ENERGY

Just And Inclusive Energy Transition: The Driver Of Development

Ministério
das Infraestruturas
e Recursos Naturais

UNITED NATIONS
SAO TOME AND PRINCIPE

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1 Introduction

Sao Tome and Principe's electricity system is highly dependent on fossil fuels, with 95% of electricity produced by diesel thermal power stations in 2024. This dependence makes the sector financially unsustainable and extremely vulnerable to international market fluctuations. In addition, the predominance of diesel in the energy matrix represents the main source of Greenhouse Gas (GHG) emissions in the country, contributing significantly to environmental and climate challenges. The sector also faces structural difficulties, such as an obsolete electricity grid with limited capacity, high technical and financial losses, as well as obsolete distribution and billing systems.

The transition to a sustainable energy matrix is a determining factor for the country's development, making it possible to reduce energy costs, increase electricity capacity and modernize the sector. The Sustainable Development Goals (SDGs) establish the fair and inclusive energy transition as a central axis of the 2030 Agenda, especially with regard to access to clean and affordable energy (SDG 7) and climate action (SDG 13).

As part of its Nationally Determined Contributions (NDCs) under the Paris Agreement on Climate Change, Sao Tome and Principe has committed to increasing the percentage of clean technologies in the energy matrix to 50% by 2030. To achieve this goal, it is essential to mobilize all relevant actors - the government, development partners, private investors and civil society - to transform the energy sector by modernizing critical infrastructure, strengthening energy efficiency, drastically reducing dependence on fossil fuels and increasing national capacities for energy sector management. This transition will position the country as a model of sustainable development in the region.

The transition to a low-carbon economy represents one of the greatest challenges and, at the same time, one of the greatest opportunities for the country. On the other hand, global climate change profoundly threatens our way of life and we cannot continue to rely on traditional fossil energy sources.

ADVOCACY NOTE FOR THE ENERGY SECTOR IN SAO TOME AND PRINCIPE

In parallel, Sao Tome and Principe reiterated its commitment to reducing GHG emissions in various sectors, through the Action Plan for the Decarbonization and Resilience of the Energy Sector of Sao Tome and Principe approved in October 2024. This strategic plan defines concrete measures for the electricity, transport and cooking sectors, setting a target of a 27% reduction in GHG emissions by 2030.

Despite the challenges, the country has significant potential for renewable energy production, especially solar and hydroelectric power. Studies show that the average solar radiation in the territory reaches 4.25 kWh/m²/day, a particularly favorable value for the implementation of solar projects. The high hydroelectric potential of the main rivers has been extensively studied in recent years and could reach an output of up to 30 MW. The potential for wind energy is considered relatively low.

The modernization of the energy sector is not only a necessity but also a strategic opportunity to transform energy into a tool for social inclusion and economic development. Expanding access to electricity in both rural and urban areas, while ensuring affordable tariffs, is essential to reduce inequalities, improve quality of life, and boost national productivity.

2 Current situation in the sector

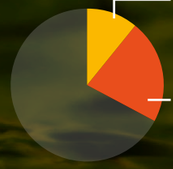
Electrification rate

84.7%

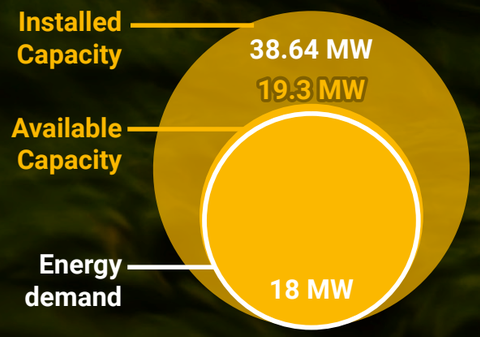
Percentage of Renewable Energy in the Energy Matrix

6.461%

Total losses



33%



Source: DGRNE/MIRN

ADVOCACY NOTE FOR THE ENERGY SECTOR IN SAO TOME AND PRINCIPE

Main challenges for the sustainability and accessibility of energy:

Management (EMAE): Delays in payments are compromising the sector's sustainability. Strengthening management practices could promote more efficient energy use, including by the Government itself.

