ENERGY OUTLOOK OF LATIN AMERICA AND THE CARIBBEAN

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2021

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Energy joins us

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The Regional Energy Prospective included as part of this Energy Outlook consists of the hypothetical elaboration of feasible scenarios for regional and subregional energy development, prepared by OLADE based on the information available from the latest energy expansion plans, programs and policies of its Member Countries and articles published by other international organizations such as the International Energy Agency (IEA), the Inter-American Development Bank (IDB), the World Bank and the International Renewable Energy Agency (IRENA), which are publicly accessible.

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Latin America and the Caribbean move forward

ALFONSO BLANCO BONILLA
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The pandemic in 2020 reached Latin America and the Caribbean (LAC), deepening a complex economic situation in the entire region. According to the World Bank's report for the region, LAC is the most affected region by the COVID-19 pandemic and the contraction of the economies, which in 2020 was 6.7%, has had a direct impact of the health crisis with enormous economic and social costs.

At the end of 2020 we can see that the contraction in energy demand caused by the pandemic in LAC was 6.7% and that supply contracted by 9.2%.

Even though we thought that there would be an impact on the evolution of ongoing projects, public policies and the development of the sector, reality showed us that the region is moving forward despite the adversity.

In 2020 we achieved 60% renewability in installed generation capacity, which sets the path for the 70% target set in RELAC. We have made progress in the gradual decarbonization of energy systems by increasing renewability with respect to primary energy to 34%. More than 11 GW of non-conventional renewable energies were installed in 2020, 23 GW of coal and liquid fuels were taken out of operation in the region, all signs of a strong climate commitment from our region.

Significant progress was made in terms of regulation and legal and institutional frameworks, and despite the pandemic, milestones were achieved in terms of modernization, planning and the development of a modern sector, oriented towards energy transitions with greater digitalization and gradually incorporating actions in sustainable mobility, new energy vectors, energy storage and energy efficiency.

OLADE has accompanied a large part of this observed dynamic, ensuring that the information is available, updated and in modern platforms that allow the different actors of our society to make informed decisions. We already have 10 national energy information systems in place, accompanying these profound processes of strengthening the institutions that are led by the energy ministries and agencies of our member countries.

To support this process of institutional and information systems strengthening, this year we also launched the mobile application for statistical information from Latin America and the Caribbean (https://www.olade.org/app-olade/). The mobile application is another leap in the way OLADE brings value to the region, with a modern proposal, easy to access and with processed information for all types of public. OLADE is thus closer, more engaged and creating a dynamic and modern connected communication.

From the Energy Hub, in which we participate as IDB associates, we also make available statistical information on Latin America and the Caribbean, always with the idea of promoting synergic and collaborative work among organizations.

The pandemic has not halted our region's progress; we demonstrated that the energy sector can become a driver of the much-needed economic recovery.

But let us not forget that the pandemic has also left a strong scar on our entire society. After 20 years of uninterrupted progress in providing energy access to our population, the pandemic has slowed this trend, this is another of the numbers reflected in this Outlook, and in this case, it is not positive. The pandemic has displaced part of our population and widened the gaps between rich and poor. It left us with indelible moments of suffering in many of our families, for that reason, for the displaced and for the suffering of many, it is our responsibility to act to recover part of that lost space in the well-being of our people.

ARGENTINA	Ministry of Economy	Pablo Ronco
BARBADOS	Ministry of Energy, Small Business and Entrepreneurship	Mark Millar
BELIZE	Ministry of Public Service, Energy and Public Utilities	Ryan Cobb Geon Hanson Arelí Sutherland
BOLIVIA	Ministry of Hydrocarbons and Energies Vice Ministry of Energy Planning and Development	Boris Eduardo Ballester Gemio
BRAZIL	Ministry of Mines and Energy	Gustavo Santos Masili André Luiz Rodrigues Osório João Antonio Moreira Patusco
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NICARAGUA	Ministry of Energy and Mines	Manuel Flores Indiana León Carlos Sánchez
PANAMA	National Energy Secretariat	Stella Escala Oscar Gálvez
PARAGUAY	Vice Ministry of Mines and Energy, Ministry of Public Works and Communications (VMME-MOPC)	Daniel Puentes
PERU	Ministry of Energy and Mining (MINEM)	Alan Campos Daniel Paz Luis Vilchez
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VENEZUELA	Ministry of People's Power for Petroleum	Luis José Olivares Ramírez Joelmi F. Pérez Ramírez Ronny Rafael Romero Rodríguez

In this 2021 Energy Outlook, about 1,000 graphics are presented containing detailed information about the recent evolution of the energy matrices of the 27 Member Countries of the Latin American Energy Organization (OLADE). Likewise, a set of graphics is presented where the trends of the regional aggregates that the organization usually considers are expressed, namely: Central America, Brazil, the Caribbean, the Southern Cone, Mexico and the Andean Zone, as well as Latin America and the Caribbean in its entirety. In the case of hydrocarbons, regional trends are compared with global trends considering the regions of Africa, Latin America and the Caribbean, Asia and Australasia, Europe, the Commonwealth of Independent States (that is, some countries of the former Soviet republics), Middle East and North America. The information presented comes from the Energy Information System of Latin America and the Caribbean (sieLAC) managed by the OLADE information team.

Furthermore, this document includes a chapter called Legislation, Regulation and Energy Policy, which reports on the progress in regulatory, policy and planning issues. It also presents a report on the main events in the energy sector during 2020.

An energy prospective exercise is also included, which consists of the hypothetical elaboration of feasible scenarios for regional and subregional energy development, prepared by OLADE based on the information available from the latest energy expansion plans, programs and policies of its Member Countries and articles published by other international organizations such as the International Energy Agency (IEA), the Inter-American Development Bank (IDB), the World Bank and the International Renewable Energy Agency (IRENA), which are available to the public. The modeling was carried out using the Model for the Simulation and Analysis of the Energy Matrix (SAME), developed by OLADE.

On the first page of each country, the values of the main energy indicators are presented to the year 2020 or the last available year according to each case, together with a summary version of the Sankey diagram of each one. The graphs presented contain information on reserves and production from various sources, energy supply and its flows, primary and final energy consumption, also considering their values at the sector level. An extensive set of indicators is then presented, including energy intensities of various kinds, renewable energy indexes, energy autarchy, avoided demands, per capita and per unit of added value indicators, evolution of the relative shares of various energy sources, etc. Then, some indicators that analyze the recorded trends of CO_2 emissions are presented. Finally, a summary chart is presented that shows the recent and comparative evolution of several energy and economic indicators.

Those indicators that do not turn out to be of habitual use are defined and described in the respective chapter of this Energy Outlook. To facilitate and make the visualization of the indicators more friendly, it was preferred to present the trend information as smoothed curves. Also, as can be seen, in some cases in addition to presenting the respective variables, the accumulated variation rates for five-year periods 2000 - 2004 / 2005 - 2009 / 2010 - 2014 / 2015 - 2019 and interannual rate for the 2020.

We hope that this Energy Outlook will become a common use and consultation tool that accounts for the evolution of trends in the region in the area of energy. Given that, as of 2017, the Energy Information System of Latin America and the Caribbean, sieLAC, is freely accessible and it is enough to register to have access to the entire database, we recommend and invite those interested in deepening the analysis and work with the information available to do so by visiting the website:

http://sielac.olade.org.

sieLAC | Energy Information System of Latin America and the Caribbean

simLAC | Energy Planning Tools for Latin America and the Caribbean

Relevant Events

I INSTITUTIONAL, IMPLEMENTATION OF ENERGY PLANS AND POLICIES

Chile announced the closing of the thematic roundtables for the update of the National Energy Policy (PEN) 2050, the results of which will allow new objectives and goals to be established. The topics discussed included: equitable access to sustainable energy, cities and energy, clean energy and climate change, the social and environmental dimension of energy development, energy as a driver of economic development, security, intelligent electricity systems and the new role of the energy user. Furthermore, the start of the "Solar House" program was announced, an initiative aimed at promoting the use of solar photovoltaic systems for self-generation in household consumption, by facilitating access to technology at a lower price and state co-financing. In addition, and with the aim of encouraging new generations to make changes in favor of sustainability, Educa Sostenible - Energy Education Program (from Kindergarten to High School) was launched, which with the support of the Ministry of Education began its pilot stage in 2020 to benefit educational establishments in the regions of Atacama, Metropolitan, La Araucanía and Aysén.

The **Colombian** Ministry of Mines and Energy (MME) adopted the Natural Gas Supply Plan 2019-2028, presented by the Mining and Energy Planning Unit (UPME), aimed at ensuring that the works required to guarantee the reliability and security of supply of natural gas are executed and put into operation in a timely manner.

In **Ecuador**, EP Petroecuador absorbed Petroamazonas EP, thus unifying the oil value chain in its exploration, exploitation, transportation, refining and marketing phases. The unified company will expand its scope of management towards processes related to petrochemicals and the development of geothermal energy. On the other hand, the Energy Social Pact was launched, an initiative aimed at promoting the development of new investments in the electricity sector, expansion of coverage, agreements with the communities in the areas of influence of hydrocarbon projects, management of appropriate technologies to protect the biodiversity of the Amazonian ecosystem, etc.

In order to address the country's energy crisis, the Government of **Haiti** made a commitment in 2020 to create sustainable energy services through municipal mini-grids based on renewable energies, built and operated in areas that are not connected to a regional grid. To this end, the PHARES Program (Haitian Program for Rural Community Access to Solar Energy) was launched (with support from the IDB and the World Bank) to increase access to solar energy in rural and peri-urban communities and, in particular, to provide access to affordable, accessible, sustainable and high quality electricity through sustainable energy services for the development of the sector, through mini-grids using renewable energies and developed by private sector operators.

On July 29, 2020, **Paraguay** socialized the progress of the project "The Green Hydrogen Route in Paraguay," which aims to promote the green hydrogen economy considering that the country has all the favorable conditions to become a regional leader in the production of this energy source because it has abundant water resources, electricity surpluses and a strategic location in the region. This initiative responds to the guidelines of the National Energy Policy and consists of three phases: - Knowledge acquisition; - Expansion of the Project to increase the capacity to generate H2 and – consolidation of the use of H2 in Paraguay. Additionally, the official launch of the RRA Program (Renewable Energy Readiness Assessment) was held, whose objective is to support the country in its efforts to include renewable energies in the Nationally Determined Contributions (NDCs) and their effective implementation. The official kick-off workshop was held for the PROEZA Project (Poverty, Reforestation, Energy and Climate Change), which integrates elements related to the production of biomass for energy purposes and also incorporates a component aimed at promoting energy efficiency through the use of improved and more efficient stoves in low-income households.

In compliance with the provisions of the corresponding Emergency Decree, as of February 1, 2020, the **Peruvian** Ministry of Energy and Mines (Minem) assumed the administration of the Energy Social Inclusion Fund (FISE), with the commitment to give greater impetus to the massification of natural gas and the expansion of the electricity frontier for the benefit of millions of families in vulnerable situations.

Within the framework of the MOVÉS Project, the first letters of adhesion were signed by four important companies in the local market in **Uruguay** to the Green Fleet Plan, an initiative that aims to support all companies with utility vehicles, in order to accompany them in the process of transforming their fleets towards more efficient and sustainable solutions.

II HYDROCARBONS

2.1 Exploration and Exploitation

Bolivia confirms oil success of the YARARÁ -X1 exploratory well, which reached a final depth of 2,850 meters, evidencing the presence of hydrocarbons with an excellent reservoir. The Yarará-X1 exploratory project is an entirely Bolivian effort, proposed and developed by YPFB and with its own drilling equipment. The project is in the completion phase, which will allow the well to be put on production with an initial flow rate of 300 to 400 bbl/day. The initial investment plan considers drilling 2 additional exploratory wells.

By the end of 2020, **Brazil** had a total of 11,900 Mbbl of proven oil reserves (97% offshore), enough to meet 11 years of production (this represented a 6.1% decrease from 2019). Natural gas reserves were 338,000 Mm^3 (77% offshore), equivalent to 7.2 years of production (this represented a 7.1% decrease from 2019). In 2020 the oil area had export records of 1 million barrels per day in April and production of 2.8 Mbbl/day in August. Productivity per pre-salt oil well approached 25,000 boe/day while in the other wells the average does not reach 200 boe/day. In this context, oil and natural gas production began in the Atapu Pre-Salt by Petrobras and other companies participating in this shared field. When operating at full production capacity, the P-70 will be responsible for an increase of approximately 5% over current domestic oil production, the equivalent of 150,000 barrels per day.

Colombia reported the discovery of hydrocarbons in the following wells during 2020: Galope-1 (oil), Contrapunteo-1 (oil), Canario-1 and Canario-2 (gas), Bullerengue-3 (oil), Azogue-1 (oil), La Belleza (oil), Merecumbé-1 (gas), Mandinga-1 (gas), Arandala-1 (gas), Mulato-1 (gas).

Ecuador became the 55th nation to join the Extractive Industries Transparency Initiative (EITI). The acceptance was formalized by the representatives of the International Council of this agency during its International Board held in Norway on October 15, 2020. By being part of this standard, the country reaffirms its commitment to promote transparency and the proper management and governance of oil, gas and mining resources, as well as to encourage the participation of various stakeholders in society.

In 2020, ExxonMobil has made its final investment decision to proceed with the Payara field offshore development in **Guyana** after receiving government approvals. Payara is the third project in the Stabroek Block and is expected to produce up to 220,000 barrels of oil per day after startup in 2024, using the Prosperity floating production, storage and offloading (FPSO) vessel. According to ExxonMobil the development will target an estimated resource base of around 600 Mboe. Ten drill centers are planned along with up to 41 wells, including 20 production and 21 injection wells.

The **Mexican** Energy Secretariat (SENER) instructed the unitization of a shared field, between the Zama field discovered through Contract CNH-R01-L01-A7/2015 in charge of Talos Energy Offshore and Assignment AE-0152-Uchukil whose ownership is in charge of Petróleos Mexicanos. The shared field has an approximate area of 26.7 km2 and is located in shallow waters of the Gulf of Mexico 58 km off the coast of Tabasco and represents one of the most important discoveries made by private companies in Mexico. Expected light oil production from the unitization is scheduled for the first half of 2024. This is the first deposit in the history of the country to be developed between the State-owned productive enterprise and a private enterprise under the umbrella of a unification procedure.

In **Peru**, the year 2020 began with 39 contracts (26 in the exploitation phase and 13 in the exploration phase) and during the months of June, September and December, 3 contracts were completed: Lot 116, Lot 108 and Lot 103, respectively; likewise, during the month of July 2 exploration contracts were signed in Lots Z-67 and Z-68.

The **Dominican Republic** signed a contract for the exploration and exploitation of hydrocarbons in the San Pedro de Macorís sea basin with the American company Apache Corporation. The agreement implies that the company allocates 15% of its production to the local market. This is a shared production agreement, which guarantees the Dominican State a minimum share of 40% of the profits attributable throughout the life of the project, that is, the total oil rent. The area subject to the contract has a size of 2,535 km2 and a depth between 800 and 1,400 meters.

In October, 2020, Touchstone Exploration Inc. made a significant onshore gas Discovery in **Trinidad and Tobago** at its Chinook-1 exploration well on the Ortoire block. According to the company's report, wireline logs indicated significant natural gas pay totaling approximately 589 net feet in three unique thrust sheets in the Herrera sands. Additionally, it noted, natural gas pay of approximately 20 net feet was encountered in the shallower Cruse formation.

2.2 Oil and derivatives

Bolivia announced that the LPG Cylinder Bottling Plant in Yacuiba (Tarija) tripled its production, benefiting urban and rural residents of the Tarija Chaco. The semi-automation of the plant increased production from 100 to 300 cylinders and benefited not only the inhabitants of the urban area, but also at least 30 rural communities in the Chaco region of Tarija. Previously, the cylinder bottling plant carried out its work manually achieving modest results.

Brazil reported that installed oil storage capacity was close to 12 Mm^3 at the end of 2020.

In March 2020, **Colombia** made a further reduction in fuel prices, throughout the national territory. This is the largest historical percentage decrease in the last 10 years and is mainly due to the performance of refined products and the price of Brent crude oil in international markets. This decision was taken in the midst of reduced economic activity due to the effects of COVID-19, in order to provide relief to essential activities that require liquid fuels, such as food transportation. Gasoline had not seen a price at this level since March 2017, while a gallon of diesel had not seen this price since May 2018. On the other hand, energy authorities reported that in the course of 2020 more than 19,100 new users were connected to the LPG service by networks, for a total of 145,300 users. On the other hand, it was announced the start-up of the Castilla 3 Station of the Castilla Field, from the Castilla Development and Production Operations Management of Ecopetrol, which began the process of filling and start-up with the direction of well fluids. Phase I of this facility has a nominal handling capacity of 30,000 barrels of crude oil and 300,000 barrels of production water. Additionally, during 2020, the Ministry of Mines and Energy (MME) co-financed ten infrastructure projects (distribution and connections) for NG and LPG networks, with resources from the Special Fund for the Promotion of Natural Gas and the National Budget, for the departments of Santander, Caldas, Quindío, Risaralda, Putumayo, Boyacá, Nariño, Cauca and Cesar, benefiting 24,853 users.

Ecuador, by decree, exceptionally authorizes the joint management between the private company and EP PETROECUADOR for the operation of the Esmeraldas Refinery. To this end, the Ministries of Energy and Non-Renewable Natural Resources (MERNNNR), Economy and Finance, together with EP Petroecuador, will define the contractual mechanism for a private investor to contribute, at its own risk, to improve the management, supply and quality of fuels produced at the Esmeraldas Refinery, which will continue to be the property of the Ecuadorian State.

In **Uruguay**, the sessions of the expert committee that will study the fuel market began. The aforementioned Committee, made up of representatives of the Executive Branch and the Congress of Mayors, will carry out a comprehensive review of the characteristics of the fuel market, as provided for in the Urgent Consideration Law.

2.3 Natural gas

The government of **Argentina** presented the guidelines of the Argentinian Gas Plan with which it foresees: the substitution of imports for 30,804 Mm^3, foreign currency savings of some 9,274 MUSD and tax savings of

2,574 MUSD until 2024; an increase in tax collection at national, provincial and municipal level of 3,486 MUSD with equal participation of all producing regions; thousands of jobs to operate drilling equipment and fracturing sets including the activity of SMEs and service companies linked to the sector; incentive to investment and gas production to meet domestic demand with Argentinian gas. As part of the investments of the new Gas Production Stimulus Plan, it was announced the start of drilling activities in YPF's Rincón del Mangrullo field, in the Vaca Muerta formation, a block in which YPF carried out two unconventional developments, one of tight gas in the Mulichinco formation and the other of shale gas in Vaca Muerta. It is a deposit that had no drilling activity since February 2019 and that thanks to the new Gas Production Stimulus Plan will be able to double its current production, to reach 5 Mm^3/ day. In this scenario, the Energy Secretariat, by means of a resolution, formalized the call for tenders for the Gas.Ar Plan for the auction of a quota of 70 Mm^3/ day of natural gas from the different basins and for four years, with a system that rewards with priority and higher volume the producers that offer the lowest price. Sixteen national and multinational production companies participated in the bidding process, and the prices offered ranged from a minimum of USD 2.40 to a maximum of USD 3.66 per MBTU. On the other hand, Argentina's Energy Secretariat signed an agreement with the city of San Rafael in Mendoza for the construction of a gas pipeline that will connect more than 25 thousand new users to the natural gas network. Also, a gas plant was inaugurated in the city of Mercedes, in the province of Buenos Aires, which will increase the supply of gas to neighbors and industries in the region.

Bolivia reported the reactivation of the process of new domestic gas installations. As of September 2020, 993,238 households have the basic service of household gas connections. Likewise, natural gas distribution operations by networks were resumed in the Gran Chaco Region of the Department of Tarija, following the decision of the Second Contentious, Social and Administrative Chamber of the Supreme Court of Justice, regarding the reestablishment of the rights and obligations granted by the ANH to YPFB, through the Operating License of March 13, 2019, for an indefinite period of time. In order to resume its functions, YPFB updated the Expansion Plan for the Gran Chaco region, which includes the budget and programming for the construction of gas networks. In this context, the Ministry of Hydrocarbons and Energy, through the state-owned company YPFB, delivered 454 home gas network installations in the municipality of Mizque in the department of Cochabamba. On the other hand, the Carrasco-Yapacaní Gas Pipeline Transportation Capacity Expansion Project was completed, and the Carrasco-Yapacani Gas Pipeline Loop operations began, guaranteeing gas to the Bulo Bulo ammonia and urea plant and to the western domestic market.

Brazilian natural gas processing units amounted to 107.7 Mm^3 / day of installed capacity by the end of 2020, an amount practically the same as in 2019. The total installed capacity of the natural gas regasification terminals was 47 Mm^3 / d, representing 49% of the total gas demand in 2020. In this scenario, the Porto de Sergipe I plant was inaugurated, located in the municipality of Barra dos Coqueiros, and considered the largest natural gas thermoelectric plant in Latin America. With an installed capacity of 1.5 GW and a consumption of 6 Mm^3/day of natural gas, the project is expected to double the generation capacity to 3 GW and meet an average of 15% of the demand in the Northeast, equivalent to 16 million citizens.

Chile announced the start of operations of the first private Liquefied Natural Gas (LNG) transportation network, implemented by AB InBev Brewery, where 35 trucks will operate, in a migration process that will reduce CO_2 emissions by 801 tons per year, which is equivalent to removing 251 cars from circulation or planting more than 1,614 trees, in addition to reducing particulate matter (PM) emissions by more than 90% by replacing diesel with natural gas. The 100% LNG-powered European trucks were manufactured by Iveco and will be operated by Transportes San Gabriel, headquartered in the Maule Region.

Colombia surpassed 10 million users of piped gas and is approaching the goal of the National Development Plan. More than 680,000 new residential, commercial and industrial users have connected to the networked fuel gas service in Colombia, from 2018 to 2020. New gas connections were made mainly in the departments of Antioquia, Cundinamarca and Valle del Cauca, with a total of 309,165 thousand connections.

Within the framework of the priority state policy of massification of natural gas in the transportation sector, the **Peruvian** Ministry of Energy and Mines (Minem) signed an inter-institutional agreement with the Urban Transportation Authority for Lima and Callao (ATU), aimed at joining efforts to promote projects to replace traditional fuels with natural gas, as an economical, cleaner and environmentally friendly fuel. Through this alliance, the Minem seeks to implement the expansion of the BonoGas Vehicular program, to finance the conversion of public transportation buses to natural gas instead of diesel, a measure that will make it possible to save more than 50% in fuel costs. This program makes it easier for transportation companies to obtain loans to finance the change from diesel to natural gas engines. This credit can be repaid in up to 5 years and has an interest rate of no more than 1.6%. The agreement will strengthen ATU's work for urban mobility plans, through the continuous transfer of technology and appropriate planning to implement new natural gas distribution infrastructure for passenger transportation.

A 300 MW plant converted to natural gas was inaugurated in SPM in the **Dominican Republic**. The initiative will save the country more than USD 1 billion over the next 10 years by eliminating the use of oil products for energy production. The conversion of the plant to natural gas is a milestone for the energy sector because it combines economic and environmental benefits for the country through the purchase of energy at much lower prices and the reduction of the carbon footprint through the generation of electricity with a clean fuel, which will significantly support the country's commitments to the Sustainable Development Goals (SDGs). This transformation will reduce greenhouse gases by 460,000 tCO_2 and more than 1,050 tons per year.

In December 2020, the National Gas Company of **Trinidad and Tobago** (NGC) signed an agreement with Trinity aimed at maximizing expectations for access to compressed natural gas, renewable energy options, pursuit of stranded gas assets and other opportunities at existing Trinity assets.

III ELECTRICITY

3.1 Generation, transmission, distribution and consumption

The YPF La Plata Cogeneración II (LPC II) thermal power plant was inaugurated in **Argentina**, in the La Plata Industrial Complex, which, with an investment of 166 million dollars for its construction, will supply energy to 210,000 homes. LPC II will incorporate 90 MW and generate 605 GWh per year to supply the Argentine electricity system, in addition to providing 200 ton/hour of steam for YPF's industrial complex. Together with LPC I, it is the largest cogeneration complex in Argentina, generating 271 MW of electricity equivalent to the consumption of 440,000 homes. The La Plata Industrial Complex is the largest fuel, lubricants and petrochemical products production center in the country. Additionally, with the commissioning of the 132 kV Double Line, 28 km long, between Mar del Plata and the Vivoratá 500 / 132 kV Transformer Station, with a transformation capacity of 900 MVA, the North Atlantic Interconnection System was completed, a work of great importance that optimizes the energy supply in several localities in the south of the Province of Buenos Aires and strengthens them by linking them to the Argentine Interconnection System (SADI). Furthermore, the expansion and repowering of Edesur's Glew Electric Substation was inaugurated, which will benefit 200 thousand people in the southern area of the Buenos Aires metropolitan area.

Brazil's net expansion of installed capacity for electricity generation in 2020 was 7.2 GW, bringing energy to 179.5 GW, of which 83.4% was renewable. It is worth highlighting the expansion of 2.6 GW in Distributed Generation, which is already responsible for 2.7% of the total installed capacity. Solar energy accounted for 48% of the 2020 expansion. In the transmission lines network, 7.66 thousand km were added in 2020, increasing the total length to 162.1 thousand km, being 38.6% in 230 kV and 35.6% in 500 kV. Properties with electric meters reached 86.7 million in 2020 (84.9 million in 2019) of which 74.9 million were households. In December 2020, a Transmission Lines auction was held and 1,960 km of lines were contracted, in addition to 6,420 MVA of substation power. Additionally, two energy expansion studies were completed, the Ten-Year Energy Expansion Plan - PDE2030 and the National Energy Plan - PNE2050, the former more deterministic in terms of projects and investments and the latter more exploratory in terms of options for the use of energy resources. In the horizons of both studies, the proportions of renewable sources remain close to 50% in the energy matrices and above 80% in the electricity matrices.

The Electromobility Accelerator 2020 was launched in **Chile**, an initiative aimed at achieving progress in the incorporation of technologies or strategies for efficient and electrified transportation. In this context, the Chilean Safety Association, ACHS, launched its electric fleet - made up of 25 vehicles - which will be used for preventive work and will avoid the emission of 1.5 tCO_2e per year. This initiative is in line with the government's long-term commitments to ensure that 40% of private vehicles are electric by 2050, and that by 2040, 100% of public transportation will be based on electric buses. Additionally, operations began at the El Conquistador electro-terminal in the Maipú Commune (the largest of its kind in the country), which will supply buses in the metropolitan region. The terminal is supplied entirely with clean energy and has a self-generation system powered by photovoltaic solar panels. In a space of 15 thousand square meters, it has 55 chargers with the capacity to simultaneously charge 110 electric buses. The implementation of this electro-terminal is the result of public-private collaboration. With the entry into operation of the El Conquistador electro-terminal, there are now 10 electro-terminals in the Metropolitan Region, which are supplying energy to the 776 electric buses currently circulating in Santiago. The new enclosure has an innovative top-loading system (with its devices located on a second floor and a retractable connector that descends to the second floor where the bus is parked), which allows the first level to be kept clear, increasing safety and facilitating both operation and maintenance in the enclosure. El Conquistador is the only deposit in the world with high altitude electric loaders. Furthermore, it has a load management software developed by young Chilean engineers from STP, which allows the operational materialization of the design planning of the electric fleet, maintaining an optimal ratio between the number of buses and the number of chargers. On the other hand, government authorities announced a new alternative for heating that benefits ten communes in the south-central part of the country through a special discount on the electricity rate for heating, which will combat pollution in the south-central part of the country and will benefit more than 87,000 homes. This announcement is part of a comprehensive strategy to solve pollution in the south-central part of the country, which includes the regulation of firewood and other solid biofuels, among other improvements in thermal insulation and education.

Costa Rica was positioned as the first country in the region with a national charging network for electric vehicles, which was reported in the framework of the progress of the Decarbonization Plan to modernize transportation; scenario in which it was also reported that Costa Rica is the third country in Latin America with more electric vehicles per capita, according to data from Bloomberg Financial Unit; and the first country in Central America and the Caribbean with a network with more than 100 points throughout the national territory. In this context, the German ambassador in Costa Rica made the official delivery of three electric buses to the national government, which will be used in the execution of a pilot test in the country to generate the framework conditions and a replicable operating model for the electrification of public transportation. The data collected from this one-year pilot called "Public Transport Electrification Model," which will include bus energy consumption, battery capacity and range, charging times, and fleet operation and maintenance costs, will form the basis for creating an operational model for the electrification of all public transport in the country.

Ecuador announced the entry into operation of the Electric Company (EEQ) Electric Power Station Network, with the activation of the recharging point installed at its South Operating Center in Turubamba, where a technical demonstration of its operation and the contribution it represents for the strengthening of the sector, the community and the care of the environment was carried out. The acquisition of the electric charging stations was made through an agreement signed with the United Nations Development Program (UNDP). The equipment is modern, safe, fast-charging, with multi-brand and environmentally friendly connectors; the other components are of national technology and installed by EEQ technicians. Additionally, the new Electric Distribution System Control and Monitoring Center located in Portoviejo, Manabí, was inaugurated. This infrastructure is aimed at improving the electric power distribution service, the management of the response to outages and reconnections, and the quality indexes of the electric service in this province, thanks to the implementation of SCADA technology (supervision, control and data acquisition), benefiting more than one million inhabitants of this province. A total of 31 electrical substations were interconnected to the Control and Operations Center, which allows remote operation to maintain continuity of service to more than 328,000 customers of the Manabí Business Unit. A new transmission system was also inaugurated to ensure reliability in the supply of current and future energy demand to 1.3 million inhabitants of La Concordia - Pedernales, Manabí. Furthermore, the second stage of Substation 50 - La Troncal was inaugurated, which included the installation of the 22 kV yard with 10 outlet positions for feeders, thus providing greater capacity and reliability of the electric power service, benefiting more than 70,000 inhabitants, located in the parishes of Pancho Negro, Manuel de Jesús Calle and La Troncal.

In terms of construction or entry into operation of facilities in the National Interconnected System of **Guatemala** in the course of 2020, a total installed capacity of electricity generation of 4,109.53 MW and an actual capacity of 3,406.98 MW was reached; of the installed capacity, 6.75 MW corresponded to new facilities for an effective capacity of 5.34 MW. In this context, the start of operations of Actun Can Gas generation in Petén was announced, with 4 MW of power. The following works in the electric power transmission system were reported: Esquipulas 69/13.8 kV substation, Barberena 69 / 13.8 kV substation, Carolingia 69 / 13.8 kV substation, La Vega II - Barberena 69 kV transmission line, Quetzaltepeque - Esquipulas 69 kV transmission line, Guate Oeste - Las Flores 69 kV line.

Nicaragua announced an average reduction of 12.5% of the electricity tariff to be applied from January 2021. To this effect, consumers up to 150 kWh-month, which represent 77% of the users, will have a 15% reduction, for users who consume more than 150 kWh-month, the reduction will be 10.5%, the same for industrial customers who represent 6.6% of the tariff sheet.

Panama reported 100% completion of the following projects implemented in the electricity subsector: "Evolution of the Strengthening of the Institutional Framework of the Electricity Sector;" and "Development of a transitory mechanism to guarantee a strategic reserve for the National Interconnected System."

By the end of 2020, **Peru** announced the entry into service of four power plants that together add 48.2 MW of installed capacity to the National Interconnected Electrical System (SEIN). Also, by the end of 2020, two projects in the transmission system came into service, a transmission line of approximately 128 km in length at 220 kV and a change in the configuration of an electrical substation.

As part of the MOVÉS - Efficient and Sustainable Urban Mobility project, **Uruguay** awarded six public transport operators a subsidy for the purchase of 33 electric buses. This subsidy, resulting from inter-ministerial coordination, covers the price difference between an electric bus and a diesel bus of similar dimensions. Furthermore, the sessions of the Electric Mobility Roundtable (MME), a forum for exchange with the main private actors in the transportation sector aimed at promoting energy efficiency and its application in transportation through the promotion of electric mobility in the country, were initiated. In this regard, it is planned to harmonize strategies between the private and public sectors for the promotion and use of electric vehicles, both for passenger and freight transportation. This area analyzes the normative, regulatory and fiscal elements with the aim of minimizing the barriers to the acquisition of electric vehicles.

According to a report by the United Nations Environment Program (UNEP), the cities in Latin America with the greatest progress in the electrification of public transport buses in 2020 were Bogota **(Colombia)**, with the acquisition of 406 units, and Mexico City **(Mexico)**, which acquired 193 trolleybuses. In the Caribbean, **Barbados**, with a population of about 300,000, introduced 33 buses in its capital, Bridgetown. According to the report, if current trends continue, by 2025 more than 5,000 electric buses will be deployed annually in Latin American cities. The market for private electric vehicles also grew in 2020. In **Costa Rica**, the registration of electric cars grew 77% in 2020 and the registration of motorcycles and similar increased 36%. In **Peru**, imports of electric motorcycles increased 220% year-on-year, according to the report. Even so, there is a lack of heterogeneity in the range and category of electric vehicles available in the region.

3.2 Universalization of energy

The Federal Government of **Brazil** launched the More Light for the Amazon Program, with the objective of guaranteeing clean and renewable energy to 70,000 families living in remote areas of the Legal Amazon. With the installation of electric power, the Program aims to promote the social and economic development of these areas, most of which are riverine, indigenous and quilombola communities. To this end, photovoltaic panels will be installed in communities that do not have access to conventional distribution networks. This initiative will reduce the consumption of fossil fuels, help establish traditional communities and preserve the environment, thus contributing to the fulfillment of Brazil's commitments to the UN's 2030 Sustainable Development Goals

(SDG 2030). Furthermore, a project that will bring electricity to 800 families in rural settlements in Flores de Goiás was inaugurated. The action is the result of the Federal Government's Energy Access Universalization Program which, together with the efforts of Enel Goiás Distributor, made access to electricity possible.

In **Chile**, as part of the "Ruta de la Luz" program, more than 80 families from Quilaco, Granerillos, Crucero de Huaro and other sectors of Florida gained access to electricity service. In addition, with the connection to the electricity grid, the electrification project for families in Totoral, Canto del Agua and Carrizal Bajo was completed, which will benefit more than 300 families in Atacama. The project, financed with public and private contributions, consists of 153.3 kilometers of Medium Voltage and 25.4 kilometers of Low Voltage Distribution Network, to supply electricity to 331 homes and 19 establishments and/or public services, benefiting a population of more than 1,100 people. The "Ruta de la Luz" plans to electrify more than 2,500 families per year, nationwide, projecting to connect 21,000 families by 2022, reaching nearly 100,000 beneficiaries.

Over the course of 2020, **Colombia** increased electricity coverage in isolated or rural areas, increasing its installed capacity of non-conventional renewable energies by seven times. The government authorities of the energy sector reported that currently 13 departments of the country have projects totaling 225 MW of non-conventional energy sources. As part of the "Plan 5 Caribe," the La Guajira Electric Reinforcement was inaugurated, an infrastructure project that strengthens the La Guajira Regional Transmission System by incorporating an electric line from Cuestecitas to Riohacha and closing the ring between Riohacha and Maicao. More than 100,000 families have benefited in the municipalities of Riohacha, Maicao, Uribia and Manaure. Additionally, with financing from the Fund for the Development of the Todos Somos Pazcífico Plan, an electricity interconnection project was inaugurated in Sipí - Chocó, benefiting 863 families in the municipal capital. The 13.2 kV Electrical Interconnection project will allow this community to go from having 5 hours a day of electrical energy service through diesel plants to 24 hours with electrical interconnection. With this same source of funds, an electrical interconnection project was inaugurated in Cauca, municipality of Suarez, consisting of the construction of medium and low voltage electrical structures and the assembly of distribution substations, benefiting 559 families.

As part of the Rural and Urban Marginal Urban Electrification Program (FERUM), **Ecuador** carried out work to upgrade networks, increase power and expand public lighting, benefiting approximately 712 families in the Calpaquí and Tocagón communities of the San Rafael parish in the Otavalo canton. Furthermore, the remodeling of networks in rural neighborhoods of the Pangua canton in the province of Cotopaxi was carried out, directly benefiting 23,000 inhabitants whose main economic activity is agriculture and livestock farming. Likewise, in Jalligua La Esperanza, 1.7 km of medium voltage lines, 1.30 km of low voltage lines, 15 100 W lights, 2 transformation equipment, 18 connections and meters were built, together with the execution of the Pinllopata three-phase network consisting of 21 km of medium voltage lines. As part of the project "Strengthening of distribution lines and networks to reduce voltage drops and technical losses in electrical networks," electrical works were delivered to the rural communities of San José de Tunguiza, San Vicente de Nanzag and San Francisco de Telán, located in the Guamote canton of the province of Chimborazo, benefiting approximately 650 inhabitants of the area. On the other hand, the Chobo Electric Substation was delivered, located in the Milagro canton, which is connected to the drinking water distribution plant for Durán; and the double sub-transmission line, 14.5 km long at 69 kilowatts, located on the Durán - Tambo road, both in the province of Guayas. The two electrical works benefit more than 300,000 inhabitants and close to 400 companies dedicated to the industrial development of Durán. The Chobo Substation has an installed capacity of 6/7MVA and will upgrade the distribution system to ensure, through electricity, the operation of 13 drinking water pumping stations. In addition to this infrastructure, there is a 69 kV sub-transmission line, 3.55 km long, between the Chobo Lateral Pass and the substation; and a 13.8 kV distribution line, divided into three primary feeders, 7.6 km long, to provide quality and higher levels of electricity supply. Also, two 69 kilowatt sub-transmission lines, called "L3 and L4", were built in the Durán canton to meet the demand of the residential sector and more than 400 industries in the area. The network extends over 14.5 kilometers and is supported by the installation of 109 steel towers 25 meters high, 89 concrete poles 23 meters high, 17 metal poles, 98 km of installed cable, among other elements.

Within the framework of the National Sustainable Electrification and Renewable Energy Program (Pneser) **Nicaragua** reached 98.5% electricity coverage in December 2020 with the electrification of 670,695 homes where 3.5 million people live with a total of 515 projects that also included supply improvements. This figure is expected to rise to 99 per cent by 2021.

In **Peru**, during 2020, a total of 58,961 rural inhabitants gained access to electricity service, thanks to the completion of eight electrification projects promoted by the Ministry of Energy and Mines (Minem). Cajamarca concentrated three of the projects and almost 27,000 beneficiaries; while in the Amazon two others were implemented, benefiting 6,782 people. The largest project was carried out in Huánuco, with 21,000 beneficiaries. Projects were also implemented in Ancash and Huancavelica, allowing 6,480 people from those regions to benefit from the service. By the second half of 2020, eight rural electrification works executed directly by the DGER were completed in Peru, in the departments of Amazonas, Ancash, Cajamarca, Huancavelica and Huánuco, benefiting a population of 59 thousand inhabitants.

3.3 Hydroelectricity

The Bedim Small Hydroelectric Power Plant (SHP) was inaugurated in **Brazil**, with a total installed capacity of 6 MW and the capacity to supply more than 12 thousand homes. The project, located between the municipalities of Francisco Beltrão and Renascença, in southwestern Paraná, joins 419 other Small Hydroelectric Power Plants currently in operation in Brazil, which together add a considerable installed capacity of 5,400 MW to the national electricity grid. In addition, another 27 SHPs are currently under construction in the country and will add another 331 MW to the Brazilian electricity matrix. Currently, of the 174 GW in installed power in Brazil, 10% (about 17 GW) is distributed in two hundred and twenty-two projects that operate in Paraná. Of these, 31 are SHPs (with 306 MW of installed power).

Guatemala announced the entry into operation of the Hidrosan II hydropower plant, with a capacity of 1.5 MW, and the Los Encuentros hydropower plant with 1.25 MW, both in the Department of Chimaltenango.

3.4 Nuclear energy

The construction of the CAREM reactor was completed in **Argentina**, the first nuclear power reactor entirely designed and built in the country, which reaffirms with this milestone its capacity for the development and start-up of nuclear power plants, becoming one of the world leaders in the small and medium power modular reactor (SMR) segment. This type of reactor has a great projection for the electricity supply of areas far from large urban centers or manufacturing and industrial poles with high energy consumption. Additionally, Nucleoeléctrica Argentina reached, three months before the end of 2020, the historical record of annual nuclear electricity generation. Thus, the operating company of the Atucha I, Atucha II and Embalse power plants generated 7,947,430 MWh from January 1 to September 30, 2020. In the months of April and May, historical records for monthly electricity generation were achieved and in April the nuclear share of the electricity market reached a peak of around 11%. So far, the energy generated in 2020 saved the emission of approximately 5,058,677 tCO_2.

In **Brazil**, the Angra 2 nuclear power plant reached a historic milestone, completing a 13-month continuous power generation cycle, with a capacity factor of 99.43%. In addition, the renewal of uranium production was announced, starting with the open-pit exploration of a new mine at the Caetité Uranium Concentration Unit - URA, in Bahia, the Engenho Mine. The expectation is to produce 260 tons of uranium concentrate per year when the Engenho mine reaches full capacity in 2022. Mining activities at the Unit were halted in 2015, following the exhaustion of the open pit mining process of the first area that was mined, Mina Cachoeira. On the other hand, INB (Brazilian Nuclear Industries) delivered to Argentina a new load of enriched uranium to supply the Atucha Nuclear Power Plant and the Carem-25 reactor. This is the third sale of enriched uranium to Argentina in the last four years. The growth of enriched uranium production by INB is part of the company's objectives to make its operations economically viable and meet the country's strategic interests, becoming an exporter of fuel for nuclear reactors, with very high added value.

In **Mexico**, the Energy Secretariat (SENER) authorized the renewal of the operating license for Unit 1 of the Laguna Verde Nuclear Power Plant (CNLV-U1). The license granted to the Federal Electricity Commission (CFE) has the technical endorsement of the National Nuclear Safety and Safeguards Commission (CNSNS) and is valid from July 25, 2020 to July 24, 2050.

IV ENERGY EFFICIENCY

The support program for the productive sector "Ponle Energía a tu Pyme" was launched in **Chile** to promote energy efficiency and renewable energies in micro, small and medium-sized enterprises (MSMEs). Under this initiative, MSMEs from any productive sector will be able to access co-financing and support to contain their electricity and fuel costs through energy efficiency initiatives and self-consumption renewable energies. One of the main actions of this program is the provision of non-refundable co-financing for the implementation of energy efficiency projects, self-consumption renewable energies and energy audits.

Colombia launches energy efficiency program Caribe Eficiente for strata 1 and 2 in the department of Atlántico, with the goal of replacing more than 54 thousand refrigerators. The Caribbean Energy Efficiency and Sustainable Energy Program - PEECES, reaffirms the intention of adopting measures through Efficient Energy Management to promote a change of refrigerators, and generate in the users of the region a responsible acquisition and use of these equipments, as well as their correct final disposal. It also promotes energy labelling.

In 2020, the Government of **Jamaica** allocated budget for the Energy Efficiency and Conservation Program to be implemented during fiscal year 2020/21. The initiative involves the design and implementation of concrete cost saving measures for energy efficiency (EE) and energy conservation (EC) in the public sector. The project is being implemented by the Ministry of Science, Energy and Technology, through funding provided by the Government.

In the area of Energy Efficiency, **Panama** reported 100% execution of the following projects: "Support to Panama to strengthen the energy efficiency financing mechanism (scrap management and disposal strategy) and diagnosis and recommendations to improve the Energy Administrators program in the public sector. PALCEEIII;" and "Publication of the Panama Energy Efficiency Indicators Base (BIEE)." Additionally, as part of the commemoration of World Energy Efficiency Day, it was announced that as of January 1, 2020, the labeling program for the importation of efficient household appliances was launched, in accordance with the entry into force in October 2019 of the Sustainable Building Regulations for new constructions.

The Ministry of Industry, Energy and Mining (MIEM) of **Uruguay** launched the 2020 edition of the National Energy Efficiency Award, an initiative of public recognition to institutions, organizations and companies for their efforts and achievements in relation to energy saving and efficient use of energy in different sectors of activity. This year, the award, in addition to the traditional categories included mobility. Furthermore, the 2020 call for applications for Energy Efficiency Certificates (CEE) was launched, a monetary award granted by the MIEM for successful Energy Efficiency Measures (MMEE) that have been implemented in companies of all sectors of activity, public and private organizations and households to contribute to the avoided energy goal established in the National Energy Efficiency Plan. In this context, the MIEM presented its "Put your best energy in efficiency" campaign, which aims to inform and accompany micro, small and medium-sized companies in the search for and application of available measures and tools to make their energy consumption more efficient. To this end, the MIEM provides assistance in carrying out self-testing of energy consumption and obtaining non-reimbursable funds to implement energy efficiency measures.

V RENEWABLE SOURCES

Argentina's Energy Secretariat reported the signing of 7 contracts for 45 MW, corresponding to the pending projects of the "RenovAr Program - MiniRen/Round 3." With the signing of these last contracts, a total of 33 projects were reached for a power of 203 MW that will be developed under the modality of Round 3, with an investment of more than 319 MUSD. These projects will generate electricity for 223,000 households. MiniRen projects cover the various possibilities of generation from renewable sources (wind, solar photovoltaic, biomass, biogas or small hydropower), with the particularity of not exceeding a power of 10 MW. Two power plants were also inaugurated in Chaco, which will generate 19 MW of power from renewable energy sources.

In September, 2020, the United Arab Emirates-Caribbean Renewable Energy Fund (UAE-CREF) committed to developing **Belize**'s largest renewable energy rural electrification project, which will bring modern electricity services to three remote communities in the country for the first time. The engineering, procurement and construction contract to build a hybrid solar photovoltaic (PV) and diesel plant, equipped with battery storage will have resources of USD 50 million, the largest investment in renewable energy of its kind in the region.

Brazil reported that renewables were not greatly affected by the pandemic, increasing by 2.5%, supported by increases in sugarcane, wind, solar and biodiesel products. In this context, there was an increase in the share of renewable sources in the Energy Matrix (OIE), from 46.1% in 2019 to 48.4% in 2020. In 2020, Brazil's energy surplus indicator more than doubled, and primary production exceeded total demand by more than 11%. In this scenario, the national electricity supply fell by 0.8% in 2020, but renewable sources increased by 1.3%. Thus, the proportion of renewables increased by 1.8 percentage points, to 84.8%. Solar energy was the highlight, with growth of more than 60% in 2020. In this context, a major solar generation park was inaugurated in the Brazilian Midwest. The project, located in the state of Goiás, comprises 26 generation projects and has an installed capacity of 5.6 MWp, capable of serving the equivalent of 4,265 families. The Coremas solar plant was also inaugurated in the state of Paraíba, the size of which is approximately equivalent to 1,100 football fields with solar modules, capable of supplying the consumption of 300,000 low-income housing units. The interior of Paraíba, specifically the city of Coremas, is considered the best solar irradiation point in Brazil. When completed, the complex will have 312 MW of power, with 686 thousand photovoltaic modules installed. On the other hand, the mandatory minimum percentage of 12% of biodiesel in diesel sold to the final consumer (B12) came into force. The measure complies with the schedule approved by the National Energy Policy Council (CNPE). According to the Council Resolution, the next evolutions of the mandatory addition should be on 1/3/2021 to 13%; on 1/3/2022 for 14%; on 1/3/2023 for 15% (maximum limit). With the use of B12, biodiesel demand is expected to grow by one billion liters this year. Also, in June 2020, the L73 Biodiesel Auction was held, which recorded the largest volume traded in a bimonthly auction and the largest financial movement in the history of the biodiesel trading system. In addition, one of the world's largest biogas plants for sustainable electricity generation was inaugurated. The biogas plant, installed in the Bonfim plant, has a power generation capacity of 138,000 MWh / year that will supply a total of 62,000 households or approximately 150,000 inhabitants. October 2020 saw record wind power generation, which reached 12,229 MW, enough energy to supply 32 million people. Solar photovoltaic generation reached 2,073 MW in April, enough energy to supply 5 million people.

In **Chile**, in the first half of 2020, the Coquimbo Region reached 99% of electricity generation with renewable sources, with a predominance of wind energy. During the first six months of the year, new NCRE projects were added to the grid: the Llanos de Potroso photovoltaic farm (9 MW) in the municipality of La Serena and the La Chimba Bis photovoltaic farm (2.8 MW) in Ovalle. The largest floating solar plant in Chile was also inaugurated. It is an island with 456 photovoltaic panels connected to the distribution grid under the Net Billing law. Likewise, during 2020, the generation of non-conventional renewable energies exceeded 21%. In this context, the southernmost photovoltaic solar park on the planet was inaugurated in the Biobio Region. The Cabrero photovoltaic plant has 7,056 panels and a capacity of 2.62 MW to supply 4,000 homes in the region, with an estimated annual production of 5.8 GWh. The largest solar parking lot in Chile was also inaugurated, with the installation of 768 solar panels that will generate 390,000 kWh and will supply 100% of the energy for the Safari Park in the Rancagua district (animal recovery and care center), which will stop emitting more than 150 tons of CO_2 per year. This project will be connected to the network under the Net Billing Law. In addition, a solar photovoltaic plant was inaugurated at Viña Pérez Cruz, a space comprising 1,255 solar panels with the capacity to generate 308 KW, equivalent to 70% of its electricity demand. Additionally, the 9 MW Libertadores photovoltaic park was inaugurated in Rinconada. The plant, which covers 24.4 hectares, will inject 11.7 MW of electricity into the national grid and will enable 9,000 households to receive clean, renewable energy. On the other hand, key works were inaugurated to strengthen the Electrical System in the Norte Grande and transition to a renewable matrix. These are the Frontera substation in the Antofagasta Region, and two new power lines at the Cóndores and Parinacota substations in the Tarapacá and Arica and Parinacota regions, respectively. It is important to note that Bloomberg's Climatescope 2020 Report placed Chile as the most attractive country to invest in renewable energy, in the historical record of Chile in this global ranking, it is noted that in 2017 it ranked number 7; jumping from 2018 to date, to the top one. During 2020, renewable energy generation exceeded 21% of the country's total consumption. On the other hand, within the framework of the Green Hydrogen Strategy, the first green hydrogen pilot in the country was inaugurated in Magallanes. Magallanes has great projections to be one of the most important poles in the world in the production of green hydrogen and clean energies in consideration of its wind potential.

Colombia inaugurated in Ovejas, Sucre an electrification project based on the installation of isolated individual photovoltaic systems that benefits more than 500 people with resources from the General Royalty System. Likewise, a Photovoltaic Solar System was inaugurated in Medellín with 780 solar panels located in the Advanced Manufacturing Technology Center -CTMA of SENA Antioquia, which will generate 44 MW of energy per month. In addition, as part of the New Energy from the Sun initiative, a solar photovoltaic electrification project was inaugurated in Urumita, department of La Guajira, benefiting 10,402 families. In addition, the Bosques de los Llanos I solar farm, located in the municipality of Puerto Gaitán, Meta, was inaugurated. The commissioning of this solar energy project, with an installed capacity of 20 MW, will generate 51 GWh of energy per year, equivalent to the energy consumed by 23,800 families, and will reduce CO_2 emissions by 19,450 tons per year. Five solar energy projects were also inaugurated, installed during 2020 at the Matecaña International Airport, Victoria Shopping Center, Alcides Arévalo Shopping Center, Viva Cerritos and the Biopark itself, in addition to two others already installed and in operation at the Pino Verde High School and the Technological University of Pereira. These systems have a total of 5,632 panels that will cover a large part of the energy demand of the different institutions, representing a decrease of 671 tons of CO_2 each year in the city. On the other hand, more than one thousand Caquetá families in the rural area of San Vicente del Caguán gained access to electricity service as part of the New Energy from the Sun program through the installation of solar panels with resources from the Financial Support Fund for the Energization of Non-Interconnected Areas (FAZNI). Together, the "Pétalo de Córdoba I" solar park was inaugurated in Cartagena de Indias. The plant, with an installed capacity of 12 MWac, will generate more than 17 GWh per year, which it will contribute to the national interconnected system (SIN). With the start-up of the plant, more than 6,000 tons of CO_2 will no longer be emitted into the atmosphere, equivalent to the energy consumption of 692 homes for one year. Also in Cartagena, the Bayunca Solar Park was inaugurated, a modern facility with 9,810 solar panels, capable of generating more than 7.1 GWh/year, enough to serve more than four thousand homes. Similarly, a solar energy farm was inaugurated in Santander de Quilichao, Cauca, Colombia, consisting of 4,890 panels installed on a structure with sophisticated technology that moves in the direction of the sun to maximize energy production, which supplies 20% of the annual energy demand of a cookie production plant. The complex was built on an area of 22,000 m^2, and will produce more than 2,716 MWh/year of energy, contributing to the reduction of CO_2 by more than 1,000 tons per year. Additionally, the first large-scale solar farm in Tolima was inaugurated, located in the municipality of El Espinal, consisting of 37,876 panels with an installed capacity of 9.9 MW, sufficient for the average consumption of 6,000 families. In this context, a transitory subsidy of 86% was approved for electricity service tariffs with solar panels for households in non-interconnected areas. This subsidy will benefit more than 13,300 users who currently have access to New Energy from the Sun.

Costa Rica, managed to electrify 337 days of 2020 with renewable energy. Electricity generation based on renewable sources reached historic figures in recent years, reaching its sixth consecutive year with more than 98% of renewable electricity generation. In 2020, despite the effects of the pandemic, the country recorded 99.78% of renewable electricity production, which meant that the energy generated by fossil fuels was the lowest since 1986. Hydroelectricity accounted for 71.95% of electricity production, benefiting from a surplus of rainfall in the second half of the year. Geothermal energy was positioned as the second energy source with a generation of 14.90%, while wind energy was in third place with 12.39%. In this context, biomass and solar energy contributed 0.54%. With these figures, the country is above the world average of 72%, according to the 2020 Renewable Capacity Statistics report of the International Renewable Energy Agency (IRENA). Additionally, it was announced that less than two years after the launching of the National Decarbonization Plan, important progress has been made in terms of the goals set for 2022, such as the compliance by the Costa Rican Electricity Institute (ICE) and the National Power and Light Company (CNFL) with the goal of maintaining a 100% renewable electricity matrix by 2020.

After its synchronization to the National Electroenergy System, **Cuba** began the test phases of its first bioelectric plant, located in the central province of Ciego de Avila. The new plant will generate electricity from the biomass of the marabú bush and will also produce clean energy during the sugar harvest using bagasse. It is located in the area of a sugar mill and is expected to save about 100,000 barrels of oil per year when it becomes operational. It was built with an investment of 180 MUSD that includes technology from a Chinese company and the execution of the works was in charge of the mixed company BioPower S.A. (with Cuban, British and Chinese participation). When fully operational, this unit is expected to generate 60 MW of electricity per day, equivalent to 50% of Ciego de Ávila's energy consumption. The plant will provide all the electricity needed by the Ciro Redondo plant for sugar production and the rest will be added to the national grid. The implementation of bioelectric plants in Cuba to produce clean energy through biomass, which is less costly and more efficient, is part of the country's strategy to change its energy matrix and expand the use of renewable sources, reaching 24% of electricity generation (14% will come from biomass) by 2030.

Ecuador reported that as of 2020, 92% of the country's energy generation came from hydroelectric plants, 7% from thermal plants and 1% from non-conventional sources (photovoltaic, wind, biomass, biogas, geothermal, among others). This production, marked by environmentally friendly energies, was able to satisfy the national demand for electricity, as well as the export of electrons to neighboring countries (Colombia and Peru).

In April 2020, two solar photovoltaic generation plants began commercial operation in El **Salvador**'s wholesale electricity market, adding 110 MW to the country's generation capacity. The largest are the Albireo I and II plants, which are 50 MW each, totaling 100 MW. These facilities are equipped with tracker systems that provide greater efficiency in the production of electrical energy. Likewise, in the first half of 2020, the 10 MW Sonsonate Solar plant entered into commercial operation, which has fixed facilities on the ground. Additionally, as part of the promotion of renewable distributed generation, in 2020, 19 projects began commercial operation, using hydroelectric and solar photovoltaic resources for an installed capacity of 30.93 MW.

Guatemala reported that 41% of the new electricity generation capacity installed in 2020 uses a renewable resource.

The World Bank's Board of Executive Directors approved in September, 2020 a USD 6.9 million in additional financing for the **Haiti**: Renewable Energy for All Project. This financing aims to scale up renewable energy investments to expand and improve access to electricity for health infrastructure, households, businesses, and community services. The Project includes the installation of solar photovoltaic and battery energy storage for health infrastructure and water facilities. It will also complete the rehabilitation of the Drouet mini hydroelectric plant in the Artibonite Department, which will provide clean and reliable electricity to nearby communities and the regional grid.

During 2020, in an effort to reduce electricity costs in public schools in **Jamaica**, and decrease reliance on Jamaica Public Service Co. Limited, the Ministry of Education, Youth and Information invested $60 million in solar photovoltaic systems that will reduce current electricity bills by 40 to 70%.

Nicaragua reported that the capacity to generate renewable energy reached 75.94% in 2020, which represents 50 points more than in 2007, this scenario implied savings of approximately 5.1 million barrels of oil products in 2020. In this context, the Corn Island Solar Plant, Caribbean Pride Solar Energy Plant, won the Project of the International Year Award in Solar Energy Storage, awarded during the Solar and Storage Live UK 2020 Event. This hybrid solar plant was inaugurated in July 2019, to provide clean energy to the residents of Great Corn island. It was built by ENATREL through the National Program for Sustainable Electrification and Renewable Energies PNESER, and was financed by the Inter-American Development Bank IDB.

Panama announced the start of operations of the Dacona Star, Fotovoltaica Santiago and Eco Solar photovoltaic plants, with capacities of 240 kW, 4,980 kW and 9,900 kW respectively, for a total of 15,120 kW. In addition, 100% execution was achieved in the following renewable energy projects: "Accelerating the transition to sustainable and low-emission mobility in the Metropolitan Area," aimed at facilitating the necessary tools to better focus the use of the country's resources in its efforts to achieve more sustainable transportation; "Feasibility study of a pilot project to decrease subsidy (gas/electric) through the use of photovoltaic solar panels and efficient technology" which involved the installation of electric power generation units for self-consumption, as well as equipping residences that receive subsidized electricity rates (consumption < 300 kWh) and the 25-pound LPG cylinder with appliances, lighting fixtures and other efficient equipment, in order to offset subsidized energy and thus gradually decrease state energy contributions and subsidies; "Development of the Social Impact of the Energy Transition Agenda," in charge of conducting a qualitative and quantitative analysis on the interrelationships between sustainable energy according to Sustainable Development Goal 7, and poverty and inequality in Panama, within the framework of the Strategic Guidelines of the Energy Transition Agenda 2020-2030 for Panama.

In the area of renewable energies, **Peru** concluded the installation of the first Mass Program with Photovoltaic Systems (August 2020), benefiting with the installation of 208,145 photovoltaic systems, 820,000 inhabitants of the departments of Amazonas, Ancash, Apurímac, Arequipa, Ayacucho, Cajamarca, Cusco, Huancavelica, Huánuco, Ica, Junín, La Libertad, Lambayeque, Lima, Loreto, Madre de Dios, Moquegua, Pasco, Piura, Puno, San Martín, Tacna, Tumbes and Ucayali.

In the **Dominican Republic**, the Coordinating Agency of the Interconnected Electric System (OC-SENI) launched its Solar and Wind Energy Generation Forecasting Service, which will ensure the massive integration of renewable energies in an efficient and sustainable manner over time. This service makes it possible to establish how much renewable generation will enter the electricity system and thus know how much conventional generation is necessary to complement the rest of the demand, thus strengthening the main pillars of the electricity market, such as planning, trust and certainty, while correcting the dispersion of information in this area. Additionally, the Ministry of Energy and Mines MEM of the Dominican Republic reopened the Renewable Energy Theme Park located in Ciudad Juan Bosch, a space in which clean energy is generated with various technologies. The park was in the phase of completion of works that were delayed due to the effects of the pandemic. The theme park offers the opportunity to learn about all renewable energy sources in a half-hour tour.

In November, 2020, the JGH Group has signed a contract for the delivery of a 250KWp solar micro grid to the Ministry of Natural Resources to be installed in the remote village Godoholo in **Suriname**. Godoholo is located in the southeastern part of the country, approximately two days down the Amazon by canoe from Paramaribo, and was powered by a diesel generator, now the inhabitants will have electricity generated from 756 solar panels, enough to supply the entire town with renewable energy.

VI ENERGY AND ENVIRONMENT

In 2020, **Brazil**'s greenhouse gas emissions were 383 Mt CO_2 eq., Which shows a decrease of 5.5% with respect to 2019 emissions and 21% below the 2014 emissions record of 484.6 Mt, a year of high thermoelectric generation from fossil sources. The ratio of emissions to OIE was 1.33 tCO_2/toe in 2020, 40% less than the global indicator. The low carbon intensity indicator in relation to energy is due to the high proportions of renewable sources in the electricity matrix (84.8%), in the industrial energy matrix (45.3%) and in the transport energy matrix (24.5%). It should be noted that in March 2020 the percentage of biodiesel blend with total diesel rose to 12%, increasing by one percentage point. By 2023, this indicator will rise to 15%, according to current legislation. On the other hand, RenovaBio surpassed the mark of 15 million Decarbonization Credits registered in the Stock Exchange (B3 -Brasil Bolsa Balcão). RenovaBio contributes to the fulfillment of the country's commitments under the Paris Agreement and promotes the adequate expansion of the production and use of biofuels in the national energy matrix, with emphasis on the regularity of fuel supply.

Chile permanently disconnected Enel's Bocamina I plant in Coronel after 50 years of operation. This act is considered a historic milestone for the Coal Plant Closure Plan in order to continue promoting the development of clean energies, 48 hours earlier the Ventanas I plant was closed after 56 years of operation, which will prevent the emission of 182 thousand tCO_2 into the atmosphere. Bocamina's phase out completes the closure of almost 20% of the total number of coal-fired power plants in Chile. The Bocamina I plant, with a capacity of 128 MW, was inaugurated in 1970, and is the fifth plant to close its operations within the framework of the Power Plant Retirement Plan led by the Ministry of Energy. These five plants involve the withdrawal of 570 MW generated by coal which will be replaced by renewable energies. The shutdown of both plants - Ventanas 1 and Bocamina 1 - means the retirement of 242 MW and the reduction of more than 705,000 tCO_2, equivalent to the withdrawal from circulation of more than 277,000 vehicles. Meanwhile, the Firewood Quality Seal was launched, an initiative of the Ministry of Energy and the Energy Sustainability Agency that highlights dry firewood traders that comply with the quality standard defined by this Seal. The Firewood Quality Seal is part of the Residential Energy Transition Strategy of the Ministry of Energy and contemplates different initiatives to modernize the solid biofuels market, its quality and production standards.

On the fifth anniversary of the Paris Agreement, **Costa Rica** presented the headline targets of the Nationally Determined Contribution 2020 (NDC 2020), an official document that brings together the public policies on climate issues that the country plans to implement between 2021 and 2030. In this new roadmap for the next decade the country increased its climate goals in relation to the contribution presented in 2015, foreseeing a reduction in emissions, with a target of 9.11 $tCO_2eq.$ including all gases and all sectors covered by the corresponding National Emissions Inventory. This ensures that the country's climate actions are in line with the global temperature rise target, defined by the international community at 1.5°C.

Uruguay launched the process of developing a "Long-term climate strategy for low greenhouse gas (GHG) emissions and climate resilient development." The activity marked the beginning of a process of searching for a national, inter-institutional and coordinated vision on climate change, but, fundamentally, on the strategies that will be designed to provide a local and global response to the objectives set for 2050, with the Paris agreement of the United Nations Framework Convention on Climate Change (UNFCCC). The project will be led by the National Climate Change Response System (SNRCC) and involves different actors in society. The first stage will end in the first half of 2021, when the Long-Term Strategy is presented.

VII ENERGY INTEGRATION, COOPERATION AND COMPLEMENTATION

In October, 2020, the **Barbados**-based Caribbean Centre for Renewable Energy and Energy Efficiency (CCREEE) signed a Letter of Agreement (LoA) to be the lead energy partner in the co-development of state-of-the-art, tailored climate information and services for the energy sector in the Caribbean Community (CARICOM). The CCREEE joins other regional agencies and institutions representing Caribbean climate sensitive sectors on the Consortium of Regional Sectoral Early Warning Information Systems Across Climate Timescales (EWISACTs) Coordination Partners.

On February 3, 2020, the first **Brazil**-United States Energy Forum (USBEF) was held in Rio de Janeiro, marking the beginning of a bilateral cooperation agenda to overcome the challenges of energy trade and investment. The meeting presented the 2020 Action Plan of the two countries in the areas of oil and gas, nuclear energy and energy efficiency. In the area of hydrocarbons, there are plans to promote U.S. investments in oil and gas resources under the Open Acreage program; accelerate the growth and development of the natural gas market in Brazil, together with the corresponding regulatory reform; provide technical and regulatory support for the development of unconventional hydrocarbons in Brazil, among other actions. With regard to nuclear energy, Brazil's long track record in mastering the nuclear fuel cycle and its large uranium reserves was valued, and the contribution of the United States in terms of technological expertise was discussed. In this regard, the Action Plan includes: technical, economic and commercial partnership to complete Angra-3 (TBD); and technical and economic partnership for the renewal of Angra-1's operating license, extending its useful life from 40 to 60 years. In parallel to the Forum, a Memorandum of Understanding was signed between the Brazilian Association of Nuclear Development Activities - ABDAN and the U.S. Nuclear Energy Institute (NEI) to reinforce the importance of Brazil-U.S. cooperation in the nuclear sector.

In 2020, a new productivity record was set at the Itaipu Binacional Hydroelectric Power Plant **(Brazil-Paraguay)**: 1.0881 MW med/m^3/s (average MW produced per cubic meter of water per second), considered the best rate in its history with more than 36 years of operation. Thus, the largest generator of clean, renewable energy on the planet overcame the greatest drought of all time recorded in 2019 and the impacts of the pandemic. This achievement is based on the optimization of operation and maintenance processes with a focus on the best possible use of the resource.

