Guatemala and its actions in the face of climate change

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Executive summary

Due to its geographical position, Guatemala is one of the countries in the Central American region most affected by the impact of natural phenomena, both of geological and hydrometeorological origin — the latter associated with climate change and variability, which are increasingly frequent and intense, generating loss of human lives, property and livelihoods.

Anthropogenic activities such as industrialization, means of transport, forest and non-forest fires, changes in land use, deforestation and occupation of areas susceptible to droughts are among the immediate causes of climate change. The increase in greenhouse gases raises the average temperature in an accelerated manner and limits the living conditions of families and their food security.

Guatemala seeks to minimize the impact of climate change and variability through its policies, laws and international commitments. Coordination and overcoming political barriers — such as the lack of interest of governments in power to provide continuity to commitments and agreements — and economic barriers are challenges for the conservation, protection and sustainable use of the country's natural resources. The support of national public and private entities, academia, research institutes and international cooperation are also tools for the fulfillment of internal and international goals and commitments.

Although Guatemala does not generate high greenhouse gas emissions, it is very vulnerable to climate change. Climate action could adapt the country to change and, at the same time, support the reduction of poverty and inequality gaps in the most vulnerable populations.

For adaptation and mitigation measures to be more effective, in order to reduce vulnerability to the impact of climate change and variability, the development, monitoring, evaluation and reporting of actions must be based on inclusive national policies and international commitments. And for this to happen, Guatemala's ancestral knowledge and practices, worldview and cultural diversity must be prioritized — a change in relation to the current model.

Policy recommendations

- Guatemala has a strong legal basis on the issue of Climate Change, which is why it is necessary for the governments in power to give support so that these policies are complied with

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for the benefit of both the population, as well as for a better use of existing natural resources, which have been underutilized.

- Due to Guatemala's deficient political and social conditions, factors such as health, education, employment, housing, among others, do not allow for appropriate development in reference to the protection of natural resources, despite the existence of legislative frameworks and protection policies. The outlook is not encouraging if we do not act according to the sanctions dictated by law.

- It is important that Guatemala adopts an inclusive climate policy in which ancestral knowledge and practices are considered, in order to preserve a sense of relevance and pass on from generation to generation all knowledge according to its cultural context and as part of a healthy relationship with nature.

- The technical and economic support provided by international cooperation to improve or reduce the conditions of vulnerability due to the effects of climate change and variability must be considered in multi-year projects, so that they are not affected by the changes of government that occur during the transitions every four years.

- It is necessary that local governments take adaptation and mitigation issues as a priority in their actions, because populations are increasingly affected by phenomena derived from climate change and variability, losing their assets and livelihoods.

KEYWORDS
KATUN 2032; PANCC; COP; NDC; GUATEMALA.

1. Geographical and cultural context of Guatemala

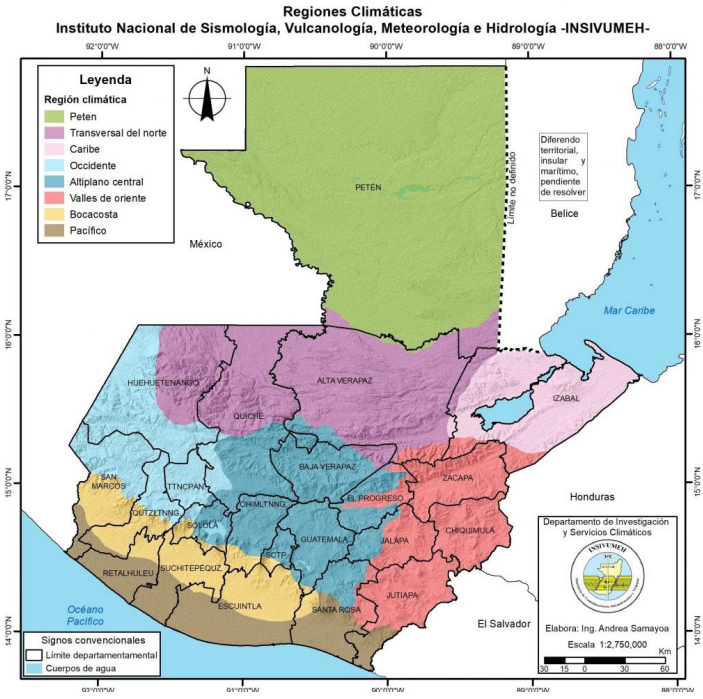
The name of Guatemala originates from the Mexican language Nahuatl, which means place of many trees. It has an area of 108,889 km^2, and the territory is divided into 22 departments and 340 municipalities. Altitudes range from zero to 4,272 meters above sea level. Furthermore, its location in the tropical strip and the influence of the Pacific and Atlantic oceans have been decisive for the country's climatic conditions, with several regions, each with its own climatic characteristics due to the effect of regional topography, vegetation, geology and soil types. Volcanic activity is associated with the geological conformation due to the interaction of three tectonic plates: North America, the Caribbean and Cocos, as well as biological diversity under the category of megadiverse countries. It is a tourist destination of great natural interest, and its cultural diversity is made up of different ethnic groups, multilingual and distributed throughout the country.