Energy production capacity: Although 95% of installed capacity comes from diesel power plants, around 50% of this capacity operates with technical limitations, mainly due to the shortage of spare parts, resulting from financial constraints on their purchase.

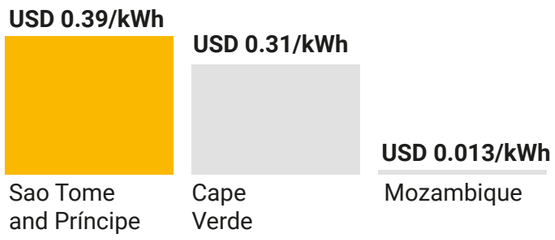
Reducing losses in the distribution network: Technical and commercial losses represent a significant challenge to the efficiency of energy supply.

The current aggregation of the primary transmission network with the distribution network is a significant constraint on the efficient operation of the national electricity system, with negative impacts on consumers. Aware of this limitation, the government is committed to its unbundling, foreseeing the implementation of short, medium and long-term measures aimed at modernizing and optimizing the sector.

Expansion of energy coverage in remote areas: The expansion of the electricity grid to isolated areas remains a challenge to guarantee universal access to electricity.

Obsolete distribution network: A considerable part of the distribution network is obsolete, constituting a source of technical and commercial losses and compromising the quality of the energy supplied to consumers.

The cost of electricity production in São Tomé and Príncipe averages USD 0.39 per kWh, placing the country among those with medium to high tariffs on the African continent. This figure significantly exceeds the USD 0.013 per kWh applied in Mozambique and remains above the USD 0.31 per kWh registered in Cape Verde.



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The relatively high price of electricity in Sao Tome and Principe can be explained by various structural and operational factors:

Dependence on imported fossil fuels: The country relies heavily on diesel generators for electricity production, which results in high costs due to the price of fuels and the logistical challenges associated with importing them.

