



STRATEGIC PROGRAM TO PROMOTE RENEWABLE ENERGY AND ENERGY EFFICIENCY INVESTMENTS IN THE ELECTRICITY SECTOR OF SAO TOME AND PRINCIPE

BASELINE ASSESSMENT OF MARKET CONDITIONS OF LIGHTING, AIR CONDITIONERS AND REFRIGERATORS



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LIST OF ACRONYMS

AC	Air Conditioning
AFAP	Agência Fiduciária de Administração de Projectos em São Tomé e Príncipe
AfDB	African Development Bank
AGER	General Regulatory Authority
AENER	Santomean Association of Renewable Energies
ARP	Autonomous Region of Principe
ATEFER	Association of Cold Technicians and Renewable Energies
BSTPPTC	Brazil-São Tomé and Príncipe Professional Training Centre
CCI	Chamber of Commerce and Industry
DGA	Directorate General of Environment
DGRNE	General Directorate of Natural Resources and Energy
DRCAE	Directorate for Regulation and Control of Economic Activities
ECCAS	Economic Community of Central African States
EDP	Energias de Portugal (EDP)
ECGCF	Green Climate Fund
ECOWAS	Economic Community of West African States
EE	Energy Efficiency
EER	Energy Efficiency Rate
EMAE	Water and Electricity Company
IDDA	Industrial Development Decade for Africa
ISO	International Organization for Standardization
GEF	Global Environment Facility
INA	International Fund for Agriculture
LDCs	Least Developed Countries
LED	Light-Emitting Diode
MEPS	Minimum Energy Performance Standards
MIRN	Ministry of Infrastructure and Natural Resource
MNECC	Ministry of Foreign Affairs, Cooperation and Communities, São Tomé and Príncipe
NGO	Non-governmental organization
PANA	National Climate Change Adaptation Plan
PANEE	National Energy Efficiency Action Plan
PANER	National Renewable Energy Action Plan
PIQAC	Quality Infrastructure Programme for Central Africa
PNDS	National Sustainable Development Plan of the STP
RECs	Regional Economic Communities
RES	Renewable Energy Sources
RISE	Regulatory Indicators for Sustainable Energy
SEER	Seasonal Energy Efficiency Rate
SENAPIQ	National Service of Intellectual Property and Quality
SIDS	Small Island Developing States
SMEs	Small and Medium Enterprises
STP	Sao Tome and Principe
TESE	Association for Development
UNDP	United Nations Development Program
UNEP	United Nation Environment Program
UNIDO	United Nations Industrial Development Organization

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INTRODUCTION

São Tomé and Príncipe (STP) is a country consisting of two main islands situated in the Gulf of Guinea, that has an exclusive economic zone of 160,000 km² and is a member of the Economic Community of Central African States (ECCAS).

With an area of 1001 km², STP is part of the Small Island Developing States (SIDS), which means that STP is facing different challenges, due its size, its remoteness, its low economic development level, and part of the list of least developed countries (LDCs).

The country has developed the following documents to guide its economic growth:

- *2030 Vision: “São Tomé e Príncipe 2030: the country we need to build”*, which aims to develop a climate-resilient island, a blue economy, financial and touristic serviced.
- *National Development Plan (PNDs) 2020 – 2024*, which has the Government Program as the basis for its conception and elaboration and aligns with the United Nations 2030 Agenda for sustainable development, the accelerated implementation modalities of the Samoa Roadmap and the 2063 Africa We Want Agenda

The aim is to develop a climate resistant archipelago, and therefore it is necessary to develop its energy sector, especially the electricity sector, to develop renewable energy sources (RES) and improve energy efficiency.

The success of these policy documents depends heavily on a reform of the energy sector and a transformational shift of the entire energy system from an almost complete reliance on imported fossil fuels to renewable energy and energy efficiency. Such a transition will lead to a significant reduction in fossil fuel import costs and free up scarce monetary resources for social and economic development (e.g., education, health, transport, export diversification, development of Small and Medium Enterprises (SMEs) and adaptation to climate change). In addition, it will help the island's main industries and income generating activities (e.g., water supply, agriculture, food processing, tourism, fisheries and the blue economy in general) to become more productive and competitive.

To answer these challenges, several projects are also on the way, for instance the Global Environment Facility (GEF) project “*Strategic program to promote renewable energy and energy efficiency investments in the electricity sector of São Tomé and Príncipe*”. A Green Climate Fund (GCF) funded by the UNIDO project “*Building institutional capacity for a renewable energy and energy efficiency investment programme for Sao Tome and Principe*”, is currently under final approval.

This UNIDO project aims to decrease electricity demand-side losses, thanks to the introduction of a well-proof mechanism, **the MEPS (Minimum Energy Performance Standards) and energy labels, for three main electric appliances: lighting, air conditioning (AC) and refrigeration.**

The promotion of energy efficiency measures can offer great opportunities early on, to reduce overall electricity demand and peak electricity demand. It will also enable electricity to reach out to a greater proportion of the population and improve the economic activities in the country.

It is expected that the successful implementation of minimum energy performance standards (MEPS) and a corresponding labeling scheme will:

- Reduce electricity peak demand and thereby reduce the pressure on the electricity network. Also, the new electrification plans being developed will reach a higher percentage of the population, and consequently reduce government future public expenditures;
- Reduce overall electricity consumption and bills for consumers, who will spend a smaller fraction of their incomes on energy. This is especially important for low-income households, for which the high price of electricity is a barrier to meeting their basic needs;
- MEPS and labeling of household appliances can serve as a powerful tool to inform consumers about differences in energy performance. This will direct consumers towards purchase of more efficient appliances.

The overall objective of the project is to contribute to increasing national capacity to uptake energy efficient appliances in compliance with quality standards.

1 SUMÁRIO EXECUTIVO

The project aims to decrease electricity demand-side losses in São Tomé and Príncipe, thanks to the introduction of a well-proven mechanism, the Minimum Energy Performance Standards (MEPS) and energy labels, for three main electric appliances: lighting, air conditioning and refrigeration.

This report contains a baseline assessment for the market conditions of electrical appliances (lighting, air conditioners and refrigerators) in the country of São Tomé and Príncipe. It aims to set the foundations for a complete mapping of the national energy consumption profile, as well as the socio-economic characteristics of the energy demand by consumers in the country.

This report contains the results of the market research, emphasizes the potential legislative improvements, offers an analysis of international standards that could be adapted to national conditions and highlights the benefits and gains expected from the energy efficiency measures at STP.

O projeto visa diminuir as perdas do lado da procura de eletricidade em São Tomé e Príncipe, graças à introdução de um mecanismo bem provado, as Normas Mínimas de Desempenho Energético (MEPS) e etiquetas energéticas, para três aparelhos elétricos principais: iluminação, ar condicionado e refrigeração.

Este relatório contém uma avaliação de base para as condições de mercado de eletrodomésticos (iluminação, ar condicionado e frigoríficos) no país de São Tomé e Príncipe. Tem como objetivo estabelecer as bases para um mapeamento completo do perfil de consumo de energia nacional, bem como as características socioeconômicas da demanda de energia pelos consumidores no país.

Este relatório contém os resultados da pesquisa de mercado, enfatiza as potenciais melhorias legislativas, oferece uma análise das normas internacionais que podem ser adaptadas às condições nacionais e destaca os benefícios e ganhos esperados das medidas de eficiência energética em STP.

2 OBJECTIVES OF THE REPORT

This report contains a **baseline assessment for the market conditions of electrical appliances** (lighting, air conditioners and refrigerators) in the country of São Tomé and Príncipe. These appliances have been selected according to previous local assessment studies and similar initiatives deployed in other African countries. For instance, in an undertaken assessment, Energias de Portugal (EDP) identified the great potential for reducing the electricity consumption of air conditioner equipment. This potential was identified for the island of Príncipe but may also be very relevant on the island of São Tomé, assuming that a similar situation occurs, where there are more public and commercial buildings. Air conditioners are usually considered the first target of the energy efficiency regulations due to their contribution to peak loads. EDP also identified the possibility of replacing common incandescent light bulbs and compact fluorescent light bulbs with LED light bulbs, which consume the equivalent of 10% of the consumption of an incandescent and 40% of a compact fluorescent lamp, respectively. Currently, EMAE with the support of the World Bank is starting to implement an ambitious initiative to phase out incandescent and fluorescent tube lights from the residential sector and public facilities.

This report aims to **set the foundations for a complete mapping of the national energy consumption profile**, as well as the **socio-economic characteristics of the energy demand** by consumers in the country.

The report contains several parts:

- 1. Market research in the STP market:** This part aims to provide information on the market conditions of lighting, refrigeration and air conditioning appliances. The information was gathered through desk research and a mission/visit in STP to perform surveys, autopsies, interviews and workshops with the participation of users, commercial operators and stakeholders in general.
- 2. Report on potential legislative improvements:** There are several decrees/laws and regulations in place in STP, which are presented in this report. By studying the existing legislation on the energy sector, it is possible to identify gaps in regulation and concentrate on an action course for the legislative improvement of energy efficiency.
- 3. Analysis of the benchmarking:** The process of mapping and benchmarking the energy efficiency of electrical appliances enables the creation of baseline assessments for the STP energy market. The objective of the part is to compare the efficiency of the national market with other countries in the ECOWAS region which have adopted earlier international standards for lighting, air conditioning and refrigerators. Some countries in the region (for example Ghana, Gambia, Benin, Nigeria, Cabo Verde, etc.) have adopted standards for some of these appliances and are working to improve on the remaining ones. By gathering all the relevant information and utilizing the international expertise of the consulting team in similar projects, it will be possible to propose the most suitable standards for STP, in order to create a realistic plan for energy efficiency targets and in order to align with the rest of the region. The African Union has also developed some recommendations for its member states, to adopt MEPS and target values of energy efficiency for some appliances, this can also be used as references.
- 4. Savings/benefits of EE measures:** This part underlines the benefits, gains expected from the energy efficiency measures at STP.

3 Market research in the STP market

3.1 Methodology

The Consultants have conducted a detailed assessment of the electrical appliances available in the STP market. As all the products are imported to the country, it is important to map the current level of efficient appliances in the national market, as well as forecasted models for the future. The lighting, air conditioning and refrigerator appliances have been examined for their energy efficiency and characteristics in order to benchmark them accordingly. The Consultants also identified whether any of the aforementioned products are manufactured locally, and the potential to improve their energy efficiency.

Interviews (for instance with Customs for importation data) and bibliographic studies were carried out for data collection during an on-site mission. A **short tour** in the main markets and shops for home appliances was carried out also to complete the information.

Professional organizations of appliance importers, distributors and retailers for instance, were also consulted, as provided some data. Role of men and women in the purchase decision was asked to the retailers.

Cost of appliances was also included in the research, as the insularity of the country may increase their cost, due to transportation and a reduced concurrency.

3.2 Bibliography & Findings on EE & appliances in STP

3.2.1 Present Situation

3.2.1.1 Energy Efficiency

In the *National Action Plan for Energy Efficiency (PANEE)*, a study produced by UNIDO in cooperation with the MIRN and DGRNE, it is mentioned that there were few initiatives or projects that studied the potential of EE and the rational use of energy in STP. However, the current state of the electrical infrastructure with high losses and inefficiencies of thermoelectric plants as well as in the transmission and distribution of electricity, points to an enormous potential for improving the EE of the national electricity grid. Information collected for the development of the GHG Inventory finalized in June 2021 indicates that the total losses in the network are around 35% of which 14% are technical losses and 21% commercial losses (DGRNE, 2021). Considering the gaps and losses in the energy and electrical system, energy efficiency can play a crucial role in the sustainability of the sector at a national level, with associated economic and financial savings. Although few initiatives have been implemented to date, almost all in the context of replacing incandescent light bulbs, there is enormous potential for savings in terms of behavior change, for example turning off air conditioning and lights at night in empty public buildings.

Inefficient energy systems directly impact the cost of industrial and commercial activities in the country, making them less competitive, which affects domestic consumption of goods and services, as well as exports.

Regarding electricity sales tariffs, these have a “social” character that does not take into account the cost of electricity production, and the last update was in 2007. The implementation of a new tariff structure is therefore a need in order to ensure the financial and technical sustainability of EMAE, and in this sense a tariff study has already been prepared. Regarding electricity purchase tariffs, there is no calculation model with specific criteria for determining prices. (ALER/Government of STP, 2019).

In addition, the banking sector in STP is very small, the financial system is very weak and the State is not able to provide the sovereign guarantees necessary to cover the risk of EMAE in the Energy

Acquisition Contracts (CAE) to be signed, which makes it difficult access to credit for private investors. For this reason, most projects are financed by international institutions and promoted by the public sector or Non-Governmental Organizations (NGOs) (ALER/Government of STP, 2019).

In terms of education, the already limited national offer of higher, technical and professional education does not include specialized courses in the energy sector, offering only more general courses that may have an exit profile for further studies in the area of renewable energies. In terms of training, it has been given at the local level during the implementation of renewable energy projects, to their beneficiaries and those responsible for management and maintenance, which has enabled the training of some local technicians, namely young people. In terms of research, certification and audits, there are no initiatives. This failure in terms of training local human resources has been one of the main barriers in the sector, (ALER/Government of STP, 2019).

Electricity production in STP has increased over the last 40 years, as a result of the increase in consumption resulting from the country's electrification, in line with the growth of the population and economy of São Tomé. Electricity production has grown sharply since 2009 with the entry into service of new thermal power stations. If in 2010 production was 57.9 GWh, in 2019 it reached 109.1 GWh, an increase of approximately 90% in 9 years. The following figure shows the electricity demand by sector in the BAU (**Fehler! Verweisquelle konnte nicht gefunden werden.**), which, taking into account the potential evolution of the economy, will continue to increase.

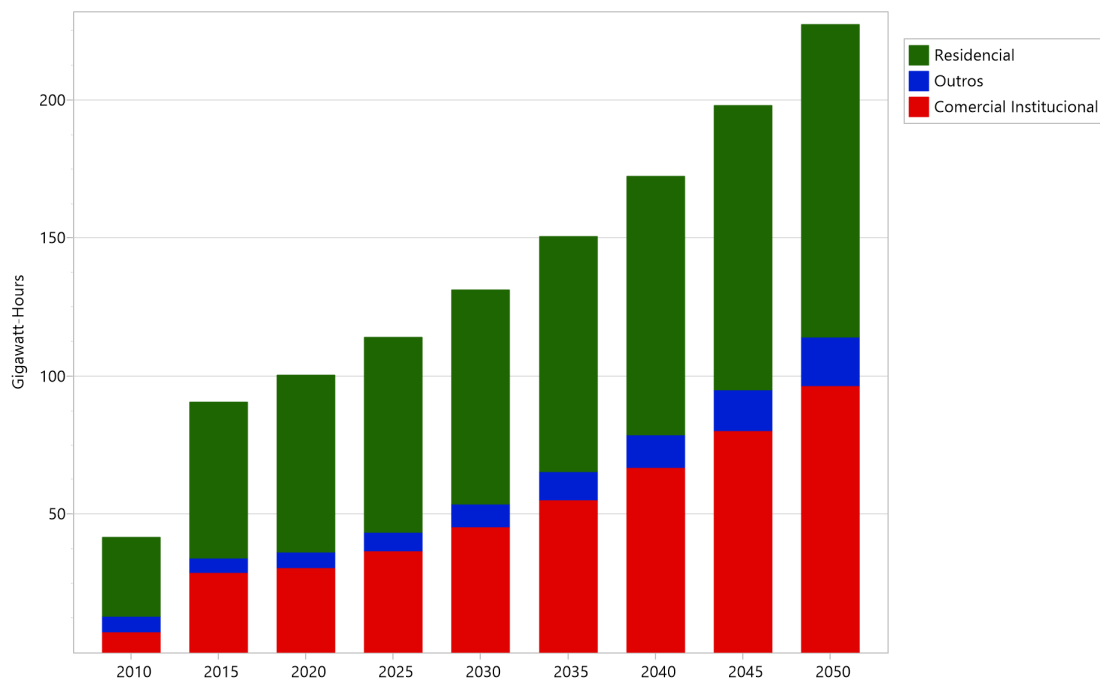


Figure 1: Projection of residential and commercial consumption (PANEE)

3.2.1.2 Appliances

In the *São Tomé and Príncipe Renewable Energy and Energy Efficiency Status Report (July 2020)*, the priority needs for technology transfer in the energy sector are identified. The technological needs regarding energy efficiency in lighting, refrigeration and air-conditioning are:

- ✓ Standard energy efficiency technologies for household appliances with the potential to reduce peak load demand by at least 1 MW;
- ✓ Innovative technologies for low energy consumption refrigeration and air conditioning systems;

The study of UNIDO and DGRNE (2021) titled *Report on the survey on the technical characteristics of the appliances marketed in STP* allows to draw several lessons:

- Most of the electrical equipment surveyed do not have energy labels available to consumers,
- Available electrical equipment that has outdated energy labels needs to be updated,
- Each of the stores sells its own brand of home appliances and for this reason there is a certain variation in prices from one store to another,
- Consumers have a preference to low prices rather than higher efficiency,
- There are still incandescent lamps available at stores.

In general, it was observed that most customers **prefer to purchase electrical equipment**, such as lamps, air conditioning and refrigerators **at a lower price**, without worrying about the level of energy efficiency and quality. In other words, STP consumers are more interested in purchasing cheaper electrical equipment, regardless of energy efficiency in the consumption of the equipment.

Table 1: Average price of equipment, according to data from Report on the survey on the technical characteristics of the appliances marketed in STP

			Store Nour (dobra)	Store Batmat (dobras)		Store Alfer (dobra)
Air conditioners	13599	11000 - 22000	8195 - 9075	8100-12.500	8.750-29.170	
Refrigerators	14368	6000-29000	10.500	4.970-17.500	-	
LED lamps	108	-	75-90	70-89	100-225	
Incandescent lamps	85	-	-	-	15	130-180
Fluorescent lamps	61	-	80-110	25-40	50-60	

It was observed that there are stores that still sell incandescent lamps even though they know that they have a low lighting performance. Most of the electrical equipment available in STP's stores does not have an energy label. But we notice some labels on a few appliances (lamps or refrigerators “A+” with a European labeling system).

In another study carried out by UNIDO and DGRNE (2021) titled *Report on the survey on household appliances used in STP residences*, which presents the results of the survey on the technical specifications of household appliances used in homes in the district of Agua-Grande - S. Tomé, there are more conclusions to be drawn:

- Most expensive electrical equipment does not have energy labels,
- Electrical equipment available in residences are old and have been found with old or outdated energy labels,
- Each of the residences has distinct brands of household appliances, with a greater emphasis on the LG brand (approximately 66.7%) which are imported from Europe,
- There is a **huge lack of information from residents** regarding the labeling and wattage of the equipment available in their homes,
- There was noticeable resistance from residents to participate in the survey by providing data,

- In general, **the expectation of energy efficiency is not taken into account**, it has been observed that the majority of the population prefers to buy electrical equipment at a lower price, regardless of the level of energy efficiency,
- However, **a small part of the population is already on alert about the efficiency of equipment, using LED lights**,
- It has been observed that there are residences which still use incandescent lamps even knowing that they have a low lighting efficiency for economic reasons, that is to say that they are the cheapest,
- It has also been observed that a small part of the population is aware of the energy efficiency of equipment, especially with regard to lamps,
- In most of the homes there are some devices that do not get frequent use, i.e., are rarely connected,
- The use of electric lights in homes is most common in the 5:30 p.m. to midnight range.

Households from different regions were selected to determine whether they own any of the appliances above. The results are as follows:

- Refrigerator 28 out of 30 households;
- Air Conditioning 13 out of 30 households;
- LED lamps 16 out of 30 households;
- Fluorescent lamps 28 out of 30 households;
- Incandescent lamps 8 out of 30 households.

Note: The study was carried out for a rather small region of the country so its validity could be questioned. In general, we note that the quantity of imported equipment has increased in recent years (cf. Table of imports of lamps and refrigeration appliances below).

The equipment available in homes and therefore on the local market has a deficit in terms of its energy class. Several devices identified in homes do not have "marks" or it has faded with the long life of the equipment. Therefore, it is possible to verify that residents do not exchange electrical equipment while they are in operation, for a long time compared to its useful life due to higher power consumption.

To conclude, the main points raised from the survey are:

1. There is a lack of knowledge regarding Energy Efficiency
2. There are no or outdated labels on appliances
3. Consumers prefer cheap rather than efficient products
4. Some consumers are aware of the advantages of LED lamps

In the *São Tomé and Príncipe Renewable Energy and Energy Efficiency Status Report* (July 2020), there is useful information regarding the Energy Market of STP. Analysis of the EMAE data shows that the **tourism sector accounts for 41% of consumption, followed by local businesses at 21%** (category of large professional consumers), with supermarkets and bakeries accounting for more than two-thirds of consumption. In terms of the Energy Market, the report concludes that the energy efficiency component is still almost unknown and the government has not yet set targets. Apart from the replacement of light bulbs, little has been done in this area, but it can be explored in terms of efficient equipment (certification, labeling and supply).

Finally, data provided by the Customs Directorate, show the quantity of appliances per type imported from 2019 to 2021, as well as the net weight of the equipment, the total value of the appliances, the tax duties paid and the countries of origin.

