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MINISTERIO
DE ENERGÍA
Y MINAS

NATIONAL POLICY

ON ENERGY EFFICIENCY 2023 - 2050





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ABBREVIATIONS AND ACRONYMS

A/C	Air Conditioners
AG	Governmental Agreement
AMM	Wholesale Market Administrator
BAU	Business As Usual
BEN	National Energy Balance
BID	Inter-American Development Bank
CNEE	National Commission of Electric Energy
EE	Energy Efficiency
GEI	Greenhouse Gases
GLP	Liquefied Petroleum Gas
GT	Guatemala
IPC	Consumer Price Index
ISO	International Organization for Standardization
kBEPS	Kilo Barrels of Oil Equivalent
LEDS	Low Emission Development Strategies
MEM	Ministry of Energy and Mines
NDC	Nationally Determined Contributions
ODS	Sustainable Development Goals
PANCC	National Action Plan against Climate Change
PIB	Gross Domestic Product
PNE	National Energy Plan
SEGEPLAN	Secretariat of Planning and Programming of the Presidency
SNI	Interconnected Nacional System
TJ	Tera-Joules
USAID	United States Agency for International Development



DEFINITIONS

To facilitate understanding, the following list of definitions and concepts is presented.

Concept	Definition
Energy Saving	Act of rationalizing energy consumption through good practices carried out in everyday life procedures.
Energy Audit	It involves the study and verification of energy flows (generation and demand) that occur within an operating facility, presenting a diagnostic report, with conclusions, recommendations, and improvement proposals. There are different levels of inspection and analysis depth in an energy audit.
Bunker	Also known as Bunker C or Fuel Oil. It's the fuel obtained because of petroleum distillation, commonly classified as Fuel Oil No. 5 and No. 6.
Energy Efficiency	Also known as efficient energy use, it is the optimization of energy consumption through specific products or actions, avoiding the use of more energy than necessary for a final purpose.
Energy	It is the ability of matter to produce work in the form of movement, light, heat, among other forms.
Primary Energies	Energy sources obtained from natural resources, without the need for transformations for their acquisition. These include: Oil, Coal, Natural Gas, Hydro, Geothermal, Biogas, Firewood, Sugarcane Bagasse, Solar, and Wind.
Secondary Energies	Energy sources obtained from transformation processes of primary energy sources. These are: Electricity, Liquefied Petroleum Gas, Gasoline, Kerosene, Diesel, Fuel Oil, Coke, and Non-energetics.
Energy Labeling	A seal, stamp, or plate visibly included on the surface of a specific piece of equipment. The energy label displays the annual energy consumption of the equipment it is on.
Greenhouse Gas	An atmospheric gas which absorbs and in turn emits radiation to surfaces, within an infrared range.
Standard	A set of principles that are adopted or imposed to guide behavior or the execution of actions in the development of an activity.
Technical Losses	Energy dissipated by equipment and conductors that make up the distribution lines.



INTRODUCTION

Guatemala is the country with the largest population in the Central American Integration System region; 28.50% of the over 60 million inhabitants in this area are Guatemalan. Hence, it is also one of the largest consumers of energy resources in the region. Regarding the various energy sources used in Guatemala (e.g., Electricity, firewood, or hydrocarbons), a reference point is the national consumption of kilo barrels equivalent to oil recorded in 2020, which reached 92,696 kBEP.

The Energy Balance of Guatemala, a tool used to account for the supply, distribution, and demand for energy resources, proves that more than half of the annual national energy demand is met with firewood, the main energy source used in household activities, especially in those located in rural areas.

Likewise, hydrocarbons are consumed as fuel for cooking food, maritime, aerial, and land mobility. However, in Guatemala, all hydrocarbons are imported, which means both prices and the supply capacity depend on international market conditions in our country. For example, in 2020, 33.40 million barrels of hydrocarbons for general uses (LPG, premium and regular gasoline, low-sulfur and ultra-low sulfur diesel) were imported, of which 95% was used to meet national demand.

On the other hand, there are conditions of poor utilization of energy resources in the country's electricity subsector. In 2020, technical and non-technical losses from the distribution service amounted to over 15% of the demand this activity supplies. Also, the land transport sector shows little diversification in energy resource consumption, mainly demanding gasoline and diesel for a vehicle fleet whose age exceeds 18 years.

Added to this is the presence of technology in the daily lives of most of the country's population. Its use is present in all daily activities; the technological increase is significant, especially because the bulk of Guatemala's age pyramid is in training, education, or economically active.

Considering the above, it can be deduced that Guatemala mismanages energy resources, and there is also weak control over the manufacturing, import, and commercialization of technologies by not having a quality infrastructure to weigh such a situation. To the extent that the Guatemalan population runs the risk that available energy resources will be depleted. This constitutes a national problem that needs to be prioritized on the public agenda and addressed with a preventive but urgent focus, with the participation and commitment of the various sectors of Guatemalan society. It is up to the State, through the Ministry of Energy and Mines, to propose, coordinate, promote, and monitor the attention to this problem, as well as the necessary interventions to solve it. Hence, the interest in implementing this national public policy in energy efficiency.

The National Policy on Energy Efficiency (NPEE), presented by the MEM, is the tool through which the co-participation of the Government and Civil Society will address the causes of the problem and prevent the effects it may cause. The content proposed in this document perfectly frames the country's legal and public policy framework, also responding to international commitments that Guatemala has acquired through the signing of agreements, agendas, treaties, and conventions, among others.

In the legal field, the policy subsumes the Political Constitution of the Republic of Guatemala as the highest law at the national level, also linking with a series of ordinary laws, regulations, and standards that determine the orientation of government management in electricity, renewable energy, wholesale market, environment, climate change, and others, all related to the topic addressed in this content. Regarding national public policies, the policy responds and links directly or indirectly, initially to the National Development Plan, K'atun: Our Guatemala 2032, as well as the National Priorities and Goals derived from it. Also, to a series of policies linked to the energy issue: electrification, environment, climate, forests, solid waste and waste, education, competitiveness, municipal strengthening, and efficient use of firewood.

Finally, there is a strong link and consistency with international instruments ratified by Guatemala: from the Sustainable Development Goals, through commitments related to climate change, GHG reduction, responsible use of mercury, and coordinated work on these themes -among several others- at the Central American, Belize, and Dominican Republic levels.

It can be verified in the policy's development that its content aligns with all these legal, political, and international instruments, with which it seeks articulated and coordinated implementation that includes inter-institutional participation with civil society involvement. The details of the indicated instruments can be observed in the legal and political framework of this document.

The construction line of this public policy defines its content as a general objective: "Establish guidelines to ensure the efficient management and use of available energy resources as a measure to contribute to the sustainable development of the Guatemalan population in an environment that also promotes environmental conservation by 2050", which is broken down into 4 specific objectives:

- Promote the use of efficient technologies to maximize the use of energy resources, through trained human capital in different sectors of the country.
- Contribute to the protection of the economy and well-being of the Guatemalan population with access to electrical coverage.
- Strengthen coordination and consensus mechanisms between public institutions and the population to optimize the use of available energy resources in the country.
- Increase the opportunity for research and development of energy efficiency projects for the benefit of energy-consuming sectors in the country.

Within this framework, the Ministry of Energy and Mines, in its role as the governing and normative body for all energy-related matters, assumes the leadership to, within the context of this policy, develop various technical, political, and social actions that must be adopted and implemented by everyone: public institutions, the private sector, and civil society at large. Likewise, the MEM will act as the coordination link to ensure compliance with the content of this instrument, through monitoring, evaluation, and tracking systems that will allow for continuous feedback.

The importance of enacting an energy efficiency policy in the country lies in the impact it would have on economic, security, ergonomic, and environmental aspects. With this, the aim is that by 2050 a large percentage of the population will have the information, knowledge, and guidelines that allow them to implement concrete energy efficiency actions with cultural relevance.



CHAPTER

1

1. LEGAL AND POLITICAL FRAMEWORK

The legal framework upon which the formulation of this policy is based stems from various treaties, agreements, conventions, and international declarations to which Guatemala is affiliated. This policy will contribute by fulfilling different commitments. Among the most prominent is the 2030 Agenda for Sustainable Development, approved at the United Nations Summit held in New York in 2015. From this agenda arise the 17 Sustainable Development Goals, which involve mandatory actions by Member States, anticipated for 2030, aiming to end poverty, protect the planet, and improve the lives of the global population.

In terms of energy, this policy will contribute to the achievement of SDG 3 "Good Health and Well-being", SDG 7 "Affordable and Clean Energy", and indirectly to SDG 11 "Sustainable Cities and Communities", and SDG 13 "Climate Action".

Moreover, the country has been part of the Paris Agreement since 2016, which aims to prevent the average global temperature of the planet from rising more than 2°C. For this reason, it contemplates actions in terms of energy efficiency to mitigate greenhouse gas emissions.

Additionally, the country has been a member of the Kyoto Protocol since 1999, following the commitments acquired in the United Nations Framework Convention on Climate Change, approved in 1995. Both documents aim to reduce Greenhouse Gas Emissions (GHGs) causing global warming.

Regarding the Central American Integration System (SICA for its acronym in Spanish), Guatemala was one of the original signatories of both the Organization of Central American States (ODECA for its acronym in Spanish) and the Tegucigalpa Protocol, which established SICA in 1991. In 2018, the regulations organizing and governing the council of energy ministers of SICA were approved, which set its support entities, such as the Committee of Energy Directors, the SICA Energy Coordination Unit (UCE SICA for its acronym in Spanish), and technical groups.

The "Minamata" convention aims to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. It includes provisions on public information, environmental education, promoting participation, and capacity-building.

Nationally, the legal framework starts from the Political Constitution of the Republic, which in its article 125 declares "the technical and rational exploitation of hydrocarbons, minerals, and other non-renewable resources as of public utility and necessity." Article 129 of the same legal body declares "the electrification of the country as a national emergency, based on plans formulated by the State and municipalities, in which private initiative may participate." Both regulations constitute the supreme legal foundation, within which the content of this policy is defined; this is in line with the principle of constitutionality as it revolves around a public necessity topic specifically related to electrification and energy efficiency in the country.

For its part, the Executive Organism Law details in its article 34 the functions of the Ministry of Energy and Mines, among which the following stands out: "It is responsible for addressing matters related to the legal regime applicable to the production, distribution, and marketing of energy and hydrocarbons, and the exploitation of mineral resources. For this, it has -among other functions- the following: a) Study and promote the use of new and renewable energy sources, promote their rational utilization, and stimulate the development and rational use of energy in its various forms and types, aiming for a national policy that seeks energy self-sufficiency in the country."

The General Law on Electricity, approved in 1996, was implemented for the development and assurance of the national electrical system. It establishes the mechanisms that govern and monitor the activities of the electric market, comprised of the activities of generation, marketing, transportation, distribution, and electricity consumption. Subsequently, the Regulation of the General Law on Electricity was formalized, thus attending to article 4 of the transitional provisions of the law.

The Wholesale Market Administrator Regulation, on the other hand, contains the rules that allow for sufficient and reliable electrical energy supply.

Likewise, the Social Tariff Law establishes specific regulations to benefit the regulated user, who is most affected by the increase in electricity production costs.

In 2003, the Incentives Law for the Development of Renewable Energy Projects was created, which aims to promote the development of renewable energy projects and establish fiscal, economic, and administrative incentives for this purpose.

These mandates are complemented by what the Internal Organic Regulation of MEM stipulates (approved by Governmental Agreement 382-2006). In its article 16, it specifically outlines the functions and powers of the General Directorate of Energy, among which the following stand out: ...b) Implement policies, state plans, and indicative programs of various energy sources... g) Promote and develop programs aimed at studying, efficient use, conservation of energy sources and disseminate the achievements obtained to link them to the country's development..."

The Procedures Manual of the Unit of Mining Energy Planning (approved by Ministerial Agreement 445-2012) is consistent with the above, as it describes that among the functions and powers of the Unit of Mining Energy Planning are the following: "...g) Prepare diagnostics that allow the formulation of plans and programs in energy and mining policy matters... And j) Promote, design, and prioritize plans, programs, and projects related to savings, conservation, and efficient use of energy in all fields of economic activity and advance the necessary dissemination efforts..."

