THE NATIONAL HUMAN DEVELOPMENT REPORT.
PARAGUAY 2020

ENERGY AND HUMAN DEVELOPMENT

SUMMARY

The cover illustration -with its simple lines and vivid colors- depicts the links that exist between different types of energy sources and societal transformation. It recreates people's lives and their environment, at different points in time. It goes from a past that appears in the background with more opaque colors to the present and the aspirational future with more vivid colors.
Such an evolution leaves behind the use of coal or firewood (biomass), as well as oil (hydrocarbons), and moves forward, with the use of new energy sources such as solar and aeolic energy, as well as sustainable biomass use (with reforestation). It also depicts a significant reduction of fossils fuels through the use of clean and sustainable energy produced by the current and new hydroelectric dams. Such an energy transition is aimed at human development, because the whole process is geared towards improving people's lives, taking care of the resources of planet earth, now and for the future.

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Foreword

The *National Human Development Report. Paraguay 2020: Energy and Human Development* was written before the Covid-19 global pandemic's onset in March 2020. All through the year the national response to the pandemic has been in the forefront of public concern, but that does not mean that the challenges identified in the Report are no longer relevant. On the contrary.

A crisis, like the one unleashed by the pandemic, brings about a series of changes and accelerates certain processes that were already underway. This has been the case in Paraguay, as in other parts of the world. Trends that have been noticeable for some time have acquired new impetus in the present and future projections had to be recalibrated, resetting what was meant to happen in the medium term as an actual and very present occurrence. This is the case of telecommunications, for example, which went from being an object of planning to an urgent requirement for the continuity of multiple basic activities. Unfortunately, such a sudden uptick in what was required revealed significant asymmetries in who had access, unfolding serious disparities according to income and area of residence. Indeed, just as access to energy in physical and economic terms is increasingly perceived as a right, today a similar process can be seen in relation to Internet connection, with quality and affordable cost so that "no one is left behind."

Energy is a requirement to satisfy the needs or fulfill the basic rights of people. It is essential for cooking, preserving food or medicine, to go to school or work and back, to study or for leisure at home, for proper functioning of machinery in factories and computers in service providers, for lighting in public spaces and for other multiple functions.

Two key factors demonstrate the validity, importance and urgency of our challenges. On the one hand, climate change and its harmful effects on people and the planet and, on the other, the relevance of Sustainable Development Goal 7 (SDG 2030) –Guarantee access to affordable, safe, sustainable and modern energy– included in Paraguay's National Development Plan 2030.

This Report seeks to be a contribution of the United Nations Development Program (UNDP) to Paraguay's sustainable development, and we take great pride in fulfilling our mandate in that regard. It is a technical report that

nonetheless aims at the larger public, trying to minimize the use of specialized language, and offer an impartial view of the government and the different stakeholders involved in the area of *Energy and Human Development*. Like the previous ones –*Equity for development (2008) and Decent Work and Human Development* (2013)– it represents yet another contribution of UNDP to the development of public policy guidelines on issues that are particularly relevant for the country. We offer them for consideration by the government, civil society and the private sector.

The energy issue in Paraguay has usually been considered a subject for specialists and high government officials. The technical requirements necessary to understand the phenomenon and the high levels of political decision-making kept the topic away from relevant socio-political and economic actors, as well as from the general citizenry. In other words, the protagonists have been engineers, economists or high government officials; almost always exclusively men.

The energy used on a daily basis in homes is linked to hydrocarbons, hydroelectric plants and biomass; that is to say, gasoline, electric power and firewood or charcoal. There is national pride in the ownership of binational hydroelectric dams and a certain awareness of the sale of Paraguay's share of hydroelectric power to associated countries (Brazil and Argentina). However, there is still little debate about the energy matrix –both in production and consumption–, and on global changes in government policies towards clean and sustainable energy.

The Human Development approach sheds more light on people's rights to be informed, debate and participate in energy and development policies in general, including government policies related to planning of energy production and use. The follow-up to this report and the participation (2019-2020) of an Advisory Committee –representing a wide range of government institutions, the private sector, civil society, academia, international cooperation organizations, and others– reflects such an approach.

It is therefore imperative to define themes, establish priorities and formulate responses to the challenges encountered. This report offers analysis and proposals for an informed dialogue and for implementing consistent, renewed and comprehensive policies.

Alfonso Fernández
Deputy Resident Representative

Silvia Morimoto
Resident Representative

Key Messages

1. There is a need for more human development and less inequality;
2. The country ought to transition to a more complex and diversified economy with a resilient middle class and social inclusion;
3. Enable more affordable, clean and sustainable energy (SDG 7), in response to the 2030 National Development Plan, and develop new energy sources;
4. Strengthen policies for energy equity, eradication of poverty and vulnerability and support MSMEs, introducing electromobility;
5. Implement the energy national policy for 2040, particularly its governance proposals, with the creation of a Ministry of Energy, and the proposals to transform the income hydroelectric plants into a development bank.

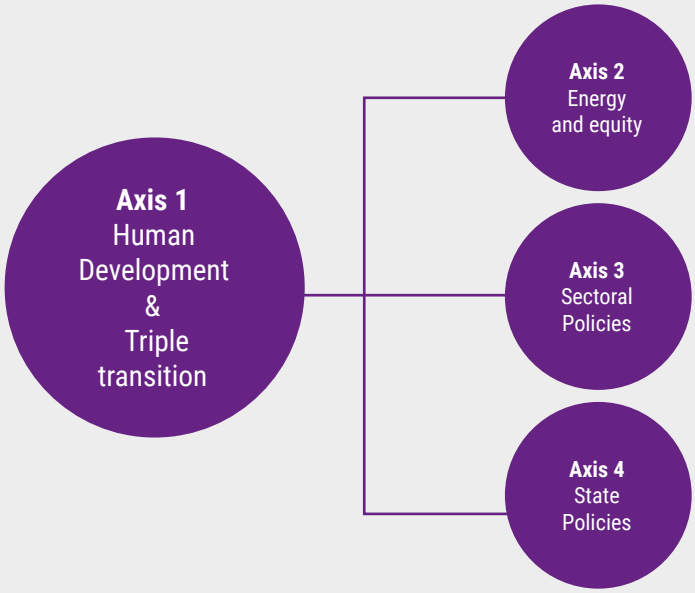
Summary

Human development and the triple transition (the social, economic and energy transition) is the starting point of Paraguay's ***National Human Development Report 2020. Energy and Human Development.*** *It is also the basis on which its content is structured. The human development approach is key to the work of the United Nations Development Program (UNDP). This approach and the triple transition make up a strategic axis around which national public policy may be formulated.*

In Paraguay, promoting human development is the goal that should guide all public policies that aim at ensuring that the population as a whole enjoys better living conditions and wellbeing, thus expanding their capabilities and freedoms.