Costa Rica signed a non-reimbursable financing agreement that, under the Payment by Results approach, will enable it to receive USD 60 million from the World Bank over the next five years in recognition of its efforts to protect forests and reduce emissions in the context of the current climate crisis. The announcement was made after the official ceremony of the United Nations (UN) 2020 World Climate Action Award, whose category Financing climate-friendly investments was given to Costa Rica. The funds come from the Emission Reduction

Purchase Agreement (ERPA) between the Government of Costa Rica and the Forest Carbon Partnership Facility (FCPF), which is administered by the World Bank. The funds will be allocated to individuals and organizations who own forest land and who voluntarily wish to participate in the Programme. The agreement will particularly benefit key populations such as indigenous territories with forest and organized groups of women and young people who carry out conservation actions but do not own the land due to their conditions. The agreement covers the reduction of CO_2 emissions due to deforestation and forest degradation and the increase in carbon stocks. It also includes institutional actions to address the main factors affecting deforestation and forest degradation, such as fire and illegal logging. As a world leader in sustainability, Costa Rica has stood out for implementing over 20 years a Payment for Environmental Services (PSA) program to reverse deforestation executed by the National Forestry Financing Fund (FONAFIFO), as well as a program to combat forest fires led by the National System of Conservation Areas (SINAC) of the Ministry of the Environment and Energy (MINAE).

Between January and February 2020, **Ecuador** exported 234.38 GWh to **Colombia**. This export has meant an income of USD 16 million for the Ecuadorian State. 90% of electricity generation was produced by renewable sources - such as hydroelectric, photovoltaic and wind power - which allowed export prices to be competitive and of interest to Colombia.

On October 9, 2020, the Meeting of the Special Commission of Binational Entities and Development of the Electricity System of the Republic of **Paraguay** was held with advisors from the different governmental institutions involved in the renegotiation of Annex C 2023 of the Itaipu treaty. Within the framework of the session, the progress made by the working groups led by the Ministry of Foreign Affairs in the revision of the aforementioned annex was reported. The Paraguay-Chile Forum on Non-Conventional Renewable Energies and Energy Efficiency was held with the aim of generating alliances and complementing available hydroelectric energy with other sources, such as solar and wind power, as well as optimizing its use with energy efficiency solutions.

In August 2020, **Trinidad and Tobago** and **Barbados** entered into a Memorandum of Understanding (MOU) that establishes a general framework for both parties to undertake cooperative initiatives in the areas of energy, energy security, as well as energy exploration, development and production, based on the hydrocarbon resources that straddle their maritime border.

VIII NATURAL PHENOMENA AND DISASTERS THAT AFFECTED THE SECTOR

In **Brazil**, the state of Amapá remained without electricity service for approximately three weeks, after a thunderstorm set fire to the station that supplies the service in the region on November 3, 2020, a situation that was aggravated by severe rains that caused flooding in several parts of the city. The population of Amapá recovered electricity service early in the morning of November 7, after intense efforts coordinated by the Crisis Cabinet, established by the Ministry of Mines and Energy (MME), together with organizations from the Brazilian electricity sector, the Federal Government and the State Government of Amapá.

In November 2020, hurricane Iota reached category 5 (the highest on the Saffir-Simpson scale) and impacted the archipelago of San Andres, Providencia and Santa Catalina in **Colombia**, causing severe damage due to strong winds and torrential rains that affected the electrical infrastructure. The government undertook multiple actions to reestablish electric power through the installation and energization of poles and the delivery of solar kits, as well as to guarantee the distribution of liquid fuels and LPG gas for cooking.

In **Ecuador**, on April 7, 2020, due to a process of regressive erosion in the area of San Rafael, on the provincial border between Napo and Sucumbíos, a sinkhole occurred that destroyed the pipelines of the Trans-Ecuadorian Oil Pipeline System (SOTE) and the Shushufindi-Quito Polyduct, causing a hydrocarbon spill into the Coca River. Immediately, containment barriers were implemented at different points, and the construction of emergency works was initiated to reduce the speed of the Coca River's water flow, mitigate the phenomenon of natural erosion and protect this strategic infrastructure. Also, in order to prevent possible damage to the existing oil infrastructure in the area, construction will begin on a new variant of the Trans-Ecuadorian Oil Pipeline System

(SOTE) pipeline. Ecuador's Ministry of Energy and Non-Renewable Natural Resources declared Force Majeure in hydrocarbon exploration and exploitation activities due to the stoppage of the Trans-Ecuadorian Oil Pipeline System (SOTE) as of June 3, at 00h00. The suspension of activities at SOTE was due to the construction of two pipeline variants, 380 and 690 meters long, which will safeguard the integrity of the pipeline. The decision adopted was preventive and of an environmental nature, with the purpose of avoiding the risk of a spill, while the works of the new variant of the SOTE are finished. The country's oil exports were not affected due to the existing stock of crude oil at the Balao Terminal.

In **Guatemala**, storms ETA and IOTA affected the northern regions of the country, which required modifications to the transmission network to guarantee the supply of electricity to the entire population.

Hurricane Iota caused damage to **Nicaragua**'s electricity sector, 160,233 homes throughout the country were without electricity. The energy authorities reported that the plants and distribution circuits were disconnected to avoid human damage due to pole drops and breaks in the lines. Subsequently, the corresponding works were carried out and the service was restored in the affected areas.

Panama reported that in November 2020, the damage caused by hurricanes ETA and IOTA caused significant damage in several provinces of the country, Bocas de Toro being one of the most affected, which led to the disabling of the access road, thus blocking the arrival of fuel to the province and forcing the use of an alternate route through Costa Rica for entry. Due to the quick action of public institutions with the support of fuel and liquefied petroleum gas importers and distributors, fuel was delivered to several towns in the province, thus avoiding shortages. Additionally, fuel was brought to an electricity generation plant to provide the service to the province.

In **Peru**, on January 23, 2020, an LPG tanker truck was involved in an accident in Villa El Salvador, district of Lima due to a broken valve in its lower part, which caused the gas to leak. The deflagration caused by a spark resulted in unfortunate loss of life and injuries. Material damage also occurred. The Ministry of Energy and Mines coordinated actions to clarify the causes of the accident and to determine compliance with current safety regulations for fuel transportation.

In August 2020, storm Laura strongly impacted the island of Hispaniola, causing damage to the **Dominican Republic**'s national electric service, forcing the Energy Control Center to declare a state of emergency in the Interconnected Electric System (SENI). Work began immediately to restore the service to the affected users.

Origin of the indicators and sources of information used

For the calculation of the indicators and the presentation of the graphs of this Energy Outlook, there are three types of sources of information corresponding to the producers or compilers› work scale who report the statistics and indicators. Generally, each type of information source responds to different user needs, of different scale, and presents specific advantages and disadvantages for analytical purposes.

Global Sources

They consist on databases that come from international organizations on a global scale, whose characteristic is to offer a high coverage of countries, sometimes resorting to estimates and imputations of data for countries that lack of national official data. Another characteristic is the usual transverse homogenization of calculation and estimation methods, without considering the differences in the statistical generation capacity of countries and regions. The main sources of global information used to prepare this Energy Outlook were the World Bank›s database, the World Development Indicators[1]; the last update of the database was used, consulted on July ,10 2021, and the BP Statistical Review of World Energy 2021[2].

Regional Events

These are databases and statistical information from regional organizations that, just like OLADE, have a partial coverage of the countries of the Latin American and Caribbean region. In this case, the statistical processing used allows regional comparability based on the national data that these agencies compile from their Member Countries. The economic and demographic indicators were obtained for this Energy Outlook, form the database of the Commission for Latin America and the Caribbean (ECLAC, UN) called CEPALSTAT[3].

Needless to say, the energy information from the Latin America and the Caribbean countries contained in the Energy Outlook comes from sieLAC (http://sielac.olade.org/), the Energy Information System which manages and updates OLADE on the basis of information officially supplied by Member Countries. The energy statistics presented and plotted in this document come from the most recent update of the information requested to the OLADE›s Member Countries through the OLADE SIE Advisers in the countries, who act as a link between the energy authorities in each country and OLADE and provide official information. In this sense, it is important to note that for the realization of this document, OLADE acts as a user and it does not constitute the producer or primary source of the energy information sector. The energy authorities in each country ore the one who provide this information and have the necessary resources and knowledge to collect and process the data with which this Energy Outlook was made, based on previously agreed methodologies. Likewise, aware of the relevance of the information used could have some discrepancies with the national data sources, particularly in the first years recorded in the time series, we have invited the energy community of the Member Countries to send us their comments and suggestions about the information provided and the contents of the Energy Outlook to the email address: sielac@olade.org.

National sources

In most cases, it was used official information provided by the SIE Advisors of each country. When no information is available for the Energy Balances of a given country, estimates are made with partial information that is usually obtained from official institutions (Ministries, Secretariats and National Energy Directorates, Sector Regulatory Agencies, National Commissions of Energy, etc.) Data from these sources usually have a lower scope and are not always comparable with other data in the region and are therefore used to estimate trends, particularly in the last reference year (in this case, 2020).

Given the dynamic nature of the statistical information presented in this Energy Outlook, the series included may not coincide with subsequent queries to the used databases.

1. http://databank.worldbank.org/wdi
2. https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf
3. http://estadisticas.cepal.org/cepalstat

Timeline of the analysis and base year

The Energy Outlook presents information about the evolution and trends of numerous statistics and indicators that combine energy, economic and social information. Attempts have been made to make the most of the visual space in each graph so that in some cases, additional information is presented on the right axis. The information is displayed in the form of graphs covering a period between 2000 and 2020. The economic information refers to the base year 2011 in the case of GDP of Purchasing Power Parity and base 2010 for GDP at constant prices.

Country coverage

The information presented covers the 27 Member Countries of OLADE, where available data so allow it. These are: The Republic of Argentina, Barbados, Belize, the Pluri-national State of Bolivia, the Federative Republic of Brazil, the Republic of Chile, the Republic of Colombia, the Republic of Costa Rica, the Republic of Cuba, the Republic of Ecuador, the Republic of el Salvador, Grenada, the Republic of Guatemala, the Co-operative Republic of Guyana, the Republic of Haiti, the Republic of Honduras, Jamaica, the United Mexican States, the Republic of Nicaragua, the Republic of Panama, the Republic of Paraguay, the Republic of Peru, the Dominican Republic, the Republic of Suriname, the Republic of Trinidad and Tobago, the Eastern Republic of Uruguay and the Bolivarian Republic of Venezuela. In order to make the presentation of the indicators as user-friendly as possible, the short name of each country was used and it is presented in alphabetical order.

Discrepancies and statistical reconciliation

It is possible that when comparing indicators presented in this Energy Outlook with those published in other documents, there may be statistical discrepancies due to differences in the applied units systems and their conversion factors, conceptual definitions and methodological options used. These differences may be subtle, such as differences in the years or countries included, or more complex ones, such as the use of approximate indicators (proxies) or estimates of different nature, different geographic coverage (regional, national, local), differences in the databases updating periods consulted or the use of different population denominators and / or GDP. This Energy Outlook has sought to reconcile statistical data, presenting as explicitly and comprehensively as possible the conceptual and methodological definitions used.

About the population denominators and GDP

For all per capita indicators used in the Energy Outlook, the same database was used from the Latin American and Caribbean Demographic Center (CELADE, Population Division, ECLAC, and UN).

In order for comparability between countries to capture as effectively as possible the real effects of economic activity and to isolate, as much as possible, the exchange rate effects, the GDP values used in the Energy Outlook correspond to the annual statistical series of accounts expressed in purchasing power parity (PPP) and published by the World Bank in the base year 2011. The current series published by ECLAC were considered to carry out the sectorial weights, in the case of energy intensities and CO_2.

Methodology and definition of indicators

Reserves

These are the total amounts available in the deposits of fossil and mineral sources at a given date, within the national territory, which are feasible to be exploited to the short medium or long term. They are classified into proven, probable or possible reserves. The proven reserves are those that are economically extractable from existing wells or reservoirs with the country's available infrastructure and technology at the time of evaluation. Included are schemes of improved production, with a high degree of certainty in reservoirs that have demonstrated favorable performance in the exploitation. They are measured by exploratory studies.

Natural gas reserves represent the amount of natural gas that is found in the subsoil of all the deposits, whether associated or not associated with oil, at a certain date. Associated gas reserves are estimated as percentages of oil reserves.

Energy Sources

Primary energy sources

Defined as energy sources in their natural state; i.e., they have not undergone any physical or chemical transformation through human intervention. They can be obtained from nature, either directly as in the case of hydro, solar and wood energy and other plant fuels, or after an extraction process such as petroleum, coal, geothermal energy, etc.

Crude oil

A complex mixture of hydrocarbons of different molecular weights with a fraction, generally small, of compounds containing sulfur and nitrogen. The composition of crude oil is variable and can be divided into three classes according to its distillation residues: paraffin, asphalt or a mixture of both. In its natural state, it is in the liquid phase and remains in this stage under standard temperature and pressure conditions, although the field it may be associated with gaseous hydrocarbons. This category includes associated gas liquids that condense in production facilities when they reach the surface (petroleum condensates) or other liquid hydrocarbons that are mixed with the commercial flow of crude oil. Crude oil is the main feedstock for refineries that produce petroleum products and derivatives.

Natural Gas

Mixtures of gaseous hydrocarbons formed in sedimentary rocks and in dry deposits or together with crude oil. It consists mainly of methane (86%), liquefied petroleum gases, nitrogen and carbon dioxide. Due to its high caloric power and the almost total absence of contaminants, it is used in the generation of electric power and in domestic consumption for caloric uses.

Natural gas production refers to the sum of the production of the natural gas fields both associated and not associated with oil, including offshore production within national waters. Shale gas and gas obtained from coal mines is also added to the production. For gas associated with oil, this measurement is performed after the separation of the extraction fluid that contains crude oil, natural gas liquids, natural gas, and water. For free or non-associated gas, the measurement is taken directly from the wellhead.

Coal

It is the sum of the productions of the coal mines of the country. Coal has very different calorific power before and after washing. To avoid inconsistencies, coal is considered as washed coal, that is, without impurities. This coal is known as: anthracite, bituminous coal, lignite, and peat, which are the main varieties and possess precise calorific powers of between 4000 and 8000 kcal/kg. The production of coal can come from three sources: underground mines, surface mines, and recovery. The quantities used for the production process and those delivered to other energy producers are included.

Biomass

Plant and animal organic matter used for energy purposes. Biomass can be used directly as fuel or processed into liquid and gaseous products. The most widely used sources include wood, agricultural crops, municipal organic waste and manure.

Firewood

Energy that is obtained directly from forest resources. It includes tree trunks and branches but excludes logging waste, which is designated 'plant waste' used for energy purposes.

Sugarcane products

Products that are used for energy purposes. These include bagasse, cane juice and molasses. The latter two are the main feedstocks for ethanol production.

Other biomass

Organic materials obtained from biological and industrial processes that produced by various sectors such as agriculture, livestock, timber, etc. Depending on the sector where it originates, waste can be classified as a) animal waste, b) vegetable waste, c) industrial or recovered waste, d) urban waste.

Secondary energy sources

Energy sources obtained by processing primary sources or other secondary sources are called secondary energy sources. The sources and forms of secondary energy included in the energy balance are classified according to the primary source from which they were obtained.

Electricity

Energy transmitted by moving electrons. It includes electric power generated from any primary or secondary, renewable or nonrenewable resource in different types of power plants.

Oil derivatives

These are the products processed in a refinery that use oil as raw material. Depending on the composition of crude oil and demand, refineries can produce different oil products. Most of the crude oil is used as raw material for energy, for example, gasoline. They also produce chemical substances, which can be used in chemical processes to produce plastic and/or other useful materials. Since oil contains 2% sulfur, large amounts of sulfur are also obtained. Hydrogen and coal in the form of petroleum coke can also be produced as oil derivatives.

The production of oil derivatives is broken down into fuel oil, diesel oil, LPG, kerosene, jet fuel, gasoline, alcohol, and others (non-energy plus other secondary and all energy that are not recorded individually).

Biofuels

Fuel from organic matter or biomass. It includes primary energy sources such as wood, as well as derived fuels such as methanol, ethanol, and biogas, from primary elements after undergoing biological conversion processes, i.e., fermentation or anaerobic digestion.

Other energy Other Sectors

It corresponds to the grouping of the following energy: coke, fuel oil, gas, non-energy and other secondary.

Other energy Transport Sector

It mainly corresponds to the grouping of the following energy: natural gas and fuel oil.

Energy aggregates

Production

It is considered the internal production of all primary energy source, extracted, exploited or harvested, in the national territory, that is important for the country.

Imports

It is the amount of primary and secondary energy sources, originated outside the borders and entering the country to form part of the total energy supply.

Exports

It is the quantity of primary and secondary energy sources that leave the territorial limits of a country and, therefore, are not destined to the supply of the domestic demand. This concept excludes the quantity of fuels sold to foreign air and sea ships.

Total Energy Supply

It is the sum of the total amount of energy, of both primary and secondary sources and, to avoid double accounting, in the case of Production, only the production of primary sources that is available for internal use is considered, either for input to transformation, for self-consumption of the energy sector or for final consumption. Part of this item is also covered by the losses that occur in the different stages of the energy chain. The total domestic supply is calculated using the following formula:

$$TPS_t = PP_t + IM_t - EX_t + SC_t - NU_t$$

Where:

$$\begin{aligned} TPS_t &= \text{Total energy supply in } t \\ PP_t &= \text{Production of primary sources in } t \\ IM_t &= \text{Imports of primary and secondary energy in } t \\ EX_t &= \text{Exports of primary and secondary energy in } t \\ SC_t &= \text{Stock changes in } t \\ NU_t &= \text{Not used energy in } t \end{aligned}$$

Total energy supply by source

It is the quantity of energy of each source, which is available for internal use, either for input to transformation, for self-consumption of the energy sector or for final consumption. Part of this item is also covered by the losses that occur in the different stages of the energy chain. The total domestic supply by source is calculated using the following formula:

$$TPS_t^i = PP_t^i + IM_t^i - EX_t^i + SC_t^i - NU_t^i$$

Where:

$$\begin{aligned} TPS_t^i &= \text{Total energy supply in } t \text{ of source } i \\ PP_t^i &= \text{Primary and secondary production in } t \text{ of source } i \\ IM_t^i &= \text{Primary and secondary imports in } t \text{ of source } i \\ EX_t^i &= \text{Primary and secondary exports in } t \text{ of the source } i \\ SC_t^i &= \text{Stock changes of primary and secondary energy} \\ &\quad\ \text{in } t \text{ of source } i \\ NU_t^i &= \text{Not used energy in } t \text{ of source } i \end{aligned}$$

Total Primary Energy Supply

The Total Supply of Primary Energy is defined by the following flows of the National Energy Balance (BEN):

$$TPES_t = PP_t + IM_t - EX_t + VI_t - NA_t$$

Where:

$$\begin{aligned} TPES_t &= \text{Total Primary Energy Supply in } t \\ PP_t &= \text{Primary Production in } t \\ IM_t &= \text{Primary Imports in } t \\ EX_t &= \text{Primary Exports in } t \\ VI_t &= \text{Stock Variation (positive or negative) in } t \\ NA_t &= \text{Unused energy in } t \end{aligned}$$

The main primary sources considered by the energy balances of Latin American and Caribbean countries are: oil, natural gas, coal, hydroelectricity, firewood and other firewood by-products, biogas, geothermal, wind, nuclear, solar and other primary sources such as bagasse and agricultural or urban waste.

Installed Capacity of electricity generation

It is the nominal capacity of supply of a generation plant by each type of technology. In the Energy Outlook , it is presented in aggregate form. It is expressed in Megawatts (MW) or Gigawatts (GW).

Electricity Generation

It is defined as the production of electricity from local generators, including self-producers. It is expressed in Megawatts hour (MWh) or Gigawatts hour (GWh).

Electrification rate

It is the percentage of inhabitants that have electric service versus the total number of inhabitants. It is obtained by dividing the total population served by the total population of the country, expressing the value in percentage.

Population without access to electricity service

It is an estimate of the number of people who do not have access to electricity services. It is defined by the expression:

$$PWAE = \text{Total Population} \cdot (1 - \text{Electrification rate})$$

Final energy consumption

It refers to all the energy delivered to the consumption sectors (total final consumption, of all productive sectors, final consumption by sector) for its use as useful energy. Excluded from this concept are the sources used as inputs or raw materials to produce other energy products, as this corresponds to the «transformation» activity.

Macroeconomic aggregates and social indicators

Added Value

It is the macroeconomic magnitude that measures the added value generated by the set of producers of the economy of a country. Gross Value Added (GVA) is the Gross Value of Production (GVP) (i.e. the value of all goods and services produced in a country) minus the Intermediate Consumption (IC) (i.e. the value of the inputs used in the production of non-durable goods and services). The GVA in a given period at constant prices of a given base year is estimated by valuing the quantities produced in that period at the prices of the base year considered. For more technical details it is recommended to consult the National Accounts System (UN, 2008).

Gross domestic product at constant prices

The Gross Domestic Product (GDP) is the macroeconomic magnitude that expresses the monetary value of a country's final set of goods and services over a specific period of time. It is published quarterly or annually. Annual values are used in this Energy Outlook. The sum of the Gross Aggregate Values (GVA) of all the economic sectors plus the net taxes of subsidies on the products, make up the Gross Domestic Product (GDP) of a country. Since national accounts are calculated in local currency, for international comparisons, GDP values are converted into dollars or expressed in Purchasing Power Parity (PPP). GDP can be expressed at current or constant prices. In the first case, the value is expressed at current market prices in the year of its calculation. For the GDP indicator to express the evolution of levels of economic activity in real terms, the distortion of price changes is eliminated and prices of a base year are taken as a reference. In this case, GDP is expressed at constant prices. To this end, GDP is accounted for by reference to a basket of prices (deflator) that refers to the base year considered.

GDP expressed in PPP constant dollars is an indicator that transforms the nominal value of local GDP to a valorization that is performed in relation to a weighted standardized price basket and that takes the United States of America as a reference for comparisons. The valorization of GDP and other macroeconomic aggregates to PPP, allows decoupling the results of the variations that may exist in the exchange rate between the local currency and the dollar from year to year. By eliminating the monetary illusion linked to the value of the dollar in each country and reflecting the purchasing power that this currency has in each of them, this valorization methodology, when used to compare the performance of the countries, reflects more accurately the real activity in the consumption and production of goods and services and therefore, of the final demand of the economy.

Private consumption

Household consumption expenditure, commonly referred to as private consumption, is the effective and imputed expenditure of households plus social in-kind transfers from non-profit institutions that serve the households.

Human Development Index (HDI)

It is a compound indicator, defined by the UNDP (United Nations Development Programme) that represents a measure of the progress achieved by a country in three basic dimensions of human development: (i) long and healthy life, (ii) access to education and (iii) decent standard of living, and it is estimated as a geometric mean, at equal weights, of the normalized indices of each of the three dimensions mentioned above. The variables used for each dimension are as follows:

(i) Life Expectancy Index: life expectancy at birth is used.

(ii) Education Index: It is a compound indicator that includes the adult literacy rate and the combined gross ratio of enrollment in primary, secondary and higher education, as well as the years of mandatory education.

(iii) Standard of living: Composed of GDP adjusted to purchasing power parity dollars per capita.

For the construction of the aggregate index, for each dimension, the results are normalized by taking the minimum and maximum values, so that values between 0 and 1 are obtained, in order to finally calculate the geometric average of the indices of the 3 dimensions to the same weight.

Energy Indicators

Energy intensity

It is an economic-energy indicator that allows aggregate quantification of the link between energy consumption and the production capacity of the economy. In general, it is calculated as the ratio between Energy Consumption and Gross Domestic Product (GDP). It allows a rough estimate for the level of efficiency in the use of the energy resources of the unit under analysis. Variations in the values of this relationship over time and across countries reflect changes in the economy and changes in the way energy is consumed in each country.

In order to establish cross-country comparisons, it can be calculated by using GDP values at constant prices in dollars of a base year or GDP at purchasing power parity (PPP) values. In the latter case, the valorization is performed in relation to a weighted standardized price basket, which takes the United States of America as a benchmark for comparisons. The valorization of GDP and other macroeconomic aggregates to PPP allows decoupling the results of the variations that may exist in the exchange rate between the local currency and the dollar from year to year. By eliminating the monetary illusion linked to the value of the dollar in each country and reflecting the purchasing power that this currency has in each of them, this valuation methodology, when used to compare the performance of the countries, reflects more accurately the real activity in the consumption and production of goods and services.

Primary Energy Intensity

It is defined as the ratio between the Total Supply of Primary Energy and the Gross Domestic Product in Purchasing Power Parity at a constant value of 2011 (GDP USD2011 PPP). It measures the total amount of energy needed to produce a unit of GDP. It is expressed in kilograms of oil equivalent per PPP constant dollar (koe / USD2011 PPP).

Final Energy Intensity

It is defined as the ratio between Final Energy Consumption and GDP USD2011 PPP. It is linked to final uses, that is, it is evaluated at the level of final consumption (excluding the production centers) and can be calculated at the sectorial level by taking values from the energy balances and the variables that make up the GDP. Among the factors that affect the intensity of the final energy we can name the following:

(i) Structure Effect: changes in the sectorial composition of GDP. For example, if the economy is outsourced, under equal conditions, the final energy intensity decreases, thus a decrease in the contribution of energy-intensive branches would lead to a decrease of the final energy intensity.

(ii) Efficiency Effect: the replacement of more efficient sources and generation technologies, the penetration of more efficient equipment, the implementation of energy saving techniques or the change of habits of the population, towards more rational consumption practices.

(iii) Activity Effect: Changes in the economic activity levels and the consequent changes in consumption patterns can obviously affect the evolution of final energy intensity.

(iv) Changes in patterns of consumption, for example, modal changes in the use of urban transport or social changes, like the increase of single-parent housing due to the increase in separations or divorces, or improvements in the living standards, which lead to a higher demand for devices in households.

It is expressed in kilograms of oil equivalent per PPP constant dollar (koe / USD2011 PPP).

Sectoral energy intensities

It is the relation between the Final Energy Consumption of each sector and the Sectoral Added Value expressed in PPP at constant value of the year 2011, corresponding to the same sector. For the specific case of the Residential sector, energy intensity is defined as the ratio between the final consumption of the sector and the PPP private consumption at a constant value.

$$EI_{it} = \frac{FC_{it}}{GVA_{it}}$$

Where:

$$\begin{aligned} EI_{it} &= \text{Energy intensity of sector } i \text{ in time } t \\ FC_{it} &= \text{Final consumption of sector } i \text{ in time } t \\ GVA_{it} &= \text{Gross value added of sector } i \text{ in time } t \\ i &= \text{Sectors: Industrial, Service, Transport,} \\ & \quad \text{Residential \& others} \end{aligned}$$

This Energy Outlook expresses the sectorial intensities in kilograms of oil equivalent per PPP constant dollar (koe / USD2011 PPA).

It is important to note that, since more detailed information on the transport sector is not available, the added value of the transport sector has been used as a proxy for the level of activity. In this case, the level of economic activity in this sector only computes activities related to passenger and cargo transportation (land, air and maritime), storage activities and communications. It should be borne in mind that self-transport by companies to distribute their products and households, is not part of this definition.

For this reason, the energy intensity of the transport sector tends to be underestimated, since the energy consumption of the sector also includes fuel consumption of the residential sector and companies.

Ratio between Final Intensity / Primary Intensity

It represents the relation between the Final Consumption and the Total Supply of Primary Energy. In most countries, there is a slight decrease in this ratio indicating that, on average, more and more primary energy per unit of final energy consumption is needed. The losses in the transformations and the distribution of energy, and mainly in energy generation, where the majority of these losses are registered, are responsible for most of the differences between the primary and final energy consumption.

The variability of this relationship can be due to several factors (ECLAC, 2013):

(i) Changes in energy supply, particularly in the generation mix or in the technical and non-technical loss levels, will affect the relationship. For example, an increase in the share of thermal energy generation increases the gap between the two intensities; in contrast, an increasing share of hydropower or wind energy reduces this gap.

(ii) Changes in the efficiency of the transformations: for example, a higher efficiency of thermal power plants (for example, by the development of combined cycle gas plants) reduces the relationship between final and primary intensity.

(iii) Changes in the share of secondary energies (mainly electricity) in the final consumption.

(iv) The change in the percentage of energy for non-energy uses decreases the value of the relation since these consumptions are included in the primary intensity but are excluded from the final intensity.

(v) Changes in the proportion of imported secondary energies, for example, the increase in electricity imports will reduce the transformation losses and, therefore, will reduce the gap between the two intensities.

Intensity of final energy at constant structure

It serves to analyze the effect of the structural changes in the GDP on the energy intensity by facilitating the comparison of the Final Energy Intensity with an estimate of the Final Energy Intensity calculated on the assumption that the economic structure remained unchanged with respect to a base period. The Energy Intensity at Constant Structure is then a theoretical intensity that results from assuming that all sectors grow at the same rate as GDP (i.e. the structure of GDP remains constant with respect to the base year). It is estimated using the actual values of the sectorial intensities. The calculation is made considering the main sectors (industry, tertiary, transport and residential).

$$EICS_t = \frac{\left[\frac{VA_{t_o}^{Ind}}{VA_t^{Ind}}\right] \cdot FC_t^{Ind} + \left[\frac{VA_{t_o}^{Serv}}{VA_t^{Serv}}\right] \cdot FC_t^{Serv} + \left[\frac{GDP_{t_o}}{GDP_t}\right] \cdot FC_t^{Trans} + \left[\frac{C_{t_o}^{Resid}}{C_t^{Resid}}\right] \cdot FC_t^{Resid}}{GDP_{t_o}}$$

Where:

$$\begin{aligned} EICS_t &= \text{Energy intensity at constant structure in time } t \\ VA &= \text{Value added: industrial (Ind) y Service (Serv)} \\ t_o &= \text{Reference or base period: 2000} \\ FC &= \text{Final consumption of energy: Industrial (Ind),} \\ &\quad \text{Service (Serv), Transport (Trans), Residential (Resid)} \\ C^{Resid} &= \text{Household final consumption expenditure} \\ GDP &= \text{Gross Domestic Product} \end{aligned}$$

Contribution of the Electricity Sector to Primary Intensity

Defined as the ratio of electricity production expressed in kilograms of oil equivalent (koe) to Gross Domestic Product in Purchasing Power Parity (PPP).

Avoided energy demand due to changes in energy intensity

The elasticity of a "y" magnitude respect of another "x", that is the Elasticity (y, x) , tells in what percentage does "y" vary, when "x" increases by 1%. Since it is a ratio between 2 rates of variation, it can be represented as:

$$Elasticity(y,x) = \frac{x}{y}\frac{dy}{dx} = \frac{d\ln(y)}{d\ln(x)} \approx \frac{\Delta\ln(y)}{\Delta\ln(x)}$$

Similarly, if we take the Energy Intensity and the Final Energy Consumption of the sector i, the value of:

$$\frac{\ln(EI_t) - \ln(EI_{t-1})}{\ln(FC_t) - \ln(FC_{t-1})}$$

It represents the percentage that varies the Energy Intensity between t and t-1 of sector i, when the final energy consumption varies by 1%. We can then use this value to weight the variation in the final consumption and calculate the avoided energy demand in the period t of the sector i, that is:

$$AED_t^i = \left(FC_t^i - FC_{t-1}^i\right) \cdot \left(\frac{\ln(EI_t^i) - \ln(EI_{t-1}^i)}{\ln(FC_t^i) - \ln(FC_{t-1}^i)}\right)$$

This indicator estimates the variation of the final energy weighted by the changes in the Energy Intensity due to the changes in the final energy. For this reason, it is a good approximation of the avoided demand by improvements in energy efficiency. In this case the value is negative. Conversely, when its value is positive, it accounts for the final energy demand induced by increases in inefficiency (increase in intensity) in the use of energy.

This same indicator could be calculated at the level of the economic sectors, thus computing the energy avoided demands in each sector. In the graphs published in this Energy Outlook, and to better capture the evolution of the ongoing avoided (or induced) demands, given due to the changes that occur over time in energy intensity and in final energy consumption, the evolution of avoided energy demand is calculated by setting 1999 as the base year (World Bank, 2015).

Analysis of the structural decomposition based on the Logarithmic Mean Divisia Index (LMDI)

It is an index developed by François-Jean-Marie Divisia in the 1920s, designed to analyze changes of a magnitude over time from subcomponents that are measured in different units. The resulting series is dimensionless. It started to be used in the 1970s, in the energy scope to break down the causal factors of the changes in energy consumption, allowing to disaggregate the activity effect (due to the aggregate change in economic activity), the structure effect (due to changes in the structural composition of the economy, i.e. changes in the relative shares of the activity's branches) and efficiency effect (due to the energy savings generated) (Ang and Liu, 2006).

Since we are processing time series, we used the multiplicative version of the Logarithmic mean divisia Index of the changes in the Final Consumption between the instant t and a reference instant to, are decomposed into the 3 effects mentioned:

$$\frac{FC_t^{Tot}}{FC_{to}^{Tot}} = D_t^{Tot} = D_t^{act} \cdot D_t^{str} \cdot D_t^{eff}$$

With:

$$D_t^{act} = \exp\left[\sum_{i=1}^{n_{sectors}} \widetilde{w_t^i} \cdot \ln\left(\frac{Q_t}{Q_{t_o}}\right)\right]$$

$$D_t^{str} = \exp\left[\sum_{i=1}^{n_{sectors}} \widetilde{w_t^i} \cdot \ln\left(\frac{P_t^i}{P_{t_o}^i}\right)\right]$$

$$D_t^{eff} = \exp\left[\sum_{i=1}^{n_{sectors}} \widetilde{w_t^i} \cdot \ln\left(\frac{EI_t^i}{EI_{t_o}^i}\right)\right]$$

Being:

$$\widetilde{w_t^i} = \frac{\left[\frac{FC_t^i - FC_{to}^i}{\ln(FC_t^i) - \ln(FC_{to}^i)}\right]}{\left[\frac{FC_t^{Tot} - FC_{to}^{Tot}}{\ln(FC_t^{Tot}) - \ln(FC_{to}^{Tot})}\right)\right]}$$

Where:

$$\begin{aligned}
FC_t^{Tot} &= \text{Final consumption of all sectors in time } t\\
FC_t^i &= \text{Final consumption of sector } i \text{ in } t\\
t_o &= \text{Reference or base time period: } 2000\\
D_t^{act} &= \text{Decomposition factor that explain activity effect in } t\\
D_t^{str} &= \text{Decomposition factor that explain structure effect in } t\\
D_t^{eff} &= \text{Decomposition factor that explain efficiency effect in } t\\
Q_t &= \text{Total activity level (i.e the sum of sectoral value added) in } t\\
P_t &= \text{Share of sector } i \text{ in } t\\
EI_t^i &= \text{Energy intensity of sector } i \text{ in } t\\
i &= \text{Represents sectors: industrial, service, transport and others}
\end{aligned}$$

The year 1999 was considered as a reference year in this Energy Outlook, and only the productive sectors were used to analyze the evolution of the explanatory factors of the changes that occurred in the final energy consumption.

Efficiency in the transformation processes

It is defined as the relation between the Final Energy Consumption and the Total Energy Supply. This indicator, when presented as a time series, accounts for the aggregate performance of the transformation centers that convert primary energy into secondary energy regardless of the source.

Efficiency of the electricity sector

It is the relationship between the production of electricity and the inputs required in its generation. In this case, and taking into account that the indicator refers to the processes of transformation of the electricity sector, the inputs must be taken from the transformation centers (including self-producers) and not from the consumer sectors as in the latter case that considers the transformation process as a whole (including, for example the refining processes). As for the hydroelectricity, wind and solar generation, the value of the inputs is equal to the amount of electricity produced, thus it is assumed that the efficiency is 100%.

Ratio between Losses / Electricity supply

Losses in the electricity transmission and distribution systems are the sum of the technical or non-technical inefficiencies that occur in a given time frame.
The technical losses are related to the energy lost during transportation and distribution within the network as a result of the natural heating of transformers and conductors that transport electricity from the generation plants to the customers. According to the second principle of thermodynamics, the technical losses cannot be eliminated completely, although it is possible to reduce them through improvements in the network.

Non-technical losses represent the remaining balance of energy losses and constitute the energy consumed that has not been billed due to technical or administrative errors, measurement anomalies, self-connecting customers or energy thefts.

Since increasing levels of losses in the system result in lower availability of installed capacity, decrease, in turn, revenues from unbilled consumptions; this can lead to increases in electricity rates due to the waste of energy generated and increases the costs of maintenance of the distribution networks. It becomes important to establish quantitative measures that allow to evaluate the evolution of the levels of the losses and, therefore, of the efficiency of the electrical system. The relationship between losses and the electricity supply is the appropriate indicator to measure and evaluate the state of electricity losses over time.

Renewability index

It is defined as the ratio between the total supply of renewable sources (primary and secondary, discounting their production to avoid duplication), divided by the total energy supply. In the case of OLADE, the total supply of primary renewables includes: hydro, geothermal, wind, solar, biomass and, in the case of secondary renewables, electricity and biofuels. This indicator measures the degree of penetration of renewable resources in the country's energy matrix. In combination with emission factors, it can also assess the mitigation of the environmental impact that takes place in the energy sector.

Energy External Dependency Index

Se It is defined as the ratio of total energy imports minus total exports divided by total primary energy supply.

Hydrocarbon autarky index

It is defined as the primary production of hydrocarbons (oil and natural gas) divided for the total supply of these same sources plus the supply of oil products minus the production of derivatives (to avoid double accounting). When the index is greater than the unit, the country is self-sufficient, while if it is less than 1, the country is dependent on imports of crude oil, natural gas or oil products.

Index of biomass residential consumption

It is defined as the ratio between the sum of fuelwood and charcoal consumption in the residential sector divided by the final consumption of the residential sector.

Participation of hydroenergy in the renewable primary supply

It defines the proportion of hydroelectricity in the renewable supply. It is calculated by dividing the total supply of hydro-energy by the primary supply of renewable energies.

Participation of dendroenergy in the total renewable supply

It is defined as the amount of dependence on energy produced after the combustion of wood fuels such as firewood, charcoal, pellets, etc. It is calculated dividing the total supply of firewood and charcoal by the primary supply of renewable energy.

Energy path

It is a graphical representation that attempts to briefly summarize the link between the evolution of the levels of development of a country or sub-region, expressed in a very simplified way by GDP per capita, and the quality of its energy performance, represented by changes in the Energy final intensity. By combining both variables in a single graph it is possible to identify periods of time that have a virtuous or desirable performance, since the per capita GDP levels increase and, therefore, the path shifts to the right, while the energy intensity decreases, moving the energy path downwards. On the contrary, if at some period of time the energy path shifts to the left, this would mean that a contraction of economic activity has taken place; whereas if it moves upward, energy intensity would be increasing over previous periods, for which the energy performance would be, in aggregate terms, more inefficient. Given this combination of variables expressed in the figure, it is also possible to represent a set of level curves that represent the possible combinations of GDP per capita and Energy Intensity that maintain a constant value of the final energy consumption per capita. In this sense, if a sub-region or country has an energetic path whose trajectory moves through different level curves, that is crossing them, it means that the final consumption per capita is changing and, therefore, the patterns in which the energy demand is generated have been modified.

This may be due for example, to a greater provision of electronic devices in households or a substantial growth in the vehicle fleet. Likewise, it could happen that the energy path moves to the right and up, which could mean not a growth of energy inefficiency but a change in the productive structure that, in particular, happens in the industrial sector. Clearly, the analysis of the energy paths should be complemented by a more detailed analysis of how the economic activity and the productive matrix evolved, as well as to know the how and why of the changes that took place in the energy matrix.

Indicators of CO_2 emissions

CO_2 emissions derived from the combustion of fossil fuels, unlike other greenhouse gases, can be calculated with an acceptable degree of accuracy from the calculation of the amounts of carbon contained in fuels, while the volume of the other emissions depends on the technologies and the combustion conditions.

The most important source of CO_2 emissions in the Energy Sector is the carbon oxidation that takes place during the combustion process of fossil energy sources and represents between 70% and 90% of total anthropogenic emissions. The rest is emitted in the form of carbon monoxide (CO), methane (CH_4) and another form of compound hydrocarbons, that, in the time frame from a few days to 10 or 11 years, oxidizes in the atmosphere to become CO_2.

In this Energy Outlook, the method of estimation of emissions by technologies was applied. According to the IPCC (Intergovernmental Panel on Climate Change), this method consists of estimating the CO_2 emissions depending on the activity and technology under which the energy is used. It is about quantifying the emissions that occur along the energy chains, from the use of primary energies, through the processes of transformation, losses due to transportation and distribution, until the final use of energy. CO_2 emissions of the sector i during the time t, are calculated using the expression:

$$Emissions_t^i = \sum_{j=1}^{\text{Source}} EF_j^i \cdot FC_{jt}^i$$

Where:

$$\begin{aligned} EF_j^i &= \text{Emission factor of source } j \text{ of sector } i \\ FC_{jt}^i &= \text{Final consumption of energy of source } j \\ &\quad \text{of sector } i \text{ in } t \end{aligned}$$

Thus the total emissions during time t are:

$$Total\ Emissions_t = \sum_{i=1}^{Sectors} Emissions_t^i$$

This Energy Outlook not only presents total CO_2 emissions by sectors of final consumption, but it shows total emissions per capita and per unit of GDP in dollars as of 2011, expressed in purchasing power parity.

It is worth mentioning that the emission values presented do not strictly correspond to the national official greenhouse gas inventory reports, according to the 2006 IPCC guidelines.

The Carbon Dioxide Emission factors used as reference for the calculations can be consulted in the sieLAC option Energy Statistics - Environmental Impact.

CO_2 emissions index per energy consumed

It is defined as the ratio of total CO_2 emissions divided by the final consumption of energy.

CO_2 emissions index in the electric generation

It is defined as CO_2 emissions produced by electricity generation divided by total electricity production.

Generic formulas

Variation rates

It is defined as a variation of an amount relative to its previous value in relative terms, that is, as the rate of change of it. It is expressed as a percentage. The rate of change can be “punctual” when comparing data from two periods or maybe a "cumulative average variation rate" when calculated based on the initial and final data of a series of values.

Formula of the percentage change rate:

$$VR_t = \frac{M_t - M_{t-1}}{M_{t-1}} \cdot 100$$

Where:

$$\begin{aligned} VR_t &= \text{Percentage change rate in } t \\ t &= \text{Period of time} \\ M_t &= \text{Amount or value in time } t \\ M_{t-1} &= \text{Amount or value in previous time } t-1 \end{aligned}$$

Formula of the cumulative average variation rate:

$$\overline{VR_{t+n}^{t}} = \left[\left(\frac{M_{t+n}}{M_t} \right)^{\frac{1}{n}} - 1 \right] \cdot 100$$

Where:

$$\begin{aligned} \overline{VR_{t+n}^{t}} &= \text{Average accumulated variation rate} \\ &\quad\ \text{between } t+n \text{ and } t \\ M_t &= \text{Amount or value in time } t \\ M_{t+n} &= \text{Amount or value in time } t+n \end{aligned}$$

Statistics and aggregate energy indicators of Latin America and the Caribbean and the World

LATIN AMERICA AND THE CARIBBEAN

General Information 2020

Population (thousand inhab.)	646,479
Area (km^2)	20,397,604
Population Density (inhab. / km^2)	32
Urban Population (%)	81
GDP USD 2010 (MUSD)	5,379,958
GDP USD 2011 PPP (MUSD)	9,498,538
GDP per capita (thou. USD 2011 PPP / inhab.)	15

Energy Sector 2020

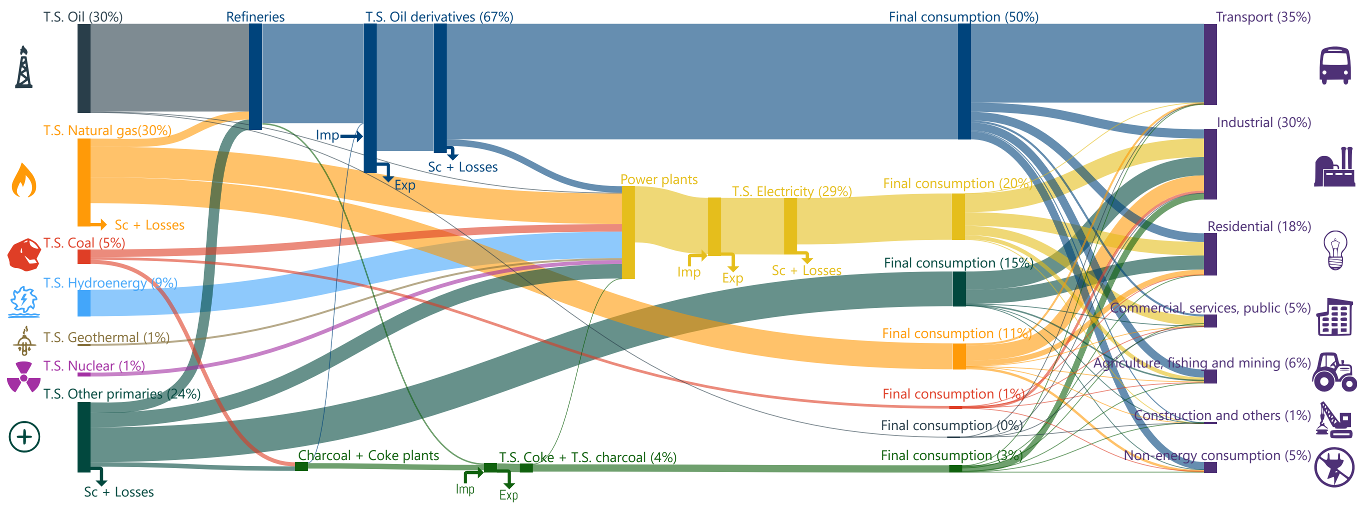
- Final consumption in the Transport Sector: Mtep 197
- Final consumption in the Industrial Sector: Mtep 171
- Final consumption in the Residential Sector: Mtep 102.90
- Final consumption in the Commercial and Service Sector: Mtep 30.88
- Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption: Mtep 64.11 [2]
- Oil Reserves: Mbbl 337,710
- Natural gas Reserves: Gm^3 7,954
- Coal Reserves: Mt 16,118

[1] Includes non-energy consumption.
[2] Does not include consumption of the energy sector.

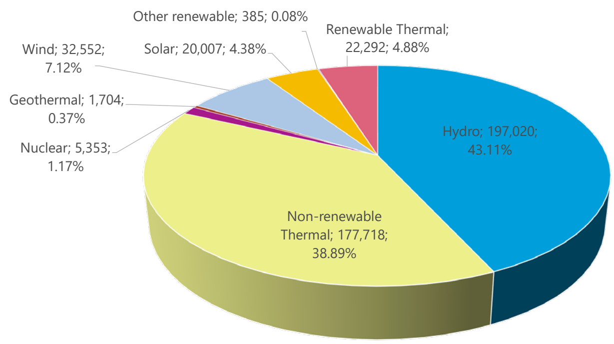
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
2,029	0.88	97.4	786	920	241	358	566 [1]	7,302	457	0.08 / 0.06
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

1. The Sankey diagrams presented in the LAC chapters and by country have been prepared based on the following considerations:
   - Total Supply (T.S.)= Production + Import - Export +/- Stock Variation - Not Used.
   - Other primary sources include: Biogas, vegetable waste, cane products, firewood, solar and wind (This applies to each country depending on the availability of energy sources that each one has).
   - The inputs from Other primary sources to refineries refer to distillery transformation centers or other transformation centers (biodiesel plants), the outputs being ethanol or biodiesel.
2. The information on the Southern Cone that is presented in this chapter does not include Brazil since this country is considered a subregion.

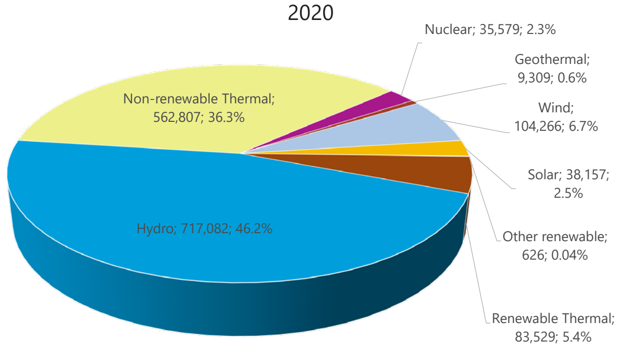
Summarized energy balance 2020



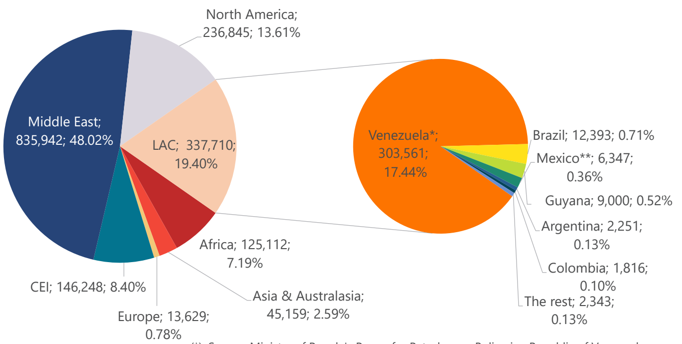
Installed power generation capacity LAC [MW; %]
2020



Electricity Generation LAC by Source [GWh; %]
2020



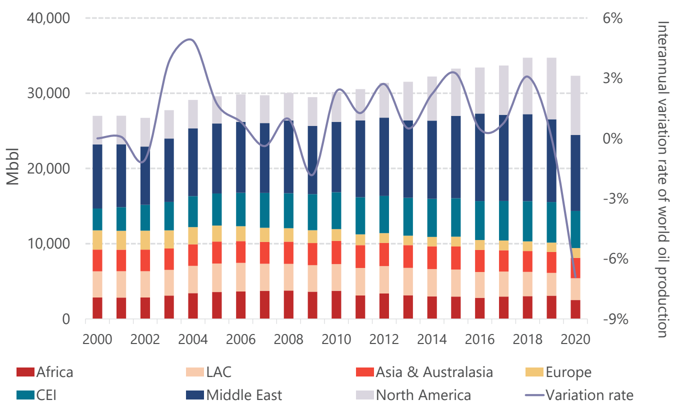
World proven reserves of oil [Mbbl, %]
2020



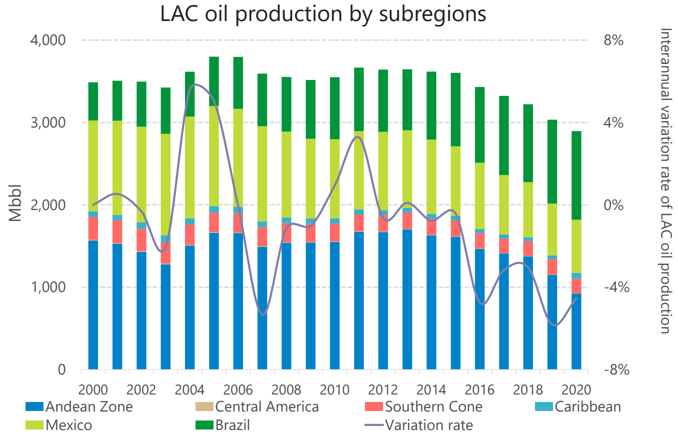
Total: 1,740,644 Mbbl

(*): Source: Ministry of People's Power for Petroleum - Bolivarian Republic of Venezuela.
(**) PEMEX and National Hydrocarbons Commission of Mexico databases.

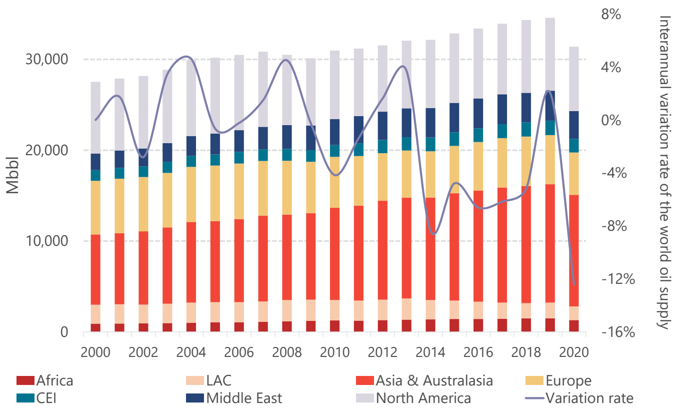
World oil production by subregions



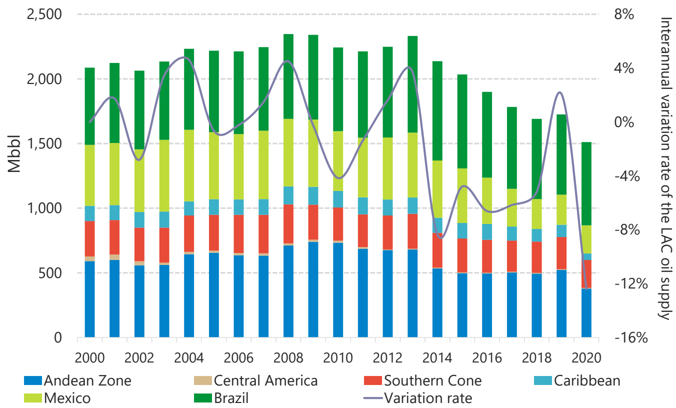
LAC oil production by subregions



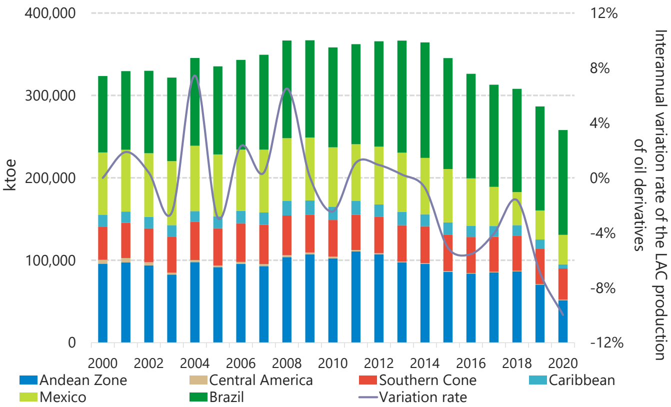
Total world oil supply by subregions



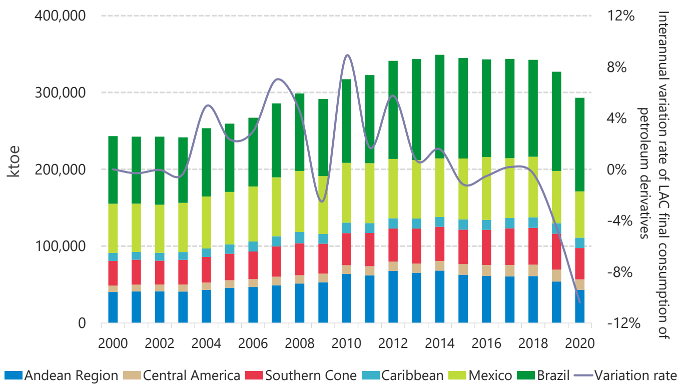
Total LAC oil supply by subregions



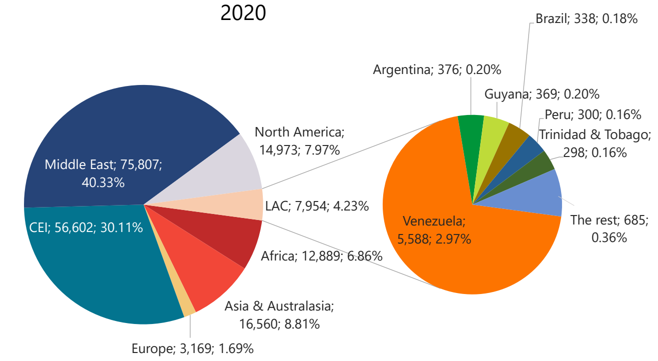
LAC Production of oil derivatives by subregions



LAC Final consumption of oil derivatives by subregions

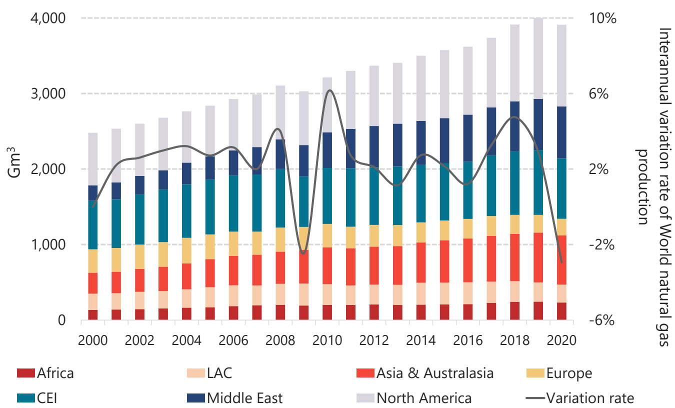


World proven natural gas reserves [Gm^3, %]
2020

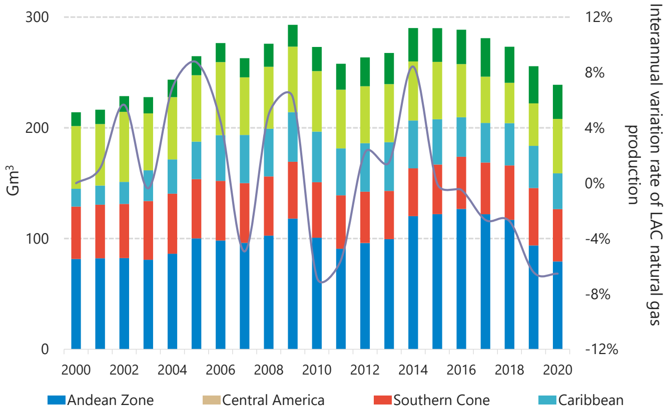


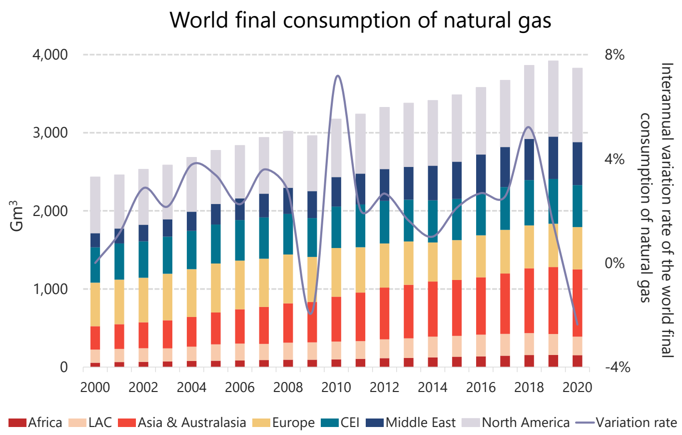
Total: 187,952 Gm^3 (*): Source: Ministry of People's Power for Petroleum - Bolivarian Republic of Venezuela.

World natural gas production

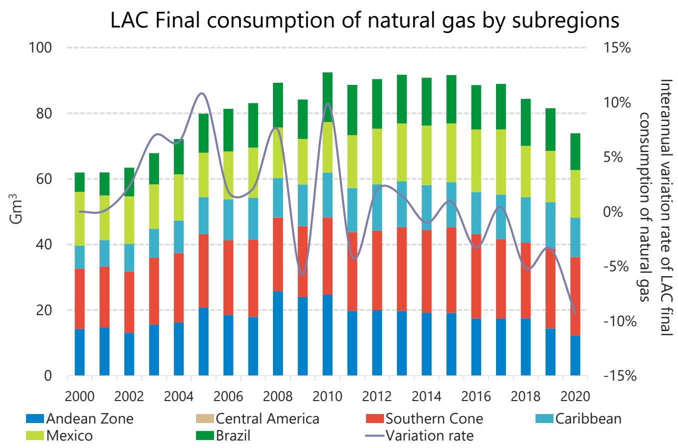


LAC Production of natural gas by subregions

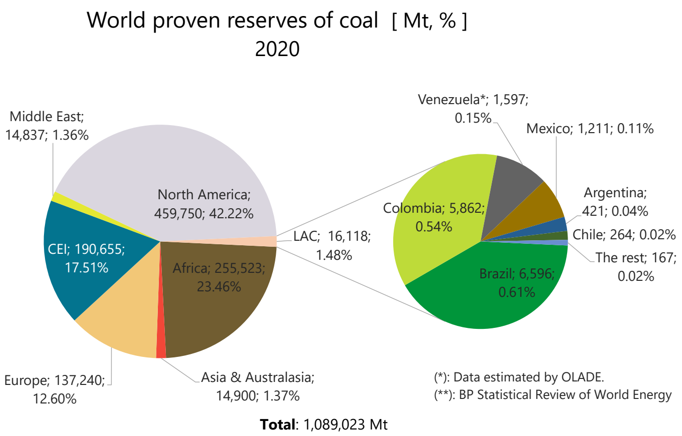




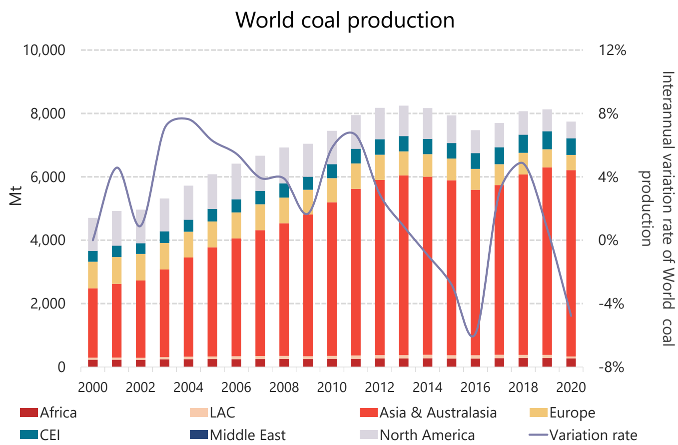
World final consumption of natural gas
Gm3
Interannual variation rate of the world final consumption of natural gas
Africa
LAC
Asia & Australasia
Europe
CEI
Middle East
North America
Variation rate



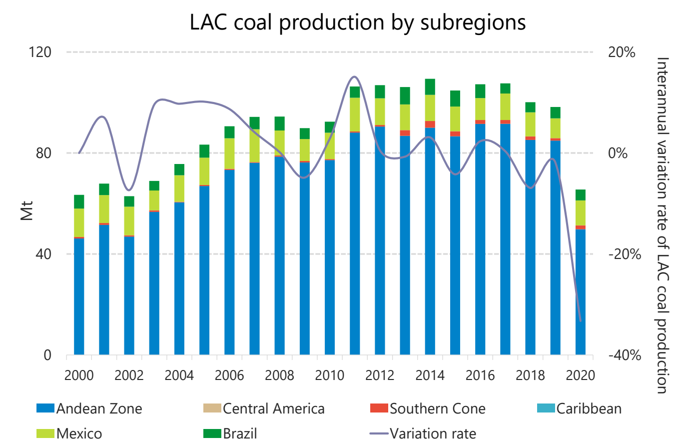
LAC Final consumption of natural gas by subregions
Gm3
Interannual variation rate of LAC final consumption of natural gas
Andean Zone
Central America
Southern Cone
Caribbean
Mexico
Brazil
Variation rate



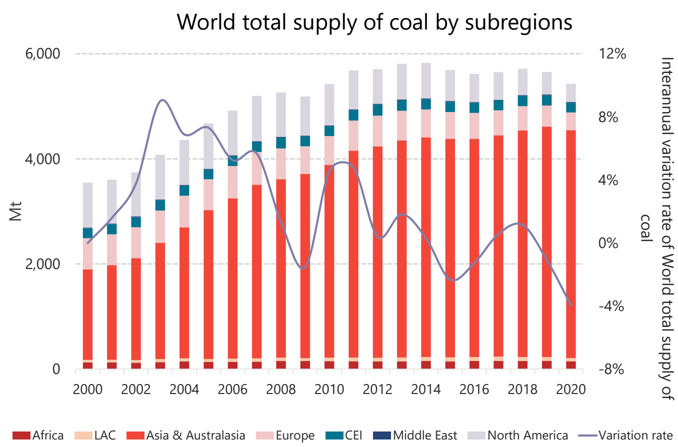
World proven reserves of coal [Mt, %]
2020
Middle East; 14,837; 1.36%
North America; 459,750; 42.22%
CEI; 190,655; 17.51%
Africa; 255,523; 23.46%
Europe; 137,240; 12.60%
Asia & Australasia; 14,900; 1.37%
LAC; 16,118; 1.48%
Venezuela*; 1,597; 0.15%
Mexico; 1,211; 0.11%
Colombia; 5,862; 0.54%
Argentina; 421; 0.04%
Chile; 264; 0.02%
The rest; 167; 0.02%
Brazil; 6,596; 0.61%
(*): Data estimated by OLADE.
(**): BP Statistical Review of World Energy
Total: 1,089,023 Mt



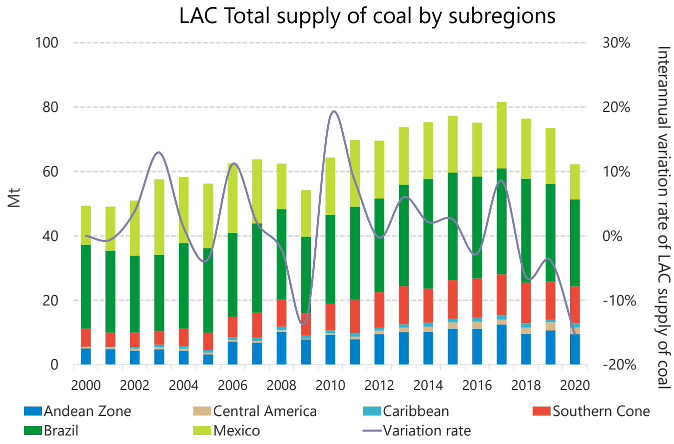
World coal production
Mt
Interannual variation rate of World coal production
Africa
LAC
Asia & Australasia
Europe
CEI
Middle East
North America
Variation rate

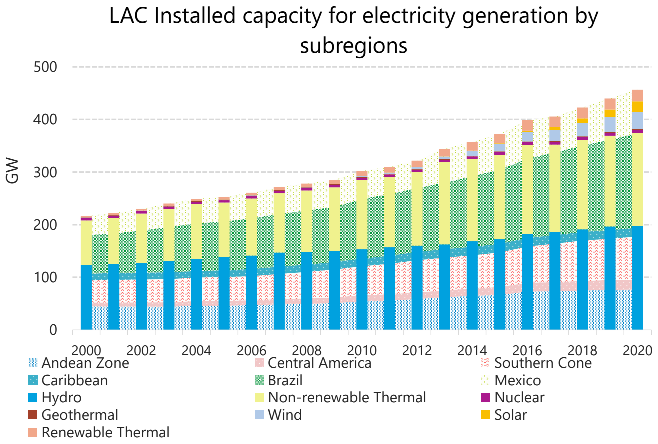


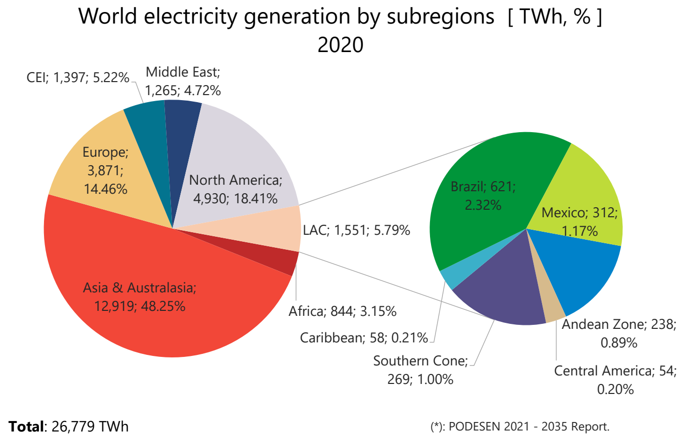
LAC coal production by subregions
Mt
Interannual variation rate of LAC coal production
Andean Zone
Central America
Southern Cone
Caribbean
Mexico
Brazil
Variation rate

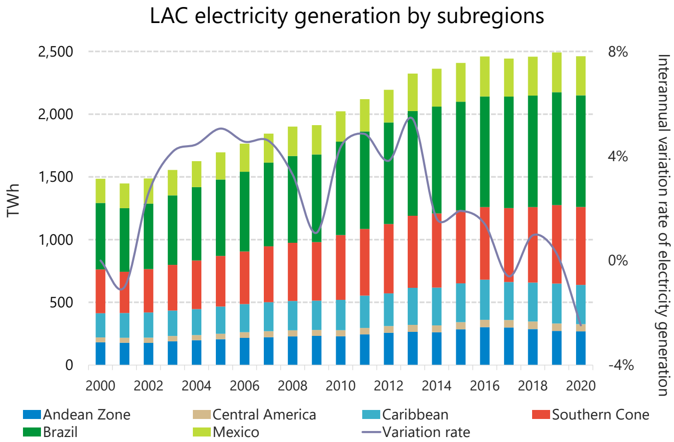


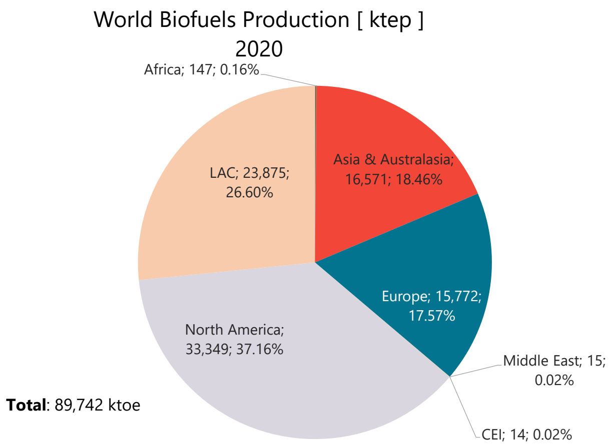
World total supply of coal by subregions
Mt
Interannual variation rate of World total supply of coal
Africa
LAC
Asia & Australasia
Europe
CEI
Middle East
North America
Variation rate

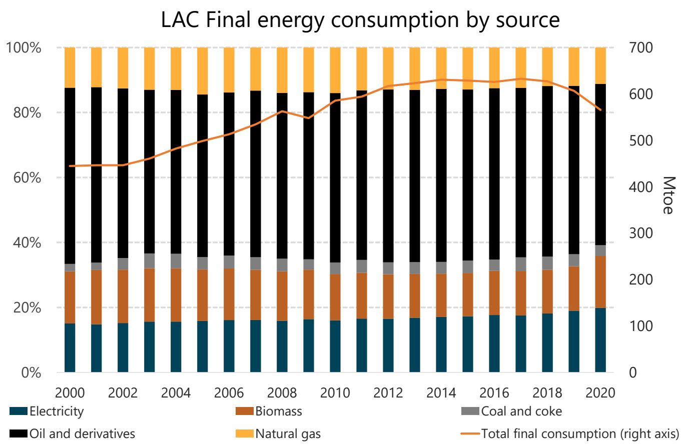

LAC Total supply of coal by subregions
Mt
Interannual variation rate of LAC supply of coal
Andean Zone
Central America
Caribbean
Southern Cone
Brazil
Mexico
Variation rate


LAC Installed capacity for electricity generation by subregions
GW
Andean Zone
Central America
Southern Cone
Caribbean
Brazil
Mexico
Hydro
Non-renewable Thermal
Nuclear
Geothermal
Wind
Solar
Renewable Thermal

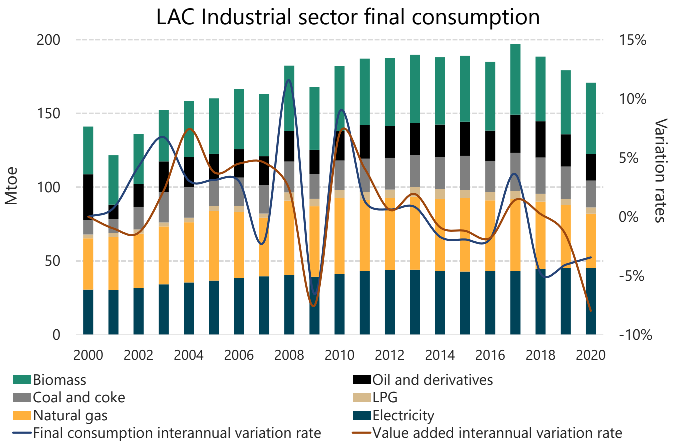

World electricity generation by subregions [TWh, %]
2020
CEI; 1,397; 5.22%
Middle East; 1,265; 4.72%
Europe; 3,871; 14.46%
North America; 4,930; 18.41%
LAC; 1,551; 5.79%
Asia & Australasia; 12,919; 48.25%
Africa; 844; 3.15%
Brazil; 621; 2.32%
Mexico; 312; 1.17%
Andean Zone; 238; 0.89%
Caribbean; 58; 0.21%
Southern Cone; 269; 1.00%
Central America; 54; 0.20%
Total: 26,779 TWh
(*): PODESEN 2021 - 2035 Report.