This has allowed the country to be considered as megadiverse, also generating the ideal conditions for agricultural production, both for local consumption and export, different species of forests, among other activities that are an important part of the country's economy, which are based on the use of natural resources (Guatemala, n.d.; MARN, SGCCC and PNUD, 2021).

1.1. Climatic regions of the country

Guatemala possibly has more than 1,171 endemic plant species, about 15% of endemism with respect to the total number of reported species. At least 8 regions have been identified as particularly important and priority for conservation due to the endemism of the species they represent (United Nations Decade on Biodiversity, 2020).

Figure 1. Map of climatic regions



Source: INSIVUMEH, 2017.

Caribbean Region
Altitudes range from 0 to 900 meters above sea level. The altitude rises as long as one enters the territory where there are warm climates, varying between very humid, humid and semi-dry, and without a well-defined dry season.

Eastern Valleys Region
The main feature is the rainfall deficiency. The factor that defines the conditions of the region is the Sierra de las Minas, which leaves it without humidity, filtering only warm air. In this region, there are warm climates, varying in character from semi-dry without a well-defined dry season.

Western Region
It is the most mountainous region of the national territory. The mountains have altitudes ranging from 1600 to 4200 meters above sea level. These geographical features allow the generation of a great diversity of microclimates. There are climates that vary from temperate and semi-cold, to humid and semi-dry.

Boca Costa Region
It is the decline from the plateau towards the Pacific coastal plain. Together with the northern section, it has the highest precipitation rates in the country. Temperature levels increase as it descends towards the coast. They reach a certain stability in the regions near the sea. There is a generalized climate of semi-warm and without a well-defined cold season, with a very humid character without a well-defined dry season.

Pacific Coast Region
It descends from 600 to 0 meters above sea level. With less intense rainfall than the Boca Costa, which tends to decrease nearby the sea coast. Temperature records are high. And there are warm climates without a well-defined cold season, with a humid character varying to semi-dry.

Central Plateau Region
It is considered a mountainous region, which favors the development of microclimates, its elevations range between 1000 and 2500 meters above sea level. There are climates that vary from temperate and semi-cold, to humid and semi-dry.

Northern Traversal Strip Region
Altitudes range from 900 to 2000 meters above sea level. It is very rainy, and the highest records are obtained from June to October. Temperature levels drop as altitude increases, with the highest temperatures between May and September. There are very humid warm climates with no well-defined cold season.

Northern Region
Altitudes range from 0 to 900 meters above sea level. It is a very rainy area, it rains throughout the year, although the heaviest rainfall is recorded from June to October. The average temperature records range from 20 to 30°C. In this region there are very humid, humid, semi-dry warm climates with no well-defined dry season.

2. Legal framework and international commitments related to climate change

Due to political conditions, violence and crime, the Guatemalan population is affected in the exercise of (or excluded from) their rights. Other factors such as low access to health, education, employment, decent housing, food security, water, discrimination, among others, also influence and do not allow adequate development, being more noticeable in indigenous peoples and women communities in the rural area of the country.

“Although Guatemala has a legal framework based on laws, plans and strategies for climate action (...) social conditions and the vulnerability of the territory create even more complex conditions for climate action and for the availability of natural resources.”