Table 2: Table of Imported Appliances, 2019-2021 (Source: Customs Directorate, January 2022)

Year	Product	Quantity (Unit)	Net weight (kg)	CIF value/ (Dobra)	Duties paid/Dobra	Origin
A/C Appliances						
2019	Air conditioner	1,422	53,419	6,263,929	570,534	China/Portugal
2020	Air conditioner	1,200	49,658	6,584,738	580,455	China/Portugal
2021	Air conditioner	1,527	62,678	9,533,066	848,190	China/Portugal
	TOTAL	4,149	165,755	22,381,733	1,999,179	
Refrigerators						
2019	Refrigerators	3,920	181,903	15,413,968	1,551,771	Portugal/China
2020	Refrigerators	5,137	189,603	15,433,962	1,568,397	Portugal/China
2021	Refrigerators	6,016	212,343	21,350,475	2,135,839	Portugal/China
	TOTAL	15,073	583,849	52,198,405	5,256,007	
Lighting Appliances						
2019	Various lamps	203,378	34,354	3,738,645	321,393	China/Portugal
2020	Various lamps	758,951	80,869	5,141,196	521,317	China/Portugal
2021	Various lamps	259,251	62,115	6,708,014	577,664	China/Portugal
	TOTAL	1,221,580	177,338	15,587,855	1,420,374	

3.2.2 Scheduled Actions

In the *National Action Plan for Energy Efficiency (PANEE)*, 46 measures are proposed for the Energy and Electricity sector, as well as other sectors, which are scheduled to start either in 2020 or 2021, and be completed in the either in the short-term or the long-term

The action plan is described more extensively in chapter 5.2.1. The measures regarding the energy sector and efficient lighting are listed below:

Table 3: Measures proposed in PANEE regarding EE and efficient lighting

SCOPE OF MEASURE	MEASURES
a. Energy and Electricity Sector	
Development of Prior Studies and Collection of Information (Policy and Technical)	1. Preparation of studies and collection of information on the potential for energy efficiency in STP and its contribution to mitigation and adaptation
Organizational strengthening (Institutional)	2. Creation and integration of the EE department at DGRNE
	3. Institution of a National Energy Certification Body or Entity (ENCE)
Market development (Regulatory and Legal)	4. Regulate the energy efficiency of appliances available on the market
	5. Regulate energy labeling for equipment (development of MEPS - Minimum Energy Performance Standards)
	6. Regulate minimum energy performance standards for new buildings
	7. Regulate minimum energy efficiency standards for importing appliances
	8. Regulate energy intensive consumers

	9. Regulate projects and installation of industrial equipment
	10. Regulate the incorporation of technologies suitable for energy savings and efficiency in public and private real estate infrastructure projects with an emphasis on the tourism sector such as hotels
Creation of incentive mechanisms and guarantees (Financial and Fiscal)	11. Creation of incentives and financial mechanisms to increase the population's access to energy efficient appliances (e.g., discount for exchanging old appliances for new ones, installment payment system, among others)
	12. Creating tailored financing solutions
Transparency and Decision Support (Policy and Information)	13. Creation of a centralized system including a database on energy efficiency
	14. Creation and implementation of an MRV (Monitoring, Recording and Verification) system for the implementation of EE measures
Training initiatives, qualification and certification (of products and services) in EE	15. Creation, updating and continuous implementation of a training program for specialists in specific EE topics (creation of technicians and auditors)
	16. Carrying out continuous training actions for institutional managers in the structuring of complete energy efficiency project proposals and project management for fundraising
	17. Creation of competences within the DGRNE for centralization and management of energy efficiency data, including calculation standards
	18. Carrying out continuous actions to support the capacity building of national associations and entrepreneurs
	19. Elaboration and continuous implementation of a training and capacity building plan for technical staff on EE
	20. Training actions for EMAE technicians on the use of SGI and O&M
	21. Creation and installation of laboratories in the EE area
	22. Promoting technical and technological training for staff at training centers and universities, on an ongoing basis
	23. Establish cooperation agreements with universities and international centers for technological research in the field of EE
Development of programs and action plans	24. Create an action plan to promote national energy autonomy and encourage energy efficiency in homes and commercial/industrial buildings in addition to public lighting
	25. Create a program to adopt innovative technologies for energy-efficient refrigeration and air conditioning systems
	26. Create a program to accelerate the development of smart grids and the mass use of smart meters
Information and Awareness Initiatives	27. Execution of SEforALL awareness campaigns for STP that include energy efficiency
	28. Continuous implementation of communication campaigns from a gender perspective to increase bill collection and combat commercial losses
	29. Carry out continuous publicity and awareness campaigns for the population on the rational use of energy
	30. Carrying out continuous publicity and awareness campaigns on the rational use of energy in hotels and other tourist accommodation
	31. Dissemination of information on EE projects that have been successfully implemented at national level
b. Efficient Lighting	
Investment in infrastructure (Political and Economic)	1. Replacement of approximately 300,000 incandescent light bulbs with LED (10 light bulbs in 60,000 homes over 10 years)
	2. Replacement of 100,000 conventional light bulbs with LED light bulbs in the most impoverished households (5 light bulbs in 20,000 households)
	3. Replacement of 198,000 incandescent light bulbs with LED light bulbs in public buildings
	4. Replacement of 20,000 inefficient light bulbs with LED in public lighting

There are ongoing projects in STP regarding energy efficiency, which are mentioned in the *São Tomé and Príncipe Renewable Energy and Energy Efficiency Status Report (July 2020)*. Those projects are listed below:

Table 4: Ongoing EE projects in STP (São Tomé and Príncipe Renewable Energy and Energy Efficiency Status Report - July 2020)

Project	Description	Promoter	Status
Initiatives to improve energy efficiency	Replacement of approximately 170 inefficient light bulbs with LED in public lighting and awareness raising campaigns.	EMAE	Implemented
Rehabilitation of the STP Electricity Sector	Replacement of about 300,000 incandescent light bulbs with LED in order to reduce 8.5 MW of peak demand and 15 GWh of energy needs. Communication campaigns from a gender per-spective to increase invoice collection and fight commercial losses.	WB/EIB	In implementation
Promotion of investments in renewable energy and energy efficiency in the STP electricity sector	<p>Drafting of PANEE.</p> <p>Implementation of energy efficiency standards for domestic appliances in order to reduce 1 MW at maximum peak load.</p> <p>Implementation of investment projects that promote energy efficiency, for example, replacement of 3,300 compact fluorescent and incandescent light bulbs with LED to reduce the peak load between 6 p.m. and 9 p.m.</p> <p>Awareness raising campaign.</p> <p>Energy efficiency training aiming at training local experts specialized in the area.</p>	GEF/UNIDO	To be implemented
Institutional support program and energy transition in STP	Implementation of an energy efficiency program to reduce electricity consumption in buildings and public lighting.	AfDB	To be implemented
Intelligent counting system at transformer stations	Reduce losses by around 10% reflected in more than EUR 1.5 M.	Simbatu	To be implemented
SIDS DOCK Partnership and ESMAP Programme	Replacement of incandescent light bulbs with compact fluorescent light bulbs.	IDA, IFC and MIGA	To be implemented

Replacement of incandescent light bulbs with energy-saving light bulbs	Reduction of 2.6 MW	Leonel Wagner	To be implemented
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3.3 Mission 1 - Findings

3.3.1 Interviews

During the first mission, the consultants conducted interviews with several organizations, while some of them filled out questionnaires with questions regarding the market and legislative aspects of lighting, refrigerator and air conditioning appliances. Each interviewee provided information regarding their role, their knowledge on the aforementioned appliances, energy efficiency standards and energy labels. They also mentioned challenges that they have identified in terms of the increase of energy efficiency in the country, while some provided recommendations on how to overcome those challenges.

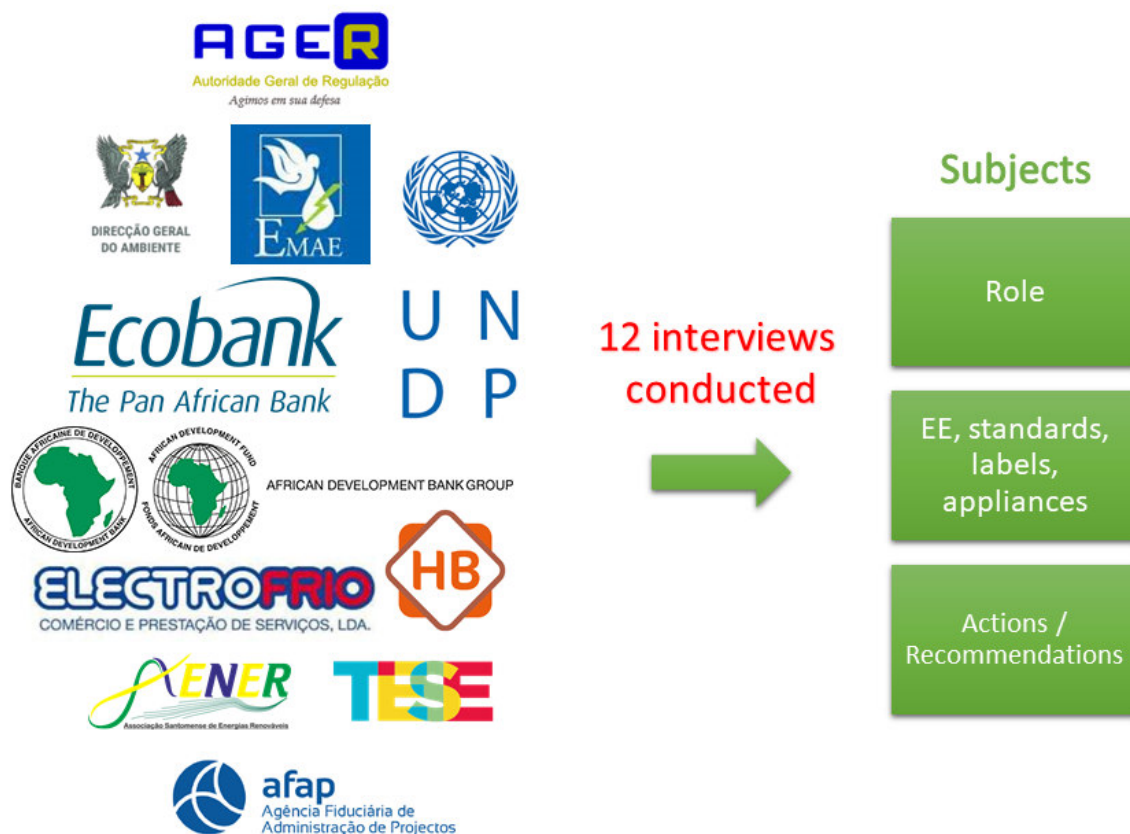


Figure 2: Interviewed organizations - subjects of interviews

The organizations that were interviewed are summarized in the following table. The organizations vary in terms of background, operational field (regional, international).

Table 5: List of interviewed organizations - Background

Number	Participant	Category/ Background
1	Customs Directorate	Public
2	AGER	Public
3	Directorate of Commerce & Industry	Public

4	SENAPIQ	Public
5	AENER	Public
6	ATEFER	Public
7	CCI	Public
8	EMAE	Public – Private
9	DGA	Public
10	TESE	Private - International
11	AFAP	Public
12	AfDB	International
13	Ecobank	International
14	UNDP	International
15	BSTPPTC	Public
16	Electrofrio	Commercial
17	HB	Commercial

1) Customs Directorate

Role

The customs' primary role is to collect custom duties from imported products and exercise control over the goods which are entering, leaving and transiting the country's borders. Although currently there is no procedure or legislation for prohibiting any type of appliances entering the country, the country is working on legislation to ban the import of old or used appliances. The number of appliances has increased in the last 3 years, while the Customs Directorate keeps track of the number of appliances imported each year. Nevertheless, the customs officers are only aware of the price of the imported appliances, without keeping data of brand or type of appliance.

Products & Standards

Customs are in cooperation with other sectors who are responsible for certain products. These sectors are responsible for determining quality, while customs are responsible for collecting duties and tackling tax fraud. For example, they have the authority to ban certain refrigerants. The Customs Directorate estimates that there is capacity to regulate MEPS and labels if needed, though there is yet to be a department within the Directorate to analyze electrical equipment. Appliances are being imported by the big stores, and then sold directly to the consumers. Fluorescent lamps are identified as the most popular type of brand.

The Directorate states that there is no knowledge within the organization regarding labels, as appliances are imported regardless of having an energy label. They have identified the need for technical training for the customs officers, as well as awareness creation for the stakeholders about benefits of more efficient products. In their opinion, this type of work is encouraged by the fact that Santomeans are interested in buying efficient products.

Challenges & Actions

The first challenge lies with monitoring, verification and enforcement due to poor cooperation between stakeholders on the matter of energy efficient appliances. There is a need for public education and awareness creation on Energy Efficiency. Demonstration projects could help with raising awareness. Capacity building for Customs Officers is needed on identification of non-conforming appliances. Testing facilities or a laboratory for the verification of appliances could help on that front.

2) AGER



Role

AGER is a legal person governed by public law with regulatory and supervisory powers in the sectors of Telecommunications, Electricity, Water and Postal Services. It has effective regulation in the telecommunications and electricity sectors. Regarding the electricity sector, its mission is to boost market efficiency, promote competition and defend the interests of present and future consumers.

Products & Standards

While being interested as a regulatory body, AGER is not related to lighting, refrigerators and air conditioning appliances yet, as there is no department in place to deal with those appliances. Policies and a regulatory framework are deemed important. Its concern is that developed labels must be kept simple for consumers to understand, and international standards should be adapted to the context of STP.

Challenges & Actions

It is necessary to create policies to encourage the reduction of the price of the most efficient appliances on the market in order to encourage the demand for such equipment while, on the other hand, educate and sensitize consumers about the labels of EE appliances and the efficient use of the appliances. Finally, AGER needs capacity building with training materials for its staff.

3) Directorate of Commerce and Industry - National Service of Intellectual Property and Quality (SENAPIQ)

Role

The Directorate is in charge of industry development, science, strategy of commerce, inspection, training, and harmonization of enterprises at the national level. It is also responsible for standards and granting licenses to companies dealing with appliances, and can potentially guide companies that sell appliances.

The SENAPIQ is responsible for applying the Montreal Protocol to control Greenhouse Gasses by monitoring conformity of refrigerants.

Products & Standards

Improvement of Energy Efficiency is already included in the National Determined Contributions (NDCs). There are standards in place included in the Regional Quality Policy, under the Quality Infrastructure Programme for Central Africa (PIQAC 2017). SENAPIQ serves as a national regulation authority of quality, but it has no executive capacity.

Challenges & Actions

There is poor synergy between DGRNE and the Directorate of Commerce on Energy Efficiency, and in general between all the institutions. Consumers may not be able to purchase EE appliances due to low income.

It is suggested that a quality tax could be applied to enterprises for using inefficient appliances. Additional government policies could give incentives for energy efficiency. Funding should be mobilized to support the implementation of standards and labels, and also for supporting low-income households to switch to EE appliances. Public education and awareness creation needs to be conducted. ISO standards could be initially adopted and then adapted to the STP context. For monitoring the implementation process, a national database on trade and industry should be established.

Capacity building is another area to focus on. The government needs help to improve its structure, with well-defined roles and relations between institutions. Knowledge on EE and standards, implementation strategies and collaboration with partners are also topics for capacity building. Training is needed for all the stakeholders (AGER, DGRNE, Ministry of Trade and Industry, etc.), while the National Quality Commission should also participate.

4) AENER - ATEFER



Role

AENER is a non-profit association, with the aim of coordinating and promoting the deployment of renewable energy as an alternative to conventional energy. In order to promote energy efficiency in buildings, AENER conducts lobbying and awareness creation of construction professionals, architects, etc.

ATEFER was created by the Ministry of Environment as an association to propose environmental regulation and conduct conferences on the subject. It is affiliated with UNEP, has received capacity building on strategies to avoid ozone-depletion emissions. Likewise, it promotes actions for the introduction of clean energy and energy efficiency.

Products & Standards

AENER participates in the definition of regulations for energy standards and energy efficiency. It also promotes conformity of RE professionals and companies to standards related to the installation and sale of different equipment. It has direct follow-up with AGER in the finalization process of these regulations.

ATEFER, combined with the environment management, promotes legal actions that allow the correct handling and consequent withdrawal of freon used in the refrigeration process. These gases, which attack and deplete the ozone layer, which prevents the penetration of ultra-violet rays on planet earth. Refrigeration is energy demanding, so being in the era of changes to clean energy and EE, ATEFER must be involved.

5) Chamber of Commerce and Industry (CCI)

Role

The CCI is a private institution responsible for representing the private sector at the national level, by promoting the private sector's interests in the implementation of policies. It offers training to its members on various subjects. For this, the CCI is trained by different organizations to provide training.

Although it has representatives throughout the country, it lacks human resources to train all its member companies (4000 in total).

Products & Standards

Standards need to be gradually introduced, as to not spoil the market. The banning of less efficient appliances must follow a plan as to not interfere with business, and companies can be allowed to continue their business.

Challenges & Actions

There is a need for low-cost products, as the average Santomean earns two to three minimum wages, or 40 euros per month. While awareness for all sides is very important, the objective is to allow retailers to sell high-performance products at the same price.

Currently, companies have great difficulty in accessing electricity. This project is an opportunity to reduce electricity peak demand and reduce the pressure on the electricity network.

6) EMAE



Role

EMAE is a public electricity production and distribution company. EMAE has many ongoing projects on energy efficiency at the moment: changing incandescent bulbs to LED bulbs, changing public lighting, lighting public buildings. These projects are financed by banks. EMAE follows the directives and guidelines of the Ministry of Infrastructures. EMAE applies the national policy. AGER takes care of setting up regulatory standards.

Products & Standards

Around 60% of the customers have meters, while the rest of them pay fixed electricity tariffs. Refrigerators are currently a popular purchase among the general public, while the general public are buying more and more equipment. Peak consumption is at 7 pm.

Challenges & Actions

With electricity being an expensive commodity, more and more people are becoming aware of energy efficiency benefits, and as a result they buy more efficient equipment. However, there are no regulations to control that equipment, and customs are not authorized to control imports of inefficient appliances. There needs to be a change in mentality through awareness work. Stakeholder engagement on the necessity of standards and labels. Consumer education on energy consumption is an important task that EMAE needs to continue performing.

Legislative actions (e.g., decree), investments on efficient equipment acquisition, population awareness on energy efficiency, training of sales staff on standards and labels: these are all tasks suggested by EMAE.

7) Directorate General of Environment - DGA



Role

The DGA is constituted of three Directorates and works together with the UNDP Energy Project on energy efficiency and environmental impact issues.

Products & Standards

There is no work directly linked to energy efficiency being carried out. However, there is collaboration with DGRNE on an EE project. There is not a lot of knowledge on EE within the Directorate, although some knowledge has been gained through synergies on the impact of refrigerants to the ozone layer.

Challenges & Actions

Disposal of used lamps, refrigerators and air conditioners is difficult as there are no environmentally-sound facilities for that matter. Therefore, appropriate equipment is needed.

There is also a need for capacity building on the topics of EE awareness and environmentally safe disposal of appliances. In addition, stakeholders should participate in training in order to support the DGA.

8) TESE



Role

TESE is an NGO operating in the water sector and matters of waste management and training. It is not directly involved in energy efficiency.

Products & Standards

TESE carried out an awareness campaign in 2021 in the field of energy efficiency and energy conservation for stakeholders (EMAE, AGER, DGRNE) and the public (TV, schools, communities). It also developed a strategy to reduce EMAE's commercial losses, and offered LED lamps to schools. Finally, TESE takes gender mainstreaming into consideration, by engaging women in its programs.

Challenges & Actions

It is difficult for consumers to acquire EE appliances due to high prices.

There is a lack of laws and regulations to support monitoring of inefficient appliances. Minister is considering increasing custom fees on inefficient appliances.

Public awareness on EE appliances and their benefits needs to be raised.

Capacity building for TESE staff is deemed important in order to enable it to engage stakeholders on the subject of energy efficiency.

9) AFAP - AfDB

Role

AFAP has a project to improve the energy efficiency of public buildings and public lighting. AFAP has not started the project yet.

AfDB is working on many projects related to energy efficiency. AfDB has a project which aims to change light incandescent bulbs to energy-efficient lamps (LEDs) in households. AfDB hopes with this project to reduce nation energy demand in STP.

Challenges & Actions

The objective of the project is to give 500,000 energy-efficient lamps free of charge to EMAE customers. The idea is to recover the incandescent bulbs to process as waste. With this operation, it is estimating a drop in demand of 9MWh.

AfDB's project includes several components:

- The contract for the purchase of the lamps is signed, the lamps should arrive in STP in April 2022;
- A call for tenders is underway to conduct an awareness campaign;
- A call for tenders is underway to procure the LEDs and solutions for treating the recovered incandescent bulbs as waste;
- A call for tenders is underway to find a consultant to be in charge of monitoring the installation of the lamps and collecting information to assess the results of the operation – this activity aims to provide support to EMAE (monitoring, management of teams, data collection, direction of EMAE...);
- A consultant has been recruited to monitor the production of the lamps (in China), check the manufacturing process, carry out random quality tests before exporting the lamps to STP;
- A call for tenders is underway for waste management (equipment, lamp distribution schedule, reuse of waste).

10) Ecobank



Role

Ecobank is interested in and supports RE and EE initiatives in some African countries, but not yet in Sao Tome and Principe, due to its small market size. The UNIDO EE project presents a new business opportunity for Ecobank in STP. The bank may consider the development of loan products for consumers, importers, distributors of EE appliances

Challenges & Actions

There are high market risks associated with the initial market entry of new products – EE appliances, as well as loan recovery risks and cost of loan recovery.

The bank has also identified its need for training in the principles and benefits of EE and how to evaluate them.

Support by the government is deemed important on the following matters:

- Enacting a law to facilitate loan recovery,
- Assisting to manage loan recovery,
- Promoting public education and awareness on EE benefits.

11) United Nations Development program (UNDP)



U N
D P

Role

UNDP is the coordinator of a project for the promotion of Energy Efficiency in Agriculture and Forestry, which includes energy policies/legal frameworks, sustainable energy promotion, and management of the land/forest. Also, the UNDP worked on defining the role of each national institution.

Challenges & Actions

UNDP has already started training with the stakeholders, in collaboration with the Polytechnic Center. It is also working with several organizations within the country to achieve different goals:

- with the Customs Directorate towards the introduction of EE appliances,
- with AGER to propose regulations,
- with the Ministry of Trade and Industry on the question of prices.

The main difficulty identified is the cost of purchasing efficient appliances. The importance of showing the gains and benefits of EE appliances was noted.

12) Brazil-São Tomé and Príncipe Professional Training Centre (BSTPPTC)

Role

BSTPPTC offers vocational training to young people for the job market in STP. This EE project motivates the BSTPPTC with the issue of energy efficiency, and the Centre is open to work hand in hand with the project, since it is a project that will benefit STP.

Challenges & Actions

Incandescent lamps are still in use, but they are in the process of changing to more efficient lamps. BSTPPTC can contribute to the capacity building activities of this EE project. The Centre can also contribute to awareness creation on EE appliances, including the trainees at the Centre. Provided support is made available, BSTPPTC can host testing facilities for EE appliances.

13) HB Stores - Electrofrío



Sales people from HB and Electrofrío admitted to having little knowledge on appliance labels. Most customers do not ask about energy efficiency or labels on appliances, instead they choose the cheapest option. However, the store advises people to opt for energy efficient appliances.

The appliances come with labels, but most of them are old and with low energy efficiency labels. It was noticed that the labels are not visibly available on the equipment in the first store visited. Only after asking for the labels that they were presented. Nevertheless, in this store energy efficiency was a selling argument (sign indicating “save energy with this equipment”). The salary that people earn does not match the costs of the most efficient equipment in the stores, for this reason the consumption of inefficient equipment is still considerable.



Figure 3: Pictures from store visits (Source: Consortium AERE-Thelcon & Co)

3.3.2 Questionnaires

Along with the interviews, several stakeholders filled out questionnaires prepared by the consultant. The questionnaires consisted of questions about lighting, refrigerator and air conditioning appliances, regarding the distribution chain, the actual appliances and legislative issues on them.