In addition to the aforementioned strategic axis, three other axes are key for formulating effective public policies. They are: a) energy and equity; b) sectoral policies; and c) State policies. All of them are linked to governance and institutional strengthening. These axes cut across and help structure the topics developed in this Report.

Diagram 1
Structure and logic of the axes



Source: Own elaboration.

1
The central theme and frame of reference of the Report

The relevance of focusing on energy and human development, has to do with the fact that the energy matrix of a country, considered both from the point of view of supply and demand, constitutes a vital point of entry to assess a country's achievements in terms of sustainable development, and how pending challenges are resolved. Indeed, energy is an essential resource to promote human development. It creates capacities to take advantage of the opportunities that development brings, as well as to face the challenges it poses. The use of sustainable and clean energy sources is crucial to guarantee protection of the environment and promote equitable development.

This Report examines the relation between human development and access to energy. The analysis of Paraguay's energy matrix is done taking into consideration the institutional framework and the energy policy, seeking to promote an energy transition focused on electricity and aimed at promoting equity and sustainable development. It is guided by the premise that SDG 7 needs to be achieved by 2030, as well as in Paraguay's

2030 National Development Plan. It is also intended to provide possible scenarios that will unfold in Paraguay beyond 2023, the year in which key elements in Annex C of the Itaipú Treaty will be reviewed.

The 2030 Agenda for Sustainable Development adopted by the United Nations General Assembly in September 2015 is defined as "an action plan in favor of people, the planet and prosperity". It consists of 17 Goals and 169 targets that the Member States of the United Nations, including Paraguay, have set for themselves, committing to achieve them in the period between the date of adoption and the year 2030.

SDG 7, in particular, is about ensuring "access to affordable, reliable, sustainable and modern energy" for all people, and includes the following targets: 7.1) Ensure universal access to affordable, reliable and modern energy services ; 7.2) Considerably increase the percentage of renewable energy in all energy sources; 7.3) Doubling the global rate of improvement in energy efficiency; 7.4) Enhance international cooperation to facilitate access to clean energy research and technologies, including renewable energy sources, energy efficiency and advanced and cleaner fossil fuel technologies, and promote investment in energy infrastructure and in clean technologies, and; 7.5) Expand infrastructure and upgrade technology to provide modern and sustainable energy services for all people in developing countries (United Nations, 2015).

Paraguay's 2030 National Development Plan, presented by the Technical Secretariat for Economic and Social Development Planning and approved in 2014 through Decree 2794, aims to transform Paraguay by 2030 on the basis of public policies focused on three strategic axes: i) reduce poverty and promote social development; ii) achieve inclusive economic growth, and iii) achieve an adequate insertion of Paraguay in the world. Four cross-cutting lines are incorporated in each axis: i) equal opportunities; ii) efficient and transparent public management; iii) land use planning and development, and iv) environmental sustainability. From the interaction between the strategic axes and the cross-cutting lines, 12 strategies emerge to provide guidance for the formulation of the country's public policies (Ministry of Finance, 2014).

With regards to energy, the Paraguay 2030 National Development Plan sets out various objectives, among which it is worth mentioning the following: i) universal access to quality electric power (as part of the strategy on suitable and sustainable habitat); ii) increase the consumption of renewable energies by 60% and reduce the consumption of fossil fuels by 20% (as part of the valuation of environmental capital strategy), and; iii) improve the physical infrastructure of the border, the navigability of the rivers, and energy, trade and border integration (as part of the regional economic integration strategy) (Ministry of Finance, 2014).

It is important to also note that the debate on the importance of the negotiations regarding the amendment of Annex C of the Itaipú Treaty, which will take place in 2023, has been taken into account[1]. Its importance is beyond doubt, since these negotiations will have their economic, energy and environmental impact on the future of the country.

Another two key factors must also be considered. Firstly, in the years close to 2035 Paraguay may have already consumed all the energy produced by Paraguay's share of Itaipú, if consumption maintains the rate that it has presented so far. Even if power generation extends a little beyond the year considered as the deadline, it is important to bear in mind that the energy produced by Itaipú has an end date, just like the one generated by the Yacyretá dam, whose ownership is shared by Argentina and Paraguay. In other words, the energy generated will run out at some point, since hydroelectric plants do not produce surplus energy indefinitely.

Secondly, we should bear in mind that since 2016 the country has had the Energy Policy of the Republic of Paraguay, cited in this report as the National Energy Policy 2040, which constitutes a significant advance in terms of medium-term planning. The country also has an update of the scenarios proposed by the energy prospect for the year 2050, which was prepared by the Vice Ministry of Mines and Energy of the Ministry of Public Works and Communications, and has been available since 2019.

All of the above mentioned factors emphasize the importance of carrying out an analysis of the energy sector that includes variables extending beyond the year 2023.

2
The structure of the Report

The Report consists of an introduction and eight chapters. Chapter 1 analyzes human development and its link with access to energy, and defines the triple transition - economic, social and energy - that the country is going through, and the complex challenges in terms of public policies. In chapter 2 the economic-productive transition is studied.

1 The Itaipu Treaty was a bilateral agreement signed by Brazil and Paraguay on April 26, 1973 to establish the guidelines that would govern the hydroelectric exploitation of the Paraná River that the two countries would carry out. This agreement gave rise to the Itaipu dam.

Chapter 3 addresses social transition. Chapter 4 examines the evolution of the energy matrix and the electricity sector in Paraguay. Chapter 5 analyzes the energy-electricity transition, presents key notions for public policy, examines the role of micro, small and medium-sized companies in the country, and studies the use of non-conventional renewable energies. Chapter 6 discusses the benefits of the transition to electromobility. Chapter 7 examines Paraguay's energy prospects and evaluates various possible scenarios. The conclusions and challenges are presented in chapter 8. The Report is completed with a detailed bibliography and the corresponding annexes.