Although Guatemala has a legal framework based on laws, plans and strategies for climate action — such as the Political Constitution of the Republic, Framework Law on Climate Change (Decree 7-2013 of the Congress of the Republic), National Policy for Climate Change, National Action Plan for Climate Change (PANCC, for its acronym in Spanish), National Strategy for the Reduction of Deforestation and Degradation of Forests in Guatemala, among others —, social conditions and the vulnerability of the territory create even more complex conditions for climate action and for the availability of natural resources.

The Political Constitution of the Republic indicates, in Article 19, that the obligations of the state are, in paragraph: “c) To adopt the necessary measures for the conservation, development and efficient use of natural resources”[2].

The general objective of the National Policy for Climate Change (Governmental Agreement 329-2009) is:

> (…) That the state of Guatemala, through the Central Government, municipalities, organized civil society and citizens in general, adopt risk prevention practices, reduce vulnerability and improve adaptation to climate change, and contribute to the reduction of greenhouse gas emissions in its territory and to the improvement of the quality of life of its inhabitants and strengthen its advocacy capacity in international climate change negotiations (…) (MARN, 2009, p. 10)[3].

However, data presented in the Third Communication on Climate Change indicate that 14 of the 38 major basins of Guatemala have high levels of physical and biological contamination and toxic pollutants, and that the estimated annual deforestation rate is 38,356 hectares, due to unsustainable forest products activities, expansion of territories for livestock, agriculture, expansion of urban and industrial infrastructure. Another important fact is that only 49% of the population has a sewerage system for wastewater (MARN, SGCCC and PNUD, 2021).

“In its NDC, Guatemala has presented two proposals for the reduction of GHG emissions. The first is a ‘Non-conditional Proposal’, in which the country plans, with its own capabilities, a reduction of 11.2% of its total GHG emissions from the base year 2005 projected to 2030. The second is a ‘Conditional Proposal’, which submits a reduction of up to 22.6% of its total GHG emissions from the base year 2005 projected to 2030, whose achievement is conditional on having the technical and financial support of new and additional public and private international resources.”

Guatemala, through Decree 15-95 of the Congress of the Republic, is part of the United Nations Framework Convention on Climate Change (UNFCCC), in order to stabilize the levels of Greenhouse Gases (GHG) generated by human activity.

The Paris Agreement (2015) seeks to carry out joint actions to reduce GHGs, through emission reduction commitments submitted by each country — the Nationally Determined Contributions (NDCs), which include mitigation and adaptation measures to the effects of climate change. On October 27, 2016, Guatemala was added to the countries that ratified the Paris Agreement, through Decree Number 48-2016 of the Congress of the Republic.

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2. Original source: “c) Adoptar las medidas que sean necesarias para la conservación, desarrollo y aprovechamiento de los recursos naturales en forma eficiente.”

3. Original source: “(…) Que el Estado de Guatemala, a través del Gobierno Central, las municipalidades, la sociedad civil organizada y la ciudadanía en general, adopte prácticas de prevención de riesgo, reducción de la vulnerabilidad y mejora de la adaptación al cambio climático, y contribuya a la reducción de emisiones de gases de efecto invernadero en su territorio, coadyuve a la mejora de la calidad de vida de sus habitantes y fortalezca su capacidad de incidencia en las negociaciones internacionales de cambio climático (…)”.

3. Adaptation and mitigation actions in Guatemala in the face of climate change

As a guide for this document, the Framework Law on Climate Change, Decree 7-2013, is taken as a basis to identify the different actions that have been achieved since its creation for the benefit and better use of the country's natural resources. It is worth considering the priorities or plans of the governments in charge on the issue of climate change and variability to give it the necessary impetus so that these actions have the expected results. Not only is the government responsible for the best use of natural resources, but also the inhabitants, organized civil society, business organizations, among others. We must all contribute with actions from our daily activities, such as the best use of water resources, proper management of solid waste, rational use of electrical energy and fossil fuels, among others.

3.1 Development of national capacity

From the institutional point of view, the Framework Law on Climate Change, Decree 7-2013, specifically in Chapter III, Development of National Capacities, points to the creation of entities such as:

National Council on Climate Change chaired by the Presidency of the Republic, with public and private participation from different sectors of the country. The functions of this Council include the regulation, supervision of the implementation of actions, conflict resolution, and tracking of the actions derived from this law, including the national climate change policy, the climate change fund, strategies and action plans and programs on mitigation (emission reduction) and adaptation to the impacts of climate change (Gobierno de Guatemala, 2013).

