; Majid, 2020).

Closing Remarks

After the end of Cold War, international cooperation has emerged as a powerful tool for national development and global realignments among developing countries. So far, most of the global South has formed coalitions of different geometry in order to increase their bargaining power vis-à-vis the North. South-South cooperation has a much greater potential than diplomatic coordination in multilateral fora and is yet to reach its maturity in strategic affairs. After centuries of colonization and dependency, Southern powers are emerging in the global economy as drivers of a post-hegemonic order, forging trade and investment links among themselves. It remains an open question whether India and especially Brazil will be able to overcome structural barriers to their economic rise, but energy transition must definitely become a critical aspect of their national strategies.

The growth of energy demand in Brazil and in India brings increasing pressure for energy resources. In addition, climate change will demand that these countries take action regarding the clean and efficient use of their resources in the long term. Their respective investments in renewable energies show not only their areas of interest and expertise but also the intention to diversify their energy matrices. This is especially true when we consider trends in energy geopolitics, with maritime routes and traditional sources in the Middle East (and now Africa) being subjected to great uncertainty and political instability.

Since the 2000s, Brazil and India have shown the desire to increase bilateral ties by increasing the number of high-level and bureaucratic exchanges, also expanding trade flows, with Brazil becoming the largest Indian trading partner in Latin America and Caribbean region. Brazil and India have been developing a range of policies over the years in order to promote renewable energy, which show their mutual interest in biofuels, wind power, solar energy and hydroelectricity. This has led to the signing of MoUs between these two nations, especially in ethanol. Moreover, their institutional arrangements and public policies have addressed the issues of promoting renewables both in energy production and national industries. Brazil and India have tried, with a few cases of success, to overcome the entry barriers of late development in cutting edge technologies. Despite some relative progress, the two countries need to address more vigorously the issue of policy coordination among the government, bureaucracy, private sector and domestic consumers. At the external level, joint funding, R&D

and investment may promote the economies of scale needed to reduce production costs and mitigate infrastructure bottlenecks.

The BRICS Summits demonstrate that cooperation activities in the energy sector are also shared by the other countries of this group. This may mean that cooperation in this area can take place bilaterally or multilaterally, broadening the spectrum of cooperation, and strengthening the ties between Brazil and India. Another road of international development cooperation may come from trilateral partnerships with like-minded developed countries, such as Germany, France and Japan.

The synchronicity of policies and actions aimed at promoting renewable energy leads to the strategic strengthening of Brazil and India in the South. The energy geopolitics in the South, especially regarding the ocean (Indian and Atlantic), is an additional factor to reinforce the relevance of alliance between the referred nations. In order to take the leap, Brazilian and Indian political leadership will have to acknowledge the inevitability of energy transition and the opportunity costs of a late development in this area. As this study shows, early policies in ethanol, for example, engendered expertise and competitive advantages for Brazil in the long term. Now, both countries could benefit from South-South cooperation, diluting the costs of research and increasing the economy of scale among interested parties. Otherwise, they may fall in a new dependency trap or, in the case of India, rely on geopolitically unstable sources.

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[1] The Bandung Conference (1955) represents a milestone for the Southern countries, which aimed to confront the colonialism and imperialism of traditional powers by promoting cooperation and the recognition of equality between races and nations. There was also a strong geopolitical component of non-alignment, also called a third way, between the United States and the Soviet Union.

[2] In 1961, the Non-Aligned Movement (NAM) emerged as a coalition advocating the principles of non-interference in domestic affairs, mutual equality and benefit, non-aggression, peaceful coexistence between political systems and respect for sovereignty. The initial logic for the NAM's coalition was to avoid domestic and regional polarization, provoked by the superpowers, and to increase the Third World's bargaining power in the international order.

[3] In 1978, in Argentina, the United Nations held the Conference on Technical Cooperation among Developing Countries, in which 138 countries agreed on the Plan of Action for Promoting and Implementing Technical Cooperation among Developing Countries (the Buenos Aires Plan of Action), which established principles to be followed afterwards (UNOSSC, 2017).

[4]A few examples of agencies are the Brazilian Cooperation Agency (ABC), created in 1987, South Korea's KOIKA (1991), Mexico's AMEXID (2011), India's Development Partnership Administration (DPA) in 2012, and South Africa's Development Partnership Agency (SADPA) in 2013.