3 Axis 1. Human development and the triple transition

3.1 Human development

From the first measurement of the Human Development Index (HDI) in 1990 to 2016, Paraguay was among the countries that reached a medium level of human development. However, in recent years, thanks to an accumulation of favorable trends related to the components of the HDI (life expectancy at birth, level of education and gross national income per capita, with adjustments based on real purchasing power), Paraguay crossed the threshold (0.700) and entered the group of countries that have reached a high level of human development (0.702), according to data from 2017 presented in the update of the human development indices released in 2018 by UNDP. Paraguay now occupies the 110th position out of a total of 189 countries and territories in the global HDI ranking (UNDP, 2018).

However, the progress made in the country in terms of human development was limited due, in part, to the late implementation of social policies, or to their lackluster impact, either because of problems with their orientation or the lack of resources. Therefore, public policies aimed at promoting human development in Paraguay must be improved so that their implementation contributes to guaranteeing the full realization of citizens' rights.

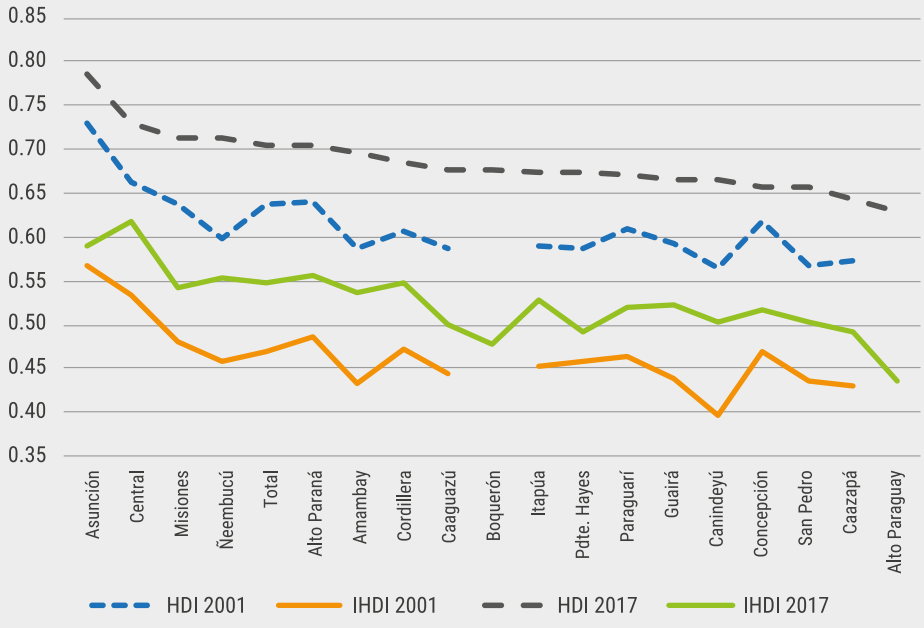
The data from the UNDP update (2018) also show that the HDI adjusted by gender (HDI-G) expresses a high level of human development in the country (0.972). It places Paraguay in a higher rank than the general HDI. However, inequality appears as a factor that significantly restricts people's development. When the HDI adjusted for inequality (HDI-D) is considered, it is observed that Paraguay amounts to 0.522, positioning it close to the average of countries with a medium level of human development (0.483). This indicates that inequality is a factor that leads to large development losses. The Gender Inequality Index (GDI), which measures gender inequality, is another index that positions the country at a medium level of development (0.489).

In addition to the human development indices presented in the update released by UNDP in 2018, the Report presents indices built on the basis of national data, consulted in the Permanent Household Survey (EPH) of the General Directorate of Statistics, Surveys and Censuses (DGEEC), and exceptionally disaggregated in 2017 according to ethnic origin (indigenous population and non-indigenous population). Thanks to the indices estimated from national data, which do not differ significantly from international data, it was possible to measure the level of human development of the departments that make up the country.

When the HDI corresponding to the country and its departments in 2001 and 2017 are compared, it is observed that the HDI of 2017 was higher than that of 2001. However, the weight of inequality in Paraguay is expressed in the fact that the HDI-D of 2017 was lower than the HDI of 2001. This means that, on average, the level of human development in 2001, measured with the HDI, was higher than the level of human development of 2017, measured with the HDI-D. Consequently, inequality represents a setback of at least 16 years in terms of the country's human development (see graph 1).

Graph 1

HDI and IDHI of Asunción and departaments, 2001 and 2017



Source: Own elaboration based on national data.

In addition, the indices calculated based on national data allow identifying disparities in the levels of human development, depending on ethnic origin and sex, as can be seen in table 1.

Table 1
HDI and level of human development according to ethnic origin and sex in the Paraguay, 2017

	High	Medium	Low
Total population	0.706		
Non-indigenous men	0.722		
Non-indigenous women		0.690	
Indigenous men		0.572	
Indigenous women			0.482

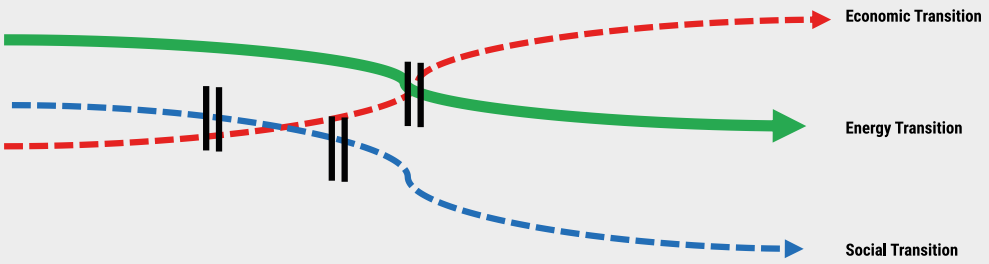
Source: Prepared on the basis of the data consulted in the United Nations Development Program (UNDP), *Indices and indicators of Human development 2018. Statistical update of 2018*, New York, 2018.

