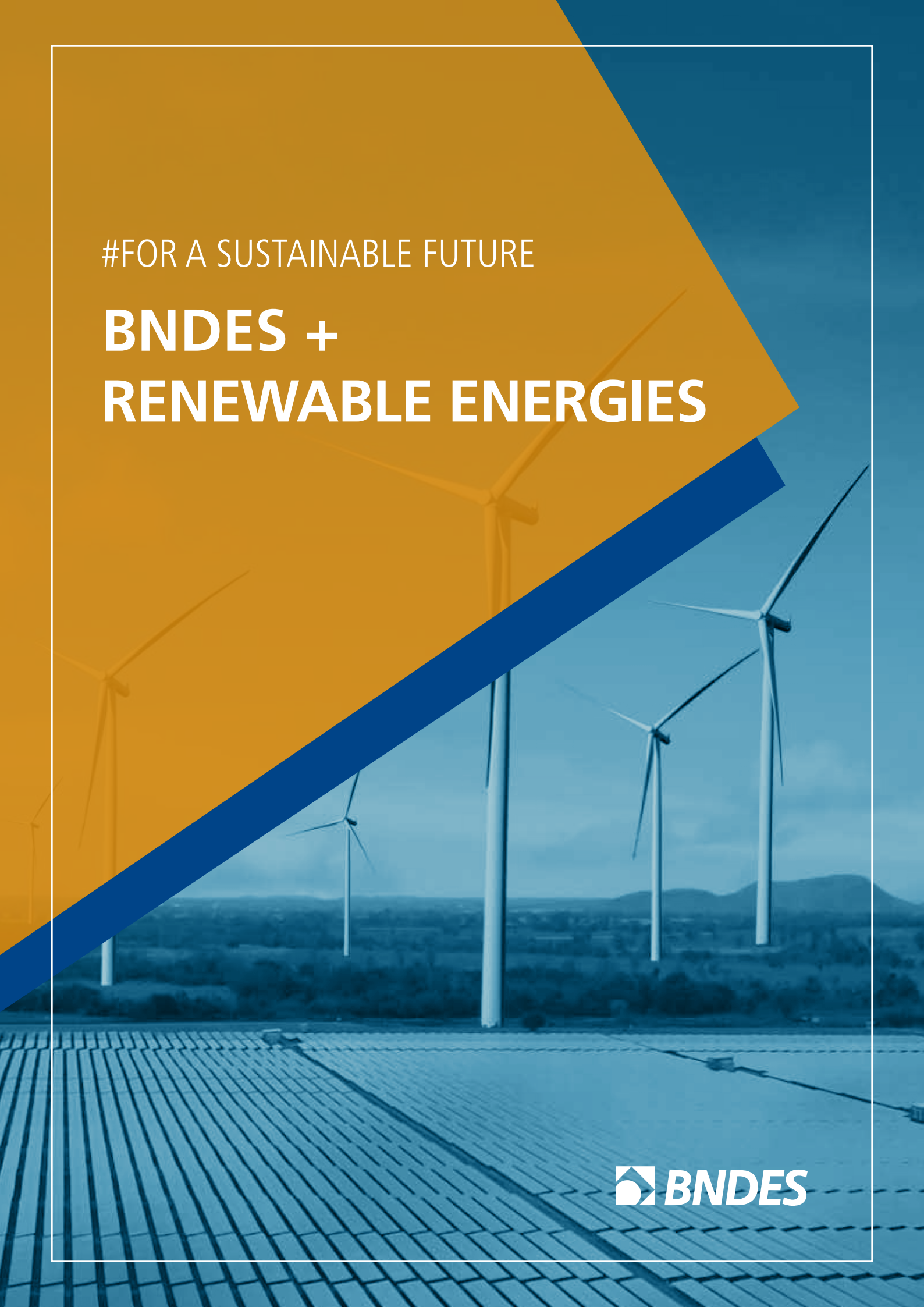
#FOR A SUSTAINABLE FUTURE

BNDES + RENEWABLE ENERGIES



BNDES

WHY SHOULD A DEVELOPMENT BANK SUPPORT RENEWABLE ENERGIES?

Economic development is energy demanding. The greater the gross domestic product (GDP) growth, the greater the amount of energy required to enable productive activities. With this in mind, in addition to the amount of energy required, it is important to consider the composition of the energy matrix.

There are a number of benefits associated with a greater share of renewable energy in a country's energy matrix. The main ones are the sustainable use of natural resources, reducing the potential emission of pollutants and greenhouse gases, and the creation of new production chains and new high-skilled jobs.

Because they have long maturation periods, as is typical of infrastructure operations, and higher risks (initial diffusion of new technologies), renewable energy projects do not always have sufficient resources in the private credit market to finance them. This means that, in spite of the positive externalities that these projects typically generate, there is no predictability on the depth, the maturity and the costs available in the credit market in order for countries to execute investments in a timely manner, given their targets and ambitions. The transition to a low carbon economy imposes the acceleration of investments, requiring the greatest possible amount of funding, whether public or private.