Another law associated with the theme of this policy is the Environmental Protection and Improvement Law, whose objective is to ensure the maintenance of ecological balance and environmental quality, to improve the quality of life of the country's inhabitants.

The Forestry Law declares the reforestation and conservation of forests a national urgency and of social interest, promoting forest development and its sustainable management.

Finally, the Framework Law on Climate Change was approved in 2013 and aims to establish the necessary regulations to prevent, plan, and respond to the impacts of climate change in Guatemala.

There is also a range of specific technical standards on energy efficiency that have been adopted in the country by the Guatemalan Commission for Standardization - COGUANOR-. These are strategically important as, on the one hand, they demonstrate the interest that has existed in our country to achieve a voluntary link to regulations related to energy efficiency, and on the other, they provide the foundation for creating a specific framework -in terms of imports- to which any legal or juridical person wishing to join the guilds that have adopted them must adhere.

Guatemala has thus far adopted a total of ten energy standards, which are described below, highlighting the specific focus of each¹

- ✓ NTG 21015: Energy Efficiency. Test method for determining the electrical and photometric measurements of single-base compact and circular fluorescents.
- ✓ NTG 11001: Energy Efficiency for self-contained commercial refrigeration equipment – Consumption value limits.
- ✓ NTG 11002: Energy Efficiency for self-contained commercial refrigeration equipment – Labeling.
- ✓ NTG 11003: Energy Efficiency for self-contained commercial refrigeration equipment – Test methods.
- ✓ NTG 11004: Energy Efficiency of household refrigerators and freezers – Maximum energy consumption limits.
- ✓ NTG 11005: Energy Efficiency of household refrigerators and freezers - Labeling.
- ✓ NTG 11006: Energy Efficiency of household refrigerators and freezers - Test methods.
- ✓ NTG 11007: Energy Efficiency. Window, split, and package type air conditioners. Energy efficiency ranges.
- ✓ NTG 11008: Energy Efficiency. Air conditioners for spaces with cooling capacities up to 10,548 W (or 36,000 BTU/h) – Labeling.
- ✓ NTG 11009: Energy Efficiency. Window, split, and package type air conditioners – Test methods.

¹ It's worth noting that currently the country does not have a specialized technical committee on the subject.

In terms of national public policies, there are instruments related to energy, such as the National Development Plan, K'atun: Our Guatemala 2032. Within this, the "Natural Resources for Today and the Future" Axis sets priorities related to climate change adaptation and mitigation; access to quality energy with national coverage; and increasing the share of renewable energy in the energy matrix, considering the participation of the Maya, Xinka, Garifuna, and gender and age groups.

To ensure country-level compliance with mandates from the Plan K'atun: Our Guatemala 2032 and the Sustainable Development Goals, 10 National Development Priorities emerged, leading to 16 Strategic Development Goals.

These address priorities such as employment and investment, access to water and natural resource management, education, and the economic value of natural resources.

The Energy Policy 2013-2027 consists of five operational axes, of which number 4 "Saving and efficient use of energy" is taken into consideration, which dictates the actions to be taken to create mechanisms that allow the efficient and productive use of energy, and achieve that 30% of public institutions use energy efficiently. This Policy adheres to this objective in the search for mechanisms for the efficient and productive use of energy in the public services, industrial, residential, and trade and other services sectors of the country. All this, with the aim of achieving the institutionalization of the country's energy efficiency in different sectors.

The Energy Policy 2019-2050 constitutes an institutional mandate, the implementation of which is the direct responsibility of MEM. It encourages actions aimed at operationalizing the implementation of national energy efficiency strategies in the residential, public services, industrial, mobility and transport, commerce, private services, and energy industry sectors, thus benefiting the entire Guatemalan population.

Among other policies related to the topic, we can mention the National Rural Electrification Policy, which seeks to increase the number of users with access to electricity sustainably over time; increasing electrical coverage considering the implementation of new supply technologies and identifying areas to electrify through a methodology that allows the establishment of priority projects, encouraging local productivity through electrification projects.

The National Climate Change Policy aims to adopt risk prevention practices, reduce vulnerability, and improve adaptation to Climate Change, and contribute to the reduction of greenhouse gas emissions in its territory, support the improvement of the quality of life of its inhabitants and strengthen its capacity to influence international climate change negotiations.

In the case of the Environmental Management Framework Policy, actions are promoted to improve environmental quality and the conservation of the nation's natural heritage, as well as to safeguard the ecological balance to guarantee access to its benefits for the economic, social, and cultural well-being of current and future generations.

The National Environmental Education Policy of Guatemala seeks to implement formal, non-formal, and informal environmental education programs and processes with a multicultural and equity approach, which allows society to become aware and adopt responsible attitudes in the conservation of goods and environmental services.

On the other hand, the National Cleaner Production Policy contributes to sustainable development, in such a way that natural goods and services are rationally used, waste is reused, and proper management of pollutants is carried out.

The National Competitiveness Policy establishes the requisite conditions for enhancing productivity, thereby fostering inclusive, accelerated, and sustainable economic growth, with a target average growth rate surpassing 6% annually for the Gross Domestic Product by 2032.

The Economic Policy is geared towards achieving sustainable economic growth that yields opportunities manifested in high-quality, decent employment opportunities. This is aimed at achieving a marked reduction in poverty and inequality. Its primary objective is to create ample and suitable opportunities for human development for all, predicated on an inclusive and sustainable economic growth model.

The National Policy for the Comprehensive Management of Solid Waste and Residues aims to efficiently minimize risks to humans and the environment, with a particular focus on reducing the volume or hazard of solid waste that ends up in final disposal sites. This overarching policy covers all types of solid waste and highlights the need to strengthen the legal and regulatory framework, considering the waste's origin, composition, or hazard. Its implementation enhances the holistic management of solid waste, involving all stakeholders through social participation, advancing sustainable development in Guatemala.

The Policy for Conservation, Protection, and Environmental Enhancement aims to harmonize, define, and provide directives to various sectors for improving the environment and the quality of life of the country's residents, maintaining ecological balance, and promoting the sustainable use of natural resources.

Guatemala's Forestry Policy strives to amplify the socioeconomic benefits derived from forest ecosystems and contribute to rural land-use planning. It promotes the productive management and conservation of natural resources, with a pronounced emphasis on forestry resources and associated assets like biodiversity, water, and soil. It integrates forestry activities into the nation's economy for the broader benefit of Guatemalan society.

Meanwhile, the National Policy on Disaster Risk Reduction is rooted in the imperative to protect human life, minimize harm to individuals, communities, and human settlements caused by the recurring impact of various disasters. It considers the significant economic losses which hinder the nation's secure, sustainable, and comprehensive development.

Furthermore, the Policy for Strengthening Municipalities aims to bolster the nation's municipalities, enabling them to efficiently provide their respective services, elevate their management quality, better assume their responsibilities, and align their endeavors with State Policies. This is achieved through the collaborative and coordinated support of public institutions and municipal associations.

Among other management instruments related to the subject of this policy is the National Energy Plan 2017-2032, designed to bolster the nation's efforts to cut greenhouse gas (GHG) emissions. This policy sets forth essential guidelines on energy efficiency that assist in mitigating and adapting to the effects prompted by climate change.

The National Energy Efficiency Plan 2019-2032 lays out a roadmap that proves invaluable to both national and international organizations eager to engage in achieving this policy's goals.

Regarding the Indicative Generation System Expansion Plan and the Transmission System Expansion Plan, both linked to electric power service, they stipulate the criteria for the national interconnected system to function optimally, ensuring the service's reliability and continuity.

The Indicative Plan for Rural Electrification seeks to broaden the country's electric grid coverage, diversifying energy resource access options for citizens, furthering human development and well-being.

The National Action Plan on Climate Change delineates the primary actions and guidelines that government institutions and other state sectors must adopt. This is to effectively reduce the vulnerability faced by most of the national populace, enhance the nation's adaptive capacity, and cut GHG emissions considering the threats posed by climate change and climatic variability.

Similarly, the National Strategy for Sustainable Firewood Production and Efficient Use 2013-2024 aims to ensure a steady firewood supply for the populace. It develops tools and local capacities for sustainable firewood production and promotes the adoption of suitable technology for efficient firewood use. This approach creates non-agricultural rural employment opportunities, diminishes adverse health impacts from smoke, and aids in forest conservation.

The National Quality Policy 2019-2032 strives to augment the country's productivity and competitiveness by enhancing the conditions for national and international trade of goods and services. It does so by bolstering the institutionalization of the National Quality System.

The Central American Policy for Comprehensive Risk Management serves as a specialized regional public policy tool concerning risk management. It outlines measures, commitments, and actions that contribute to strategic political guidelines designed to counteract vulnerability from natural phenomena and climate change and to reinforce institutions addressing these emergencies.

Based on the public policies analyzed and linked to the identified public issue, it can be inferred that currently, several institutions are contributing to address this problem through strategic programs related to energy matters. Notably, the Ministry of Energy and Mines stands out as the guiding entity in the energy sector, which, as part of its management, implements a substantive program called "Increase in Renewable Energy in the Energy Matrix". This initiative steers efforts towards mitigating the risk of depleting the available energy resources in the country.

This program produces an institutional product titled "Reports and Promotion of Renewable Energy Generation Projects". From this emerges the "Preliminary Report on the Progress of the Generation and Transportation System Expansion Plan 2020-2034". This report encompasses actions that include the planning for the expansion of the National Electric System, through which public interests regarding the improvement of the energy efficiency of electricity generation and transmission systems are showcased.

Also highlighted is the "Annual Statistical Report of the Electric Subsector", where significant events occurring within the electric subsector on an annual basis are reported. Finally, the "Monitoring Report for the Reduction of Greenhouse Gas (GHG) Emissions at the National Level" serves as a basis for estimating GHG emissions that the country's energy sector presents through the Ministry of Environment and Natural Resources.



The identified institutions are listed in the following table.

Table 1. Institutions linked to the central problem identified.

National Commission of Electric Energy	
Program	Activity
Management of support to the regulatory activities of the electricity sub-sector in Guatemala.	
Regulation of the oversight of the quality of electricity service quality in the electricity subsector of Guatemala.	
Regulation of the surveillance and monitoring of the electricity market of the electricity subsector in Guatemala.	
Technical Institute for Training and Productivity	
Program	Activity
Training of human resources	Certifiable occupational education and training
Technical Assistance	Technical Assistance
Labor certification	Labor certification under labor competency standards.
Ministry of Environment and Natural Resources	
Program	Activity
Environmental management with emphasis on climate change	Issuance of licenses, resolutions and environmental reports.
	Development of climate change adaptation and mitigation measures.
Conservation and protection of natural resources and environment	Development of environmental policies, plans and strategies.
	Control of water pollution and prevention of desertification and drought.
	Advice on the application of cleaner production processes.
	Supervision of wastewater treatment plants.
Socio-environmental awareness and citizen participation	Socio-environmental training
	Environmental awareness and sensitization



Ministry of Communications, Infrastructure and Housing

Program	Activity
Road infrastructure development	
Regulation of extra-urban road transportation	

Ministry of Economy

Program	Activity
Investment promotion and competition	Analysis services, diagnostics and projects to improve investment and competitiveness.
	Standardization, metrology and accreditation services.
	Training services for the culture of competition.
	Consumer Assistance and Protection.

Ministry of Education

Program	Activity
Primary school education	Environmental education for sustainable development.
Basic school education	
Diversified school education	
Extracurricular education	

Source: Integrated Governmental Accounting System – SICOIN (for its acronym in Spanish). Consulted in August 2021.



CHAPTER

2

2. SITUATION ANALYSIS

Compared to the countries affiliated with the Central American Integration System, Guatemala has the highest population. Out of the estimated 60.03 million inhabitants in the region in 2021, 28.50% are Guatemalan. This makes the country one of the largest energy consumers in the region. In 2020, the nation recorded a total national consumption of 92,696 kilobarrels equivalent of petroleum (kBEP). This unit of measure serves to compare energy consumption from different sources such as firewood, hydrocarbons (fossil fuels), and electricity.