Although the HDI of Paraguay as a country is high, when disaggregating the data according to sex and ethnic origin of the population, only non-indigenous men maintain a high level of human development, while the other population groups reach a lower level of development. Non-indigenous women and indigenous men are at a medium level of human development, although the former are in a better situation than the latter, while indigenous women are in the most disadvantaged situation, since they only reach a low level in human development. Thus, the data analyzed indicate that there are great pending challenges in the country on the way to achieving full human development that includes everybody. The main challenge is to overcome the gaps that express persistent inequality and limit people's opportunities.

3.2 The triple transition

In the Report, Paraguay's progress and challenges in terms of human development are analyzed in the context of three transitions currently underway in the country: the economic, social and energy transitions, each evolving at different rates. In order to promote such transitions successfully, from a public policy perspective, the State must consider both the complexity of the transitions and their interactions.

Figure 1.
Triple Transition



Source: Own elaboration.

3.2.1 The energy transition

Paraguay is a particular case worldwide, due to its high capacity for hydroelectric energy production. In fact, it is one of the few nations in the world that has an electrical system based almost exclusively on a renewable and non-polluting source, hydropower. It has two large dams, Itaipú and Yacyretá, jointly owned with Brazil and Argentina, respectively, and it has a third plant, Acaray, which is exclusively owned by the Paraguayan State.

The country's advantage in this regard is remarkable, and its effects extend beyond the electricity and energy sector. Along with Albania, Paraguay is the country that has the cleanest energy production in the world, due to zero emission of carbon dioxide in 99.9% of its electricity generation, according to data from the World Economic Forum (*Paraguay.com*, 2016).

The surplus of hydroelectric energy that Paraguay possesses provides the opportunity to use it to further human development and transition towards a more sustainable energy system. However, to promote human development using available energy, it is necessary to implement public policies that promote the use of that surplus energy for the benefit of the whole of society (Blanco et al., 2017).

The current energy matrix of the country is characterized by an important production of renewable energy, that is, hydropower (47%) and biomass (33%). On the other hand, its final consumption (53% of Paraguay's production in 2017) reveals a high consumption of biomass (44%) and hydrocarbons (40 %). Despite the increase in internal consumption of renewable energy, there is still a large surplus of electricity

that is exported. Indeed, of the portion of energy generated by each of the binational dams that corresponds to Paraguay, almost four-fifths is transferred and sold to Brazil and Argentina, turning the country into the first per capita exporter of hydroelectricity in the world.

The availability of energy in the future inevitably requires the development of institutional, planning and energy regulation capacities. Particularly regarding energy efficiency issues, and anticipating future infrastructure needs, because the commissioning of electricity generation infrastructure works takes years. All these issues are related to governance and energy prospects, which are analyzed in Chapter 7 of the Report.

The country is at an opportune moment to promote its energy transition, moving from existing energy consumption patterns to cleaner and more sustainable ones. It consists of going from being a hydro-energy exporting country to becoming a country that uses hydro-energy as a platform to diversify and boost its economy. This Report focuses on the study of the electrical transition, based on the goals established both in SDG 7 of the 2030 Agenda for Sustainable Development and in the Paraguay 2030 National Development Plan The assessment of the energy matrix and the country's electricity sector is addressed in Chapter 4, while the analysis of Paraguay's energy transition is presented in Chapter 5.

The energy transition will not occur by itself, nor will it be the only structural transition underway. It will catalyze the economic and socio-environmental transitions that are underway and intertwined with each other. They are all equally important and together constitute the core of Paraguay's structural transformation necessary to reach the 2030 Agenda for Sustainable Development.

3.2.2 The economic transition

Paraguay's economic performance since the beginning of the 21st century has been positive. The average GDP growth rate was 3.4%, with values higher than 5% since 2010, which meant a sustained increase in GDP per capita. This led to a reclassification of the country, from the group of lower-middle income countries to the group of high middle-income countries, according to the World Bank (s / f).

The engine of growth was basically the primary sector, concentrated only in a few products (soybeans, livestock and, to a lesser extent, wheat, and corn). The downside is that such poor diversification makes the country highly dependent on a few markets and products, making it

vulnerable to external shocks, falls in international prices and changes in international demand. Exported goods have little added value, positioned in the lower end of the global supply chains, with unstable or low prices. This productive structure restricts the possibilities of achieving sustained growth over time, capable of generating optimal conditions for economic inclusion.

Another effect of the productive structure is the volatility of the agricultural sector, whose determining factors are the climate, the prices of raw materials, investment levels and the sanitary conditions of the livestock sector (World Bank, 2014, p. 20). Public policies are not very effective in relation to exogenous variables such as the climate or international prices, and the low levels of investment, reflected in the lack of irrigation systems or the lack of adaptation of seeds, reinforce climate problems. The costs of such volatility are relatively high for a small economy like Paraguay.

Macroeconomic stability was one of the country's undoubted achievements in the 2000 to 2017 period. However, Paraguay experiences fiscal tensions derived from the rapid increase in indebtedness, low tax pressure and public deficit. In addition, the tax pressure in the country, one of the lowest in the region, is inequitable due to the excessive weight of indirect taxes.

There have been many years of economic stability, with a favorable international context, resulting in relatively high average growth rates. However, these have also been highly volatile conditions. The close dependence on climatic and external factors, and the concentration of production and exports in few goods and services with low added value, limited the sustainability of long-term growth, as well as the generation of income through paid work , so the effect of economic growth on poverty and economic inequality was limited.

Long-term inclusive growth, which contributes to promoting human development, requires the implementation of structural changes in the productive matrix in order to have an impact in the quantity and quality of employment, since a country that produces and adds value through manufacture and innovation has more opportunities for growth in the long term, thus increasing income and narrowing ~~the~~ disparities.

In Paraguay, it is all important to create opportunities for women and young people to participate in the economic process. They have not benefited from the effects of economic growth, nor have they been able to fully contribute to development, making it difficult for the country to reap the benefits of a potential gender and demographic bonus.

The economic transition could lead more effectively to promoting human development if certain structural and complementary changes occur. Changes that could arise out of more productive diversification,

taking advantage of the existing capacities and accumulated knowledge that help create new products. Such a dynamic could result in increasingly more sophisticated products, with the potential to raise the level of income and reduce inequalities. This is why, in Chapter 2, the Report examines different scenarios of productive diversification based on the identification of the products with the greatest potential to achieve it, acting as the building blocks of a more complex economy.