National Climate Change Information System (SNICC, for its acronym in Spanish), so that all public and private entities provide information related to GHG emissions and reduction, vulnerability and adaptation to climate change required by the Ministry of Environment and Natural Resources, necessary to carry out the country's mandatory national communications (Gobierno de Guatemala, 2013).

Land Use Regulation for Climate Change Adaptation and Mitigation, the Secretariat of Planning and Programming of the Presidency (SEGEPLAN, for its acronym in Spanish) prepared, in 2018, the Methodological Guide for the Preparation of the Municipal Development Plan and Land Use Regulation in Guatemala (Government of Guatemala, 2013).

This methodological guide seeks to manage planning and land use regulation at the municipal level in the processes of coordination and organization, political decisions by local authorities, in order to go beyond government periods, carry out technical activities, have the budget for strategic planning and capacity building, and make decisions about development. All of this is based on knowledge of the territory, social, economic, cultural, environmental, and political-institutional dynamics, in other words, recognising the problems and potentialities that limit or promote progress (SEGEPLAN, 2018).

In 2022, only 06 of 340 municipalities had implemented a land use regulation plan: Guatemala, Antigua Guatemala, Quetzaltenango, Salcajá, Poptún, and Villa Nueva; although 91 municipalities have this document, in compliance with the K'atun 2032 National Development Plan and the 2030 Agenda of the SDGs (Martínez, 2022).

Although article 142 of the Municipal Code establishes the Land Use Regulation Plans as mandatory, there has been little progress, mainly due to changes in municipal authorities every four years, and lack of economic resources and support from the central government for their implementation. Other factors that delay the implementation of land use regulation

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plans are the lack of participation and consensus of the population, pressure on natural resources, due to the accelerated change in land use, opposition from some landowners due to the uses and regulations that such plans could apply to their properties, among others.

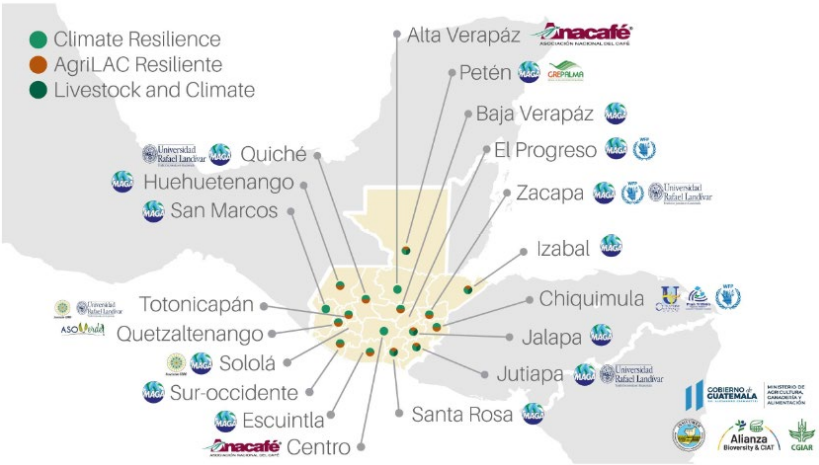
Guidelines for the reduction of vulnerability, these were developed based on article 14 of the Framework Law on Climate Change, Decree 7-2013, on the issue of adaptation, and with the support of the Alliance for Resilience in 2018. These consist of actions for the reduction of vulnerability, the improvement of adaptive capacity. In addition, they are technical tools that describe the steps to be followed in the processes of planning and implementing adaptation measures to the risk of extreme hydrometeorological events, in the following sectors: Infrastructure, Biodiversity, Agriculture, Coastal Marine Zone, and Health.

The Alliance of Biodiversity International and the International Center for Tropical Agriculture (CIAT, for its acronym in Spanish) with research-based solutions to the global crises of malnutrition, climate change, biodiversity loss and environmental degradation, have supported since 2018 the implementation of climate services that integrate information adapted to users' needs in order support decision making in the field, and avoid losses at the local level, in particular, the Agroclimatic Technical Committees (MTA, for its acronym in Spanish). The Alliance of Biodiversity International and CIAT have the support of several entities, mainly the Ministry of Agriculture, Livestock and Food (MAGA, for its acronym in Spanish) and the National Institute of Seismology, Volcanology, Meteorology, and Hydrology (INSIVUMEH, for its acronym in Spanish) as strategic partners for the development of the MTAs.