Energy, as defined by the RAE, is the capacity of a system to perform work. Guatemala's energy is accounted for using a system known as the Energy Balance. The version used in the country was created by the Latin American Energy Organization (OLADE).

Guatemala's energy balance reveals that firewood is the energy source that supplies more than 50% of the annual energy demand of the national population. This is due to activities mainly carried out in households, especially those in rural areas.

Regarding hydrocarbon consumption (fuels used for cooking and maritime, aerial, and terrestrial mobility), the country imports its entirety. Consequently, the conditions of the international oil market influence the price of hydrocarbons at the national level and the supply capacity of these fuels. For instance, in 2020, 33.40 million barrels of general-use hydrocarbons were imported (LPG, premium and regular gasoline, low-sulfur and ultra-low-sulfur diesel), of which 95% was used to meet national demand.

Additionally, 4.62 million barrels of hydrocarbons used in the industrial sector (bunker or fuel oil and petroleum coke) were imported, which supplied 97% of national demand. In both instances, it's evident that Guatemala relies on the international hydrocarbon market for the activities of various sectors, with an average daily consumption of 104,160-barrel equivalents of petroleum.

Being dependent on the fluctuation of oil prices in the international market, the Guatemalan population is impacted by changes in costs.

An important element to analyze is climate change. The effects caused by this are reflected in the variation of climates that have historically been characterized in the different territorial zones of Guatemala. For instance, if by 2050 the temperature rises between 0.5 to 2°C, there would inevitably be a reduction of over 50% in humid and very humid forests, over 50% in montane forests, and over 50% in rainforests. Concurrently, dry, and very dry forests would increase by more than 55%².

This impacts the availability of water resources for various purposes, such as human consumption, health, irrigation, and electricity generation, among others.

² Rafael Landivar University, Climate Change and Biodiversity. Elements to analyze their interactions in Guatemala with an ecosystemic approach. Scenario B2. [Online]. <https://www.url.edu.gt/publicacionesurl/FileCS.ashx?Id=40423>. [Accessed: September 2021].



Likewise, the depletion of forests results in a reduced possibility of obtaining firewood as an energy resource.

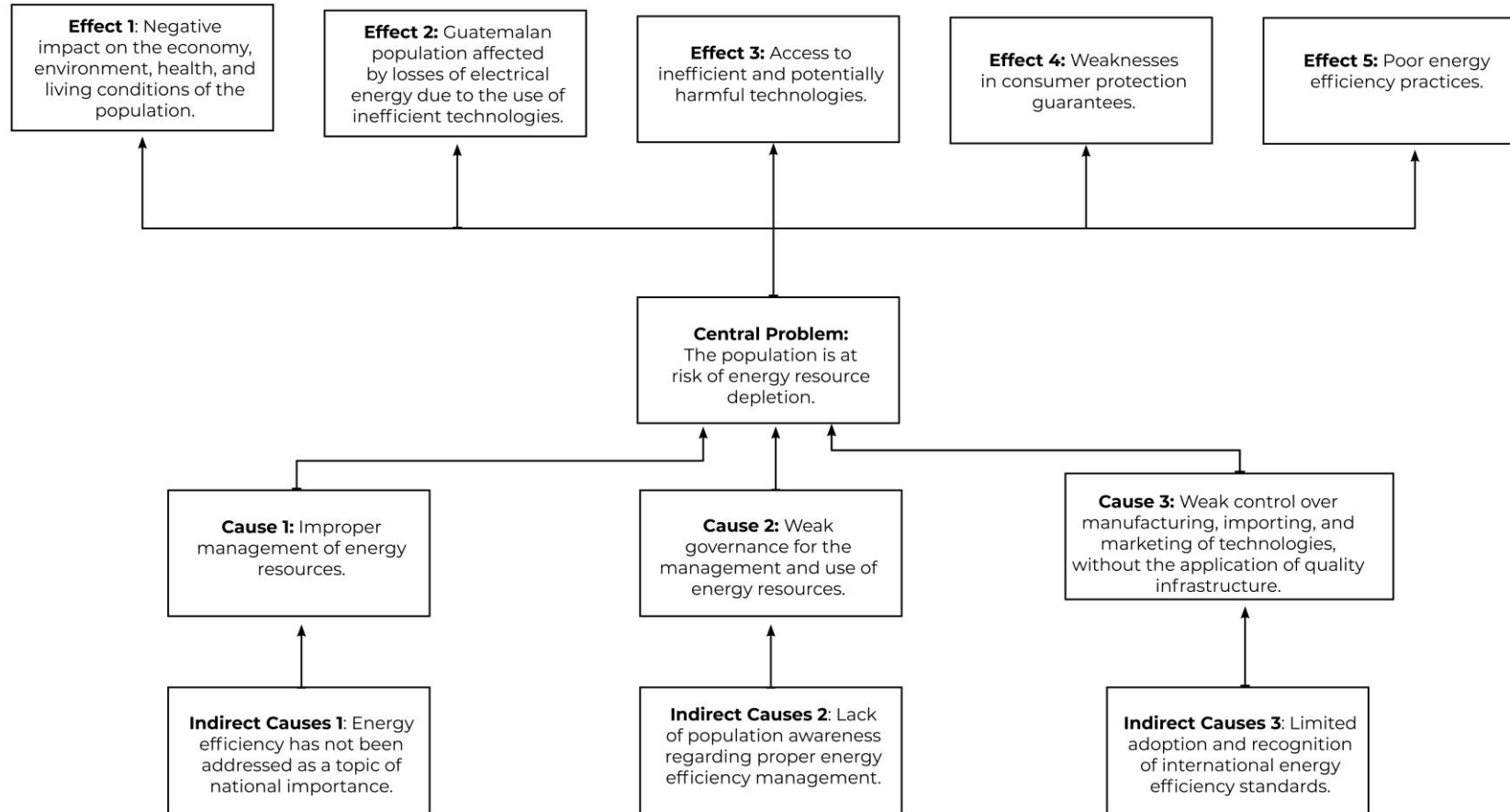
All the above will be exacerbated by rapid population growth³, and proportionally, by the increased demand for energy resources, including electricity, water, firewood, and hydrocarbons.

Given the general context presented above, it can be identified that the Guatemalan population is at risk of exhausting available energy resources. Therefore, it is an issue that has been placed on the public agenda to mobilize various stakeholders to address this problem, with the State, through the Ministry of Energy and Mines, being responsible for intervening in its solution.

From the identified problem, an analysis of the causal factors was carried out, as well as the effects it causes. To interpret this, the problem tree is presented below.

³ Average annual population growth of 319,360 people.

Figure 1. Problem Tree.



Source: Proprietary Production.



Figure 1 shows that the central public issue is that the Guatemalan population is at risk of exhausting the available energy resources. This is based on the identified causes, which are as follows:

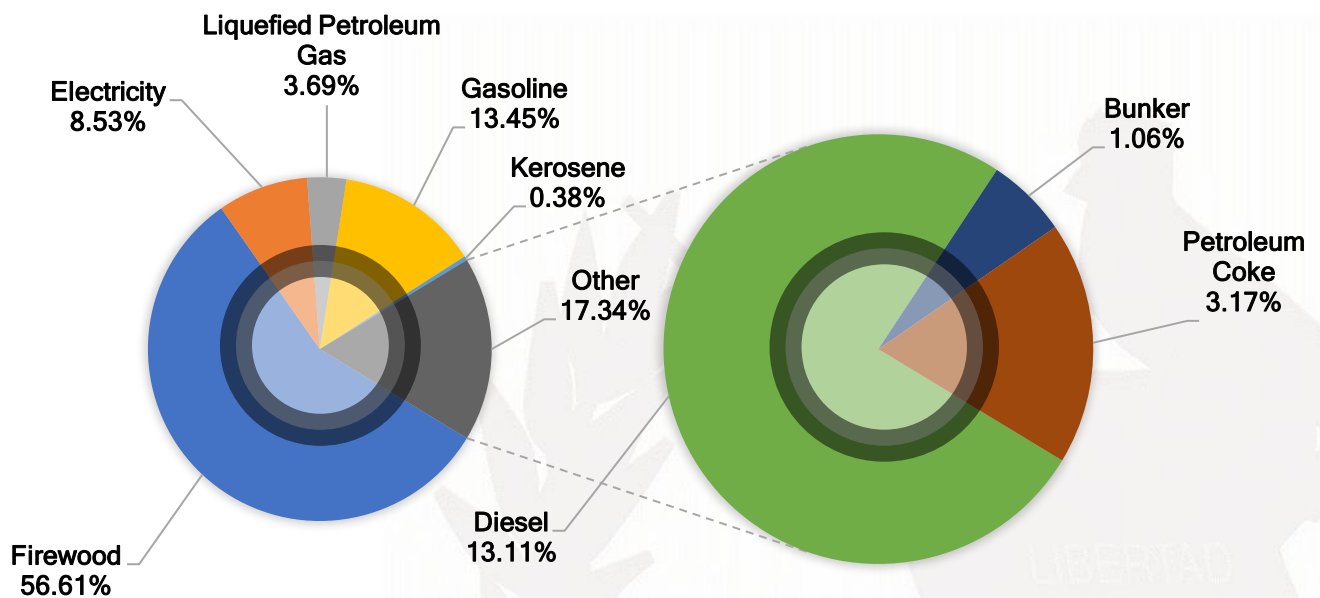
- a) Improper management of energy resources.
- b) Weak governance for the management and use of energy resources.
- c) Poor oversight in the manufacturing, importing, and marketing of technologies without the application of quality infrastructure.

The figure also displays the consequences of the identified problem, illustrating some of the effects it generates, such as:

- a) Negative impact on the economy, environment, health, and living conditions of the population.
- b) The Guatemalan population affected by energy losses due to the use of inefficient technologies.
- c) Access to deficient and potentially harmful technologies.
- d) Weaknesses in consumer protection guarantees.
- e) Poor energy efficiency practices.

To address the analysis of the causes and the effects produced by the stated problem, it's essential to detail the energy resources the country consumes⁴. These are shown in the following figure, represented as percentages based on their share in the final consumption.

Graph 1. Energy Consumption Matrix.



Source: Proprietary Production, based on the Energy Balance 2020, MEM.

⁴ Among the detailed energy resources, petroleum coke is mentioned, which is used in power plants and for industrial purposes.

One of the primary drivers of the identified issue is the improper management of energy resources. Historical data from national energy balances indicates that the demand for firewood as a resource surpasses that of other energy sources, with firewood even being used more diversely than hydrocarbons for ground transportation. Throughout 2020, the use of firewood and Liquefied Petroleum Gas (LPG) for domestic purposes showcased a notable disparity; firewood accounted for 55% of the country's total energy demand, serving applications such as food cooking, water heating, indoor heating, and more. Conversely, the demand for LPG only stood at 3% for analogous purposes. Such variances in consumption across different energy sources can be attributed to factors like the populace's purchasing power, the mismanagement of available resources in both urban and rural settings, and the inherent efficiency of each energy type.

Another instance of the mismanagement of available energy resources is evident in ground transportation, which demonstrates a predominant demand for both premium and regular gasoline. In the 2020 national energy demand, these hydrocarbons accounted for 26%. Pertinently, the analysis should consider the fleet using these hydrocarbons, as the average age of vehicles approaches 19 years, and there are no set standards to verify the operational reliability of each vehicle. Such conditions result in inefficient hydrocarbon consumption.

The table below provides a summary of the national vehicle fleet as of the end of 2020. It reveals that gasoline-powered vehicles overwhelmingly dominate over other modes of ground transportation. Similarly, light vehicles, encompassing both motorcycles and four-wheeled vehicles, constitute 89.93% of the entire vehicle fleet.

Table 2. Vehicle fleet in Guatemala to 2020.