3.2.3 The social transition

The political changes that took place in 1989 signaled a new beginning. One that was marked by a more active presence in the international arena, leading to the ratification of various international human rights instruments. It was also characterized as a time when social demands began to be articulated on behalf of the population as a whole and of specific groups, such as indigenous people, women, children, young people, and others. A new political Constitution was also approved in 1992 and an appropriate legal framework was formulated to guarantee and protect the economic, social and cultural rights of the population.

However, although Paraguay has undoubtedly achieved significant improvements in the quality of life of its population in recent decades, they have been insufficient and have not substantially reduced the gaps that still persist between different population groups.

The years of economic growth led to the reduction of monetary poverty, but stopped short of eradicating the stark inequalities that still persist. This was mainly due to the low fiscal priority given to social policies in matters of health, education and social protection; insufficient coordination between the various actions implemented, and the persistence of social problems that are not addressed properly by existing public policies and programs.

Universal coverage of quality basic social services is still wanting, with multiple challenges that need to be overcome. Universal access to education and health services are still confronted with major hurdles, with significant gaps in basic education coverage and access to primary health services. Although the health conditions of the Paraguayan population have improved in the period studied, the country's progress was not as relevant compared to the achievements of other Latin American countries, nor did it occur with the speed necessary to reduce the existing lag that exists with respect to regional averages. The insufficient coverage of health, education and social protection services, registered in the EPH,

is the result of the low per capita social investment of the Government, which, despite having quadrupled in the last 15 years, currently represents only 9.3% of GDP.

Thus, the principle of leaving no one behind, raised by the 2030 Agenda for Sustainable Development, means responding to the thousands of citizens who did not benefit from the regional economic boom of the years of growth. In particular, the challenges of Paraguay's social transition consist of promoting the consolidation and expansion of the middle class, reducing poverty and promoting the social inclusion of vulnerable populations. To achieve the necessary social and redistributive improvements, it is necessary to implement policies that support the labor market, guarantee social protection, promote the development of care systems and favor the participation of women and young people in the labor market.

4
Axis 2. Energy and equity

4.1 Equity, poverty and energy vulnerability

The concepts of equity, poverty and vulnerability ought to be seriously considered when formulating and implementing public policies in the energy sector. Equity, as in the case of the gender perspective, are cross-cutting factors that need to be included in all public policies, for they are fundamental conditions for the achievement of human development.

Energy equity is aimed at ensuring that "the entire population has physical access to [modern] commercial energy, as well as economic access." To achieve such equity, it is necessary to establish affordable costs and prices, which allow the entire population to access the energy service (Mulás del Pozo, 2019). In this way, energy equity reflects the aforementioned SDG 7, which consists of guaranteeing affordable energy for all people.

In Paraguay, access to electricity has increased significantly in recent decades, reaching very high levels. In fact, the main achievement of the

country, in social and energy terms, consists in the almost universal physical access to electricity. However, the gaps still persist, and there are still groups that remain excluded. The inclusion of the last stretch or the "last mile" is still pending, and it is necessary to guarantee greater affordability and quality of the electric power service, with a view to complying with the principle of leaving no one behind, the foundation of the 2030 Agenda for Sustainable Development.

On the other hand, although Paraguay has rates of access to electricity close to 100%, household spending on energy is important, and not only for households living in poverty (IADB and OLADE, 2018). Furthermore, the country's average per capita electricity consumption is below the regional average (IADB and UNDP, 2018), and more than a third of the population relies on solid biomass for cooking (DGEEC, 2017).

The type of fuel used for cooking is crucial to meeting the needs of the population in terms of nutrition, health and gender equality. In Paraguay, the type of energy used to cook food at home constitutes an element in which gender, income and area of residence inequalities converge and accumulate. The poorest households, and particularly those located in rural areas, are those that use biomass to a greater extent for cooking food. Such practice has harmful effects on health: the burning of solid biomass in inefficient kitchens or in spaces without ventilation produces carbon monoxide and pollutant particles that can cause acute respiratory infections in girls and boys, and chronic obstructive pulmonary diseases in adults. Women and girls are the most affected, as they are in charge of collecting firewood and preparing food. The use of this source of energy also damages the environment.

Therefore, it is crucial to break the dependency of Paraguayan households on biomass, both to reduce the time spent collecting fuel and to promote the improvement of the health of the population as a whole and, especially, of girls and women. (IADB and UNDP, 2018; European Commission and E-Mindset, 2007). At the same time, it is necessary to promote the use of modern energy sources such as gas or electricity, which have beneficial effects on people's health and contribute to achieving gender equality and caring for the environment.

In conclusion, to achieve human development that benefits the population as a whole, the State must implement public policies aimed at eradicating poverty and energy vulnerability and guarantee an increase in more balanced and quality electricity consumption. This can be done by promoting a paradigm shift in the productive sector and energy consumption patterns in Paraguay. Doing so by incorporating policies focused on achieving equity, eradicating poverty and energy vulnerability. This is one of the greater challenges for the country's electricity sector.

4.2 The social tariff

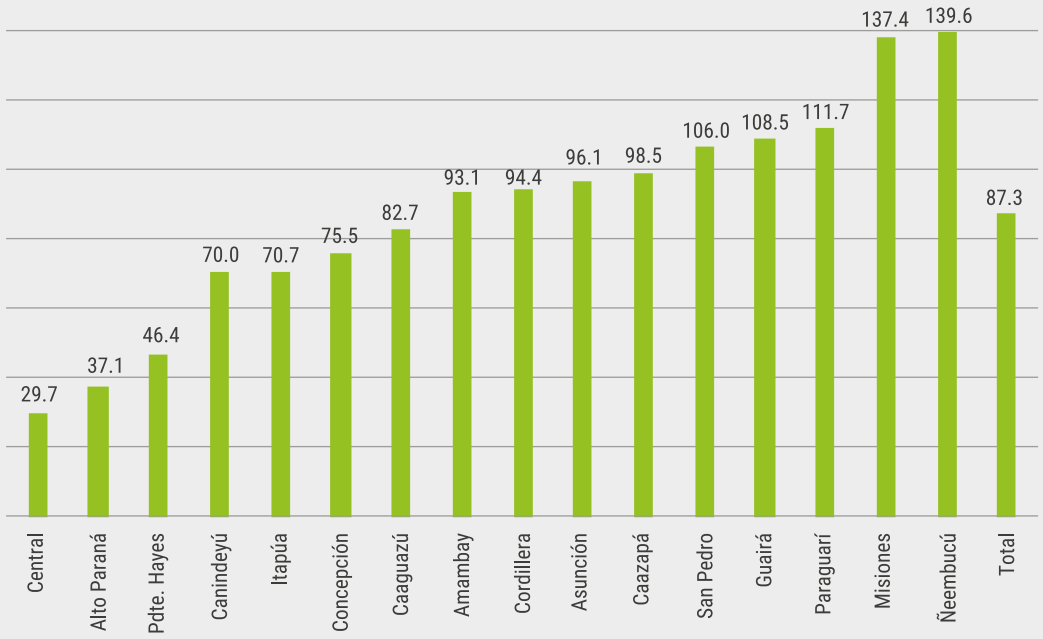
Equity is included in Paraguay's 2030 National Development Plan, as part of the goals of reducing poverty and promoting social development and equal opportunities. The concept of energy equity is implicitly acknowledged in the social tariff policy that reduces service costs according to specific criteria. One of them is to guarantee access to energy for families with fewer resources.