> (…) The MTAs in Guatemala are open spaces for dialogue between actors representing different public and private institutions, associations, academies, cooperatives, Non-Governmental Organizations, and international cooperation, among others, together with local agricultural producers in each region, in order to try to understand the possible behavior of the climate in a locality. Based on seasonal climate information and meteorological information issued by INSIVUMEH, agroclimatic recommendations are analyzed, discussed and issued to help reduce risks related to climate variability (…) (Hernández-Quevedo, 2022, p. 13)[4].

In 2023, there were 19 active MTAs, whose area of influence covers 100% of the national territory, as shown in the following picture.

Figure 2. Agroclimatic Technical Committees in Guatemala and areas of influence of the different initiatives



Source: Hernández-Quevedo, 2022, p. 14.

4. Original source: "(…) Las MTA en Guatemala son espacios abiertos de diálogo entre actores representantes de diferentes instituciones públicas, privadas, asociaciones, academias, cooperativas, Organizaciones No Gubernamentales y de cooperación internacional, entre otras, unidas a los productores agropecuarios locales de cada región, con el propósito de procurar comprender el posible comportamiento del clima en una localidad. Basados en la información climática estacional y la información meteorológica que emite el INSIVUMEH, se analizan, discuten y emiten recomendaciones agroclimáticas que ayuden a disminuir los riesgos relacionados con la variabilidad climática (…)."

“These forecasts designed to suit users are making it possible to offer products for the implementation of better climate services in Guatemala in relation to the management of agriculture and food security, water, disaster risk reduction, health and energy, better performance of crops, vegetation indices, among others.”

The climate forecasts used and presented in the MTAs are developed with the New Generation of Forecasts “NextGen”. These seasonal probabilistic forecasts generated by INSIVUMEH with the support of the International Research Institute for Climate and Society (IRI) provide useful information for making climate-smart decisions. These forecasts designed to suit users are making it possible to offer products for the implementation of better climate services in Guatemala in relation to the management of agriculture and food security, water, disaster risk reduction, health and energy, better performance of crops, vegetation indices, among others.

In the Monitoring and Evaluation Report of the Agroclimatic Technical Committees (MTA) in Guatemala 2022, it is identified that:

> (…) 84% said that the forecast of the amount of rain was accurate, showing the degree of confidence of users of the weather information generated by the meteorological service. There are some variations in confidence among some MTAs, particularly in committees such as Quiché, Huehuetenango, and Totonicapán, where between 35-40% say they have average confidence in the information. Only in two cases, the committees of El Progreso and Izabal, the information was not correct (…) (Hernández-Quevedo, 2022, p. 39)[5].

The agroclimatic bulletins are considered to be the tangible products of the MTAs. These have information on the conditions of the last months or years of climatic variables of interest, local climate prediction, probability of occurrence of rainfall above normal, normal or below normal, the implications of climate prediction in different phenological phases of crops, and a set of recommendations to reduce negative impacts or take advantage of opportunities in relation to the given forecast.

Figure 3. PETÉN Agroclimatic Technical Committee

Source: CGIAR, 2022.

The bulletins highlight good practices and general information on agriculture and are written in a simple, easy-to-understand way. They are designed to be used as a guide for agricultural technicians, who in turn can pass them on to farmers. There are bulletins that are translated into the main Mayan languages that are used in the MTA, where farmers speak these languages (Hernández-Quevedo, 2022).

5. Original source: “(…) el 84% manifestó que el pronóstico de cantidad de lluvia fue acertado, mostrando el grado de confianza de los usuarios de la información climática que genera el servicio meteorológico. Existen algunas variaciones de la confianza entre algunas MTA, particularmente en mesas como Quiché, Huehuetenango y Totonicapán, donde entre el 35-40% manifiesta tener confianza media en la información. Únicamente en dos casos se computó nada acertada la información, siendo estas las mesas de El Progreso e Izabal (…).