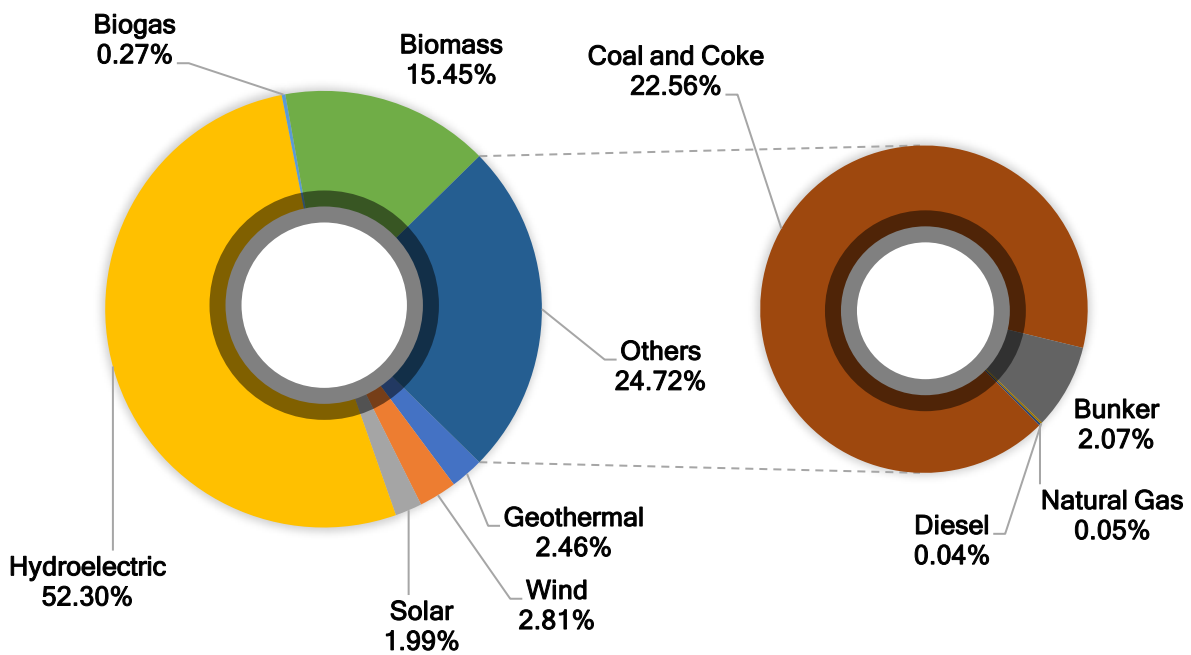
Type of vehicle	DI	GA	OT	EL	PG	HYB	TOTAL
4-wheeled vehicles	188,525	1,818,714	2,018	55	143	2,396	2,011,851
Collective public transportation	71,617	45,338	113	2	7	-	117,077
Freight transportation and delivery	189,753	15,522	44,525	7	4	-	249,811
Motorcycles	162	1,701,829	51	148	25	-	1,702,215
Trimotorcycles	345	28,522	34	27	-	-	28,928
Specialty	900	18,813	134	27	1	-	19,875
Total	451,302	3,628,738	46,875	266	180	2,396	4,129,757

Source: Proprietary Production, with information from the Superintendency of Tax Administration.

Regarding the electrical subsector, its participation accounts for approximately 9% of the national energy demand and is an essential service for the population as it serves as the foundational energy resource for activities carried out in the country, such as: mobility and transportation; manufacturing, agriculture, construction, and mining; urban and rural households; private commerce and services; and public services.

To meet the demand for electrical energy, various resources are used; as depicted in the following chart, showcasing the electrical energy generation matrix for 2020.

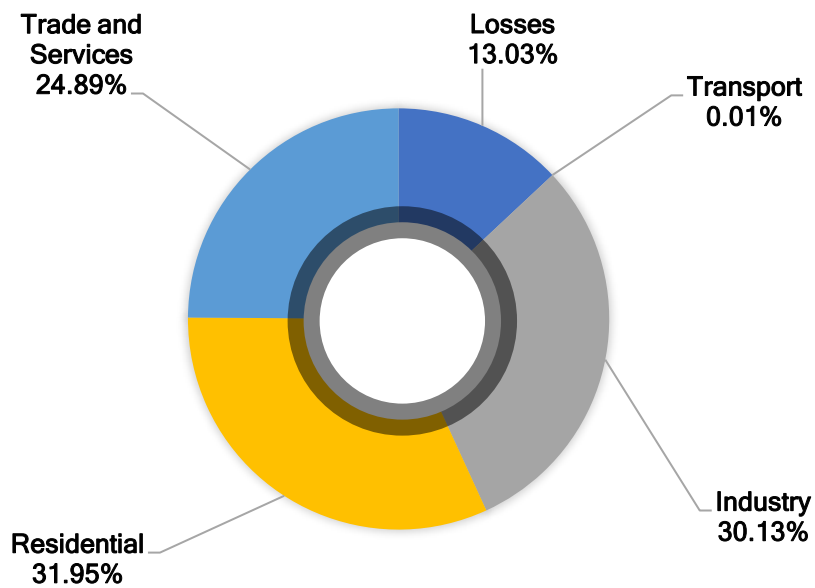
Graph 2. Electrical Energy Generation Matrix for 2020.⁵



Source: Proprietary production with information from the 2020 Statistical Report, MEM.

As for the population's demand for electricity consumption, which is about 9% as indicated above, it is distributed in the groups of commerce and services, transportation, industry and residential, as shown in the following graph.

Graph 3. Electrical Energy Consumption Matrix in the 2020 Energy Balance⁵



Source: Proprietary production, with information from the 2020 Energy Balance.

As the previous chart indicates, 13.03% pertains to electrical energy losses, both technical and non-technical. Technical losses occur when transporting electrical energy from generation points to consumption points; non-technical losses are due to factors unrelated to the operation of the electrical system.

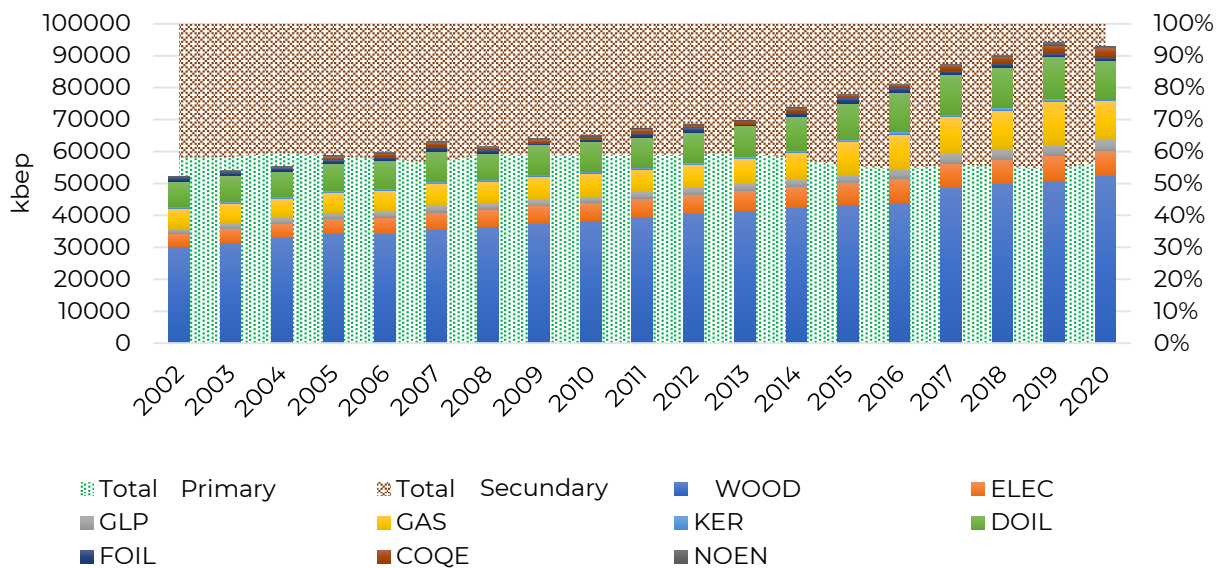
In this context, for the population to have access to electrical energy, there must be infrastructure to transport the energy from generating power plants to end consumers.

By 2020, out of the total existing households in the country (3,717,038 households), 88.90% have access to electrical energy services. For the same year, 412,707 households, equivalent to 11.10%, do not have access to this service.

Energy demand growth in Guatemala is directly proportional to population growth and the development of economic activities. Linked to these conditions are the causes leading to the improper use of the various energy resources previously discussed. Such information can be seen in the next chart.

⁵ There may be rounding differences in land transportation consumption.

Graph 4. Historical National Energy Consumption.



Source: Ministry of Energy and Mines.

Revisiting the central issue identified, the second cause refers to weak governance in managing and using energy resources. This means that there are insufficient inter-institutional coordination mechanisms, preventing proper regulation of the energy sector. Moreover, there's a prevalent lack of general knowledge among the population about the management and efficient use of energy resources, resulting in the various involved sectors not taking on the responsibilities they should.

The Executive Organism Law mandates the Ministry of Energy and Mines, in its role as the guiding and regulatory entity, to promote and encourage the use of new and renewable energy sources to achieve the country's energy self-sufficiency. In compliance with this mandate, MEM has identified a gap regarding specific regulations related to the efficient management and use of energy resources and confirmed that such a situation contributes to the risk of exhausting available energy resources.

On the other hand, public institutional outreach to society in Guatemala has been weak concerning information, dissemination, awareness, and training for the proper management and use of available energy resources to prevent their depletion risk.

Electrical energy consumption in the country has seen significant fluctuations in recent years due to unforeseen external factors. In 2019, consumption reached 11,155 GWh. However, due to the Covid-19 pandemic, consumption dropped by 3.07 percentage points in 2020, down to 10,823 GWh. This decline happened because sectors like commerce and services, as well as industry, were negatively affected, with many ceasing operations either entirely or substantially. Activities have gradually resumed, and in 2021, consumption has rebounded with a projected total demand of 11,755 GWh, equivalent to a 7.93% national recovery compared to 2020.

A third cause threatening the country regarding energy resource shortages is the use of inefficient technologies due to weak controls over their manufacturing, import, and sale. The current Quality National System in Guatemala lacks regulations to ensure quality infrastructure overseeing the mentioned aspects, ensuring technologies meet energy efficiency standards. In other words, there's neither a regulatory framework nor adequately trained human capital to verify product origins or ensure they meet declared requirements.

By 2021, Guatemala has a population projection of 17,109,746 inhabitants⁶, of which 53.85% live in urban areas and 46.15% in rural areas.

As for households in the mentioned year, there are 3,713,595⁷; 88.90% have access to the electrical grid, and 54.42% use wood for cooking.