Below is a summary for each questionnaire answered, along with the profession and organization of each participant.

3.3.2.1 Lighting Questionnaire



LIGHTING QUESTIONNAIRE				
Question	SENAPIQ	EMAE	TESE	DGRNE
1. General Questions				
1.1. Profession	Public Employee	Energy Engineer	Environmental Engineer	Electrical Technician
1.2. Relation to lighting	None	Working in Power Plant	None	For the workspace and in general
1.3. Knowledge on standards and labels	Low	High	High	High
1.4. Relation to EE		Through work in energy production	Conducting awareness campaign on EE	Works on technical & administrative documents about EE
2. Distribution Chain				
2.1. Domestic production	Don't think so	No	No	
2.2. Defined	No	No		No

LIGHTING QUESTIONNAIRE				
Question	SENAPIQ	EMAE	TESE	DGRNE
distribution network				
2.3. Distribution chain description				
2.4. Number of importers				
2.5. Number of retailers				
2.6. Top 3 importers	Electrofrio Nour Batmat	Nour LG Alferes	Nour Electrofrio Alferes	Electrofrio Nour Batmat
2.7. Top 3 retailers	I think so		Nour Electrofrio Alferes	
2.8. Technicians for maintenance in STP		Yes	Yes	Several
2.9. Licenses for technicians				
2.10. Second-hand retailers			Yes	
2.11. Informal retailers				
3. Lighting Appliances				
3.1. Brands available				
3.2. Most popular lamps	Incandescent	Fluorescent	Incandescent	Fluorescent & incandescent
3.3. Year of manufacture - LED lamps				
3.4. Year of manufacture - incandescent lamps				

LIGHTING QUESTIONNAIRE				
Question	SENAPIQ	EMAE	TESE	DGRNE
3.5. Year of manufacture - fluorescent lamps				
3.6. LED lamps sold in 2021				
3.7. Incandescent lamps sold in 2021				
3.8. Fluorescent lamps sold 2021				
3.9. Average price of LED lamps	STN 70		STN 90	STN 75
3.10. Average price of incandescent lamps	STN 5		STN 10	STN 10
3.11. Average price of fluorescent lamps	STN 50		STN 40	STN 45
4. Legislation				
4.1. Labels on appliances			Yes	On most
4.2. Distributors aware of EE lighting	I think not	Yes	Yes	Yes
4.3. Consumers aware of EE lighting	I think not	Some	Some	Yes
4.4. Promotion actions for EE appliances on distributors	I think not	Yes	Few	
4.5. Promotion actions for EE	I think not	Yes	Few	Replacement of 300,000

LIGHTING QUESTIONNAIRE				
Question	SENAPIQ	EMAE	TESE	DGRNE
appliances on consumers				incandescent lamps with LED
4.6. Law/regulation in place for EE lighting	I think not	No	No	Don't think so
4.7. Challenges for implementing EE legislation				
4.8. Necessary actions			Awareness. Import tax increase for less efficient home appliances. Reduction in the import tax on more efficient home appliances.	
4.9. Stakeholders to involve		Import, installation, maintenance/repair companies	Import, installation, maintenance/repair companies	Import, installation, maintenance/repair companies

3.3.2.2 Refrigerator Questionnaire



REFRIGERATORS QUESTIONNAIRE			
Question	EMAE	TESE	DGRNE
1. General Questions			
1.1. Profession	Instrumentation and Control Technician	Environmental Engineer	Electrical Technician
1.2. Relation to refrigerators	As a consumer	None	Not directly
1.3. Knowledge on standards and labels	High	Average	High
1.4. Relation to EE	EMAE takes EE into account	Conducting awareness campaigns on EE	Works on technical & administrative documents about EE
2. Distribution Chain			
2.1. Domestic production	No		
2.2. Defined distribution network			
2.3. Distribution chain description			
2.4. Number of importers	3		Several
2.5. Number of retailers			
2.6. Top 3 importers	HB Silver Braganca	HB Silver Batimat Nour	Electrofrío Nour HB Instalfer
2.7. Top 3 retailers		HB Silver Batimat Nour	
2.8. Technicians for maintenance in STP	Yes	Yes	Yes
2.9. Licenses for technicians			

REFRIGERATORS QUESTIONNAIRE			
Question	EMAE	TESE	DGRNE
2.10. Second-hand retailers		Yes	
2.11. Informal retailers			Yes
3. Refrigerators			
3.1. Brands available	LG Silver	LG Silver Samsung	LG Nasco Samsung Silver
3.2. Most popular refrigerator types	Bottom freezer		Top freezer Bottom freezer
3.3. Average refrigerator size			35-60 liters
3.4. Average noise level			
3.5. Average year of manufacture			
3.6. Refrigerators sold in 2021			
3.7. Is a refrigerator a common commodity		Yes	Yes
3.8. Percentage of refrigerator owners (households)		90%	75%
3.9. Average price			STN 700
4. Legislation			
4.1. Labels on appliances		Yes	Yes
4.2. Distributors		Yes	Yes

REFRIGERATORS QUESTIONNAIRE			
Question	EMAE	TESE	DGRNE
aware of EE refrigerators			
4.3. Consumers aware of EE refrigerators		Yes	Mostly yes
4.4. Promotion of EE appliances on distributors		No	
4.5. Promotion of EE appliances on consumers		No	Some fairs are organized periodically
4.6. Law/regulation in place for EE refrigerators		No	No
4.7. Challenges for implementing EE legislation			
4.8. Necessary actions		Awareness. Import tax increase for less efficient home appliances. Reduction in the import tax on more efficient home appliances.	
4.9. Stakeholders to involve			All stakeholders, from importers to consumers

3.3.2.3 Air Conditioning Questionnaire



AIR CONDITIONING QUESTIONNAIRE				
Question	Customs	EMAE	TESE	DGRNE
1. General Questions				
1.1. Profession	Senior Customs Technician	Electrical Engineer	Environmental Engineer	Electrical Technician
1.2. Relation to A/C	Imports and exports of merchandise	Through work at Power Station	No	For use in workspaces
1.3. Knowledge on standards and labels	Low	Average	Average	High
1.4. Relation to EE	No	No	Conducting awareness campaigns on EE	Aims to guarantee production and reduce consumption
2. Distribution Chain				
2.1. Domestic production		No	No	Don't think so
2.2. Defined distribution network	Some companies do imports	No		
2.3. Distribution chain description	Imports of air conditioners are carried out by companies with due knowledge, with the exception of natural persons.			

AIR CONDITIONING QUESTIONNAIRE				
Question	Customs	EMAE	TESE	DGRNE
2.4. Number of importers	At least 7			
2.5. Number of retailers	At least 4			
2.6. Top 3 importers	Electrofrio Nour HB	Electrofrio HB Batimat	Electrofrio Nour HB	Electrofrio Nour HB
2.7. Top 3 retailers	Electrofrio Nour HB	Electrofrio HB Batimat	Electrofrio Nour HB	
2.8. Technicians for maintenance in STP	Many	Yes	Yes	The are some
2.9. Licenses for technicians	Most are not licensed			They are brought together through the National Association
2.10 Number of maintenance workers	At least 7 companies			Several, including the sole proprietorship
2.10. Second-hand retailers	At least 2 companies		Yes	
2.11. Informal retailers	At least 3 groups			I think so
3. Air Conditioning Appliances				
3.1. Brands available		LG	LG Samsung	LG Samsung
3.2. Most popular A/C types	Window A/C Split System A/C Portable A/C	Evaporative Coolers	Window A/C Portable A/C Split System A/C Central A/C	Split System A/C Central A/C
3.3. Most popular A/C size	12000 BTU	9000 BTU and 10000 BTU	9000 BTU and 10000 BTU	9000 BTU and 18000 BTU
3.4. Labels on A/C units		No	No	Some, especially on smart inverter systems
3.5. A/C units sold in 2021				

AIR CONDITIONING QUESTIONNAIRE				
Question	Customs	EMAE	TESE	DGRNE
3.6. Are A/C units a common commodity	Has become necessary	No	Yes	
3.7. Percentage of A/C owners (households)	20-30%			
3.8. Average price of A/C unit	STN 4500		STN 9000	STN 12000
4. Legislation				
4.1. Labels on appliances			Yes	
4.2. Distributors aware of EE A/C units		Yes		Yes
4.3. Consumers aware of EE A/C units			No	Yes
4.4. Promotion of EE appliances on distributors			No	
4.5. Promotion of EE appliances on consumers			No	Fairs are organized, but most consumers are upper class of society.
4.6. Law/regulation in place for EE			No	
4.7. Challenges for implementing EE legislation				
4.8. Necessary actions				Standardization of equipment
4.9. Stakeholders to involve				Import, installation, maintenance/repair companies

3.3.3 Workshop

A workshop was conducted by the consultant with participation from the stakeholders. In total, 50 participants contributed to the workshop that took place after the interviews. The participants were members of DRCAE, the Tourism Directorate, SRADSM MIRN, DGRNE, DSGC, INA, EMAE, ATEFER, DGA, AGER, the Industry Directorate and MNECC. Out of the 23 listed workgroup participants, 9 were women.

The participants of the workshop are presented in the following table:

Table 6: Workshop participants by organization

Participant Number	Organization	Gender
Workgroup A		
1	DRCAE	F
2	Tourism Directorate	M
3	SRADS	M
4	DRCAE	M
5	DGRNE	M
6	DGRNE	F
7	DGRNE	F
Workgroup B		
8	DGRNE	F
9	DGRNE	F
10	DSGC	M
11	INA	F
12	EMAE	M
13	ATEFER	M
14	DGRNE	M
15	EMAE	M
Workgroup C		
Participants did not fill out the attendance sheet		
Workgroup D		
16	EMAE	F
17	DGA	F
18	DGA	
19	AGER	M
20	SENAPIQ	M
21	MNECC	M

22	DGRNE	F
23	-	M

The Consultants presented the project objectives, methodology, schedule and the results of the market study. The conclusions of the mission, which are presented below, were also presented:

- Incomplete questionnaires: reflects the lack of knowledge and data on imported appliances,
- Stakeholders very interested in the project,
- Understanding of the interest of the project,
- Need for stakeholders training because they do not know much about energy efficiency,
- Some existing institutions have capacity as facilitators for training, raising awareness of the general public and actors in the distribution chain,
- Need for governance for the implementation, monitoring and evaluation of standards and labels (who does what),
- Potential funders to support the public,
- Problematic: the price of efficient equipment, need to find a solution to solve this problem,
- Some current lamp initiatives,
- Financial support schemes need to be established for appliance consumers, importers, distributors and retailers to facilitate procurement of EE appliances - Local financial institutions need to be engaged on this new business opportunity.

The participants were then invited to work in groups to complete and review these results. The workgroups were consisted of the following organizations:

- Workgroup A: DRCAE (2 participants), Tourism Directorate, SRADSM MIRN, DGRNE (3 participants);
- Workgroup B: DSGC, INA, EMAE (2 participants), ATEFER, DGRNE (3 participants);
- Workgroup C: Participants did not fill out attendance sheet for this group (around 6 participants);
- Workgroup D: EMAE, DGA (2 participants), AGER, Industry Directorate, MNECC, DGRNE.

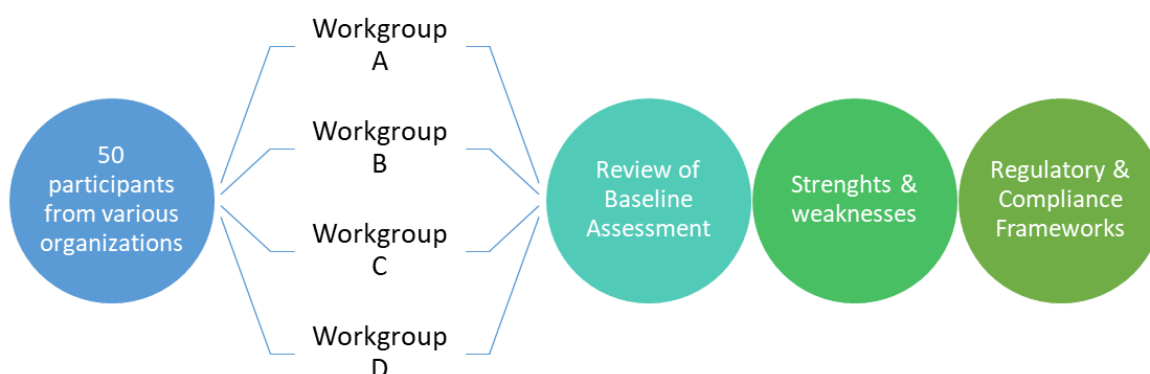


Figure 4: Workgroups Structure & Topics

The participants, divided in 4 workgroups, provided insight on the conclusions the consultant reached for the mission, which were divided in 3 categories:

1. Review of Baseline Assessment
 - a. STP Market
 - b. Legislative improvement
 - c. Benchmarking of MEPS and labels in other countries
2. Strengths and Weaknesses
3. Regulatory and Compliance Frameworks
 - a. Capacity Building
 - b. Public education and awareness creation
 - c. Institutional framework
 - d. Regulatory framework

In the infographics presented below, these categories are presented with the answers provided by the participants. Their suggestions in each matter are clearly displayed, and the points on which there is consensus and the divergent opinions are underlined.

The findings from the workgroups are presented in this chapter.

1. Review of Baseline Assessment

a. STP Market

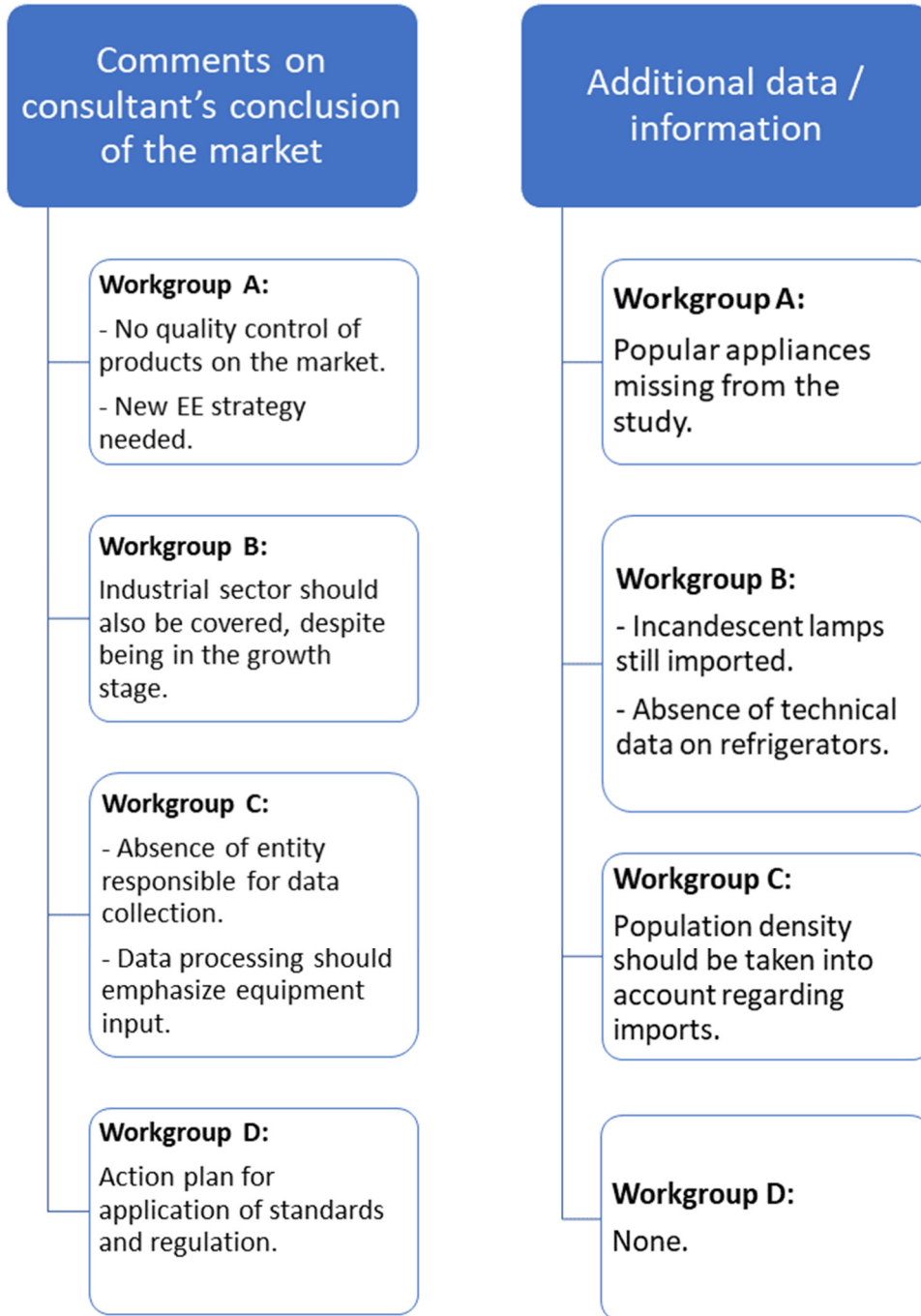


Figure 5: Workshop Results - Review of Baseline Assessment - STP Market

1. Review of Baseline Assessment

b. Legislative Improvement

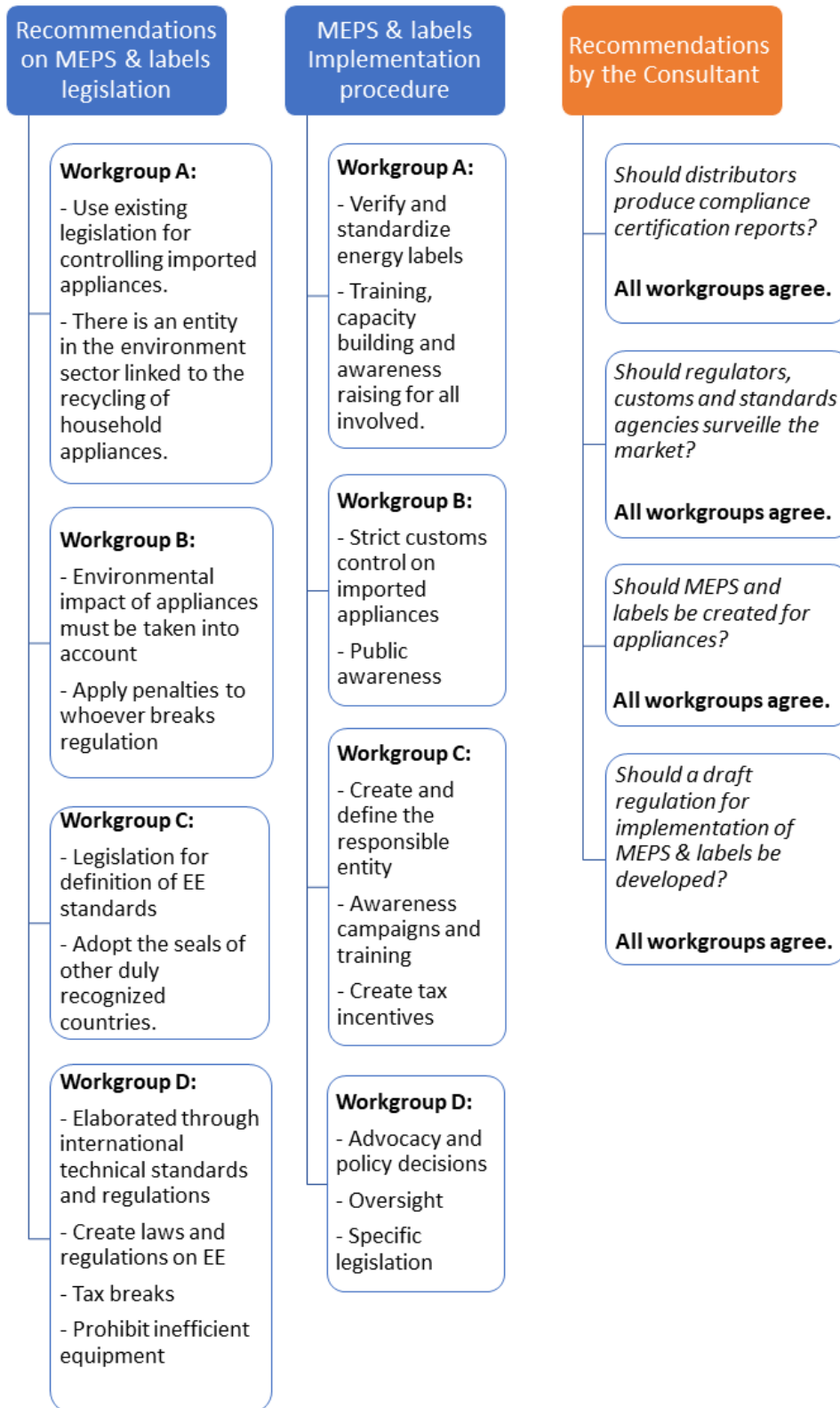


Figure 6: Workshop Results - Review of Baseline Assessment - Legislative Improvement