Figure 4. Quetzaltenango Agroclimatic Technical Committee in Mam language - CDRO

Source: CGIAR, 2022.

The National Action Plan for Climate Change (PANCC, for its acronym in Spanish) arises in compliance with Article 11 of Decree 7-2013. It has two versions: the first was in October 2016, and the following version was updated in 2018. The General Purpose of this is:

> (…) to define, in a clear and orderly manner, the main actions and guidelines that government institutions and other sectors of the state must follow in order to effectively contribute to reducing the vulnerability of the majority of the national population, to expand the country's adaptive capacity and to reduce greenhouse gas emissions, in the face of the threat of the effects of the phenomenon of climate change and climate variability (Guatemala, 2018, p. 17)[6].

Moreover:

> The PANCC Specific Objectives (OE, for its acronym in Spanish) refer to what is expected from the Plan as an instrument for better government management and decision making in general terms. This is an area that is located above thematic management and rather concerns the highest levels — those with the capacity for planning and inter-institutional coordination — because they are transversal in nature.
>
> OE1: Operationalize the Framework Law on Climate Change, the PNCC, and the other national and international instruments related to the subject.
>
> OE2: Guide public institutions and other sectors of the state linked to the issue, regarding the actions to be implemented in the short, medium and long term.
>
> OE3: Guide the preparation of institutional strategic plans, defining priorities in sectoral, territorial and institutional planning.
>
> OE4: Define criteria for prioritizing public investment linked to the implementation of actions to reduce vulnerability and promote adaptation to the effects of climate change.

6. Original source: "definir, de forma clara y ordenada, las principales acciones y lineamientos que las instituciones de gobierno y demás sectores del Estado deberán seguir a efectos de contribuir de manera efectiva a la reducción de la vulnerabilidad en que se encuentra la mayoría de la población nacional, a ampliar la capacidad de adaptación del país y a reducir las emisiones de gases efecto invernadero, ante la amenaza de los efectos del fenómeno del cambio climático y la variabilidad del clima."

"The National Energy Plan 2017-2032 was prepared in 2016, to comply with Article 18 of the Framework Law on Climate Change, to improve the consumption and use of renewable natural resources, implement technologies to improve efficiency and energy savings, and reduce greenhouse gas emissions."

OE5: Define priorities for international cooperation (Guatemala, 2018, p. 17)[7].

The National Energy Plan 2017-2032 was prepared in 2016, to comply with Article 18 of the Framework Law on Climate Change, to improve the consumption and use of renewable natural resources, implement technologies to improve efficiency and energy savings, and reduce greenhouse gas emissions. It has three strategic axes:

1) Use of renewable resources

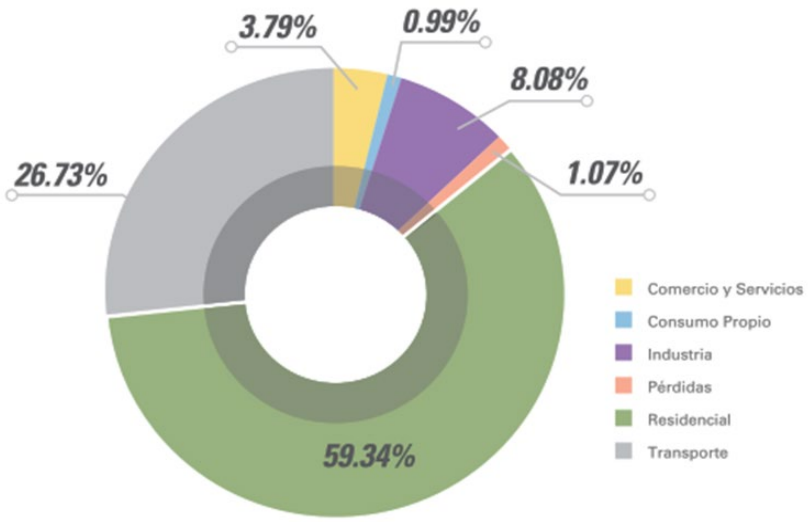
2) Energy efficiency and saving

3) Greenhouse gas emissions reductions

Each of these axes indicates actions for all the subsectors and actors that make up the energy sector.