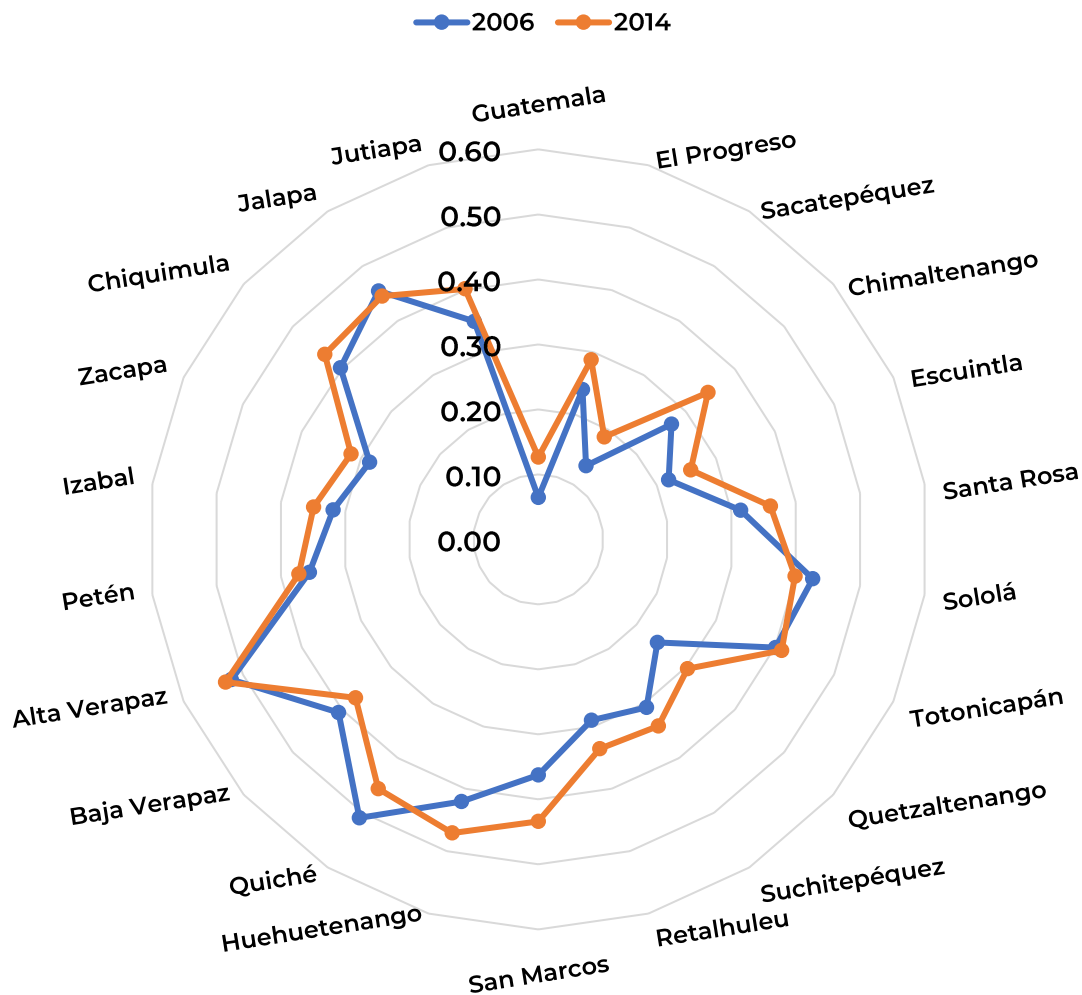
Rural areas account for a significant percentage of the population in poverty and extreme poverty. In 2014, the multidimensional poverty index was at 0.34 nationally.

The multidimensional poverty index is an indicator developed by the United Nations Development Program. This index reflects poverty conditions from various facets, weighted based on their impact on individuals' quality of life. It consists of 10 parameters: Years of Schooling, Children Enrolled in School, Infant Mortality, Nutrition, Electricity, Sanitation, Drinking Water, Flooring, Household Fuel, and Goods. Access to electricity contributes 0.055 to the multidimensional poverty index.

⁶ Total population estimates and projections by sex and age. Revision 2019. INE.

⁷ Proprietary Production. MEM.

Graph 5. Departmental human development index.



Source: National Human Development Report Guatemala, UNDP.

Each department of the country requires specific attention so that the population makes a reasonable use of the available energy resources. As an example based on the information described above, the department of Alta Verapaz has a multidimensional poverty index of 0.529⁸ being the highest in the country; its electricity coverage index is the lowest in the country: 50.26%⁹ as can be seen in the following table that shows the electricity coverage index at the departmental level.

⁸ National Human Development Report Guatemala. UNDP.

⁹ Electricity Coverage Report 2020. MEM.



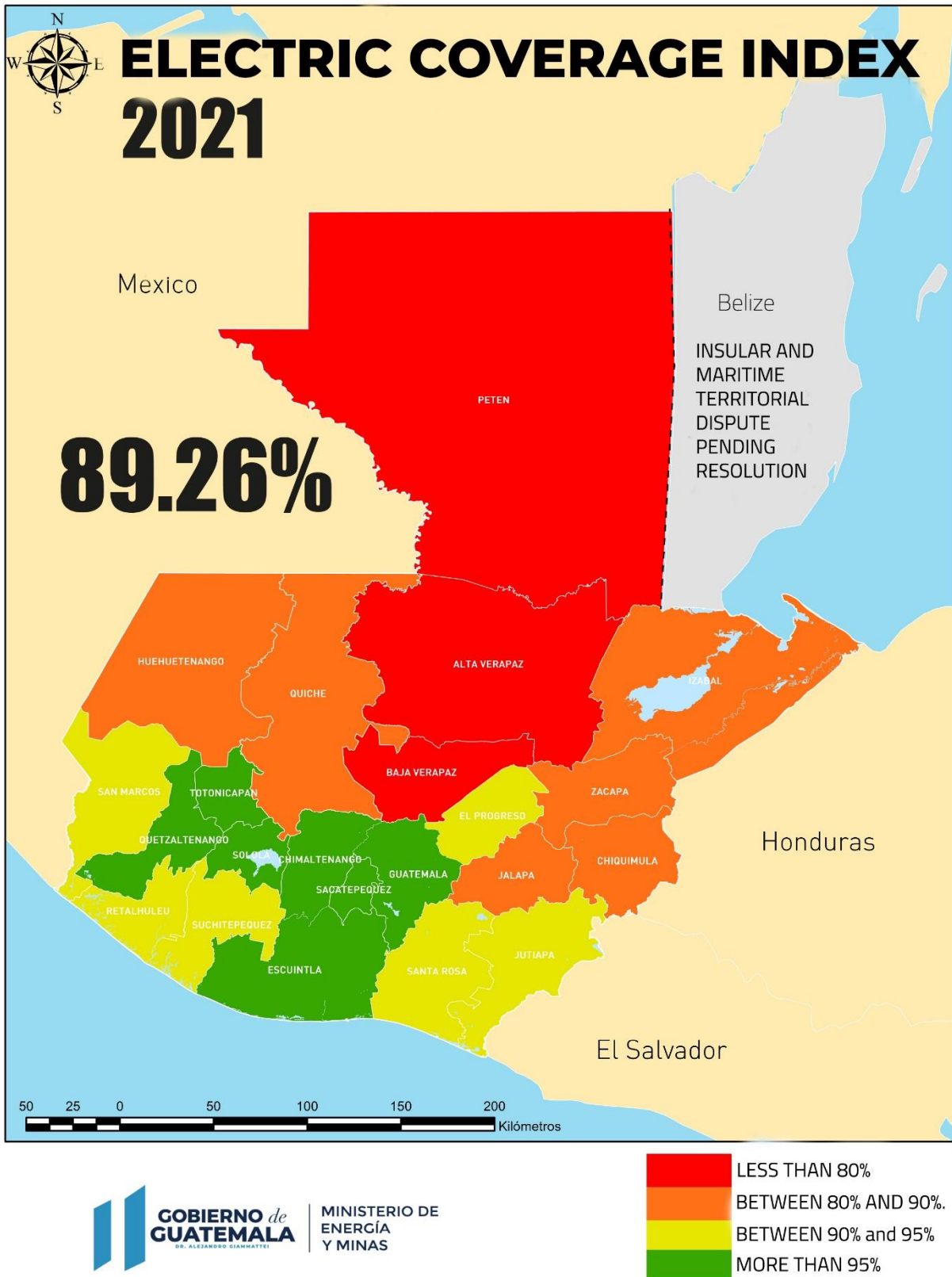
Table 3. Electricity coverage by department as of 2021.

DEPARTMENT	ELECTRICITY COVERAGE INDEX 2021
Guatemala	99.45%
El Progreso	93.04%
Sacatepéquez	99.62%
Chimaltenango	97.48%
Escuintla	97.44%
Santa Rosa	91.79%
Sololá	96.01%
Totonicapán	95.50%
Quetzaltenango	96.51%
Suchitepéquez	94.06%
Retalhuleu	93.89%
San Marcos	90.57%
Huehuetenango	82.69%
Quiché	81.47%
Baja Verapaz	78.34%
Alta Verapaz	50.89%
Petén	74.70%
Izabal	80.46%
Zacapa	89.20%
Chiquimula	81.73%
Jalapa	87.54%
Jutiapa	92.18%
Country average	89.26%

Source: Proprietary Production, with information from the Electric Coverage Report 2021.

The following map shows the national electricity coverage index broken down by department.

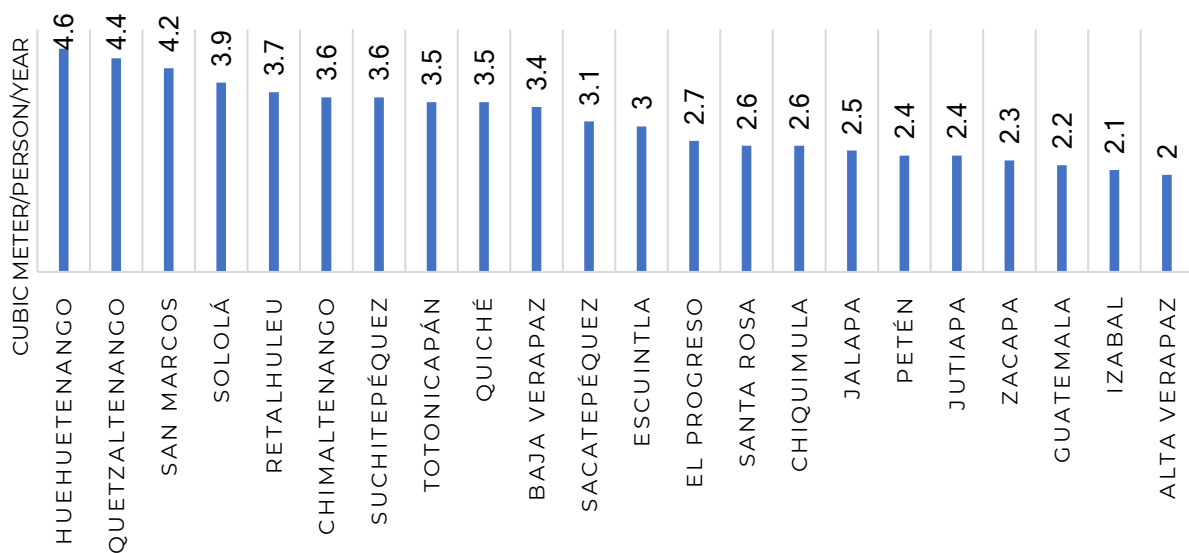
Figure 2. National electricity coverage index 2021.



Source: Electricity Coverage Index 2021, Ministry of Energy and Mines.

Although Alta Verapaz has one of the lowest demands for firewood per capita, it is one of the departments with the highest use of firewood for cooking due to the conditions of human development and access to electricity described above.

Graph 6. Per capita firewood demand in rural areas at the departmental level.



Source: Proprietary Production, with information from Supply and demand of firewood in the Republic of Guatemala, IARNA and INAB.

The above establishes a correlation between human development conditions and the efficient use of available energy resources. This suggests that improving access to diversified and efficient energy resources will contribute to enhancing human living conditions.

Contrary to the previous example, there are departments with better human development conditions and access to energy resources, mainly located in urban areas. As evidence of this, in these areas, there is Liquefied Petroleum Gas (LPG) - also known as propane gas - and electricity as available energy resources for cooking, which are used in proportions of 43.72% and 1.08%, respectively.¹⁰

Despite the above, the regulation and standards for managing and using available energy resources are still weak. Therefore, the governance framework involving various stakeholders in this field needs enhancement.

Following the points previously raised, it is essential to mention some of the most relevant indicators for the topic discussed, which will later help identify the goals corresponding to the policy's development; among them:

- ✓ Electrical coverage
- ✓ Losses in the electricity transmission system
- ✓ Losses in the electricity distribution system
- ✓ Vehicle fleet
- ✓ Greenhouse Gas Emissions (GHG) associated
- ✓ Firewood use

Below is a description and the significance of each.

¹⁰ XII National Population and VII Housing Survey. INE.

Table 4. Indicators for establishing the baseline.