1. Review of Baseline Assessment

c. Benchmarking of MEPS & labels in other countries

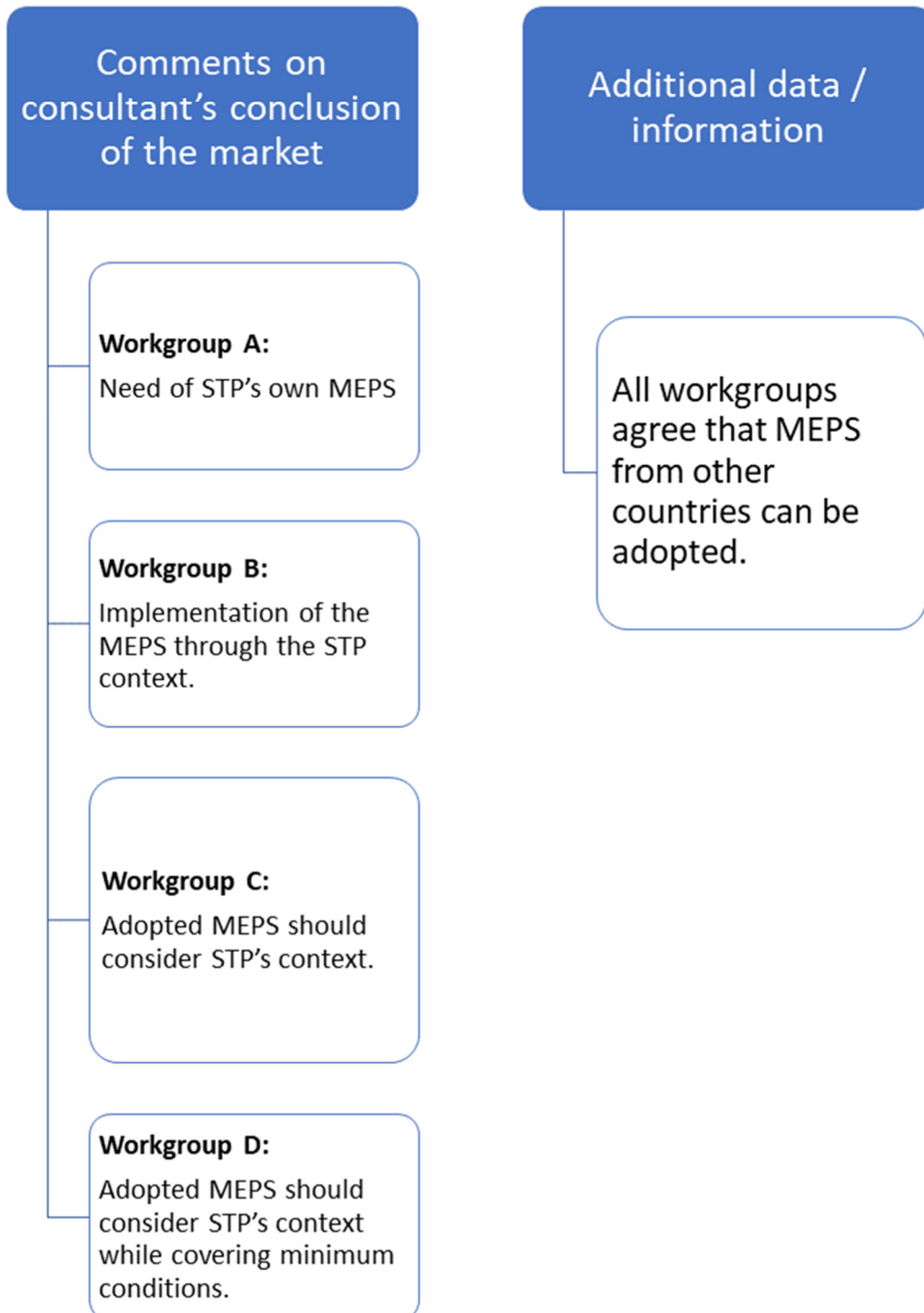


Figure 7: Workshop Results - Review of Baseline Assessment – Benchmarking of MEPS & labels in other countries

2. Strengths & Weaknesses for the Introduction of MEPS and labels for appliances in STP

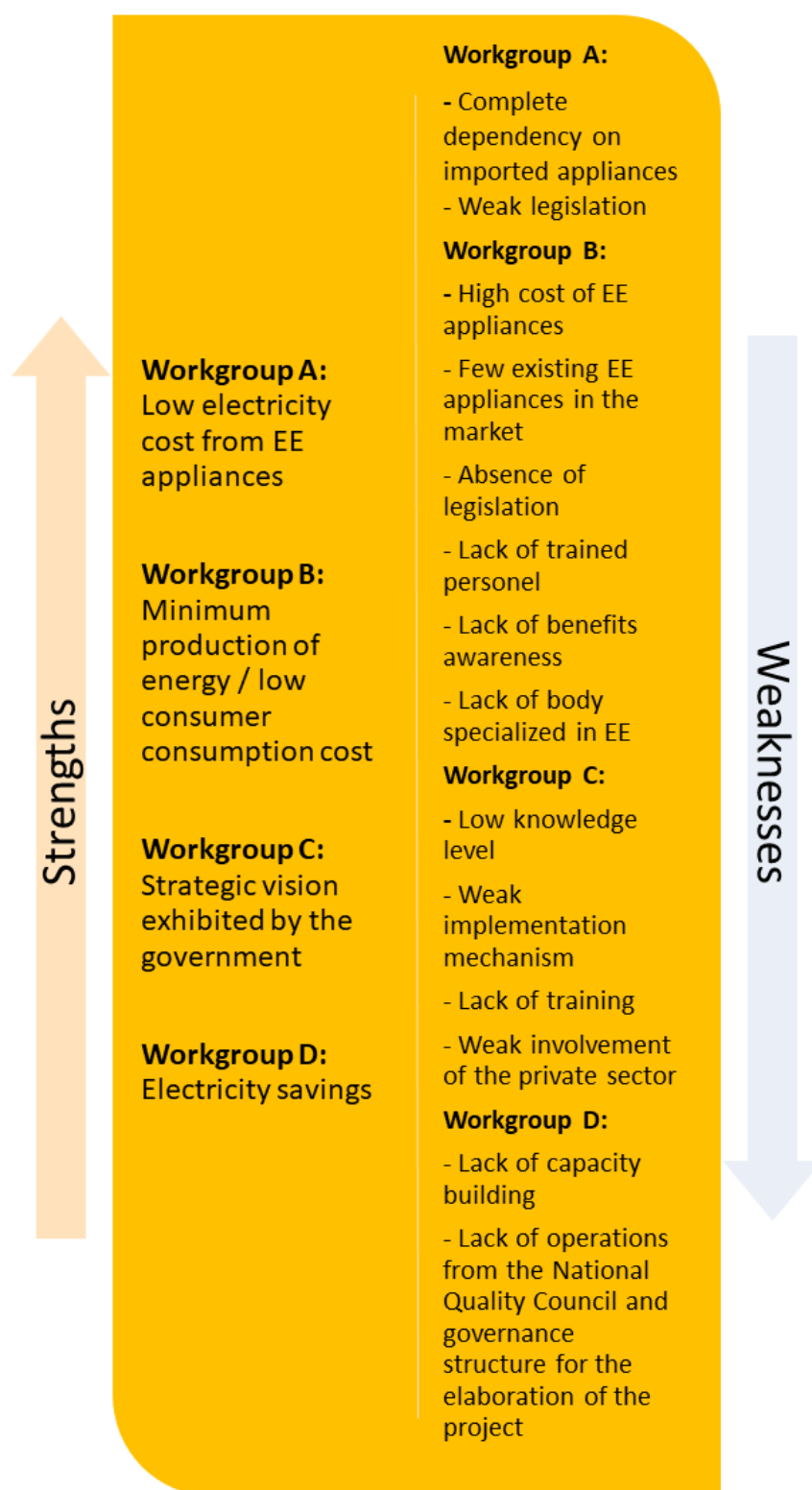


Figure 8: Workshop Results - Strengths & Weaknesses for application of MEPS and labels

3. Regulatory and Compliance Frameworks

a. Capacity Building

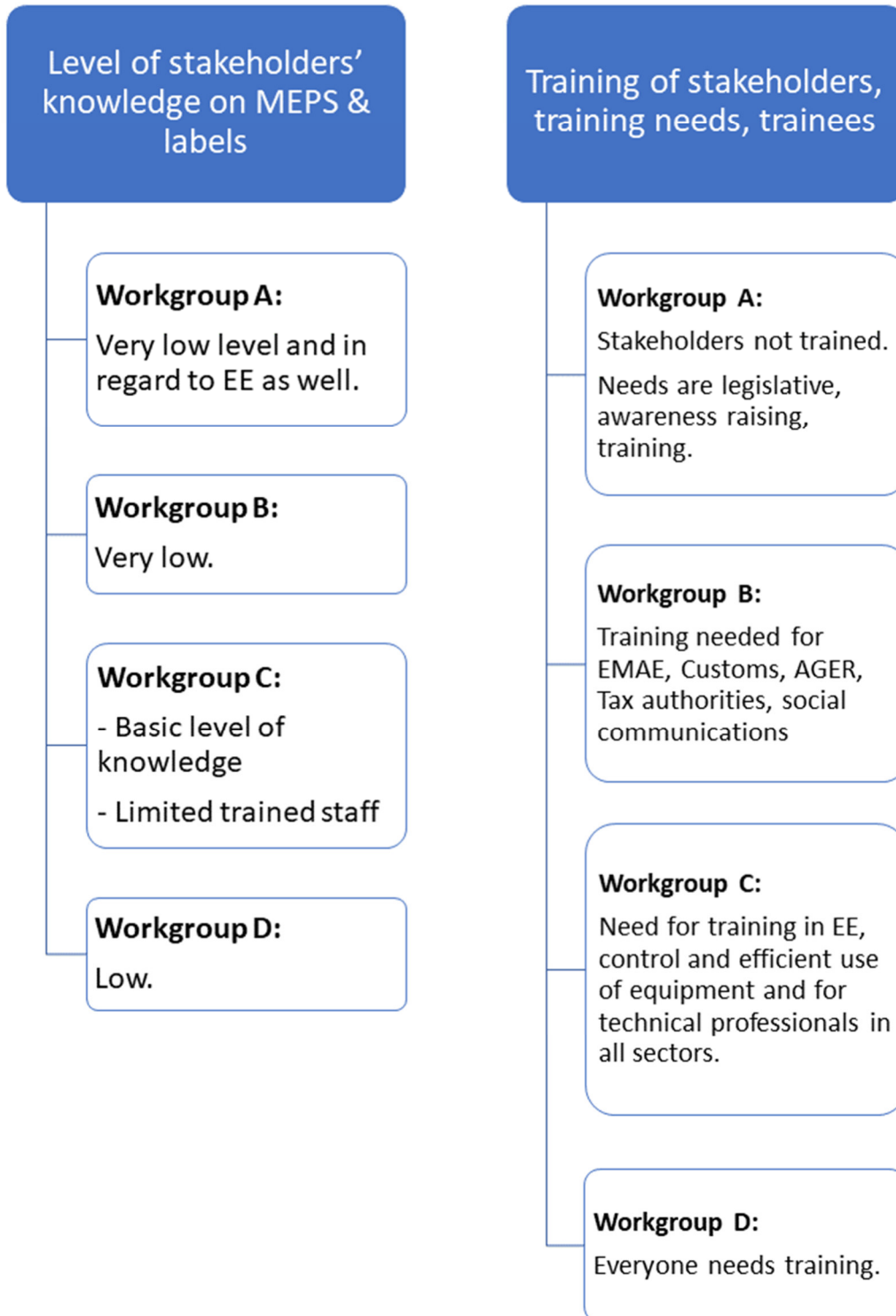


Figure 9: Workshop Results - Regulatory & Compliance Frameworks - Capacity Building

3. Regulatory and Compliance Frameworks

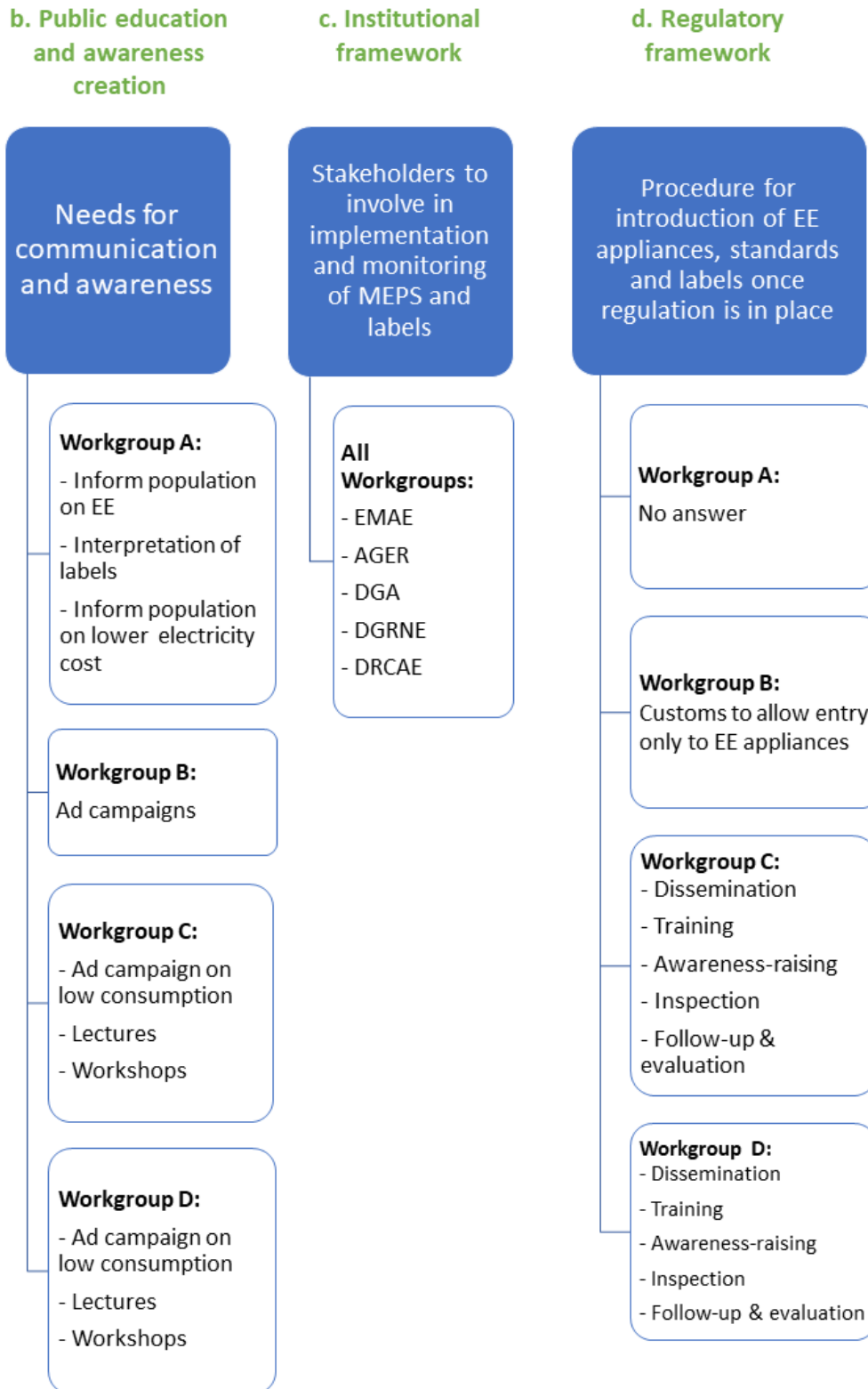


Figure 10: Workshop Results - Regulatory & Compliance Frameworks – Public education & awareness creation – stakeholders to involve – procedure for introduction of EE appliances, MEPS and labels

4 Report on potential legislative improvements

4.1 Methodology

This part aims to present the potential for improving national legislation and minimum energy performance standards (MEPS) for the uptake on energy efficiency. Having conducted the baseline assessment, we will be able to compare the MEPS and labeling with the rest of the region and indicate where Sao Tome and Principe needs further enhancement. This will include a realistic plan to set and develop energy efficiency targets, considering regional and international standards, but more importantly the financial condition of both the country and the average end-consumers that need to purchase these appliances. This plan will be detailed in the report on implementation frameworks.

4.2 Results

4.2.1 Analysis of the national regulatory framework

Institutionally, the São Tomé and Príncipe energy sector is supervised by the MIRN, through the Directorate-General for Natural Resources and Energy (DGRNE). In the Autonomous Region of Príncipe (ARP) the sector is under the responsibility of the Regional Secretariat for Environment and Sustainable Development.

At the local level the districts only have regulatory powers in the energy field, although informally they have a very involved role in the design of public policies and regulations of the sector.

In regard to regulation, the energy sector in general is not attached to a specific regulatory body, besides the electricity sector which is regulated by the General Regulatory Authority (AGER). Energy regulations in STP are still quite minimal, with there being no general energy law, rather various legal decrees focused on the various forms of energy use. There has been identified Renewable Energy potential for the country, and regulation was developed towards the production of it. Regarding Energy Efficiency, there is no regulatory framework governing MEPS and energy labeling at STP. Regulation of the energy sector in STP is still very recent.

The institutions responsible for the energy sector are listed below:

- Ministry of Public Works, Infrastructures, Natural Resources and Environment (MOPIRNA)
- Directorate-General for Natural Resources and Energy (DGRNE)
- Directorate-General for the Environment (DGA)
- Autonomous Region of Principe (ARP)
- Districts/Local Authorities
- General Regulatory Authority (AGER)
- Water and Electricity Company (EMAE)
- National Petroleum Agency (ANP)
- Fiduciary Agency for Project Administration (AFAP)
- Coordination Committee for the Electricity Sector Transformation Program (CC-PTSE)
- Technical Support Group for the Electricity Sector Transformation Program (GT-PTSE)
- National Sustainable Energy Platform (PNES)

The existing frameworks related to energy, energy efficiency and renewable energy are presented below:

- 2021: **National energy efficiency action plan (PANEE)** outlines STP's current energy profile along with future projections, describes the regulatory and legal framework, and sets specific objectives and targets for the EE sector with the main objective of increasing the energy efficiency of the country. Regarding electrical appliances, the PANEE sets specific EE targets to be achieved in the 2020-2050 time horizon:
 - i. for replacing incandescent bulbs with LED lamps in public and residential / commercial lighting,

- ii. for labeling of household appliances and other equipment,
- iii. for replacement of traditional stoves with high-efficiency stoves and progressive increase in the use of LPG
- iv. for replacement of old cars with more efficient ones and introduce electric vehicles
- v. for implementation of EE & RE measures

In the study there is also included a detailed description of each adopted measure, including its priority in terms of implementation and its expected results/impacts. In total, 46 measures are proposed for the Energy and Electricity sector, as well as other sectors, which are scheduled to start either in 2020 or 2021, and be completed in the either in the short-term or the long-term. The measures vary between studies, organizational strengthening, regulatory market development, incentive creation, decision support and training initiatives. It is forecasted that those measures will result in financial, social and environmental benefits.

- 2021: **National renewable energy action plan (PANER)** sets specific targets for the RE sector with the main objective of significantly increasing the penetration of generation capacity based on renewable sources in the STP power matrix by 2030
- 2021: **Law 4/2021 Great Options Plan (GOP)**: the government expresses that it aims to accelerate the energy transition in STP, certain measures aim to regulate energy efficiency rules, regulate the process inspection of poor-quality electrical equipment and develop energy mapping studies.
- 2020: **Law 1/2020** approves the Regulation Establishing the Special and Transitional Regime for the Acquisition of Energy from Renewable Sources, serving as a legal framework for Independent Power Producers (PEIs). However, the law is only valid for one year.
- 2019: **The third national communication on climate change 2019** identified mitigation options in the energy sector which notably include EE initiatives (equipment and adoption of efficient lighting, building materials energy efficient, energy efficient appliances)
- 2019: **The National Sustainable Development Plan of the STP 2020-2024 (PNDS)** published by the STP government in 2019, In the field of energy, the strategy underlines the need to reverse the current situation with the implementation of EE measures.
- 2019: **Resolution 29/2019**: Based on the electric energy crisis, aggravated by the substantial cut in fuel by the Sonangol Company, the only supplier of this product to the country, the Council decided to authorize the implementation of renewable energy projects that already have commitments and memoranda signed with the State for the Autonomous Region of Príncipe.
- 2019: **Law 15/2019**: The Rate Regulation is applicable to natural or legal persons, governed by public or private law, who operate in the national electricity market, either through licensing or through concession, who carry out the activities of management and exploitation of production, transport services., distribution and commercialization of electricity through the National Electricity Grid. The regulation fixes the fees and establishes the general provisions, the base of incidence, the method of payment and the procedures for indexing and revising the fees. It includes, among electricity producers, those who use fossil fuels or renewable energy sources. The DL does not mention any payment exemption for renewable energy producers.
- 2019: **Law 8/2019 (GOP)**: The GOP Law guarantees consistency with long-term planning instruments, such as STP 2030 – The country we want to build, United Nations Agenda 2030 and the African Union Agenda 2063. Among the various strategic axes and main objectives of the GOP, it is mentioned that STP needs to strengthen its energy, airport, road and water (water supply) infrastructures.
- 2018: **Major Plan Options for 2019** identified the need to address the deficit in production and installed capacity as well as frequent losses in the distribution grid. Actions were proposed to cover those needs, by increasing production capacity and energy efficiency and reducing the cost of fuel imports.
- 2017: **The National Development Plan 2017-2021** includes strategic goals on the economic, social, institutional, infrastructure and environmental domain, as well as the electricity sector. For the later, the plan aims to 1) increase production capacity through investments, 2) expand

transmission and distribution capacities and 3) increase energy efficiency through improved performance of EMAE.

- 2016: **Law 4/2016:** Definition of role of DGRNE, DGA
- 2016: **Contribution Nationally determined for the UNFCCC:** STP is a natural carbon sink thanks to its lush forests. However, the country proposes to reduce its emissions from the sector that emits the most: the energy sector, which would be achieved with the introduction of renewable energies (mainly hydro and solar) to replace fossil fuels. Furthermore, the document clarifies that it is only possible to achieve this goal by 2030 if there is external financial assistance, technology transfer, training and know-how.
- 2015: **STP Transformation Agenda 2030** is based on UN’s 2030 Agenda, and sets out some key projects, related to construction of a PV power plant and rehabilitation of electricity production, transmission and distribution. The document also envisages a guarantee fund for private renewable energy investment initiatives, including hydropower, with the aim of covering 50% of the country’s electricity needs from clean and sustainable energy sources by 2019.
- 2014: **Law 26/2014:** The electricity sector in STP is essentially defined by the *Organizational Legal Regime for the Electricity Sector (RJSE)*, approved by Decree-Law 26/2014. The regulations applicable to the electricity system can be grouped into three parts: i) basic legislation for the sector: RJSE; ii) complementary regulation to the RJSE; iii) “cross sector” legislation applicable to the electricity sector and others (e.g., environmental legislation). The RJSE provides the general rules applicable to activities in the electricity sector, including the production of energy from renewable sources (Article 50 and following). The RJSE standards are mostly prescribed and require development through complementary legislation.
- 2006: **The National Climate Change Adaptation Plan (PANA)** contained the introduction of technologies that reduce the consumption of wood for energy production, for example through the implementation of EE measures such as improved stoves, and with nationally accessible technologies and knowledge

In the *São Tomé and Príncipe Renewable Energy and Energy Efficiency Status Report (July 2020)*, several barriers on the country’s framework and regulatory issues are identified along with recommendations on overcoming them.