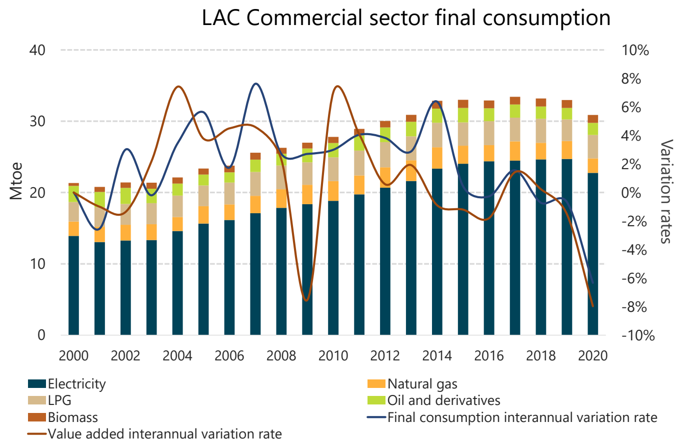

LAC electricity generation by subregions
TWh
Interannual variation rate of electricity generation
Andean Zone
Central America
Caribbean
Southern Cone
Brazil
Mexico
Variation rate

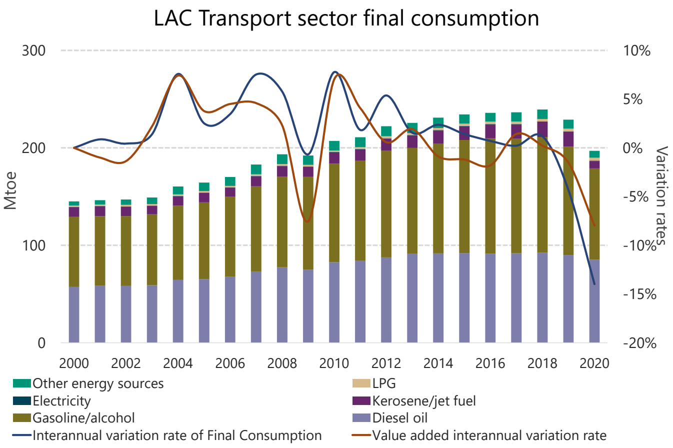

World Biofuels Production [ktep]
2020
Africa; 147; 0.16%
LAC; 23,875; 26.60%
Asia & Australasia; 16,571; 18.46%
Europe; 15,772; 17.57%
North America; 33,349; 37.16%
Middle East; 15; 0.02%
CEI; 14; 0.02%
Total: 89,742 ktoe

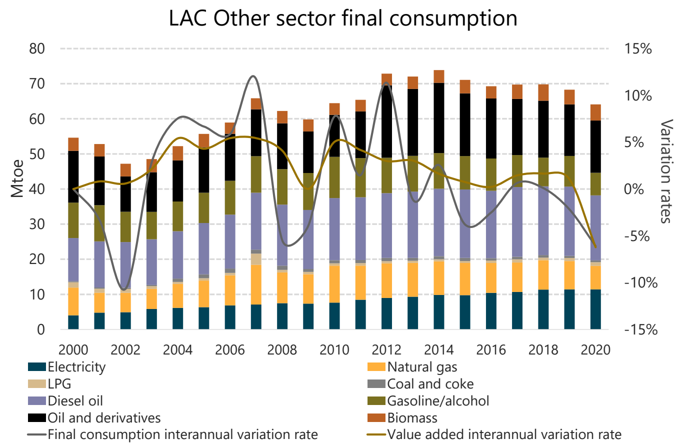

LAC Final energy consumption by source
Mtoe
Electricity
Biomass
Coal and coke
Oil and derivatives
Natural gas
Total final consumption (right axis)

LAC

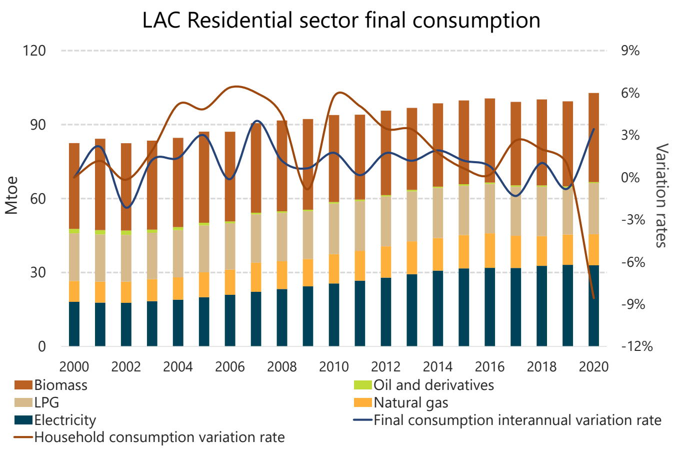

LAC Industrial sector final consumption
Mtoe
Variation rates
Biomass
Coal and coke
Natural gas
Final consumption interannual variation rate
Oil and derivatives
LPG
Electricity
Value added interannual variation rate

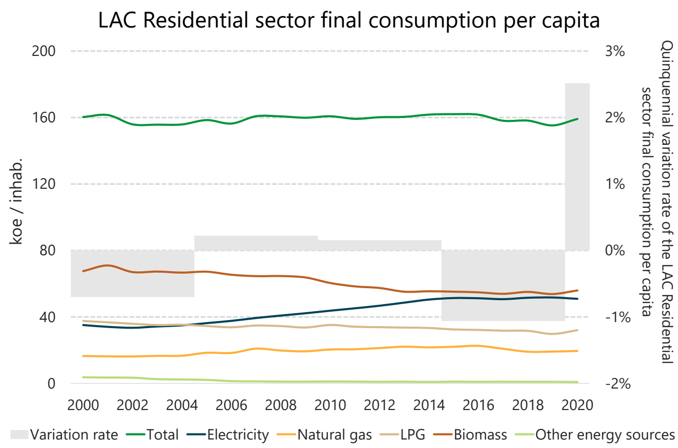

LAC Commercial sector final consumption
Mtoe
Variation rates
Electricity
LPG
Biomass
Value added interannual variation rate
Natural gas
Oil and derivatives
Final consumption interannual variation rate

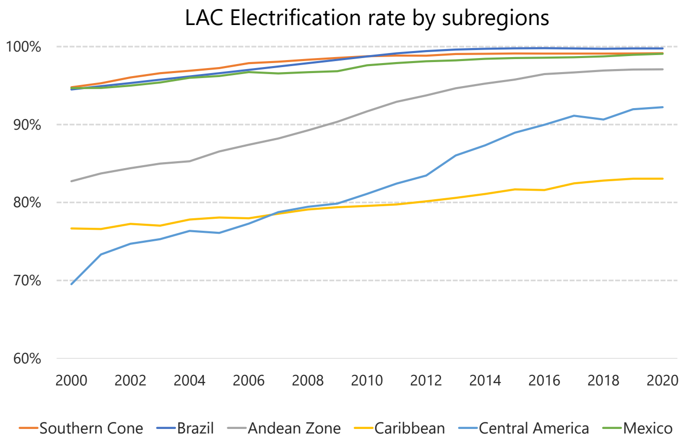

LAC Transport sector final consumption
Mtoe
Variation rates
Other energy sources
Electricity
Gasoline/alcohol
Interannual variation rate of Final Consumption
LPG
Kerosene/jet fuel
Diesel oil
Value added interannual variation rate

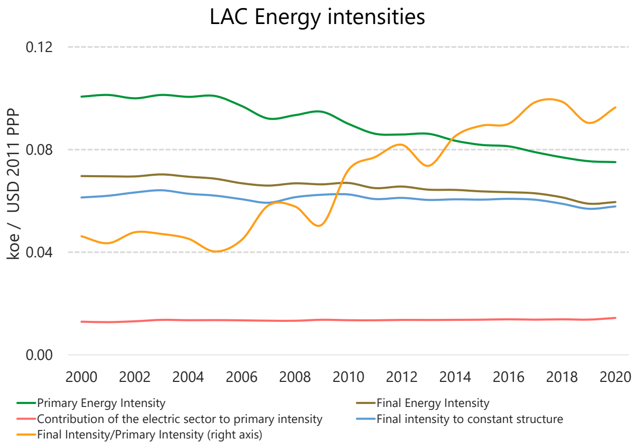

LAC Other sector final consumption
Mtoe
Variation rates
Electricity
LPG
Diesel oil
Oil and derivatives
Final consumption interannual variation rate
Natural gas
Coal and coke
Gasoline/alcohol
Biomass
Value added interannual variation rate

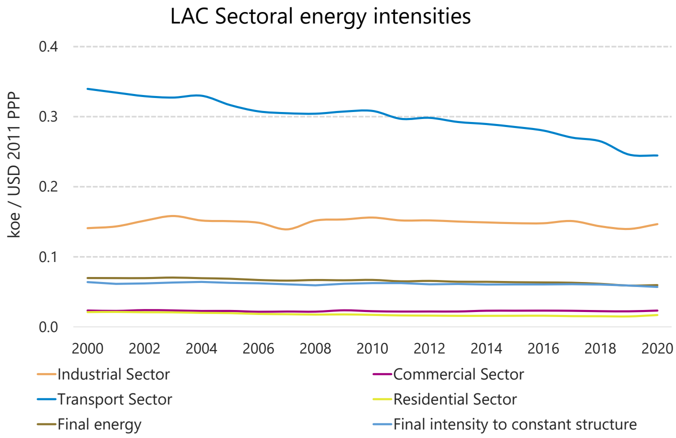
LAC

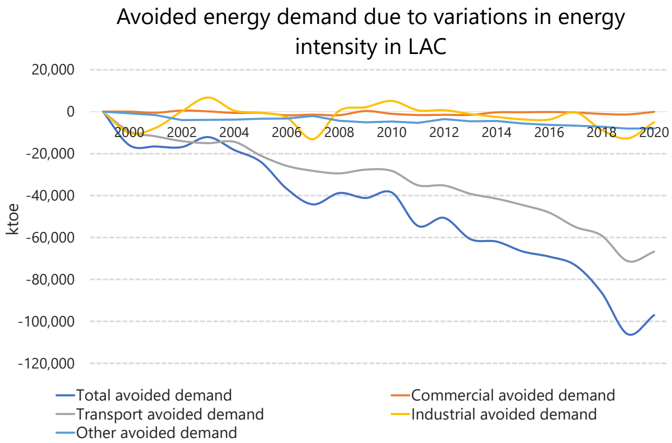

LAC Residential sector final consumption
Mtoe
Variation rates
Biomass
LPG
Electricity
Household consumption variation rate
Oil and derivatives
Natural gas
Final consumption interannual variation rate

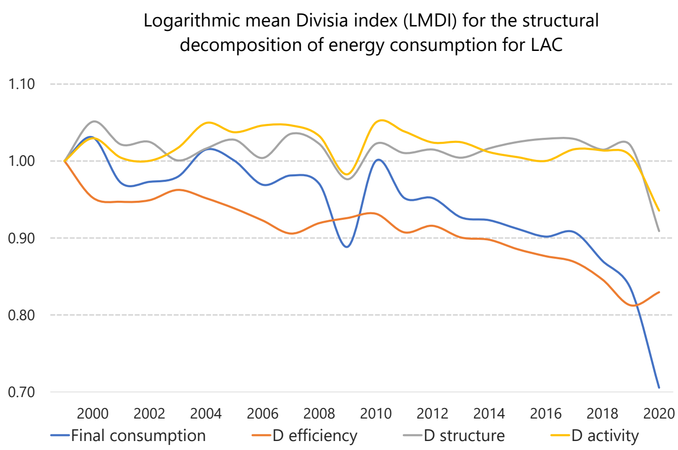

LAC Residential sector final consumption per capita
koe / inhab.
Quinquennial variation rate of the LAC Residential sector final consumption per capita
Variation rate
Total
Electricity
Natural gas
LPG
Biomass
Other energy sources

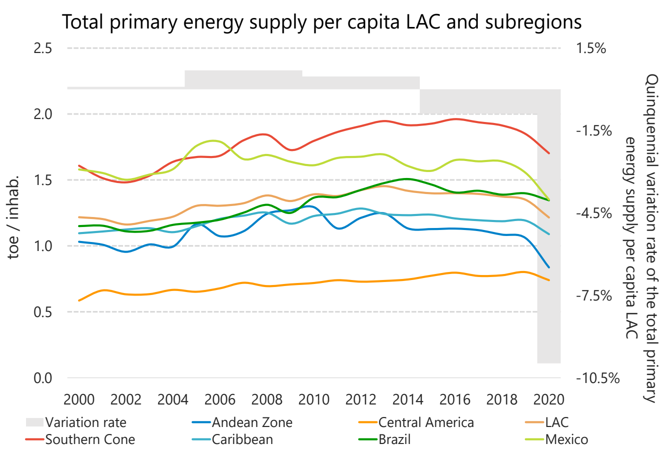

LAC Electrification rate by subregions
100%
90%
80%
70%
60%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Southern Cone
Brazil
Andean Zone
Caribbean
Central America
Mexico


LAC Energy intensities
koe / USD 2011 PPP
0.12
0.08
0.04
0.00
0.84
0.80
0.76
0.72
0.68
0.64
0.60
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Primary Energy Intensity
Final Energy Intensity
Contribution of the electric sector to primary intensity
Final intensity to constant structure
Final Intensity/Primary Intensity (right axis)

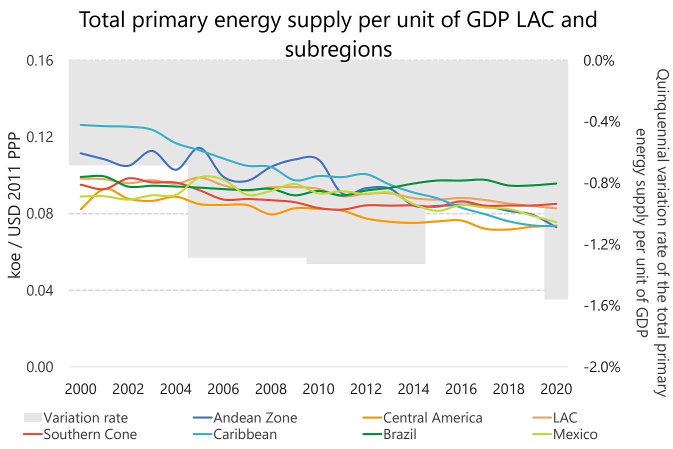

LAC Sectoral energy intensities
koe / USD 2011 PPP
0.4
0.3
0.2
0.1
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Industrial Sector
Commercial Sector
Transport Sector
Residential Sector
Final energy
Final intensity to constant structure

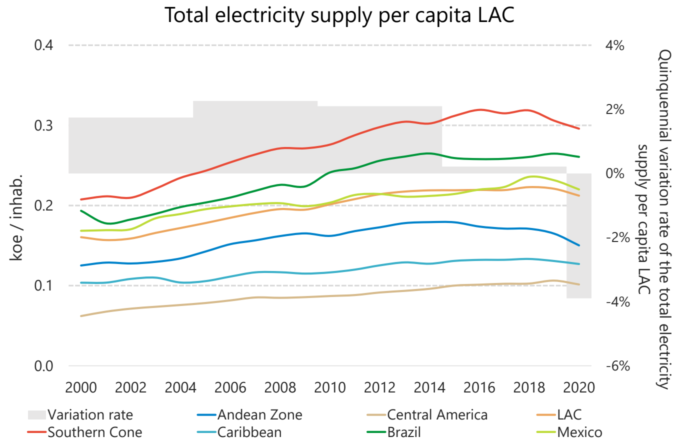

Avoided energy demand due to variations in energy intensity in LAC
ktoe
20,000
0
-20,000
-40,000
-60,000
-80,000
-100,000
-120,000
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Total avoided demand
Commercial avoided demand
Transport avoided demand
Industrial avoided demand
Other avoided demand

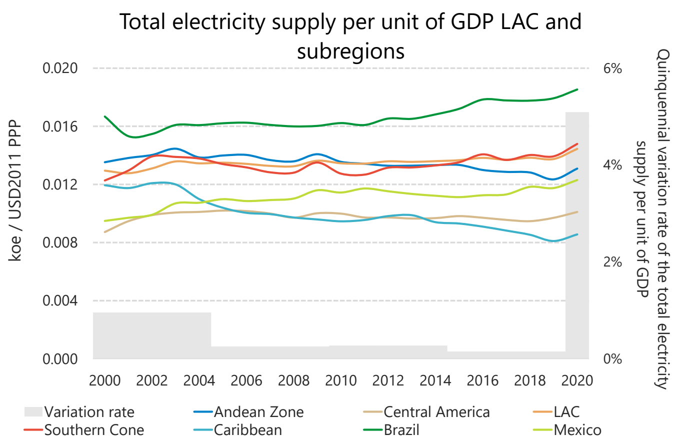

Logarithmic mean Divisia index (LMDI) for the structural decomposition of energy consumption for LAC
1.10
1.00
0.90
0.80
0.70
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Final consumption
D efficiency
D structure
D activity

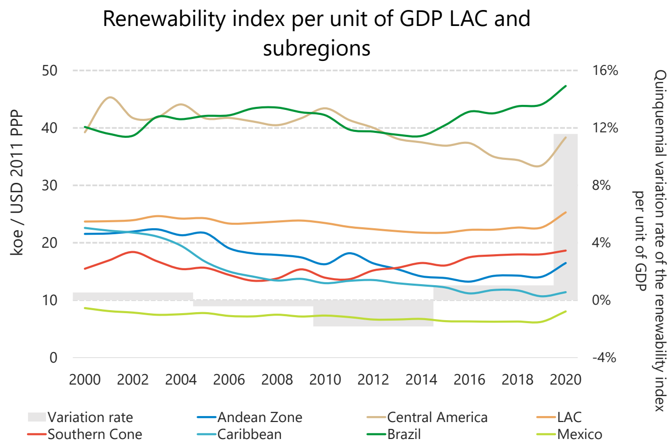

Total primary energy supply per capita LAC and subregions
toe / inhab.
2.5
2.0
1.5
1.0
0.5
0.0
1.5%
-1.5%
-4.5%
-7.5%
-10.5%
Quinquennial variation rate of the total primary energy supply per capita LAC
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Andean Zone
Central America
LAC
Southern Cone
Caribbean
Brazil
Mexico

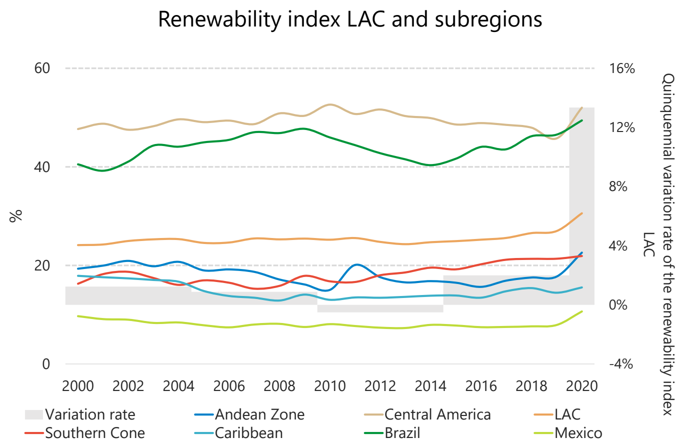
LAC

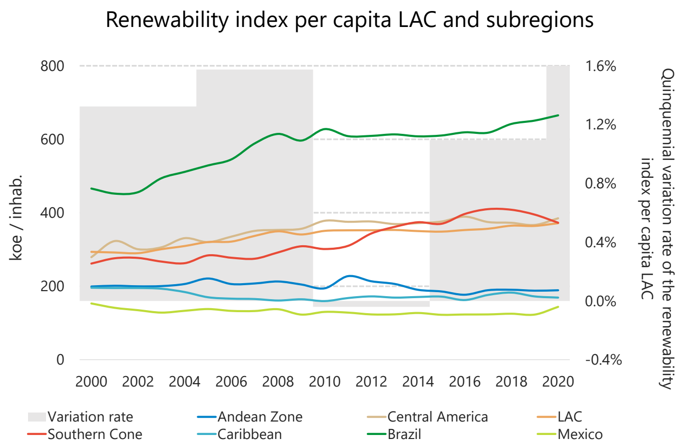

Total primary energy supply per unit of GDP LAC and subregions
koe / USD 2011 PPP
0.16
0.12
0.08
0.04
0.00
0.0%
-0.4%
-0.8%
-1.2%
-1.6%
-2.0%
Quinquennial variation rate of the total primary energy supply per unit of GDP
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Andean Zone
Central America
LAC
Southern Cone
Caribbean
Brazil
Mexico


Total electricity supply per capita LAC
koe / inhab.
0.4
0.3
0.2
0.1
0.0
4%
2%
0%
-2%
-4%
-6%
Quinquennial variation rate of the total electricity supply per capita LAC
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Andean Zone
Central America
LAC
Southern Cone
Caribbean
Brazil
Mexico

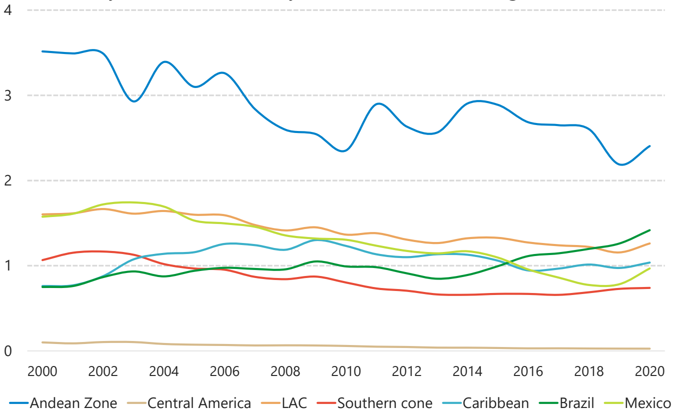

Total electricity supply per unit of GDP LAC and subregions
koe / USD2011 PPP
0.020
0.016
0.012
0.008
0.004
0.000
6%
4%
2%
0%
Quinquennial variation rate of the total electricity supply per unit of GDP
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Andean Zone
Central America
LAC
Southern Cone
Caribbean
Brazil
Mexico


Renewability index per unit of GDP LAC and subregions
koe / USD 2011 PPP
50
40
30
20
10
0
16%
12%
8%
4%
0%
-4%
Quinquennial variation rate of the renewability index per unit of GDP
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Andean Zone
Central America
LAC
Southern Cone
Caribbean
Brazil
Mexico

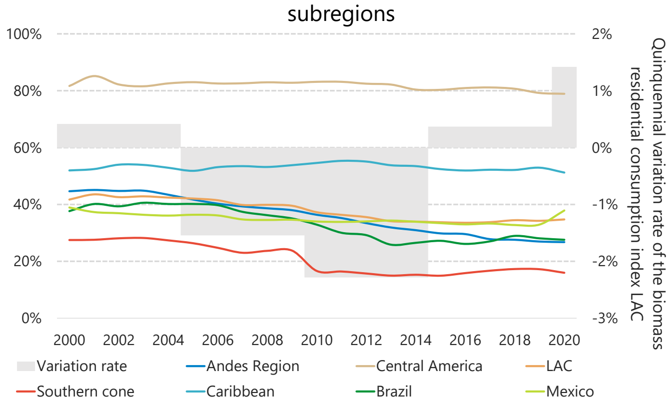

Renewability index LAC and subregions
%
60
40
20
0
16%
12%
8%
4%
0%
-4%
Quinquennial variation rate of the renewability index LAC
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Andean Zone
Central America
LAC
Southern Cone
Caribbean
Brazil
Mexico


Renewability index per capita LAC and subregions
koe / inhab.
800
600
400
200
0
1.6%
1.2%
0.8%
0.4%
0.0%
-0.4%
Quinquennial variation rate of the renewability index per capita LAC
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Andean Zone
Central America
LAC
Southern Cone
Caribbean
Brazil
Mexico

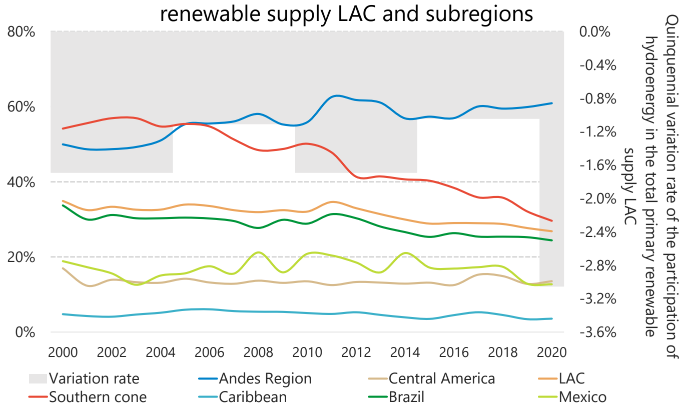
Hydrocarbon autarky index LAC and subregions



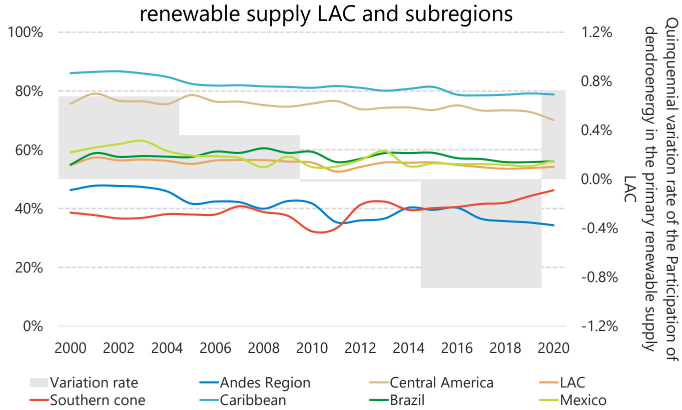
Biomass residential consumption index LAC and subregions



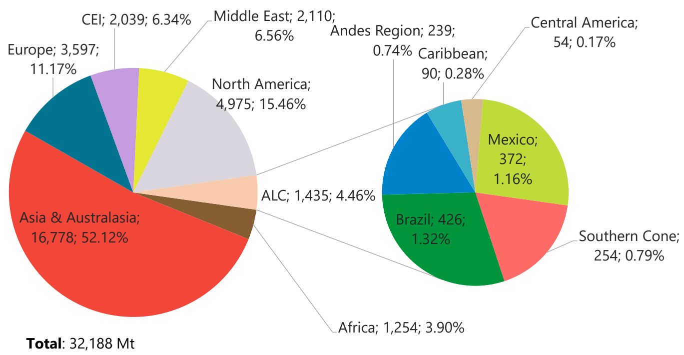
Participation of hydroenergy in the total primary renewable supply LAC and subregions



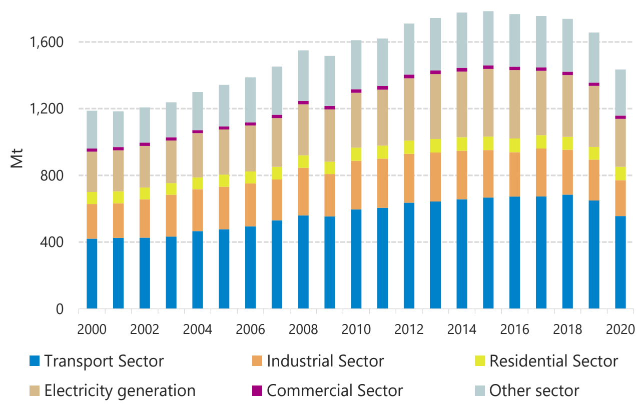
Participation of dendroenergy in the primary renewable supply LAC and subregions



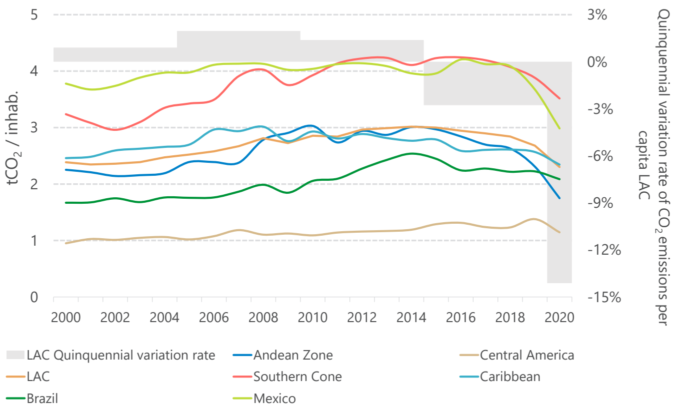
Global CO_2 emissions by subregions[Mt; %] 2020



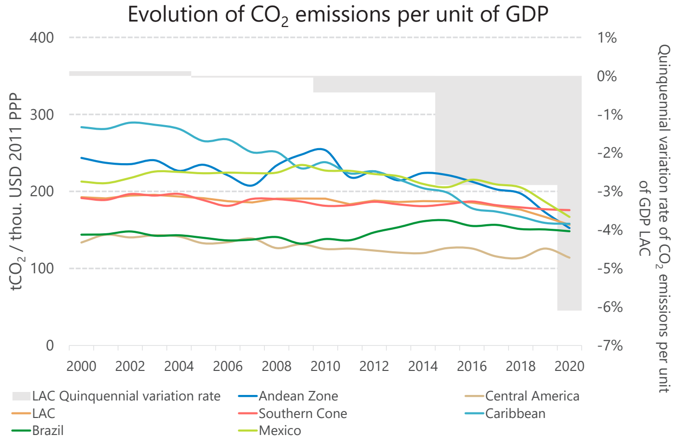
Evolution of CO_2 emissions by sector



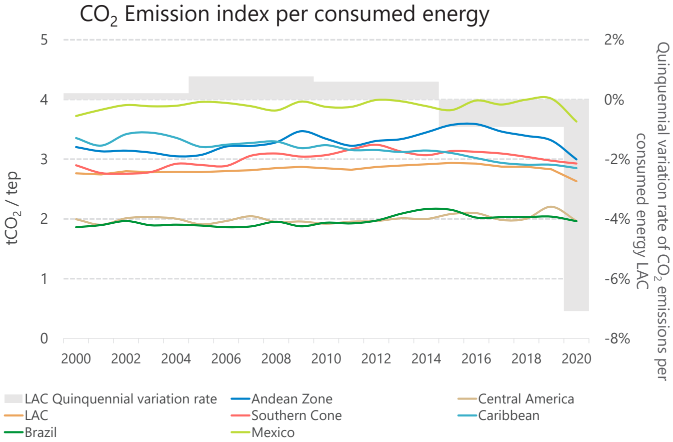
Evolution of CO_2 emissions per capita



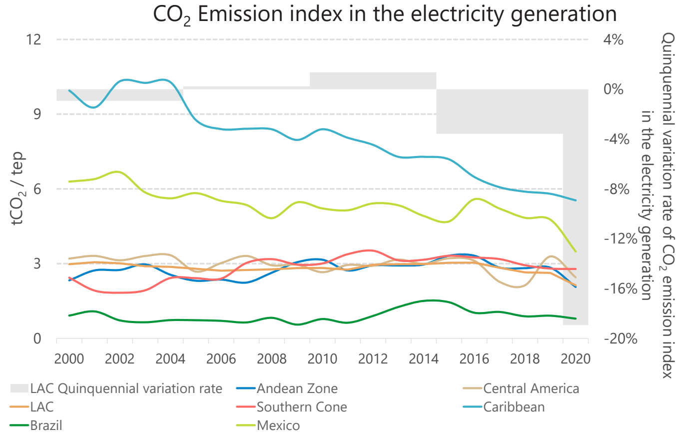
Evolution of CO_2 emissions per unit of GDP



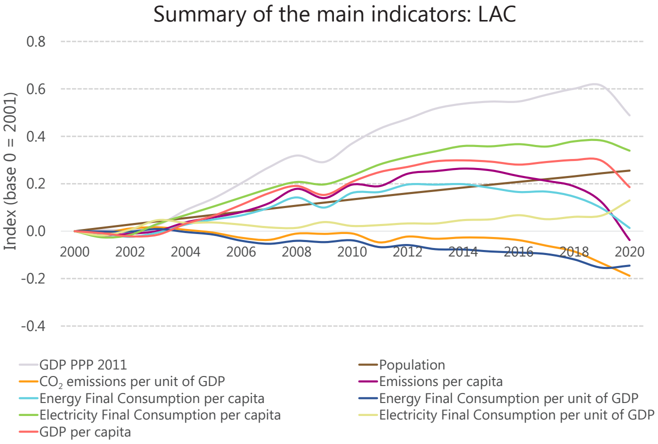
CO_2 Emission index per consumed energy



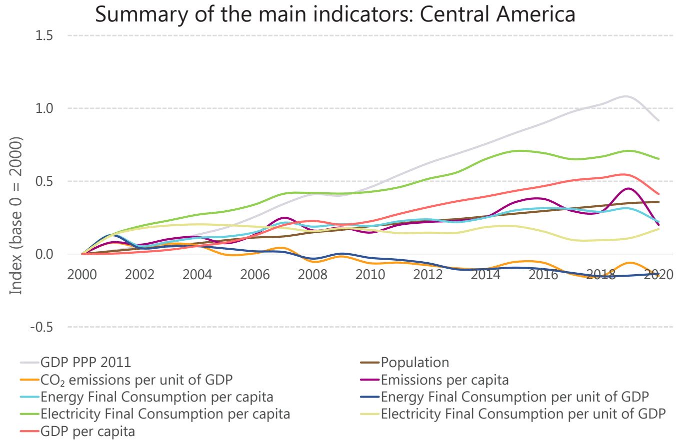
CO_2 Emission index in the electricity generation

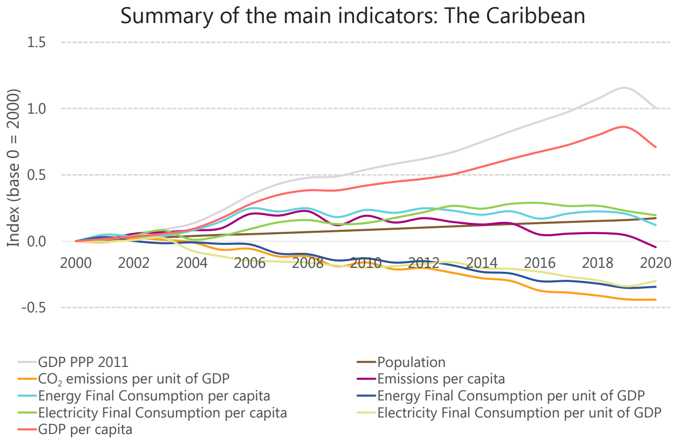


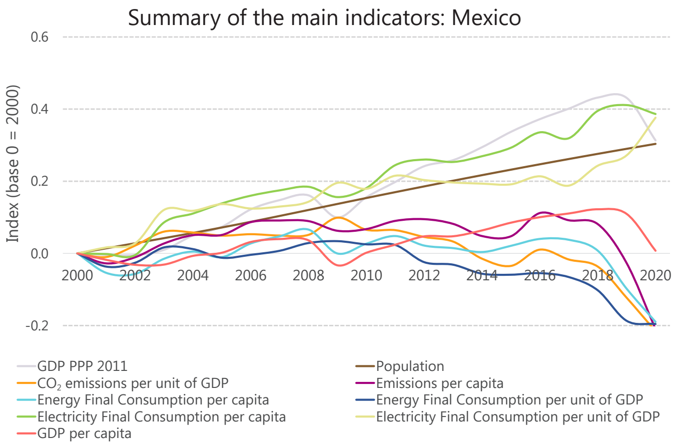
Summary of the main indicators: LAC

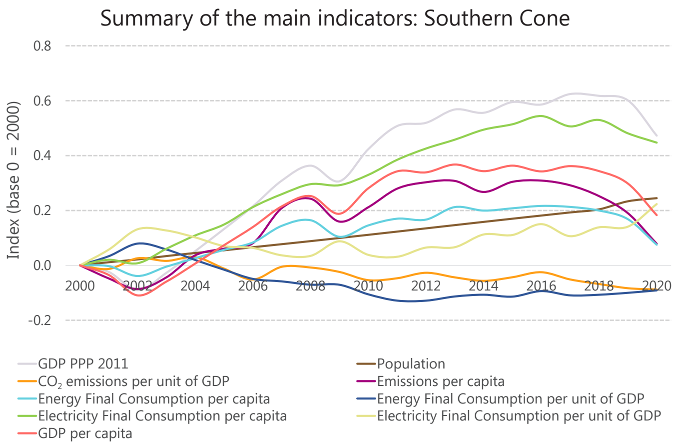


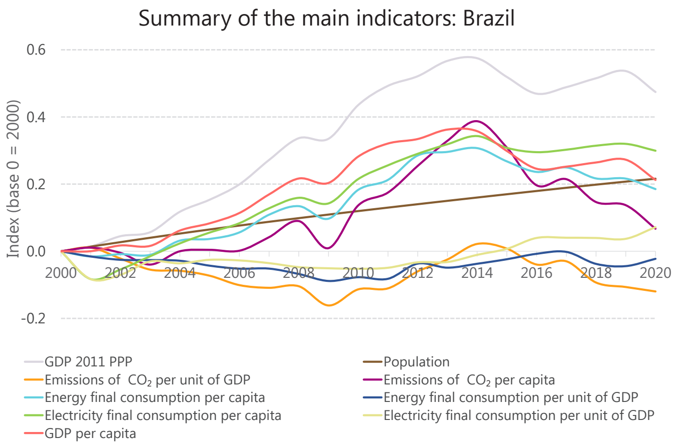
Summary of the main indicators: Central America

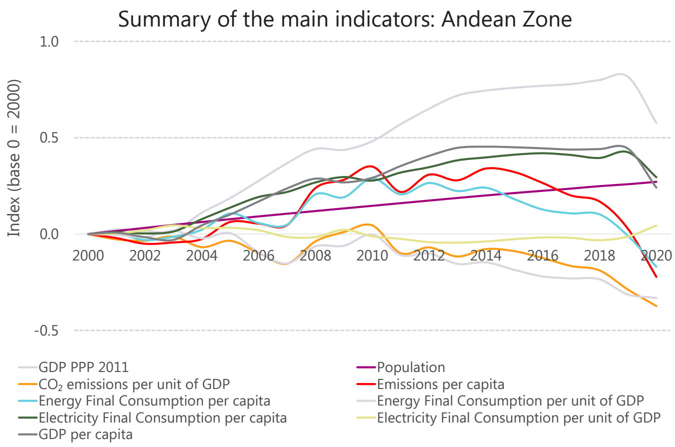



Summary of the main indicators: The Caribbean
Index (base 0 = 2000)
1.5
1.0
0.5
0.0
-0.5
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP PPP 2011
CO_2 emissions per unit of GDP
Energy Final Consumption per capita
Electricity Final Consumption per capita
GDP per capita
Population
Emissions per capita
Energy Final Consumption per unit of GDP
Electricity Final Consumption per unit of GDP

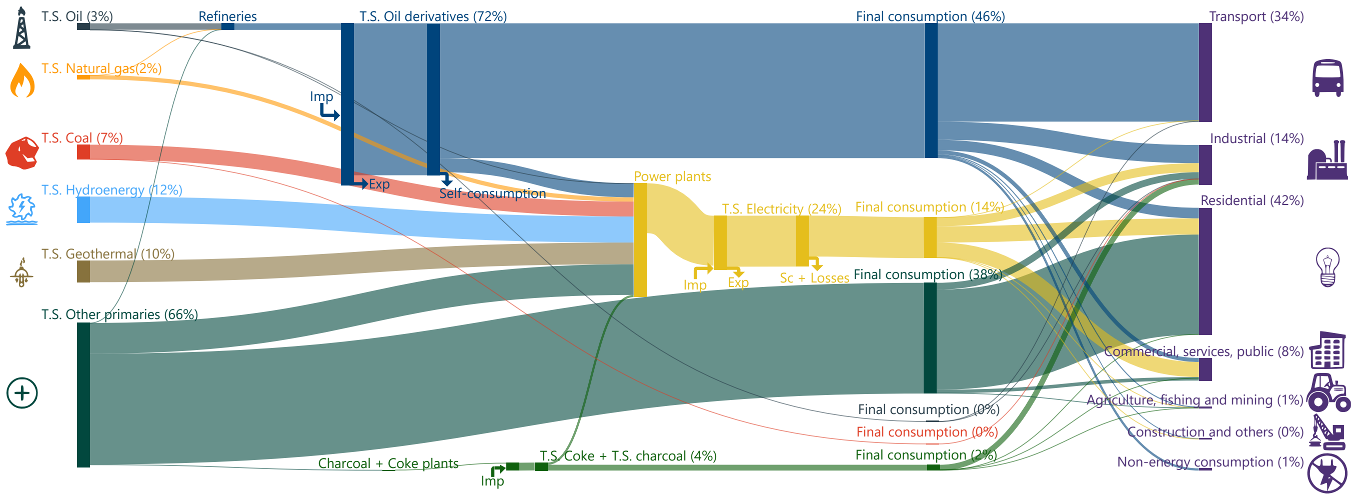

Summary of the main indicators: Mexico
Index (base 0 = 2000)
0.6
0.4
0.2
0.0
-0.2
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP PPP 2011
CO_2 emissions per unit of GDP
Energy Final Consumption per capita
Electricity Final Consumption per capita
GDP per capita
Population
Emissions per capita
Energy Final Consumption per unit of GDP
Electricity Final Consumption per unit of GDP


Summary of the main indicators: Southern Cone
Index (base 0 = 2000)
0.8
0.6
0.4
0.2
0.0
-0.2
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP PPP 2011
CO_2 emissions per unit of GDP
Energy Final Consumption per capita
Electricity Final Consumption per capita
GDP per capita
Population
Emissions per capita
Energy Final Consumption per unit of GDP
Electricity Final Consumption per unit of GDP

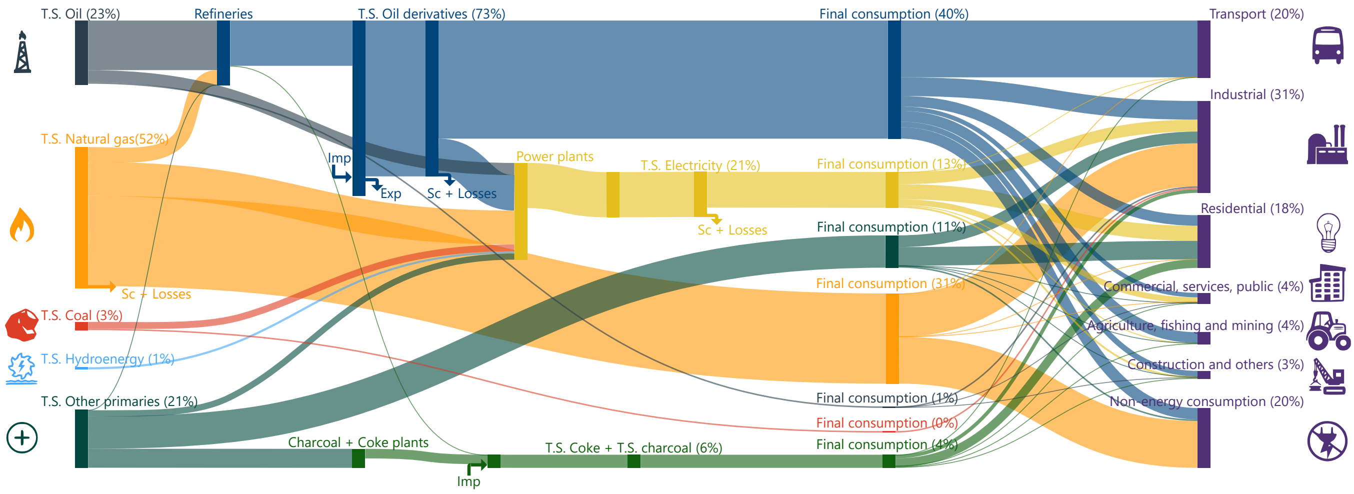

Summary of the main indicators: Brazil
Index (base 0 = 2000)
0.6
0.4
0.2
0.0
-0.2
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Emissions of CO_2 per unit of GDP
Energy final consumption per capita
Electricity final consumption per capita
GDP per capita
Population
Emissions of CO_2 per capita
Energy final consumption per unit of GDP
Electricity final consumption per unit of GDP


Summary of the main indicators: Andean Zone
Index (base 0 = 2000)
1.0
0.5
0.0
-0.5
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP PPP 2011
CO_2 emissions per unit of GDP
Energy Final Consumption per capita
Electricity Final Consumption per capita
GDP per capita
Population
Emissions per capita
Energy Final Consumption per unit of GDP
Electricity Final Consumption per unit of GDP

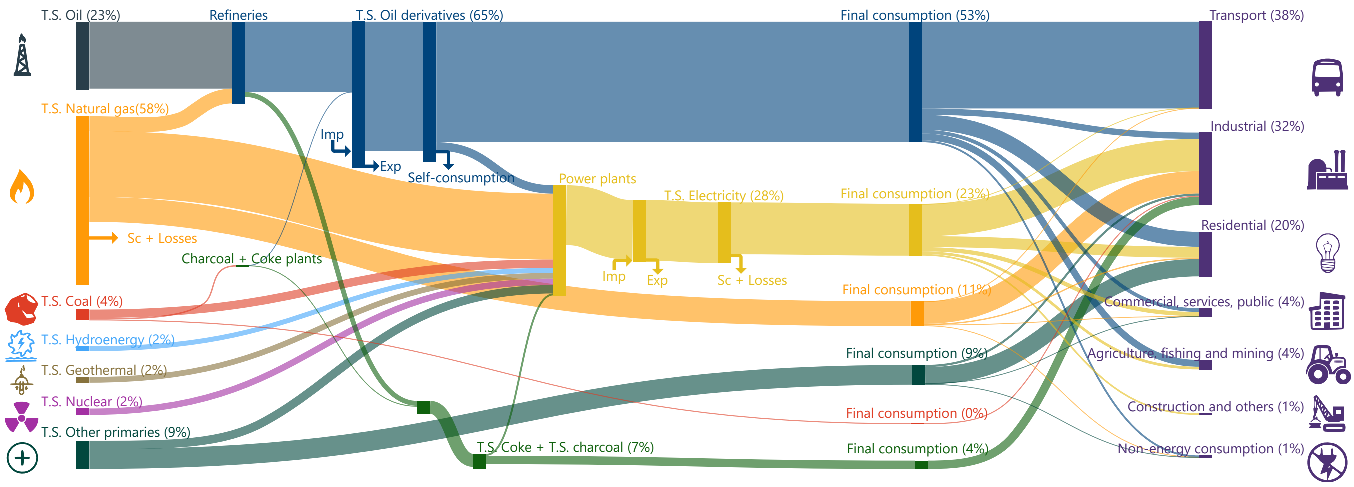
Summarized energy matrix: Central America - 2020 | Total energy supply: 36,250 ktoe



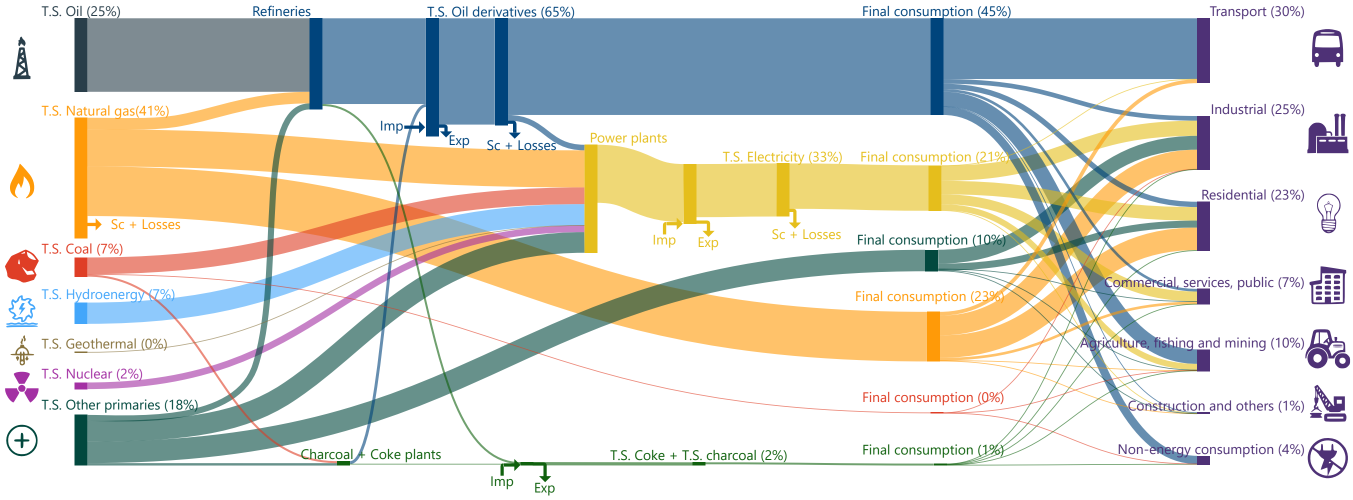
Summarized energy matrix: Caribbean - 2020 | Total energy supply: 42,812 ktoe



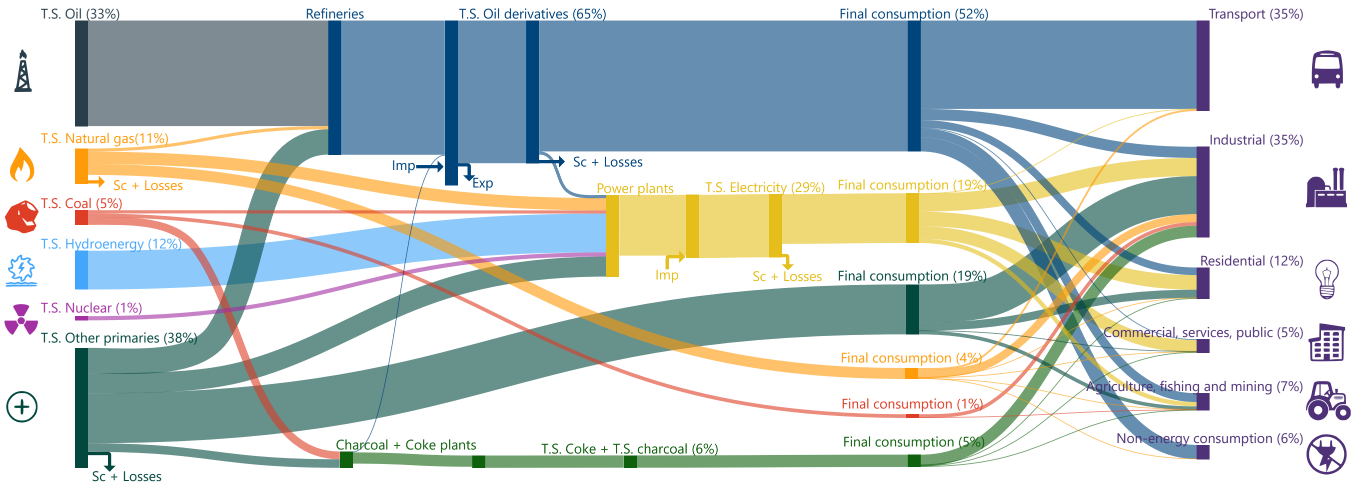
Summarized energy matrix: Mexico - 2020 | Total energy supply: 174,189 ktoe



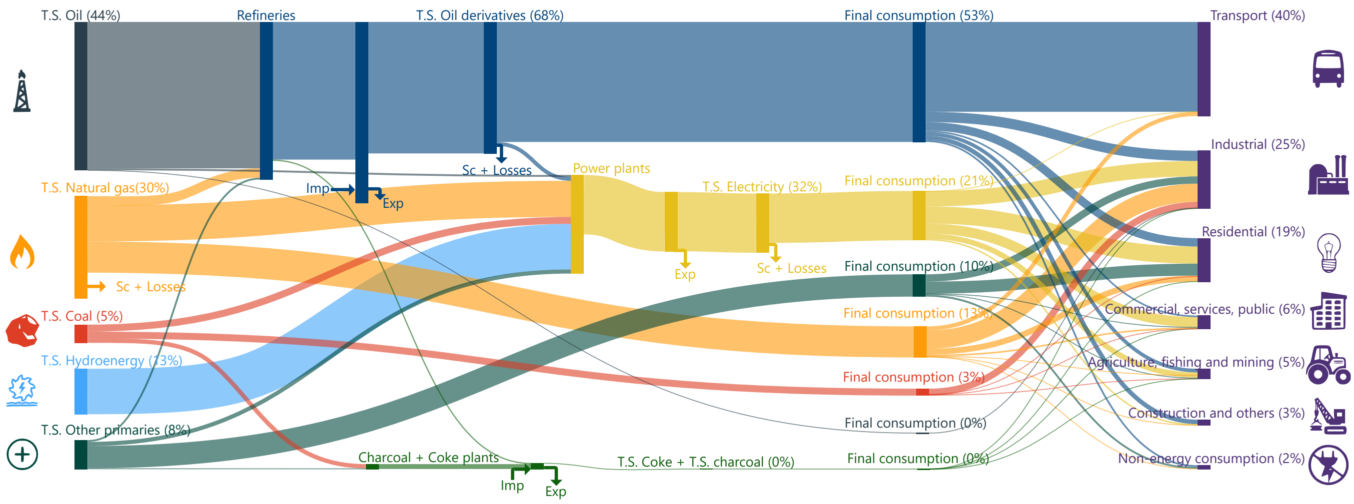
Summarized energy matrix: Southern Cone - 2020 | Total energy supply: 127,852 ktoe

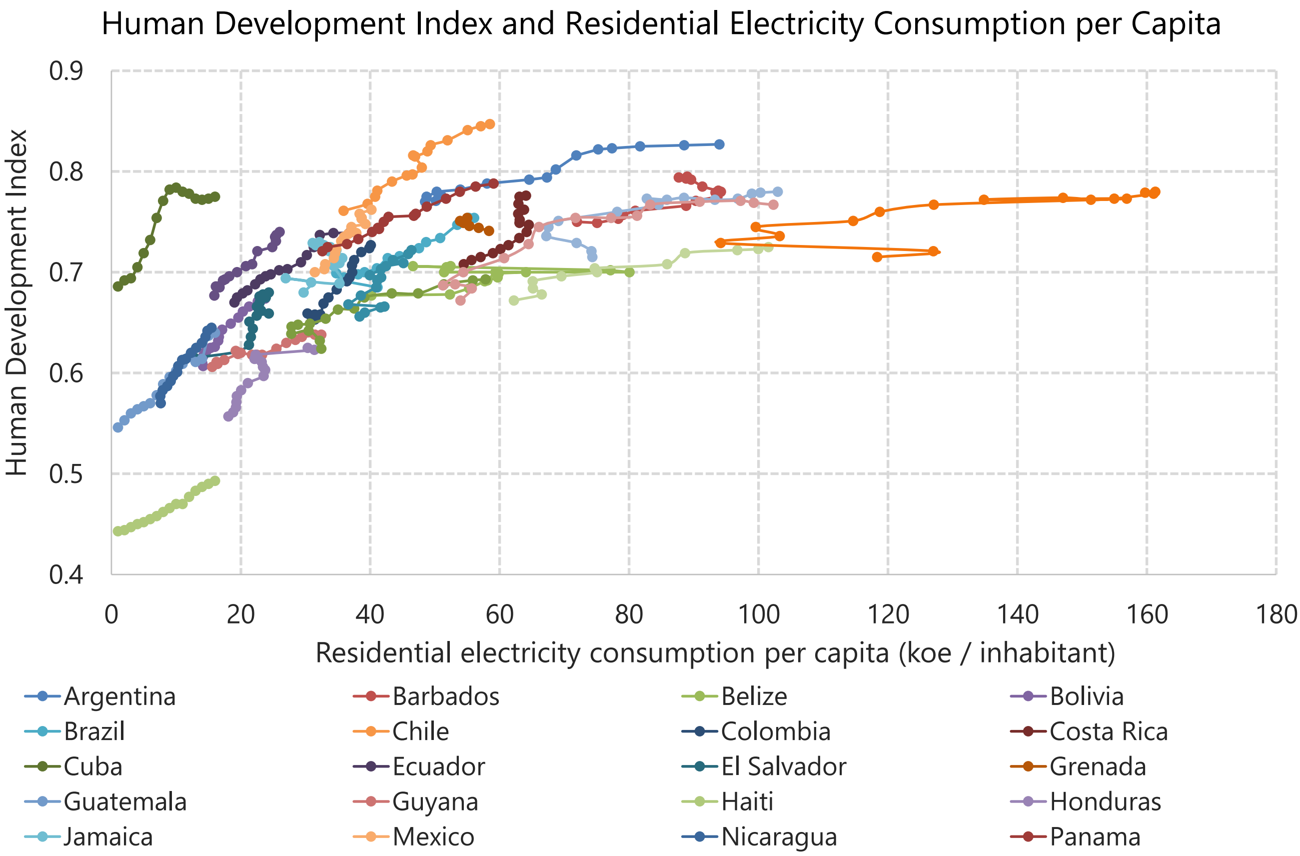


Summarized energy matrix: Brazil - 2020 | Total energy supply: 286,094 ktoe

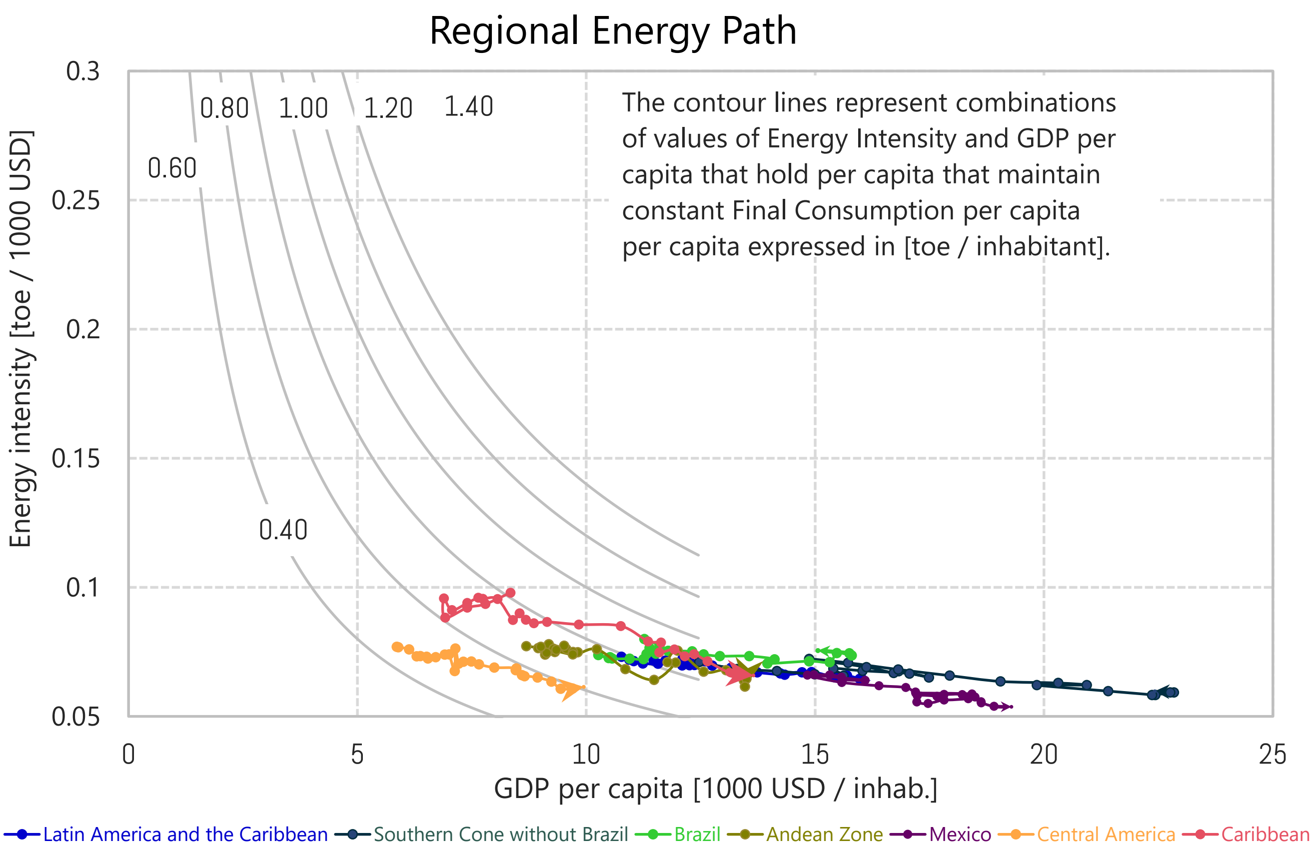


Summarized energy matrix: Andean Zone - 2020 | Total energy supply: 118,514 ktoe





Human Development Index and Residential Electricity Consumption per Capita
Human Development Index
Residential electricity consumption per capita (koe / inhabitant)
0.9
0.8
0.7
0.6
0.5
0.4
0
20
40
60
80
100
120
140
160
180
Argentina
Barbados
Belize
Bolivia
Brazil
Chile
Colombia
Costa Rica
Cuba
Ecuador
El Salvador
Grenada
Guatemala
Guyana
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama



Regional Energy Path
Energy intensity [toe / 1000 USD]
GDP per capita [1000 USD / inhab.]
0.3
0.25
0.2
0.15
0.1
0.05
0
5
10
15
20
25
0.40
0.60
0.80
1.00
1.20
1.40
The contour lines represent combinations of values of Energy Intensity and GDP per capita that hold per capita that maintain constant Final Consumption per capita per capita expressed in [toe / inhabitant].
Latin America and the Caribbean
Southern Cone without Brazil
Brazil
Andean Zone
Mexico
Central America
Caribbean

Energy profile of Members Countries

ARGENTINA

General Information 2020

Population (thousand inhab.)	45,196 [1]
Area (km²)	2,780,400
Population Density (inhab. / km²)	16
Urban Population (%)	92
GDP USD 2010 (MUSD)	397,193 [1]
GDP USD 2011 PPP (MUSD)	893,311 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	20

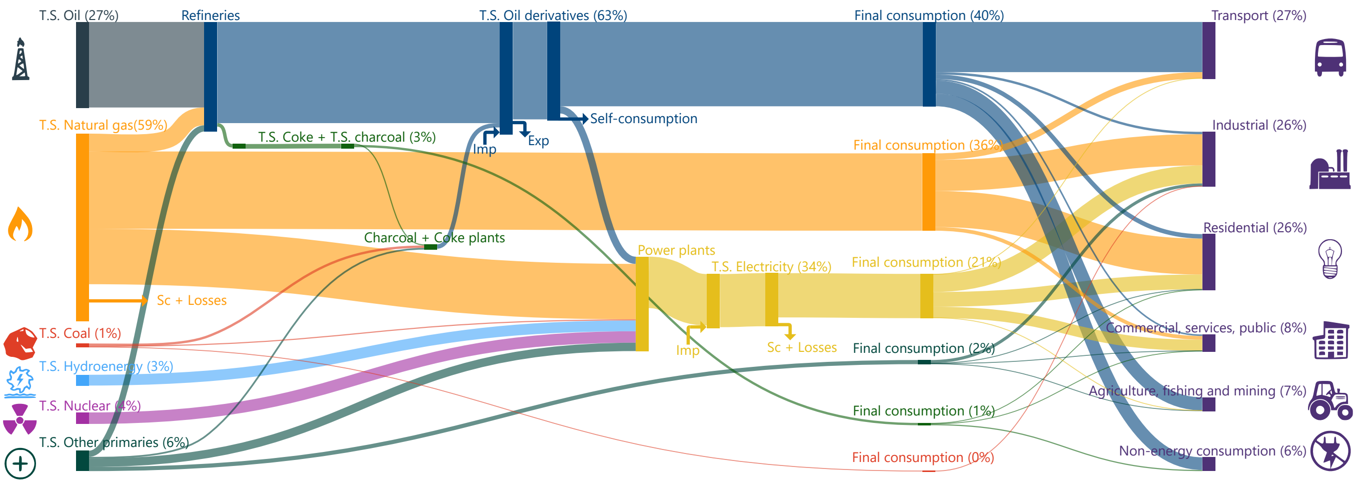
Energy Sector 2020

Final consumption in the Transport Sector	Mtep	13.71 [4]
Final consumption in the Industrial Sector	Mtep	13.25
Final consumption in the Residential Sector	Mtep	13.61
Final consumption in the Commercial and Service Sector	Mtep	4.14
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	6.69
Oil Reserves	Mbbl	2,251
Natural gas Reserves	Gm³	376 [3]
Coal Reserves	Mt	421 [3]

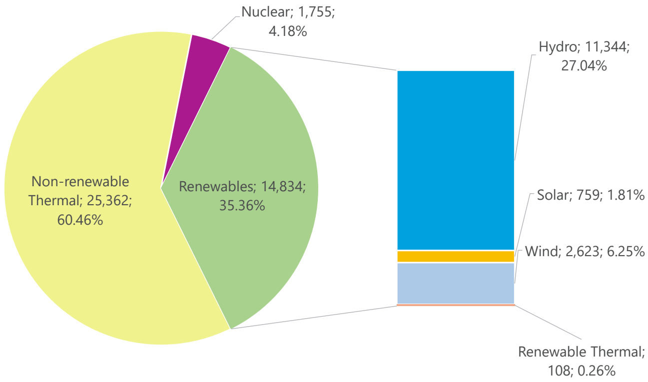
[1] Source: ECLAC.
[2] Source: World Bank.
[3] Data corresponding to the year 2017.
[4] Includes bunker.

kWh / inhab.	2,755	Electricity consumption per capita
toe / inhab.	1.14	Final energy consumption per capita
%	98.79	Electrification rate
Mtoe	76.05	Total energy supply
Mtoe	72.10	Total energy production
Mtoe	12.06	Total energy imports
Mtoe	8.08	Total energy exports
Mtoe	51.38	Total final energy consumption
kbbl / day	632	Refining capacity
GW	41.95	Installed power generation capacity
koe / USD 2011 PPP	0.09 / 0.06	Primary energy intensity and final energy intensity

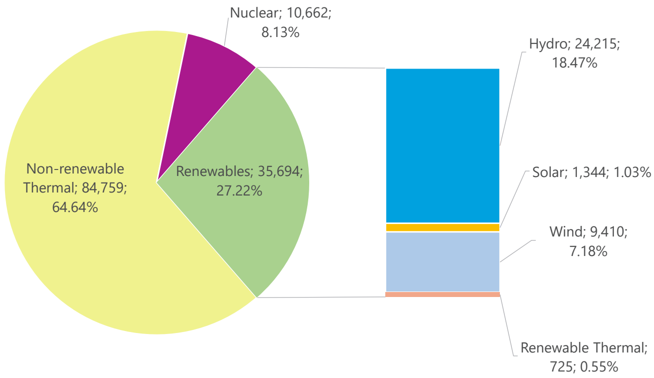
Summarized energy balance 2020



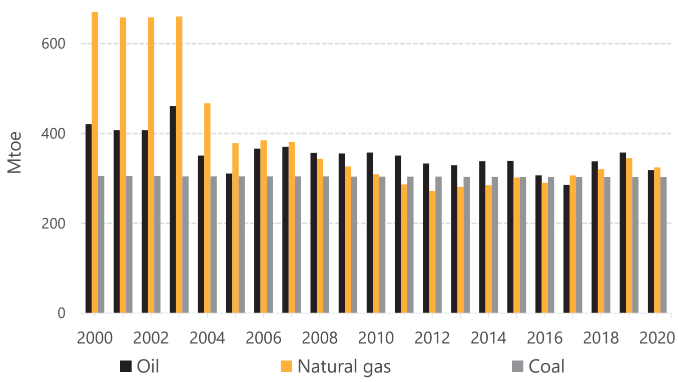
Installed power generation capacity [MW; %]
2020



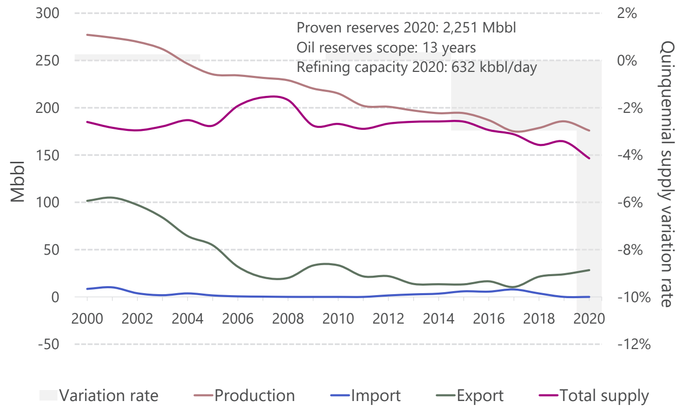
Installed power generation capacity [MW; %]
2020



Proven reserves of oil, natural gas and coal

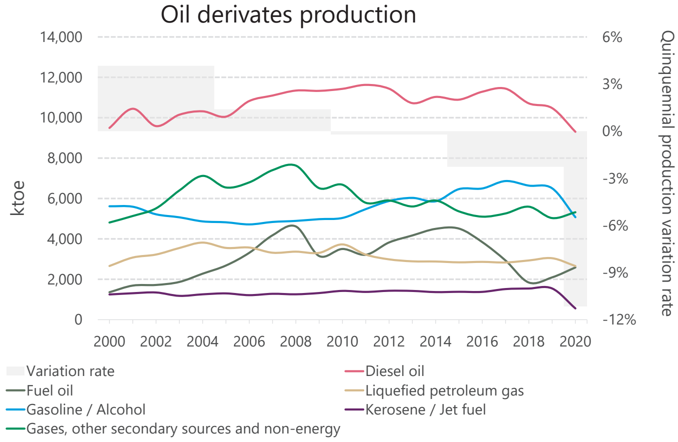


Oil supply

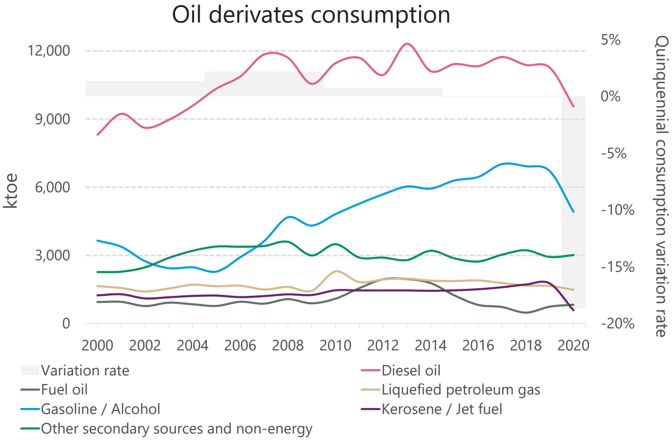


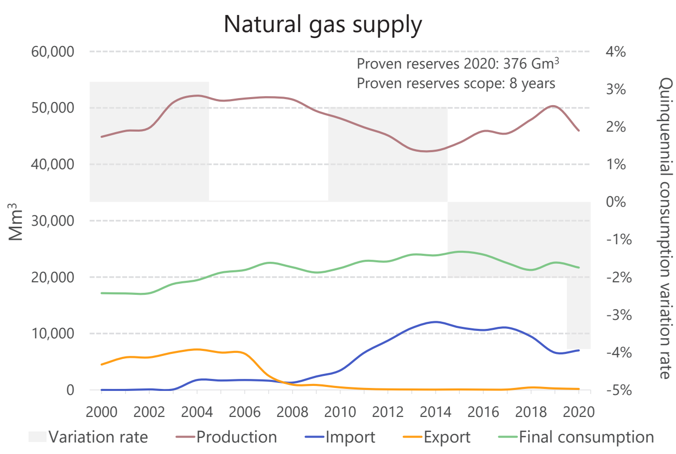
ARGENTINA

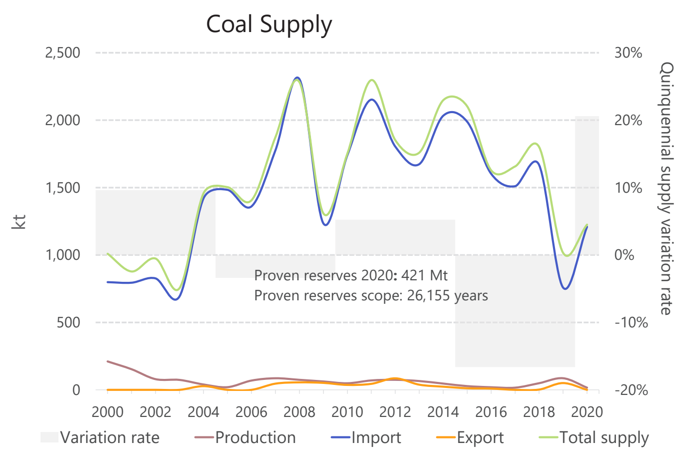
Oil derivates production

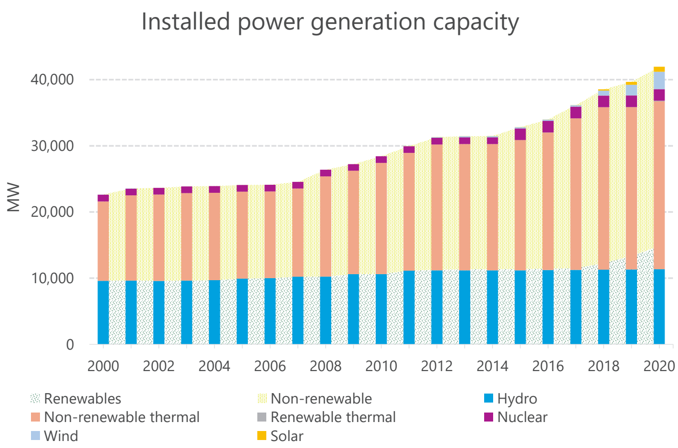


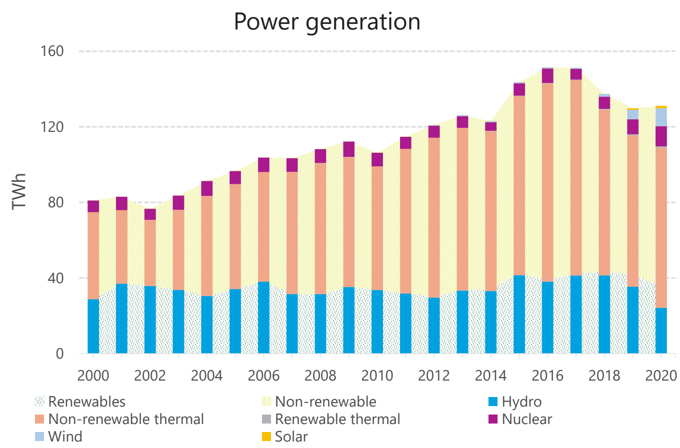
Oil derivates consumption

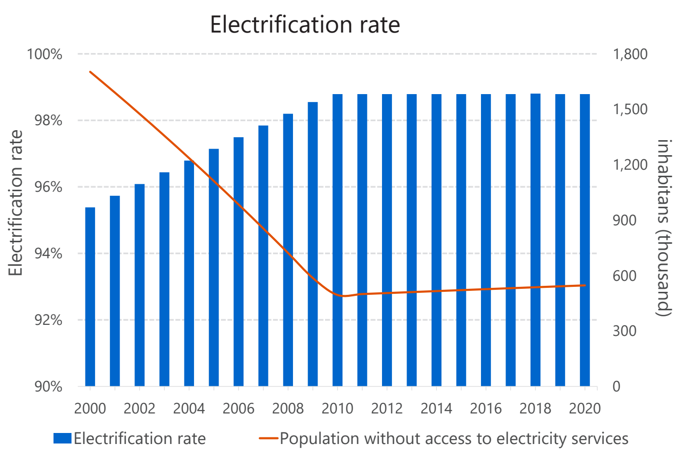


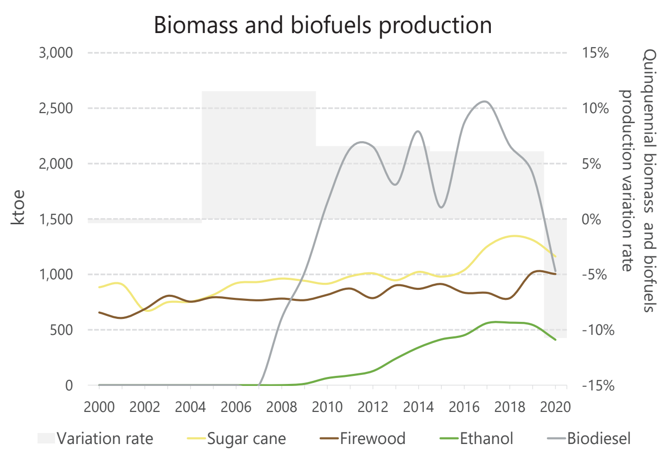

Natural gas supply
Proven reserves 2020: 376 Gm^3
Proven reserves scope: 8 years
Mm^3
Quinquennial consumption variation rate
Variation rate
Production
Import
Export
Final consumption


Coal Supply
Proven reserves 2020: 421 Mt
Proven reserves scope: 26,155 years
kt
Quinquennial supply variation rate
Variation rate
Production
Import
Export
Total supply


Installed power generation capacity
MW
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Nuclear
Wind
Solar

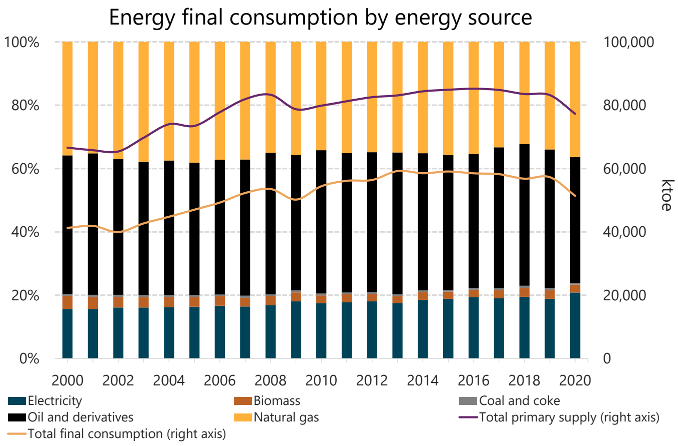

Power generation
TWh
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Nuclear
Wind
Solar


Electrification rate
Electrification rate
inhabitants (thousand)
Electrification rate
Population without access to electricity services

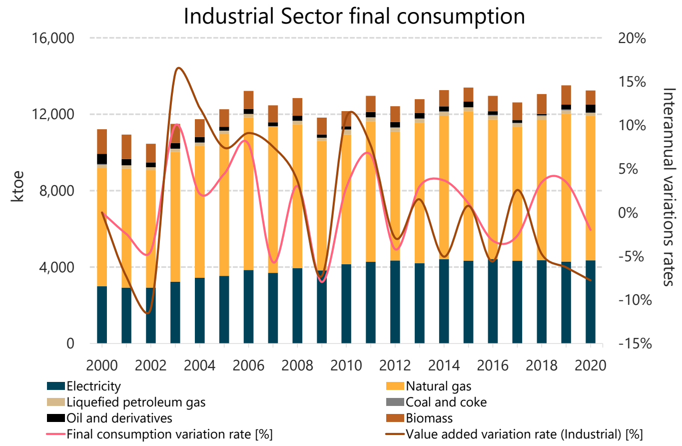

Biomass and biofuels production
ktoe
Quinquennial biomass and biofuels production variation rate
Variation rate
Sugar cane
Firewood
Ethanol
Biodiesel

ARGENTINA

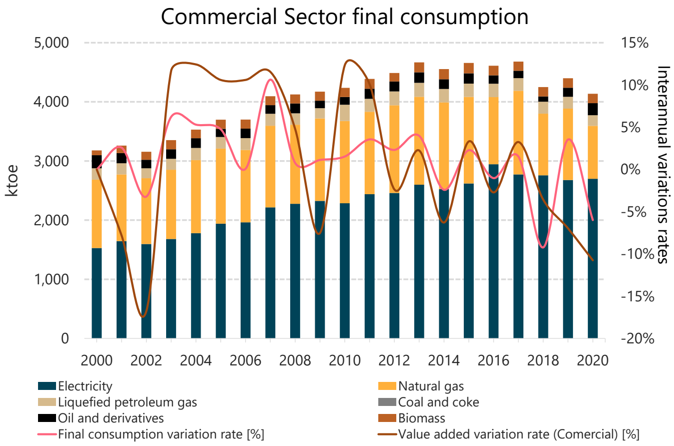
ARGENTINA



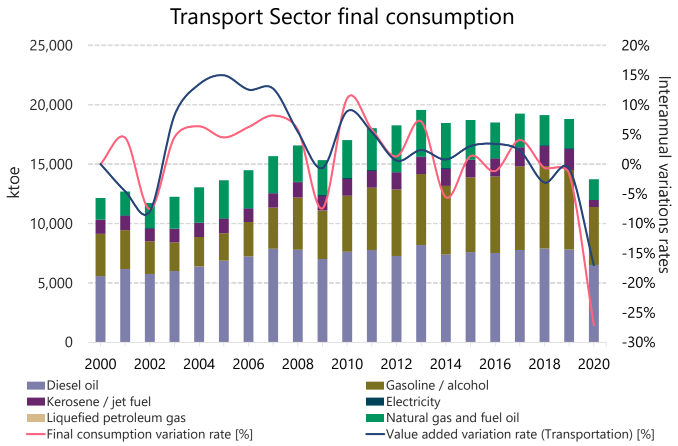
Energy final consumption by energy source
100%
80%
60%
40%
20%
0%
100,000
80,000
60,000
40,000
20,000
0
ktoe
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Biomass
Coal and coke
Oil and derivatives
Natural gas
Total primary supply (right axis)
Total final consumption (right axis)



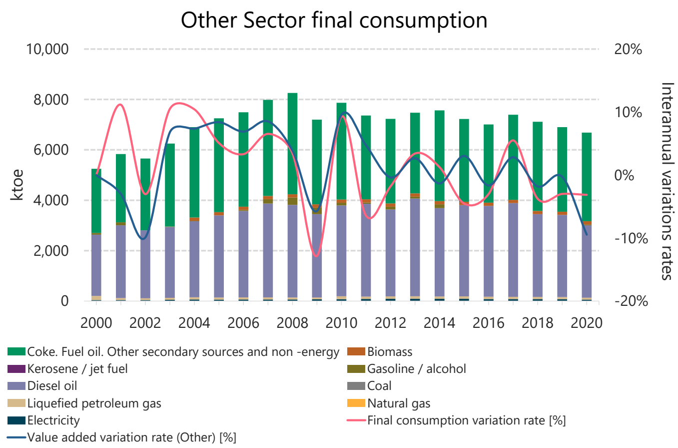
Industrial Sector final consumption
16,000
12,000
8,000
4,000
0
ktoe
20%
15%
10%
5%
0%
-5%
-10%
-15%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Natural gas
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]



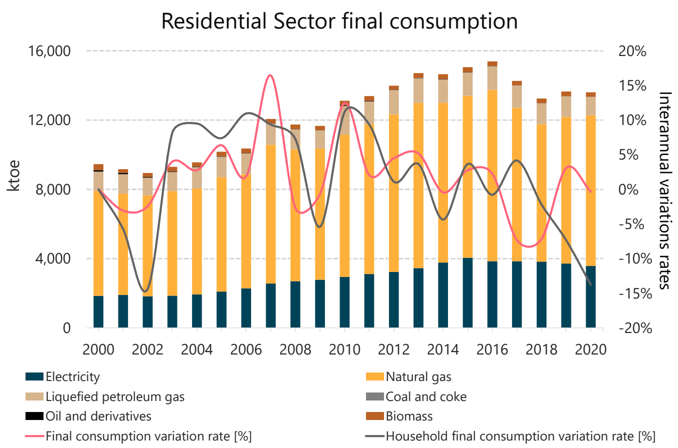
Commercial Sector final consumption
5,000
4,000
3,000
2,000
1,000
0
ktoe
15%
10%
5%
0%
-5%
-10%
-15%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Natural gas
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]



Transport Sector final consumption
25,000
20,000
15,000
10,000
5,000
0
ktoe
20%
15%
10%
5%
0%
-5%
-10%
-15%
-20%
-25%
-30%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Electricity
Liquefied petroleum gas
Natural gas and fuel oil
Final consumption variation rate [%]
Value added variation rate (Transportation) [%]

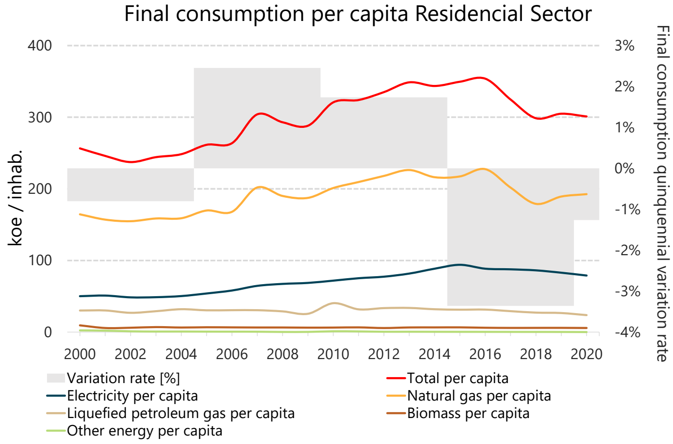


Other Sector final consumption
10,000
8,000
6,000
4,000
2,000
0
ktoe
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Coke. Fuel oil. Other secondary sources and non -energy
Biomass
Kerosene / jet fuel
Gasoline / alcohol
Diesel oil
Coal
Liquefied petroleum gas
Natural gas
Electricity
Final consumption variation rate [%]
Value added variation rate (Other) [%]

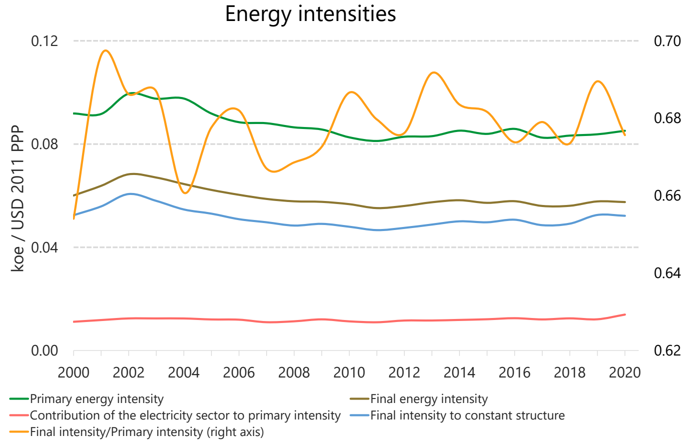


Residential Sector final consumption
16,000
12,000
8,000
4,000
0
ktoe
20%
15%
10%
5%
0%
-5%
-10%
-15%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Natural gas
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Household final consumption variation rate [%]

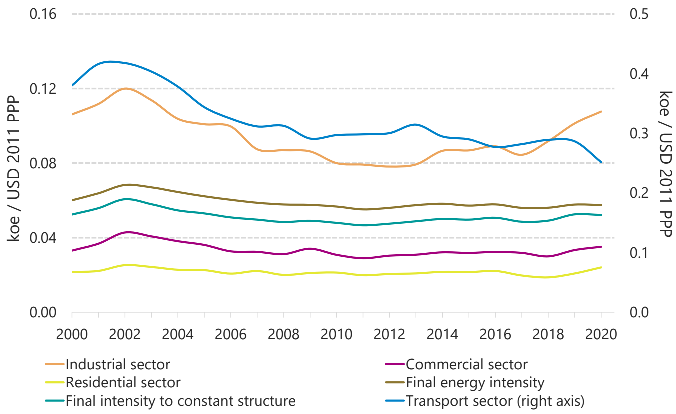
Final consumption per capita Residencial Sector



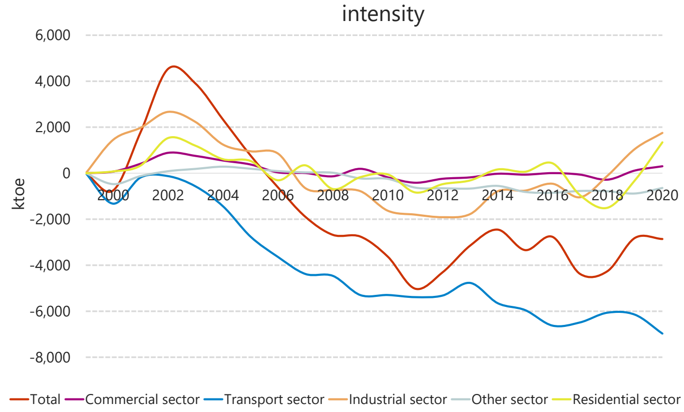
Energy intensities



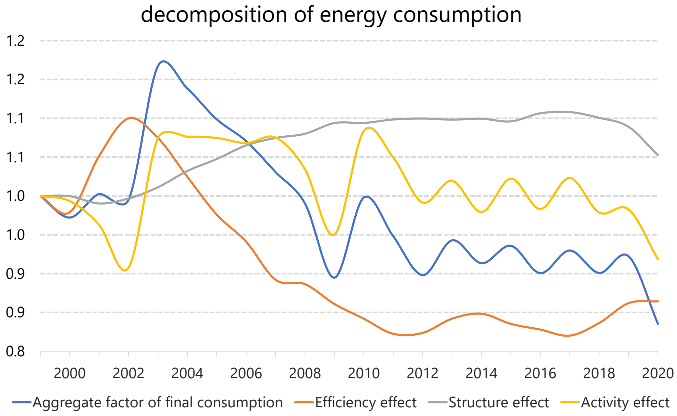
Sectoral energy intensities



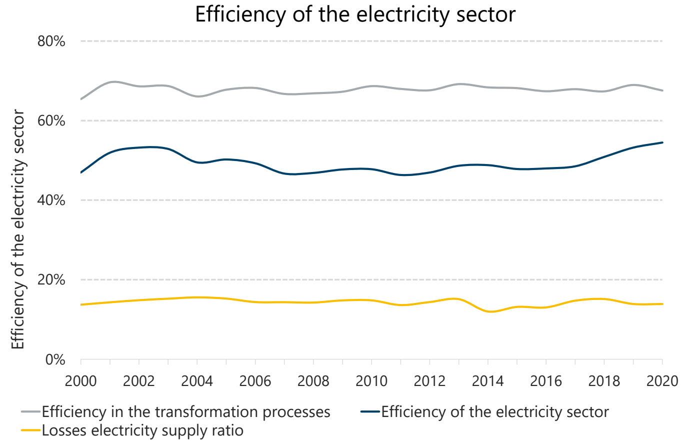
Avoided energy demand due to variations in energy intensity

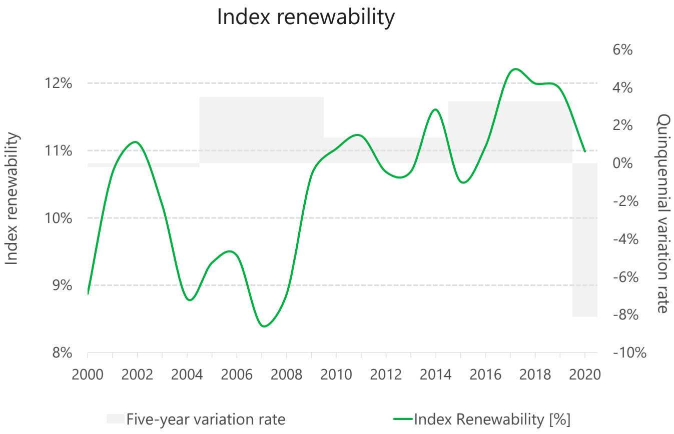


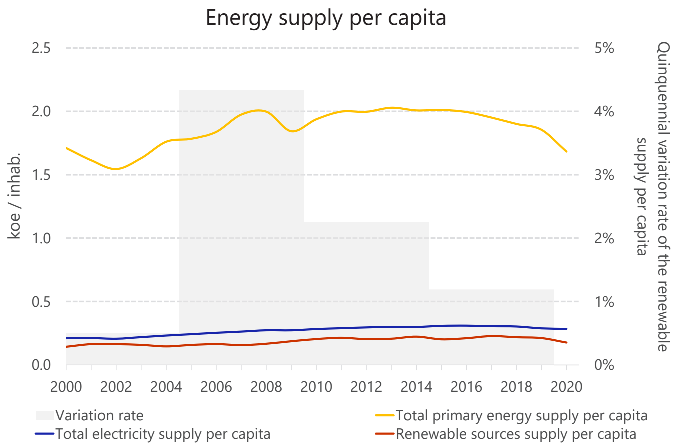
Logarithmic mean Divisia index for the structural decomposition of energy consumption

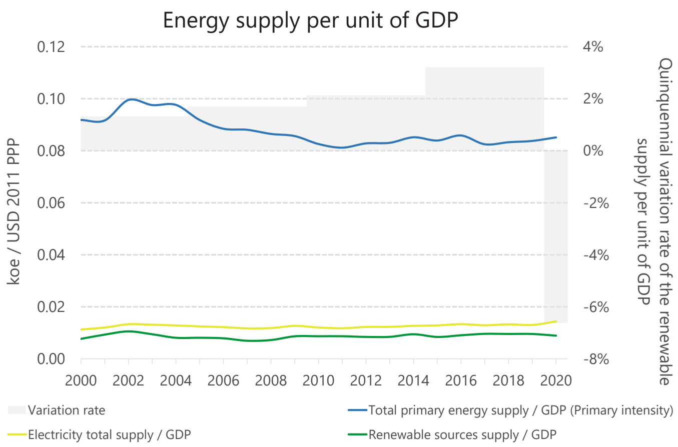


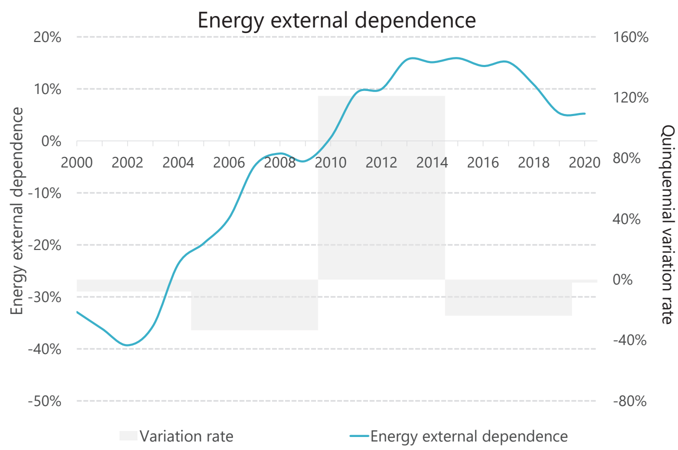
Efficiency of the electricity sector

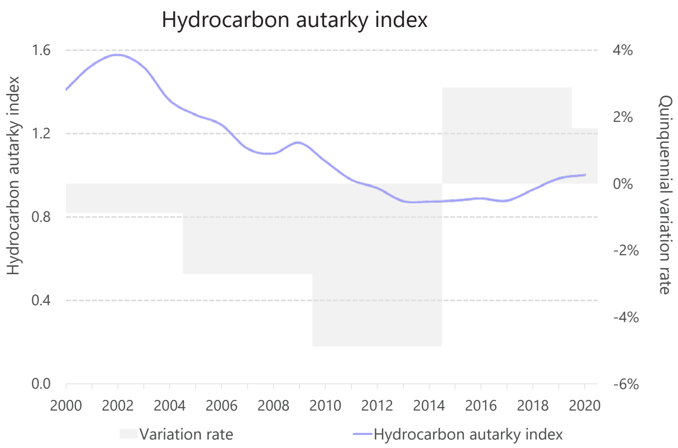


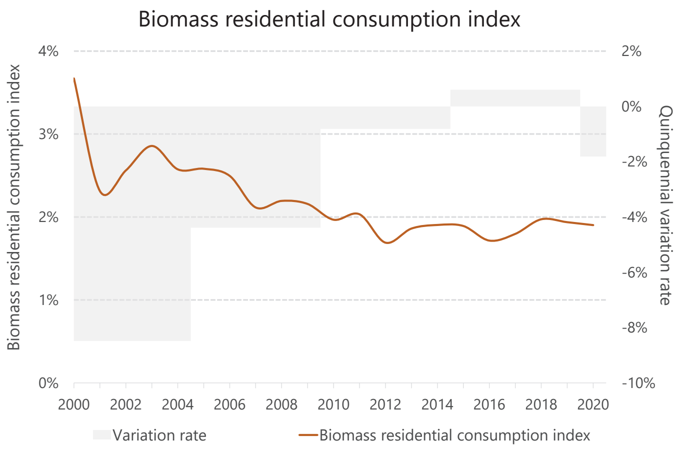

Index renewability
Index renewability
12%
11%
10%
9%
8%
6%
4%
2%
0%
-2%
-4%
-6%
-8%
-10%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Five-year variation rate
Index Renewability [%]


Energy supply per capita
koe / inhab.
2.5
2.0
1.5
1.0
0.5
0.0
5%
4%
3%
2%
1%
0%
Quinquennial variation rate of the renewable supply per capita
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita

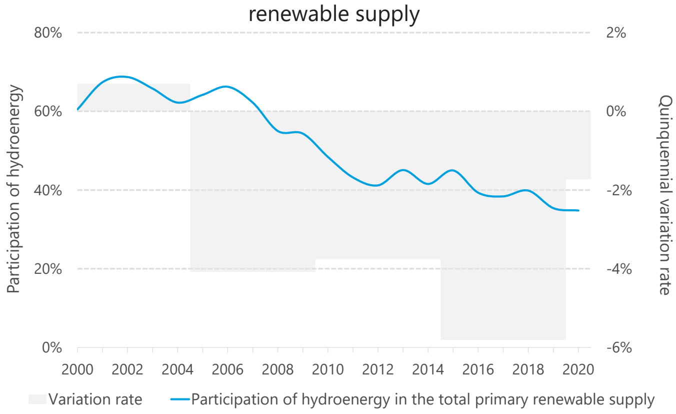

Energy supply per unit of GDP
koe / USD 2011 PPP
0.12
0.10
0.08
0.06
0.04
0.02
0.00
4%
2%
0%
-2%
-4%
-6%
-8%
Quinquennial variation rate of the renewable supply per unit of GDP
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP


Energy external dependence
Energy external dependence
20%
10%
0%
-10%
-20%
-30%
-40%
-50%
160%
120%
80%
40%
0%
-40%
-80%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Energy external dependence

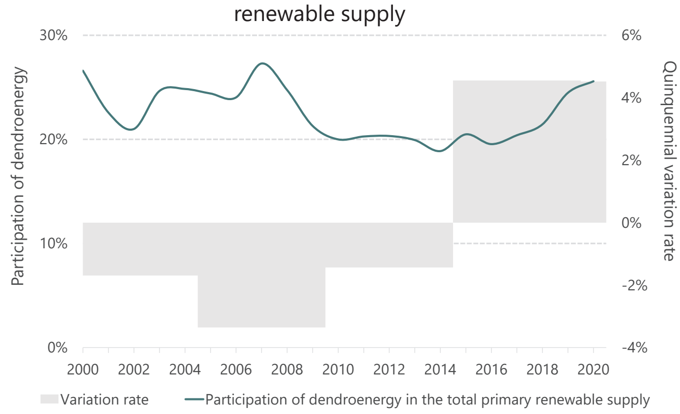

Hydrocarbon autarky index
Hydrocarbon autarky index
1.6
1.2
0.8
0.4
0.0
4%
2%
0%
-2%
-4%
-6%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Hydrocarbon autarky index


Biomass residential consumption index
Biomass residential consumption index
4%
3%
2%
1%
0%
2%
0%
-2%
-4%
-6%
-8%
-10%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Biomass residential consumption index

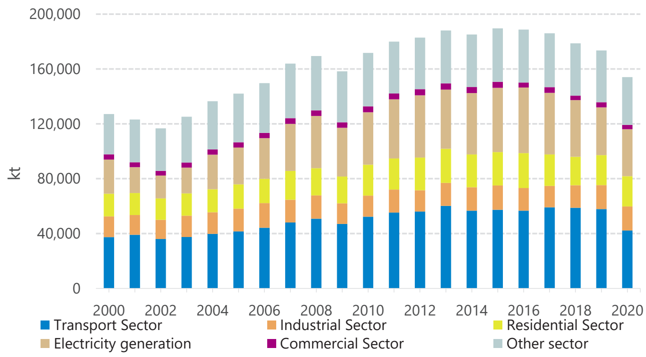
Participation of hydroenergy in the total primary renewable supply



Participation of dendroenergy in the total primary renewable supply

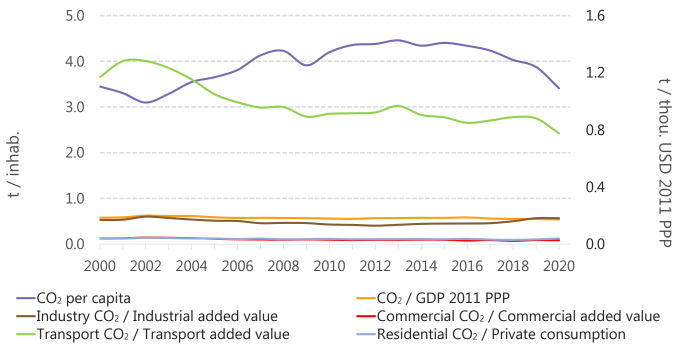


Evolution of CO_2 emissions by sector*



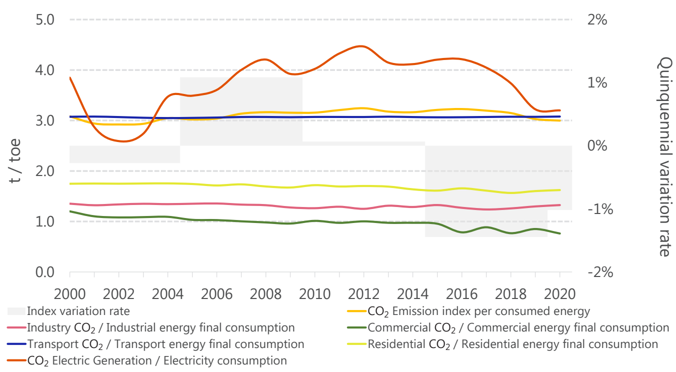
(*): The emissions data correspond to estimates made by OLADE based on the 1996 IPCC methodology.

Evolution of CO_2 emissions per capita and per unit of GDP*



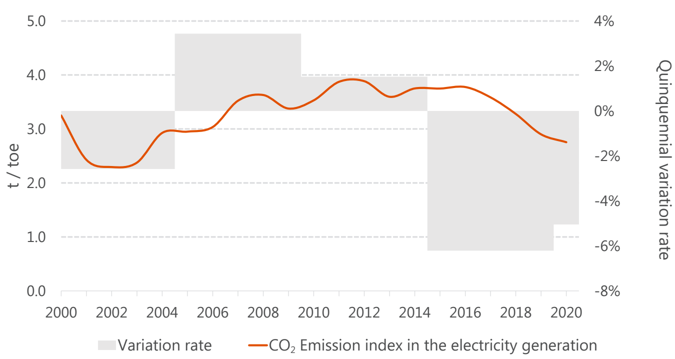
(*): The emissions data used to calculate these indicators correspond to estimates made by OLADE based on the 1996 IPCC methodology.

CO_2 Emission index per consumed energy*

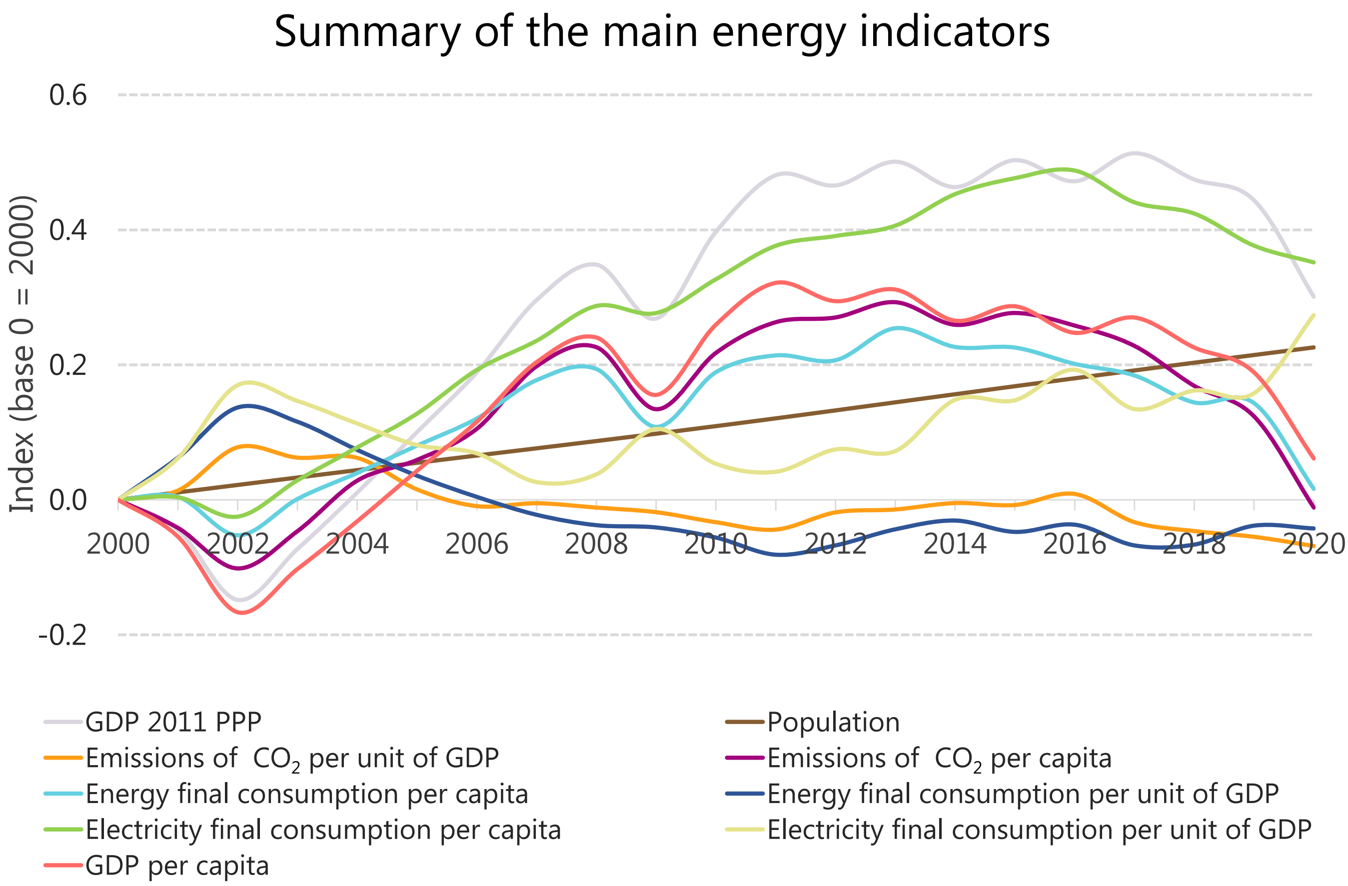


(*): The emissions data used to calculate these indicators correspond to estimates made by OLADE based on the 1996 IPCC methodology.

CO_2 Emission index of electricity generation*



(*): The emissions data used to calculate these indicators correspond to estimates made by OLADE based on the 1996 IPCC methodology.



Summary of the main energy indicators
Index (base 0 = 2000)
0.6
0.4
0.2
0.0
-0.2
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

BARBADOS

General Information 2020

Population (thousand inhab.)	287 [1]
Area (km^2)	430
Population Density (inhab. / km^2)	668
Urban Population (%)	31
GDP USD 2010 (MUSD)	3,762 [1]
GDP USD 2011 PPP (MUSD)	3,698 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	13

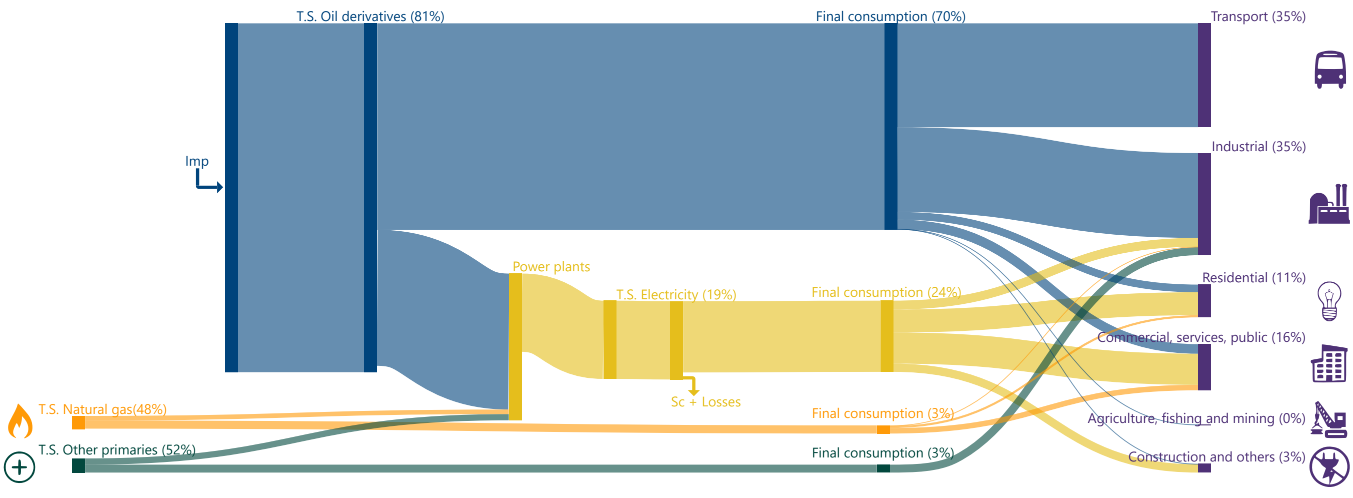
Energy Sector 2020

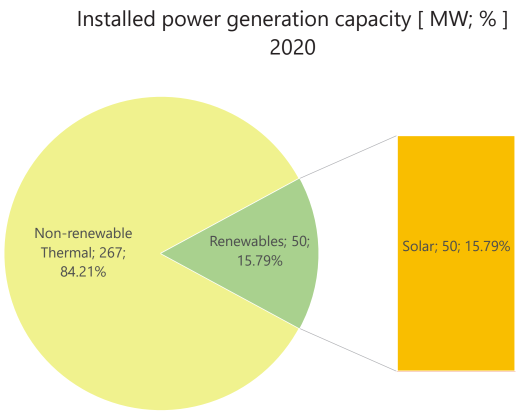
Final consumption in the Transport Sector	Mtep	0.11
Final consumption in the Industrial Sector	Mtep	0.11
Final consumption in the Residential Sector	Mtep	0.04
Final consumption in the Commercial and Service Sector	Mtep	0.05
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	0.01
Oil Reserves	Mbbl	1.85
Natural gas Reserves	Gm^3	0.12
Coal Reserves	Mt	n.a.

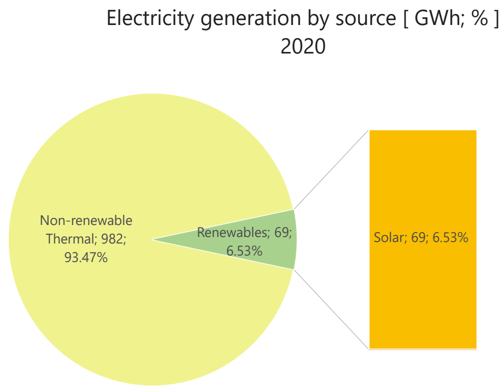
[1] Source: ECLAC.
[2] Source: World Bank.

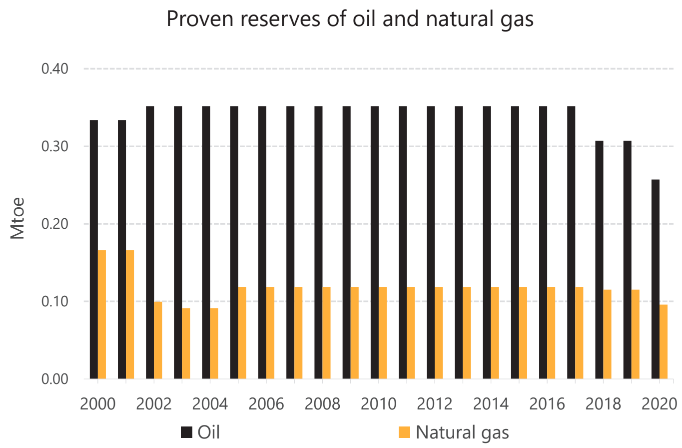
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
3,110	1.10	100	0.40	0.05	0.38	0.05	0.32	n.a.	0.32	0.11 / 0.09
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

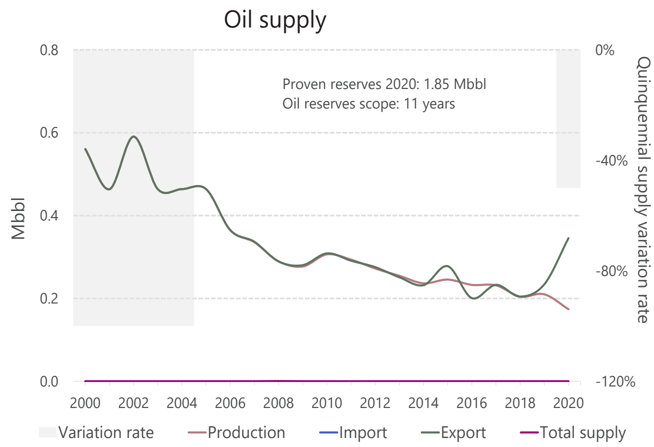
Summarized energy balance 2020

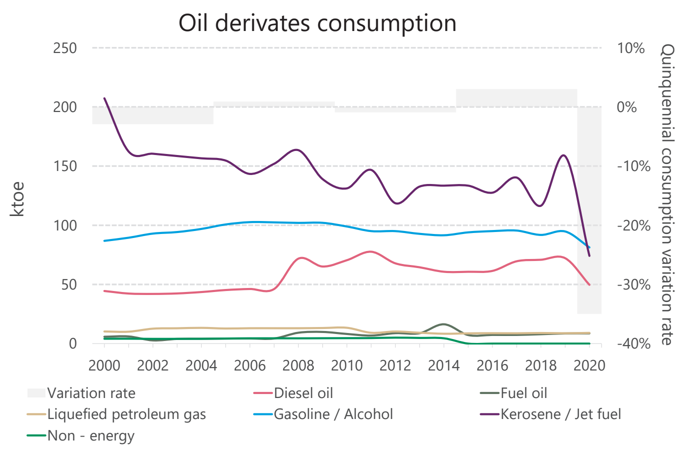


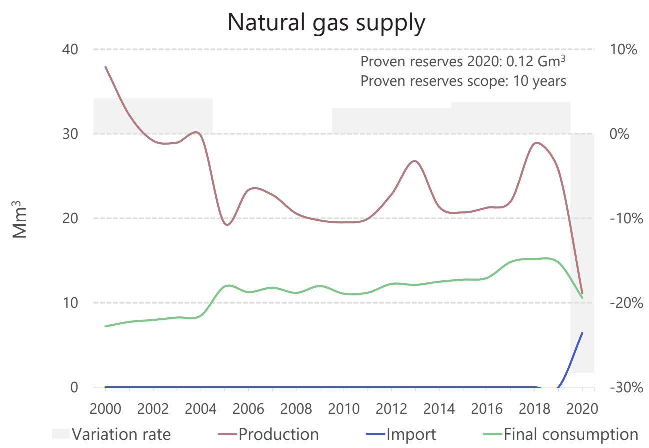

Installed power generation capacity [MW; %]
2020
Non-renewable Thermal; 267; 84.21%
Renewables; 50; 15.79%
Solar; 50; 15.79%

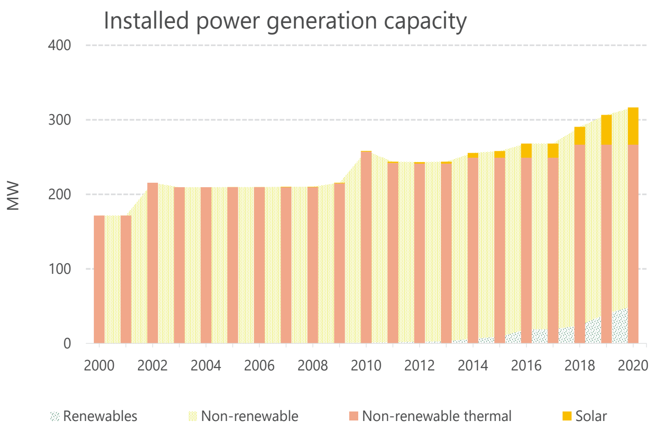

Electricity generation by source [GWh; %]
2020
Non-renewable Thermal; 982; 93.47%
Renewables; 69; 6.53%
Solar; 69; 6.53%

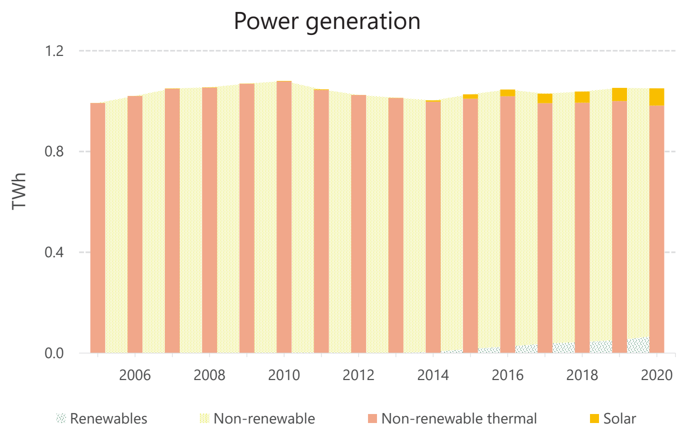

Proven reserves of oil and natural gas
Mtoe
0.40
0.30
0.20
0.10
0.00
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Oil
Natural gas

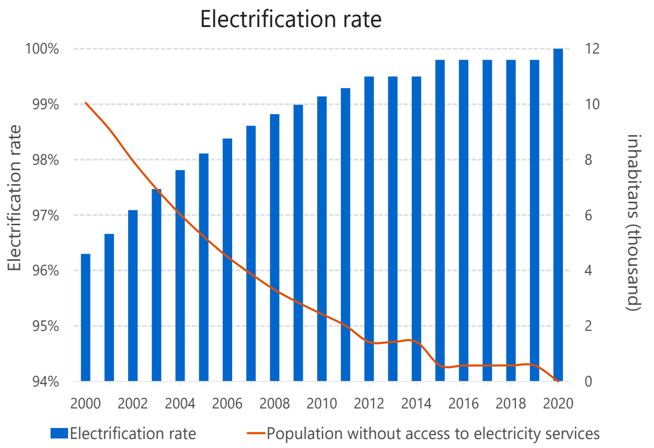

Oil supply
Proven reserves 2020: 1.85 Mbbl
Oil reserves scope: 11 years
Mbbl
0.8
0.6
0.4
0.2
0.0
0%
-40%
-80%
-120%
Quinquennial supply variation rate
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Production
Import
Export
Total supply

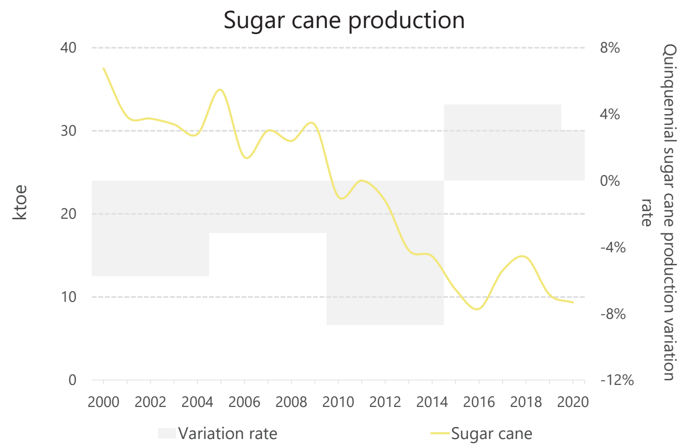

Oil derivates consumption
ktoe
250
200
150
100
50
0
10%
0%
-10%
-20%
-30%
-40%
Quinquennial consumption variation rate
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Non - energy

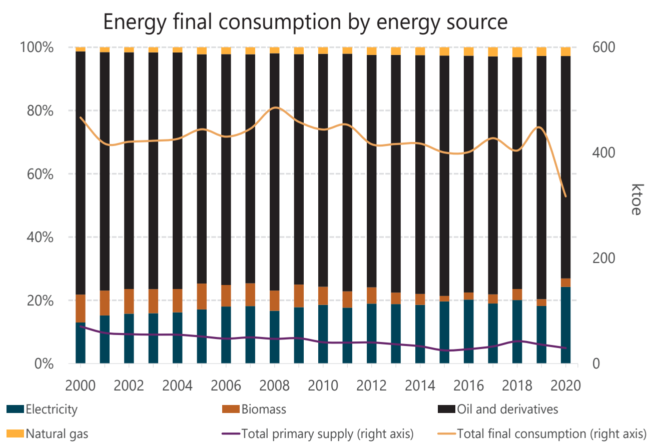

Natural gas supply
Proven reserves 2020: 0.12 Gm³
Proven reserves scope: 10 years
Mm³
40
30
20
10
0
10%
0%
-10%
-20%
-30%
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Production
Import
Final consumption

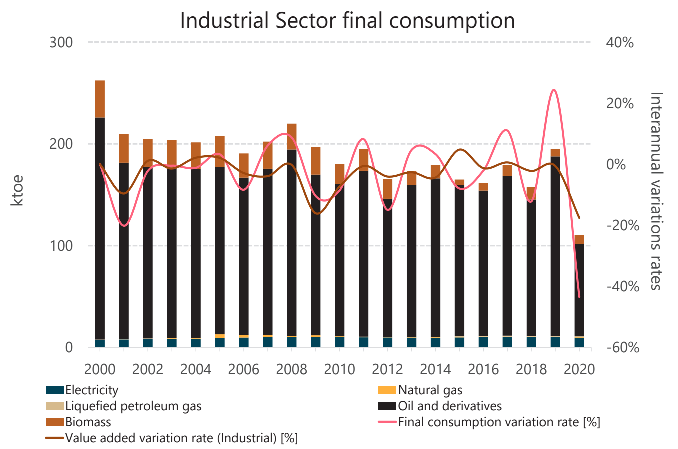

Installed power generation capacity
MW
400
300
200
100
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Renewables
Non-renewable
Non-renewable thermal
Solar

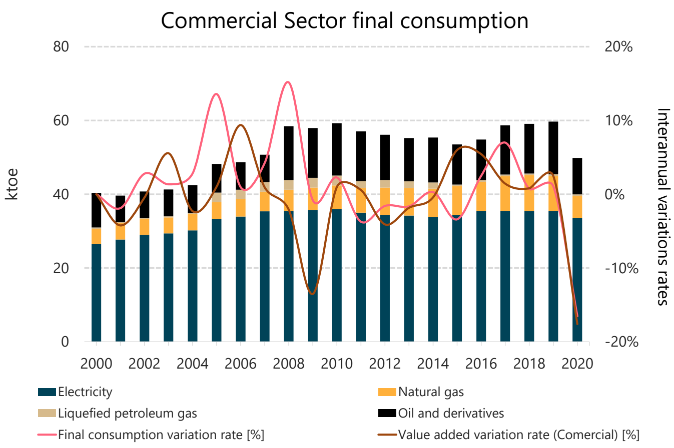

Power generation
TWh
1.2
0.8
0.4
0.0
2006
2008
2010
2012
2014
2016
2018
2020
Renewables
Non-renewable
Non-renewable thermal
Solar

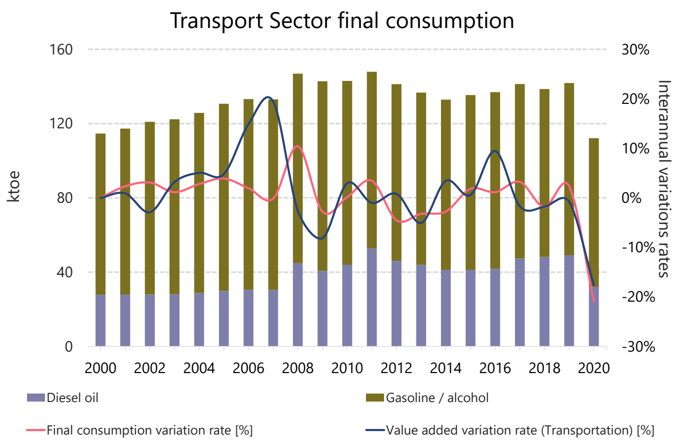

Electrification rate
Electrification rate
100%
99%
98%
97%
96%
95%
94%
inhabitans (thousand)
12
10
8
6
4
2
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Electrification rate
Population without access to electricity services

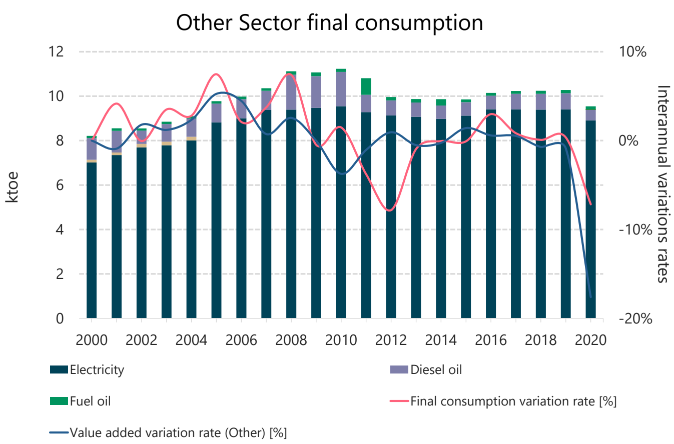

Sugar cane production
ktoe
40
30
20
10
0
Quinquennial sugar cane production variation rate
8%
4%
0%
-4%
-8%
-12%
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Sugar cane