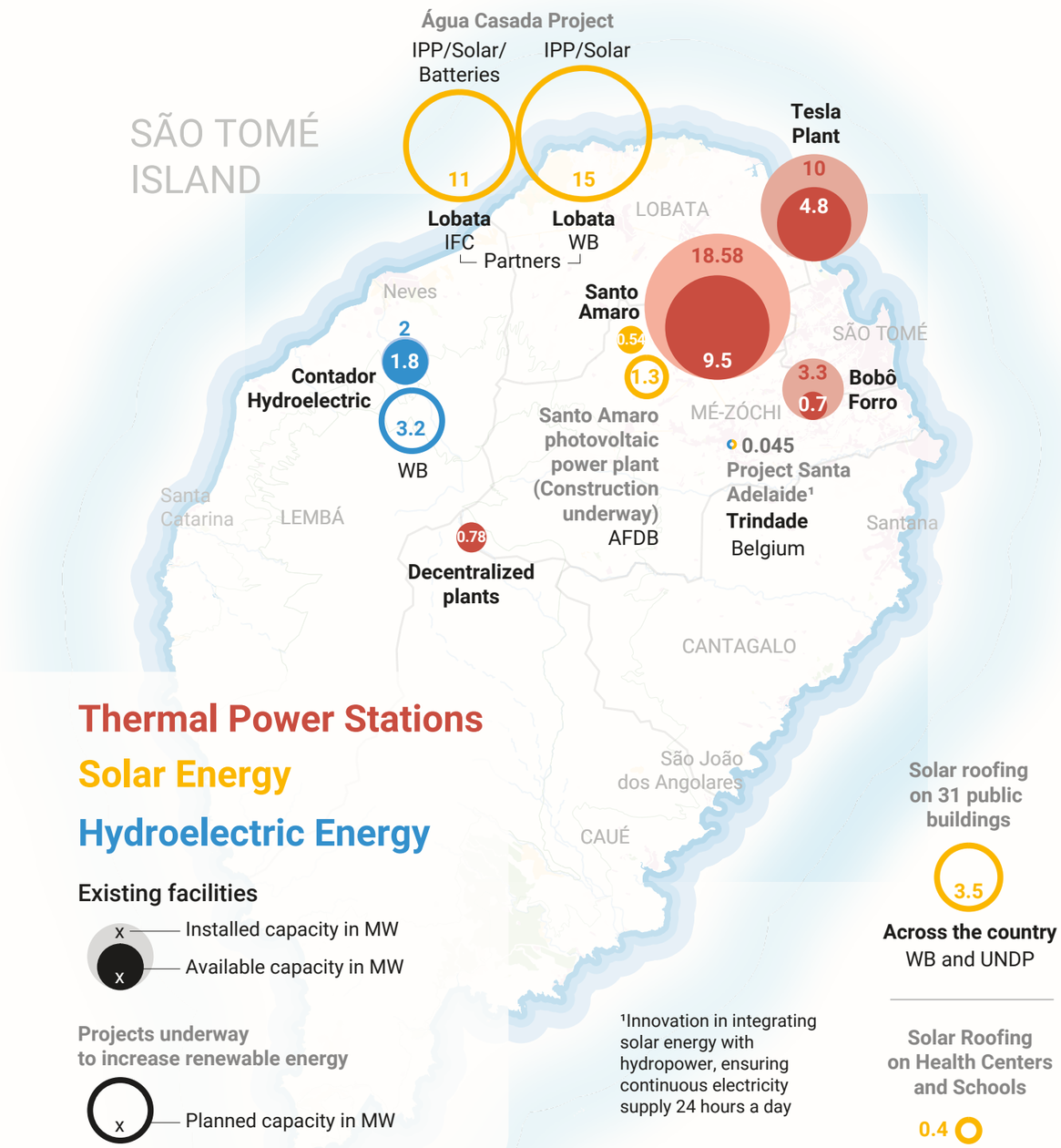
Limited Energy Infrastructure: The electricity sector faces difficulties related to obsolete infrastructure, a lack of significant investment and poor maintenance, all of which contribute to higher operating costs.

Lack of meters: A significant proportion of consumers do not have energy meters, making it impossible to measure consumption accurately. As an alternative, consumption is estimated, which is subject to inaccuracies.

Technical and Commercial Losses: The electricity grid has a high level of losses, both due to technical inefficiencies and illegal connections, which increase production and distribution costs.

Small-scale production: As a small archipelago, Sao Tome and Principe does not benefit from the economies of scale that larger countries can achieve, which results in higher average costs per unit of electricity produced.

Current and forecast electricity production



¹Innovation in integrating solar energy with hydropower, ensuring continuous electricity supply 24 hours a day