No	Indicator Name	Data	Unit of Measure	Reference Year	Source
1	Electrical coverage	88.90	%	2020	Electrical Coverage Index 2020, MEM
2	Losses in the electricity transmission system	3.08	%	2020	Statistical report 2020, MEM
3	Losses in the electricity distribution system	Not available	%	2021	Study will be carried out by MEM
4	Vehicle fleet	4,129,757	Units	2020	Vehicle fleet December 2020, SAT
5	GHG Emissions associated with the energy sector	17.83	Million Tons of CO ₂ e ¹¹	2020	National Energy Balance 2020, MEM
6	Firewood use	52,362.70	kBEP ¹²	2020	National Energy Balance 2020, MEM

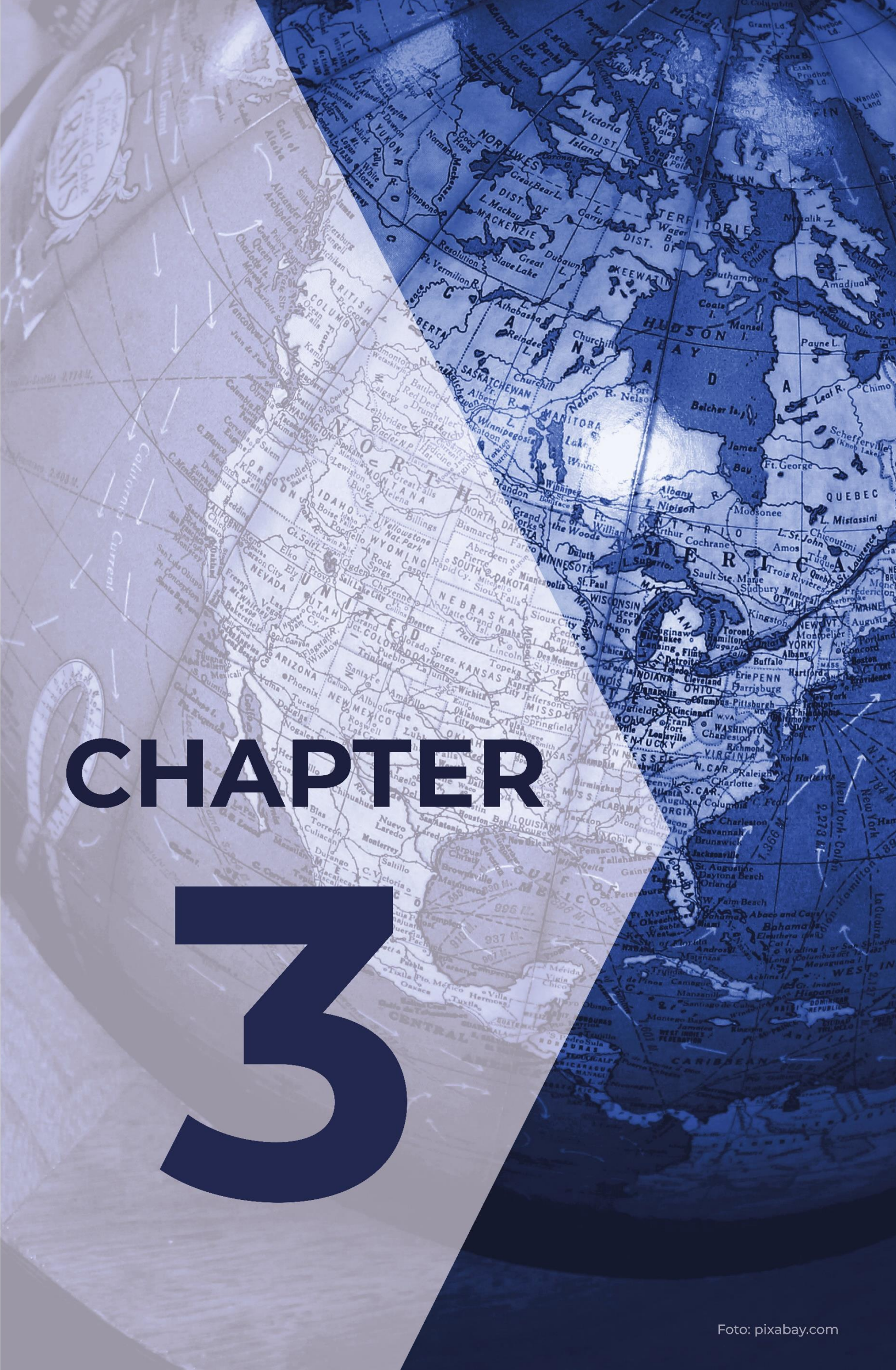
Source: Proprietary Production,

Next, each indicator is defined:

- ✓ Electrical coverage: number of households with electricity service out of the total households in the country.
- ✓ Losses in the electricity transmission system: electrical energy losses occurring during the transmission of electricity from power generation plants to electrical substations.
- ✓ Losses in the electricity distribution system: electrical energy losses occurring between electrical substations for distribution service and the connections of the end-users.
- ✓ Vehicle fleet: total number of vehicles registered in Guatemala.
- ✓ GHG Emissions associated with the energy sector: annual calculation of GHG emissions from the energy sector.
- ✓ Firewood use: national firewood consumption from an energy perspective.

¹¹ The dimensional unit "M Ton CO₂e" stands for Million Tons of Carbon Dioxide Equivalent. It is used to account for different greenhouse gases in an equivalent measure.

¹² The dimensional unit "kBEP" stands for kilo barrel of oil equivalent. It is used to account for various forms of energy in an equivalent measure.

A historical map of North America, showing various territories and states. The map is overlaid with a blue, semi-transparent layer that is darker in some areas, creating a gradient effect. A large, bold, dark blue number '3' is positioned in the lower-left quadrant of the image. The map includes labels for various regions such as 'NORTH WEST DIST. OF MACKENZIE', 'SASKATCHEWAN', 'ALBERTA', 'ONTARIO', 'NEW YORK', and 'MEXICO'. Major cities like 'Vancouver', 'Seattle', 'Portland', 'San Francisco', 'New York', and 'London' are also visible. The map is oriented with North at the top, and the Atlantic Ocean is on the right side.

CHAPTER 3

3. JUSTIFICATION

The Guatemalan population is in a transition period where, in its various daily activities, it consumes energy resources in a disorganized and inefficient manner to the point where there is a risk of depletion. This poses a national problem that urgently requires addressing energy efficiency as a national matter to solve the identified issue. This should involve the participation of different sectors of the population, proposing feasible and sustainable solutions within a specific regulatory framework.

Several reasons have led the country to this risky situation, among which stand out: improper management of available energy resources, weak intersectoral coordination or governance for its management and use, and lax control regarding the manufacturing, importing, and marketing of technologies without adequate quality infrastructure. Underlying these reasons is the national underestimation of energy efficiency's importance; the population's unfamiliarity with the subject, the lack of education and information promoting efficient energy use, and the absence of a regulatory framework specifying processes and technical specifications on energy efficiency.

This leads to the improper and inconvenient utilization of energy resources, negatively impacting the economy, environment, health, overall living conditions, and, consequently, the holistic development of the population, even if they are unaware of such links.

Furthermore, a significant portion of Guatemala's population¹³, increasingly relies on technologies for daily activities, many of which are deficient, inefficient, and potentially harmful, without robust consumer protection methodologies.

The properties of this problem, although not predictable in terms of time left before the complete exhaustion of energy resources, is alarming given the country's rapid pace. This is exacerbated by the current lack of a comprehensive framework providing guidance on action and intervention.

These circumstances make the identified problem a public issue demanding a national policy. This policy should promote energy efficiency as a solution to address the causes mentioned and as a pillar supporting the country's sustainable development.

¹³ According to the results (data) obtained in the XII National Population Census and VII Housing Census, conducted in 2018.

Following are hard data evidencing the use of energy resources in Guatemala, directly indicating the need for a comprehensive management framework:

- ✓ Energy usage.¹⁴.
- ✓ 88.91% of the population has access to the electricity grid.¹⁵.
- ✓ 54.42% of households use firewood for cooking.
- ✓ 43.72% use propane gas for cooking.
- ✓ 1.08% use electricity for cooking.
- ✓ Technology usage¹⁶.
- ✓ 65.34% of households have a radio.
- ✓ 70.51% have a television.
- ✓ 21.26% have a computer.
- ✓ 99.73% have a stove.
- ✓ 48.45% have a refrigerator.
- ✓ 19.96% have a washing machine.
- ✓ 22.74% have a motorcycle.
- ✓ 23.81% have a car.
- ✓ 14.02% use hot water.
- ✓ 23.77% have a water tank.

Aligned with the above, it's essential to highlight the most relevant areas in the addressed subject:

- ✓ Electricity coverage: number of households with electricity service among the total number of households in the country.
- ✓ Electric coverage: households with electrical service.
- ✓ Losses in the electric energy transport system: losses during transmission from power plants to substations.
- ✓ Losses in the electric energy distribution system: losses between distribution substations and end-users.
- ✓ Vehicle fleet: number of registered vehicles in Guatemala.
- ✓ Greenhouse Gas Emissions -GHG- associated: annual GHG emissions from the energy sector.
- ✓ Firewood usage: national firewood consumption from an energy perspective.

¹⁴ Data extracted from the XII Population and VII Housing Census.

¹⁵ Information updated to 2020.

¹⁶ Data extracted from the XII Population and VII Housing Census.

Each of these areas is significant for this policy, serving as indicators for baseline construction in its respective implementation. This document outlines the goals associated with each of these areas.

Furthermore, both the population's education level and its participation in the labor market directly influence the methodology implemented by this policy to promote energy efficiency awareness. Collectively, they serve as the foundation from which differentiated information and training tools will be built, allowing access to efficient technology.

Education levels and active economic population data¹⁷ are illustrated below:

- ✓ 31.69% of the population has had access to primary education.
- ✓ 55.58% have completed at least the third grade of primary education.
- ✓ Only 18.30% reach basic education level.
- ✓ 5.04% are pursuing higher education.
- ✓ Of the total population of working age, about 49% are economically active.
- ✓ The remaining 51% are unemployed or seeking job opportunities.

Given the above, this policy provides a general framework to develop actions aimed at legislating, standardizing, educating, raising awareness, and improving lighting, mobility, and cooking conditions accessible to the population. It also focuses on environmental conservation, GHG mitigation, morbidity reduction, and harnessing renewable energy sources.

All these matters significantly affect the daily lives of Guatemalans. Implementing an orderly and efficient use of energy resources can enhance the living standards of the entire population, both directly and indirectly.

For these reasons, given the magnitude and scope of the problem addressed and the impact that solutions will generate in the country, it is essential to approach the subject through the implementation of a Public Policy. The responsibility and coordination of its approach should be assumed by the State.

¹⁷ Data extracted from the XII Population Census and VII Housing Census.



CHAPTER

4

4. STRATEGIC FRAMEWORK

This framework consists of a set of strategic guidelines aimed at solving the identified public problem, which is "the population is at risk of energy resources depletion." An overall objective, four specific objectives, and four strategic axes have been defined for this, guiding action lines and the outcomes to be achieved.

General Objective

Based on the situation analysis, an overall objective is presented, reflecting the expected results through inter-institutional and cross-sectoral interventions. It is defined as follows:

Establish guidelines for the management and efficient use of available energy resources to contribute to the sustainable development of the Guatemalan population, in an environment that also promotes conservation and environmental protection by 2050.

Specific Objectives

These objectives have been set to achieve the general objective, addressing the various causes identified in the central problem identification phase.

- **Promote Efficient Technologies:** Encourage the use of efficient technologies to maximize the utilization of energy resources, through human capital trained in different sectors of the country.
- **Economic Protection:** Contribute to the protection of the economy and well-being of the Guatemalan population with access to electrical coverage.
- **Strengthen Coordination:** Strengthen coordination and consensus mechanisms between public institutions and the population to optimize the use of available energy resources in the country.
- **Increase Research and Development:** Increase the opportunity for research and development of energy efficiency projects for the benefit of energy-consuming sectors in the country.



CHAPTER

5

5. STRATEGIC AXES

The specific objectives guide the definition of strategic axes that are established as prioritized intervention areas that will enable the necessary inter-institutional coordination to achieve the results set out in this policy.

Efficient Management and Use of Energy Resources: This is conceived as a proper management of all primary energy resources characterized by coming from natural sources, and secondary resources that result from their transformation. Their use should enhance the quality of life of the country's inhabitants without implying a risk of exhausting the various sources of these resources.

Electric Subsector: This comprises activities of generation, transmission, distribution, marketing, and use of electrical energy in compliance with current legislation. Regarding the energy generation activity, it involves converting a primary or secondary energy source into electrical energy using specific technologies. Transmission involves delivering electrical energy to distribution systems, which, in turn, provide electricity to the population. Marketing targets major electricity consumers, requiring commitment from the involved parties.