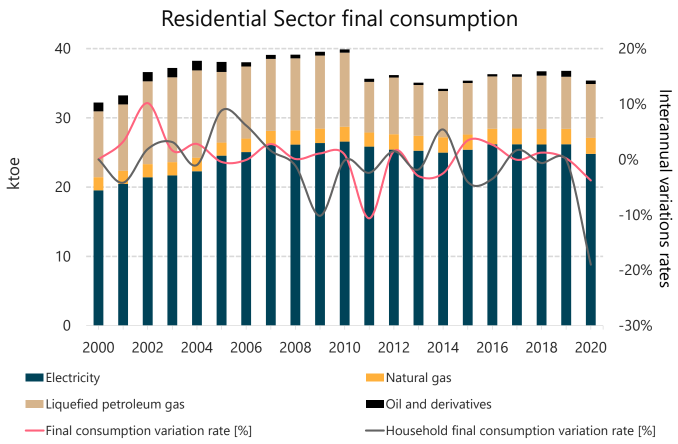

Energy final consumption by energy source
100%
80%
60%
40%
20%
0%
ktoe
600
400
200
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Electricity
Biomass
Oil and derivatives
Natural gas
Total primary supply (right axis)
Total final consumption (right axis)

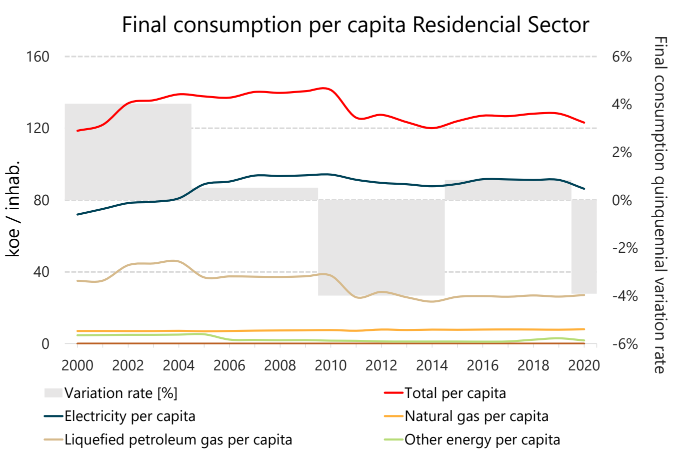

Industrial Sector final consumption
ktoe
300
200
100
0
Interannual variations rates
40%
20%
0%
-20%
-40%
-60%
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Electricity
Natural gas
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]

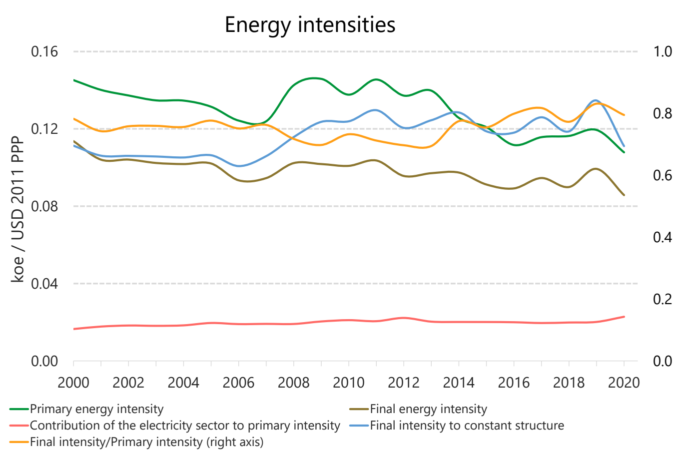

Commercial Sector final consumption
ktoe
Interannual variations rates
Electricity
Natural gas
Liquefied petroleum gas
Oil and derivatives
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]


Transport Sector final consumption
ktoe
Interannual variations rates
Diesel oil
Gasoline / alcohol
Final consumption variation rate [%]
Value added variation rate (Transportation) [%]

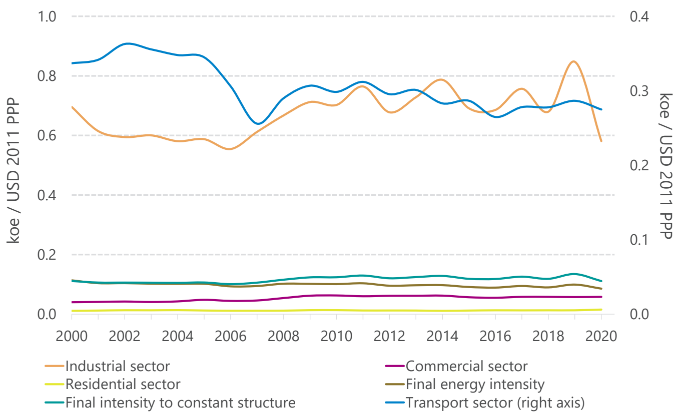

Other Sector final consumption
ktoe
Interannual variations rates
Electricity
Diesel oil
Fuel oil
Final consumption variation rate [%]
Value added variation rate (Other) [%]


Residential Sector final consumption
ktoe
Interannual variations rates
Electricity
Natural gas
Liquefied petroleum gas
Oil and derivatives
Final consumption variation rate [%]
Household final consumption variation rate [%]

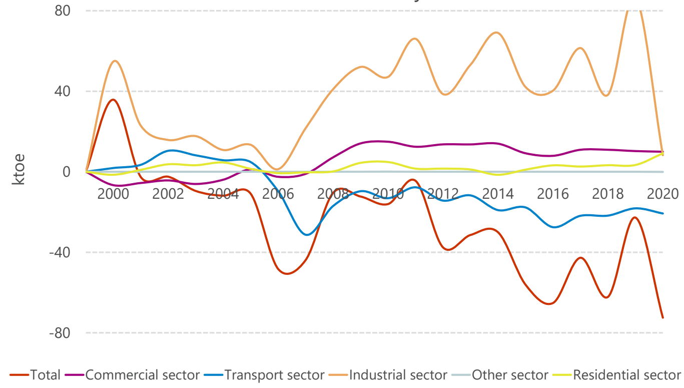

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
Variation rate [%]
Total per capita
Electricity per capita
Natural gas per capita
Liquefied petroleum gas per capita
Other energy per capita


Energy intensities
koe / USD 2011 PPP
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

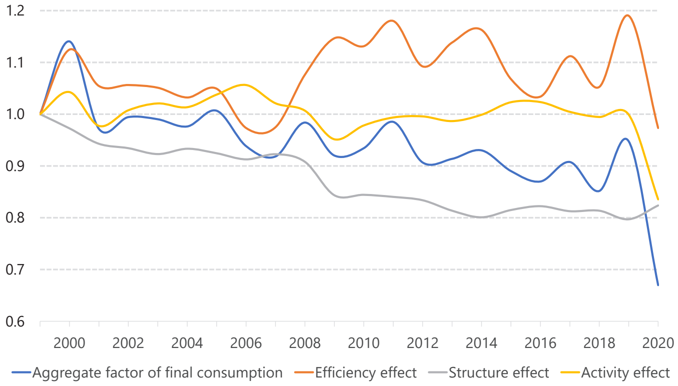
Sectoral energy intensities



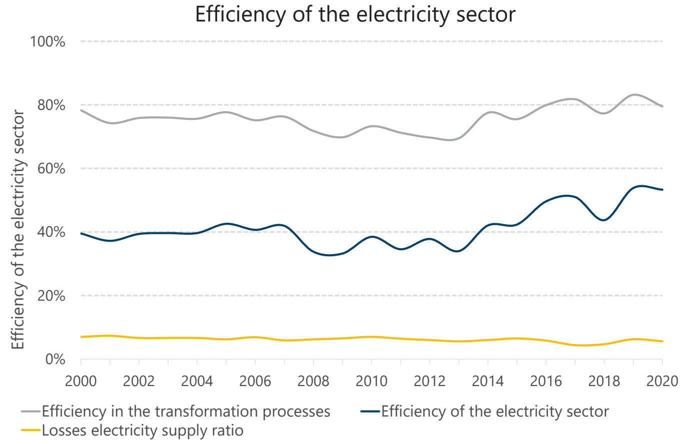
Avoided energy demand due to variations in energy intensity



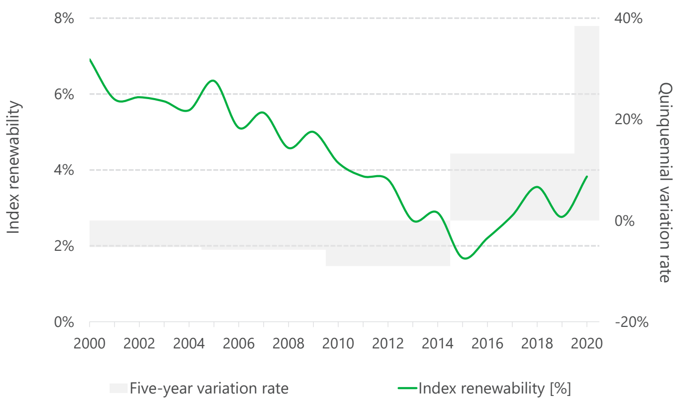
Logarithmic mean Divisia index for the structural decomposition of energy consumption



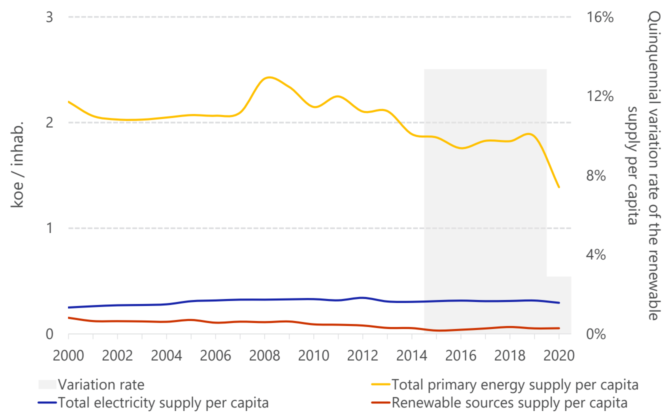
Efficiency of the electricity sector



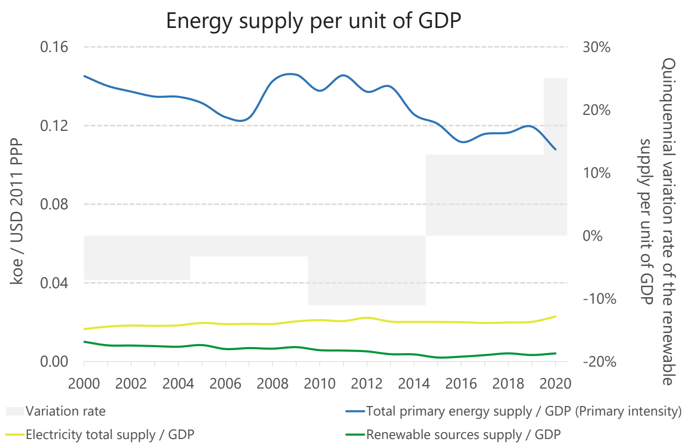
Index renewability

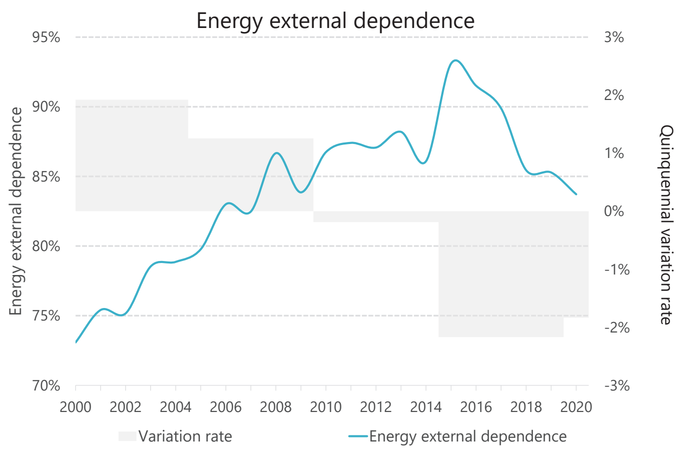


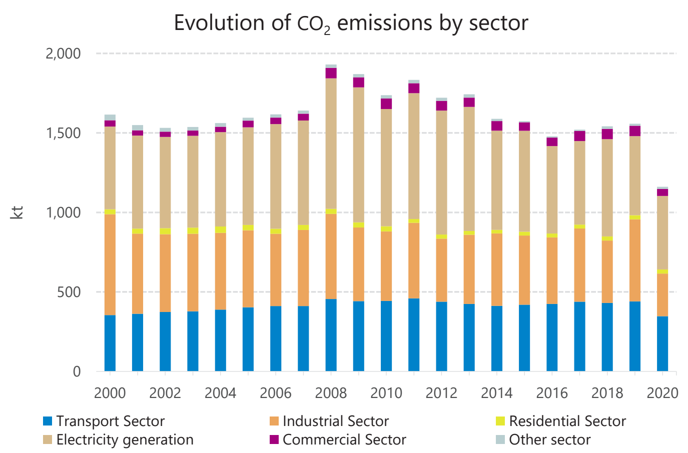
Energy supply per capita

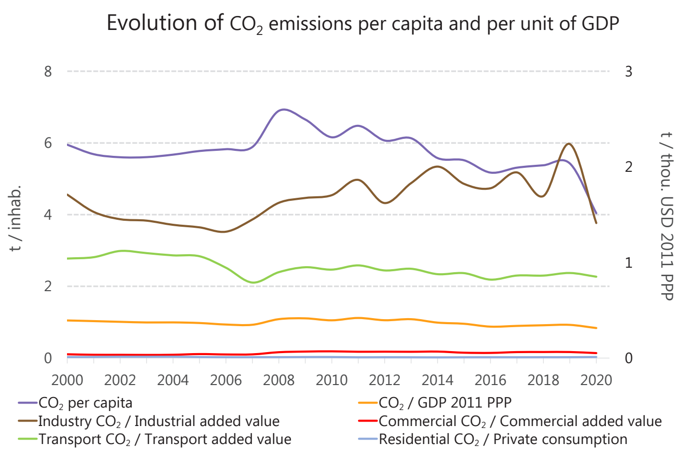


BARBADOS

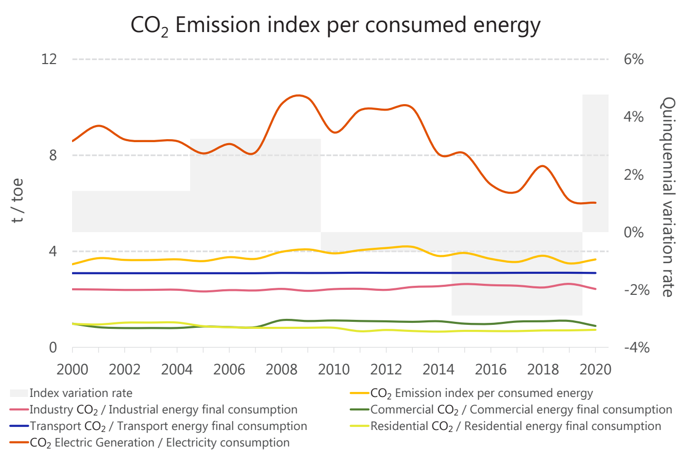

Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP

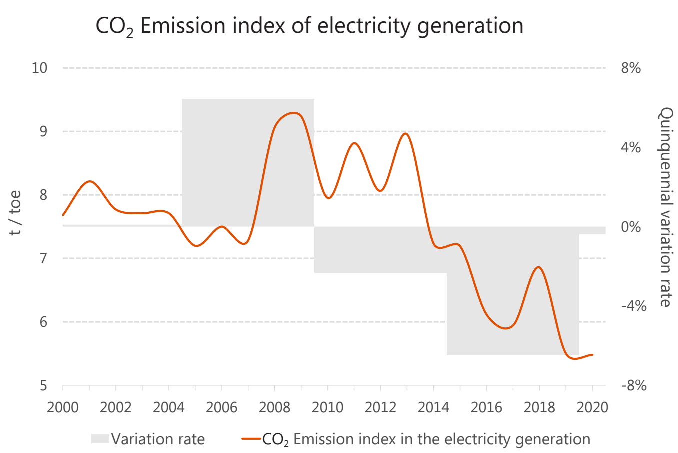

Energy external dependence
Energy external dependence
Quinquennial variation rate
Variation rate
Energy external dependence


Evolution of CO_2 emissions by sector
kt
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector

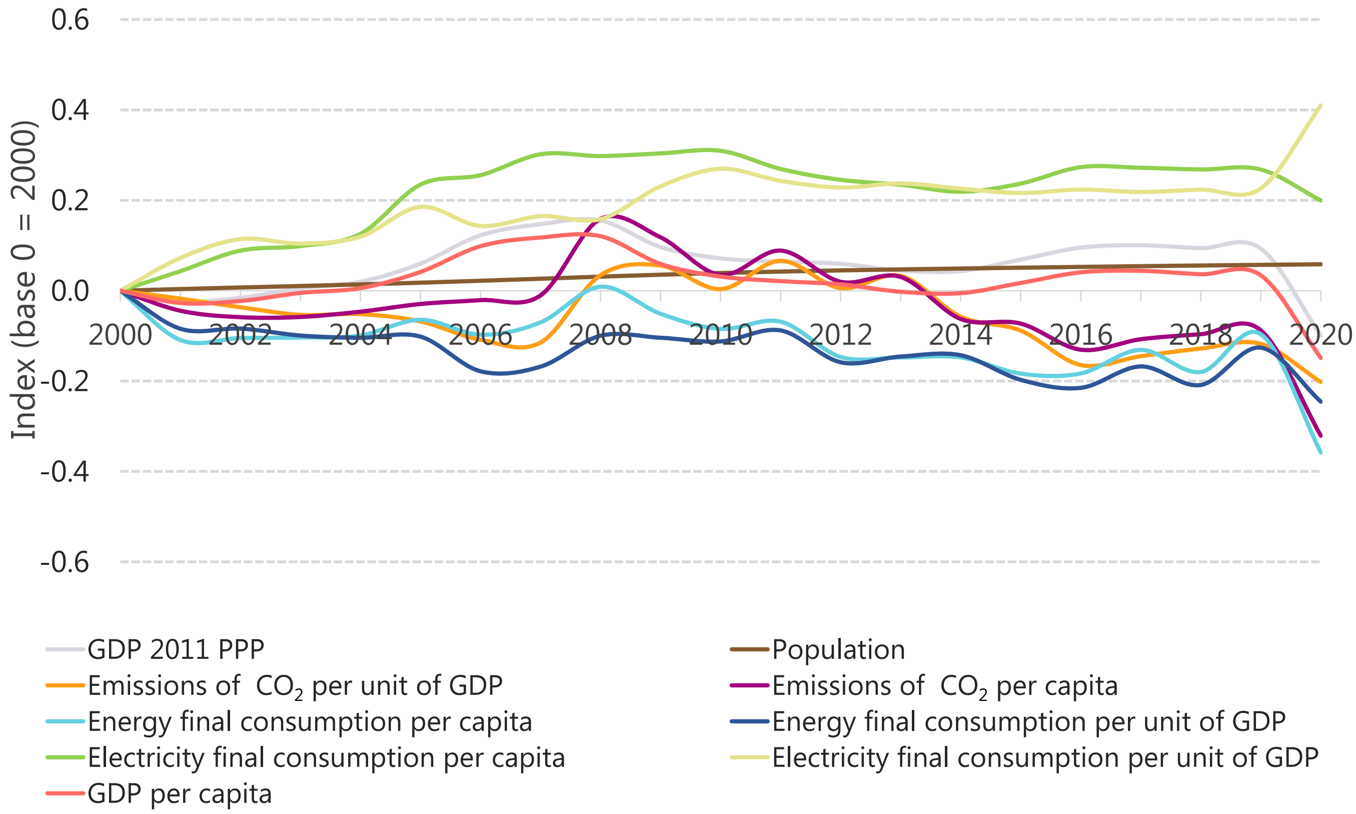

Evolution of CO_2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
CO_2 per capita
CO_2 / GDP 2011 PPP
Industry CO_2 / Industrial added value
Commercial CO_2 / Commercial added value
Transport CO_2 / Transport added value
Residential CO_2 / Private consumption

BARBADOS


CO_2 Emission index per consumed energy
t / toe
Quinquennial variation rate
Index variation rate
CO_2 Emission index per consumed energy
Industry CO_2 / Industrial energy final consumption
Commercial CO_2 / Commercial energy final consumption
Transport CO_2 / Transport energy final consumption
Residential CO_2 / Residential energy final consumption
CO_2 Electric Generation / Electricity consumption


CO_2 Emission index of electricity generation
t / toe
Quinquennial variation rate
Variation rate
CO_2 Emission index in the electricity generation

Summary of the main energy indicators

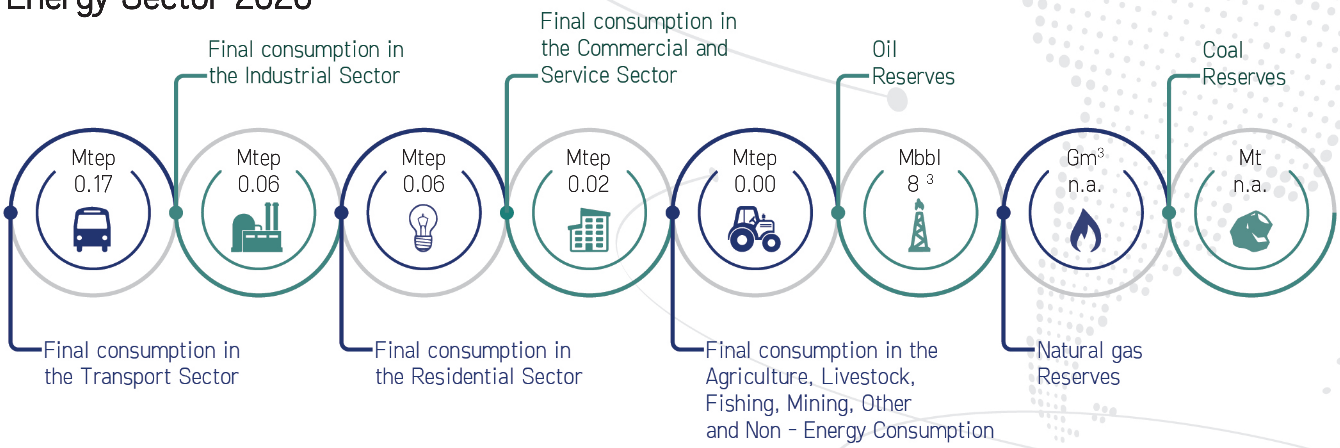


BELIZE

General Information 2020

Population (thousand inhab.)	398 [1]
Area (km^2)	22,970
Population Density (inhab. / km^2)	17
Urban Population (%)	46
GDP USD 2010 (MUSD)	1,425 [1]
GDP USD 2011 PPP (MUSD)	2,433 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	6

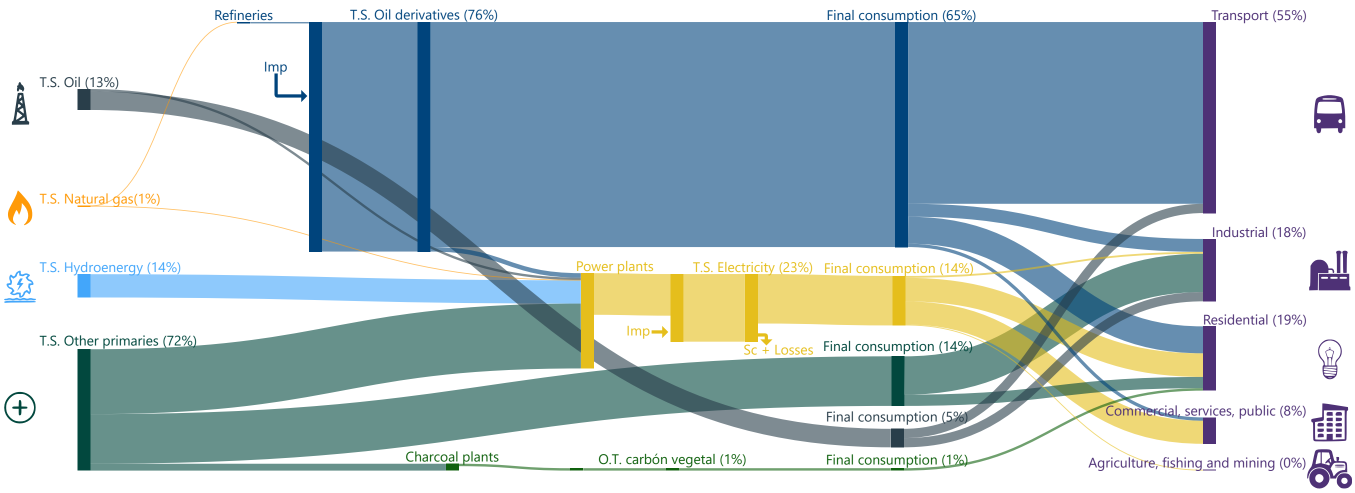
Energy Sector 2020

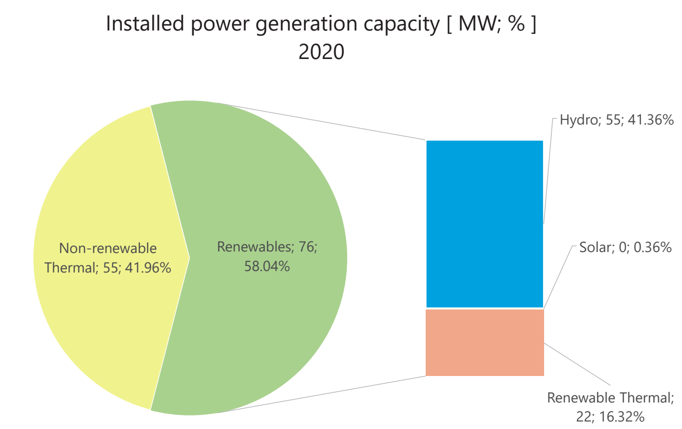


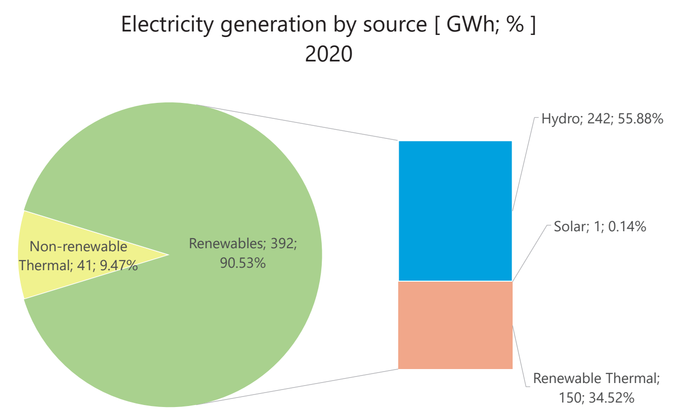
[1] Source: ECLAC.
[2] Source: World Bank.
[3] Data estimated by OLADE.

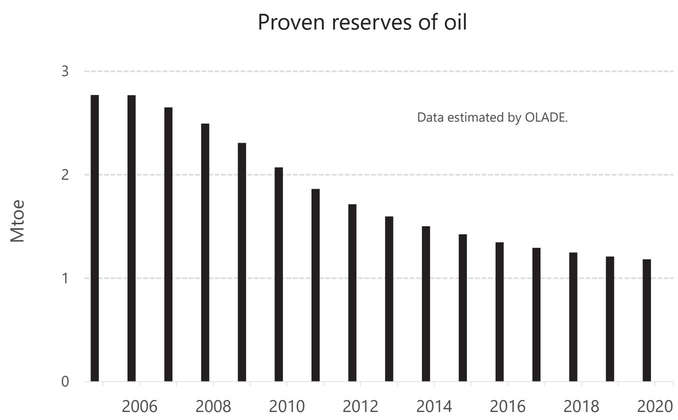
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
1,294	0.78	92.72	0.38	0.16	0.23	0.01	0.31	n.a.	0.13	0.15 / 0.13
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

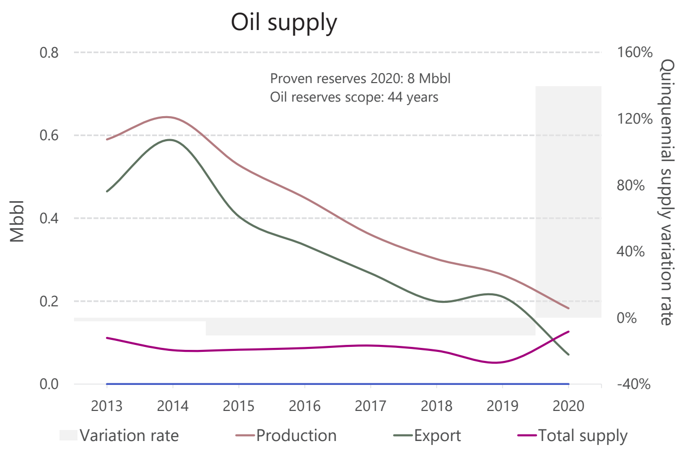
Summarized energy balance 2020

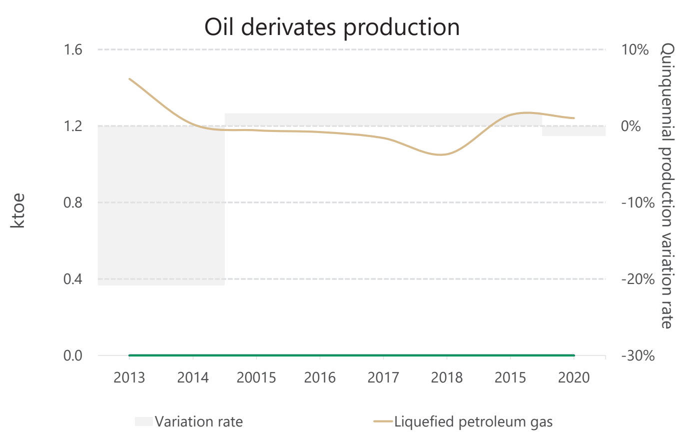


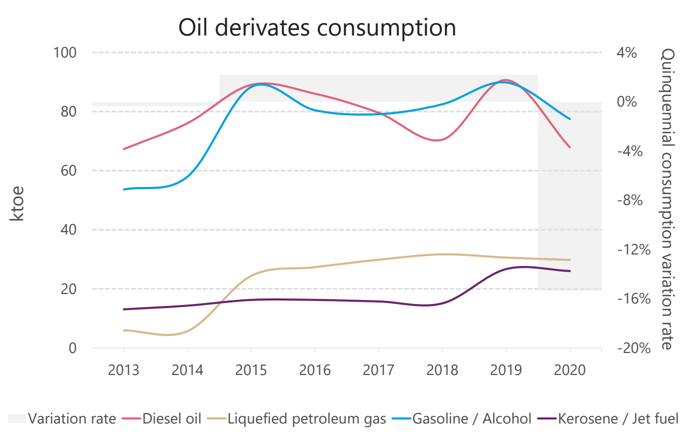

Installed power generation capacity [MW; %]
2020
Non-renewable Thermal; 55; 41.96%
Renewables; 76; 58.04%
Hydro; 55; 41.36%
Solar; 0; 0.36%
Renewable Thermal; 22; 16.32%


Electricity generation by source [GWh; %]
2020
Non-renewable Thermal; 41; 9.47%
Renewables; 392; 90.53%
Hydro; 242; 55.88%
Solar; 1; 0.14%
Renewable Thermal; 150; 34.52%

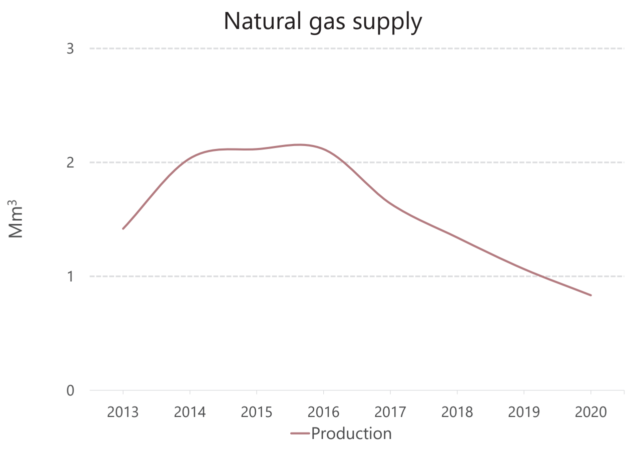

Proven reserves of oil
Mtoe
Data estimated by OLADE.
2006
2008
2010
2012
2014
2016
2018
2020

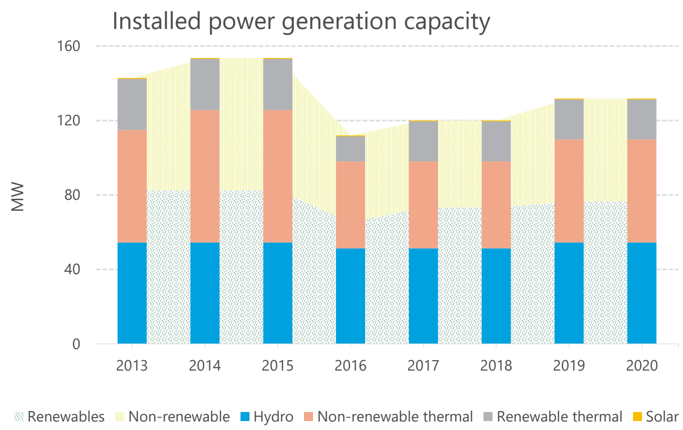

Oil supply
Mbbl
Quinquennial supply variation rate
Proven reserves 2020: 8 Mbbl
Oil reserves scope: 44 years
Variation rate
Production
Export
Total supply

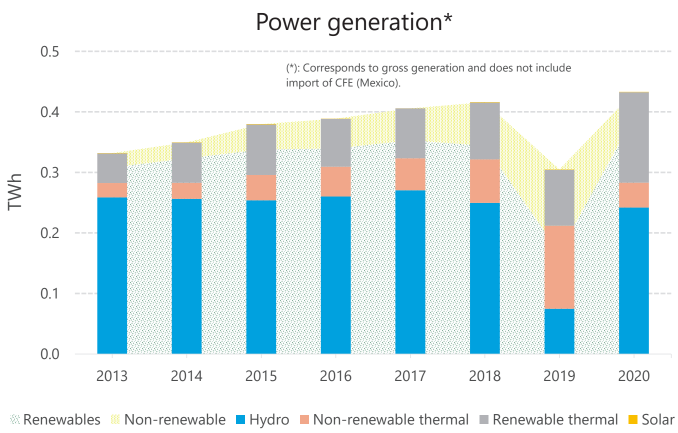

Oil derivates production
ktoe
Quinquennial production variation rate
2013
2014
20015
2016
2017
2018
2015
2020
Variation rate
Liquefied petroleum gas

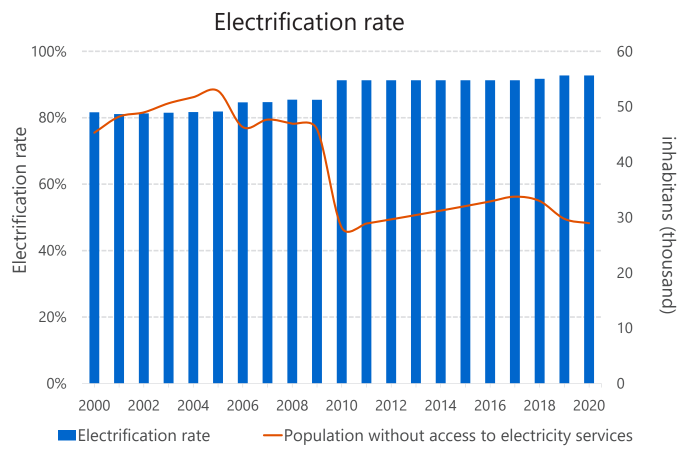

Oil derivates consumption
ktoe
Quinquennial consumption variation rate
Variation rate
Diesel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel

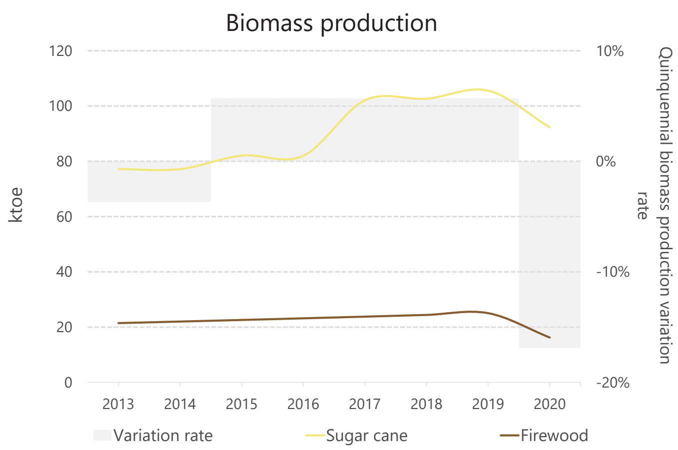
BELIZE

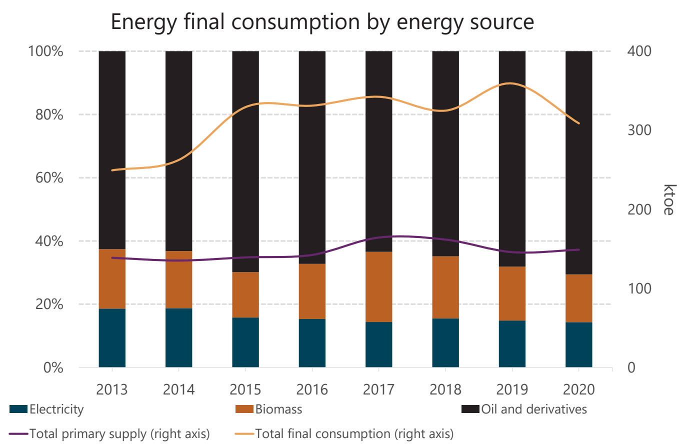

Natural gas supply
Mm3
3
2
1
0
2013
2014
2015
2016
2017
2018
2019
2020
Production

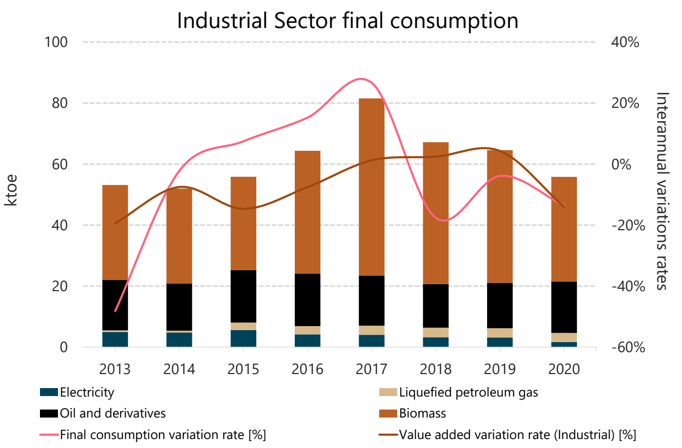

Installed power generation capacity
MW
160
120
80
40
0
2013
2014
2015
2016
2017
2018
2019
2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Solar

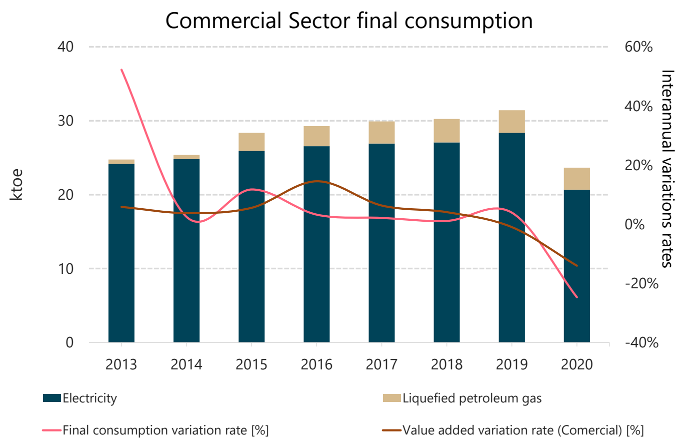

Power generation*
(*): Corresponds to gross generation and does not include import of CFE (Mexico).
TWh
0.5
0.4
0.3
0.2
0.1
0.0
2013
2014
2015
2016
2017
2018
2019
2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Solar

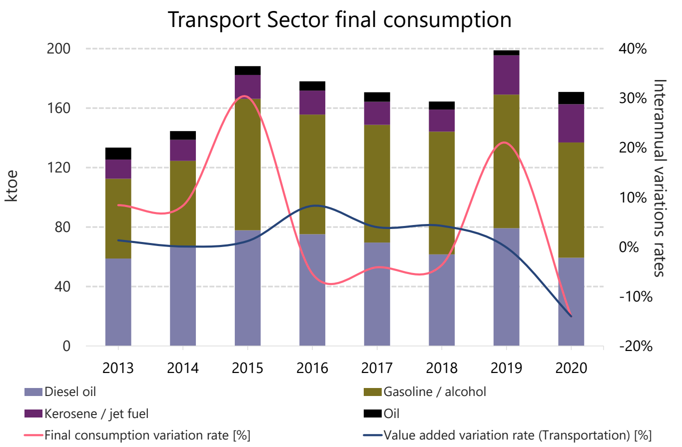

Electrification rate
Electrification rate
inhabitans (thousand)
100%
80%
60%
40%
20%
0%
60
50
40
30
20
10
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Electrification rate
Population without access to electricity services

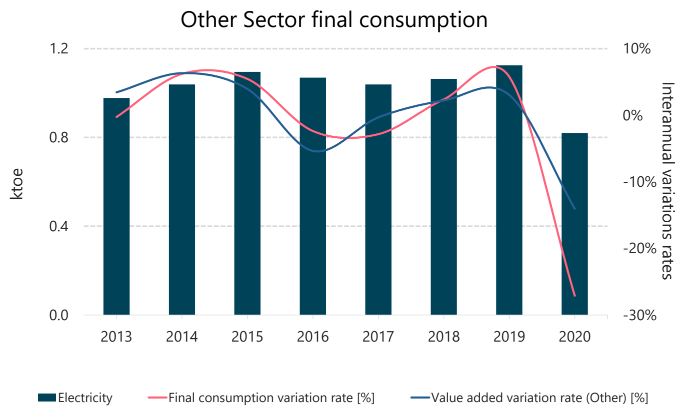

Biomass production
ktoe
Quinquennial biomass production variation rate
120
100
80
60
40
20
0
10%
0%
-10%
-20%
2013
2014
2015
2016
2017
2018
2019
2020
Variation rate
Sugar cane
Firewood

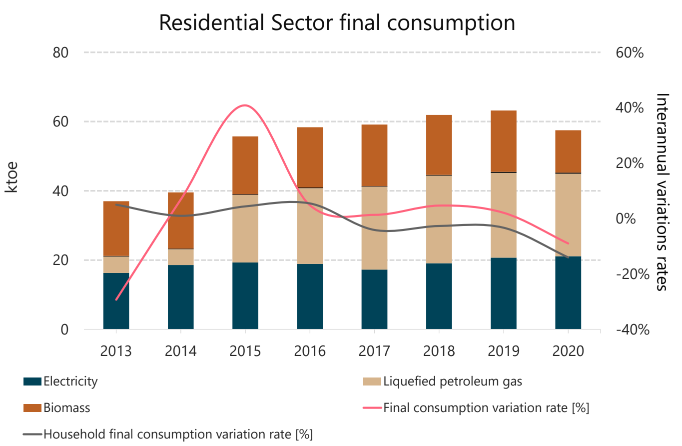

Energy final consumption by energy source
ktoe
100%
80%
60%
40%
20%
0%
400
300
200
100
0
2013
2014
2015
2016
2017
2018
2019
2020
Electricity
Biomass
Oil and derivatives
Total primary supply (right axis)
Total final consumption (right axis)

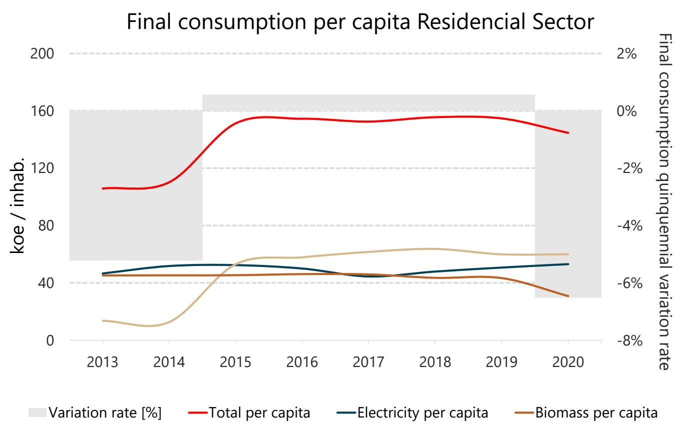

Industrial Sector final consumption
ktoe
Interannual variations rates
100
80
60
40
20
0
40%
20%
0%
-20%
-40%
-60%
2013
2014
2015
2016
2017
2018
2019
2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]

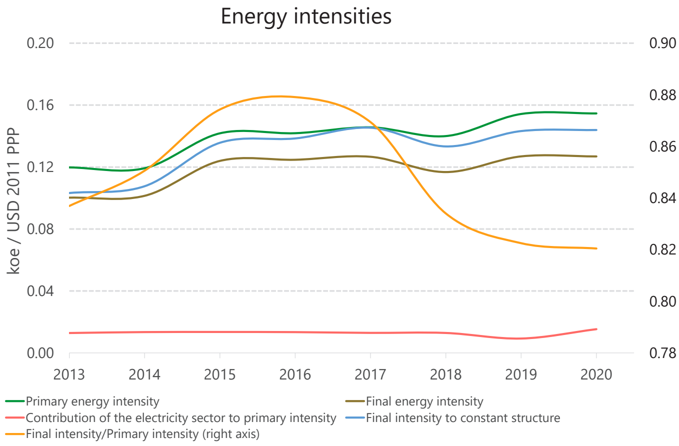

Commercial Sector final consumption
ktoe
Interannual variations rates
40
30
20
10
0
60%
40%
20%
0%
-20%
-40%
2013
2014
2015
2016
2017
2018
2019
2020
Electricity
Liquefied petroleum gas
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]

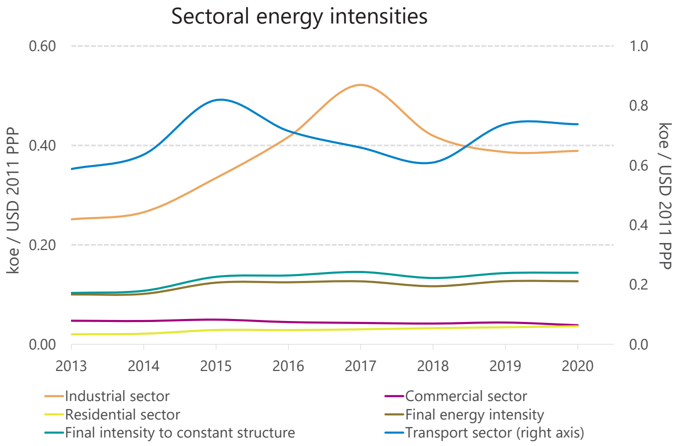

Transport Sector final consumption
ktoe
Interannual variations rates
200
160
120
80
40
0
40%
30%
20%
10%
0%
-10%
-20%
2013
2014
2015
2016
2017
2018
2019
2020
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Oil
Final consumption variation rate [%]
Value added variation rate (Transportation) [%]

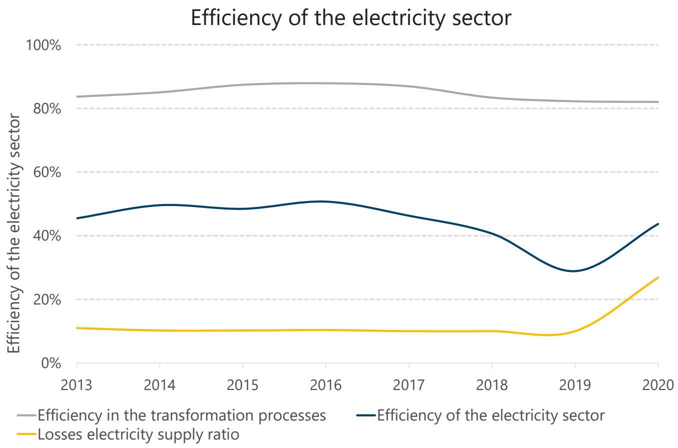

Other Sector final consumption
ktoe
Interannual variations rates
1.2
0.8
0.4
0.0
10%
0%
-10%
-20%
-30%
2013
2014
2015
2016
2017
2018
2019
2020
Electricity
Final consumption variation rate [%]
Value added variation rate (Other) [%]

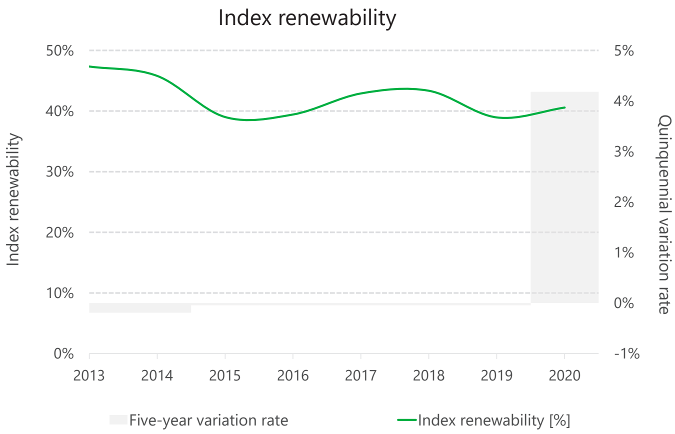

Residential Sector final consumption
ktoe
Interannual variations rates
80
60
40
20
0
60%
40%
20%
0%
-20%
-40%
2013
2014
2015
2016
2017
2018
2019
2020
Electricity
Liquefied petroleum gas
Biomass
Final consumption variation rate [%]
Household final consumption variation rate [%]

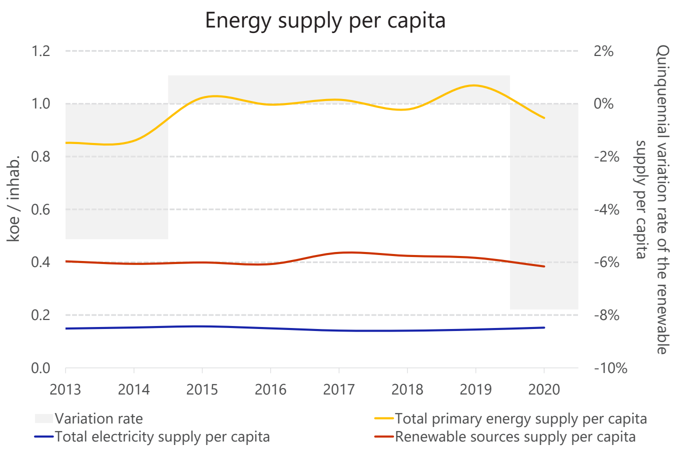

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
200
160
120
80
40
0
2%
0%
-2%
-4%
-6%
-8%
2013
2014
2015
2016
2017
2018
2019
2020
Variation rate [%]
Total per capita
Electricity per capita
Biomass per capita

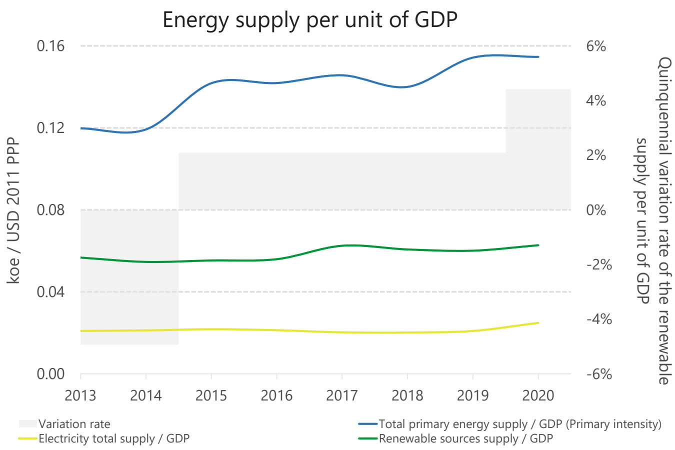

Energy intensities
koe / USD 2011 PPP
0.20
0.16
0.12
0.08
0.04
0.00
0.90
0.88
0.86
0.84
0.82
0.80
0.78
2013
2014
2015
2016
2017
2018
2019
2020
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

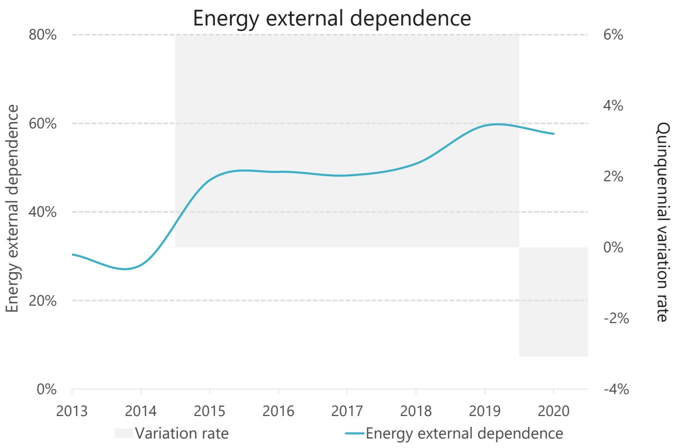

Sectoral energy intensities
koe / USD 2011 PPP
0.60
0.40
0.20
0.00
1.0
0.8
0.6
0.4
0.2
0.0
koe / USD 2011 PPP
2013
2014
2015
2016
2017
2018
2019
2020
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)


Efficiency of the electricity sector
Efficiency of the electricity sector
100%
80%
60%
40%
20%
0%
2013
2014
2015
2016
2017
2018
2019
2020
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

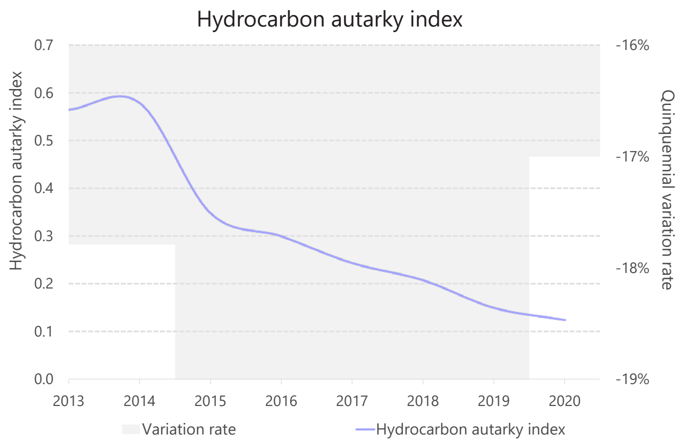

Index renewability
Index renewability
50%
40%
30%
20%
10%
0%
5%
4%
3%
2%
1%
0%
-1%
Quinquennial variation rate
2013
2014
2015
2016
2017
2018
2019
2020
Five-year variation rate
Index renewability [%]


Energy supply per capita
koe / inhab.
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2%
0%
-2%
-4%
-6%
-8%
-10%
Quinquennial variation rate of the renewable supply per capita
2013
2014
2015
2016
2017
2018
2019
2020
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita

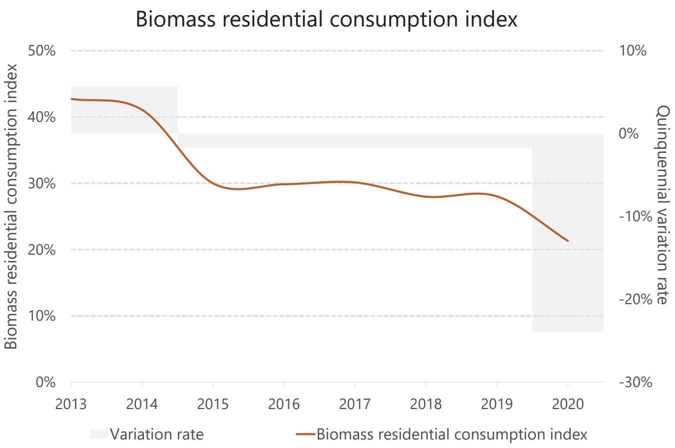

Energy supply per unit of GDP
koe / USD 2011 PPP
0.16
0.12
0.08
0.04
0.00
6%
4%
2%
0%
-2%
-4%
-6%
Quinquennial variation rate of the renewable supply per unit of GDP
2013
2014
2015
2016
2017
2018
2019
2020
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP



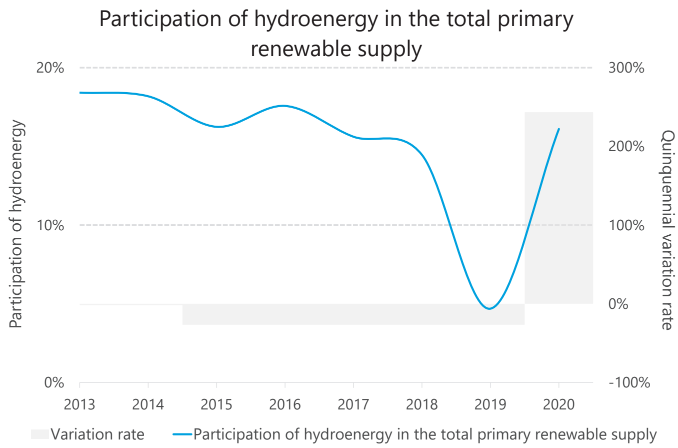
Energy external dependence
Energy external dependence
Quinquennial variation rate
80%
60%
40%
20%
0%
6%
4%
2%
0%
-2%
-4%
2013
2014
2015
2016
2017
2018
2019
2020
Variation rate
Energy external dependence



Hydrocarbon autarky index
Hydrocarbon autarky index
Quinquennial variation rate
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
-16%
-17%
-18%
-19%
2013
2014
2015
2016
2017
2018
2019
2020
Variation rate
Hydrocarbon autarky index

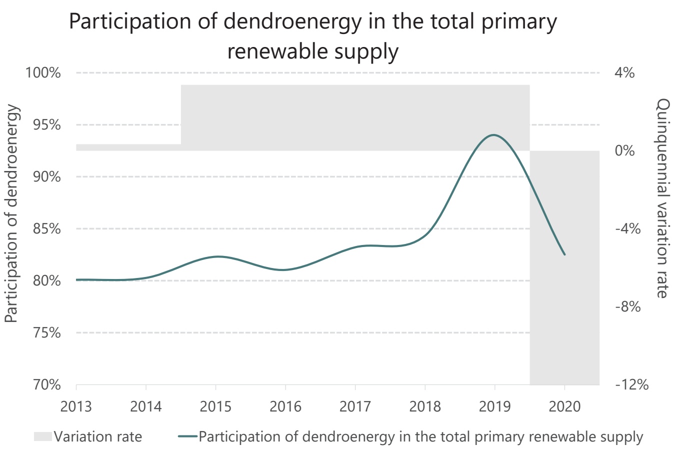


Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
50%
40%
30%
20%
10%
0%
10%
0%
-10%
-20%
-30%
2013
2014
2015
2016
2017
2018
2019
2020
Variation rate
Biomass residential consumption index

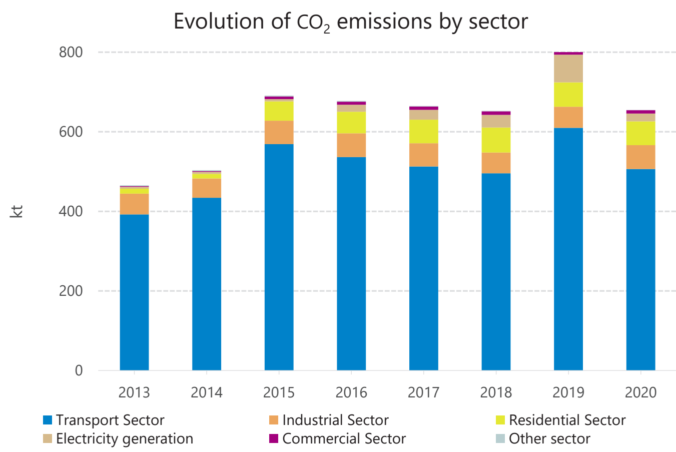


Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
20%
10%
0%
300%
200%
100%
0%
-100%
2013
2014
2015
2016
2017
2018
2019
2020
Variation rate
Participation of hydroenergy in the total primary renewable supply

BELIZE

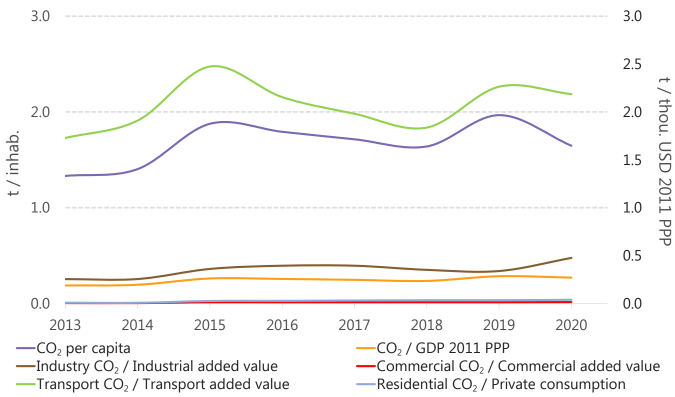


Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
100%
95%
90%
85%
80%
75%
70%
4%
0%
-4%
-8%
-12%
2013
2014
2015
2016
2017
2018
2019
2020
Variation rate
Participation of dendroenergy in the total primary renewable supply

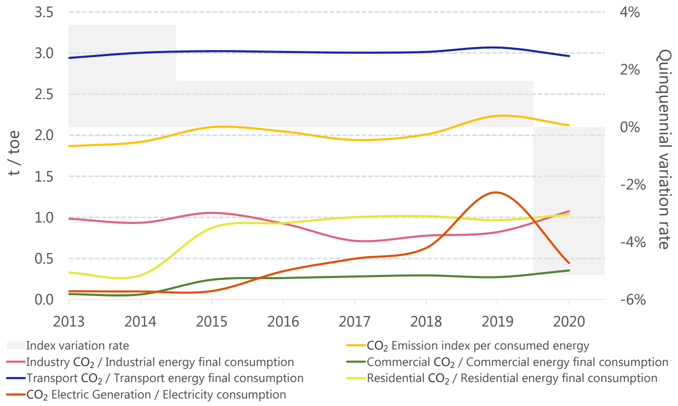


Evolution of CO_2 emissions by sector
kt
800
600
400
200
0
2013
2014
2015
2016
2017
2018
2019
2020
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector

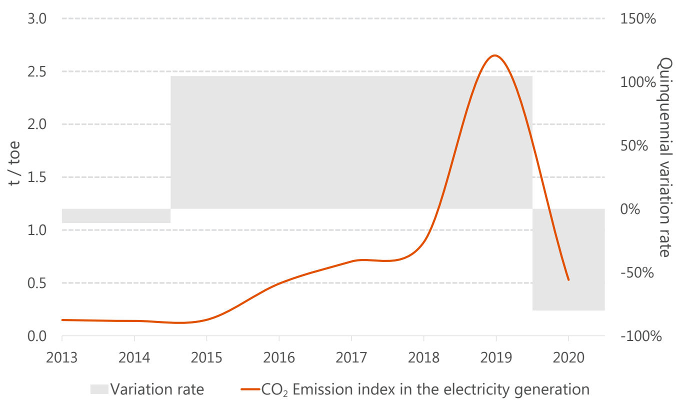
Evolution of CO_2 emissions per capita and per unit of GDP



CO_2 Emission index per consumed energy

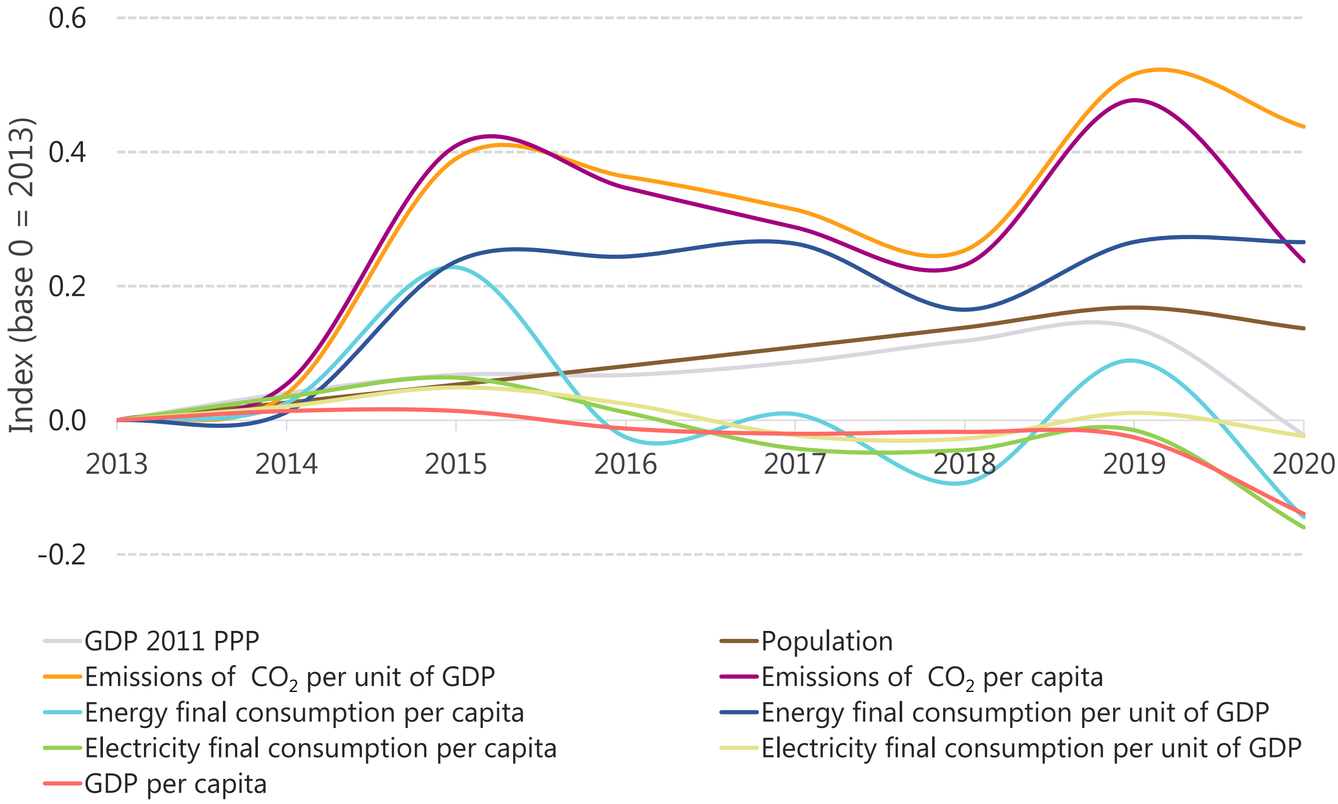


CO_2 Emission index of electricity generation



BELIZE

Summary of the main energy indicators



BELIZE

BOLIVIA

General Information 2020

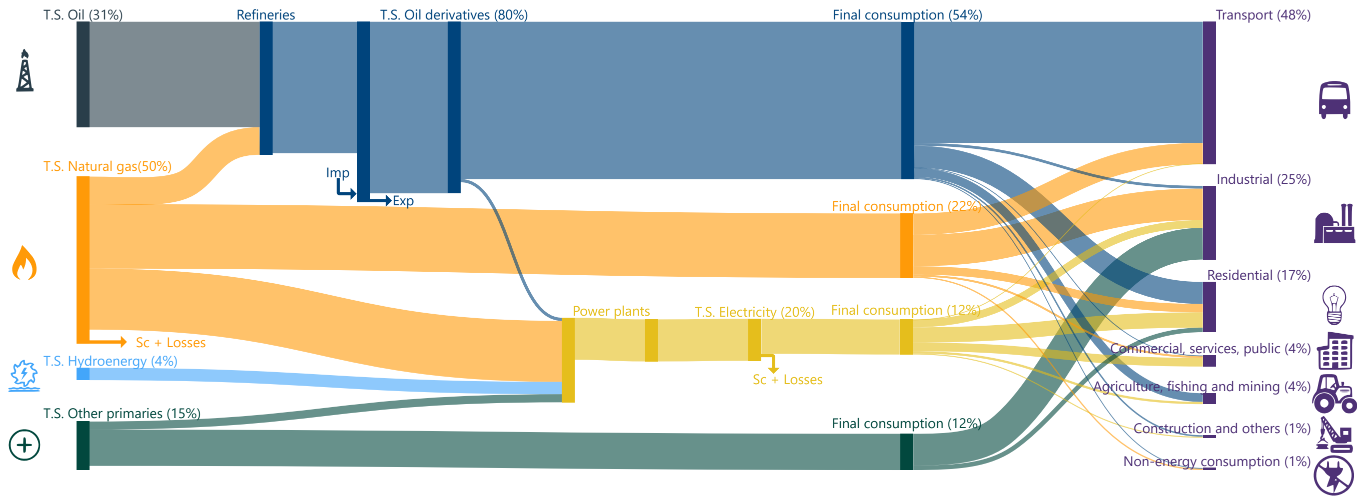
Population (thousand inhab.)	11,673
Area (km^2)	1,098,581
Population Density (inhab. / km^2)	11
Urban Population (%)	70
GDP USD 2010 (MUSD)	27,312
GDP USD 2011 PPP (MUSD)	92,588
GDP per capita (thou. USD 2011 PPP / inhab.)	7.93

Energy Sector 2020

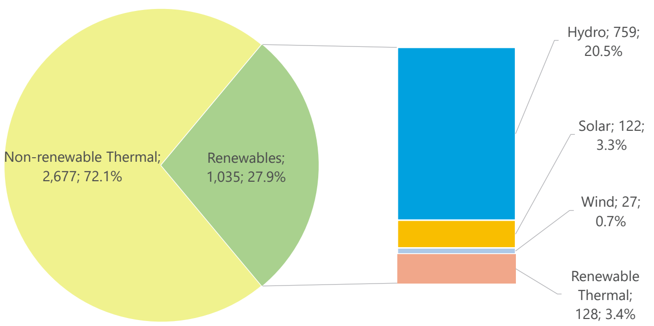
Final consumption in the Transport Sector	Mtep	2.92
Final consumption in the Industrial Sector	Mtep	1.51
Final consumption in the Residential Sector	Mtep	1.03
Final consumption in the Commercial and Service Sector	Mtep	0.23
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	0.32
Oil Reserves	Mbbl	190
Natural gas Reserves	Gm^3	253
Coal Reserves	Mt	n.a.