Solar roofing on 31 public buildings

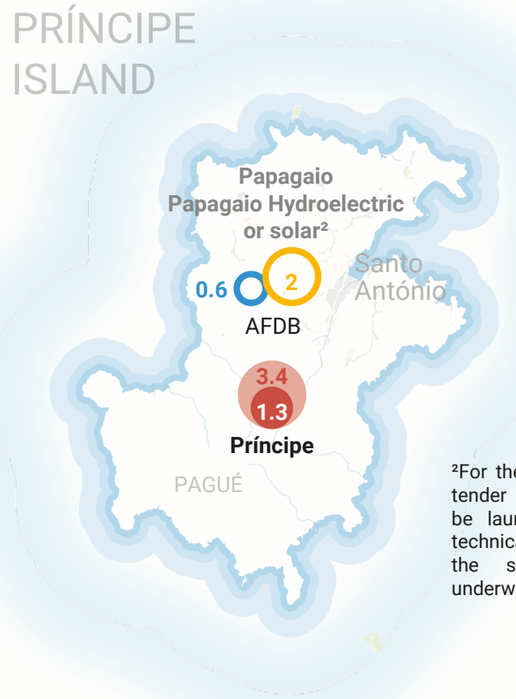
3.5

Across the country
WB and UNDP

Solar Roofing on Health Centers and Schools

0.4

Across the country
UNDP and WFP



²For the hydropower plant, a tender for rehabilitation will be launched. In parallel, a technical feasibility study for the solar alternative is underway.

Current power capacity
MW

Installed
38.64

Available
19.3
(50%)

Thermal power

36.1

17.1

Planned renewable energy projects

36.95

The incorporation of an additional 36.95 MW from renewable sources would bring the total installed capacity to 52.24% from renewables and 47.76% from thermal sources, exceeding the target set in the NDC Plan. Although solar projects make up a substantial part of this expansion, with approximately 36.95 MW planned, it is essential to ensure a minimum base load level, thus guaranteeing the stability and resilience of the energy system, particularly in periods of lower solar availability.

The swift implementation of the projects underway will allow for a substantial reduction in expenditure on fuel imports, as well as a reduction in the cost of energy production, thus contributing to a reduction in the percentage of the state budget earmarked for the purchase of diesel and making it possible to channel these resources into investment in other sectors, such as education and health. However, if the current pace is not accelerated, São Tomé and Príncipe could face considerable challenges in meeting its commitments in the energy and climate sector, jeopardizing the transition to a more sustainable and resilient model.

Summary

Current and forecast electricity production

Thermal power stations

Location	Installed (MW)	Available (MW)
Tesla	**10**	**4.8 MW**
Santo Amaro	**18.58 MW**	**9.5 MW**
Bobô Forro	**3.3 MW**	**0.7 MW**
Príncipe	**3.4 MW**	**1.3 MW**
Decentralized plants	**0.786 MW**	**0.786 MW**
TOTAL	**36.1 MW**	**17.1 MW**

Solar

Location	Installed (MW)	Available (MW)
Santo Amaro	**0.540 MW**	**0.540 MW**

Hydroelectric

Location	Installed (MW)	Available (MW)
Contador	**2 MW**	**1.8 MW**

TOTAL **Installed capacity: 38,64 MW** **Available capacity: 19,3 MW (50%)**

Ongoing projects to increase renewable energies

Projects	Location	Planned Capacity (MW)	Partner	Mode/Observations (IPP, PPA, PPP)/ Solar/ Hydroelectric
Água Casada	**Lobata**	**10 MW**	**IFC**	**IPP/Solar/ Batteries**
Água Casada	**Lobata**	**15 MW**	**WB**	**IPP/Solar**
Solar roofing on 31 buildings	**São Tomé e Príncipe**	**3.5 MW**	**WB+UNDP**	**Solar**
Solar Roofing on Health Centers and Schools	**São Tomé e Príncipe**	**0.4 MW 0.7 baterias**	**UNDP and WFP**	**Solar**
Santo Amaro photovoltaic power plant	**São Tomé**	**1.3 MW**	**AFDB**	**Solar Construction underway**
Contador Hydroelectric	**Lembá**	**3.2 MW**	**BM**	**In progress**
Papagaio Hydroelectric or solar	**Príncipe**	**0.6 MW (e 2 MW solar)**	**AFDB**	**Hydroelectric A tender is being launched for the refurbishment. In parallel, the technical feasibility study for the solar alternative is underway.**
Santa Adelaide	**Trindade**	**0.045 MW**	**Belgium**	**Innovation in the integration of solar and hydroelectric energy, ensuring a continuous supply of electricity 24 hours a day.**
		36.95 MW		

ADVOCACY NOTE FOR THE ENERGY SECTOR IN SAO TOME AND PRINCIPE

3 Solutions

To achieve an inclusive and sustainable energy transition, an integrated approach is needed that prioritizes universal access to stable and affordable energy sources, including remote areas, with a special focus on solar and hydroelectric energy.