Governance and Social Actors: This refers to the coordination relationship that must be established between the actions of the central government, local governments, and organized civil society. Each of these actors should take on their share of responsibility and actions according to their competencies, scope, capabilities, purposes, and objectives regarding energy efficiency for the comprehensive development of the population.

Innovation and Technological Development: This involves establishing the necessary conditions to develop specialized research areas in energy efficiency that drive innovation processes and the development of new technologies. These should enhance the responsible use of energy resources by the Guatemalan population, prioritizing research actions from the academic sector and specialized organizations in the country.

The tables presented below detail the strategic framework for each previously mentioned specific objective.

Table 5. Strategic Framework for Specific Objective 1.

Specific Objective 1: Promote the use of efficient technologies to maximize the utilization of energy resources, through human capital trained in different sectors of the country.			
Strategic Axis	Lines of action	Results	Actions
Efficient management and use of energy resources	Access to efficient technology	The different energy consuming sectors of the Guatemalan population implement strategies to facilitate access to efficient technology.	Design tools and methodologies to facilitate access to efficient technologies.
		By 2032, the necessary legal, technical, social and commercial conditions have been created so that 15% of the vehicle fleet in Guatemala will be made up of electric vehicles.	Develop the legal framework that regulates the conditions necessary for electric mobility to be viable for the Guatemalan population.
			Build the national electric mobility plan. Periodically update the national electric mobility plan.
	Proper use of efficient technology	In Guatemala there are technical norms that regulate the adequate use of efficient technology for energy consumption.	Develop at all levels training, dissemination and promotion of good practices in the management and efficient use of energy resources under technical standards.
			Develop programs for the efficient management and use of biomass in its different forms under technical standards.
		The student population acquires basic concepts on good practices in energy efficiency and efficient technologies.	Socialize basic concepts on good energy efficiency practices and efficient technology in the educational system.



Specific Objective 1: Promote the use of efficient technologies to maximize the utilization of energy resources, through human capital trained in different sectors of the country.

Strategic Axis	Lines of action	Results	Actions
		<p>Requests for occupational training, technical assistance, and labor certification under labor competency standards.</p>	<p>Certifiable occupational education and training.</p> <p>Technical assistance in energy efficiency.</p> <p>Labor certification under labor competency standards.</p>
		<p>Public institutions, the organized private sector and civil society acquire basic concepts on good practices in energy efficiency and efficient technologies.</p>	<p>Disseminate basic concepts on good energy efficiency practices and efficient technology in the formal and informal educational systems, as well as in the mass media with cultural and linguistic relevance.</p> <p>Create permanent higher education programs specializing in energy efficiency through agreements to obtain the necessary resources.</p> <p>Establish inter-institutional technical working groups to serve as official communication links for planning and carrying out periodic energy efficiency training.</p>
	<p>Involvement of the different sectors</p>	<p>The use of biomass has been optimized in all sectors of the country.</p>	<p>Implement strategies to reduce the percentage of households that use firewood for cooking, as a contribution to the mitigation of Greenhouse Gases.</p> <p>Develop programs and/or strategies to improve the efficiency of biomass consumption in its different forms in the sectors that use it, as a contribution to the</p>



Specific Objective 1: Promote the use of efficient technologies to maximize the utilization of energy resources, through human capital trained in different sectors of the country.

Strategic Axis	Lines of action	Results	Actions
			mitigation of Greenhouse Gases.
		Desired transformation in the population.	Ensure appropriate coordination mechanisms between the different sectors involved.

Source: Proprietary Production, Ministry of Energy and Mines.

Table 6. Strategic framework for specific objective 2.

Specific Objective 2: Contribute to the protection of the economy and welfare of the Guatemalan population that has access to electricity coverage.

Strategic Axis	Lines of action	Results	Actions
Electrical subsector	Quality of service	The country's main stakeholders are optimizing electric power transmission and distribution systems to reduce technical losses.	Establish mechanisms to ensure that electric energy losses in the transmission grid do not exceed 3%.
			Incorporate loss reduction as a priority in the Transportation System Expansion Plan.
			Establish coordination and articulation mechanisms so that electric energy losses in the distribution network do not exceed 10%.
			Develop together with the distributors, a loss reduction plan with a minimum horizon of 10 years, as a measure of indirect contribution to the mitigation of Greenhouse Gases.
	Access to quality technology	Mechanisms have been implemented to reduce or eliminate the importation and domestic manufacture of	Establish inter-institutional and intersectoral coordination mechanisms to promote access to efficient technologies for households that join the national electricity grid.



Specific Objective 2: Contribute to the protection of the economy and welfare of the Guatemalan population that has access to electricity coverage.

Strategic Axis	Lines of action	Results	Actions
		inefficient electrical equipment.	<p>Encourage the creation and operation of Technical Standardization Committees (TCN), dedicated to the adoption of energy efficiency standards for electrical equipment, where at least one technical standard is approved every two years.</p> <p>Generate mechanisms that allow compliance with the standards produced by the TCN.</p> <p>Conduct a market study on the importation and circulation of electrical equipment in the domestic market.</p>
	Consumer protection	It has contributed to the protection of the economy and welfare of users of electrical equipment in residential, commercial, industrial and public administration environments.	<p>Develop a proposal for a law and its due regulation on energy efficiency, which orders its institutionalization in the country.</p> <p>Develop technical regulations for the control and monitoring of technologies that must comply with standardized energy efficiency requirements, as an indirect contribution to the mitigation of Greenhouse Gases.</p>

Source: Proprietary Production, Ministry of Energy and Mines.

Table 7. Strategic framework for specific objective 3.

Specific Objective 3: Strengthen coordination and consensus mechanisms between public institutions and the population to optimize the use of available energy resources in the country.

Strategic axis	Lines of action	Results	Actions
Governance and social co-responsibility	<p>Institutional strengthening at the territorial level</p> <p>Interinstitutional and intersectoral coordination.</p> <p>Citizen participation in the search for and making of decisions.</p>	Capacity building to ensure an effective institutional response, along with the creation of mechanisms for social participation.	Create the necessary mechanism to make the institutionalization of energy efficiency in the country viable.
			To develop methodological tools that facilitate the articulation of institutional planning in the achievement of the objectives of this policy.
			Coordinate with the different sectors of the organized civil society and local governments, to build and implement methodologies that allow the optimization of available energy resources.
			Promote strategies that facilitate access to soft loans accessible to Guatemalan families so that they can access efficient technologies.

Source: Proprietary Production, Ministry of Energy and Mines.

Table 8. Strategic framework for specific objective 4.

Specific Objective 4: Increase the opportunity for research and development of energy efficiency projects for the benefit of the country's energy consuming sectors.			
Strategic Axis	Lines of action	Results	Actions
Innovation and technological development	Strategic alliances	Academia, public institutions and private entities have information on research and development opportunities for energy efficiency projects.	Create databases on donors and private institutions that provide access to financing for the development of energy efficiency.
			Sign bilateral agreements for the development of energy efficiency projections.
			Conduct energy audits in public buildings, guided by MEM and executed by external collaborators.
	Project construction and implementation	Stakeholders have the necessary strategies and resources for project development and implementation.	Establish fluid communication channels with the entities involved that require the execution of energy efficiency projects justified on the basis of energy audits.
	Research and Innovation	Universities, research centers, public institutions and the organized private sector have opportunities for research and development of energy efficiency projects.	Promote the mandatory use of ethanol as a fuel additive by 2023 as a measure to contribute to the mitigation of Greenhouse Gases.
			Promote opportunities for research and development of energy efficiency projects, which in turn generate investment and economic growth in the country.
Promote the creation and operation of Technical Standardization Committees (TCN), dedicated to the adoption of standards and schemes for the correct			

Specific Objective 4: Increase the opportunity for research and development of energy efficiency projects for the benefit of the country's energy consuming sectors.

Strategic Axis	Lines of action	Results	Actions
			<p>execution of energy audits and energy management systems.</p> <p>Promote the creation of an energy efficiency TCN, specifically in the public sector, aimed at applying best practices in energy efficiency and energy management in public buildings.</p> <p>Generate tools to obtain data on issues related to the energy sector and its mitigation of greenhouse gases.</p>

Source: Proprietary Production, Ministry of Energy and Mines.





CHAPTER

6

6. ACTION PLAN

To comply with the guidelines of this policy, as indicated in the strategic framework, an action, coordination, and articulation plan must be created. The minimum considerations necessary for the involved institutions to incorporate into their institutional planning are detailed in tables below, facilitating the fulfillment of this policy.

It's essential to consider the following general criteria:

- **Territoriality:** This policy is of national character; therefore, its guidelines apply throughout the country.
- **Coverage:** The guidelines that make up this policy will be implemented progressively, gradually benefiting the country's population, based on the timing set in the results.
- **Temporality:** The deadlines observed in the tables correspond to the results in the following manner: Immediate Term (2023), Short Term (2027), Medium Term (2032), and Long Term (2050).



Table 9. Access to efficient technology.

Line of action	Access to efficient technology						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Number of tools and methodologies implemented to facilitate access to efficient technologies.	In the long term, 80% of the industrial, residential, transportation, commerce and services sectors have easy access to efficient technologies.	Nonexistent baseline	The different energy consuming sectors of the Guatemalan population implement strategies to facilitate access to efficient technology.	Design tools and methodologies to facilitate access to efficient technologies.	Baseline created, tools and methodologies implemented.	Long	Public institutions and organized private sector entities.
Constructed baseline							
Number of vehicles with alternative technologies to conventional ones circulating in the country.	15% of the vehicle fleet operates with alternative technologies to conventional ones.	4,000,000 vehicles in the country.	By 2032, the necessary legal, technical, social and commercial conditions have been created so that 15% of the vehicle fleet in	Develop the legal framework that regulates the conditions necessary for electric mobility to be viable for	Annual statistical report on the energy sector published by the Ministry of Energy and Mines.	Medium	CNEE, MINFIN, CIV, MINECO, SAT, organized private sector entities and civil society, each within the scope of its competence.

Line of action	Access to efficient technology						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
			Guatemala will be made up of electric vehicles.	the Guatemalan population.			
				Build the national electric mobility plan.	Publication of the national electric mobility plan.	Immediate	
				Periodically update the national electric mobility plan.		Medium	

Source: Proprietary Production, Ministry of Energy and Mines.



Table 10. Proper use of efficient technology.

Line of action		Proper use of efficient technology					
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Number of technical standards approved and adopted.	In the medium-term Guatemala has adopted, adapted or created at least one technical standard for each of the following areas: 1) efficient	10 technical standards	In Guatemala there are technical norms that regulate the adequate use of	Develop at all levels training, dissemination, and promotion of good practices in the management and efficient use of energy resources under technical standards.	Technical standards approved and implemented.	Long	MINECO
Number of programs for the efficient management and use of biomass in its different forms under technical standards.	management and use of energy resources, 2) constructive aspects of technologies that make use of biomass, and 3) on biomass use.	0	efficient technology for energy consumption.	Develop programs for the efficient management and use of biomass in its different forms under technical standards.	Execution of programs for the efficient management and use of biomass in its different forms.	Medium	

Line of action		Proper use of efficient technology					
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Percentage of student population informed about good energy efficiency practices and motivated to implement them.	Student population with information on basic concepts of good energy efficiency practices and efficient technologies, covering at least 50% of the student population.	Nonexistent baseline	The student population acquires basic concepts on good practices in energy efficiency and efficient technologies.	Socialize basic concepts on good energy efficiency practices and efficient technology in the educational system.	Resources of the Ministry of Education	Long	MINEDUC
Contents for certification requests on energy efficiency duly implemented.	100% of requests met with certifications.	Nonexistent baseline	Requests met for occupational training, technical assistance, and labor certification	Certifiable occupational education and training. Technical assistance in energy efficiency.	POA INTECAP Results Report	Long	INTECAP

Line of action		Proper use of efficient technology					
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
			under labor competency standards.	Labor certification under labor competency standards.			
Percentage of population informed about good energy efficiency practices and motivated to implement them.	100% of the population has access to information on good energy efficiency practices and long-term efficient technologies.	Nonexistent baseline.	Public institutions, the organized private sector and civil society acquire basic concepts on good practices in energy efficiency and efficient technologies.	Disseminate basic concepts on good energy efficiency practices and efficient technology in the formal and informal educational systems, as well as in the mass media with cultural and linguistic relevance.	Outreach campaigns	Long	CNEE, MARN, each within the scope of their competence.
Number of higher education programs with a specialty in energy	3 Higher education programs specializing in energy efficiency	0		Create permanent higher education programs specializing in energy efficiency	Letters of understanding, inter-institutional agreements, strategy documents.	Medium	Academy

Line of action		Proper use of efficient technology					
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
efficiency implemented.	in the medium term.			through agreements to obtain the necessary resources.			
Number of energy efficiency training programs developed.	100% of public institutions trained in energy efficiency in the long term.	0		Establish inter-institutional technical working groups to serve as official communication links for the planning and execution of periodic energy efficiency training.		Long	MINECO
	At least 50% of the organized private sector is trained in energy efficiency in the long term.				Long		

Table 11. Involvement of the different sectors.