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
717	0.52	93.70	7.61	16.95	1.01	10.30	6.02	67.00	3.71	0.08 / 0.06
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

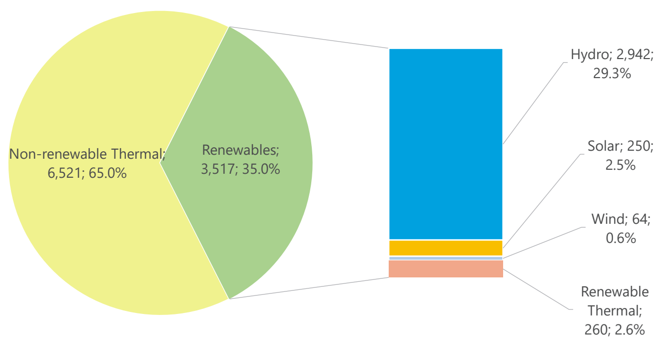
Summarized energy balance 2020



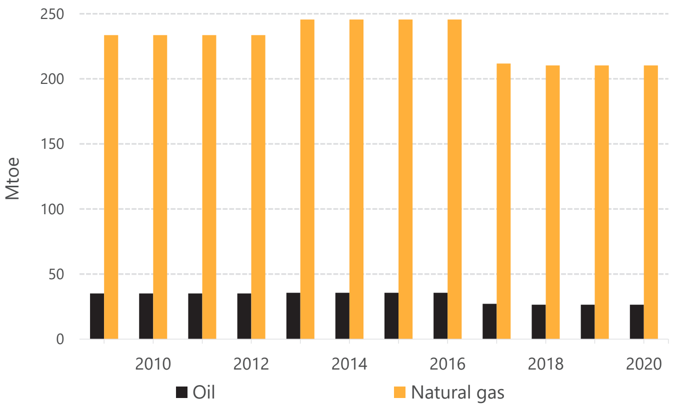
Installed power generation capacity [MW; %]
2020



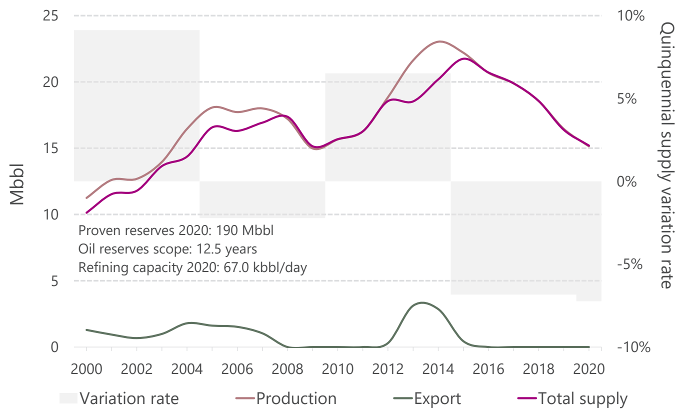
Electricity generation by source [GWh; %]
2020



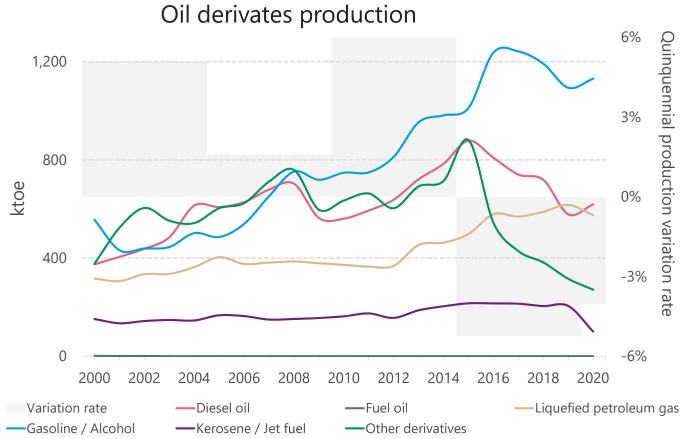
Proven reserves of oil and natural gas



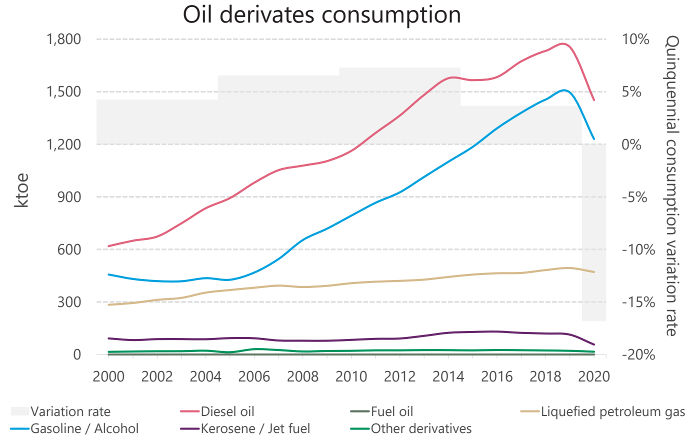
Oil supply



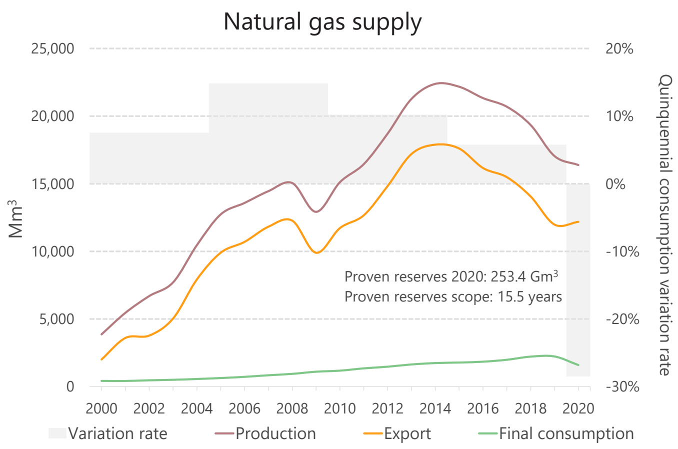
Oil derivates production



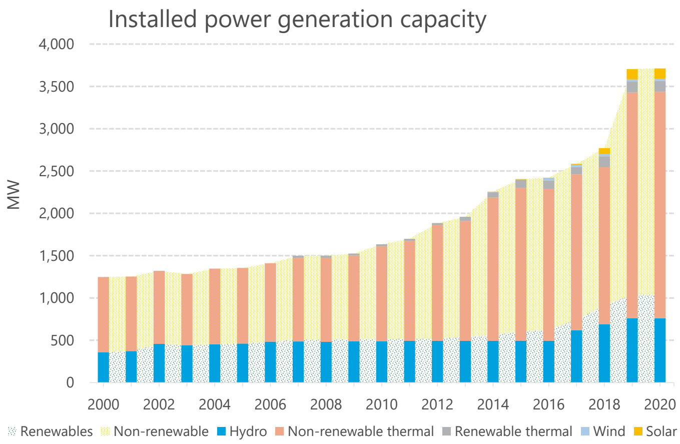
Oil derivates consumption

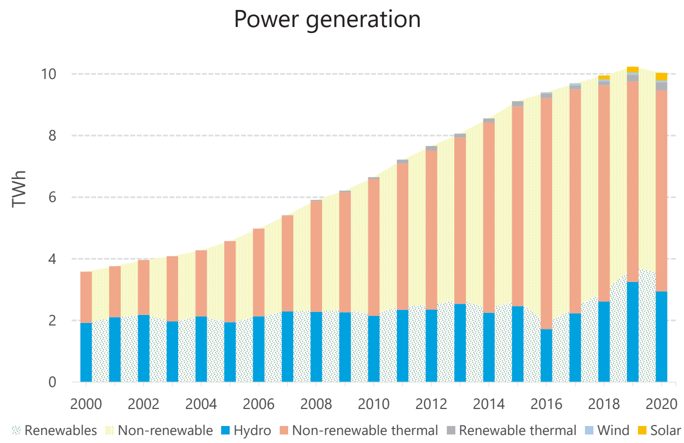


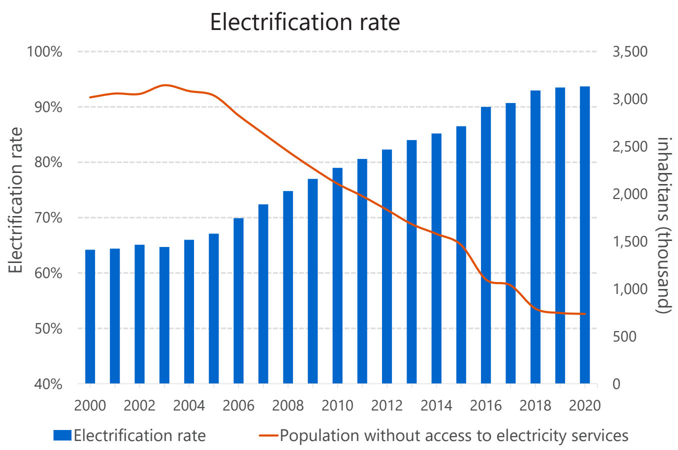
BOLIVIA

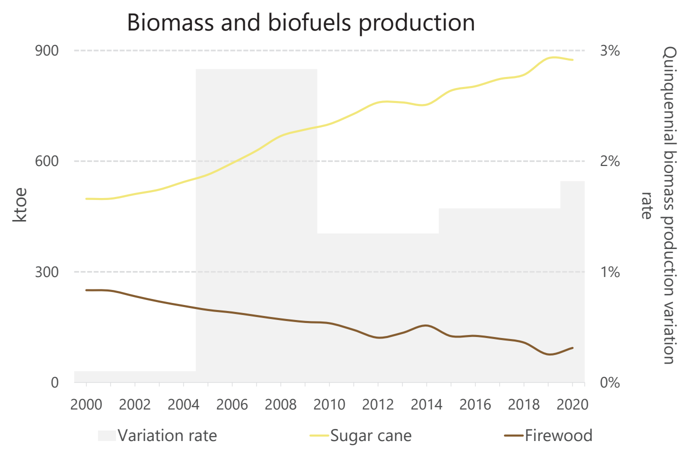


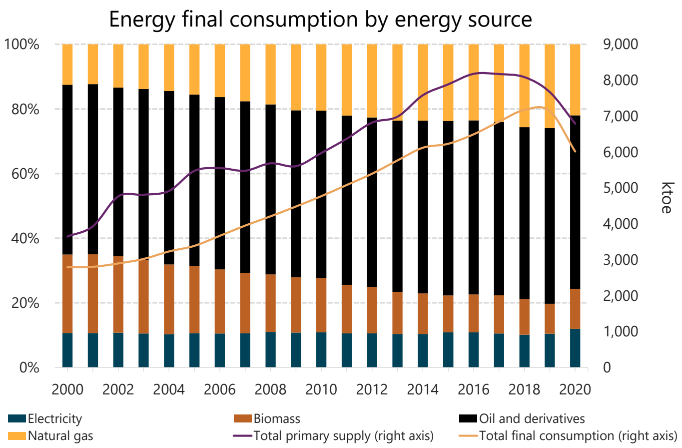
Bolivia confirms oil success of the YARARÁ -X1 exploratory well, which reached a final depth of 2,850 meters, evidencing the presence of hydrocarbons in the Petaca reservoir, which has excellent petrophysical properties. The well is located in the department of Santa Cruz, Ichilo province, Tercero municipality, and is the first exploratory well in the Yarará area. The Yarará-X1 exploratory project is an entirely Bolivian effort proposed and executed by YPFB through its technical personnel, also drilled with its own drilling equipment. The project is in the process of developing the construction of production facilities towards the Sirari plant, which will add a daily volume of 300 to 400 barrels of oil to the national production of liquid hydrocarbons.

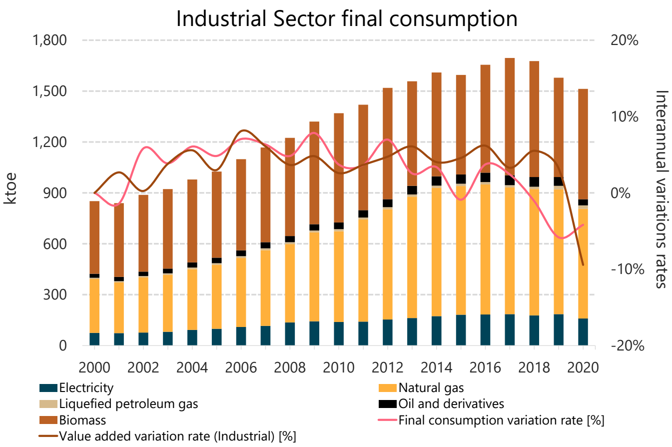


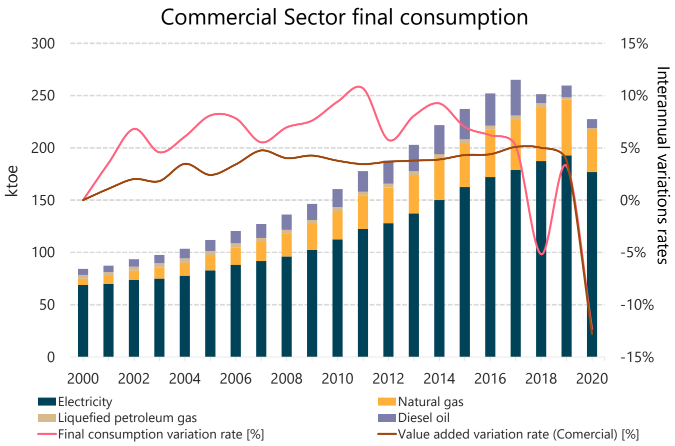


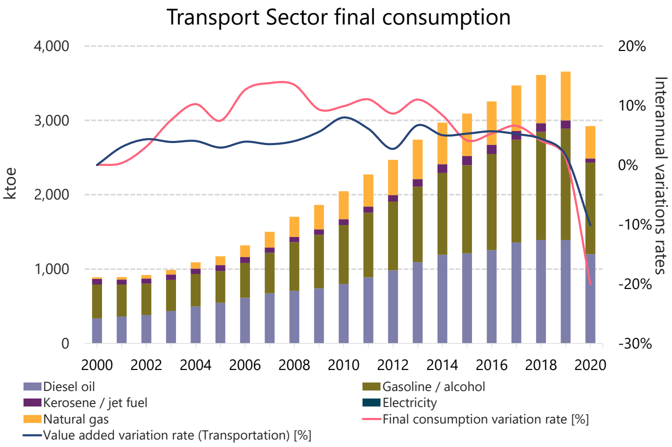




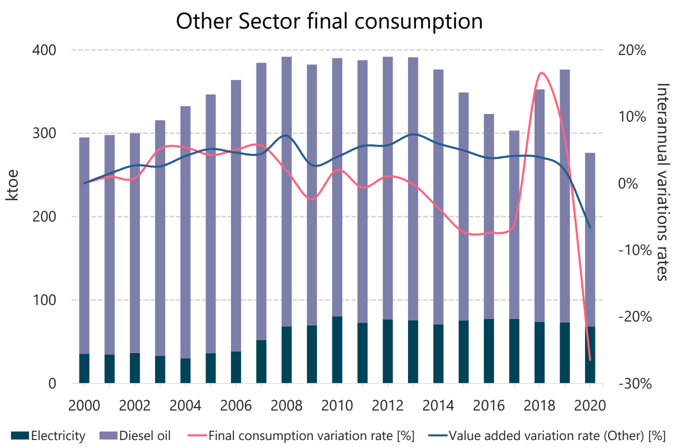

Energy final consumption by energy source
100%
80%
60%
40%
20%
0%
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
ktoe
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Natural gas
Biomass
Total primary supply (right axis)
Oil and derivatives
Total final consumption (right axis)

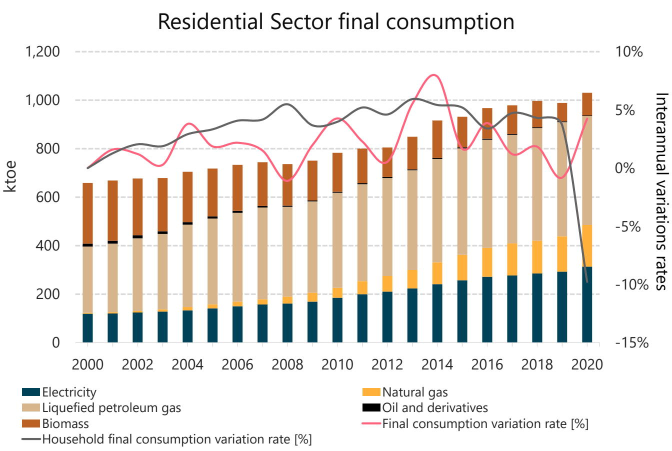

Industrial Sector final consumption
1,800
1,500
1,200
900
600
300
0
ktoe
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Biomass
Value added variation rate (Industrial) [%]
Natural gas
Oil and derivatives
Final consumption variation rate [%]

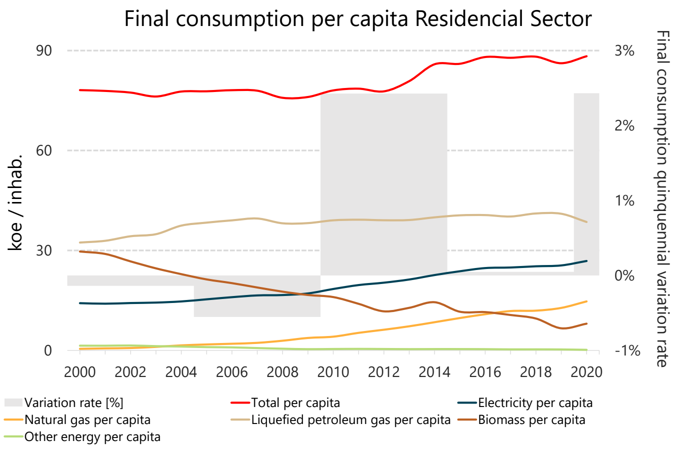

Commercial Sector final consumption
300
250
200
150
100
50
0
ktoe
15%
10%
5%
0%
-5%
-10%
-15%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Final consumption variation rate [%]
Natural gas
Diesel oil
Value added variation rate (Comercial) [%]

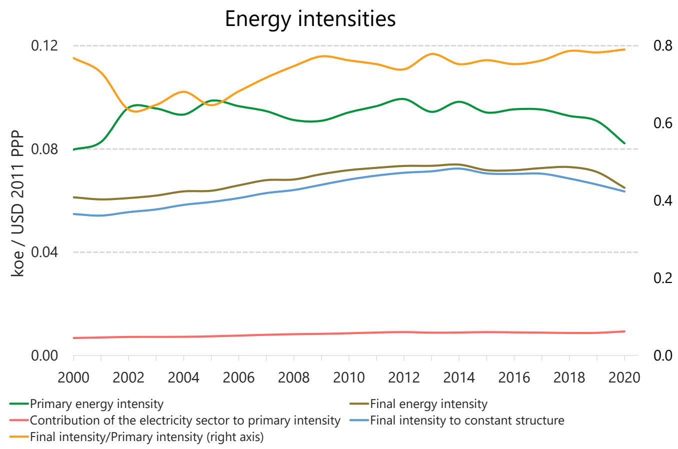

Transport Sector final consumption
4,000
3,000
2,000
1,000
0
ktoe
20%
10%
0%
-10%
-20%
-30%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Diesel oil
Kerosene / jet fuel
Natural gas
Value added variation rate (Transportation) [%]
Gasoline / alcohol
Electricity
Final consumption variation rate [%]

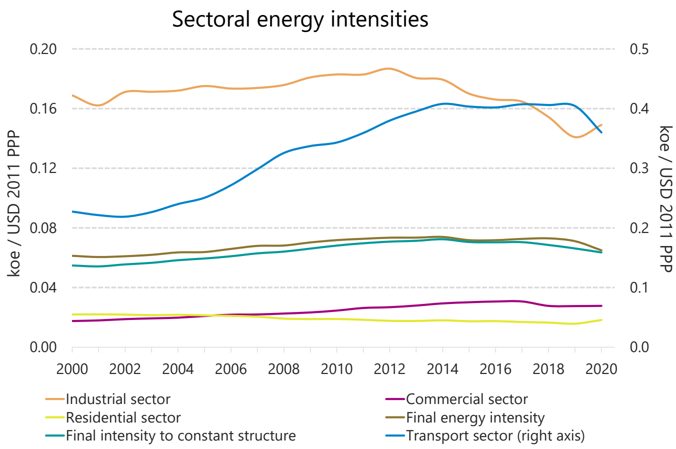
BOLIVIA

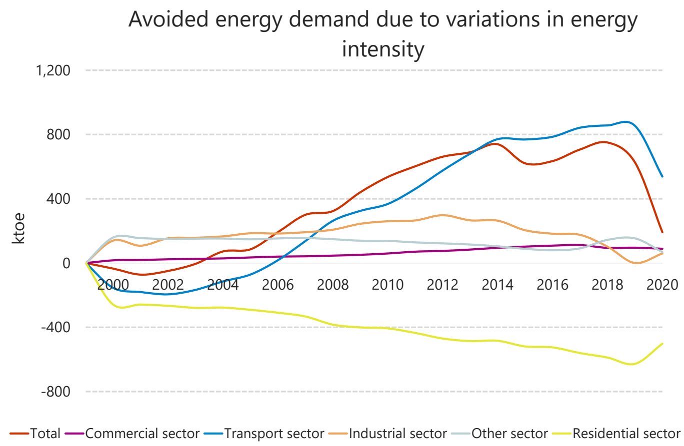

Other Sector final consumption
400
300
200
100
0
ktoe
20%
10%
0%
-10%
-20%
-30%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Diesel oil
Final consumption variation rate [%]
Value added variation rate (Other) [%]

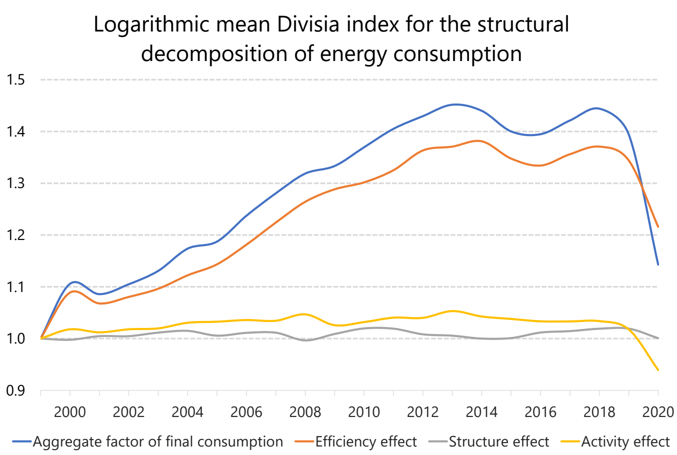

Residential Sector final consumption
1,200
1,000
800
600
400
200
0
ktoe
10%
5%
0%
-5%
-10%
-15%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Biomass
Household final consumption variation rate [%]
Natural gas
Oil and derivatives
Final consumption variation rate [%]

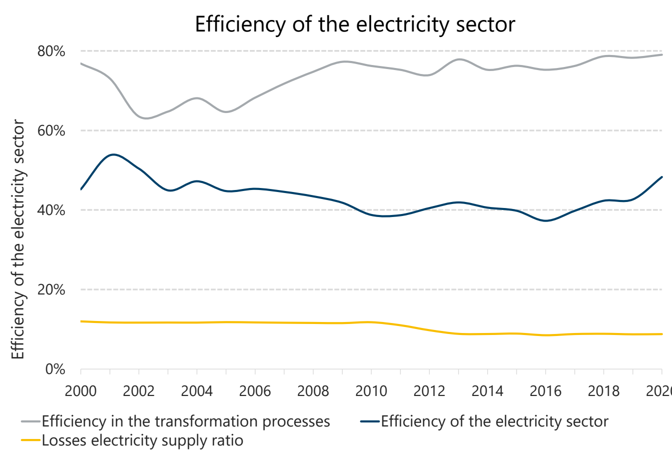

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
Variation rate [%]
Total per capita
Electricity per capita
Natural gas per capita
Liquefied petroleum gas per capita
Biomass per capita
Other energy per capita

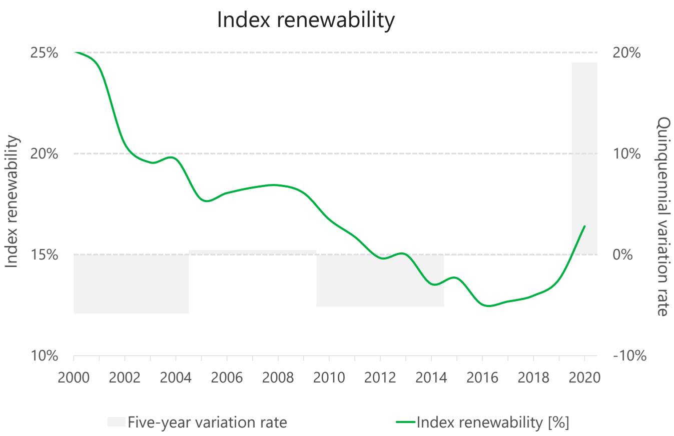

Energy intensities
koe / USD 2011 PPP
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

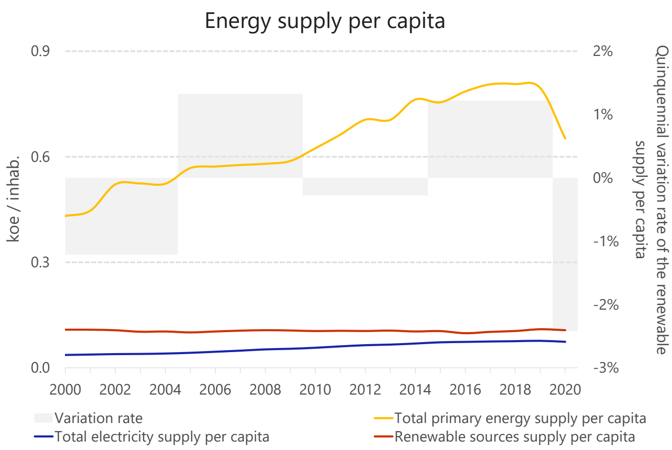

Sectoral energy intensities
koe / USD 2011 PPP
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)

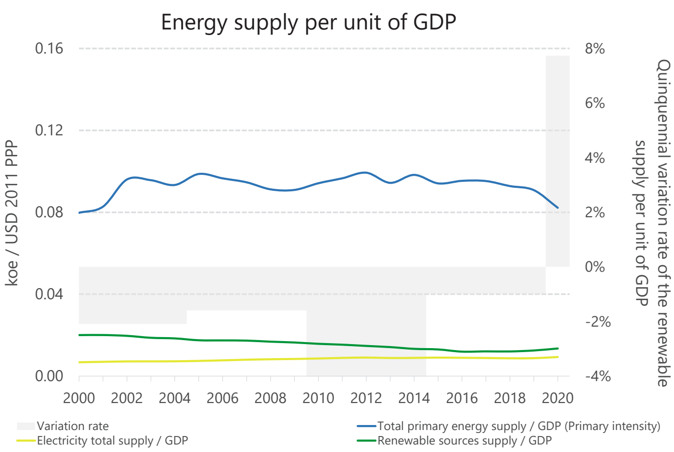

Avoided energy demand due to variations in energy intensity
ktoe
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

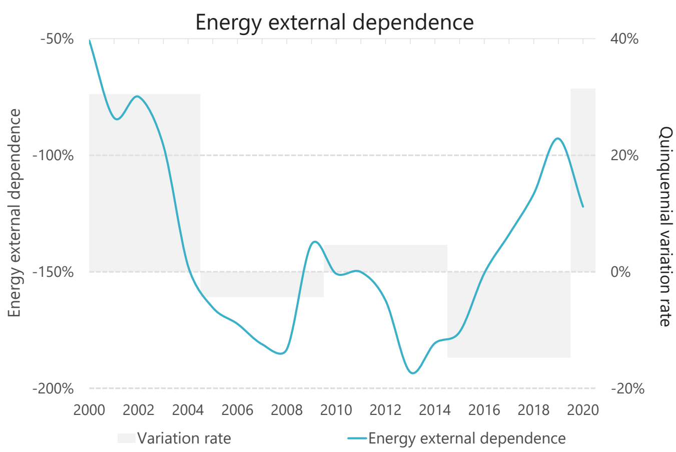

Logarithmic mean Divisia index for the structural decomposition of energy consumption
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect

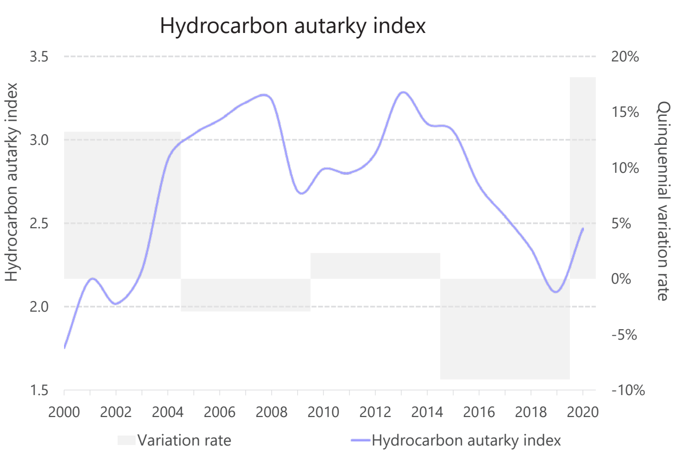

Efficiency of the electricity sector
Efficiency of the electricity sector
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

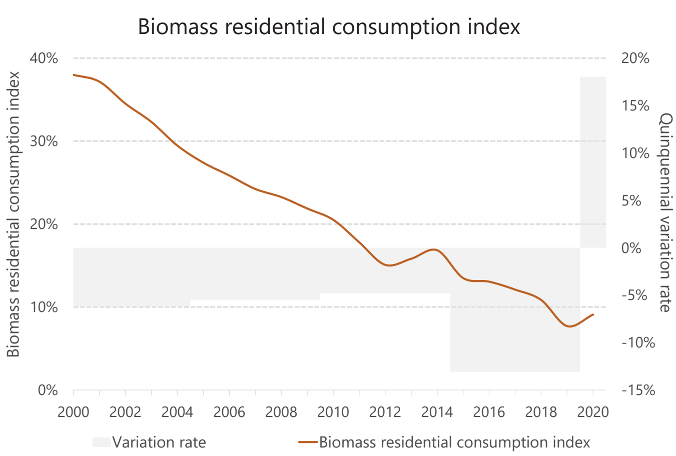

Index renewability
Index renewability
Quinquennial variation rate
Five-year variation rate
Index renewability [%]

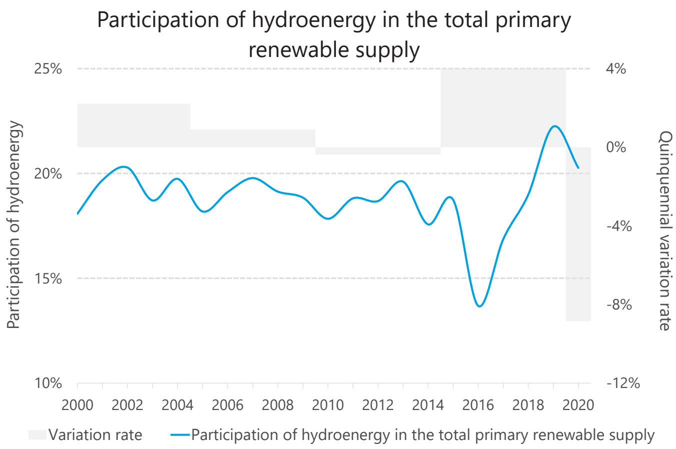

Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
Variation rate
Total electricity supply per capita
Total primary energy supply per capita
Renewable sources supply per capita

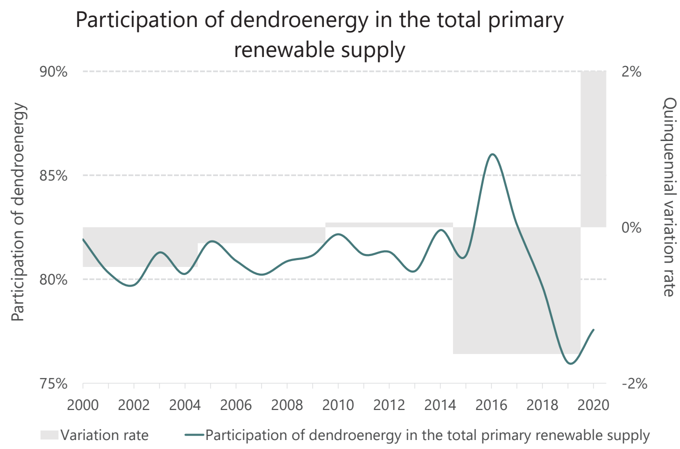

Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Electricity total supply / GDP
Total primary energy supply / GDP (Primary intensity)
Renewable sources supply / GDP

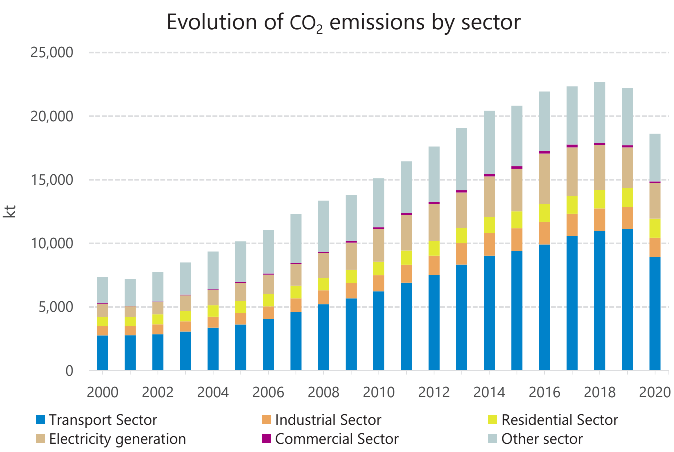

Energy external dependence
Energy external dependence
Quinquennial variation rate
Variation rate
Energy external dependence

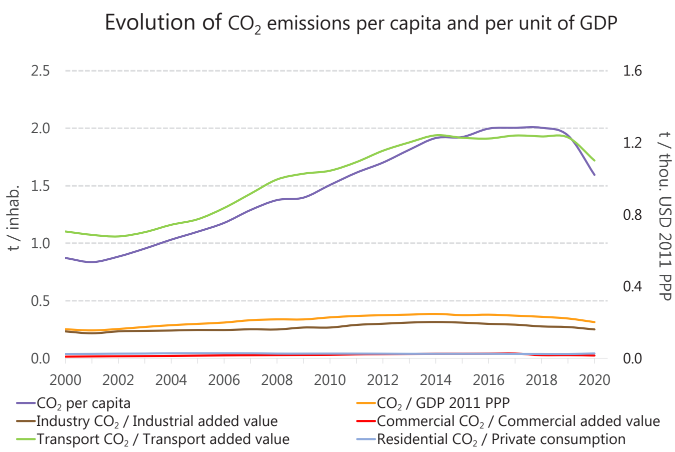

Hydrocarbon autarky index
Hydrocarbon autarky index
Quinquennial variation rate
Variation rate
Hydrocarbon autarky index

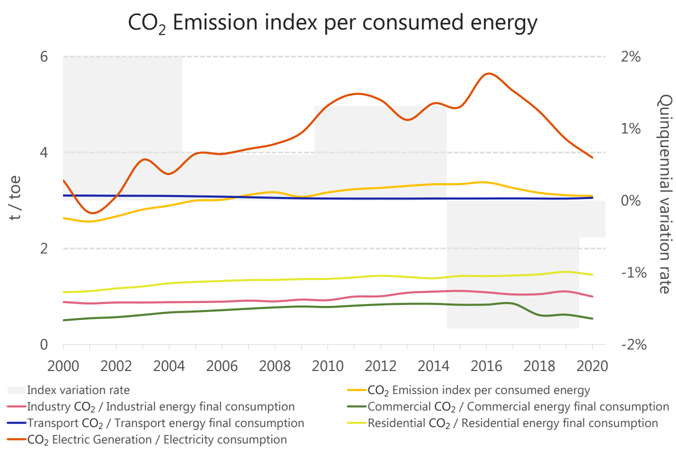

Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
Variation rate
Biomass residential consumption index

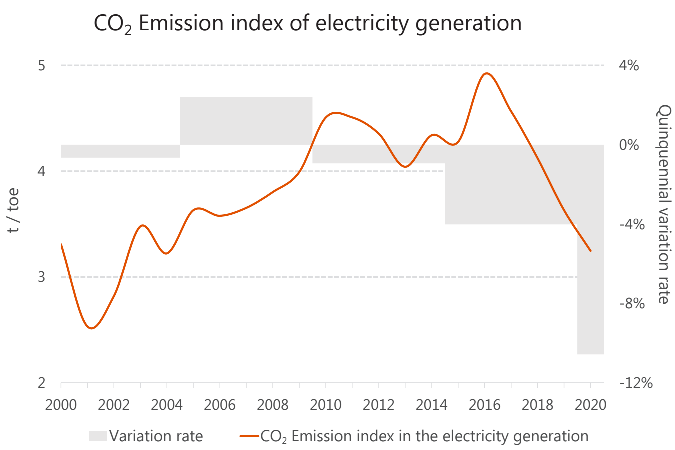

Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
25%
20%
15%
10%
4%
0%
-4%
-8%
-12%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Participation of hydroenergy in the total primary renewable supply

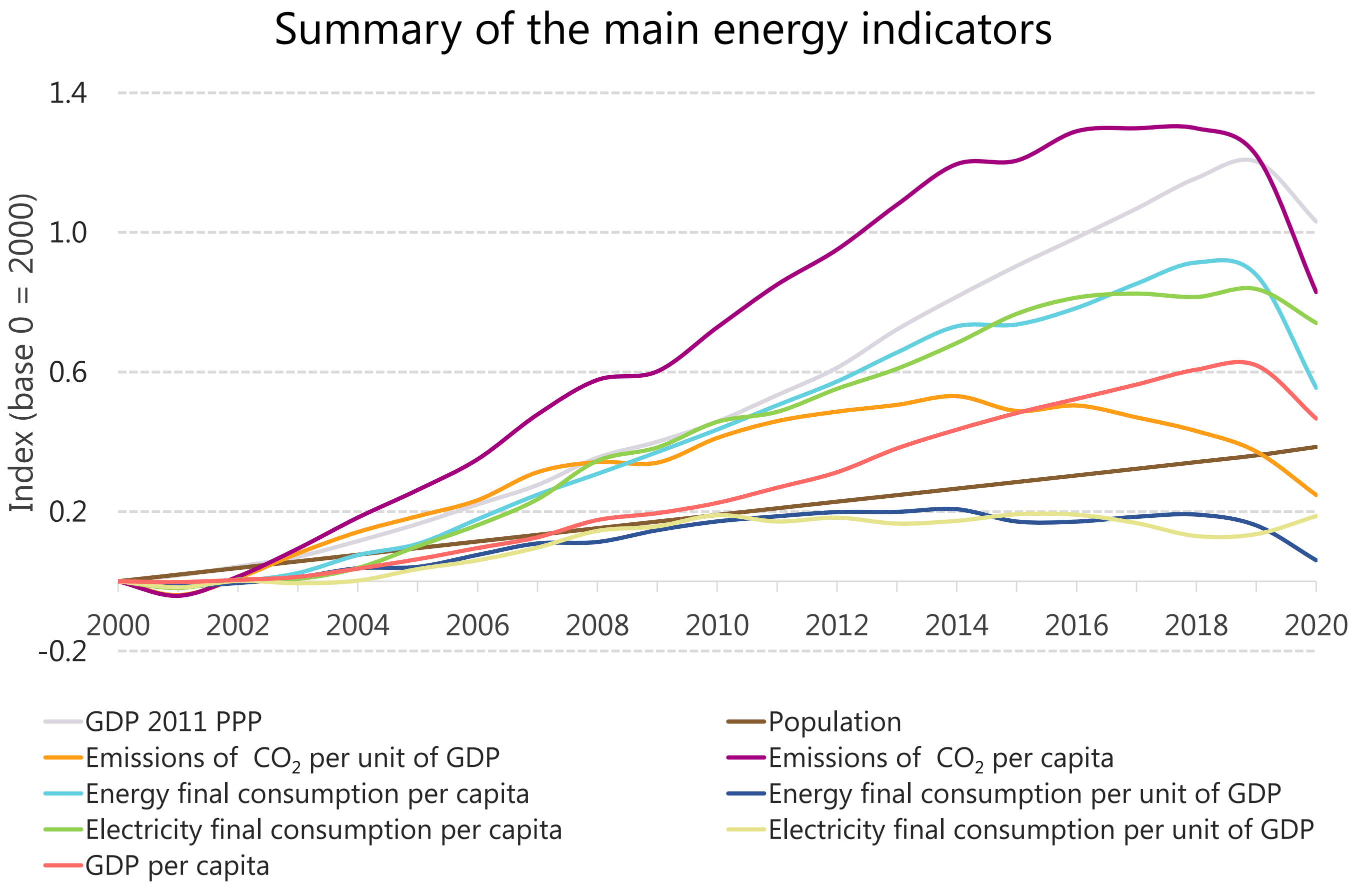

Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
90%
85%
80%
75%
2%
0%
-2%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Participation of dendroenergy in the total primary renewable supply


Evolution of CO_2 emissions by sector
kt
25,000
20,000
15,000
10,000
5,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector


Evolution of CO_2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
2.5
2.0
1.5
1.0
0.5
0.0
1.6
1.2
0.8
0.4
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
CO_2 per capita
CO_2 / GDP 2011 PPP
Industry CO_2 / Industrial added value
Commercial CO_2 / Commercial added value
Transport CO_2 / Transport added value
Residential CO_2 / Private consumption


CO_2 Emission index per consumed energy
t / toe
Quinquennial variation rate
6
4
2
0
2%
1%
0%
-1%
-2%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Index variation rate
CO_2 Emission index per consumed energy
Industry CO_2 / Industrial energy final consumption
Commercial CO_2 / Commercial energy final consumption
Transport CO_2 / Transport energy final consumption
Residential CO_2 / Residential energy final consumption
CO_2 Electric Generation / Electricity consumption


CO_2 Emission index of electricity generation
t / toe
Quinquennial variation rate
5
4
3
2
4%
0%
-4%
-8%
-12%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
CO_2 Emission index in the electricity generation



Summary of the main energy indicators
Index (base 0 = 2000)
1.4
1.0
0.6
0.2
-0.2
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

BRAZIL

General Information 2020

Population (thousand inhab.)	212,559 [1]
Area (km^2)	8,515,759
Population Density (inhab. / km^2)	25
Urban Population (%)	87
GDP USD 2010 (MUSD)	2,268,437 [1]
GDP USD 2011 PPP (MUSD)	2,989,432 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	14

Energy Sector 2020

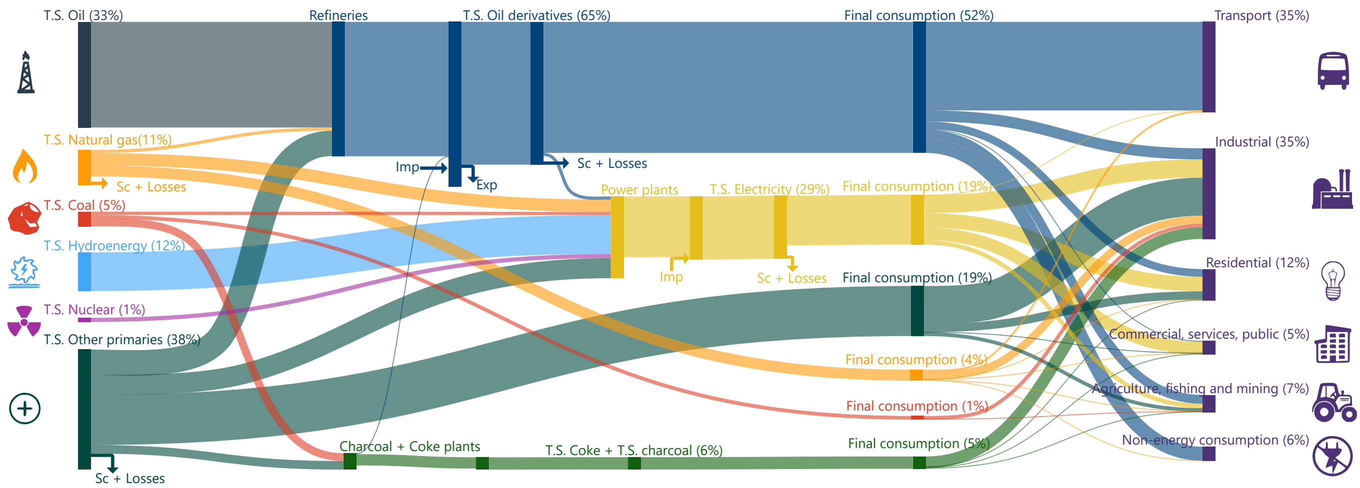
Final consumption in the Transport Sector	Mtep	79.39
Final consumption in the Industrial Sector	Mtep	79.49 [5]
Final consumption in the Residential Sector	Mtep	27.53
Final consumption in the Commercial and Service Sector	Mtep	11.86
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	27.73
Oil Reserves	Mbbl	12,393
Natural gas Reserves	Gm^3	338
Coal Reserves	Mt	6,596 [4]

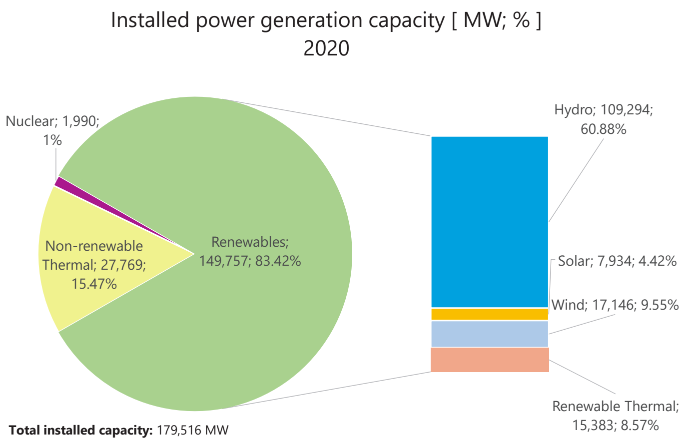
[1] Source: ECLAC.
[2] Source: World Bank.
[3] Does not include own consumption of the energy sector.
[4] Data estimated by OLADE.
[5] Does not include Mining and Pelletizing.
[6] Calculated as the relationship between Total Energy Supply and PPP GDP.

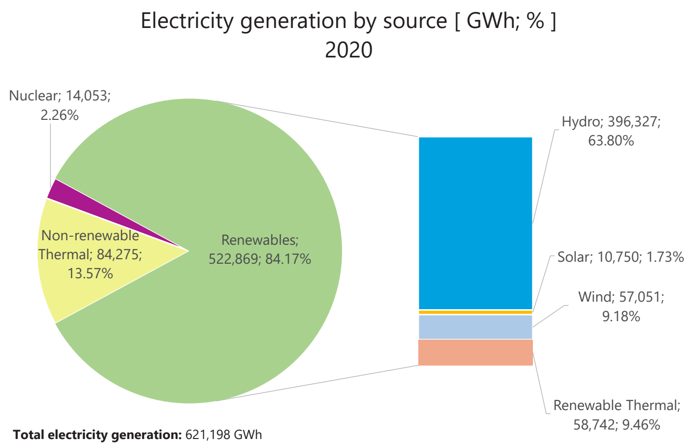
Note: The values presented in Mtoe in this publication differ from those published by the country in the same unit due to a difference between the conversion factor used between OLADE and the country. OLADE has used that 1 boe = 0.13878 and Brazil 0.13822731.

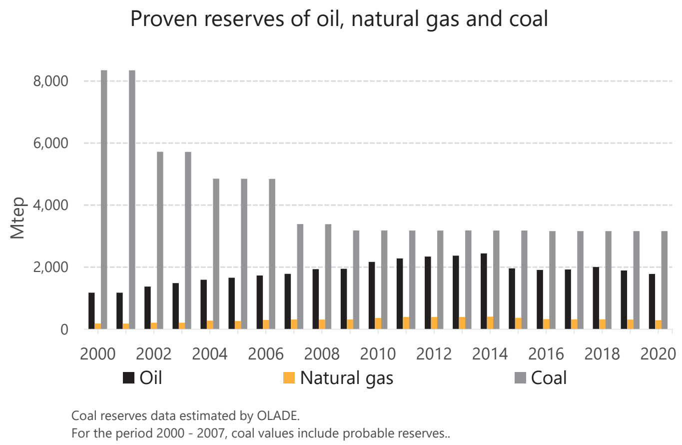
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
2,392 [3]	1.06 [3]	99.77	286.09	326.53	54.23	91.39	225.99 [3]	2,411	179.52	0.10 [6] / 0.08
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

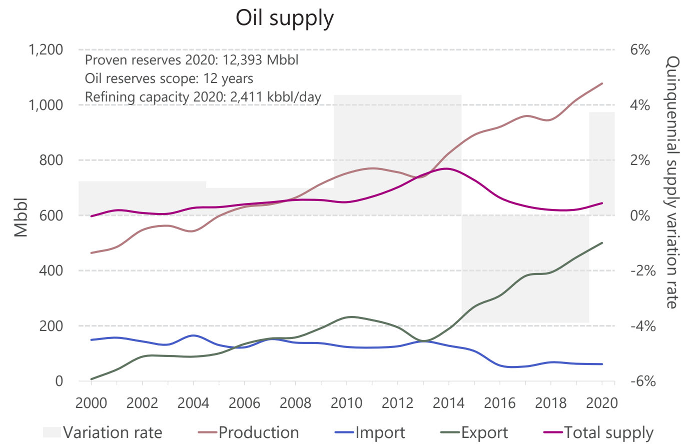
Summarized energy balance 2020

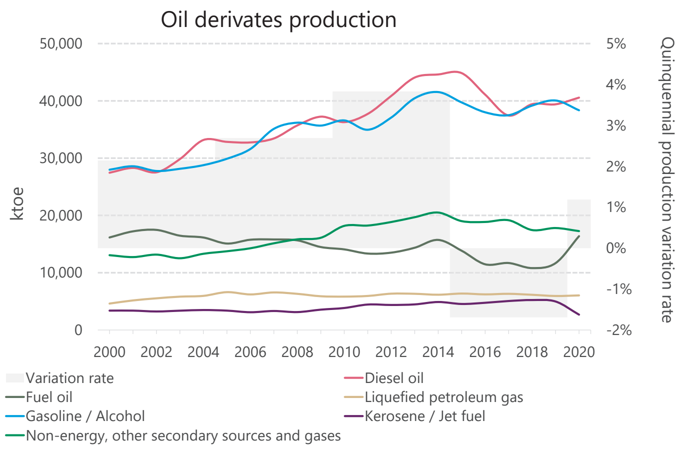


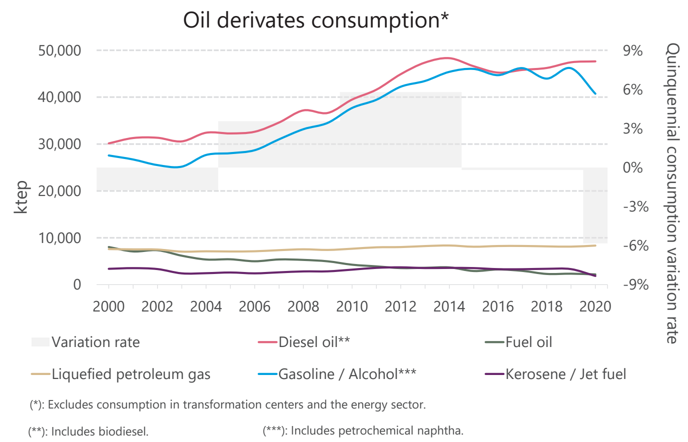

Installed power generation capacity [MW; %]
2020
Nuclear; 1,990; 1%
Non-renewable Thermal; 27,769; 15.47%
Renewables; 149,757; 83.42%
Hydro; 109,294; 60.88%
Solar; 7,934; 4.42%
Wind; 17,146; 9.55%
Renewable Thermal; 15,383; 8.57%
Total installed capacity: 179,516 MW

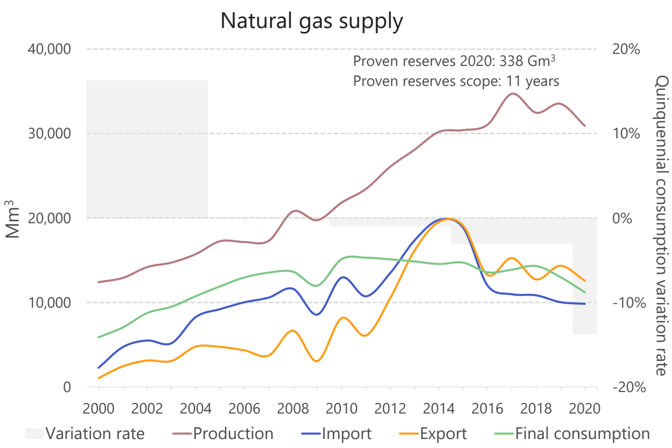

Electricity generation by source [GWh; %]
2020
Nuclear; 14,053; 2.26%
Non-renewable Thermal; 84,275; 13.57%
Renewables; 522,869; 84.17%
Hydro; 396,327; 63.80%
Solar; 10,750; 1.73%
Wind; 57,051; 9.18%
Renewable Thermal; 58,742; 9.46%
Total electricity generation: 621,198 GWh

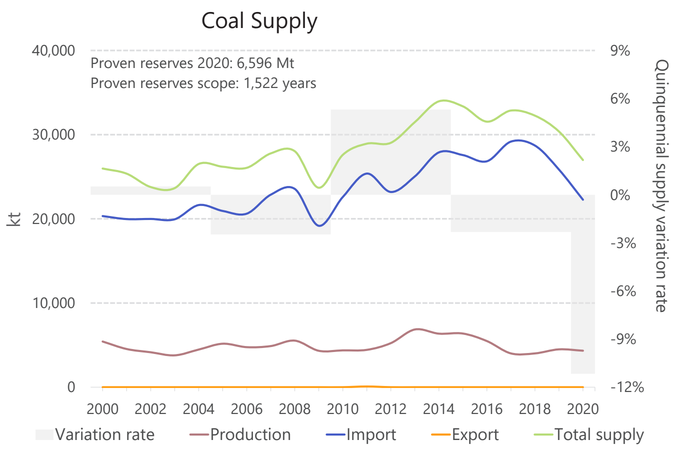

Proven reserves of oil, natural gas and coal
Mtep
Oil
Natural gas
Coal
Coal reserves data estimated by OLADE.
For the period 2000 - 2007, coal values include probable reserves..

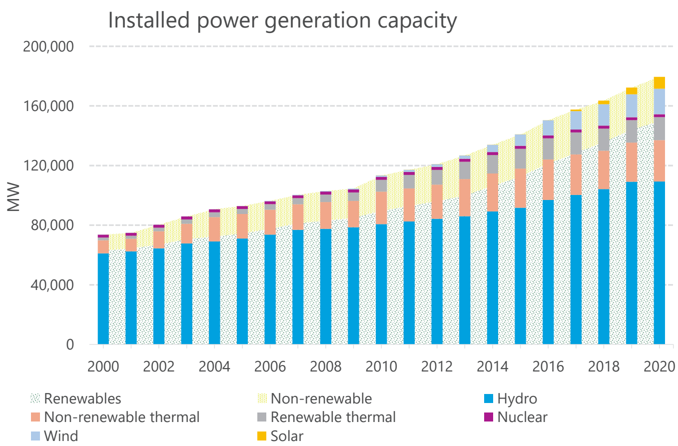

Oil supply
Proven reserves 2020: 12,393 Mbbl
Oil reserves scope: 12 years
Refining capacity 2020: 2,411 kbbl/day
Mbbl
Quinquennial supply variation rate
Variation rate
Production
Import
Export
Total supply

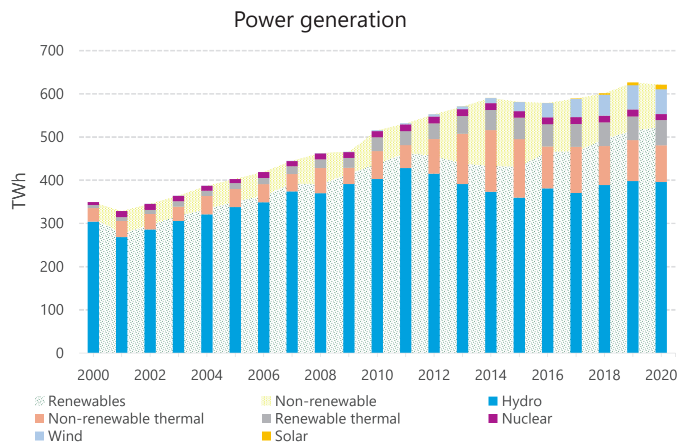

Oil derivates production
ktoe
Quinquennial production variation rate
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Non-energy, other secondary sources and gases

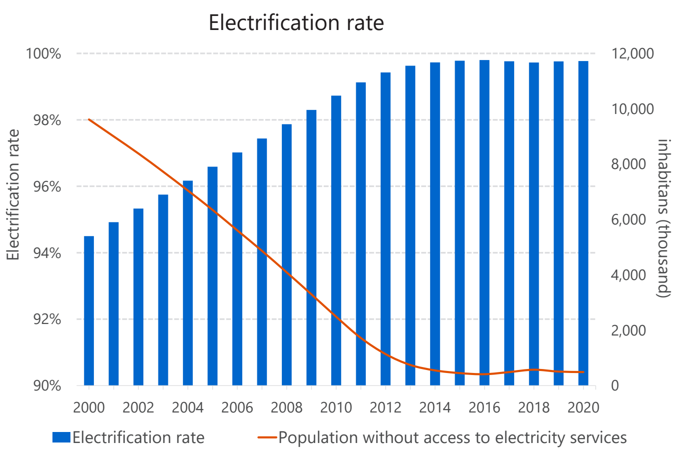

Oil derivates consumption*
ktep
Quinquennial consumption variation rate
Variation rate
Diesel oil**
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol***
Kerosene / Jet fuel
(*): Excludes consumption in transformation centers and the energy sector.
(**): Includes biodiesel.
(***): Includes petrochemical naphtha.

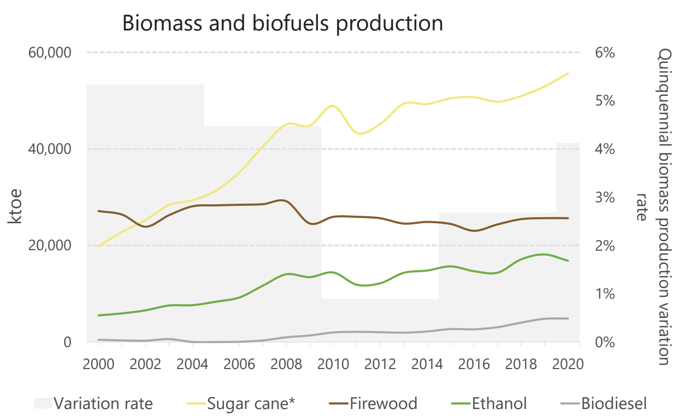




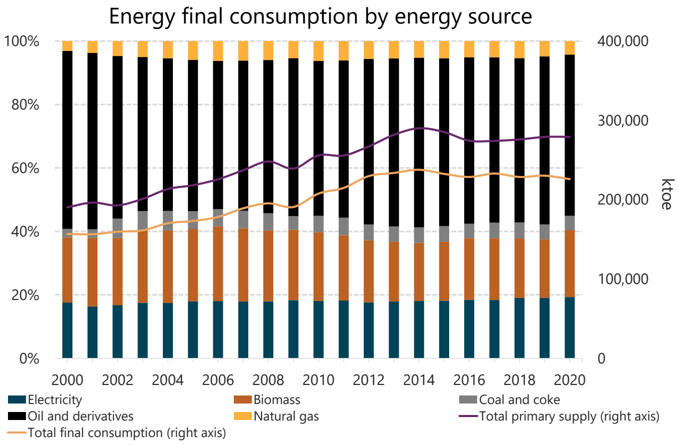




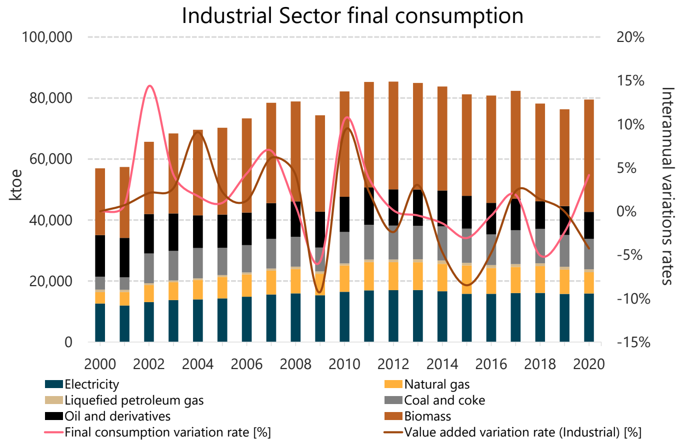




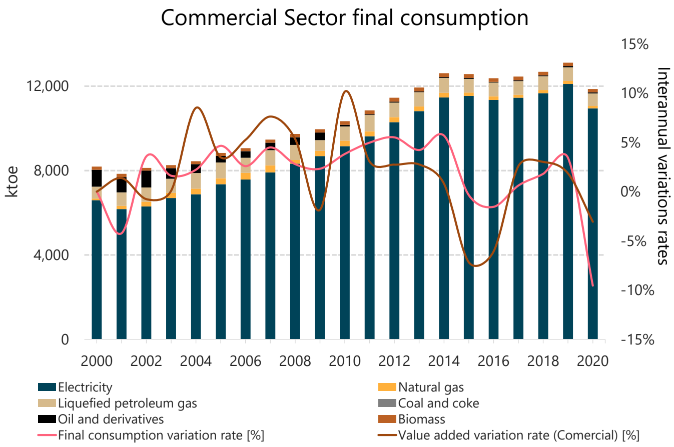
(*): It includes energy uses of bagasse and energy content of cane stock for producing ethanol.