Considering all the above, the main barriers to, with recommendation on how to address them:

Table 7: Barriers & Recommendations for legislative improvements

Barriers	Recommendations
Absence of specific regulations on the application of the RJSE rules. Lack of a specific political and regulatory framework for sustainable energy projects.	RJSE regulations, in particular: Production Activity, Grid Access, Production from Renewable Energy Sources. Creation of a coherent regulatory framework for the adoption of sustainable energy solutions.
Weak coordination among the entities directly involved in the sector.	Strengthening of synergies between the involved actors through working groups and coordination meetings that will allow the sector to become more dynamic.
Lack of knowledge of energy policies by the different government entities indirectly involved (Ministries and General Directorates).	Greater articulation and coordination between the different government entities, namely through an interministerial working group.
DGRNE and AGER are not yet prepared with all	Strengthening the institutional capacity of

human and material resources for the effective application of legally defined responsibilities.	DGRNE and AGER. Preparation of a training and education plan for technical staff on renewable energies and energy efficiency.
EMAE is a public company whose activity has a great political impact. That is why all its activity is controlled by the government, which makes the application of the principles enshrined in the RJSE more complex.	Creation of regulations at the level of the different sectors in order to structure the sector and define “who does what, how far and when they should do it”.
Little transparency in the accountability of EMAE’s current performance and lack of external control.	Little transparency in the accountability of EMAE’s current performance and lack of external control.
The lack of a standard Power Purchase Agreement (PPA) and a transparent tariff regime for production activities in general and renewable energy in particular, leads to uncertainty in guaranteeing investments and cost recovery. Tariffs are set at the discretion of the government since AGER is not yet acting in accordance with the regulations of the electricity sector.	Provide AGER with technical and legal instruments that allow it to perform well in terms of tariff calculation and strengthen its institutional capacity so that it is effectively involved in the tariff calculation. and PPA negotiation process.
High customs duties associated with the import of goods.	Revision of the Tax Benefits Code and the customs tariff to favor projects and renewable energy products that meet certain quality standards.
Slowness and complexity in assigning the necessary decisions to a project.	Concentration of the various resolutions in a one-stop shop.

4.2.2 Analysis of the regional framework

The report by the Centre for Renewable Energy and Energy Efficiency for Central Africa (CEREEAC), titled “*Baseline Report & Needs Assessment*”, provides very useful information on the status quo on regional policy in Central Africa.

As a member of the ECCAS (Economic Community of Central African States), STP is subjected to regional policies:

- The Sustainable Development Goals (SDGs),
- 3rd Industrial Development Decade for Africa (IDDA III),
- The Africa 2063 agenda,
- ECCAS Green Economy and Renewable Energy Vision,
- ECCAS Vision 2025,
- ECCAS Regional Energy Policy Strategic Document (2014)

- ECCAS / CEMAC White Paper and Energy Policy 2035: sets out the regional policy for universal access to modern energy services and economic and social development working on three principles; good governance at a regional, national and local level, energy security and the development of renewables, equality, inclusivity and poverty reduction,
- EAC Industrialization Strategy.

The World Bank's Regulatory Indicators for Sustainable Energy scorecard (RISE), a key element of the Sustainable Energy for All Knowledge hub, helps to assess government support for sustainable energy investment, thus assessing the policies and regulations in place that contribute to advance global sustainable energy goals. In general, in terms of a regulatory framework, the Central African region has a very low overall score based on RISE, indicating that more work must be done to improve the existing legal framework of the region.

The ranking takes place among three categories: Energy Access, Energy Efficiency and Renewable Energy. When analyzing the different categories separately, it is seen that the ECCAS countries score better on energy access policy framework, whereas on EE they score the worst. Although it is evident that since 2010, steps have been taken towards improving the legal frameworks, still a lot needs to be done for the countries and regions to have a strong policy framework supportive of sustainable energy development.

Priorities in the region:

- 1) Define regional RE & EE targets and priorities and assist ECCAS countries in the implementation and monitoring,
- 2) Coordinate and harmonize regional donor and country activities, avoid duplication and create synergies on technical levels,
- 3) Create regional RE & EE policies, regulations and quality standards and support countries in national implementation (e.g., MEPS, fuel & vehicle standards),
- 4) Promote training, train the trainer programmes and capacity building events and workshops,
- 5) Support countries to develop bankable projects (e.g., project preparation facilities and support for funding applications).

EE appliances & labeling - Actions:

- Life cycle knowledge of different appliances should be studied and better data on all appliances developed,
- Certification mechanism for electrical equipment, installation and materials is needed,
- Inventories of manufacturers, distributors and wholesalers required,
- Setting up recycling centers.

EE lighting - Actions:

- More data required on lighting in general,
- Intelligent management for public street lighting,
- A multi-year programme for the elimination of inefficient lamps is required,

- Gradual introduction of solar PV lights.

Regional partnerships, cooperation and integration between countries, including the private sector and civil society, can be an effective tool to address some of the existing demand and supply barriers for RE&EE market development. Integrated markets, which follow joint standards and a common framework, are an important prerequisite to reduce investment risks and foster trade with RE & EE products and services. However, for several reasons, the regional level has been ignored and remains a missing link in international sustainable energy and climate cooperation.

There are several specific challenges and opportunities for adoption and development of sustainable energy in the ECCAS region. For STP, those challenges, as identified by CEREEAC, are:

- No long-term national targets for EE (a challenge tackled with the elaboration of PANEE by UNIDO)
- Inadequate electrification plan,
- Inadequate RE regulations (a challenge tackled with the elaboration of PANER by UNIDO),
- Inadequate EE standards (labeling, energy codes etc.),
- Lack of capacity in regulators and utilities to regulate or liberalize markets,
- Lack of educational options for RE and EE,
- Skills gaps (entrepreneurship, management and/or technicians),
- No national database of existing and planned developments,
- No national constraints maps (e.g., grid constraints, environmental considerations etc.),
- No national database of available support from Govt or donors,
- Lack of consumer affordability for energy,
- Inadequate Government incentives or subsidies to encourage investment,
- Utility has poor creditworthiness,
- Lack of financing mechanisms for RE,
- Lack of financing mechanism for EE.

Specific policy gaps/barriers identified by CEREEAC across different research methods include:

1. **Weak enabling framework.** The lack of tailored policies, as well as regulatory and legal frameworks in the ECCAS region, is a key constraint for the wider usage of RE and EE technologies. Most of the efforts made in the region are still insufficient to make a difference, for various reasons:
2. **Lack of evidence-based energy planning and scenario development**
3. **While there are existing drafts or final energy policies that have been identified, there is a noticeable deficiency as it relates to clear sustainable national energy action plans/road maps and supporting policies/legislation that would be expected to provide the enabling environment for the development of RE and EE projects.** CEREEAC presents an opportunity to coordinate a policy review and assist in setting concrete roadmaps and action

plans. Inadequately defined policy targets: As identified by the targets set in some documents reviewed, some of these policies may need to be refined to ensure that the defined targets are achievable and actionable. Moreover, policies are mostly not gender sensitive. Regional policies are also outdated and need to better reflect reductions in prices of emerging technologies, such as solar and wind, and the role they can play in the mix alongside hydro.

4. **Oversight of the RE and EE policies to make sure they are adequate, coherent and aligned with policies for other sectors like, education, health, agriculture, trade and industry is necessary.** In some cases, policy statements have largely remained broad statements of intention and have not been guided by evidence-based analysis. Essentially, policies have tended to be monolithic, focusing just on the energy sector, yet renewable energy is a cross-cutting issue, where there is a clear need for linkages with other sectors, such as agriculture, health, education, etc. For example, the existing subsidies to fossil fuels are one of the key constraints to investments in RE and EE. The existence of mechanisms such as the fuel surcharge also reduces the attractiveness of RE projects to the utilities. The subsidies undermine the principle of cost-recovery.
5. **There is also a lack of specific policies relating to key aspects of RE and EE development, for example renewable heating and cooling, with the focus tending to be on electricity.** This is an issue globally, and not just in Central Africa. Similarly, although there is a recognition that energy access is crucial, there is a lack of specific policies and regulations geared towards solving rural energy problems and realizing rural energy opportunities. As well as key barriers, opportunities in digitization and innovation of RE and EE could also be addressed with specific targets or incentives. Existing RE and EE support policies in many cases are considered insufficient by the private sector: Project developers usually require financial support from bilateral and multilateral institutions, in the form of grants and concessional loans, to pass the different stages of project development. Moreover, they do not often consider EE improvement as a complementary activity.
6. **There are weak or no minimum energy performance standards for new buildings, building renovations, appliances, lights, air conditioning and refrigeration among other items** - this was confirmed by respondents to the survey. This leads to uncertainties in standards and a lack of willingness to invest due to risk, particularly from institutional or international investors.
7. **In most countries, the import of RE equipment remains highly taxed and labeling standards for appliances or building codes are not in place.**
8. **Lack of supply-side orientation of RE&EE policies, standards and incentives addressing energy entrepreneurship and innovation** e.g., manufacturing, assembling and servicing and lack of policies to promote RE/EE in rural/urban industrial sectors There is a general recognition in ECCAS policies that RE and EE policy can benefit gender issues and assist in providing opportunities and greater equality for women and girls, for example. However, there is a lack of specific policy targeting at maximizing the benefits of E and EE for gender issues.
9. **Stakeholders/General public sometimes do not possess sufficient RE AND EE knowledge and awareness to make informed decisions.** As such, there is a definite need for advocacy, awareness raising, information dissemination and stakeholder engagement efforts. Several respondents to the questionnaire noted that campaigns, particularly around clean cooking. External support is required in order to effectively engage stakeholders and obtain their buy-in. This support is usually required to be in the form of an objective and authoritative voice that can provide informed, relevant and expert advice, based on up-to-date empirical data. For example, stakeholder engagement support and awareness activities may be required in issues related to cooking but also other complex issues such as electricity tariffs, entrepreneurial

advice and setting business models. The CEREEAC will have to build a reputation as a trusted advisor to be able to play this role and also bring in support from a range of expert partners.

10. **Incomplete and decentralized regional data collection, compilation and analysis.** There is a lack of data among most countries in Central Africa. Where data is collected it is decentralized and not coordinated regionally. In most cases in ECCAS, pertinent data is yet to be collected on a consistent basis. If the region is to collectively move forward, these efforts need to be coordinated at a regional level so that relevant comparisons, possible collaborative ventures and mutual support between countries can be identified and implemented. In essence, there is a need for energy information compilation, energy statistics and analysis to facilitate strategic planning and effective decision-making at a country, sub-regional and regional level. Currently, there is no gender-specific data available, making positive interventions in this area more challenging.
11. **Lack of feasibility studies for RE and EE assessments and projects (technical Assistance (TA and Project Preparation Facilities)).** There was a clear trend among respondents that additional support for TA and project preparation is required. The CEREEAC needs to strike a balance between setting policies and roadmaps and also providing practical interventions to develop projects on the ground, thus increasing the sense of a practical contribution to the region and recognizing economic progress as well as political progress. Again, there are many organizations who already support project preparation that are involved in other GN-SEC institutions so there is knowledge to be shared here.

5 Analysis of the benchmarking

5.1 Methodology

This benchmarking indicates the current performance level and growth rate of the energy market in the different countries of the region. There is some experience that can be drawn from countries in the ECOWAS region (for example Ghana, Gambia, Benin, Nigeria, etc.), which have adopted standards for some of these appliances and are working to improve on the remaining ones. This will allow the efficiency of the national market to be compared with other countries that have adopted earlier international standards for lighting, air conditioning and refrigerators, and therefore to prepare the next step of the project.

Indeed, by gathering all the relevant information and utilizing the international expertise of the consulting team in similar projects, we will be able to propose the most suitable standards for STP, in order to create a realistic plan for energy efficiency targets and in order to align with the rest of the region. The African Union has also developed some recommendations for its member states, to adopt MEPS and target values of energy efficiency for some appliances, this can also be used as references.

5.2 Results

5.2.1 African Union: Continental Guideline on MEPS and Labels

General Approach

A 3-steps approach to implement MEPS and Labels, with the support of the continental Guidelines is proposed:

- Adopt a global and common energy labeling scheme, in a text to be adopted by the African Union;
- Establish and adopt specific MEPS and Labels, at continental level, regional level, and national level; and
- Establish continental compliance and monitoring.

Continental level actions

The actions to be taken at the Continental level in the implementation of the MEPS and Labels of appliances are (as presented in Figure 2):

1. Adoption of the continental Guidelines;
2. Following the adoption and implementation of the MEPS and Labels of appliances by Member States, AUC will monitor the progress of the implementation of the MEPS and Labels of the appliances, with the support of Regional Renewable Energy and Energy Efficiency Centers (RREEECs);
3. AUC will update its recommendations on the implementation and extend the Guidelines to other appliances and equipment.

Phasing of MEPS and labeling on appliances

The introduction of MEPS and energy labels on appliances should be phased according to three cycles: up to 3 years, up to 7 years, and up to 10 years:

Table 8: Phases of application of MEPS and labels

Phase	Phase 1: up to 3 years	Phase 2: up to 7 years	Phase 3: up to 10 years
Appliances/items considered for MEPS and labeling	Fans, lighting, refrigerators, air conditioners	Motors, distribution transformers, water heaters, washing machines, TVs	Dishwashers, electronic products (computers, monitors, etc.), electric cookers/ovens, vehicles (with a label on CO ₂ eq emissions)

The three-cycle introduction begins with the most common and most energy-consuming products. Other criteria that are also taken into consideration are energy and environmental impacts, decrease of electricity peak demand and social impacts. It is important to note that the introduction of energy labels will be more efficient if it is accompanied by a MEPS, to enable the ban of the most inefficient products.

Regional level actions

The Regional Economic Communities (RECs) and the Regional Renewable Energy and Energy Efficiency Centers (RREEECs) will offer their support for a harmonized regional implementation of the MEPS and Labels, and the establishment of regional appliance testing laboratories, including:

- Support for a global view of the market and current use of the pre-selected appliances;
- Support for a harmonized regional approach (definition of the appliances, target values, control mechanisms, penalties, etc.), in order to create a more massive, homogeneous and controlled market;
- Support for a coherent network of testing laboratories (localization, share of laboratories, rules of use and financing, etc.).

Roadmap at national level

The roadmap at the National level covers four major steps:

- Legislative actions: Adoption of a decree for MEPS and Labels for the selected appliances, based on continental guidelines;
- Control mechanisms and tools: Implementation by control institutions (customs), and organization of test laboratories at a regional level;
- Information and communication;
- Monitoring - follow up - evaluation of impacts.

Feedback from country consultation missions – Bottom-up approach

The current feedback coming from the pilot countries (Egypt, Namibia, Senegal and Uganda), regarding the implementation of MEPS and Energy Labels for appliances, is very positive. Specifically, the interest, capacity and readiness of the respective stakeholders - private and public institutions, were clearly demonstrated during the consultation missions to the countries. In addition, the respective stakeholders agreed to support the implementation, and indicated that the guidelines and roadmaps regarding the implementation were all in line with the respective national agendas.

5.2.2 Energy Efficiency, MEPS and Labels around the world

ECCAS Region

In the report produced by CEREEAC with the assistance of UNIDO and GN-SEC (2021) titled *Baseline Report & Needs Assessment*, there is useful information regarding the Energy Efficiency Market of the ECCAS region. According to the report, EE markets are yet to be developed in the region, presenting a clear potential for ECCAS to introduce new policies and projects in the field.

At a national level, some countries are also realizing the potential for progress to be made in this area. Angola has announced a programme for improving EE in Luanda, including use of LED bulbs, prepaid meters and monitoring of quality of power supplied by Empresa Nacional de Distribuição de Electricidade (ENDE), a distribution utility. In the Central African Republic, a similar programme involved distribution of 4 LED bulbs to urban homes, and a programme to improve quality of power delivered. Cameroon has clearly identified buildings as a major focus area in its National Energy Efficiency Policy, Strategy and Action Plan (2014). Gabon has mandated EE norms for all new buildings, while incentivizing at the same time existing buildings to become more energy efficient through voluntary action. Most other countries are in the process of determining their EE plans and programmes in the building sector.

The following table describes which countries are active in the pursuit of EE goals in terms strategy, mandates, incentives and standards:

Table 9: Progress in pursuit of EE goals in the ECCAS region, by Country

Country	EE targets	Strategic document aimed at increasing EE	Industrial (I) and Commercial (C) incentives & mandates	Public (P) & Utility (U) incentives & Mandates	Financial incentives for EE	Minimum Energy Performance Standards (MEPS) / Energy Labelling Systems (ELS), Building codes (BC)
Angola	✓ Improve Efficient by 2030 by 1% yearly		✓ (I)	✓ (U)		
Burundi	✓ Reduce unit energy consumption in buildings by 4%	✓				
Cameroon	✓ At least 20% savings in energy consumption by 2025	✓	✓ (C)	✓ (P & U)	✓	

Central African Republic		✓				
Chad		✓				
Republic of Congo						
Democratic Republic of Congo	✓	✓	✓ (C)	✓ (U)		
Equatorial Guinea						
Gabon	✓ Improve energy efficiency by 3.8% yearly	✓				✓ (BC)
Rwanda	✓ Reduce T&D losses by 7%	✓		✓ (P & U)	✓	✓ (BC)
São Tomé & Príncipe	✓	✓ PANEE				✓ (MEPS)

Currently, no country in the ECCAS Region has applied Minimum Energy Standards, with STP being the first country in the region do develop MEPS. In that regard, STP can act as a leader in the region and can help other countries gain valuable insight on the value of MEPS, while also gaining knowledge from its neighboring countries on other matters regarding policy, capacity building, coordination and investments.

European Union

The European Union introduced categorical labeling for household appliances in 1992, with a directive that established the A to G scale and the general design of the EU Energy Labels that is still used today. Soon after the first establishment of the Energy Labels, a major problem appeared. There was an excessive amount of products that populated the highest scales, whereas the lower classes were nearly empty. In order to restore a balance, the EU, with a 2010 Directive, rather than rescaling the energy labels, or radically reviewing the parameters of its MEPS, expanded the scales and introduced the ‘plus scales’, i.e. A+, A++, and A+++. Shortly after, it became evident that the initial problem of products overpopulating the highest scales of the Energy Labels, that the 2010 Directive attempted to solve, had not been addressed in an adequate way. Not only that, but market research as well as a series of consumer questionnaires and other qualitative research showed that the “plus scale” were deemed as not useful and not efficient for categorizing products effectively, while the initial ‘A to G’ scales were favored by consumers as they were deemed as clearer and more meaningful. Therefore, the European Commission introduced a revised legal framework for the energy efficiency label in 2017, which reinstated the A to G scale, along with stricter, and dynamically adjustable rules about the energy classes definition and classification.

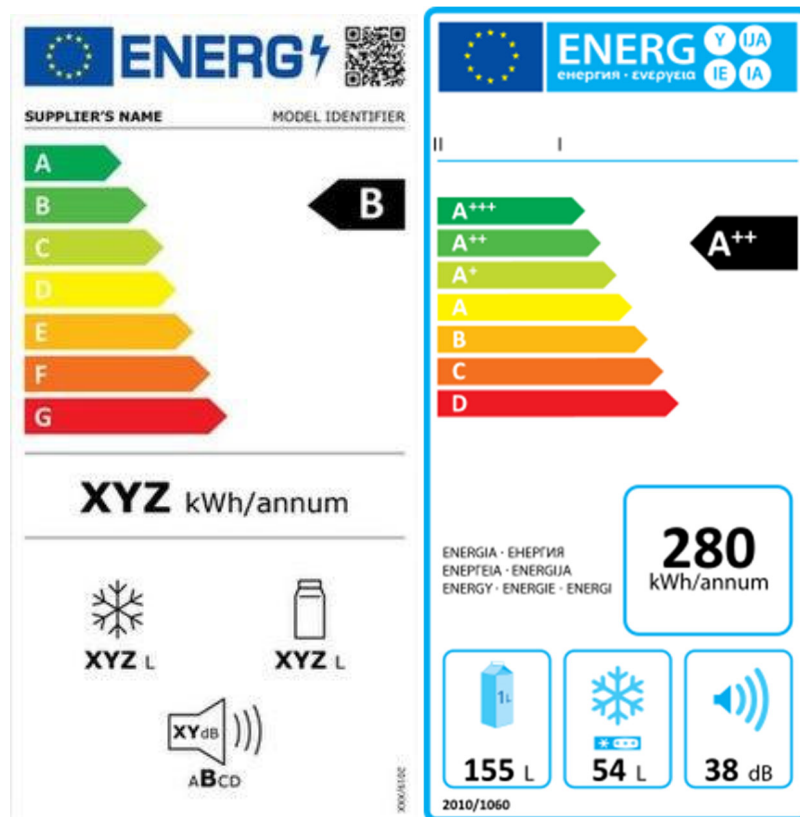


Figure 11: The old EU Energy Label (left), and the revised EU Energy Label (right)

The defining rule of the new EU Energy Label framework is that “no products are expected to fall into energy class A at the moment of the introduction of the label and the estimated time within which a majority of models falls into that class is at least 10 years later”. Finally, a very useful conclusion that came from the evaluation of the EU labeling program is that there is a need to maintain an up-to-date database containing information about all the products, and types of products, that are sold within a country’s market. Such a database allows policymakers to adjust MEPS and other Energy Label related issues swiftly, while also minimizing any room for error.

In conclusion, the analysis of the EU labeling program offers three important points:

1. Energy efficiency labels and MEPS must be frequently revised and rescaled, so as to follow the evolution of the market and the progress of the respective technologies
2. When creating Energy Labels, the use of the expanded ‘plus scale’ (A+, A++, A+++) should be avoided, as it is misleading and ineffective for the consumers. Instead, the A to G must be preferred
3. An up-to-date database must be maintained, containing all products and models available in the market, so as to simplify policymaking

Brazil

Brazil has both energy efficiency laws and programmes (action plans, combination of different energy measures), and has set as its target to reduce by 10% its overall electricity consumption by 2030. Regarding Energy Labels and MEPS, Brazil began exploring a labeling program for energy-consuming programs in 1984, making it one of the first countries in Latin America to implement MEPS. Despite the fact that the country has been at the fore-front of energy labeling, the use of Energy Labels is still voluntary.












Energia (Elétrica)	REFRIGERADOR
Fabricante Marca	ABCDEF XYZ(Logotipo)
Tipo de degelo Modelo/tensão(V)	ABC/Automático IPQR/220
Mais eficiente	
	
	
	
	
	
	
	Menos eficiente
CONSUMO DE ENERGIA (kWh/mes) <small>(adotado no teste clima tropical)</small>	XY,Z
Volume do compartimento refrigerado (l)	000
Volume do compartimento do congelador (l)	000
Temperatura do congelador (°C)	 -18
<small>Regulamento Específico Para Uso da Etiqueta Nacional de Conservação de Energia Linha de Refrigeradores e Assesmbhados - RES/001-REF Instruções de instalação e recomendações de uso, leia o Manual do aparelho.</small>	
 PROCEL <small>PROGRAMA NACIONAL DE CONSERVAÇÃO DE ENERGIA ELÉTRICA</small>	
<small>IMPORTANTE: A REMOÇÃO DESTA ETIQUETA ANTES DA VENDA, ESTÁ EM DESACORDO COM O CÓDIGO DE DEFESA DO CONSUMIDOR</small>	

Figure 12: Brazil - Energy Label

The Brazilian Labeling Program (PBE, for its initials in Portuguese) based its label on the European Union's label using the A to G scale. Various studies conducted over the years have shown that energy labels in Brazil are beneficial for consumers, assisting them in their purchases. In addition to the PBE, Brazil also has the Selo PROCEL, which is an endorsement labeling program managed by PROCEL, a state-owned electricity generation and transmission program. This program currently covers 41 product categories, starting with refrigerators in 1995 and having most recently added LCD TVs and LED luminaires in 2017. Despite its financial struggles over the years, because of its declining budget, PROCEL is seeking to update and expand the Selo PROCEL, to further support the PBE. What the Selo PROCEL program lacks is up-to-date criteria regarding the categorization of products, which have not been meaningfully revised over the past decade. Same as the Selo PROCEL program, the PBE does not have a clearly defined system for determining when and how to revise labeling criteria. Finally, the Selo PROCEL program also involves an extensive database of products available in the Brazilian market, with specific information on their efficiency and capacity, but it does not monitor actual sales, containing many products that are not currently available in the market, resulting in an inability to evaluate the sales-weighted average efficiency in the market.