The social tariff is a direct and effective subsidy that reaches households directly, provided certain conditions are fulfilled. Households that participate in the social tariff must be within a certain range of consumption per month and comply with some administrative and technical requirements.

The social tariff has not been able to avoid the risk of deviations in terms of who they include and exclude. There are households that are benefitting and who should not, and the reverse, households that should be benefitting, but are not. According to the norm, the social tariff should only subsidize households with low incomes. However, the data presented in Graph 2 allows us to verify that there are problems of inclusion and exclusion, and that the departmental distribution of the social rate was unequal in 2017. The Departments that have more that 100% of eligible poor households benefitting from the social tariff indicate that there is an inclusion problem, while those with less than 100% of poor households using the social tariff are the ones that have an exclusion problem.

Graph 2

Poor households with a social rate according to department (in percentages) in the Paraguay, 2017



Source: Own elaboration on the basis of data consulted in the General Directorate of Statistics, Surveys and Censuses (DGEEC), *Permanent Household Survey 2017*, Asunción, and National Electricity Administration (ANDE), *Annual Report 2017*, Asunción, 2017 (data from the Social Territories Unit).

The social tariff benefits both society and the energy sector, for the following reasons: i) it contributes to the fulfillment of rights that are constitutionally guaranteed; ii) it postpones the realization of onerous investments in the present and affects those that will have to be made in the near future, and; iii) it reduces the amount of hidden and informal consumption, enabling projections and improvement of service quality.

Access to the social tariff is an indication of a better quality of life for people who are more vulnerable, and represents an important step towards energy equity, even though there still are technical, social, operational and ethnic barriers that persist, hindering its full implementation. The challenge consists in reformulating the social tariff with a view to improving the targeting and coverage of the measure. It should also be able to guarantee an adequate level of consumption of the households participating in the program, allowing them to cover their electricity consumption needs, and support the development of productive micro-enterprises that allow these households to improve their living conditions and overcome poverty.

4.3 Non-conventional renewable energies and mini-grids

Since the population without access to electricity usually lives in very remote rural areas, it is difficult, due to technical and economic reasons, to extend conventional electricity networks there. Therefore, to guarantee access to energy for populations located in isolated areas or far from urban centers various solutions have been developed (IADB and UNDP, 2018). Among these, we can mention non-conventional renewable energies, as a valuable resource to guarantee access to energy for all.

In Paraguay, populations without access to electricity live in places such as the border area with Bolivia, to the northeast, or in other areas far from the cities. The isolated populations linked to the National Interconnected System can access electricity through generation microgrids based on non-conventional renewable energies, whose global incidence is increasing. These networks are made up of low-voltage distribution systems, are connected to sources of electricity generation and energy storage batteries and respond to a hierarchical control and management system. These microgrids can, in turn, be connected to another main network (traditional electrical network) or act in isolation.

Other options increasingly used globally consist of solar systems and other off-grid technologies, whose main markets are geographic areas away from the networks and high-end eco-sustainable projects.

Paraguay has an excellent level of solar radiation that could be used in photovoltaic panels and as solar thermal energy applied to various uses. For example, all the energy necessary to supply national residential consumption could be generated, in technical terms, on the roofs of homes in the country, using photovoltaic technology. Thus, it is necessary to carry out field studies and specific technical calculations to accurately estimate the usable solar potential of the country, since solar energy brings many benefits[2].

5
Axis 3. Sectoral policies

One of the axes that run through and structure the topics developed in the body of the Report are sector policies, which are wide-ranging policies that establish frameworks for the formulation and implementation of other policies or more specific and shorter programs. These policies are central to facing the challenges that Paraguay must address in terms of development.

5.1 Energy efficiency

Public policies in the energy sector are aimed at satisfying the energy needs of the population, pursuing strategic objectives related to the fundamental pillars of energy security and sustainability. Their efficiency depends, in many cases, on the technology used. For example, the decision to opt for an incandescent bulb or an efficient lamp will fall upon users in countries where there are no specific policies aimed at prohibiting the importation of incandescent bulbs.

Energy public policies directed to consumers generally include measures aimed at promoting awareness and disseminating a culture of efficiency. These are oriented to promote the use of energy in accordance with the conditions of the supply side, seeking to establish adequate costs and savings in the consumption of energy sources. The policies directed to energy providers are aimed at regulating the operation of specific

2 Use of wind energy requires further studies in the country.

agents in the energy sector, such as energy companies, and might require them, among other things, to reduce their leaks during electrical power distribution.

In Decree 6092 of 2016, which approved the Energy Policy of the Republic of Paraguay (2013-2040), energy efficiency constitutes a cross-cutting aspect of the strategies of the energy subsectors, and regulates the creation and implementation of specific instruments to achieve it.

To meet energy efficiency goals and targets, one of the main tools is the labeling of end-use equipment. It is a certification on use of energy of the devices through reports on the level of consumption of a piece of equipment with respect to the level of consumption of other devices destined to fulfill the same function. These certificates are defined by the institutions in charge of standardization at the national or regional level, and can be applied within a specific region (eg the European Union) or country.