In national energy consumption, own consumption refers to the energy that is generated and used for the transformation of a primary energy into a secondary one, for example, the energy that is needed for the operation of auxiliary services in a power generation plant. In turn, losses represent all energy that is not used. The transport sector corresponds to the transfer of cargo or passengers. Finally, the industrial, residential, commercial, and service sectors refer to the economic activity in which energy is used and needed.

Figure 5. National Energy Consumption



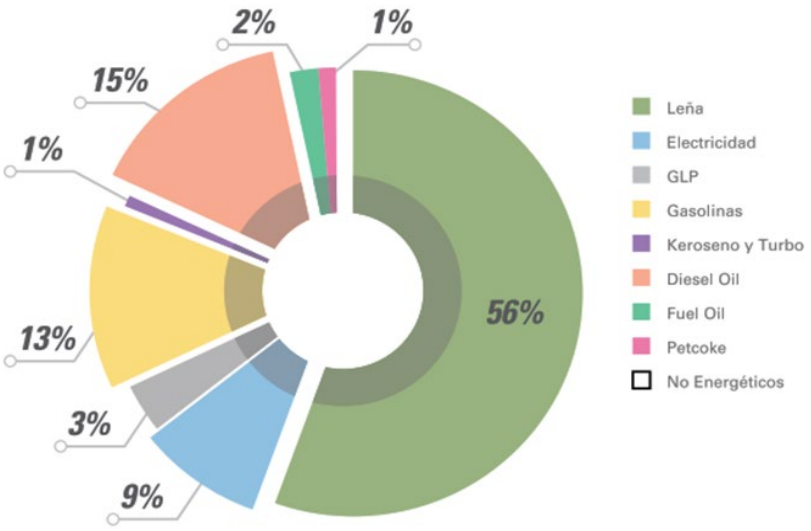
Source: MEM, 2013, p. 45.

In addition, Guatemala uses different types of energy for different end uses, and its consumption depends on this. For example, oil derivatives such as gasoline and diesel are used in the transportation sector, while firewood and LPG are used in the residential sector for cooking and heating purposes.

7. Original source: Los Objetivos Específicos del PANCC (OE) se refieren a lo que se espera del Plan como instrumento que sirva para la mejor conducción del gobierno y la toma de decisiones en términos generales. Se trata de un ámbito que se ubica por encima de la gestión temática y más bien atañe a las más altas esferas - aquellas con capacidad dispositiva para la planificación y la coordinación interinstitucional - porque son de carácter transversal.
OE1: Hacer operativos la Ley Marco de Cambio Climático, la PNCC y los demás instrumentos nacionales e internacionales vinculados a la temática.
OE2: Orientar la institucionalidad pública y demás sectores del Estado vinculados a la temática, respecto a las acciones a ser implementadas en el corto, mediano y largo plazo.
OE3: Orientar la elaboración de los planes estratégicos institucionales, definiendo las prioridades en la planificación sectorial, territorial e institucional.
OE4: Definir criterios de priorización de la inversión pública vinculada a la implementación de acciones para reducir la vulnerabilidad y promover la adaptación ante los efectos del cambio climático.
OE5: Definir prioridades para la cooperación internacional.

The most used energy in Guatemala in 2016 was firewood, and this corresponds to an economy where there are few energy-intensive industries, such as steel or mining; the Trade and Services is the sector with the highest share in the national GDP, which has a very low energy intensity. This leads to an energy matrix dominated by energy use in both the residential and transportation sectors. The transportation sector is represented through the consumption of gasoline and diesel, and although the industrial sector also consumes diesel, its participation is very low when compared to cargo and passenger transportation (MEM, 2013).

Figure 6. Participation of the different energy resources at the national level



Source: MEM, 2013, p. 46.

For 2016, national electricity generation was predominantly from hydroelectric generation, with an energy contribution of 3,951 GWh, followed by coal generation, with a contribution of 3,533 GWh.

> "...it is important to mention the participation of renewable energies in the electric energy matrix, since during 2016, 58% of the national electric generation was obtained from renewable energy sources, while the other 42% was obtained from non-renewable sources."

Additionally, it is important to mention the participation of renewable energies in the electric energy matrix, since during 2016, 58% of the national electric generation was obtained from renewable energy sources, while the other 42% was obtained from non-renewable sources.