To this end, investment and energy management models are proposed through public-private partnerships, with the aim of increasing the availability of clean energy. These could involve injecting energy into the main grid or developing mini-grids in rural areas, namely through the modalities of Independent Power Producers (IPP) or Public-Private Partnerships (PPP) with Power Purchase Agreements (PPA) for the sale of electricity to EMAE/national grid. In addition, adapted models for integrating the private sector, both nationally and internationally, into the supply of energy as a service should be explored.

To ensure the viability and sustainability of these models, it is essential to consider the following factors:

Innovative financing models for government: Access to venture capital, concessionary financing and debt conversion mechanisms for green energy investments.

Legal framework favorable to private investment: Implementation of Law No. 4/2023 of June 15, which establishes tax and regulatory incentives, such as tax exemptions and customs reductions for renewable energy equipment, promoting the entry of private capital and boosting growth in the sector.

Incentives for consumers: incentives : To adopt clean cooking technologies and incentives to use energy efficiently.

Improving Energy Efficiency: Modernizing the electrical infrastructure to reduce technical and commercial losses could reduce waste and operating costs.

Promoting technological innovation: Improving energy efficiency and exploring new technologies, including ocean thermal energy. The development and adoption of innovative solutions can increase the diversity of the energy matrix and increase the resilience of the system.

Capacity to integrate renewable energy: Given the intermittent nature of renewable energy sources, it is essential to carry out a study to assess the capacity to integrate these sources into EMAE's network. This study should ensure that the incorporation of renewable energy does not compromise the stability of the electricity grid or affect the quality of the energy supplied to consumers.

4 The role of the United Nations in the development of São Tomé and Príncipe's energy sector

"Be part of the transformation towards a greener and more promising future in São Tomé and Príncipe. Together, we can revolutionize the energy sector, creating benefits that reach everyone and inspire generations!" – Resident Coordinator, 2025

The United Nations has played a crucial role in the development of the energy sector in São Tomé and Príncipe, through technical assistance for the drafting of relevant strategic plans, the carrying out of technical and economic feasibility studies for various energy sources, including solar, hydroelectric and ocean-thermal, the development of the legal framework and the strengthening of national capacities. They have also supported the implementation of pilot projects, with a view to promoting the transition to renewable energies and reducing the risks associated with investments in the sector.

Review and development of legislation

In collaboration with the government, the United Nations has been working on developing the legislative framework, by drafting proposals for laws and regulations that encourage a favorable environment for investment in renewable energies and sustainable electrification, as well as the development of the micro-production sector from solar sources, with the possibility of injection into the grid. This effort includes creating policies that promote the replacement of fossil fuels and biomass with cleaner and more accessible energy solutions, giving priority to solar energy, electric mobility, hydroelectricity and clean cooking.

Pilot Experiences

Several UN agencies have implemented pilot projects to demonstrate the potential of renewable energies in the country:

- **Santo Amaro Solar Power Plant (UNDP and UNIDO):** This joint project provided for the installation of a photovoltaic solar power plant with an estimated capacity of 540 kWp, and the improvement of Cutting Station No. 5 (PC5) located at the Santo Amaro power plant. The total investment is approximately 900,000 USD, financed by UNIDO/UNDP/GEF, including the training of the Empresa de Água e Eletricidade (EMAE) team to maintain the plant.

- **Solar Panels at the Ministry of Infrastructure and INIC:** Solar photovoltaic systems have been installed at the Ministry of Infrastructure and INIC by the UNDP. With support from the private sector and the World Bank, 6 district health centers, the Principe hospital and 15 primary and secondary schools will receive photovoltaic systems by 2025, with the aim of increasing energy resilience to improve the quality of service offered by these essential institutions.