In Paraguay, the National Energy Efficiency Committee requested the National Institute of Technology, Standardization and Metrology to create Technical Committee No. 51 on energy efficiency, which has already developed and approved technical standards for labeling energy efficiency in air conditioners, electrical appliances, refrigeration, fluorescent lamps, household incandescent lamps and other products. However, standardization and labeling is still a challenge, as it involves covering not only all energy-consuming equipment, but also energy-using facilities.

Despite the progress made, there are still challenges that are contemplated in the National Energy Policy 2040. Among them is to increase the use of electric power in consumer sectors. To achieve this, it is necessary to promote the use of electrical energy to transport people and freight, to use it in cooking or for carrying out industrial processes. The effective implementation of the policies required to promote such changes will probably be better served with the creation of a consolidated higher-level agency, such as a ministry, responsible for the coordination of the different actors linked to the energy sector.

5.2 A prospective on energy

A prospective analysis is a planning exercise linked to the design and implementation of energy policies. It examines possible scenarios and outlines the policies that will need to be implemented to promote future transformations in the country. The Report examines two prospective studies: i) the Energy Prospective of the Republic of Paraguay 2013-2040, carried out by the Bariloche Foundation with the support of the

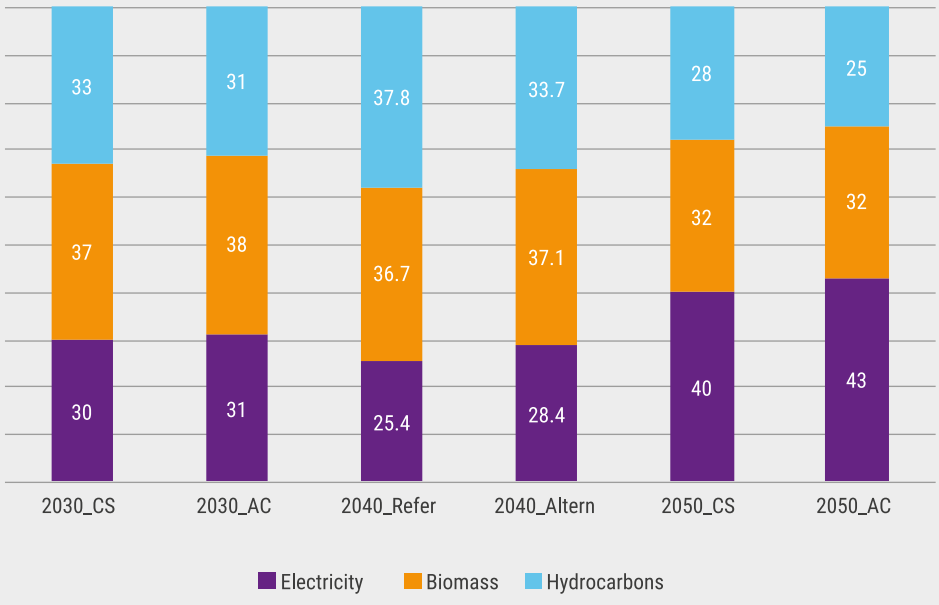
Vice Ministry of Mines and Energy, the Itaipú Technological Park and Itaipú Binacional, and disseminated by the Government of Paraguay in 2016, and; ii) the latest available national prospective analysis, which includes the period 2015-2050, prepared by the Directorate of Energy Resources of the Vice Ministry of Mines and Energy, with technical assistance from the International Atomic Energy Agency (Fundación Bariloche, 2016; Vice Ministry of Mines and Energy, 2020).

Figure 4 presents six prospective scenarios. The two scenarios proposed in the study prepared by the Bariloche Foundation extend to the year 2040 and includes a reference scenario and an alternative scenario: the reference scenario, inertial or trend, is characterized by the absence of State intervention, while the alternative scenario contemplates a state intervention favorable to the use of clean and sustainable energy (Fundación Bariloche, 2016).

The two energy scenarios proposed in the study carried out by the Directorate of Energy Resources of the Vice Ministry of Mines and Energy are the Cruz del Sur scenario and the Alfa Crux scenario. The latter is based on assumptions similar to what is outlined in the first scenario, except for an increased penetration of electricity in the transport sector. In this second study, each of the scenarios extends to 2030 and 2050. According to the results obtained, the energy scenarios contemplated would lead to significant changes in the energy matrix favoring sources based on electricity (Vice Ministry of Mines and Energy, 2020).

Graph 3

Energy prospective scenarios according to energy source or type of fuel used (in percentages) in Paraguay, 2030, 2040 and 2050



Source: Own elaboration on the basis of data consulted in Fundación Bariloche, *Energy Prospective of the Republic of Paraguay 2013- 2040. Final results*, Asunción, November 21, 2016, and Vice Ministry of Mines and Energy, Energy *prospective study 2015-2050 (Summary of energy demand study)*, Asunción, Directorate of Energy Resources, Vice Ministry of Mines and Energy, Ministry of Works Public and Communications (MOPC), Republic of Paraguay, October 2020.

Note: 2030-CS: 2030 scenario Cruz del Sur; 2030-AC: 2030 Alfa Cruz scenario; 2040-Ref: referential 2040 scenario; 2040-Alt: alternative 2040 scenario; 2050-CS: 2050 Cruz del Sur scenario, and 2050-AC: 2050 Alfa Crux scenario.

5.3 Extraordinary hydroelectric rents

The revision of Annex C of the Itaipú Treaty, which will take place in 2023, raises the need to analyze options to guarantee an adequate use of the additional hydroelectric rents that could be available as a result of said revision.

Upon completion of the payment of the debt assumed by the country for the construction of the Itaipú dam, there will be a substantial drop in the electricity rate, for which four alternatives will be deployed: i) a proportional reduction in the cost of the electricity provided by the National Electricity Administration (ANDE); ii) the distribution in equal parts of the surplus between Paraguay and Brazil; iii) the reinvestment of the surplus in a fund destined to develop new binational works, or iv) the privatization of future surpluses. Establishing the destination of these funds is especially important for the country, since proper management of the income from energy resources could help drive the transitions — energy, economic and social— that Paraguay needs.