In 2016, it was estimated that 18.44 million tons of carbon dioxide were emitted, of which approximately 50% correspond to land transportation and then 32% correspond to electricity generation activities.

In order to comply with the objectives of the National Energy Plan, three strategic areas of intervention have been proposed to guide and provide guidelines for the growth of the country's energy sector. These actions are aimed at fulfilling the objectives of the different instruments of the country's various policies:

Sustainable use of renewable resources
It aims to prioritize the use of renewable natural resources for the generation and consumption of electricity. Renewable resources must be used sustainably over time so as not to compromise the resources of future generations, achieving environmental and climate benefits through the reduction of greenhouse gas emissions.

Energy efficiency and saving
The second axis of this plan strengthens the objectives and actions of the fourth axis of the Energy Policy 2013-2027, to promote the efficient use of energy consumption in the country's residential, commercial, institutional, and commercial sectors. The plan also

emphasizes existing implementation mechanisms and new methodologies for energy saving and efficiency.

Reduction of greenhouse gas emissions
The third axis frames the importance of carrying out the actions proposed in this Plan, in its two previous axes, demonstrating the amounts of greenhouse gas emissions that can be reduced by sector, contributing to the mitigation of the effects of climate change.

The GHG emission reduction target proposed by this National Energy Plan (PNE, for its acronym in Spanish) is 29.2% by 2032. This 29.2% reduction implies that emissions, in a BAU scenario of 16.82 million tons of CO2 equivalent by 2032, will be reduced to a value of 11.91 million tons of CO2 equivalent in that year. It is important to mention that compliance with the actions proposed in this plan promotes a reduction in emissions beyond the 11.2% established as a contribution to emissions reduction described in the NDC for the energy sector.

4. Final considerations

The purpose of this article is to show that Guatemala has a legal framework on Climate Change, such as the Framework Law on Climate Change, from which several actions are derived, such as the National Climate Change Action Plan, the National Energy Plan, the Methodological Guides for the Reduction of Vulnerability, among others, which involve the actions of both public and private entities to reduce the effects of climate change and variability. However, the degradation that Guatemala has suffered in recent years due to anthropogenic activities, misuse of natural resources, deforestation, forest fires, extensive episodes of drought, extreme hydrometeorological phenomena are exacerbated due to low resilience, affecting vital infrastructure, assets and livelihoods. These events, which have been recurrent, have generated a stagnation in development, due to the lack of correct application of laws and regulations related to climate change. In a country in which its economy is based especially on agriculture, the availability of water resources and maintaining the diversity of ecosystems is important.

Other factors that influence are that, although there are adaptation programs and projects to reduce vulnerability to climate change and variability, these are slow or discarded because they are not considered a priority by the governments, in addition to the replacements of personnel with knowledge of the subject in the institutions. The lack of projects aimed at the integral management of basins and land use regulation, which is responsibility of each of the municipalities, has led to inadequate land use, causing accelerated soil degradation, landslides, flooding due to surface runoff, and consequently, recurrently affecting the inhabitants with the least economic resources.

All of the above reflects a non-encouraging scenario for the coming years, as the loss of the quality of natural resources will affect the Guatemalan population the most, who, faced with a poor health system, could experience chronic respiratory diseases, gastrointestinal problems, malnutrition, among others. Without drastic action in a short time, studies, diagnoses, projections, informative documents and others will be of no use in the face of increasing environmental degradation.

The good news is that the issue of Climate Change has gradually begun to attract the attention of actors linked to the governance of the country, who are influencing this problem, due to the high economic losses that this basically socially constructed phenomenon has caused in recent years. Both governability and governance must be supported by all research tools, developed by experts on the subject to make decisions for immediate solutions. Everything points to the need to prioritize the stability of the global climate, so it is necessary to radically dismantle CO2 emissions, logging, generate renewable energy and implement Land Use Regulation Plans in accordance with the Law in all the country's municipalities.

Reiterating the existing treaties and policies, the challenge is to enforce them, to strengthen education at the departmental, municipal and especially local levels, so that the whole society becomes aware of the danger of extinction facing the country`s ecosystems and humanity itself. We need to stop the illicit enrichment of the exploitation of natural resources, we need to protect our home called earth before an extreme climatic event makes us understand that we are not prepared to respond and even less to recover. In conclusion, we need common sense.

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