ECOWAS Region

Regarding countries of the ECOWAS region, the process of implementing Energy Labels and MEPS started in 2011 and has been a long process. After debate, in November 2015 it was confirmed that the dial type energy label will be used - using the 'star scale'.

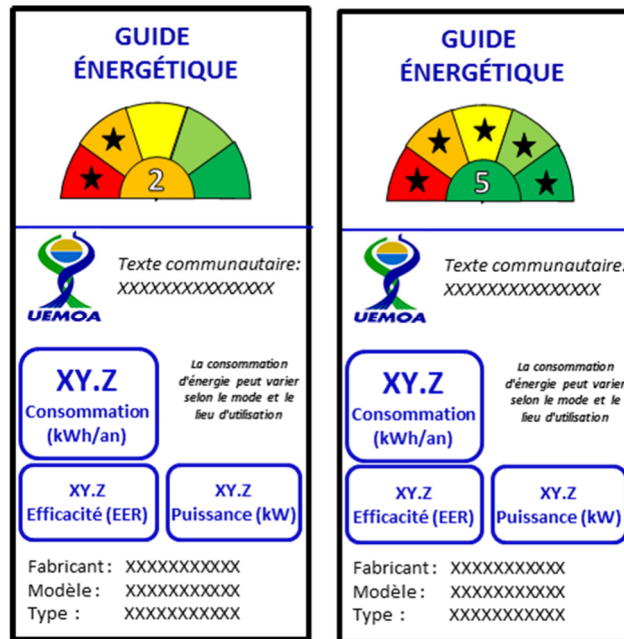


Figure 13: The general draft of the selected energy label

Based on this general draft, other countries of the ECOWAS region designed their respective energy labels. For example:

1. Nigeria:
(Energy Label designed in association with Thelcon & Aere)

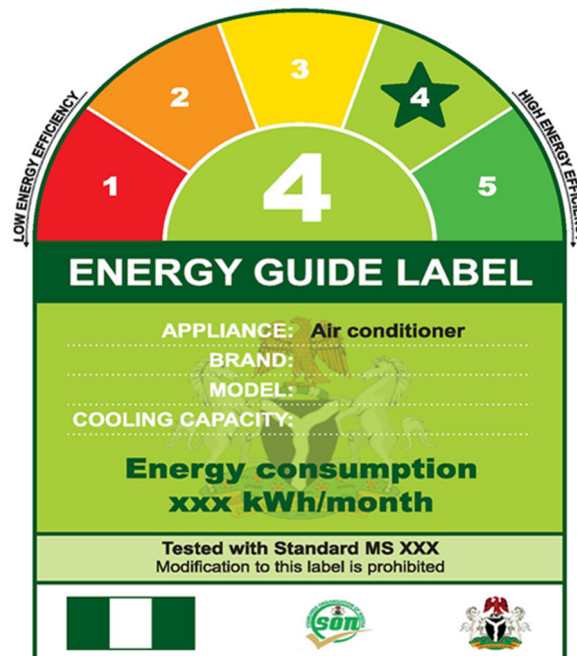


Figure 14: Nigeria energy label

2. Ghana

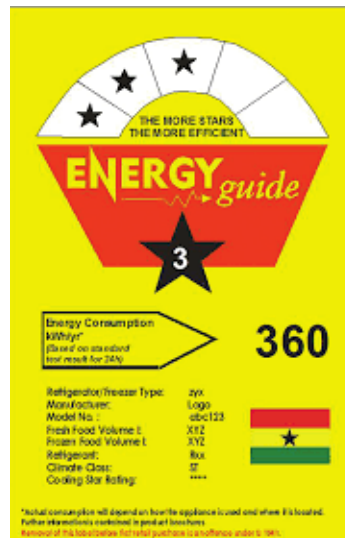


Figure 15: Ghana energy label

All identified Energy Labels in the ECOWAS region, implemented or in draft, have used the dial label with stars as their prototype, with the only exception being Cabo Verde that used the bar A+++ - G label, same as other African countries outside the ECOWAS region.

Based on the analysis of the energy labels used in the ECOWAS region we can highlight some key conclusions. Firstly, the dial star labels are the most popular and various studies have shown that they are also preferred by consumers, especially the design that uses a different color for each star that allows for a better distinction of the energy classes - as has also been adopted by Nigeria, the largest economy in Africa. In addition, the most reasonable approach is the 5-star scale, although some countries opted for the 3-star scale, and the energy labels have to cover at least the 3 official languages of the ECOWAS region. Finally, the energy label must have the following characteristics: the energy efficiency class provided as a star, the ECOWAS logo and Label Implementing Regulation, the rated energy consumption, the name of the manufacturer, the model and type of appliance.

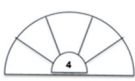

Questions	Percent		Percent	
	Star		Number	
What should be used to display Energy Class on the dial	★	100%	4	0%
Black or White	5 ★	82%	5 ☆	18%
If a number is applied: show only the number or the number with a star?	4	56%	4	44%
For a star label: shall the stars below the allocated energy class be empty or with the same colour?	☆☆☆☆★	17%	★★★★☆☆	83%
For a star label: shall the cells above the applicable energy class show the contour of a star or not?	★★★★	55%	★★★★☆☆	45%
Middle of the dial	With a cell showing the number of the class 	92%	Without a cell 	8%
Middle of the dial	With the colour of the applicable energy class	83%	Without the colour of the applicable energy class	17%
Guidance sentence	Below the dial	83%	Left and right	17%
QR Code	Yes	100%	No	0%

Figure 16: Survey results for the use of Energy Labels in the ECOWAS region

Rest of the World

1. India:

The Indian Bureau of Energy Efficiency (BEE) launched the labeling program for fixed-speed ACs in 2006 as a voluntary initiative, and the program became mandatory in 2009. Since the inception of the AC labeling program, 46 TWh of electricity have been saved and 38 million tons of carbon emissions have been avoided.

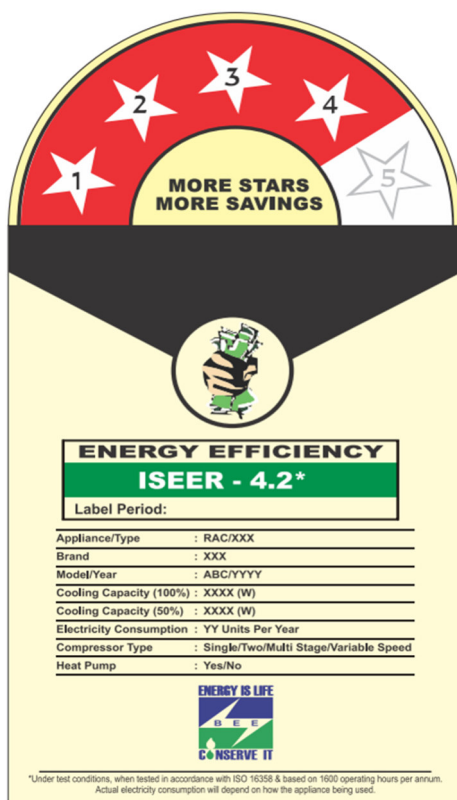


Figure 17: India - Energy Label

BEE has been revising the star rating plans for windows and split ACs since the program was launched to increase the stringency of the energy performance thresholds based on analysis of the registered labeled products in BEE’s database, with a view to ensuring that each star rating contains a meaningful share of the products available on the market. This distribution of products across all rating tiers allows consumers to clearly distinguish between the efficiency levels of the various available products.

It is also interesting to briefly analyze the Indian compliance framework. The compliance program begins with strict product registration: every product, in order to receive a label, must be fully registered and all the relevant documents must be submitted in the registration application. The registration process also involves laboratory testing by accredited labs. In the final step of the program, after labeling approval, every supplier must submit sales reports and pay a quarterly labeling fee to BEE. This system allows BEE to maintain a database of all AC models approved for sale on the Indian market, as well as their sales volumes, which facilitates policymaking by providing up-to-date information on the status of the market. Finally, BEE also conducts market surveillance, check testing and challenge testing to safeguard adherence to the compliance framework.

A notable aspect of the Indian labeling program is that the dramatic changes to the program, such as the implementation of the ISEER*, have first been introduced on a voluntary basis before being made mandatory. This transitional voluntary phase in making any large change has allowed manufacturers to adapt to policy changes over time and to understand how they can benefit from these programs before being required to participate.

*ISEER - Indian Seasonal Energy Efficiency Ratio:

Starting on a voluntary basis in 2016, BEE adopted an improved rating methodology that factors in variance in temperature across the various climatic zones in India and operating hours. ISEER, the new metric for ACs is calculated as the ratio of the total annual amount of heat that the equipment may

remove from the indoor air when operated for cooling in active mode to the total annual amount of energy consumed by the equipment during the same period.

2. China

The China National Institute of Standardization (CNIS) has led an energy labeling program for more than 15 years. The China Energy Label has three to five levels, with level 1 being the most efficient and levels 3 or 5 being the MEPS, depending on the product.



Figure 18: China - Energy label with 5 levels (left) and Energy label with 3 levels (right)

The label levels are specified in the same document as the MEPS, and label rescaling occurs as part of the MEPS revision process. Chinese regulations require that each MEPS include at least three label levels, with at least some products in each of the labeling categories. The label also now includes a QR code that allows customers to access additional information on the product's energy performance, although some retailers have been known to remove the QR codes, as they believe that it provides consumers with too much information and can be confusing.

In addition to the labeling program, China also implemented the Top Runner program at the end of 2014. This program is intended to identify and recognize the appliances, equipment, enterprises, and buildings with the best energy performance. Top Runner appliances receive a special Top Runner mark on the China Energy Label. But this program has not been sufficiently effective in shifting the household appliances market towards energy efficiency because the criteria for the Top Runner label are very strict and not directly related to the criteria for the China Energy Label. The result is that very few products have received the Top Runner designation and these products are very expensive.

In conclusion, the China labeling program shows us that energy labels that clearly differentiate highly efficient products can form the basis for effective market transformation programs, but also that very strict criteria for endorsement labels may result in few products receiving the designation, low consumer awareness, and lack of interest from certification bodies and product suppliers.

3. Southeast Asia

In 2015, members of the Association of Southeast Asian Nations (ASEAN) agreed to harmonize their standards for ACs to a single, seasonal metric. Two countries that have already made the shift to seasonal test metrics for their labeling programs are Vietnam and Thailand. The experiences of these two countries show that the test metric must be applied to all products in the same way in order to have maximum effect on the market:

- Vietnam:

Energy performance labeling is mandatory in Vietnam. Vietnam's Ministry of Industry and Trade (MOIT) oversees the energy labeling program. The Vietnamese energy label is a comparative label that provides star ratings from 1-5. A certified energy label provides the following information: manufacturer's name, product origin, model number, rated power, energy efficiency, the relevant regulation, and certification number.



Figure 19: Vietnam - endorsement label (left) and energy label (right)

- Thailand

In Thailand the Energy Label is voluntary, implemented by the Electricity Generating Authority of Thailand (EGAT), with five levels. Because the label is voluntary, manufacturers only choose to label products achieving the fifth labeling level. The label is well-recognized by Thai consumers and the vast majority of AC units sold on the Thai market are labeled EGAT No. 5. Notably, government procurement often requires that products have the EGAT No. 5 label.



Figure 20: Thailand - Energy Label

The label levels have been revised several times since the program was launched. Until 2015, all AC units had their efficiency measured by EER. However, in 2015, Thailand began the move to harmonize its labeling tiers to the ASEAN metric by introducing new label levels for inverter AC units, based on seasonal energy efficiency ratio (SEER).

5.2.3 Savings & benefits of EE measures

5.2.3.1 STP: BAU vs Mitigation

In the National Energy Efficiency Plan (PANEE), two scenarios were compared, with the difference between them being the implementation of the proposed mitigation measures as described in the PANEE and PANER reports.

Regarding the demand for electricity, table 10 and figure 21 show that implementations of mitigation measures will reduce demand by the year 2050 compared to the BAU. The estimated demand reduction for the period 2020-2050 is approximately 20% relative to the BAU. From that year onwards, further reductions are not expected, mainly because of the introduction of electrification of transport (which would start in the year 2040) and the economic development of the country. The residential sector demand stands out, which represents approximately half of the total electricity demand in the year 2050, as well as the inclusion and progressive increase from the year 2040 of the electrification measures in the transport sector (in green in figure 21).

Table 10: Consumption of energy per sector - BAU and Mitigation scenario reduction (PANEE)

Sector / Years	2010	2015	2020	2025	2030	2035	2040	2045	2050
Residential - GWh	28.5	56.8	60.1	38.6	36.4	52.5	70.9	92.1	122.9
Transport – GWh	-	-	-	-	-	-	-	12.4	24.9
Others – GWh	5.5	5.2	5.6	6.7	8.2	10.0	12.1	14.6	17.6
Institutional Commercial - GWh	7.4	28.7	30.2	33.3	38.0	43.2	50.3	58.2	67.0
Total - GWh	41.5	90.7	100.4	114.1	131.1	150.5	172.6	198.0	227.3

Demand reduction with implementation of EE and RE measures - GWh	0	0	- 4.6	- 35.5	- 48.4	- 44.7	- 39.2	- 20.6	+5.1
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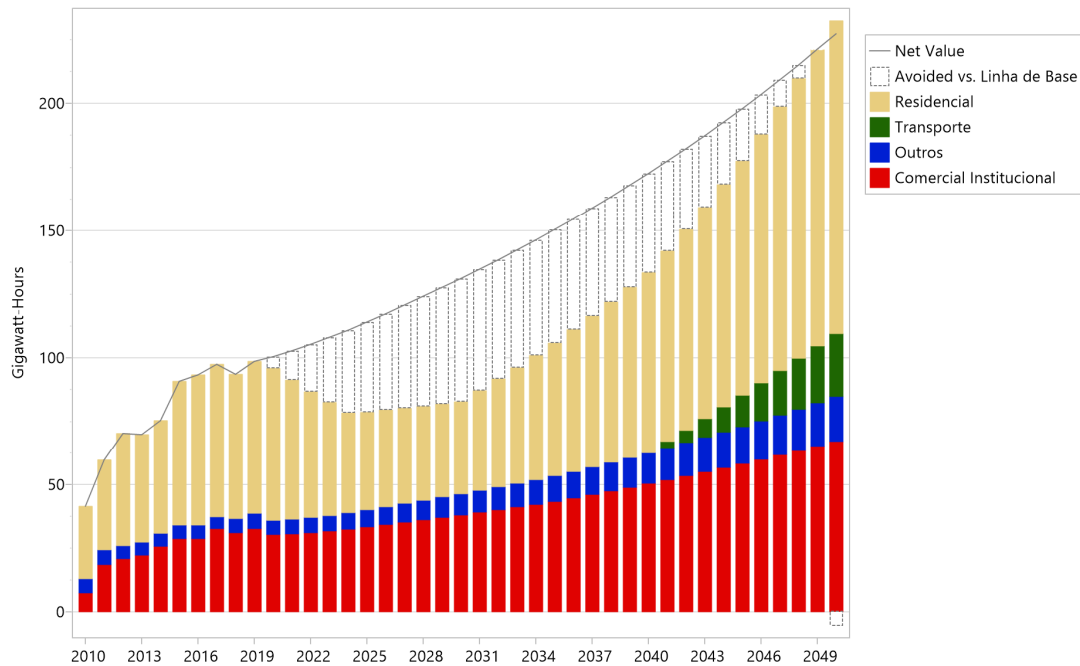


Figure 21: Consumption of energy per sector - BAU and Mitigation scenario reduction (PANEE)

5.2.3.2 International example – “Cost of non-world”

The implementation of EE measures, and especially the use of Energy Labels and MEPS for appliances, is significantly beneficial not only for economies but also for the overall quality of people’s life. Below we will discuss in brief some of the potential impacts of an extensive labeling program that would implement a global harmonization to strict MEPS and Energy Labels. For our discussion we will also present data derived from a 2015 report ordered by the European Commission Directorate-General for Energy, titled “Savings and benefits of global regulations for energy efficient products - A ‘cost of non-world’ study”.

The report contains a study based on two key elements, (1) quantitative modelling of energy saving potential from global harmonization; and (2) qualitative investigation and assessment of other impacts of global harmonization. The qualitative aspects of this assessment were heavily based on desk review of the most relevant documents globally, particularly in the focus countries and regions of the study (see below). The desk research was supplemented by stakeholder contact where necessary. The analysis followed the following steps:

1. Inventory of product groups: MEPS and labelling requirements were examined for each of the product groups and economies in the scope of this study. This provided key model inputs and contextual information for the study.
2. Product group energy consumption modelling: based on the quantitative approach described above.

3. Assessment of other benefits and savings: including expanding the results to the Rest of the World and using the results to estimate further environmental and economic impacts.
4. Assessment of other impacts: including the various socio-economic, technological and trade impacts of harmonization.
5. Assessment of barriers and merits of harmonization: based on the impacts and known barriers the various practical aspects of harmonization were discussed.
6. Conclusions and recommendations: based on the assessment conclusions and recommendations were derived.

The first and most evident impact of Energy Efficiency measures is a reduction in energy consumption. The study examined three scenarios that involved the implementation of MEPS and Energy Labels, and presented very interesting results. In the first scenario, where **the highest current [2015] MEPS levels** were to be instantly applied to global energy use, the potential energy saving was calculated to result in **gross reductions in energy use of 17%**. This reduction would of course vary across countries or regions, but would nevertheless be evident globally, as seen in the table below:

Table 11: BAU and Mitigation scenario for energy savings with application of highest current MEPS (2015)

Country/region	BAU 2015	CoNW MEPS 2015					
	Energy use (TWh)	Gross energy use (TWh)	Change on BAU (TWh)	Gross change on BAU (%)	Energy use rebound (TWh)	Net energy use (TWh)	Net change on BAU (%)
China	5 900	4 900	-1 000	-17%	200	5 100	-14%
EU	5 600	4 600	-1 000	-18%	200	4 800	-14%
India	1 100	800	-300	-27%	60	860	-22%
RSA	280	230	-50	-18%	10	240	-14%
USA	5 900	4 800	-1 100	-19%	220	5 020	-15%
RoW	24 300	18 800	-5 500	-23%	1 100	19 900	-18%
World	43 080	34 130	-8 950	-21%	1 790	35 920	-17%

The second scenario examined the potential energy saving if **the highest current [2015] energy labels or MEPS levels** were to be instantly applied to global energy use, and found that moving to globally harmonized efficiency requirements set at the highest current [2015] Energy Labels or MEPS would result in **gross energy savings of 27%**.

Table 12: BAU and Mitigation scenario for energy savings with application of highest current MEPS & energy labels

Country/region	BAU 2015	CoNW MEPS 2015					
	Energy use (TWh)	Gross energy use (TWh)	Change on BAU (TWh)	Gross change on BAU (%)	Energy use rebound (TWh)	Net energy use (TWh)	Net change on BAU (%)
China	5 900	4 300	-1 600	-27%	320	4 620	-22%
EU	5 600	3 800	-1 800	-32%	360	4 160	-26%
India	1 100	700	-400	-36%	80	780	-29%
RSA	280	200	-80	-29%	16	216	-23%
USA	5 900	4 000	-1 900	-32%	380	4 380	-26%
RoW	24 300	15 500	-8 800	-36%	1 760	17 260	-29%
World	43 080	28 500	-14 580	-34%	2 916	31 416	-27%

The third and final scenario represented the potential annual energy saving in 2030 if the highest current [2015] MEPS levels were to be introduced by circa 2020 and naturally replaced the existing stock as it came to the end of its lifetime. The results showed that moving to globally harmonized MEPS from 2020 would result in **annual gross energy saving of 11% by 2030**. As is the case in the previous two scenarios, the results varied by region. This differentiation occurs because of a combination of efficiency of the existing stock, energy end-uses within a country and the relative stringency of both any existing and the applied highest MEPS levels per product.

Table 13: BAU and Mitigation scenario for energy savings with application of highest current MEPS (2030)

Country/region	BAU 2030	CoNW MEPS 2030					
		Energy use (TWh)	Gross energy use (TWh)	Change on BAU (TWh)	Gross change on BAU (%)	Energy use rebound (TWh)	Net energy use (TWh)
China	10 900	9 800	-1 100	-10%	220	10 020	-8%
EU	5 800	5 100	-700	-12%	140	5 240	-10%
India	2 400	2 100	-300	-13%	60	2 160	-10%
RSA	490	420	-70	-14%	14	434	-11%
USA	6 600	5 700	-900	-14%	180	5 880	-11%
RoW	29 000	24 500	-4 500	-16%	900	25 400	-12%
World	55 190	47 620	-7 570	-14%	1 514	49 134	-11%

Summarizing the impact that EE measures can have on energy consumption, all of the scenarios examined result in globally **significant levels of energy savings**. This demonstrates not only the benefits of ‘instant’ application of the highest current [2015] MEPS and/or label requirements globally, but also that in a more realistic modeling of global MEPS implementation final energy use could still be reduced by 14% compared to business as usual. Finally, due to the high share of electricity in the analyzed final energy consumption the corresponding reduction in primary energy consumption may be even higher.

Another important impact that the implementation of EE measures can have been on the environment. Energy use has many negative environmental impacts associated with it, thus reducing energy use can bring **significant environmental benefits**. Any energy saving measure naturally translates into reductions of environmental damage resulting from energy production. This will impact upon the emissions of greenhouse gasses (GHG) and also other emissions to land, water and air as less energy generation is needed.