Line of action	Involvement of the different sectors						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Percentage of households using firewood for cooking.	Households using firewood for cooking within the national territory have been reduced by up to 20%.	54.42%	The use of biomass has been optimized in all sectors of the country.	Implement strategies to reduce the percentage of households that use firewood for cooking, as a contribution to the mitigation of Greenhouse Gases.	Results of future national population and housing censuses.	Long	Public institutions, organized private sector entities and civil society.
Number of programs and strategies implemented to improve the efficiency of biomass consumption in its different forms.	At least 5 programs and strategies implemented to improve the efficiency of biomass consumption in its different forms.	Nonexistent baseline		Develop programs and/or strategies to improve the efficiency of biomass consumption in its different forms in the sectors that use it, as a contribution to the mitigation of Greenhouse Gases.	Annual statistical report on the energy sector published by the Ministry of Energy and Mines.		

Line of action	Involvement of the different sectors						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Percentage share of firewood in the national energy balance.	The share of firewood in the energy balance participation matrix has been reduced by up to 20%.	56.41%	Desired transformation in the population.	Ensure appropriate coordination mechanisms between the different sectors involved.	Results of national energy balances, annual publications.	Immediate	
				Determine the degree of sustainability of the use of firewood for energy purposes in the national territory.			

Source: Proprietary Production, Ministry of Energy and Mines.

Table 12. Quality of service.

Line of action	Quality of service						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Percentage of transmission system losses	Electrical energy losses in the transmission system do not exceed 3%.	3.08%	The country's main stakeholders are optimizing electric power transmission and distribution systems in order to reduce technical losses.	Establish mechanisms to ensure that electric energy losses in the transmission grid do not exceed 3%.	Annual statistical report published by MEM.	Long	Private entities in the electricity subsector.
				Incorporate loss reduction as a priority in the Transportation System Expansion Plan.	Transmission System Expansion Plan.	Immediate	
Percentage of distribution system losses	Electric energy losses in the distribution	Nonexistent baseline.		Develop a technical study to establish the baseline.	Annual statistical report published by MEM.	Immediate	

Line of action	Quality of service						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
	system do not exceed the target established in the loss reduction plan.			<p>Develop a loss reduction plan with a minimum horizon of 20 years, together with distributors and transporters, that establishes a maximum percentage goal for losses in the distribution network as a measure of indirect contribution to the mitigation of Greenhouse Gases.</p> <p>Establish the coordination and articulation mechanisms to execute the electric energy</p>		<p>Medium</p> <p>Long</p>	

Line of action	Quality of service						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
				loss reduction plan that does not exceed the goal established in the plan.			

Source: Proprietary Production, Ministry of Energy and Mines.



Table 13. Access to quality technology.

Line of action		Access to quality technology					
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Rural population makes use of efficient technologies.	100% of the rural population can have access to efficient technologies.	Nonexistent baseline.	Mechanisms have been implemented to reduce or eliminate the importation and domestic manufacture of inefficient electrical equipment.	Establish inter-institutional and intersectoral coordination mechanisms to promote access to efficient technologies for households that join the national electricity grid.		Long	MINECO, SAT, private entities of the electricity subsector.
Number of technical standards.	At least 5 energy efficiency technical standards approved in the next 10 years.			Encourage the creation and operation of Technical Standardization Committees (TCNs), dedicated to the adoption of energy efficiency standards for		Long	

Line of action	Access to quality technology						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
				electrical equipment, where at least one technical standard is approved every two years.			
Percentage of efficient equipment based on technical standards acquired by the population.				Generate mechanisms that allow compliance with the standards produced by the CTN.		Long	
Market study developed on the importation and circulation of electrical equipment in the domestic market.	At least one market study developed in the next 2 years.			Conduct a market study on the importation and circulation of electrical equipment in the domestic market.	Immediate		MINECO, AGEXPORT

Source: Proprietary Production, Ministry of Energy and Mines.

Table 14. Consumer protection.

Line of action		Consumer protection.					
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
	Proposed law on energy efficiency.	Nonexistent baseline.	It has contributed to the protection of the economy and welfare of users of electrical equipment in residential, commercial, industrial and public administration environments.	Develop a proposal for a law and its regulations on energy efficiency, which orders its institutionalization in the country.	Proposed law on energy efficiency.	Immediate	CNEE, organized private sector
	GHGs mitigated using efficient technologies.		Develop technical regulations for the control and monitoring of technologies that must comply with standardized energy efficiency requirements, as a means of indirectly contributing to the mitigation of greenhouse gases.	Annual statistical report published by MEM.	Long	MINECO	

Source: Proprietary Production, Ministry of Energy and Mines.

Table 15. Institutional strengthening.

Line of action	Institutional strengthening at the territorial level Interinstitutional and intersectoral coordination. Citizen participation in the search for and making of decisions.						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Number of public institutions working on the creation of a mechanism to facilitate the institutionalization of energy efficiency in Guatemala.	Mechanism built, validated, and implemented for the institutionalization of energy efficiency in the country.	Nonexistent baseline	Capacity building to ensure an effective institutional	Create the necessary mechanism to make the institutionalization of energy efficiency in the country viable.	Published document containing the mechanism.	Immediate	Executive Branch Institutions
Number of methodological tools created and implemented in a participatory manner in the institutions that contribute to the implementation of this policy.	100% of public institutions articulated from their institutional planning, to manage the present policy, according to the	Nonexistent baseline	response, along with the creation of mechanisms for social participation.	Develop methodological tools to facilitate the articulation of institutional planning in achieving the objectives of this policy.	Published methodological tools.	Short	

Line of action	Institutional strengthening at the territorial level Interinstitutional and intersectoral coordination. Citizen participation in the search for and making of decisions.						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
	role it is responsible for.						
Intersectoral commissions integrated within the COMUDEs, functioning in the implementation of methodologies that allow for the optimization of available energy resources.	All local governments, working in coordination with organized civil society sectors, in the optimization of available energy resources.	Nonexistent baseline		Coordinate with the different sectors of the organized civil society and local governments, to build and implement methodologies that allow the optimization of available energy resources.	Minutes of the intersectoral commissions.	Immediate	Municipalities, institutions of the Executive Branch, organized civil society sectors.
Entities that are part of the national banking system, creating strategies	60% of the country's banks offer soft loans for the acquisition of	Nonexistent baseline		Promote strategies that facilitate access to soft loans accessible to Guatemalan families so that they	Strategies implemented.	Short	National banking system, organized private sector institutions.

Line of action	Institutional strengthening at the territorial level Interinstitutional and intersectoral coordination. Citizen participation in the search for and making of decisions.						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
that allow access to soft credits.	efficient technologies.			can access efficient technologies.			

Sourc: Proprietary Production, Ministry of Energy and Mines.

Table 16. Strategic alliances.

Line of action	Strategic alliances						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Cooperating partners and private institutions for the management and development of energy efficiency projects, duly identified.	Database on cooperants and private institutions established.	Nonexistent baseline.	Academia, public institutions, and private entities have information on research and development opportunities for energy efficiency projects.	Create databases on cooperants and private institutions that provide access to financing for the development of energy efficiency.		Immediate	
Number of bilateral agreements established.	4 bilateral agreements established.	Nonexistent baseline.		Sign bilateral agreements for the development of energy efficiency projects.	Bilateral agreements for the development of energy efficiency projects signed and ratified.	Short	Municipalities, Executive Branch institutions, academia, organized private sector.
Number of energy audits performed.	15 energy audits in public	20 energy audits performed.		Conduct energy audits in public buildings, guided	Publication of reports on energy audits.	Immediate	Municipalities, Executive Branch institutions.

Line of action	Strategic alliances						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
	buildings carried out.			by MEM and executed by external collaborators.			

Source: Proprietary Production, Ministry of Energy and Mines.



Table 17. Project construction and implementation

Line of action	Project construction and implementation						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Energy efficiency projects implemented.	15 projects implemented.	Nonexistent baseline.	Stakeholders have the necessary strategies and resources for project development and implementation.	Establish fluid communication channels with the entities involved that require the execution of energy efficiency projects justified based on energy audits.	Publication of a report on the executed project.	Short	Municipalities, Executive Branch institutions, academia, organized private sector.

Source: Proprietary Production, Ministry of Energy and Mines.

Table 18. Research and innovation.

Line of action	Research and innovation.						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
Percentage of ethanol and gasoline blending.	10% ethanol blend in all gasoline.	Nonexistent baseline	Universities, research centers, public institutions and the organized private sector have opportunities for research and development of energy efficiency projects.	Promote the mandatory use of ethanol as a fuel additive by 2023 as a contribution to the mitigation of Greenhouse Gases.	Annual Petroleum Balance Sheet.	Immediate	Organized private sector.
Research and development projects implemented.				Promote opportunities for research and development of energy efficiency projects, which in turn generate investment and economic growth in the country.		Short	Organized private sector, academia.
Standards adopted regarding the development of energy audits and energy management.	2 standards			Promote the creation and operation of Technical Standardization Committees (TCN), dedicated to the	Official publication of technical standards.	Immediate	MINECO, organized private sector.

Line of action	Research and innovation.						
Responsible institution	Ministry of Energy and Mines.						
Indicator	Goal	Baseline	Results	Activities	Means of verification	Deadline for compliance	Actors
				adoption of standards and schemes for the correct execution of energy audits and energy management systems.			
Adopted standards related to good practices in energy efficiency and energy management in public buildings.	2 standards			Promote the creation of an energy efficiency TCN, specifically in the public sector, aimed at applying good practices in energy efficiency and energy management in public buildings.	Technical standards published.	Short	
Easy access to technical information on energy efficiency and associated GHG emissions.	Database created			Generate tools to obtain data on issues related to the energy sector and its mitigation of greenhouse gases.	Annual statistical report, MEM.	Short	

Source: Proprietary Production, Ministry of Energy and Mines.

A hand holding a globe of the Earth, split into light and dark halves. The globe is held by a hand that is also split into light and dark halves. The background is a blue gradient with light rays.

CHAPTER

7

7. MONITORING AND ASSESSMENT

Monitoring and assessment involve the systematic collection, analysis, and synthesis of data related to the deployment of this energy policy, tracking the progress towards set targets, and gauging its influence and ramifications on the population, benchmarked against the established baseline.

In the context of this policy, monitoring is envisioned as a structured framework, designed to capture, consolidate, and analyze data from various initiatives, action plans, outcomes, and other relevant activities undertaken by the designated institutions and stakeholders responsible for the execution of this energy strategy.

The Ministry of Energy and Mines will take the lead in overseeing this monitoring system, collaborating closely with all related entities. To support this, a theoretical and conceptual framework will be laid out, detailing various levels, verification methods, instruments, timeframes, and methodological tools that will shape the monitoring system.

The primary objective of the assessment phase is to ensure adherence to the public energy policy's implementation, highlighting progress in terms of outcomes, effects, and overall impact on the citizenry. It's crucial to establish criteria that highlight the significance of various contexts when undertaking the evaluation, such as relevance, appropriateness, and consistency.





CHAPTER

8

8. REFERENCES

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APPENDICES

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