- These projects have been implemented with the support of the UNDP and the World Food Program (WFP), which aims to expand this project to all schools in the country.

- As part of its commitment to the sustainable energy transition, UNDP plans to expand its operations to cover 31 public buildings and 800 homes, thus strengthening access to cleaner and more efficient energy solutions.

Studies to Reduce Investment Risks in the Energy Sector

To attract private investment and ensure the economic viability of energy projects, technical studies have been carried out on innovative solutions:

- Technical and economic feasibility studies for hydroelectric production in the Abade, Manuel Jorge, Ió Grande and Papagaio/Banzu river basins, as well as the respective river basin management plans.

- **Ocean Thermal Energy (OTEC) (UNIDO/SIDS DOCK):** Study on the potential of ocean thermal energy conversion for sustainable electricity production. The Global OTEC platform offers a green alternative to fossil fuels, with zero carbon emissions, and is a vital source of renewable electricity for developing countries.

Main energy and clean cooking policy plans for São Tomé and Príncipe

- Roadmaps, Standards and Regulations for Improving Energy Efficiency in Transport Fuels and Promoting the Electric Mobility Market in São Tomé and Príncipe.
- Minimum Energy Performance Standards (MEPS) for Lighting, Refrigeration and Air Conditioning in São Tomé and Príncipe.
- National Action Plan for Energy Efficiency in São Tomé and Príncipe.
- National Action Plan for Renewable Energy in São Tomé and Príncipe.
- Technical Guidelines for Small Hydroelectric Power Plants | Brochure on Technical Guidelines for Small Hydroelectric Power Plants.
- STP Energy Sector Decarbonization and Resilience Action Plan (PADRES).
- Guide to the Development of Clean Energy Mini-Grid Policies - The Alliance for Rural Electrification.

New initiatives under development

In addition to ongoing projects, new initiatives are under development:

- **Promotion of Clean Cooking (UNIDO):** Introduction of subsidized ethanol stoves as a sustainable alternative to the use of charcoal and firewood for cooking, with the aim of reducing environmental impacts and improving public health.
- **Investment Plan and Draft Legislation for Electric Vehicles (UNIDO):** Development of a strategic plan and legislation for the introduction of electric mobility in the country, promoting more sustainable transportation.
- **Mini-grids:** aims to support access to clean energy in Africa by strengthening financial viability and encouraging the expansion of commercial investment in low-carbon mini-grids, with a special focus on cost reduction levers and innovative business models. The combination of lower hardware costs, intangible costs and financial burdens with innovative business approaches will boost the flow of capital, resulting in more affordable tariffs and improved services for end users, compared to the baseline scenario. This project is being implemented by UNDP, with funding from the GEF.

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5 Recommendations

1
Strengthening Governance

Improving governance in the energy sector is essential to ensure the efficiency, transparency and sustainability of projects. The recommendations include:

- Approval public policies and a regulatory framework to encourage the adoption of renewable energies, promoting transparency, predictability, fairness and efficiency in the provision of energy services.
- Development of public-private partnerships (PPPs) to speed up the implementation clean energy projects and foster technological innovation in the sector.
- Guarantee funds and tax incentives to make energy projects more attractive to private investors.
- Strengthen capacities for the management of the national electricity sector, with a special focus on renewable energies, in all the institutions with competencies in this area, namely EMAE, AGER and DGNRE.
- Clarify the mandates of EMAE, AGER and DGRNE with regard to the management of the national electricity sector.

2
Strengthening the Production and Distribution Infrastructure

An effective energy transition requires investment not only in production, but also in the modernization of transmission and distribution infrastructures:

- Expansion and reinforcement of the national electricity grid to support greater penetration of renewable energies.
- Implementation of energy storage systems, such as batteries and potentially green hydrogen solutions, to mitigate the intermittency of renewable sources.
- Development of microgrids and decentralized systems, allowing greater resilience and access to electricity in isolated communities.
- Development of models that enable micro-generation with grid injection, promoting micro-investment in production systems for homes and businesses.