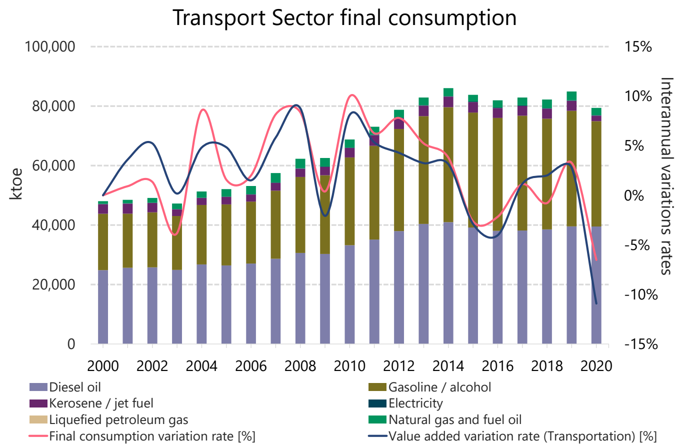
Energy final consumption by energy source
100%
80%
60%
40%
20%
0%
400,000
300,000
200,000
100,000
0
ktoe
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Oil and derivatives
Total final consumption (right axis)
Biomass
Natural gas
Coal and coke
Total primary supply (right axis)



Industrial Sector final consumption
100,000
80,000
60,000
40,000
20,000
0
ktoe
20%
15%
10%
5%
0%
-5%
-10%
-15%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Final consumption variation rate [%]
Natural gas
Coal and coke
Biomass
Value added variation rate (Industrial) [%]



Commercial Sector final consumption
12,000
8,000
4,000
0
ktoe
15%
10%
5%
0%
-5%
-10%
-15%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Final consumption variation rate [%]
Natural gas
Coal and coke
Biomass
Value added variation rate (Comercial) [%]



Transport Sector final consumption
100,000
80,000
60,000
40,000
20,000
0
ktoe
15%
10%
5%
0%
-5%
-10%
-15%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Diesel oil
Kerosene / jet fuel
Liquefied petroleum gas
Final consumption variation rate [%]
Gasoline / alcohol
Electricity
Natural gas and fuel oil
Value added variation rate (Transportation) [%]

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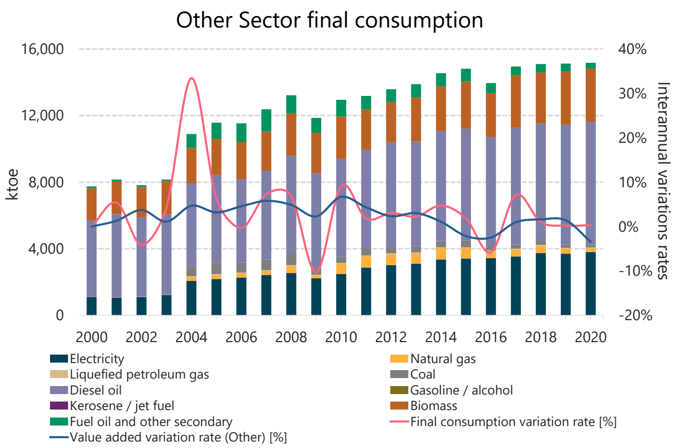
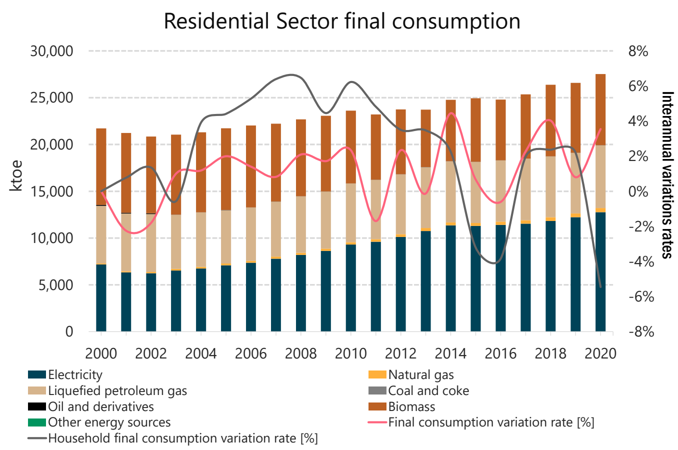
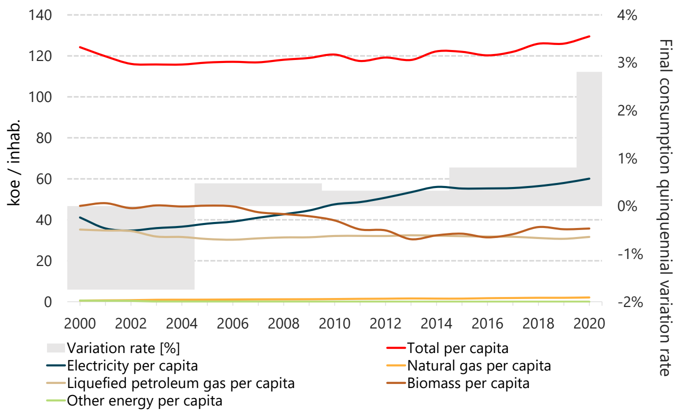


Other Sector final consumption
16,000
12,000
8,000
4,000
0
ktoe
40%
30%
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Diesel oil
Kerosene / jet fuel
Fuel oil and other secondary
Value added variation rate (Other) [%]
Natural gas
Coal
Gasoline / alcohol
Biomass
Final consumption variation rate [%]

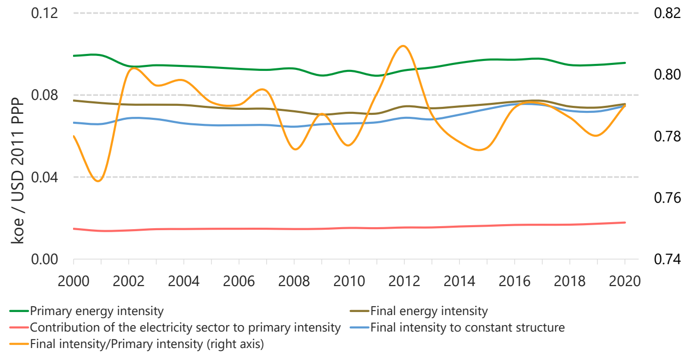


Residential Sector final consumption
30,000
25,000
20,000
15,000
10,000
5,000
0
ktoe
8%
6%
4%
2%
0%
-2%
-4%
-6%
-8%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Other energy sources
Household final consumption variation rate [%]
Natural gas
Coal and coke
Biomass
Final consumption variation rate [%]

Final consumption per capita Residencial Sector

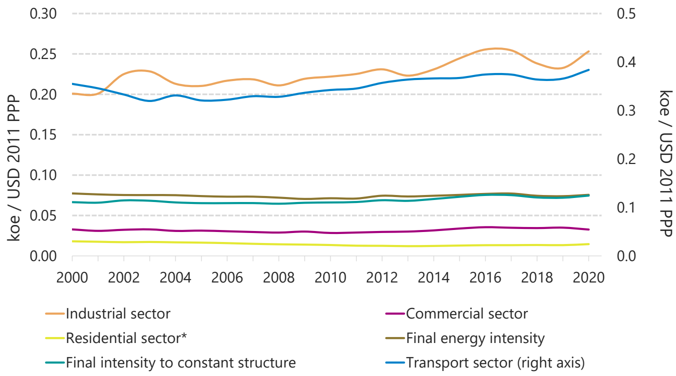


Intensidades energéticas



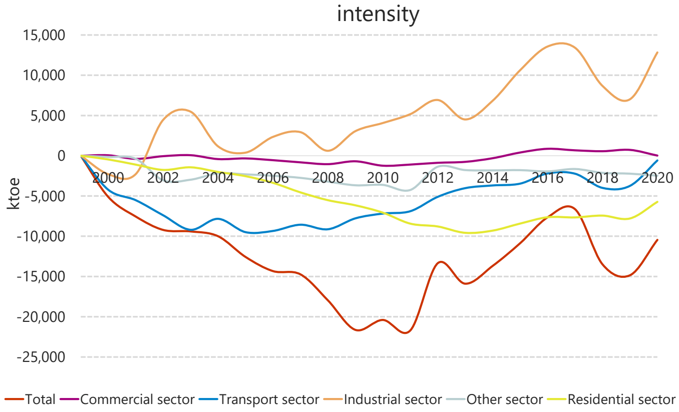
(*): Calculated as the ratio of Total Energy Supply to GDP PPP.
Includes total final energy consumption, own consumption of the energy sector, transformation losses and distribution losses.

Sectoral energy intensities

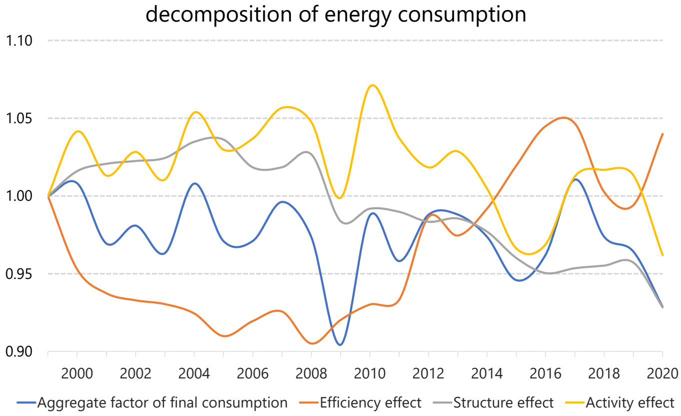


(*): Corresponds to the ratio between Residential Final Consumption and Household Consumption Expenditure.

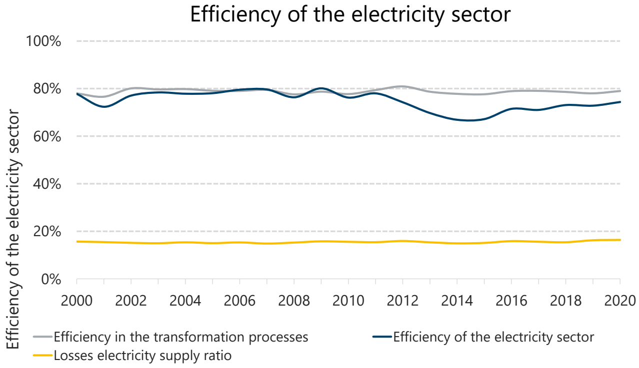
Avoided energy demand due to variations in energy intensity



Logarithmic mean Divisia index for the structural decomposition of energy consumption



Efficiency of the electricity sector



(*): Ratio between Final Energy Consumption and Total Energy Supply. Final consumption does not include the energy sector's own consumption.
(**): Ratio between electricity production and the inputs required for its generation. In caloric units.
(***): Ratio of electricity losses to electricity supply.

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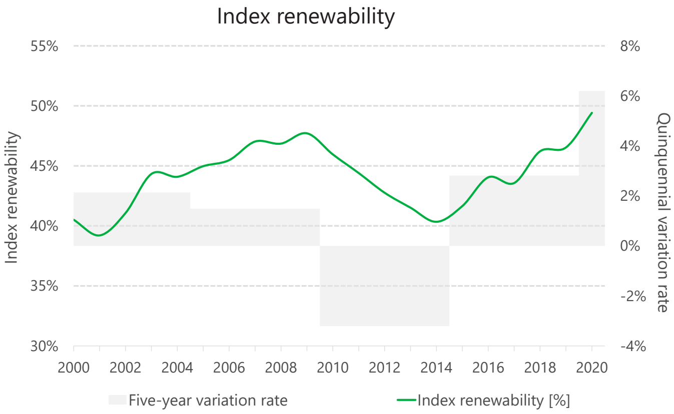
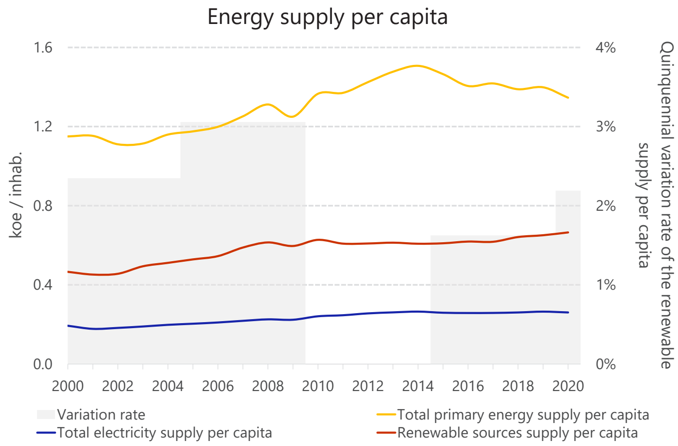
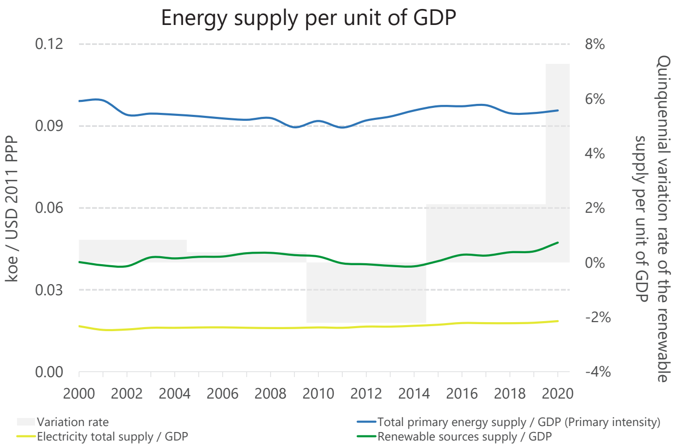
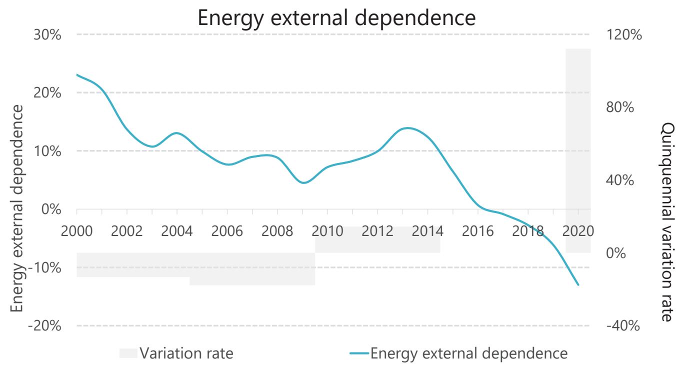


(*): The calculation is based on the Internal Energy Supply Matrix (Energy Matrix).







Note: According to the OLADE methodology, there is an export in 2017, however, in the balance developed by Ministry of Mines and Energy of Brazil, it identifies that the country still has external energy dependency. These differences are due to the existence of a significant import of uranium in the Brazil BEN which is not accounted in the OLADE BEN, because there is no transformation center for "Nuclear Fuel Cycle."

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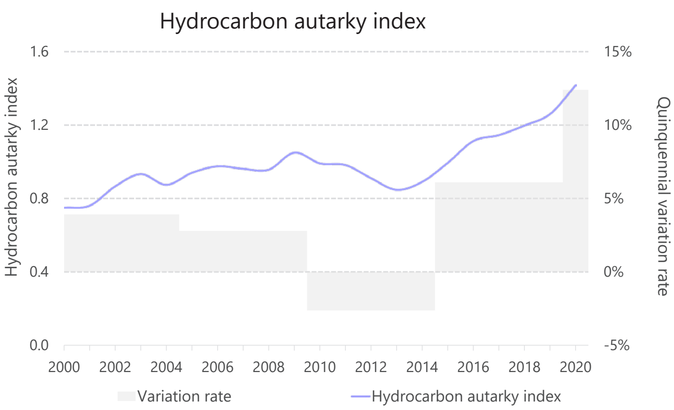
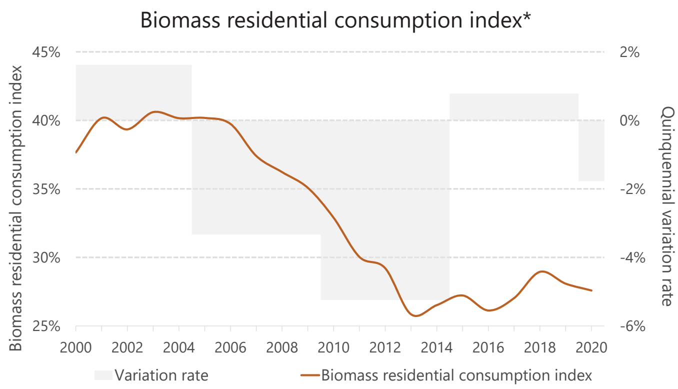
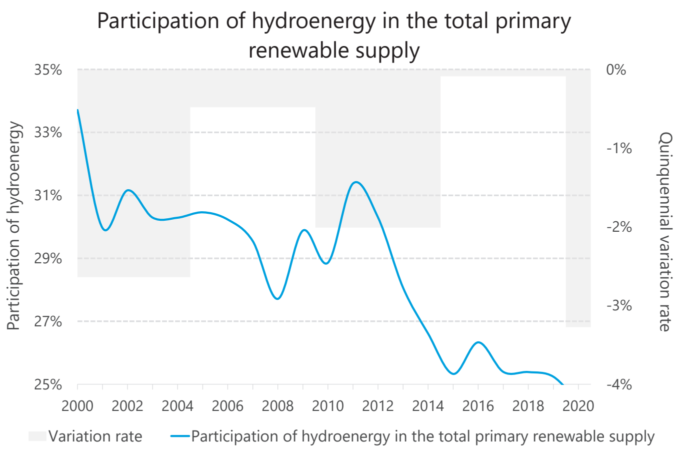
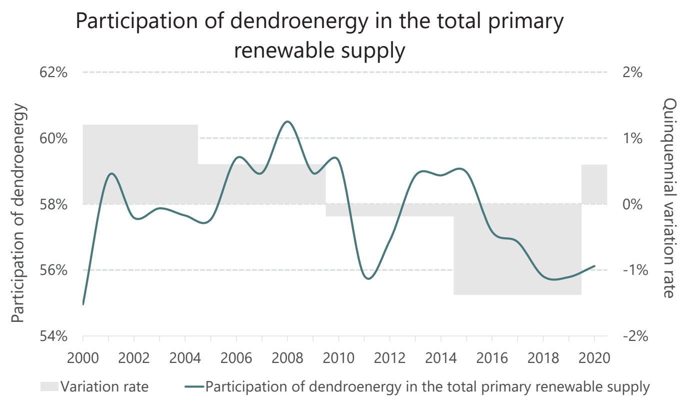


Note: Values greater than 1 represent a surplus and less than 1 a deficit.

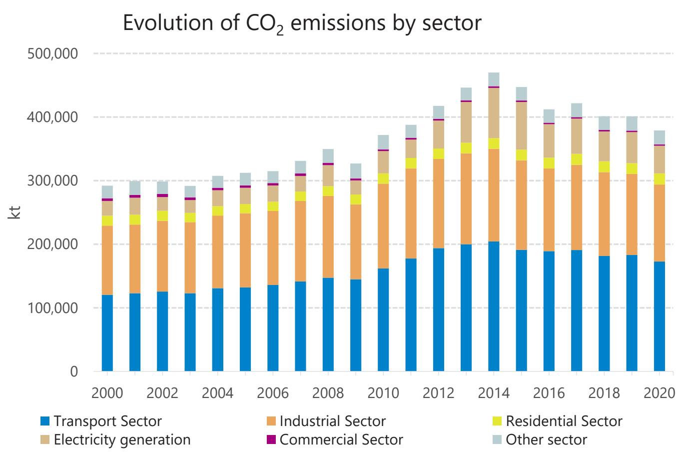


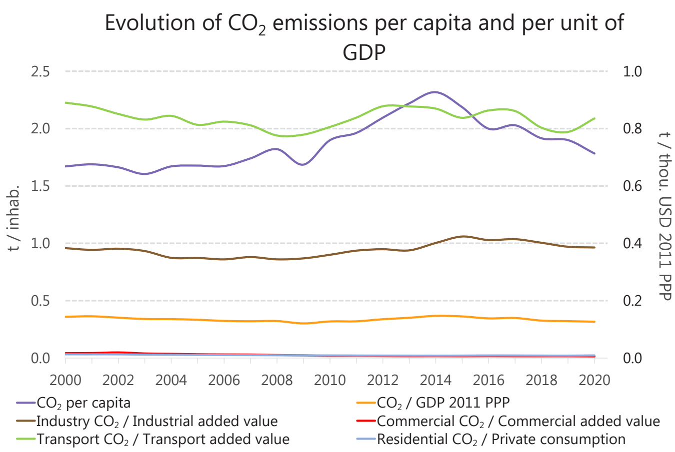
(*): Defined as the ratio between the sum of wood and charcoal consumption in the residential sector divided by the final consumption in the residential sector.

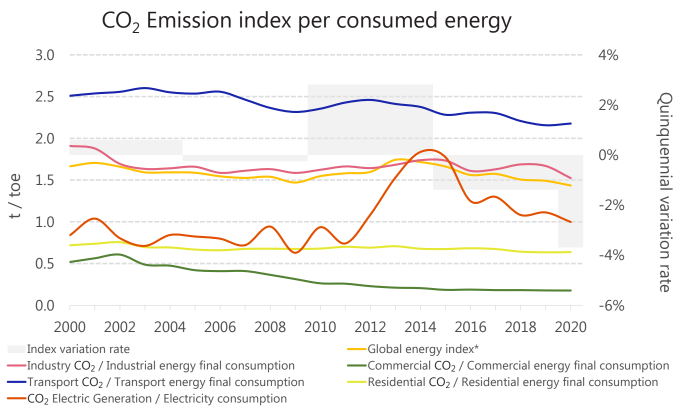




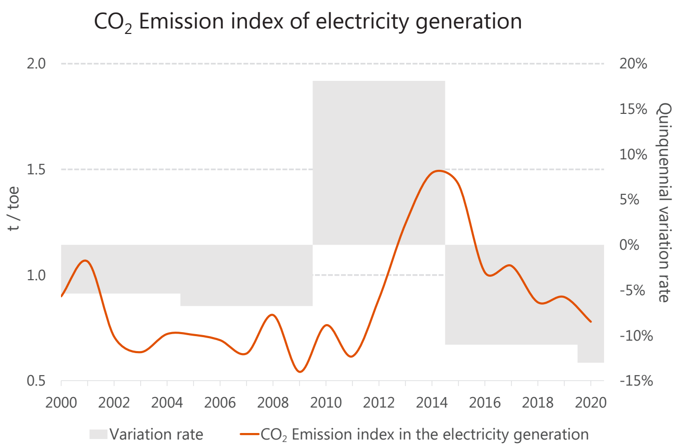
Note: Wood energy corresponds to fuels such as: firewood, charcoal, pellets, etc.







(*): Internal energy supply that includes total losses, final consumption and own consumption of the energy sector.



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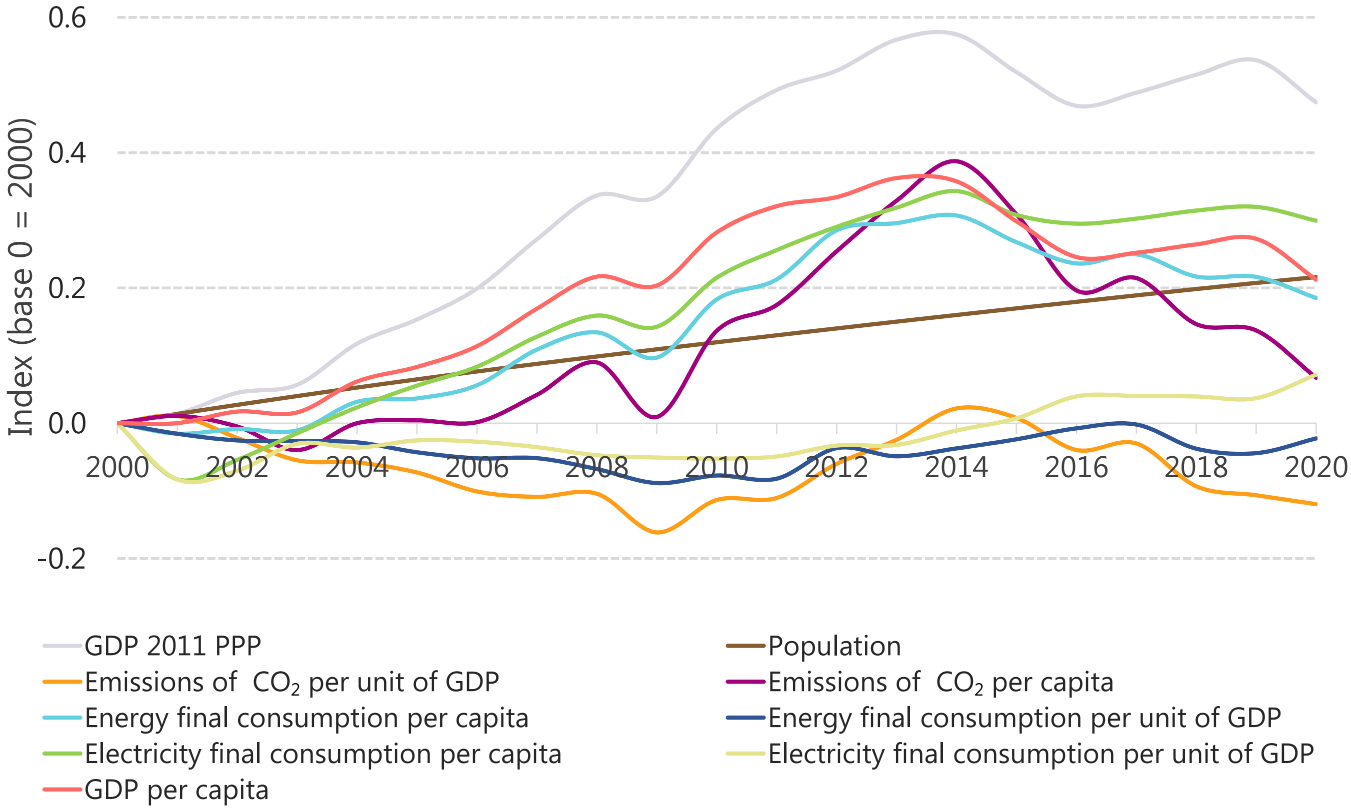
Summary of the main energy indicators



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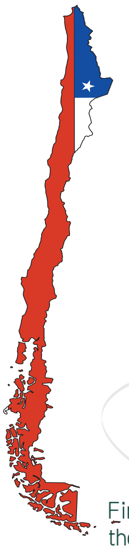


General Information 2020

Population (thousand inhab.)	19,116 [1]
Area (km^2)	756,096
Population Density (inhab. / km^2)	25
Urban Population (%)	88
GDP USD 2010 (MUSD)	268,586 [1]
GDP USD 2011 PPP (MUSD)	445,876 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	23

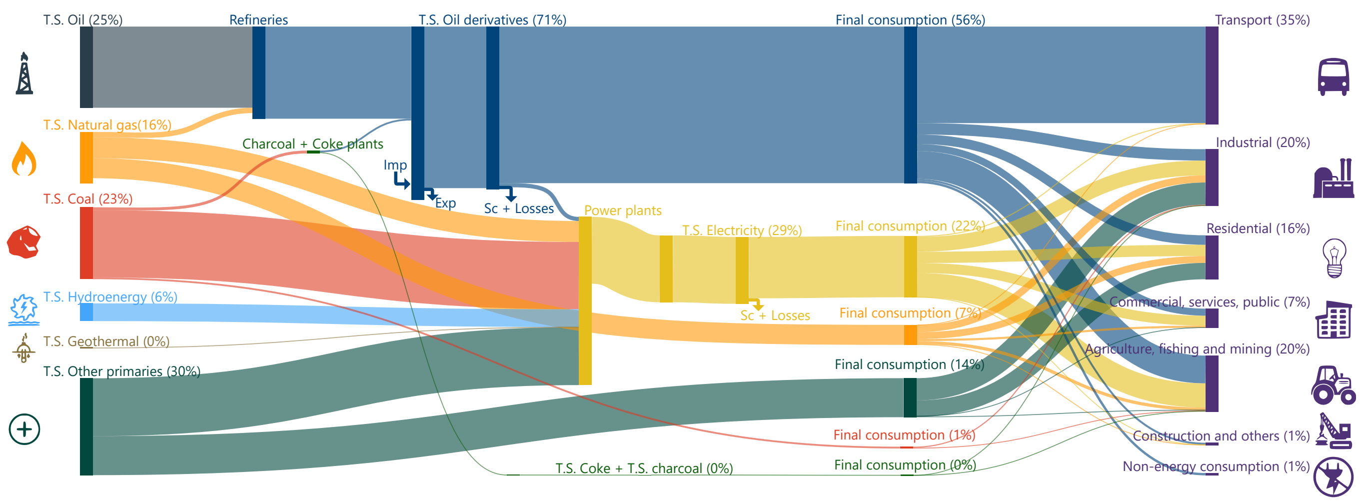
Energy Sector 2020

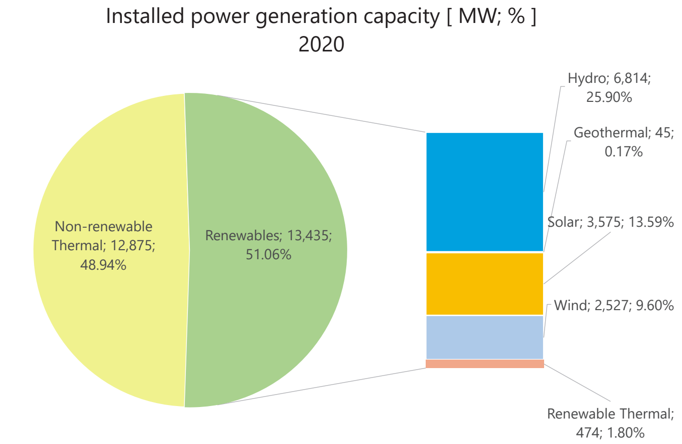
Final consumption in the Transport Sector	Mtep	9.76 [3]
Final consumption in the Industrial Sector	Mtep	5.67 [3]
Final consumption in the Residential Sector	Mtep	4.39 [3]
Final consumption in the Commercial and Service Sector	Mtep	1.93 [3]
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	6.10 [3, 4]
Oil Reserves	Mbbl	12
Natural gas Reserves	Gm^3	8
Coal Reserves	Mt	n.d.

[1] Source: ECLAC.
[2] Source: World Bank.
[3] Supply and demand data for 2020 correspond to estimates made by OLADE, subject to revision by the country.
[4] It includes non-energy consumption.
[5] Does not include own consumption of the energy sector.

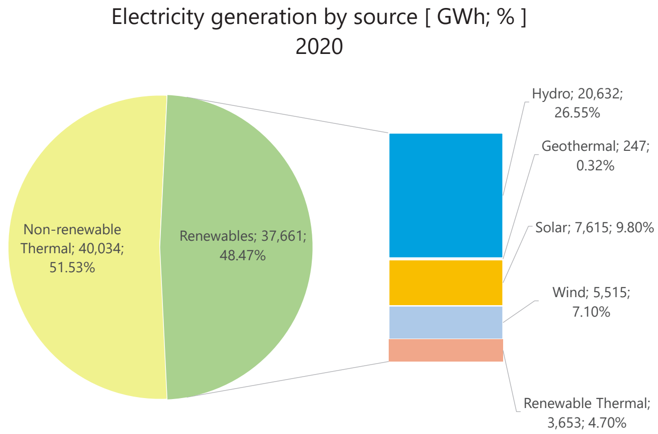
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
3,731 [3]	1.46 [3]	99.70	38.70 [3]	13.88 [3]	26.37 [3]	1.46 [3, 5]	27.87 [3]	220	26.31	0.09 / 0.06
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

Summarized energy balance 2020

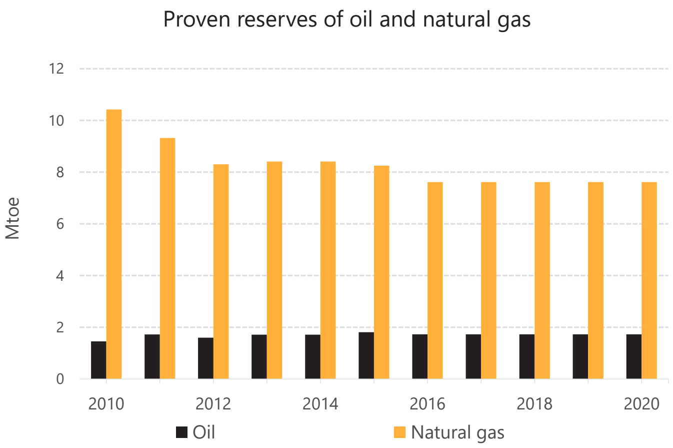




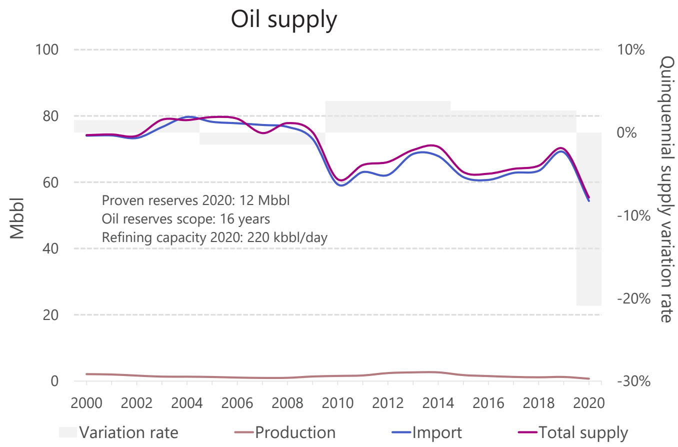
Installed power generation capacity [MW; %]
2020
Non-renewable Thermal; 12,875; 48.94%
Renewables; 13,435; 51.06%
Hydro; 6,814; 25.90%
Geothermal; 45; 0.17%
Solar; 3,575; 13.59%
Wind; 2,527; 9.60%
Renewable Thermal; 474; 1.80%



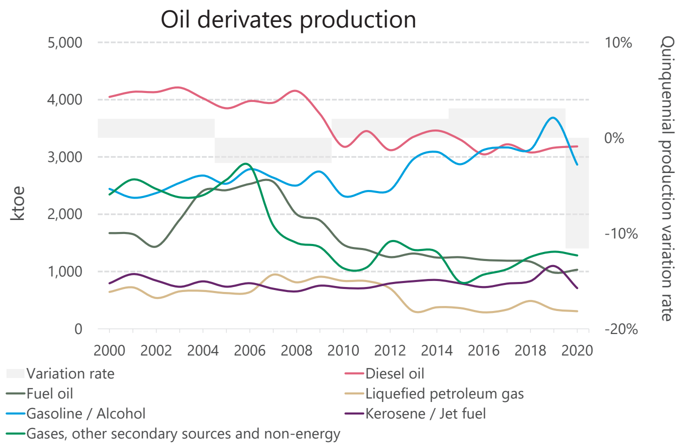
Electricity generation by source [GWh; %]
2020
Non-renewable Thermal; 40,034; 51.53%
Renewables; 37,661; 48.47%
Hydro; 20,632; 26.55%
Geothermal; 247; 0.32%
Solar; 7,615; 9.80%
Wind; 5,515; 7.10%
Renewable Thermal; 3,653; 4.70%



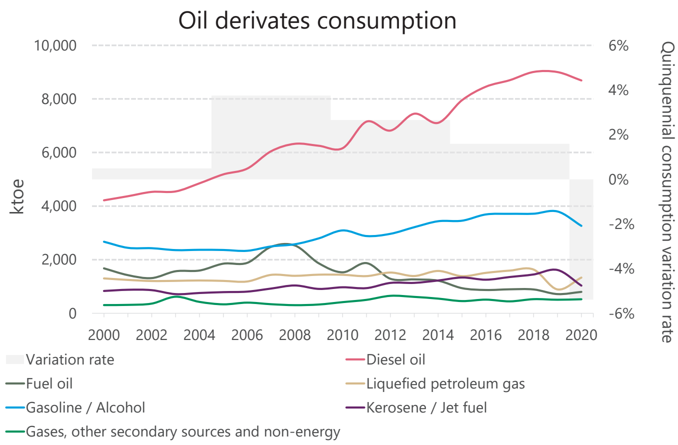
Proven reserves of oil and natural gas
Mtoe
Oil
Natural gas



Oil supply
Mbbl
Quinquennial supply variation rate
Proven reserves 2020: 12 Mbbl
Oil reserves scope: 16 years
Refining capacity 2020: 220 kbbl/day
Variation rate
Production
Import
Total supply

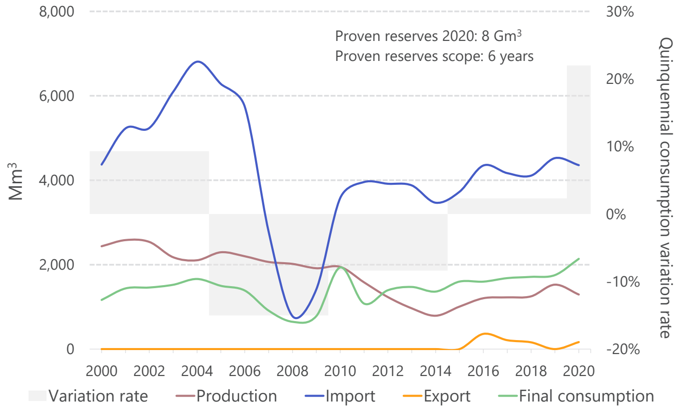


Oil derivates production
ktoe
Quinquennial production variation rate
Variation rate
Fuel oil
Gasoline / Alcohol
Gases, other secondary sources and non-energy
Diesel oil
Liquefied petroleum gas
Kerosene / Jet fuel

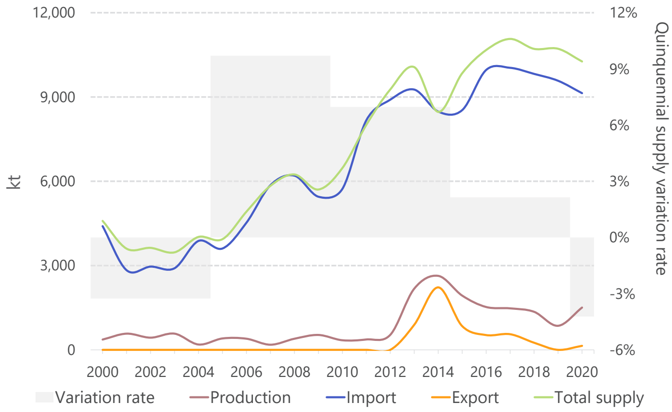


Oil derivates consumption
ktoe
Quinquennial consumption variation rate
Variation rate
Fuel oil
Gasoline / Alcohol
Gases, other secondary sources and non-energy
Diesel oil
Liquefied petroleum gas
Kerosene / Jet fuel

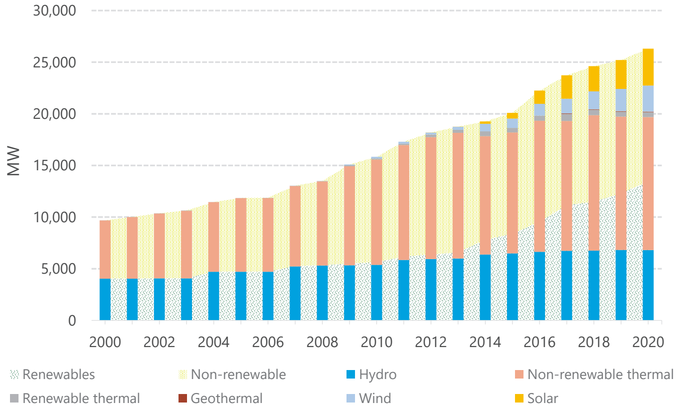
Natural gas supply



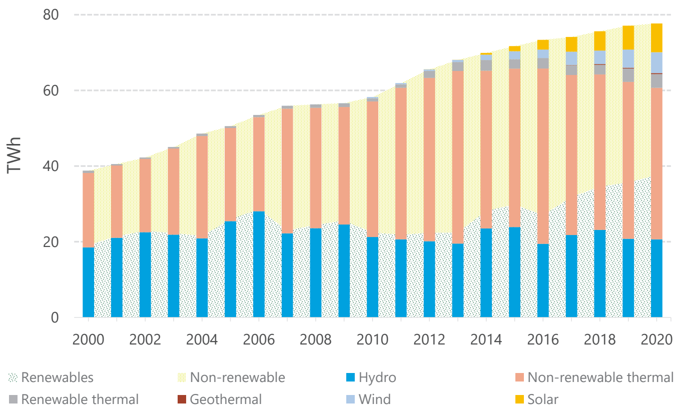
Coal Supply



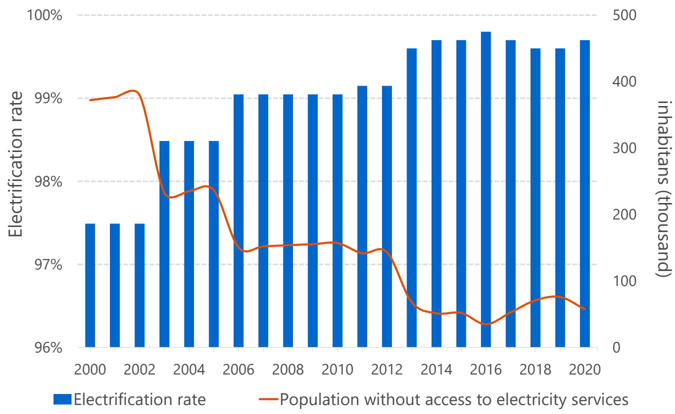
Installed power generation capacity



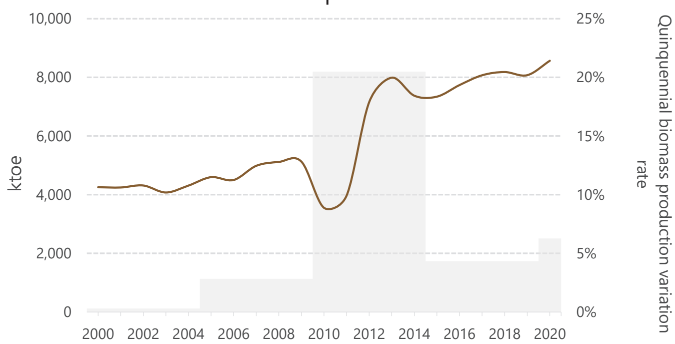
Power generation



Electrification rate



Biomass production*



(*): Includes firewood, biomass pellets and charcoal.
Note: The fall between 2009 and 2010 corresponds to a methodological change made by the country in the National Energy

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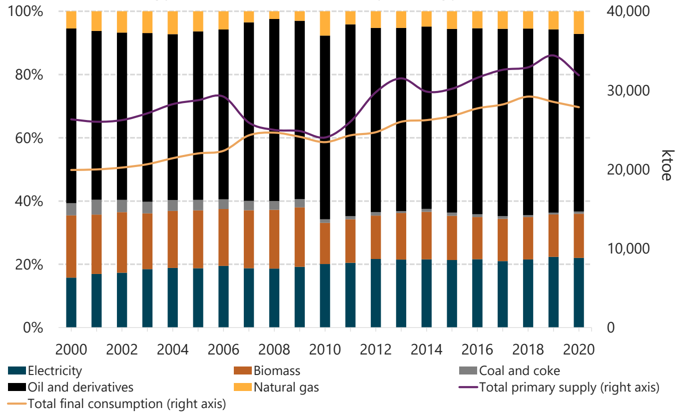
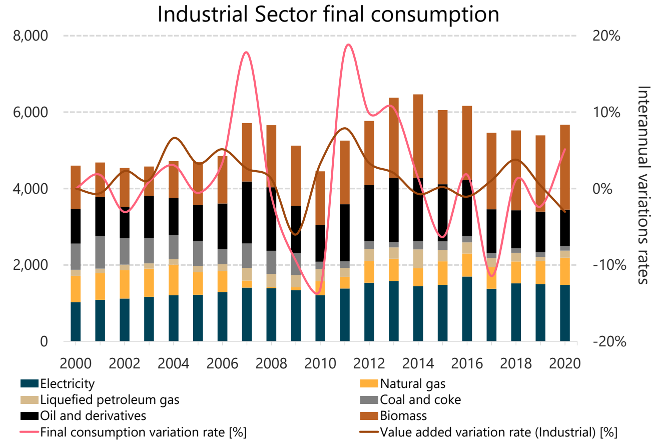
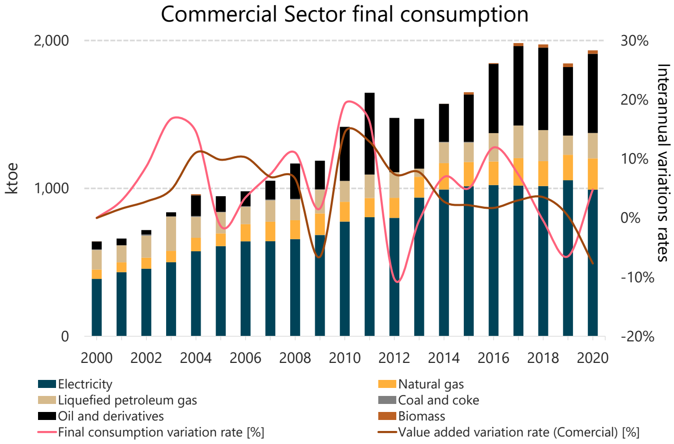
Energy final consumption by energy source



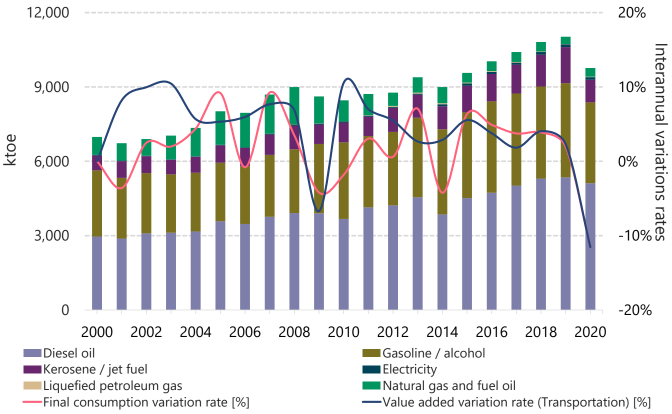
Industrial Sector final consumption



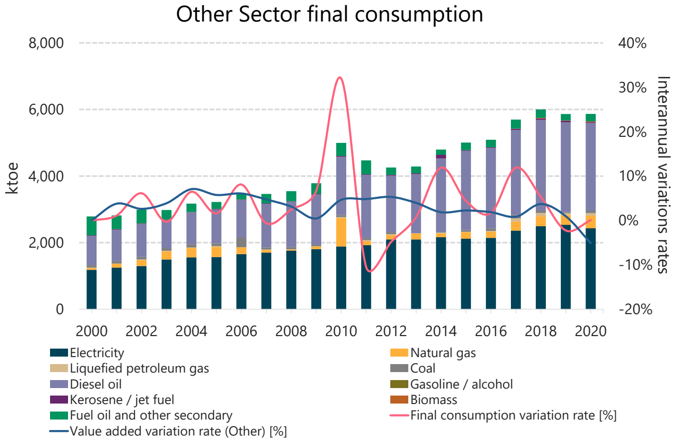
Commercial Sector final consumption



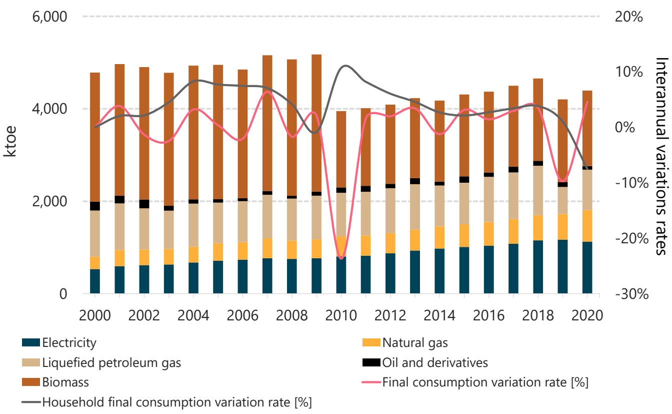
Transport Sector final consumption



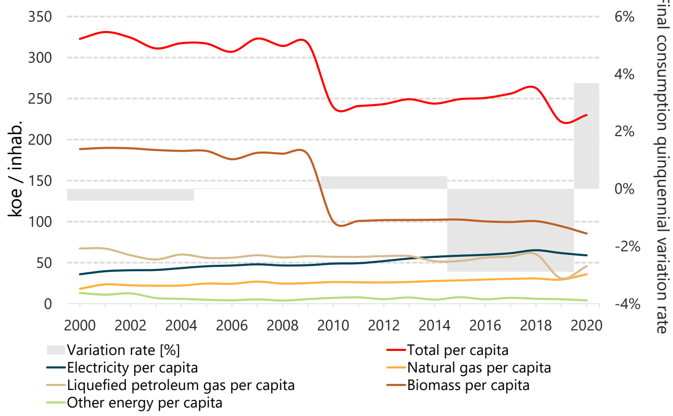
Other Sector final consumption



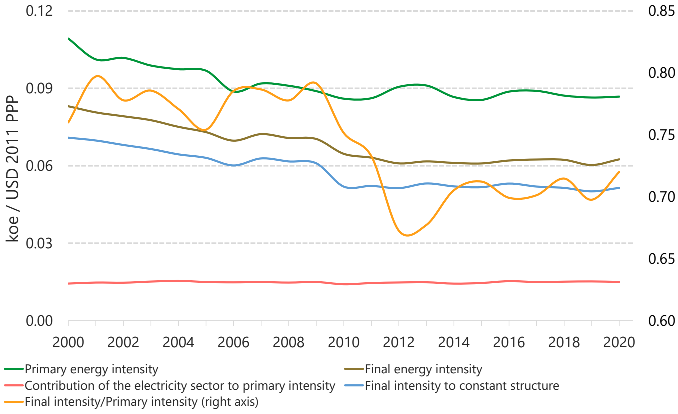
Residential Sector final consumption



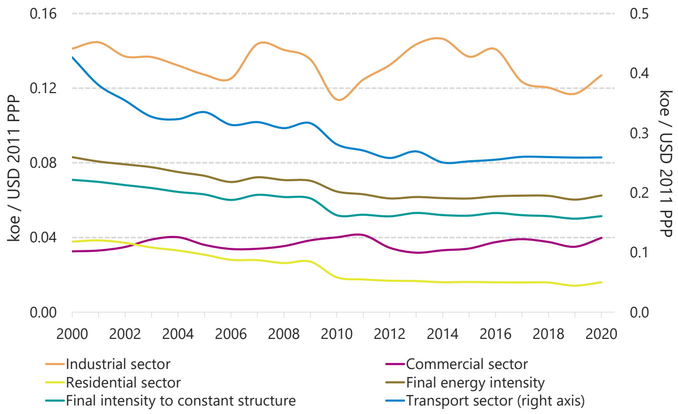
Final consumption per capita Residencial Sector



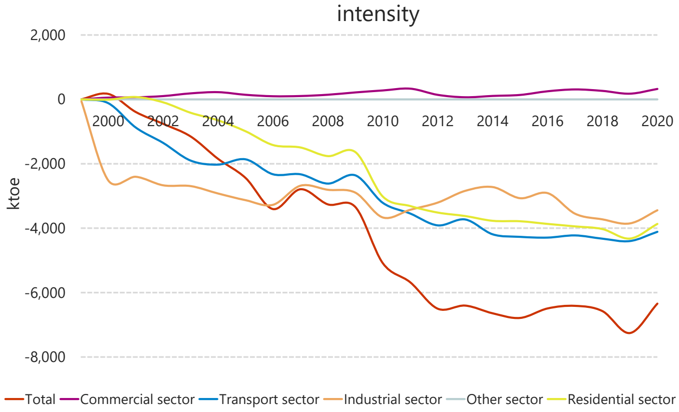
Energy intensities



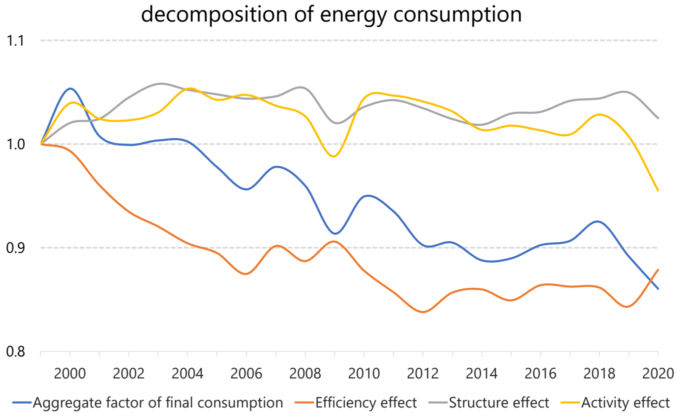
Sectoral energy intensities



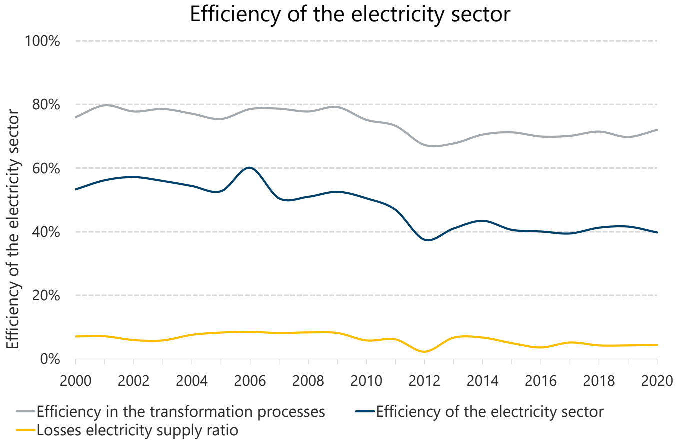
Avoided energy demand due to variations in energy intensity



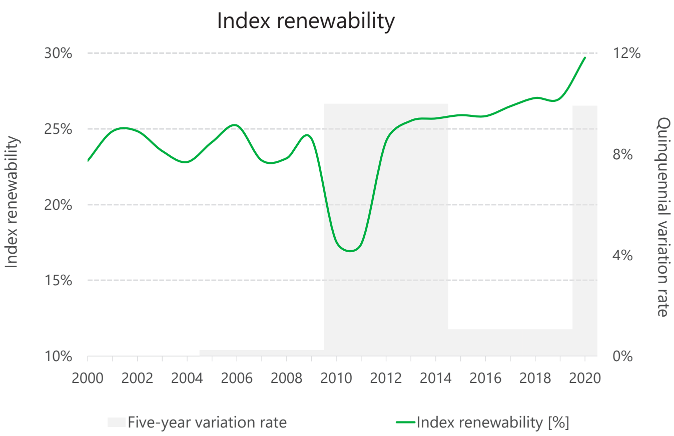
Logarithmic mean Divisia index for the structural decomposition of energy consumption

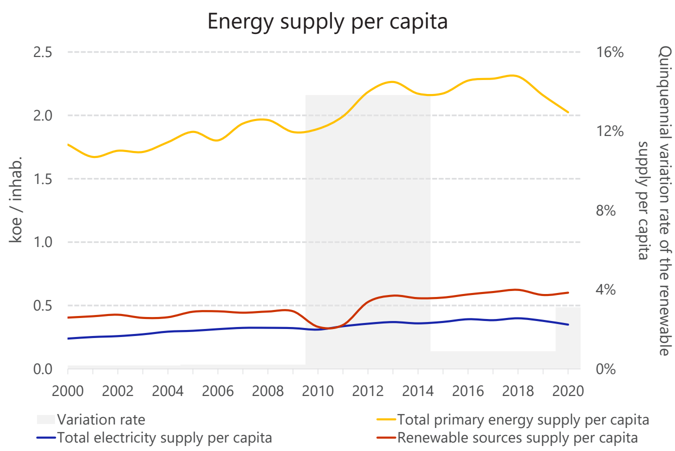


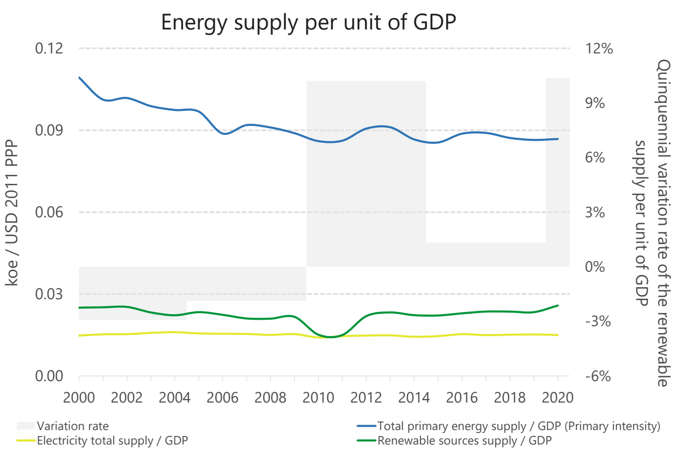
Efficiency of the electricity sector

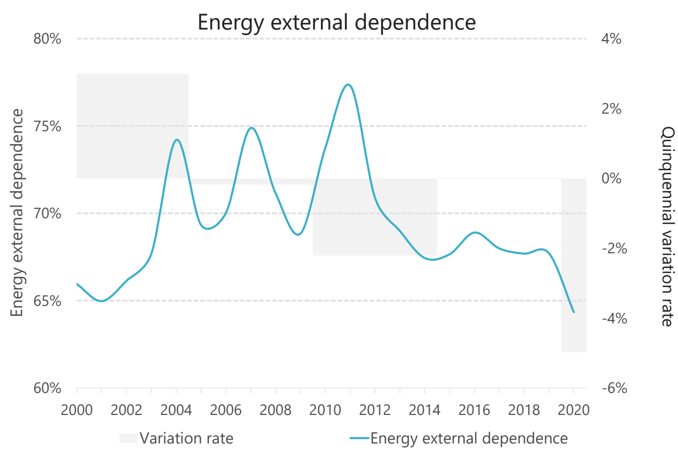


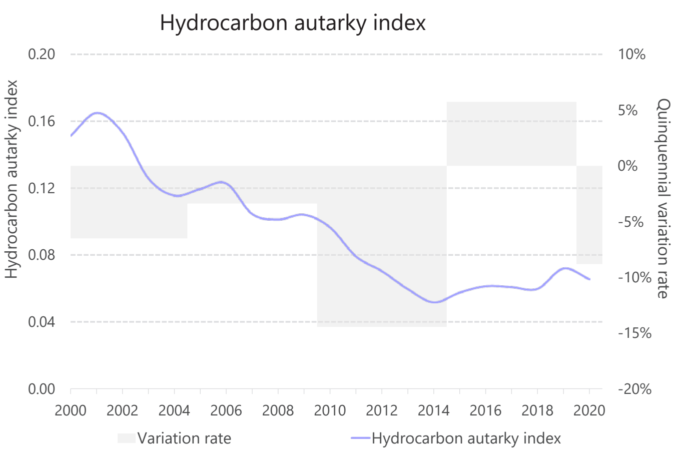
CHILE

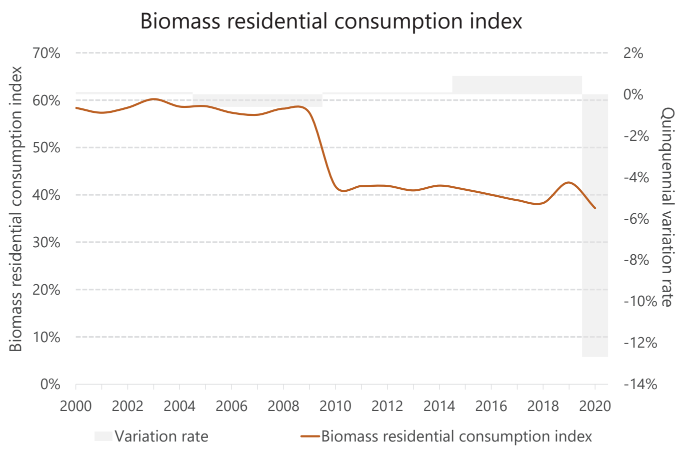

Index renewability
30%
25%
20%
15%
10%
Index renewability
12%
8%
4%
0%
Quinquennial variation rate
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Five-year variation rate
Index renewability [%]


Energy supply per capita
2.5
2.0
1.5
1.0
0.5
0.0
koe / inhab.
16%
12%
8%
4%
0%
Quinquennial variation rate of the renewable supply per capita
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Total electricity supply per capita
Total primary energy supply per capita
Renewable sources supply per capita

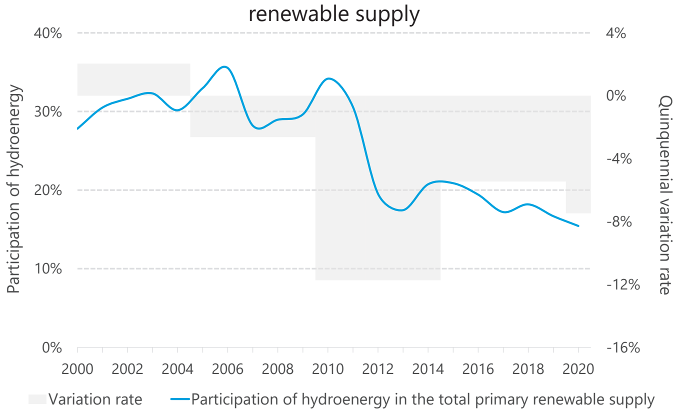

Energy supply per unit of GDP
0.12
0.09
0.06
0.03
0.00
koe / USD 2011 PPP
12%
9%
6%
3%
0%
-3%
-6%
Quinquennial variation rate of the renewable supply per unit of GDP
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Electricity total supply / GDP
Total primary energy supply / GDP (Primary intensity)
Renewable sources supply / GDP


Energy external dependence
80%
75%
70%
65%
60%
Energy external dependence
4%
2%
0%
-2%
-4%
-6%
Quinquennial variation rate
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Energy external dependence

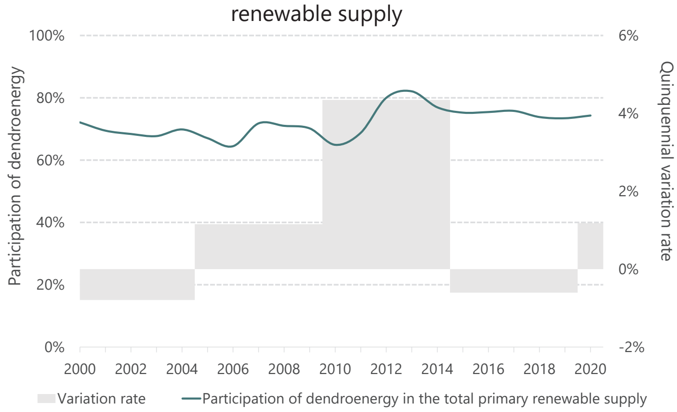

Hydrocarbon autarky index
0.20
0.16
0.12
0.08
0.04
0.00
Hydrocarbon autarky index
10%
5%
0%
-5%
-10%
-15%
-20%
Quinquennial variation rate
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Hydrocarbon autarky index


Biomass residential consumption index
70%
60%
50%
40%
30%
20%
10%
0%
Biomass residential consumption index
2%
0%
-2%
-4%
-6%
-8%
-10%
-12%
-14%
Quinquennial variation rate
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Biomass residential consumption index

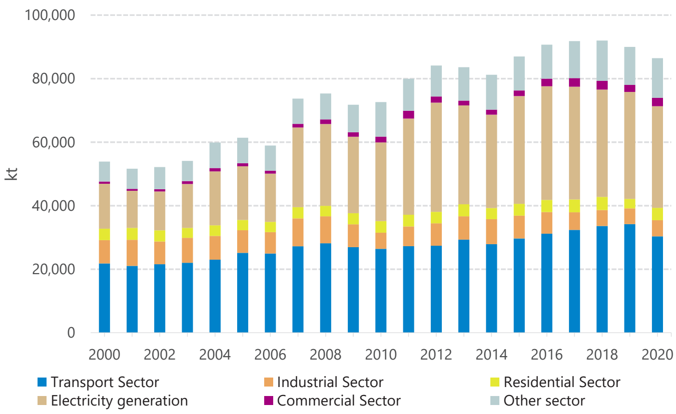
Participation of hydroenergy in the total primary renewable supply



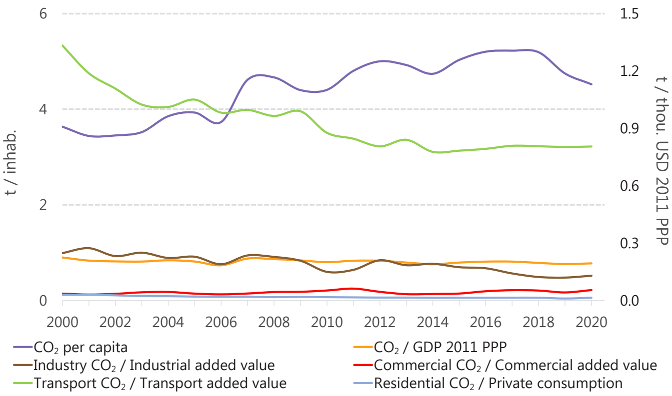
Participation of dendroenergy in the total primary renewable supply



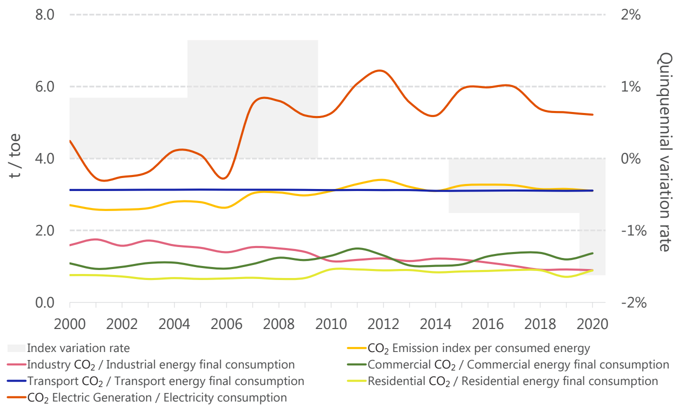
Evolution of CO_2 emissions by sector



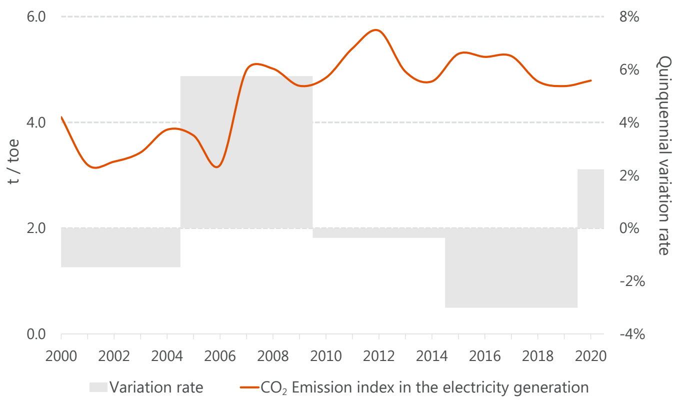
Evolution of CO_2 emissions per capita and per unit of GDP

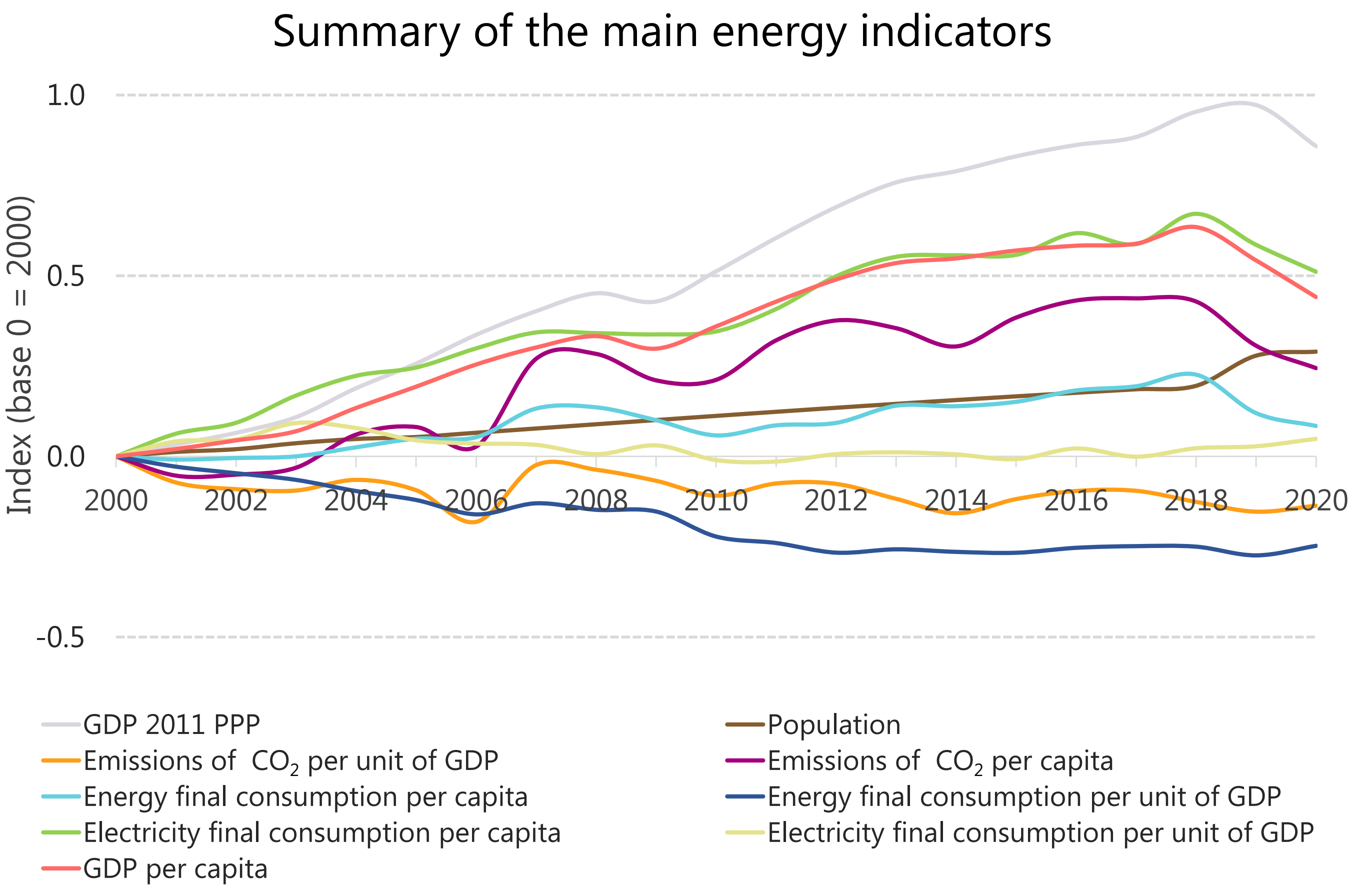


CO_2 Emission index per consumed energy



CO_2 Emission index of electricity generation





Summary of the main energy indicators
1.0
0.5
0.0
-0.5
Index (base 0 = 2000)
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

COLOMBIA

General Information 2020

Population (thousand inhab.)	50,883 [1]
Area (km^2)	1,141,749
Population Density (inhab. / km^2)	45
Urban Population (%)	81
GDP USD 2010 (MUSD)	368,007 [1]
GDP USD 2011 PPP (MUSD)	683,942 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	13

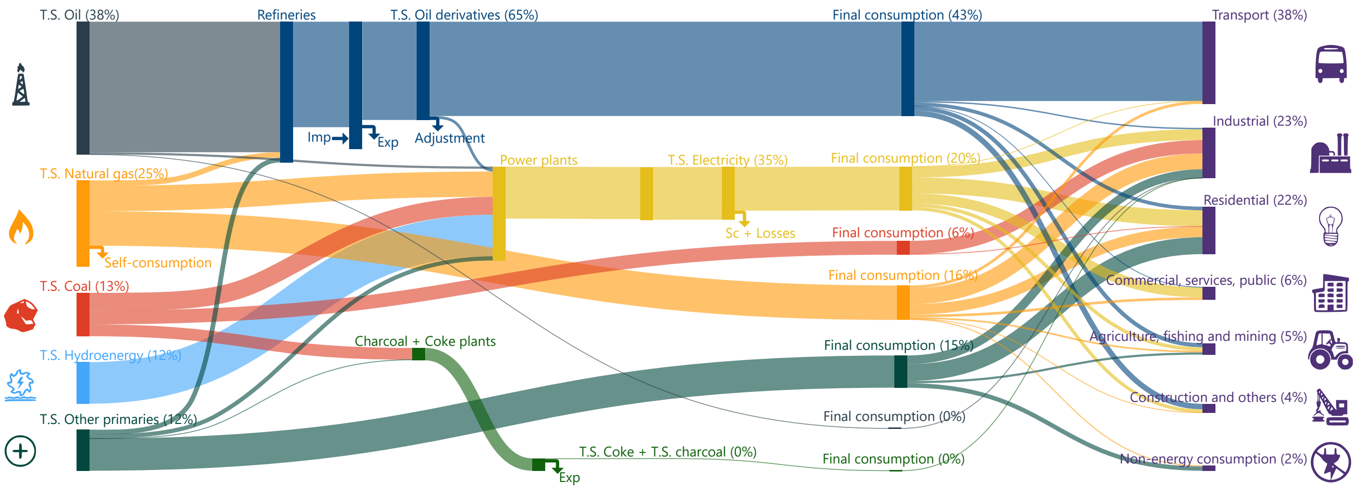
Energy Sector 2020

Final consumption in the Transport Sector	Mtep	10.78
Final consumption in the Industrial Sector	Mtep	6.59
Final consumption in the Residential Sector	Mtep	6.23
Final consumption in the Commercial and Service Sector	Mtep	1.71
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	3.37
Oil Reserves	Mbbl	1,816
Natural gas Reserves	Gm^3	84
Coal Reserves	Mt	5,862 [4]

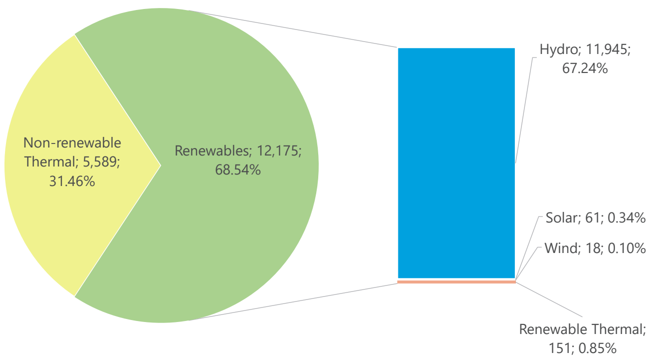
[1] Source: ECLAC.
[2] Source: World Bank.
[3] Data corresponding to the year 2019.
[4] Data estimated by OLADE.