Furthermore, energy efficiency brings **economic benefits and increased welfare**, as greater energy efficiency brings economic benefits as the increased efficiency enables increased production and/or consumption, increasing the welfare of consumers. As the study suggests, greater energy efficiency delivers significant net energy savings, which can then be spent by consumers on other things, increasing overall economic welfare. This already takes into account that appliances that are more energy efficient will cost more. These additional costs are more than repaid by the energy savings. As the study further remarks, in quantitative terms, compared to global energy costs of more than €2.5 trillion in 2015 the instant compliance of all appliances to the current [2015] highest MEPS could save between €310-470 billion per year, or 13-19% savings. Extending the scenario to compliance with the highest MEPS or energy label category would increase the savings to €490-730 billion, or 20-29% of current [2015] energy expenditure. Finally, considering the scenario of global adoption of the highest current [2015] MEPS by 2030, the savings are calculated at €280-410 billion, or 8-13% savings on estimated global energy use of €3.3 trillion per year. These savings are estimated on the basis of 2015 energy prices, assuming that in reality energy prices will increase the actual savings would be higher, although we would expect the calculated percentage changes to remain representative.

Table 14: Estimated economic impact of global harmonization of MEPS and energy labels

	Gross energy costs - BAU	Net change in costs - low	Net change in costs - high	Net change in costs - low	Net change in costs - high
	billion euros	billion euros	billion euros	as % of BAU	as % of BAU
CoNW MEPS 2030					
China	640	-35	-52	-5%	-8%
EU	510	-37	-55	-7%	-11%
India	212	-18	-26	-9%	-12%
RSA	16	-1	-2	-6%	-12%
USA	369	-33	-49	-9%	-13%
RoW	1 535	-153	-230	-10%	-15%
World	3 282	-277	-414	-8%	-13%

Another area on which EE measures can have a beneficial impact is on **employment**. As the European study suggests, economic savings will have a positive net employment impact: the economic savings from greater energy efficiency will translate into impacts on the energy sector and wider economy as spending on the former is reduced and most of the reduction is then re-spent in the latter. The relative labor intensity of the two sectors is such that this is likely to result in job creation, as the wider economy employs more people per unit of turnover than the energy sector, which is more capital intensive.

Another area on which MEPS and Energy Labels can have a direct impact is on citizens / consumers and their **ability to afford the energy efficient household appliances**. Specifically, there is little empirical evidence of significant price increases from MEPS: empirical work on the subject finds little evidence of real product price increases due to MEPS, but there is significant evidence of **reduced life cycle costs producing net savings** for end-users over the full product lifetime. Price increases are thought to be kept low due to:

- Manufacturers find cheaper ways to improve product efficiency than projected.
- Scale economies and increased competition between suppliers of higher efficiency components reduces unit costs following MEPS.
- Manufacturing systems are increasingly flexible, reducing the fixed costs of switching production lines to higher efficiency products.
- Introduction of MEPS is often taken as an opportunity to upgrade production lines and tooling and to negotiate new supplier arrangements which can help suppress cost increases.
- Advance notice of MEPS of 2-6 years is typically given, reducing the costs of switching.
- Learning effects increasingly apply as production volumes of higher efficiency products increase.

6 Conclusion

6.1 Recommendations on areas of improvement

From the data gathered by the interviews, the main areas for improvement in STP regarding EE are presented in figure 22.

- Capacity Building: In 7 out of 12 interviews, capacity building on EE, standards and labels is mentioned as an urgent need for the organizations in STP.
- Awareness/Education: The need for awareness about the benefits of EE and educating the public as well as the stakeholders is mentioned in 7 of 12 interviews.
- Laws/Regulations: The creation of new laws and regulations for the integration of EE, standards and labels is stressed in 7 out of 12 interviews.
- Funding: Due to the high prices of energy efficient appliances, and the low income of the general population, most interviewees have stressed the need for funding.
- Synergy: Some interviewees mentioned the need for better cooperation between the different organizations/stakeholders.

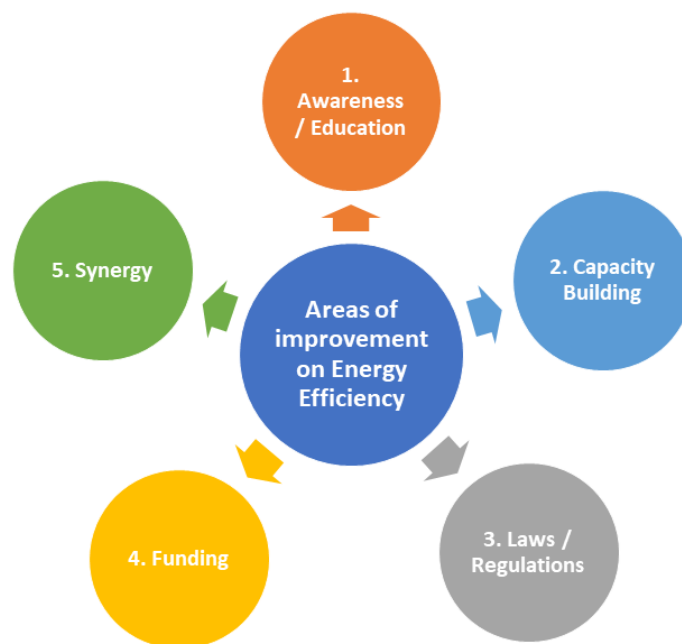


Figure 22: Areas of improvement on EE

For each of these areas, it occurred during the interviews that there is existing capacity for improvement as well as ongoing actions. The organizations that were interviewed take up roles that can accommodate the introduction of energy efficiency to the market. Several organizations have already completed or are carrying out EE projects. It is important to have a clear picture of who has experience and in which area, in order to schedule future actions.

During the interviews and the workshop, the participants identified barriers to the promotion of energy efficiency along with recommendations on how to overcome some of those barriers. They also outlined existing capacity on their organizations, so that the barriers can be overcome.

After conducting the baseline assessment of the market conditions in STP, several actions are recommended that could have accommodated this project along with future projects:

- **Set up regulation and inspection** of electrical equipment sold in stores and **support for the distribution chain** to promote efficient equipment to customers
- Carry out various **training and capacity building actions**, as well as **awareness-raising actions** in the field of energy efficiency in the short term to the general public and distribution chain.
- Establish a data gathering system and a department responsible for gathering data which can accommodate future efforts towards energy efficiency and renewable energy, attract potential investors by having a clear snapshot of the country’s capabilities. DGRNE needs to be provided with technical means to achieve that goal. Some examples of useful data to be gathered, in order to establish a relation between the purchase cost and the efficiency, are:
 - ✓ Sales of new products per type per year (number)
 - ✓ Sales of second-hand products per type per year (number)
 - ✓ Power of the AC
 - ✓ Brands and manufacturers
 - ✓ Lifetime
 - ✓ Average purchase cost, if possible, per size and type
 - ✓ Average operation cost, if possible, per size and type
 - ✓ Usage’s description
 - ✓ Energy consumption per year per type of product and for all the products
 - ✓ Cost of the electricity consumption
 - ✓ Power of the grid for air conditioning
- There seems to be little knowledge on what is MEPS and what is the value of an energy label, even among professionals. There needs to be education provided to key stakeholders and promotional actions organized in order to inform the public on the matter.
- MEPS and labels are not mentioned in potential legislative actions. Their potential implementation needs to be added to the conversation of legislative improvements.
- By implementing MEPS and labels retailers will gradually introduce more efficient products in the market, thus decreasing the technological deficit that appliances currently have in the market

In the following table is presented a list with information extracted from interviews. For every area of interest (as shown in figure 22), each organization provided barriers to the improvement of that area, reported existing capacity for the accommodation of improvements and gave recommendations on how to overcome barriers. The outcome of each recommendation and the potential of existing capacity are also listed. UNIDO through its projects established a website and supports the creation of a database for the energy sector.

Table 15: Barriers, Recommendations, Existing Capacity, Outcome and Potential per area of improvement

Organization	Area of improvement	Barrier	Existing Capacity	Recommendation	Outcome/Potential
AGER	Awareness/ Education	-	Deals with consumer complaints	-	Since AGER is already in contact with the public over

Organization	Area of improvement	Barrier	Existing Capacity	Recommendation	Outcome/Potential
					consumer complaints, a communication channel can be established in order to promote EE among consumers.
	Laws & Regulations	-	Has experience in forming regulations	-	Can help with forming regulations on EE
	Funding	-	AGER already attracts private investors	-	-
Directorate of Commerce & Industry	Awareness/ Education	-	Guides companies	-	Can promote EE practices and appliances among companies
	Capacity Building	Lack of data for identifying forecast trends	-	Creation of National Database	-
	Synergy	Poor synergy between the Directorate and DGRNE	-	-	Promote meetings for better communication and cooperation on future projects
	Laws & Regulations	-	Can apply quality tax on inefficient appliances	-	Increase use of EE appliances
AENER	Awareness/ Education	-	Promotes RE standards	-	Can help with promotion of EE standards
ATEFER	Awareness/ Education	-	Promotes EE appliances to tackle ozone-depletion emissions	-	-
CCI	Awareness/ Education	-	Promotes the private sector's interests	Gradual introduction of efficient	Can offer intermediary services for promotion of EE

Organization	Area of improvement	Barrier	Existing Capacity	Recommendation	Outcome/Potential
				appliances in the market	
	Capacity Building	Lacks capacity to train all members (4000 companies)	-	Strengthen the organization in order to provide awareness to its members	-
TESE	Awareness/ Education	-	Creates awareness on EE	-	Can help with promotion of energy efficient appliances
	Funding	-	TESE has already funded a project for introducing LED lamps to schools	-	
	Synergy	-	Has formed strategy to reduce EMAE's commercial losses	-	Can cooperate with EMAE and Directorates on that objective
AfDB	Awareness/ Education	-	Active in awareness creation	-	Can help with raising awareness on energy efficiency and energy efficient appliances
	Funding	-	AfDB has already funded a projects for the energy upgrade of the country.	-	AfDB is in the process of selecting consultants to monitor the installation of LED lamps for their ongoing project and to develop a plan for waste management of used lamps.
BSTPPTC	Awareness/ Education	-	Provides vocational training to youths	-	Can help with providing education and awareness on energy efficiency and energy efficient appliances

Organization	Area of improvement	Barrier	Existing Capacity	Recommendation	Outcome/Potential
	Synergy	-	Can host testing facilities for appliances	-	Can cooperate with Directorates on that objective
Customs	Capacity Building	-	Customs have authority to deny entry of appliances in the country	Creation of department for controlling imported appliances according to established MEPS	-
	Laws & Regulations	-	Working on legislation for banning appliances	-	Can help form regulations on EE appliances
EMA E	Capacity Building	Lack of meters results in flat electricity rates		Install meters to more consumers	Can potentially motivate customers to acquire efficient appliances
	Fundng	-	EMA E has already funded a project to introduce LED lamps to buildings	-	EMA E is continuing to run projects for replacing old light bulbs with LEDs
DGA	Awareness/ Education	-	Existing knowledge on EE	Can provide knowledge and capacity building to other organizations	-
	Capacity Building	Needs infrastructure for equipment disposal	-	-	Protect the environment by recycling old appliances while simultaneously making way for new efficient equipment in the country
SENAPIQ	Laws & Regulations	-	Monitors conformity with refrigerants	-	With appropriate training, SENAPIQ can help with monitoring

Organization	Area of improvement	Barrier	Existing Capacity	Recommendation	Outcome/Potential
					conformity with EE regulations
Ecobank	Laws & Regulations / Funding	Lack of legislation on loan recovery	-	-	With appropriate legislation, the bank can provide funding for acquirement of EE appliances

6.2 Energy Efficiency in Appliances

6.2.1 Lighting

6.2.1.1 Current situation in the market

Employees from SENAPIQ, EMAE, TESE and DGRNE participated in the lighting questionnaire. Their level of knowledge on standards and labels is mostly high.

The participants had little input on the distribution chain of lighting products. They have identified Nour, Electrofrío, Batimat, Alferes as the main importers, and Nour, Electrofrío and Alferes as the main retailers.

On the actual lighting appliances, participants identified incandescent and fluorescent lamps as the most popular. According to their answers, the price for LED lamps varies from 70 to 90 dobra, for fluorescent from 40 to 50 dobra, and for incandescent lamps from 5 to 10 dobra.

Regarding legislation, participants state that there is awareness on EE, and also that there are a few ongoing actions for the promotion of EE, with AfDB's project being mentioned. There is little input on legislative actions, with TESE suggesting awareness creation and tax incentives.

6.2.1.2 Savings of Efficient Lighting Technology

As mentioned in this document, there are existing projects running in STP for the upgrade of conventional lamps to LEDs. Below is a list of all completed or scheduled actions, regarding lighting upgrades:

Table 16: List of ongoing projects for EE lighting

Project	Promoter
Replacement of approximately 170 inefficient light bulbs with LED in public lighting and awareness raising campaigns.	EMAE
Replacement of about 300,000 incandescent light bulbs with LED in order to reduce 8.5 MW of peak demand and 15 GWh of energy needs.	WB/EIB
Replacement of 500,000 incandescent light bulbs with LEDs	AfDB
Replacement of incandescent light bulbs with compact fluorescent light bulbs.	IDA, IFC and MIGA
Replacement of incandescent light bulbs with energy-saving light bulbs. Reduction of 2.6 MW of peak demand.	Leonel Wagner

In total, proposed measures aim to replace around 1,000,000 conventional light bulbs with LEDs. By only replacing 300,000 incandescent light bulbs, the WB/EIB project aims to save up to 15 GWh of electricity.

In the following table are presented the number of lamps that were imported since 2019.

Table 17: Imported lighting appliances (Source: Customs Directorate)

Table of Imported Appliances						
Year	Product	Quantity (Unit)	Net weight (kg)	CIF value/ (Dobra)	Duties paid/Dobra	Origin
Lighting Appliances						
2019	Various lamps	203,378	34,354	3,738,645	321,393	China/Portugal
2020	Various lamps	758,951	80,869	5,141,196	521,317	China/Portugal
2021	Various lamps	259,251	62,115	6,708,014	577,664	China/Portugal
TOTAL		1,221,580	177,338	15,587,855	1,420,374	

The imported lamps are not categorized during the import process, and also there is no plan to ban inefficient light bulbs from entering the country. There needs to be capacity building and training of staff, in order to keep track of the types of lamps entering the country as well as authorize officials to ban certain lamps.

Furthermore, in order to accurately calculate the energy saved from replacing old light bulbs with LEDs, it is important to know which kind of lamps are in operation in STP. Data must be gathered during custom checks, and also in stores, where lamps are being sold.

The implementation of Minimum Energy Performance Standards along with a labeling program can potentially guide the market and the government, in order to ban inefficient light bulbs from entering the country and further organize efforts to upgrade inefficient lighting.

In the following infographic are presented some benefits from the introduction of efficient lighting.

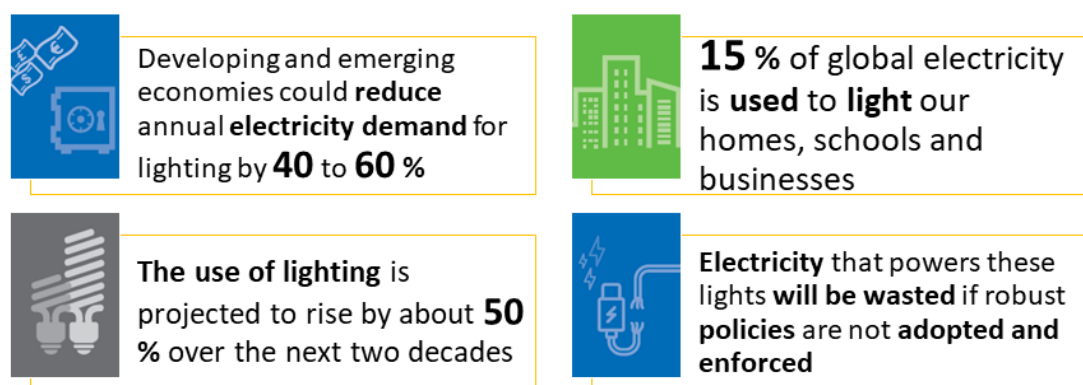


Figure 23: Lighting efficiency - energy savings facts

6.2.2 Refrigerators

6.2.2.1 Current situation in the market

Employees from EMAE, TESE and DGRNE participated in the refrigerator questionnaire. Their level of knowledge on standards and labels is mostly high.

The participants had little input on the distribution chain of refrigerators. They have identified HB, Silver, Braganca, Instalfer, Nour, Electrofrío, Batimat as the main importers, and Nour, Batimat, Silver and HB as the main retailers. It is stated by DGRNE that there are also informal retailers in operation.

On the actual refrigerators, participants identified the main brands in the market: LG, Silver, Samsung, Nasco. Also, top and bottom freezers are the most popular types of refrigerators. DGRNE states that most of the refrigerators sold are between 35 and 60 liters, and that the average price of a refrigerator is 700 dobra. According to the participants, refrigerators are a common commodity among consumers, with the percentage of households that own one is 90% according to TESE and 75% according to DGRNE.

Regarding legislation, participants state that there is awareness on EE, and also that there are no ongoing actions for the promotion of EE in refrigerators, besides a few fairs that are organized periodically. There is little input on legislative actions, with TESE suggesting awareness creation and tax incentives.

6.2.2.2 Savings of Efficient Refrigerator Technology

The Energy Efficiency of a refrigerator is expressed as coefficient of its performance known as the Energy Efficiency Ratio (EER). The IEE of refrigerators is determined according to the calculation method described in the ECOSTAND 071-1:2017 (E) standard: “Minimum energy performance standards (MEPS) – Part 1 - refrigerating appliances”.

With a population of 219,161 people (2019), and an average household size of 5.15 (2019, Globaldata), STP averages 42,309 households.

According to officials from the Customs Directorate, refrigerators are an essential commodity among Santomeans, with an estimated 80% of the population owning one (or more). Assuming that every household owns at least one refrigerator, that means that on average there are 34,045 refrigerators operating in STP. With an average wattage of 400 kW, and an average annual usage of 8,700 hours, that means that a refrigerator with an EER greater than 70% has an annual consumption of 13.6 GWh. On the other hand, a refrigerator with the same wattage and annual runtime and an EER lower than 50%, has an annual consumption of 6.8 GWh, reducing annual consumption by 50%.

Table 18: Estimated Energy Savings for Refrigerators

Calculation of Energy Savings for Refrigerators	
Total Population	219,161
Average household size (people)	5.15
Average number of households	42,556
Percentage of households owning refrigerators	80%
Average total number of refrigerators	34,045

Average wattage of refrigerator (kW)	400
Total annual usage (hr)	8,700
EER before upgrade (W/W)	70 % <EER
EER after upgrade (W/W)	EER ≤ 50 %
Total annual consumption before upgrade (GWh)	13,6
Total annual consumption after upgrade (GWh)	6,8
TOTAL SAVINGS (GWh)	6,8

6.2.3 Air Conditioning

6.2.3.1 Current situation in the market

Employees from Customs, EMAE, TESE and DGRNE participated in the A/C questionnaire. Their level of knowledge on standards and labels is mostly average.

Customs mention that at least 7 companies with knowledge on A/Cs are importing appliances. The participants have identified HB, Nour, Electrofrío, Batimat as the main importers and retailers of A/C appliances. It is stated by DGRNE that there are also informal retailers in operation. It is stated that maintenance technicians are organized by the National Association. Furthermore, Customs state that there are at least 7 companies for maintenance, 2 companies for used A/Cs and 3 groups that deal with A/Cs informally.

On the actual A/Cs, participants identified LG and Samsung as the main brands in the market. There are various A/C types stated as popular in the market:

- **Window A/C**
This type of air conditioner is installed sitting on a window or an opening of wall of a building, with the control panel facing the inside of the building. Interior air is cooled as a fan blows it over the evaporator. On the exterior, the air is heated as a second fan blows it over the condenser. In this process, heat is drawn from the room and discharged to the environment. The compressor and the heat exchanger unit are located in the same unit.
- **Split system A/C**
The Mini-Split Unit is designed to allow flexibility in the installation. Similar to the Window Unit, it is made to cool a single room or space. For this type of air conditioners, the compressor and heat exchanger unit can be located further away from the inside unit. The inside and outside units are connected with insulated ducts metallic ducts. The Mini-Split Systems are much more efficient than the Window Units; they are however costlier than window units.
- **Portable A/C**
These are single unit contains both the evaporator and condenser. The system is connected to the outside via flexible ducts. It can be moved inside the conditioned space.
- **Evaporative Coolers**

Evaporative coolers, also called swamp coolers, rely on evaporating water into the air as a means of cooling. By passing outdoor air over water-saturated pads, the water in the pads evaporate, reducing the air temperature by 15°- to 40°F-before it is directed into the home.

- **Central A/C**

Large scale systems for large buildings, with many internal units connected to a single external unit. Working fluids include water, air and refrigerants.

Opinions on the most popular A/C size varies, but mostly mentioned is the units with capacity of 9000 BTU/h and 10000 BTU/h. It is also stated that A/C appliances lack energy labels. Due to high cost, refrigerators are a rare commodity among consumers, with the percentage of households that own one is 20-30% according to Customs. The participants of the questionnaire had different opinions on the average price of an A/C unit. Therefore, the average price is:

- 4500 dobras according to Customs;
- 9000 dobras according to TESE;
- 12000 dobras according to DGRNE.

Regarding legislation, participants state that there is awareness on EE from distributors, but EMAE states that consumers are not aware. Furthermore, there are no ongoing actions for the promotion of EE in refrigerators, besides a few fairs, which according to DGRNE are not useful since A/Cs are mostly used by the upper class of society. There is little input on legislative actions, with DGRNE suggesting the standardization of equipment.

6.2.3.2 Savings of Efficient A/C Technology in STP

In order to compare energy performance of such devices, it is important to compare devices with similar characteristics. Indeed, the installed capacity as well as the type of AC (single package, split systems...) are important when such devices are compared.

For essentially understanding the savings that can occur from upgrading to more efficient A/C appliances, it is important to calculate energy savings from introducing more efficient appliances.

With a population of 219,161 people (2019), and an average household size of 5.15 (2019, Globaldata), STP averages 42,309 households.

According to officials from the Customs Directorate, A/C appliances is a rare commodity among Santomeans, with an estimated 25% of the population owning one (or more). Assuming that every household owns at least one air conditioner, that means that there are 10,639 A/Cs operating in STP. With the most common A/C being the 9000 BTU/h Split System, or 2.64 kW, and an average annual usage of 1,100 hours, that means that an appliance with a Seasonal Energy Efficiency Rate (SEER) of 4W/W (energy class G), the annual consumption is 7.7 GWh. If we replace those appliances with an A/C with a SEER of 6W/W, (energy class C), the average annual consumption drops at 5.1 GWh.

So, by upgrading all the available A/C units by 3 classes, it is estimated that a total of 2.6 GWh can be saved.