3
Sector coordination

The inter-institutional coordination between national entities and international partners, at both technical and strategic levels, plays a central role in addressing structural bottlenecks, ensuring strategic alignment among institutions, mobilizing resources, and engaging partners to support Sao Tome and Principe's energy transition.

The implementation of monitoring and evaluation systems is essential to track project progress and to ensure that results are aligned with the targets set out in the national roadmap.

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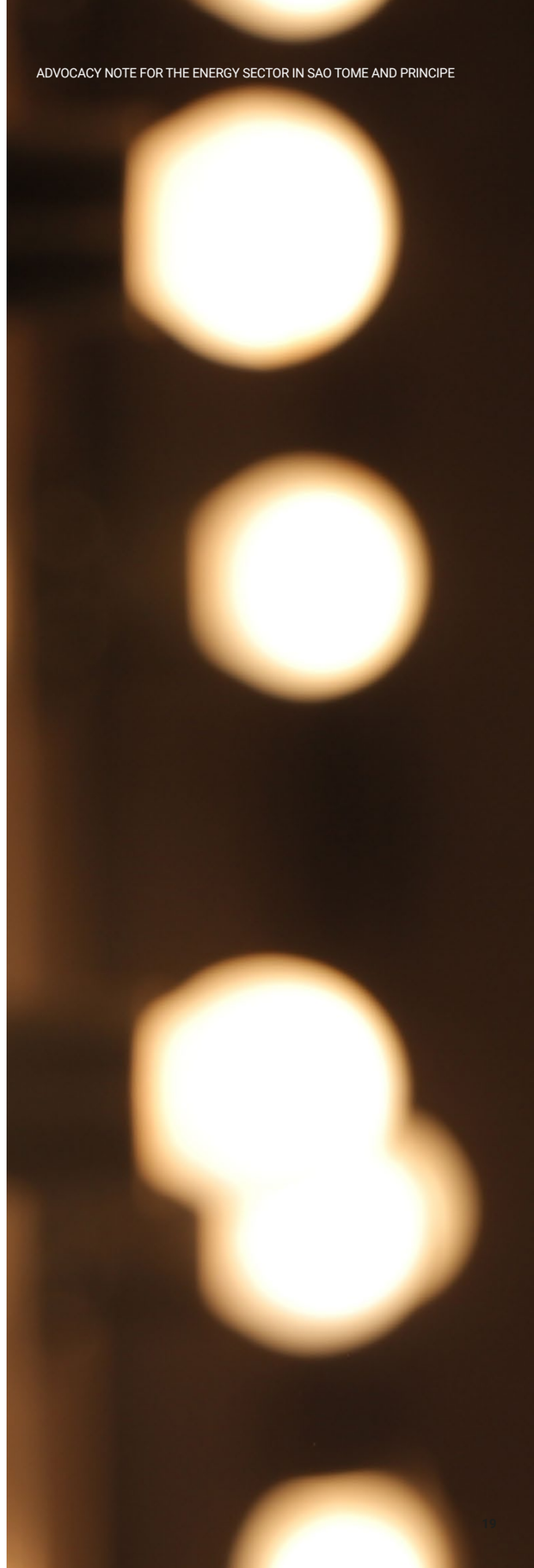

6 Conclusion

Only through coordinated and consistent action will it be possible to build a resilient, inclusive and sustainable energy sector for future generations, in full synergy with the government, technical and financial partners, the private sector and civil society.

The energy transition, with a mix of renewable and conventional sources, is considered the main driver of development in the country and must not only be rapid, but also fair, ensuring that the expansion of renewable energies contributes to wider access to electricity, at lower costs, and ensures tangible benefits for the entire population.

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