This scenario leads to the participation of governments to stimulate the development of renewable energy sources. As there is more than one market imperfection involved, public policies can contemplate the concession of financial support through innovative instruments, the establishment of favorable conditions for entrepreneurs, such as fees, term, degree of participation and risk sharing, and also the definition of socioenvironmental targets as part of the operation's conditions.

It is important to note that the costs of transition to a low carbon economy tend to decrease as renewable energy markets develop. Driven by technological improvements, gains in scale and greater competition, certain renewable energy sources have become increasingly competitive in relation to fossil fuels, as is the case of photovoltaic modules and wind turbines, which have experienced significant cost reduction over the last decades.[1] The support of public policies for the continuity of this virtuous process is therefore of vital importance.

MAIN GOALS OF THE BNDES IN THE ENERGY TRANSITION AGENDA

Brazil is in a privileged position due to the high level of renewable sources in its energy matrix and to the great potential of energy resources available in its territory. The Brazilian energy matrix, which encompasses all primary sources and forms of consumption, is one of the most renewable in the world, with 48.4% of the domestic supply of energy coming from renewable sources in 2020, compared to the 2018 averages of 11% for OECD countries and 13.8% for the world.[2] These figures show that Brazil has an energy matrix almost four times more renewable than the worldwide average.

1 A recent report by the International Renewable Energy Agency (IRENA) indicated that more than 60% of the renewable energy added in 2020 had a lower cost than the cheapest fossil alternative

2 Based on data from the National Energy Balance of the Energy Research Office (EPE), available at: https://www.epe.gov.br/en/publications/publications/brazilian-energy-balance.

The electricity sector contributes significantly to this result, since the Brazilian electricity matrix has an even greater share of renewable energies. Brazil had 84.8% of electricity generated by renewable sources in 2020. In comparison, only 23% of the world's electricity generation was produced from renewable sources in 2018.

The administration of the BNDES recently reinforced the institution's vocation to support the energy transition agenda. As such, it has inserted as a strategic guideline in the 2020-2022 Triennial Plan the "*modernization, decentralization and decarbonization of the Brazilian energy matrix*".

Indicators of installed capacity of renewable energy and expansion of the natural gas distribution network were defined as expected deliveries to society. The objective of the Bank's support for the projects is, to a large extent, the expansion of energy supply to sustain economic growth, observing the sustainable use of different sources.

In this context, natural gas is the main transition fuel for the low carbon economy, as it is the fossil fuel that emits the least amount of pollutants. As it displaces the consumption of other more polluting fossil fuels, such as gasoline, fuel oil, liquefied petroleum gas (LPG) and diesel, natural gas allows for a reduction of emissions in the greenhouse gas (GHG) balance, without giving up energy security.

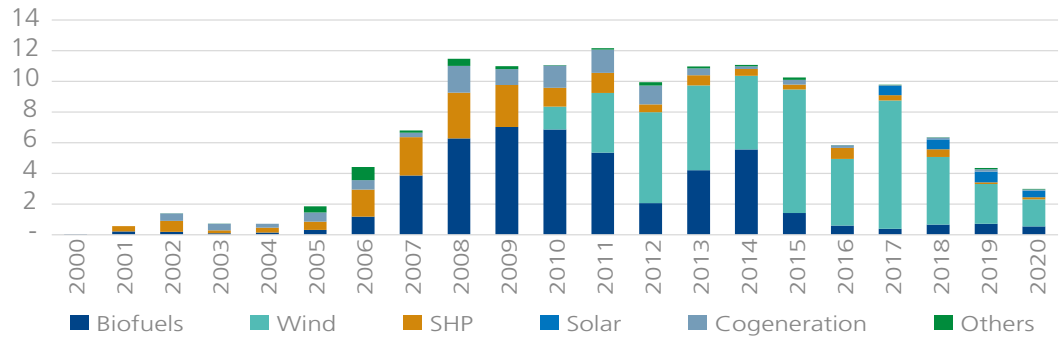
The BNDES's support should contribute directly to the nationally agreed targets for compliance with the Paris Agreement (the Nationally Determined Contribution – NDC).

THE BNDES'S SUPPORT TO THE SECTOR IN THE 21ST CENTURY

The BNDES has experience and expertise in supporting investments in renewable energy. Between 2000 and 2020, the institution disbursed BRL 133.8 billion (at August 2021 prices) for renewable projects. This is a significant amount, involving investments in wind farms, solar plants, small hydroelectric power plants (SHP), and biomass generation, among others.[3]

The following chart shows the evolution of the composition of the disbursement for renewable energy by source in the period of 2000-2020. In the 2000s, support for biofuels, SHPs and cogeneration stood out, while in the 2010s the support for wind farms was a highlight, with relevant growth of the solar source in recent years.

DISBURSEMENTS OF THE BNDES FOR RENEWABLE ENERGIES (R$ BILLION)



Prices of August 2021. Source: BNDES and IBGE.