With regards to the above mentioned options, the National Energy Policy 2040 proposes that these new funds be used to create an Investment, Infrastructure and Social Development Bank. It would need to be an institutionally sound bank, based on clear regulations that guarantee transparency and financial efficiency. Its actions would be coordinated with the fiscal and monetary policies of the country. A bank of these characteristics could grant loans to invest in infrastructure development and allocate its dividends to the areas of education and health, becoming a significant tool to translate hydroelectric rent into human development.

5.4 The Paraguayan transportation sector and the transition to electromobility

The transition of the transportation sector focuses on electromobility, which in no way means excluding the incorporation of other beneficial environmentally sound and economically viable alternatives.

The benefits of the transition to electromobility are manifold. Electric vehicles are less harmful to the health of the population and to the environment. Furthermore, because of the development of the electric vehicle industry, not only will carbon dioxide emissions be reduced, but also fuel imports. Part of the surplus hydroelectricity exports to binational

partner countries will also decrease. Currently, the energy consumption of the transport sector is exposed to variations in international prices since Paraguay depends entirely on the importation of petroleum products. In contrast, the transition to electromobility would have a favorable and direct impact on the country's trade balance and on the price stability of the energy sources used in the transportation sector, thus promoting independence or energy sovereignty.

The development of Li-ion batteries for electric vehicles will also make it possible to take advantage of national resources, strengthen regional alliances and promote the development of the country through the creation of quality jobs, thanks to the diversification and value added to the country's economic base. It is therefore necessary to formulate comprehensive public policies that promote the development of the electric vehicle industry and that include all the necessary aspects to promote, not only its production, but also its acceptance and use by the population.

5.5 The energy transition and MSMEs in Paraguay

The relationship between energy and micro, small and medium-sized enterprises (MSMEs) is relevant, since it is a significant sector that concentrates 97% of the companies and 62 % of the country's employment, according to data from the 2011 Economic Census.

The country does not currently have an explicit, and appropriate energy policy for the sector. These companies face difficulties in accessing a quality energy service, as they suffer power cuts that negatively affect their productivity. Furthermore, the sector has little information on the costs and benefits of investing in energy efficiency, and, due to high rates of informality, faces barriers to accessing the capital needed to implement innovations.

Public policies related to energy should consider the needs of the MSME sector and its heterogeneity, to provide different types of services and support. It is important to guarantee access to energy for these companies, which make up almost all of the economic units in the country, and promote the energy transition of the sector, since the use of more affordable and efficient energy would allow these companies to adopt new production technologies, diversify the economy and raise productivity. Consequently, the quantity and quality of employment would increase,

given that most jobs in Paraguay are generated by this sector, which would contribute to promoting development.

Thus, the main challenge in relation to the MIPYMES sector consists of implementing the Strategic Plan for Promotion and Formalization for the Competitiveness and Development of MIPYMES 2018-2023; respond to the specific energy needs of these companies, and guarantee them the necessary financing to promote their energy transition towards more modern, clean and sustainable energy sources.

6
Axis 4. State policies

In order to successfully promote the triple transition in the country, it is necessary to implement public policies that take into account both the complexity of these change processes and the permanent interactions they maintain with each other. These are long term public policies that require continuity and an accumulation of results, extending beyond the duration of individual government administrations. The energy transition requires the implementation of policies that include technical, economic and social aspects. The policies aimed at promoting the energy transition must consider its links to the economic and social transitions, since they are three interwoven processes. These policies, and their interrelationships, are considered in the Report, and some of the issues related to the formulation and implementation of effective public policies in the country are addressed below.

6.1 The National Energy Policy 2040

Since October 2016, Paraguay has had its National Energy Policy, which extends until the year 2040 (Ministry of Public Works and Communications, 2016). Although this Policy constitutes a relevant resource to guide the energy transition and the development of the energy sector in the country, it has not yet been fully implemented. Its content

and scope constitute a strategic resource that must be taken advantage of. With it, the State must assume a greater role and fulfill its strategic role in the energy sector, especially in the electricity sector, to decisively promote human development and economic growth in the country.

6.2 Energy governance

In Paraguay, the governance of the energy sector should include the proposals of the National Development Plan Paraguay 2030 and the aforementioned National Energy Policy 2040. The first step consists in the establishment of an institutional structure in charge of coordinating and implementing actions related to the development of the energy sector, which implies the creation of a ministerial-level government agency.

In effect, the most appropriate thing would be to have a Ministry of Energy that is responsible for carrying out energy policies, with sufficient institutional, technical and budgetary capacities to govern and manage the operation of the energy sector. It would have to lead the coordinated action of the actors and the other sectors involved, and monitor their performance. Having a ministry of these characteristics is essential to guarantee that the development of the energy sector tend towards the use of clean and sustainable energies in the medium and long term.

The fact of not having an institution dedicated exclusively to coordinating the development of the energy sector seriously limits the possibilities of good governance in the energy sector, which is essential to promote and take advantage of the opportunities that the energy transition entails, as well as its convergence with the economic and social transitions. The analysis of several bills on this issue is being developed at the parliamentary level, although no conclusive measure has been taken in this regard so far.

6.3 The horizon of the Report and public policy

As mentioned above, in 2023 a historic negotiation will take place with Brazil on the occasion of the revision of Annex C of the Itaipú Treaty. Its

results will have an impact on the development of the Paraguayan energy sector and on other ongoing social and economic processes.

However, the horizon of the Report does not close in 2023, since the analysis considers other extremely important instruments to guide the actions to be implemented in Paraguay with a view to promoting human development, namely: i) the SDGs set out in the 2030 Agenda for Sustainable Development (in particular, SDG 7 on energy); ii) the Paraguay 2030 National Development Plan; iii) the National Energy Policy 2040, and iv) the updating of the energy outlook whose time horizon extends to 2050.

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THE NATIONAL HUMAN DEVELOPMENT REPORT.
PARAGUAY 2020

ENERGY AND HUMAN DEVELOPMENT

SUMMARY

Human development and the triple transition (social, economic and energy) are conceived as a strategic axis for structuring national public policies in this Report, and by that same token became the starting point of its content.

In addition to the aforementioned strategic axis, another three axes were identified as pillars for the formulation of public policies that can address the challenges facing the country. We are referring to: a) energy and equity; b) sectoral policies, and; c) State policies. All of them are fundamentally linked to good governance and institutional development. These are cross cutting axes that also helped structure the topics developed in the Report.