Table 19: Estimated Energy Savings for A/C Appliances

Calculation of energy savings for A/C appliances	
Total Population	219,161
Average household size (people)	5.15

Average number of households	42,556
Percentage of households owning A/C appliance	25%
Average total number of A/C appliances	10,639
Average size of A/C appliance (kW)	2.64
Total annual usage (hr)	1,100
SEER before upgrade (W/W)	4.0
SEER after upgrade (W/W)	6.0
Total annual consumption before upgrade (GWh)	7.7
Total annual consumption after upgrade (GWh)	5.1
TOTAL SAVINGS (GWh)	2.6


Air-conditioners (AC) are technologies that represent the main possible EE (Energy Efficiency) savings in households along with refrigerators and lighting. A study carried out in the most populous ECOWAS countries¹ (Cote d'Ivoire, Ghana, Nigeria, and Senegal) showed that potential annual electricity savings of over 60 TWh could be achieved in these four countries by 2030. These savings were estimated assuming energy performance standards were adopted for washing machines, fans, lighting, refrigerators, room air-conditioners, standby power, televisions and motors. It is worth highlighting the fact that energy-efficient lighting, refrigerators and AC represent more than 90% of this simulated electricity savings.

¹ Letschert, V., McNeil, M. 2012. Potential Savings for Cote d'Ivoire, Ghana, Nigeria, and Senegal from BUENAS modeling. (retrieved from: <http://energyaccessafrica.org/index.php/fr/bibliotheque/finish/178-s-and-l-side-event/1596->

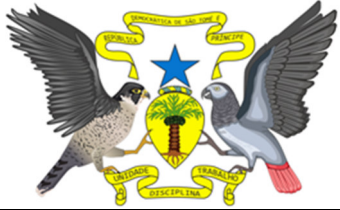
[sead-presentation-for-ecowas-sl-committee-meeting-dreyfus-corry/0](#), August 2013).

7 Annex


Questionnaires

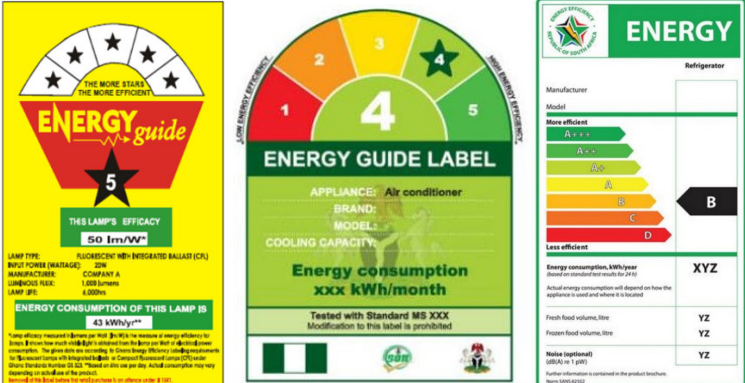
Questionnaire for baseline assessment of market conditions of LIGHTING appliances in São Tomé and Príncipe	Full Name:	
	Organization:	
	Date, place:	
Objective The goal of this questionnaire is to gain knowledge on the market status of lighting appliances. The questions cover the legislative, technical, marketing, distribution, installation and maintenance aspects of the market. As a result, valuable information will be gathered in order to formulate the Minimum Energy Performance Standards for the country's lighting appliances.		
1. General Questions		
Q1.1.	What is your profession?	
Q1.2.	How is your job related to lighting appliances?	
Q1.3.	What is your level of knowledge regarding energy standards and energy labelling? <input type="checkbox"/> Very low <input type="checkbox"/> Low <input type="checkbox"/> Average <input type="checkbox"/> High <input type="checkbox"/> Very high	
Q1.4.	Are your activities connected to energy efficiency? Describe how if so.	
2. Distribution Chain		
Q2.1.	Are any of the available appliances produced domestically?	
Q2.2.	Are enterprises organised through a defined distribution network?	
Q2.3.	Give a short description of the distribution chain of lighting appliances.	
Q2.4.	How many enterprises do imports?	
Q2.5.	How many enterprises do retail?	
Q2.6.	Name the top 3 import enterprises for lighting appliances.	
Q2.7.	Name the top 3 retail enterprises for lighting appliances.	
Q2.8.	Are there technicians offering maintenance services on lighting?	
Q2.9.	Are those technicians licensed by the state? How many enterprises and/or workers do maintenance?	
Q2.10.	Are there any second-hand retail shops or flea markets for lighting appliances in operation?	
Q2.11.	Are there any groups dealing with lighting appliances informally?	
3. Lighting Appliances (products, sales, prices)		
Q3.1.	Which brands are being represented in the market?	
Q3.2.	Which kind of lamp is most popular among consumers? <input type="checkbox"/> LED lamps <input type="checkbox"/> Fluorescent lamps <input type="checkbox"/> Incandescent lamps	
Q3.3.	What year were the LED lamps circulating in the market most commonly manufactured?	
Q3.4.	What year were the incandescent lamps circulating in the market most commonly manufactured?	
Q3.5.	What year were the fluorescent lamps circulating in the market most commonly manufactured?	
Q3.6.	How many LED lamps were sold in 2021?	
Q3.7.	How many incandescent lamps were sold in 2021?	
Q3.8.	How many fluorescent lamps were sold in 2021?	
Q3.9.	What is the average price of LED lamps?	
Q3.10.	What is the average price of incandescent lamps?	
Q3.11.	What is the average price of fluorescent lamps?	
4. Legislation		
Q4.1.	Do any of the lighting appliances have labels for their energy performance? Some labels examples are demonstrated below.	

Q4.2.	Are the distributors aware of the benefits of efficient lighting?
Q4.3.	Are the consumers aware of the benefits of efficient lighting?
Q4.4.	Are there any actions to promote energy efficient lighting among distributors taking place?
Q4.5.	Are there any actions to promote energy efficient lighting among consumers taking place?
Q4.6.	Is there a regulation, directive or law in place that defines the minimum energy performance of lighting appliances?
Q4.7.	Can you name any foreseen challenges in compliance with proposed standards and/or legislative actions?
Q4.8.	Which actions do you think are necessary for energy efficiency capacity building and implementation of performance standards for lighting appliances?
Q4.9.	Which stakeholders to involve to implement those actions? If possible please state their contact information below.
Q4.10.	Do you have questions or additional information to add?

Questionnaire for baseline assessment of market conditions of REFRIGERATORS in São Tomé and Príncipe	Full Name:	
	Organization:	
	Date, place:	
Objective The goal of this questionnaire is to gain knowledge on the market status of refrigerators. The questions cover the legislative, technical, marketing, distribution, installation and maintenance aspects of the market. As a result, valuable information will be gathered in order to formulate the Minimum Energy Performance Standards for the country's refrigerators.		
1. General Questions		
Q1.1.	What is your profession?	
Q1.2.	How is your job related to refrigerators?	
Q1.3.	What is your level of knowledge regarding energy standards and energy labelling? <input type="checkbox"/> Very low <input type="checkbox"/> Low <input type="checkbox"/> Average <input type="checkbox"/> High <input type="checkbox"/> Very high	
Q1.4.	Are your activities connected to energy efficiency? Describe how if so.	
2. Distribution Chain		
Q2.1.	Are any of the available appliances produced domestically?	
Q2.2.	Are enterprises organised through a defined distribution network?	
Q2.3.	Give a short description of the distribution chain of refrigerators.	
Q2.4.	How many enterprises do imports?	
Q2.5.	How many enterprises do retail?	
Q2.6.	Name the top 3 import enterprises for refrigerators.	
Q2.7.	Name the top 3 retail enterprises for refrigerators.	
Q2.8.	Are there technicians offering maintenance services on refrigerators?	
Q2.9.	Are those technicians licensed by the state? How many enterprises and/or workers do maintenance?	
Q2.10.	Are there any second-hand retail shops or flea markets for lighting appliances in operation?	
Q2.11.	Are there any groups dealing with refrigerators informally?	
3. Refrigerators (products, sales, prices)		
Q3.1.	Which brands are being represented in the market?	
Q3.2.	Which refrigerator type is most popular among consumers? <input type="checkbox"/> Top Freezer <input type="checkbox"/> Bottom Freezer <input type="checkbox"/> Side by Side <input type="checkbox"/> French Door <input type="checkbox"/> Mini Fridge	
Q3.3.	Which refrigerator size do consumers prefer (by total storage capacity in litres)?	
Q3.4.	What is the noise level(s) of the most popular refrigerator(s)?	
Q3.5.	What year were the refrigerators circulating in the market most commonly manufactured?	
Q3.6.	How many refrigerators were sold in 2021?	
Q3.7.	Is the refrigerator a common commodity in STP?	
Q3.8.	What is the percentage of households that own a refrigerator?	
Q3.9.	What is the average price of a refrigerator?	
4. Legislation		
Q4.1.	Do any of the refrigerators have labels for their energy performance? Some labels examples are demonstrated below.	

Q4.2.	Are the distributors aware of the benefits of efficient refrigerators?
Q4.3.	Are the consumers aware of the benefits of efficient refrigerators?
Q4.4.	Are there any actions to promote energy efficient refrigerators among distributors taking place?
Q4.5.	Are there any actions to promote energy efficient refrigerators among consumers taking place?
Q4.6.	Is there a regulation, directive or law in place that defines the minimum energy performance of refrigerators?
Q4.7.	Can you name any foreseen challenges in compliance with proposed standards and/or legislative actions?
Q4.8.	Which actions do you think are necessary for energy efficiency capacity building and implementation of performance standards for refrigerators?
Q4.9.	Which stakeholders to involve to implement those actions? If possible please state their contact information below.
Q4.10.	Do you have questions or additional information to add?

Questionnaire for baseline assessment of market conditions of AIR CONDITIONING appliances in São Tomé and Príncipe	Full Name:	
	Organization:	
	Date, place:	
Objective The goal of this questionnaire is to gain knowledge on the market status of air conditioning appliances. The questions cover the legislative, technical, marketing, distribution, installation and maintenance aspects of the market. As a result, valuable information will be gathered for a complete mapping of the national energy consumption profile.		
1. General Questions		
Q1.1.	What is your profession?	
Q1.2.	How is your job related to A/C appliances?	
Q1.3.	What is your level of knowledge regarding energy standards and energy labelling? <input type="checkbox"/> Very low <input type="checkbox"/> Low <input type="checkbox"/> Average <input type="checkbox"/> High <input type="checkbox"/> Very high	
Q1.4.	Are your activities connected to energy efficiency? Describe how if so.	
2. Distribution Chain		
Q2.1.	Are any of the available A/C appliances produced domestically?	
Q2.2.	Are enterprises organised through a defined distribution network?	
Q2.3.	Give a short description of the distribution chain of A/C appliances.	
Q2.4.	How many enterprises do imports?	
Q2.5.	How many enterprises do retail?	
Q2.6.	Name the top 3 import enterprises for A/C appliances.	
Q2.7.	Name the top 3 retail enterprises for A/C appliances.	
Q2.8.	Are there technicians offering maintenance services on air conditioning?	
Q2.9.	Are those technicians licensed by the state? How many enterprises and/or workers do maintenance?	
Q2.10.	Are there any second-hand retail shops or flea markets for A/C appliances in operation?	
Q2.11.	Are there any groups dealing with A/C appliances informally?	
3. Air Conditioning (products, sales, prices)		
Q3.1.	Which brands are being represented in the market?	
Q3.2.	Which A/C type is most popular among consumers? Give order of popularity (1, 2, 3...) <input type="checkbox"/> Window A/C <input type="checkbox"/> Portable A/C <input type="checkbox"/> Through-the-wall A/C <input type="checkbox"/> Evaporative coolers <input type="checkbox"/> Slit system A/C <input type="checkbox"/> Central A/C <input type="checkbox"/> Package Terminal A/C <input type="checkbox"/> Central A/C <input type="checkbox"/> Geothermal A/C	
Q3.3.	Which A/C size do consumers prefer mostly (by kW or BTU/hr output)?	
Q3.4.	Are there energy specifications e.g. labels on A/C units sold?	
Q3.5.	How many A/C units were sold in 2021?	
Q3.6.	Are A/C units a common commodity in STP?	
Q3.7.	What is the percentage of households that own an A/C unit?	
Q3.8.	What is the average price of an A/C unit?	
4. Legislation		
Q4.1.	Do any of the A/C appliances have labels for their energy performance? Some labels examples are demonstrated below.	

	
Q4.2.	Are the distributors aware of the benefits of efficient A/C units?
Q4.3.	Are the consumers aware of the benefits of efficient A/C units?
Q4.4.	Are there any actions to promote energy efficient A/C units among distributors taking place?
Q4.5.	Are there any actions to promote energy efficient A/C units among consumers taking place?
Q4.6.	Is there a regulation, directive or law in place that defines the minimum energy performance of A/C units?
Q4.7.	Can you name any foreseen challenges in compliance with proposed standards and/or legislative actions?
Q4.8.	Which actions do you think are necessary for energy efficiency capacity building and implementation of performance standards for A/C appliances?
Q4.9.	Which stakeholders to involve to implement those actions? If possible please state their contact information below.
Q4.10.	Do you have questions or additional information to add?

Workshop Results

Questions	Workgroup A	Workgroup B	Workgroup C	Workgroup D
Part 1: Review of Baseline Assessment				
a. STP Market				
[a-1] Do you agree with the main conclusions of the appliance market study in STP? Do you have any comments?	Yes, we agree. The market is really open, there is no quality control of products entering the country. In this sense, it is important to implement a new energy efficiency strategy.	Yes, we agree. However, we believe that the study should cover the industrial area, although the industrial sector is still growing.	Regarding the issue, we consider that the following should be taken into account: -Absence of an entity responsible for the collection; -Data processing with emphasis on the input of equipment.	From the point of view of raising public awareness and awareness, we agree, but it is necessary to create an action plan to fill these gaps. Creation of an electronics action plan for the application of technical standards and regulations that will allow greater energy efficiency in STP.
[a-2] Do you have more data or information to complete the appliance market study	It did not focus on some appliances that are widely used by the population, which are electric kettles, electric roasters and irons.	Bearing in mind that incandescent lamps are no longer produced, they continue to be imported across the country. There is a lack of technical information on some appliances (mainly refrigerators) in stores.	We believe that the home appliance market study should take into account the number of the population (population density) and the definition of an approval in terms of equipment to be imported.	No
b. Legislative improvement				
[b-3] What are your recommendations in terms of legislation to implement MEPS and labels on appliances in STP?	The recommendations in terms of legislation for the application of MEPS and device labels in STP are: -There is legislation that can control the import of all home appliances with regard to energy	Take into account the environmental impacts that each device may cause according to the label. Application of penalties (fine) for people who break the regulations	We believe that legislation (legal instrument) should be created to define energy efficiency standards, as if these standards exist, the country will adopt the seals of other duly recognized countries.	This data can be elaborated through international technical standards and regulations. Creation of laws and regulations regarding energy efficiency (Montreal Protocol). Tax breaks. Prohibition of inefficient equipment.

Questions	Workgroup A	Workgroup B	Workgroup C	Workgroup D
	<p>efficiency, type of materials used in manufacturing;</p> <p>-There is an entity in the environment sector linked to the recycling of household appliances.</p>			
<p>[b-4] How do we have to proceed to implement the MEPS and labels on appliances in STP?</p>	<p>The procedures for applying MEPS and device labels in STP are:</p> <p>-Checking the truthfulness of labels;</p> <p>-Standardize the labels;</p> <p>-Training, capacity building and awareness-raising campaigns for the population and especially for entities related to services and imports of home appliances.</p>	<p>There must be strict control by customs on the appliances that will enter the country (a control). Public awareness.</p>	<p>We believe that you should:</p> <p>-Create and define the responsible entity;</p> <p>-Awareness campaigns and training;</p> <p>-Creation of tax incentives.</p>	<p>Procedures for applying MEPS and labels:</p> <p>-Advocacy and policy decisions;</p> <p>-Oversight;</p> <p>-Creation of specific legislation for this purpose.</p>
<p>[b-5] Do you agree with the recommendations below to improve the energy efficiency of lamps, refrigerators and air conditioners?</p>	<p>Compliance certification reporting for appliance importers, distributors, and retailers.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Market surveillance and enforcement procedures for regulators, customs & standards agencies.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Creation of MEPS & labels for appliances.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Draft regulation for implementation of MEPS & labels.</p>	<p>Compliance certification reporting for appliance importers, distributors, and retailers.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Market surveillance and enforcement procedures for regulators, customs & standards agencies.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Creation of MEPS & labels for appliances.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Draft regulation for implementation of MEPS & labels.</p>	<p>Compliance certification reporting for appliance importers, distributors, and retailers.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Market surveillance and enforcement procedures for regulators, customs & standards agencies.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Creation of MEPS & labels for appliances.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Draft regulation for implementation of MEPS & labels.</p>	<p>Compliance certification reporting for appliance importers, distributors, and retailers.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Market surveillance and enforcement procedures for regulators, customs & standards agencies.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Creation of MEPS & labels for appliances.</p> <p>Yes (X) No <input type="checkbox"/>.</p> <p>Draft regulation for implementation of MEPS & labels.</p> <p>Yes (X) No <input type="checkbox"/>.</p>

Questions	Workgroup A	Workgroup B	Workgroup C	Workgroup D
	Yes (X) No ().	Yes (X) No ().	Yes (X) No ().	
c. Benchmarking of MEPS and labels in other countries				
[c-6] What do you think about the MEPS and labels for appliances in place in other countries?	We agree perfectly, however we have to implement our own, not forgetting that the countries that already have these MEPS are already developed and many of them have the possibility to manufacture their own appliances.	We think it is extremely important and we believe that it should be implemented, taking into account the reality of the country.	Regarding the MEPS and appliance labels in force in other countries, we consider them to be good, as it allows for a better choice of home appliances in terms of energy efficiency.	They are great, because they meet international standards.
[c-7] Could we adopt them? Do we have to adapt them for STP?	Yes. However, these MEPS and labels must be adapted according to our reality.	Yes. However, these MEPS and labels will have to be adapted to the country's reality.	Given the country's characteristics, territorial dimension and population density, it is considered that those that best fit the context of energy efficiency are adopted by the country.	Yes, we can adapt according to the reality of São Tomé and Príncipe (STP). STP labels must be adapted after a detailed study of the minimum conditions to be met.
Part 2: Strengths and Weaknesses				
[1] What are the strengths for the introduction of MEPS and labels for appliances in STP? Do you see some problems? If yes, which problems?	Strong point: When purchasing a high energy efficient product, the cost is higher, but the cost of electricity will be lower. Weak point: We depend 100% on imported appliances.	Strong points: -The need/importance to minimize the production of energy consumed by the population; -Low consumption cost for the customer. Weak points: -The high cost of the most efficient equipment on the market; -Few efficient equipment on the market; -Inexistence of	Strong point: -Strategic vision of the government and its international development partners; Weak points: -Knowledge level; -implementation mechanism; -Limitation of trained Human Resources.	Strong point: -Electricity savings; Weak points: -Lack of individual, organizational and systemic capacity building for the implementation of MEPS; -Lack of operationalization of the national quality council, including the absence of an electronic action plan and a technical committee to carry out this process.

Questions	Workgroup A	Workgroup B	Workgroup C	Workgroup D
		legislation/regulation regarding the issue of energy efficiency.		
[2] What are the weaknesses for the introduction of MEPS and labels for appliances in STP?	Legislation in force on energy efficiency.	-The lack of trained personnel in STP; -Lack of knowledge about the benefits of energy efficiency; -Lack of a specialized body to monitor energy efficiency standards.	-Weak involvement of the private sector; -Limited knowledge about the advantages of MEPS and labels.	-Lack of a governance structure and elaboration of a strategy for this purpose;
Part 3: Regulatory and Compliance Frameworks				
a. Capacity Building				
[a-1] What is the level of knowledge of STP stakeholders on MEPS and labels?	The level of stakeholder awareness of MEPS and labels is very low, as many do not know about energy efficiency.	Very low (almost nil).	We consider that the level of knowledge is basic, as there are some trained staff but still limited, which contributes to little dissemination of information about MEPS and labels.	A low level of knowledge.
[a-2] Are the stakeholders sufficiently trained on standards and energy labeling? If not, what are the training needs? Who should be trained? By whom?	Are not. The needs are information, legislation, awareness and training of stakeholder technicians. Training must be provided to technicians from interested entities, consumers, sellers, suppliers, private entities, financiers, inspection service and consumer law, association of traders and brokers.	Are not. There is a need for training. Consumers, commercial part, EMAE, Customs, AGER, Tax Police, Social Communication must be trained.	No, because there is a need for training in energy efficiency, control and quality of equipment and appliances, technical training in assembly and efficient use of training equipment. Technical professionals in the sectors (Commercial, EMAE, DGRNE, DGA, District Chambers, etc.)	Everyone needs training.

Questions	Workgroup A	Workgroup B	Workgroup C	Workgroup D
b. Public education and awareness creation				
[b-3] Do you identify needs in terms of communication and awareness for the introduction of MEPS and labels for appliances in STP?	-Inform the population about what energy efficiency is and its advantages and disadvantages; -Teach the population the correct interpretation of energy labels; -Inform the population that although the acquisition costs of more efficient home appliances are higher, they will lead to lower consumption of electricity.	Yes. Advertising campaigns in the media, in stores, through posters and pamphlets.	The needs are associated with carrying out programs of information dissemination campaigns (radio, television) related to the identification and use of low consumption equipment, with the objective of facilitating the implementation of MEPS and labels. Conducting lectures, workshops.	The needs are associated with carrying out programs of information dissemination campaigns (radio, television) related to the identification and use of low consumption equipment, with the objective of facilitating the implementation of MEPS and labels. Conducting lectures, workshops.
c. Institutional framework				
[c-4] Which stakeholders need to be involved to implement the standards and labels for appliances in STP? Who are the stakeholders to be involved in monitoring and evaluating the implementation of standards and labels for appliances in STP?	Stakeholders do need to be involved. For example, we have: EMAE, AGER, DGA, DGRNE, DGA, DRCAE.	Stakeholders do need to be involved. For example, we have: EMAE, AGER, DGA, DGRNE, DGA, DRCAE.	Stakeholders do need to be involved. For example, we have: EMAE, AGER, DGA, DGRNE, DGA, DRCAE.	Stakeholders do need to be involved. For example, we have: EMAE, AGER, DGA, DGRNE, DGA, DRCAE.
d. Regulatory framework				
[d-5] How do you see the introduction of standards and labels for appliances in STP? What would be the procedures to follow to introduce energy-efficient		Customs must allow entry only of appliances that will respect the MEPS and labels that will be implemented.	We consider it to be a good initiative that meets the strategic vision of the country's energy policy. Firstly, massive dissemination,	We consider it to be a good initiative that meets the strategic vision of the country's energy policy. Firstly, massive dissemination, training, awareness-

Questions	Workgroup A	Workgroup B	Workgroup C	Workgroup D
appliances, once the regulations are in force (mandatory standards and labels for all equipment entering the territory)?			training, awareness-raising, inspection, follow-up and evaluation.	raising, inspection, follow-up and evaluation.