3 In line with the Nationally Determined Contribution to the Paris Agreement agreed on by Brazil, hydroelectric power plant generation projects (large enterprises) are not considered. Nevertheless, in this period the BNDES supported relevant projects for power generation by hydroelectric plants.

INDICATORS OF DELIVERIES AND EFFECTIVENESS IN THE BNDES'S SUPPORT SINCE 2015

Between 2015 and 2020, the BNDES supported 138 projects of energy generation from renewable sources. The number of projects in the wind segment stands out, followed by biomass thermal plants and SHPs.

INSTALLED CAPACITY AND AVOIDED EMISSIONS OF RENEWABLE ENERGY PROJECTS SUPPORTED BY THE BNDES BETWEEN 2015 AND 2020

Sources	Number of projects	Installed capacity (MW)	Equivalent households	People benefited	Avoided emissions (tCO_2e)	Equivalent in km² of trees	Years of emissions from the automobile fleet of São Paulo (SP)
Wind	81	8,033	13,414,866	44,269,057	36,669,226	2,222	13.9
Solar	10	1,176	990,932	3,270,076	5,341,373	324	2.0
Hydro (SHPs)	20	450	880,704	2,906,323	5,252,512	318	2.0
Biomass thermal plants	27	602	1,082,669	3,572,808	865,291	52	0.3
Total	**138**	**10,260**	**16,369,171**	**54,018,265**	**48,128,403**	**2,917**	**18.2**

Source: BNDES.

The increase in installed capacity predicted by these projects is 10,260 MW, with around 78% of the total (8,000 MW) from wind power. It is estimated that this amount of energy is enough to supply energy to 16.4 million households in the country (considering an average loss of 12% of energy in transmission and distribution and an average profile of household consumption of 162 KW/h per month). Thus, as a result of the BNDES's action, just over 54 million people may benefit from the generation of clean energy, which corresponds to about a quarter of the current total Brazilian population.

CALCULATION OF AVOIDED EMISSIONS THROUGH SUPPORTED PROJECTS

An important indicator of the positive environmental impact of carrying out clean energy projects concerns the tons of CO_2 equivalent avoided, that is, the amount no longer released into the atmosphere due to the implementation of projects that emit less than their alternatives.

The power generation projects most recently supported by the BNDES already have the individualized calculation of avoided emissions. The operational teams used the Climate Fund Program's Greenhouse Gas (GHG) Reduction Calculation Tool, available for download here, for this purpose.

The estimates were performed with grouped data based on the sum of the installed capacities (in megawatts) by generation segment (wind, solar, etc.).[4] It is estimated that, in the projects approved by the BNDES between 2015 and 2020 in this segment alone, around 48.1 million tons of equivalent carbon dioxide will no longer be emitted into the atmosphere during the useful life of the clean energy generation projects. Again, the wind generation segment corresponds to most of the estimates: about 36.7 million tons (76% of the total).

To get an idea of the relevance of this number, it is equivalent to the carbon sequestration from an area of 2,917 km² of trees (or around 350,000 soccer fields) or 18.2 years emissions from the automobile fleet of São Paulo (SP), the largest city in Brazil.[5]

EVALUATION OF EFFECTIVENESS – LOCAL EFFECTS OF WIND FARMS

Besides contributing to avoiding greenhouse gas emissions, investment in wind power generation also has effects on the municipalities in which wind farms are installed. The BNDES team carried out an impact assessment to estimate the effect of the construction of a wind farm on the GDP *per capita* of the municipalities that received their first wind farm from 2008 to 2014.

Using the synthetic control method, the team sought to estimate effects that can be attributed to the wind farm. The results showed that the average and median effects on municipal GDP *per capita* were positive during the three years following the beginning of construction. The magnitude of the median effect was around 10% in the second and third years after the beginning of construction. The impact evaluation is available here.

4 The parameters used in the Climate Fund's emissions tool were the average capacity factors (energy actually produced in relation to the potential capacity) of 42.7% for wind farms, 21.6% for solar parks, 50% for water projects and 46% for biomass thermal plants. Additionally, the following parameters were used for the average useful life of the equipment: 20 years for wind farms, 25 years for solar parks, 40 years for water projects, and 25 years for biomass thermal plants. Lastly, an 80% reduction factor in avoided thermal emissions from biomass was considered as an emission estimate in the sugarcane production process that enables the generation of energy with the use of waste.

5 It was considered that a soccer field has an average area of 8,250 m² and that, on a typical day in 2015, the São Paulo car fleet emitted 7,253 tons of carbon dioxide equivalent in GHG emissions (based on the Institute of Energy and Environment's Inventory of Atmospheric Emissions for Road Passenger Transport in the Municipality of São Paulo, available at: http://energiaeambiente.org.br/produto/inventario-de-emissoes-atmosfericas-do-transporte-rodoviario-de-passageiros-no-municipio-de-sao-paulo).

EDITED BY THE COMMUNICATION DEPARTMENT
OF THE PRESIDENT'S OFFICE OF THE BNDES

OCTOBER 2021

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BNDES *The Brazilian development bank*

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