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
1,311	0.56	96.81 [3]	42.82	107.00	3.40	81.01	28.68	363	17.76	0.06 / 0.04
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

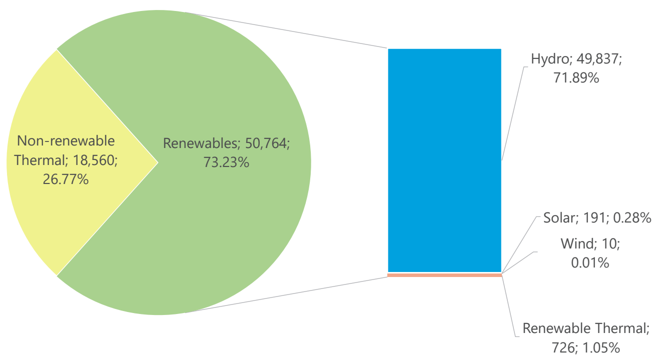
Summarized energy balance 2020



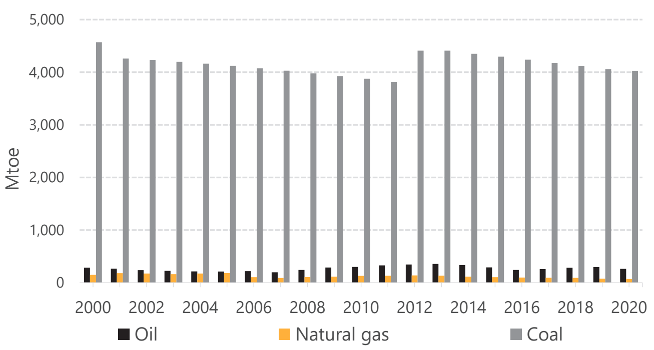
Installed power generation capacity [MW; %]
2020



Electricity generation by source [GWh; %]
2020

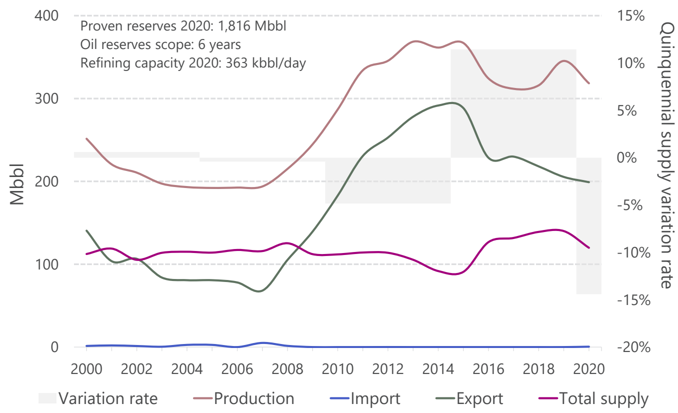


Proven reserves of oil, natural gas and coal

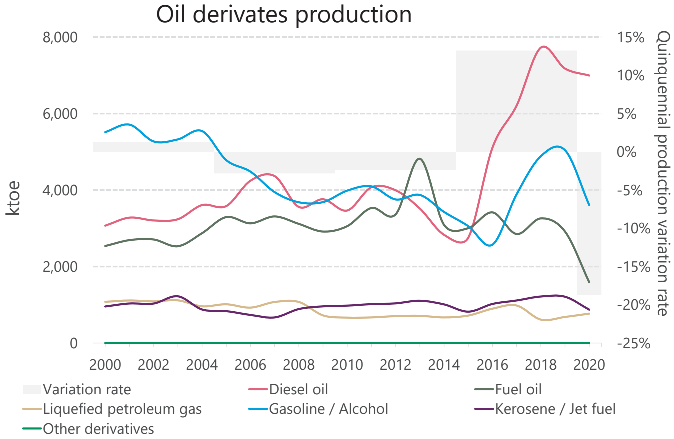


Data on proven mineral coal reserves for the period 2017 - 2020 correspond to estimates made by OLADE.

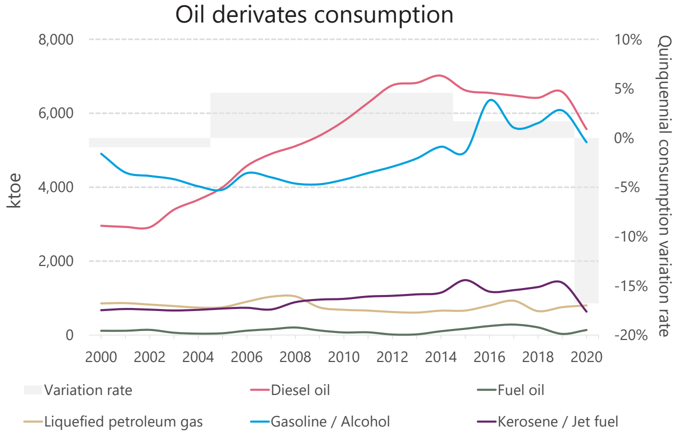
Oil supply

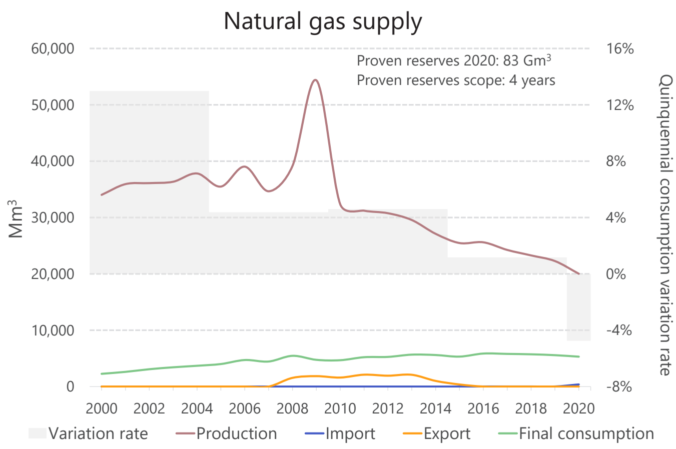


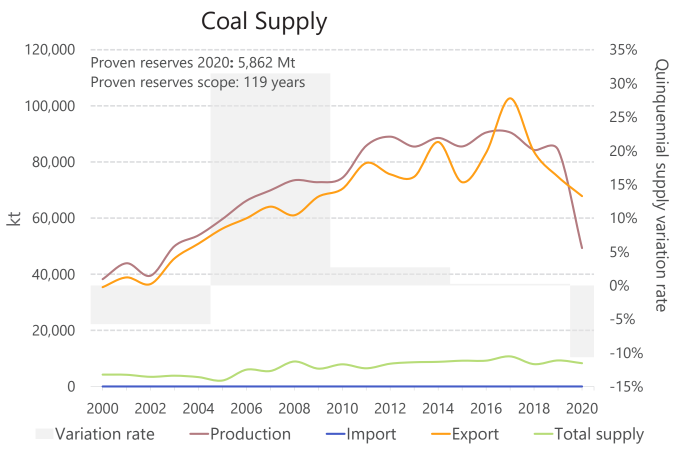
Oil derivates production

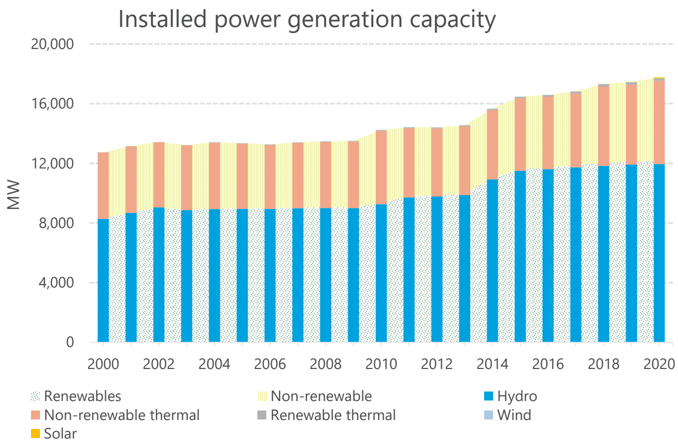


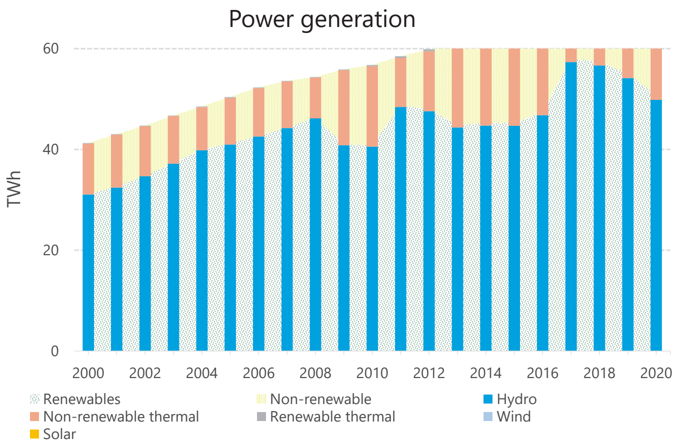
Oil derivates consumption

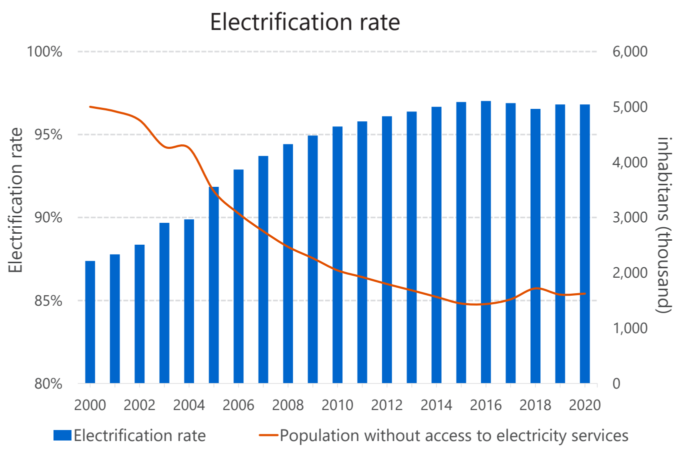


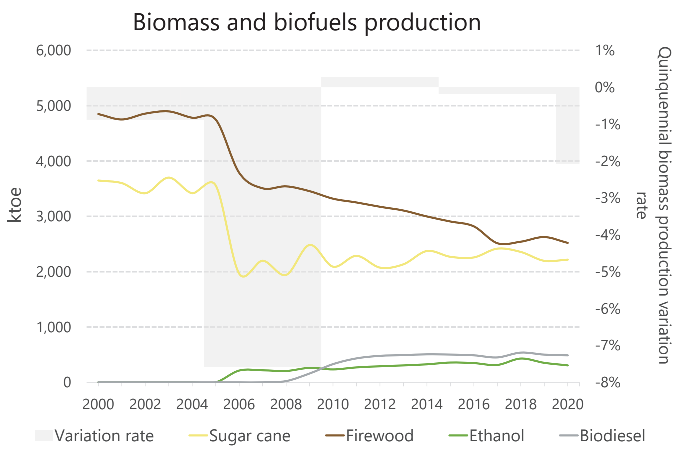

Natural gas supply
Proven reserves 2020: 83 Gm³
Proven reserves scope: 4 years
Mm³
Quinquennial consumption variation rate
60,000
50,000
40,000
30,000
20,000
10,000
0
16%
12%
8%
4%
0%
-4%
-8%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Production
Import
Export
Final consumption


Coal Supply
Proven reserves 2020: 5,862 Mt
Proven reserves scope: 119 years
kt
Quinquennial supply variation rate
120,000
100,000
80,000
60,000
40,000
20,000
0
35%
30%
25%
20%
15%
10%
5%
0%
-5%
-10%
-15%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Production
Import
Export
Total supply

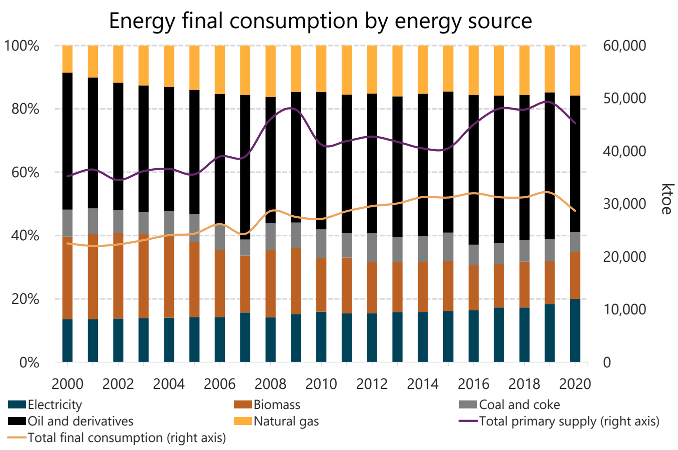

Installed power generation capacity
MW
20,000
16,000
12,000
8,000
4,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Wind
Solar


Power generation
TWh
60
40
20
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Wind
Solar

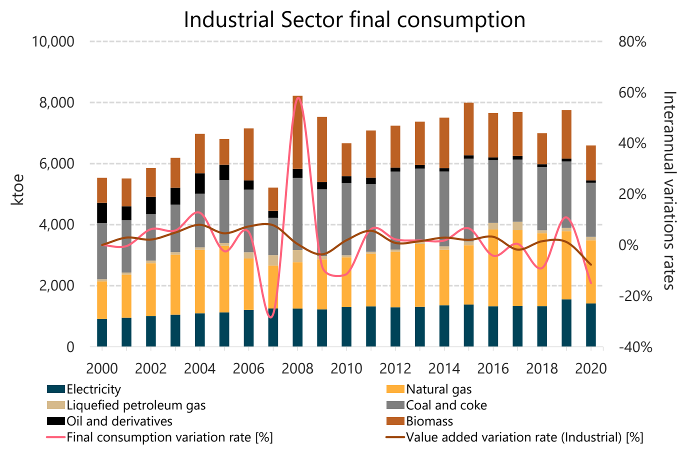

Electrification rate
Electrification rate
inhabitans (thousand)
100%
95%
90%
85%
80%
6,000
5,000
4,000
3,000
2,000
1,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electrification rate
Population without access to electricity services


Biomass and biofuels production
ktoe
Quinquennial biomass production variation rate
6,000
5,000
4,000
3,000
2,000
1,000
0
1%
0%
-1%
-2%
-3%
-4%
-5%
-6%
-7%
-8%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Sugar cane
Firewood
Ethanol
Biodiesel

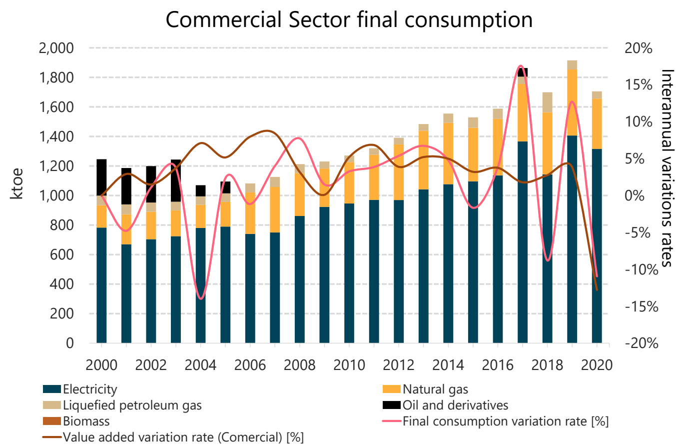
COLOMBIA



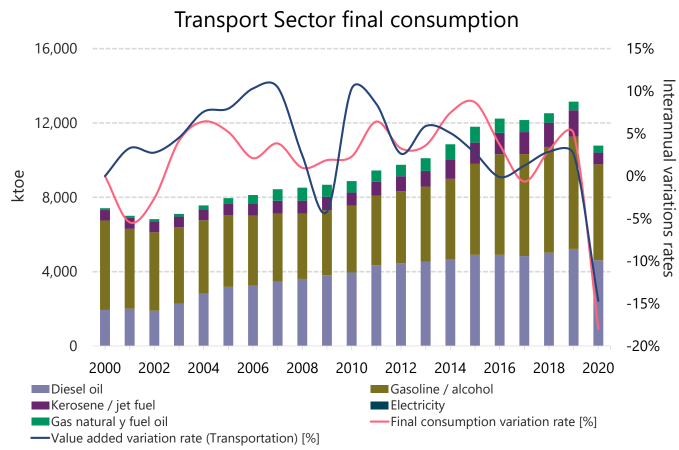
Energy final consumption by energy source
ktoe
Electricity
Biomass
Coal and coke
Oil and derivatives
Natural gas
Total primary supply (right axis)
Total final consumption (right axis)



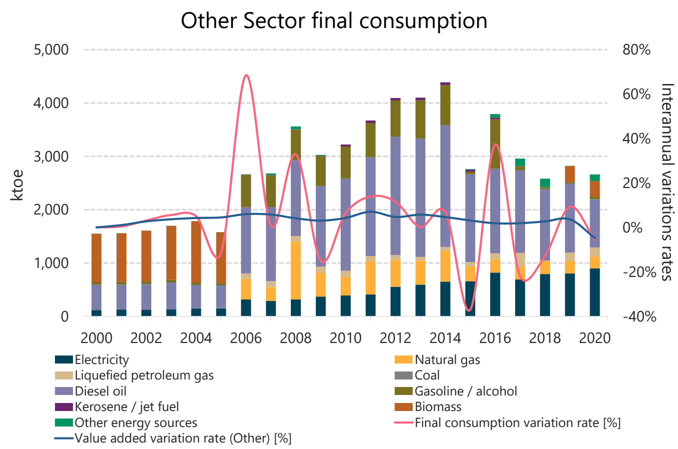
Industrial Sector final consumption
ktoe
Interannual variations rates
Electricity
Natural gas
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]



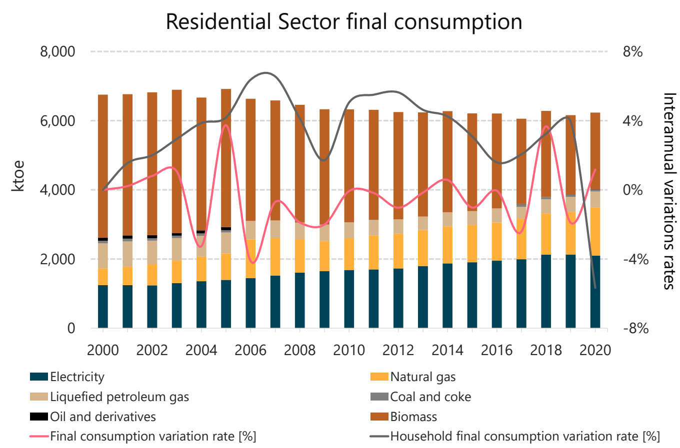
Commercial Sector final consumption
ktoe
Interannual variations rates
Electricity
Natural gas
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]



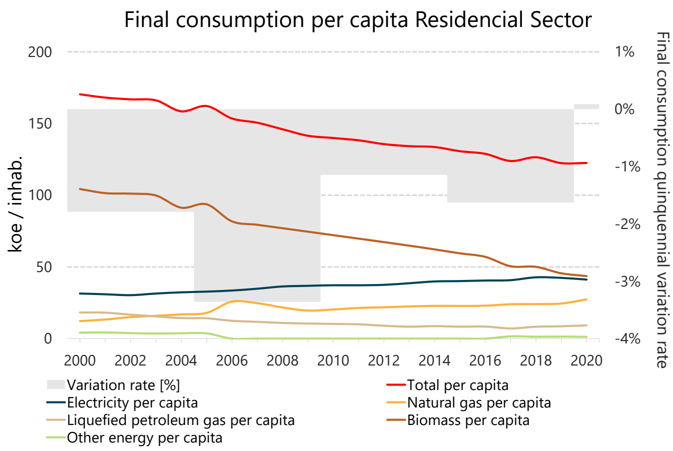
Transport Sector final consumption
ktoe
Interannual variations rates
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Electricity
Gas natural y fuel oil
Final consumption variation rate [%]
Value added variation rate (Transportation) [%]

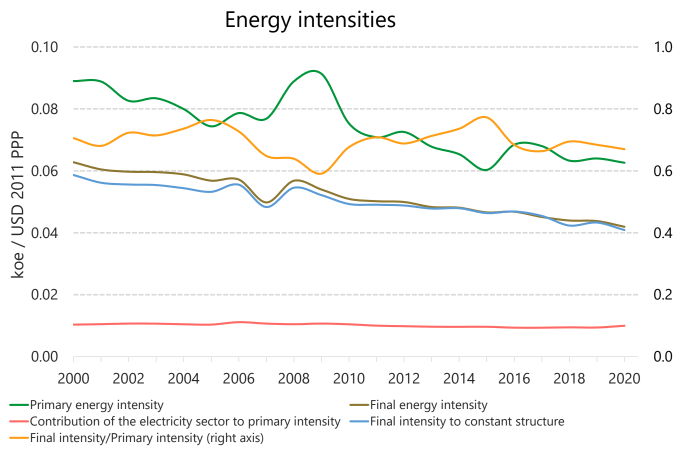


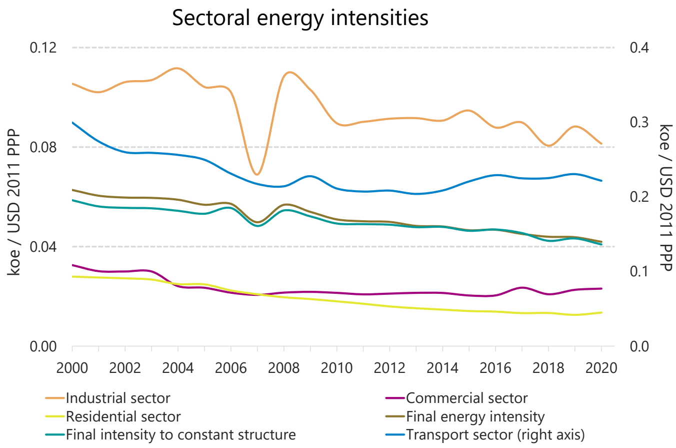
Other Sector final consumption
ktoe
Interannual variations rates
Electricity
Natural gas
Liquefied petroleum gas
Coal
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Biomass
Other energy sources
Final consumption variation rate [%]
Value added variation rate (Other) [%]

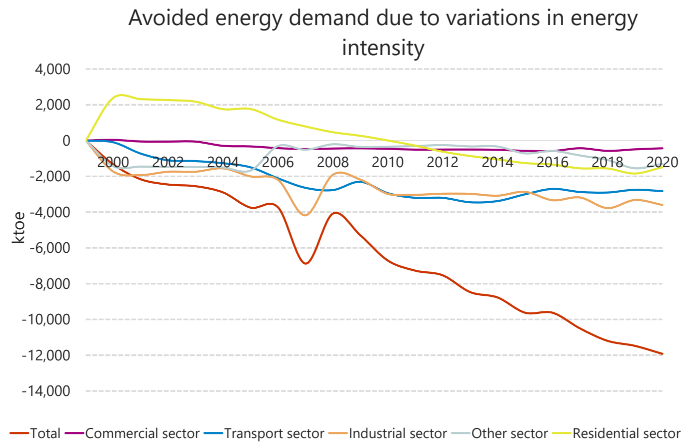


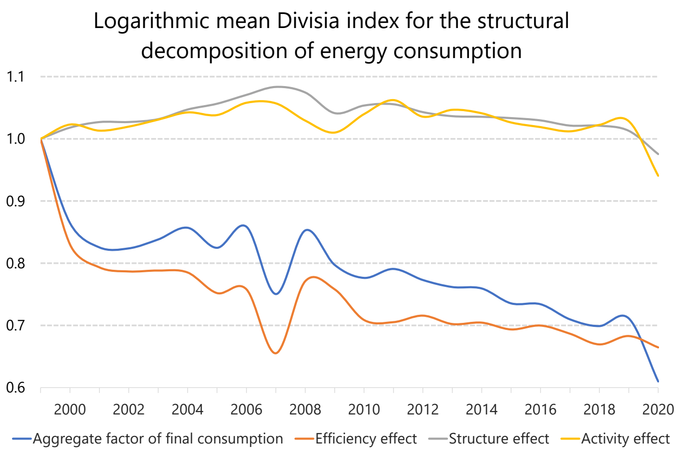
Residential Sector final consumption
ktoe
Interannual variations rates
Electricity
Natural gas
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Household final consumption variation rate [%]

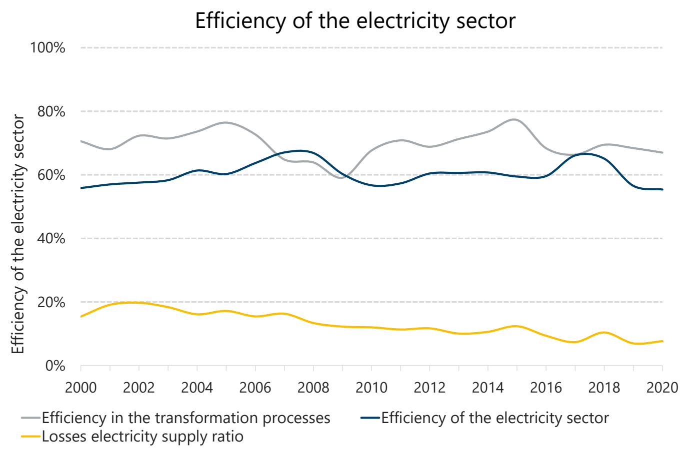

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
200
150
100
50
0
1%
0%
-1%
-2%
-3%
-4%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate [%]
Total per capita
Electricity per capita
Natural gas per capita
Liquefied petroleum gas per capita
Biomass per capita
Other energy per capita

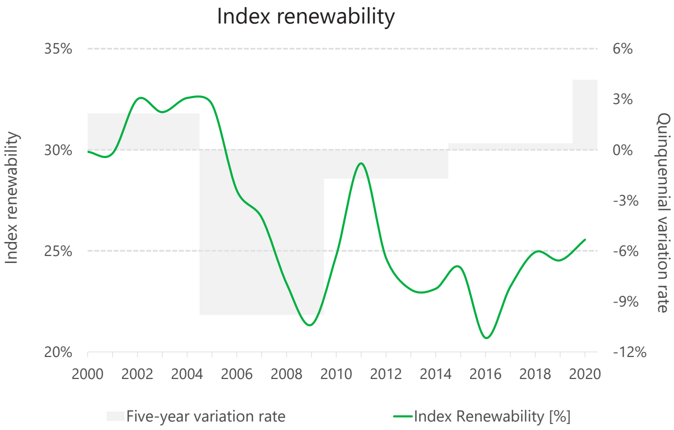

Energy intensities
koe / USD 2011 PPP
0.10
0.08
0.06
0.04
0.02
0.00
1.0
0.8
0.6
0.4
0.2
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

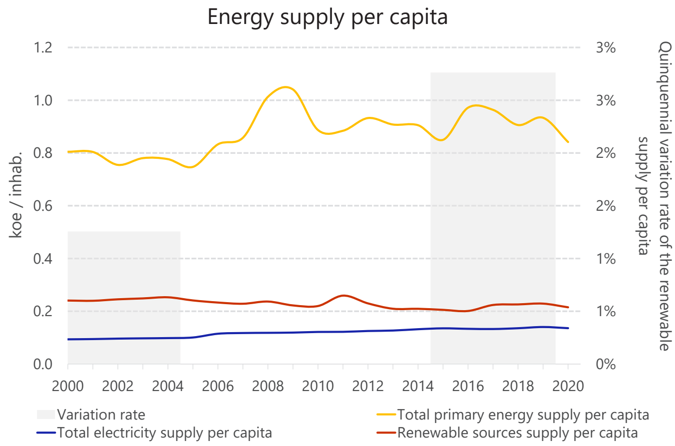

Sectoral energy intensities
koe / USD 2011 PPP
koe / USD 2011 PPP
0.12
0.08
0.04
0.00
0.4
0.3
0.2
0.1
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)

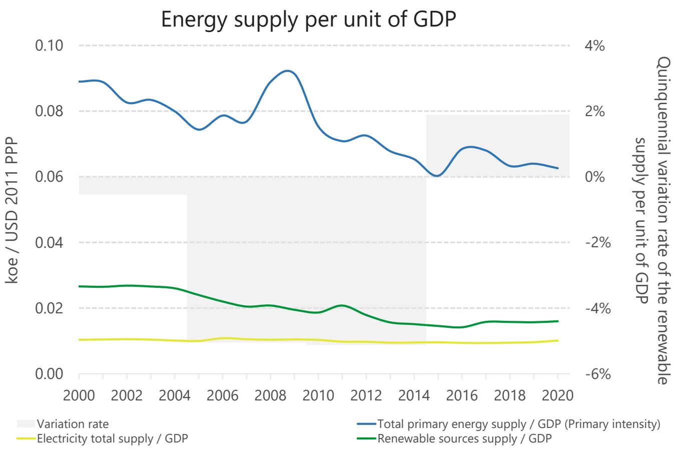

Avoided energy demand due to variations in energy intensity
ktoe
4,000
2,000
0
-2,000
-4,000
-6,000
-8,000
-10,000
-12,000
-14,000
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

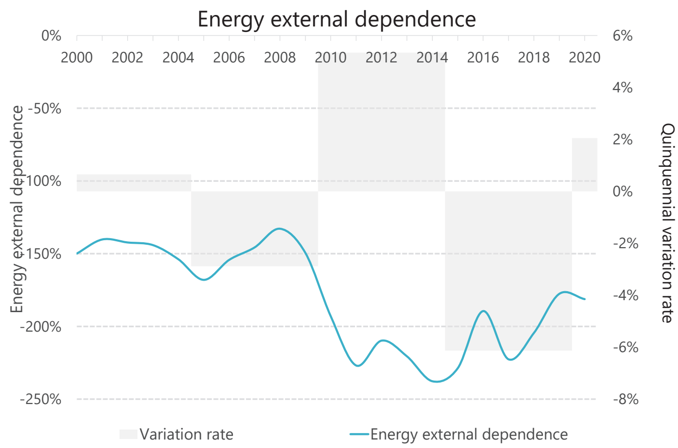

Logarithmic mean Divisia index for the structural decomposition of energy consumption
1.1
1.0
0.9
0.8
0.7
0.6
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect

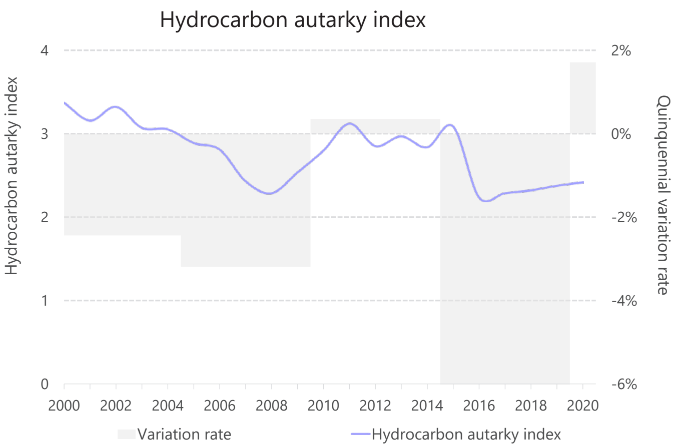

Efficiency of the electricity sector
Efficiency of the electricity sector
100%
80%
60%
40%
20%
0%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

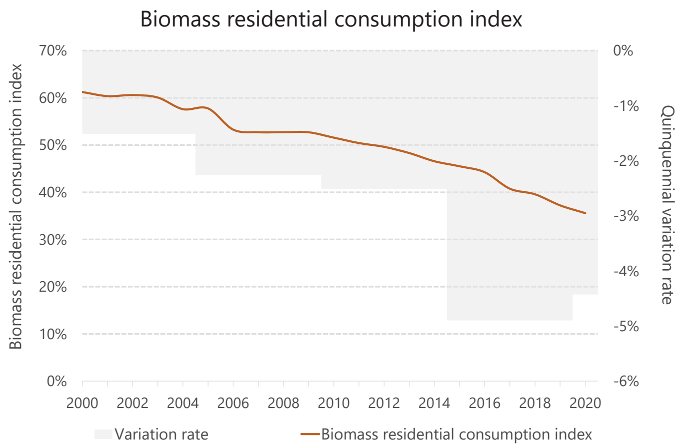

Index renewability
Index renewability
Quinquennial variation rate
35%
30%
25%
20%
6%
3%
0%
-3%
-6%
-9%
-12%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Five-year variation rate
Index Renewability [%]


Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
1.2
1.0
0.8
0.6
0.4
0.2
0.0
3%
3%
2%
2%
1%
1%
0%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Total electricity supply per capita
Total primary energy supply per capita
Renewable sources supply per capita

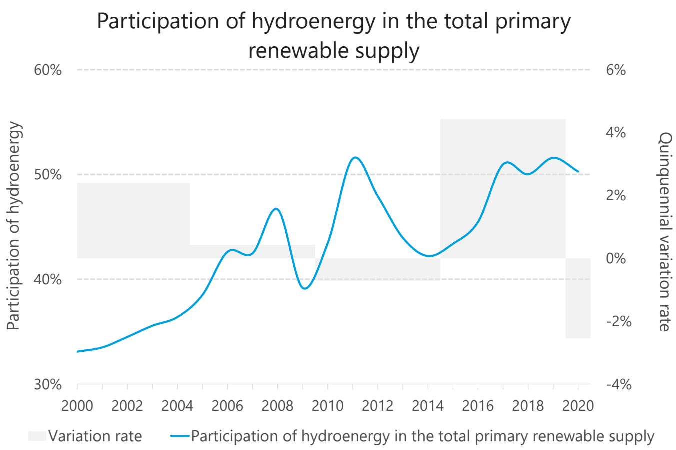

Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
0.10
0.08
0.06
0.04
0.02
0.00
4%
2%
0%
-2%
-4%
-6%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Electricity total supply / GDP
Total primary energy supply / GDP (Primary intensity)
Renewable sources supply / GDP


Energy external dependence
Energy external dependence
Quinquennial variation rate
0%
-50%
-100%
-150%
-200%
-250%
6%
4%
2%
0%
-2%
-4%
-6%
-8%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Energy external dependence

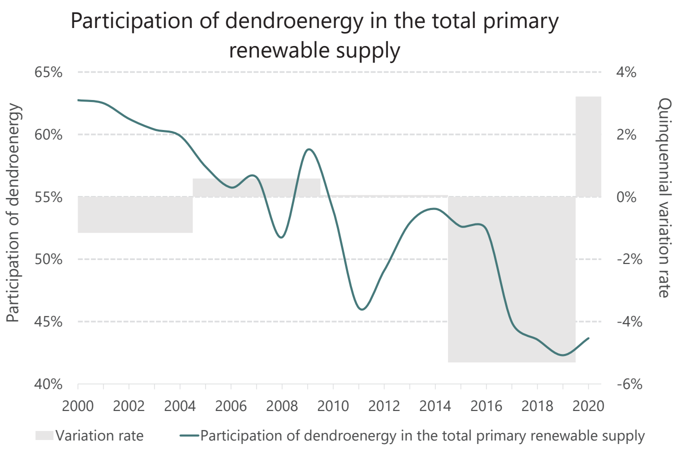

Hydrocarbon autarky index
Hydrocarbon autarky index
Quinquennial variation rate
4
3
2
1
0
2%
0%
-2%
-4%
-6%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Hydrocarbon autarky index


Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
70%
60%
50%
40%
30%
20%
10%
0%
0%
-1%
-2%
-3%
-4%
-5%
-6%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Biomass residential consumption index

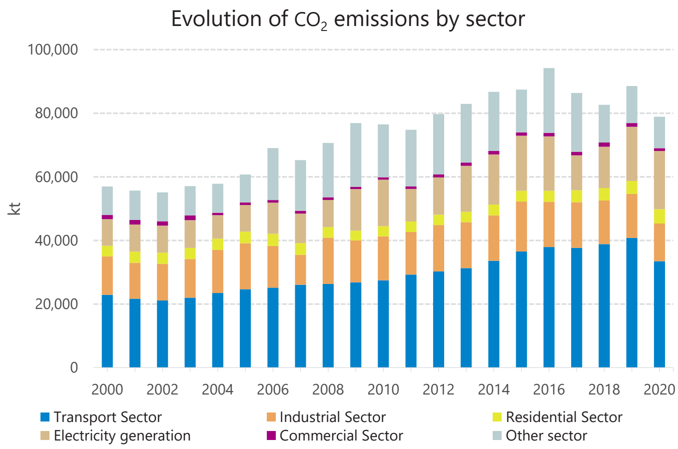
COLOMBIA



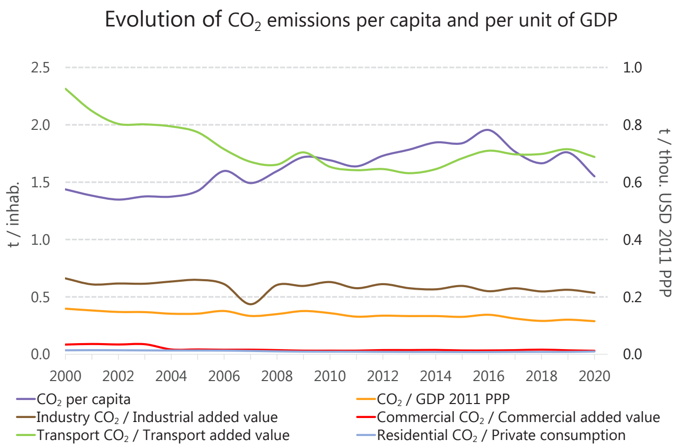
Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
60%
50%
40%
30%
6%
4%
2%
0%
-2%
-4%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Participation of hydroenergy in the total primary renewable supply



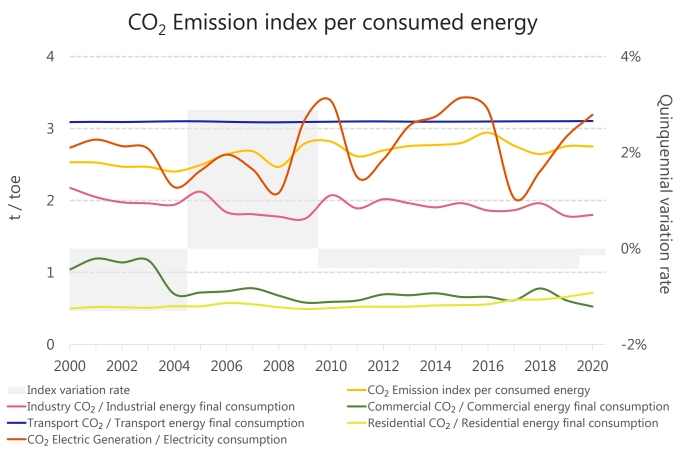
Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
65%
60%
55%
50%
45%
40%
4%
2%
0%
-2%
-4%
-6%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Participation of dendroenergy in the total primary renewable supply



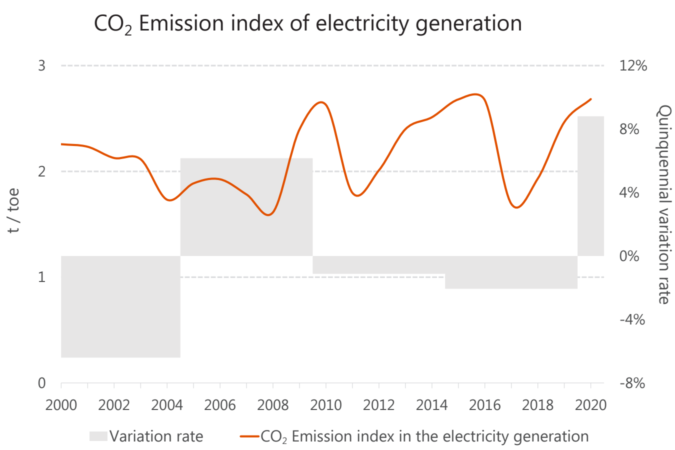
Evolution of CO_2 emissions by sector
kt
100,000
80,000
60,000
40,000
20,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector



Evolution of CO_2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
2.5
2.0
1.5
1.0
0.5
0.0
1.0
0.8
0.6
0.4
0.2
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
CO_2 per capita
CO_2 / GDP 2011 PPP
Industry CO_2 / Industrial added value
Commercial CO_2 / Commercial added value
Transport CO_2 / Transport added value
Residential CO_2 / Private consumption

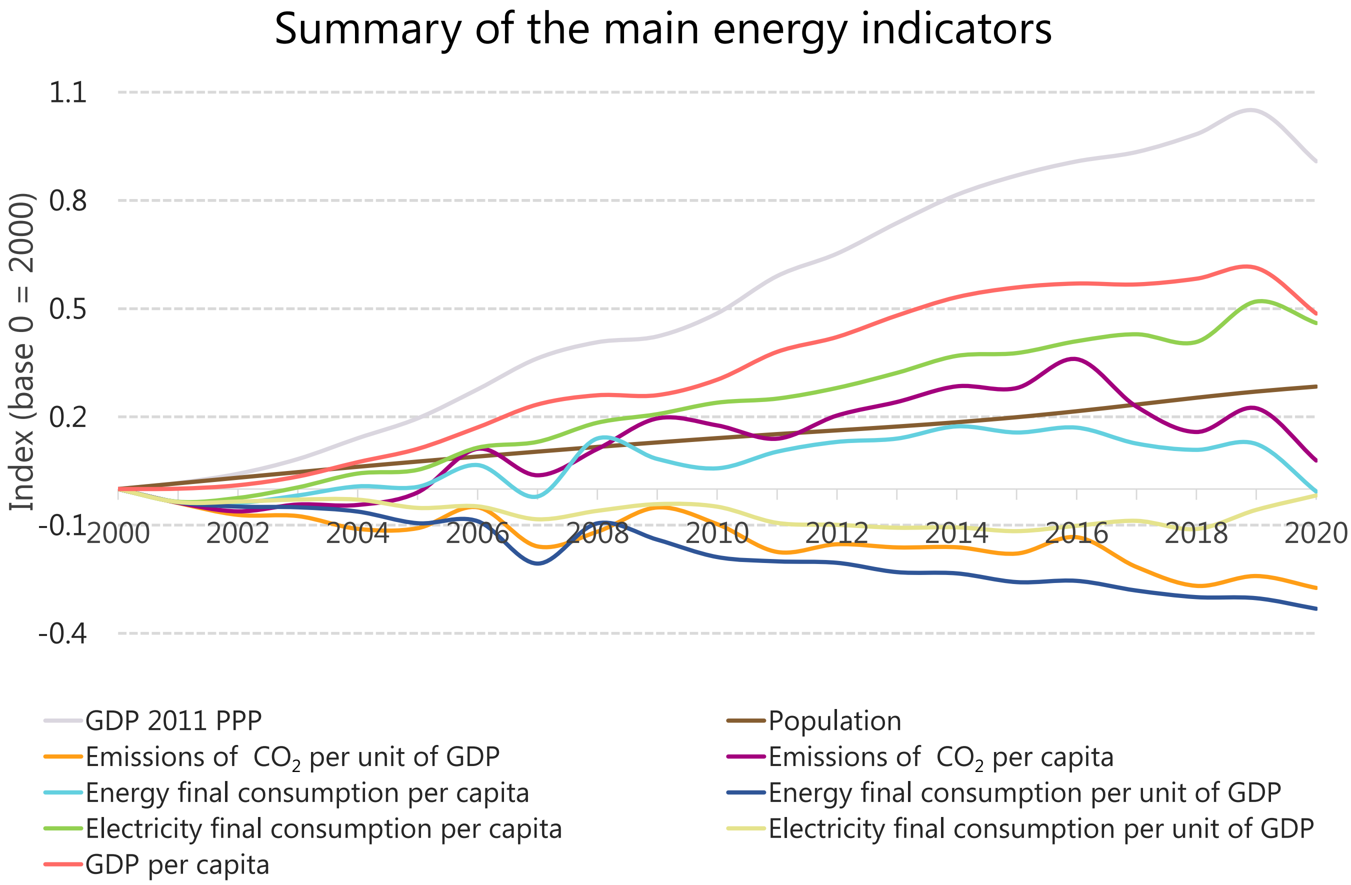


CO_2 Emission index per consumed energy
t / toe
Quinquennial variation rate
4
3
2
1
0
4%
2%
0%
-2%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Index variation rate
CO_2 Emission index per consumed energy
Industry CO_2 / Industrial energy final consumption
Commercial CO_2 / Commercial energy final consumption
Transport CO_2 / Transport energy final consumption
Residential CO_2 / Residential energy final consumption
CO_2 Electric Generation / Electricity consumption



CO_2 Emission index of electricity generation
t / toe
Quinquennial variation rate
3
2
1
0
12%
8%
4%
0%
-4%
-8%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
CO_2 Emission index in the electricity generation

COLOMBIA


Summary of the main energy indicators
Index (base 0 = 2000)
1.1
0.8
0.5
0.2
-0.1
-0.4
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

COLOMBIA

COSTA RICA

General Information 2020

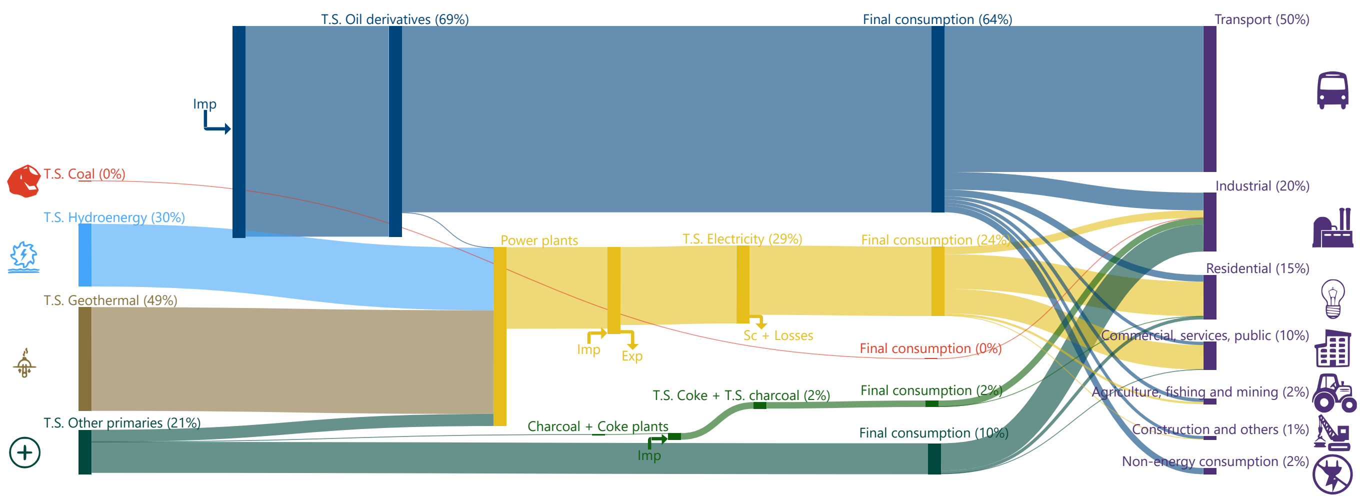
Population (thousand inhab.)	5,094
Area (km^2)	51,100
Population Density (inhab. / km^2)	100
Urban Population (%)	81
GDP USD 2010 (MUSD)	49,561
GDP USD 2011 PPP (MUSD)	100,249
GDP per capita (thou. USD 2011 PPP / inhab.)	20

Energy Sector 2020

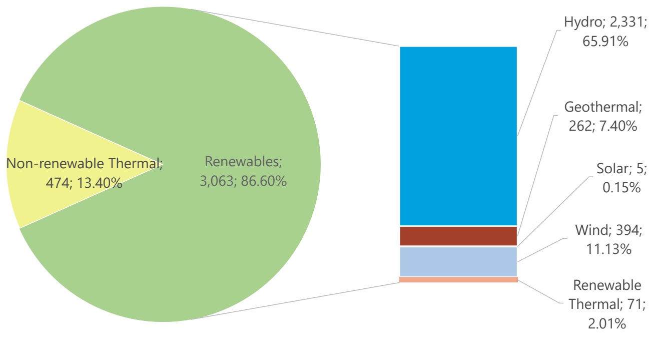
Final consumption in the Transport Sector	Mtep	1.81
Final consumption in the Industrial Sector	Mtep	0.73
Final consumption in the Residential Sector	Mtep	0.55
Final consumption in the Commercial and Service Sector	Mtep	0.35
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	0.19
Oil Reserves	Mbbl	n.a.
Natural gas Reserves	Gm^3	n.a.
Coal Reserves	Mt	32.80

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
1,961	0.71	99.40	4.95	3.35	2.75	0.12	3.63	n.a.	3.54	0.05 / 0.04
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

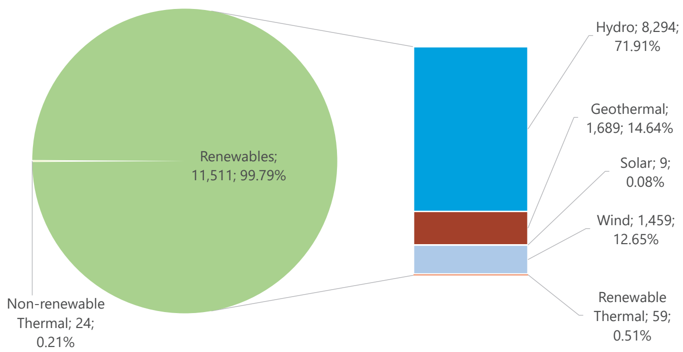
Summarized energy balance 2020



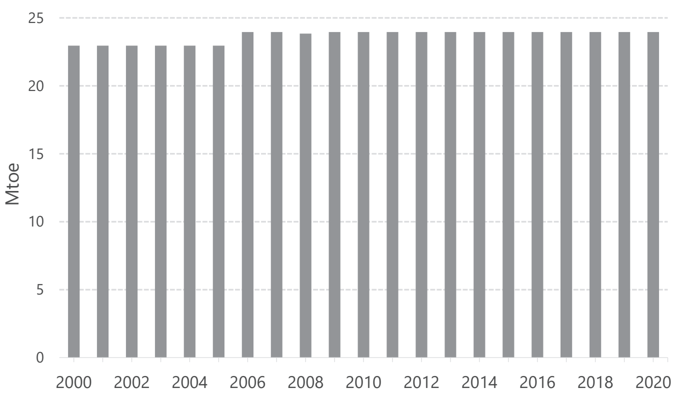
Installed power generation capacity [MW; %]
2020



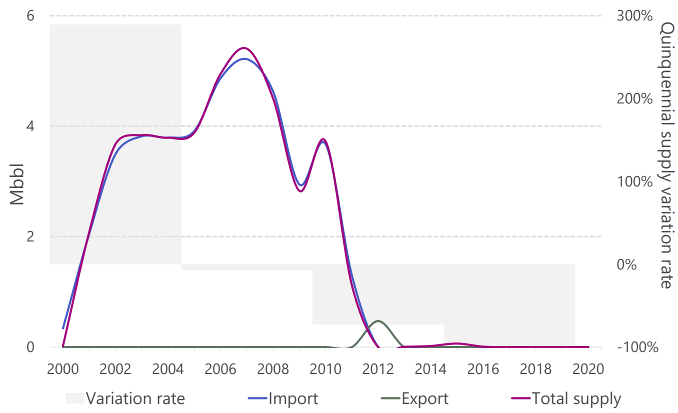
Electricity generation by source [GWh; %]
2020



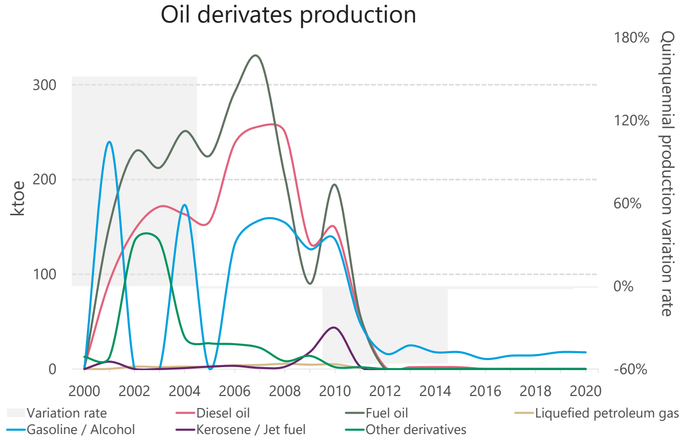
Proven reserves of coal



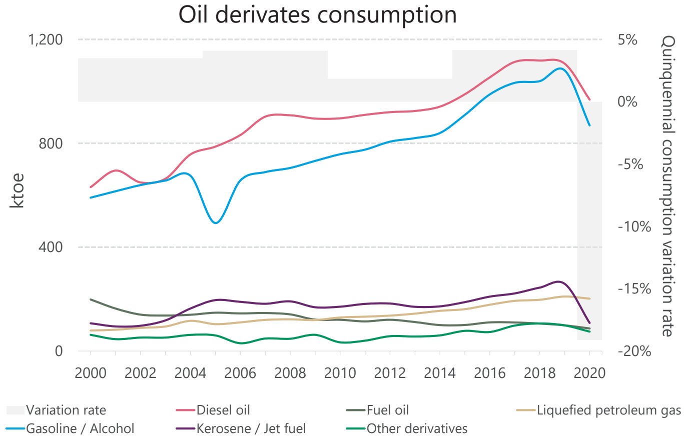
Oil supply



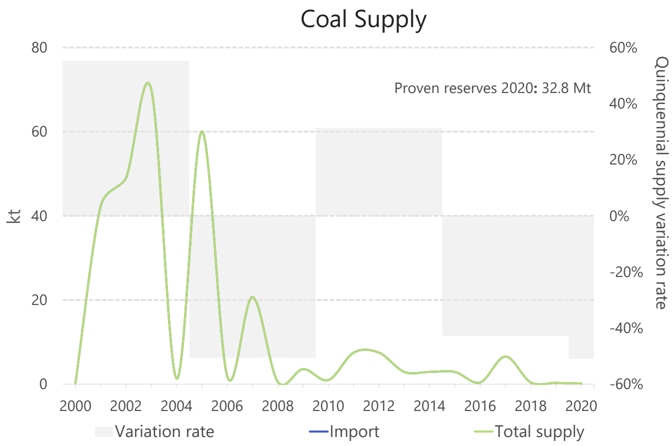
Oil derivates production

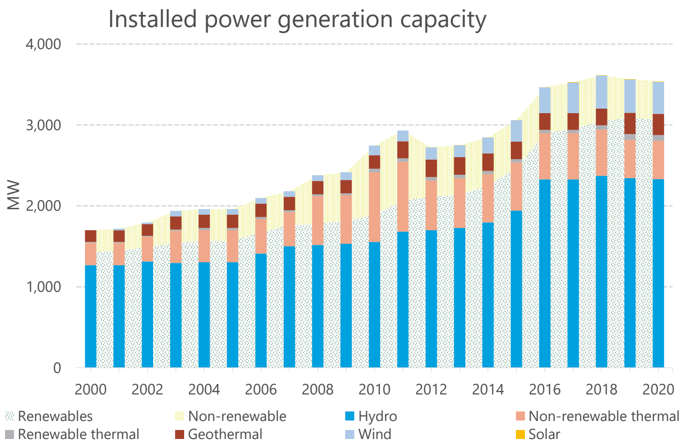


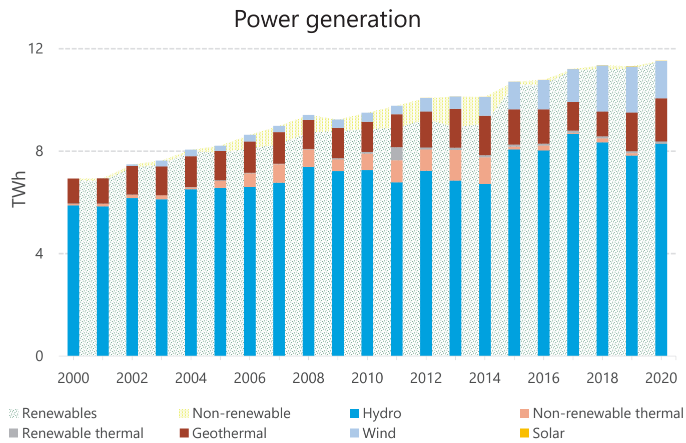
Oil derivates consumption

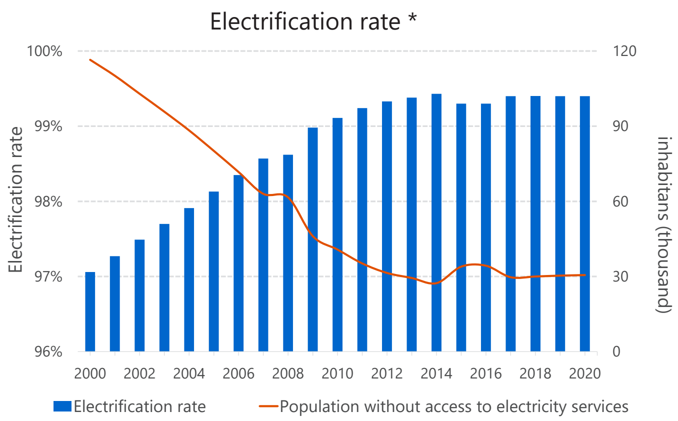


Costa Rica was positioned as the first country in the region with a national charging network for electric vehicles, which was reported in the framework of the progress of the Decarbonization Plan to modernize transportation; scenario in which it was also reported that Costa Rica is the third country in Latin America with more electric vehicles per capita, according to data from Bloomberg Financial Unit; and the first country in Central America and the Caribbean with a network with more than 100 points throughout the national territory.

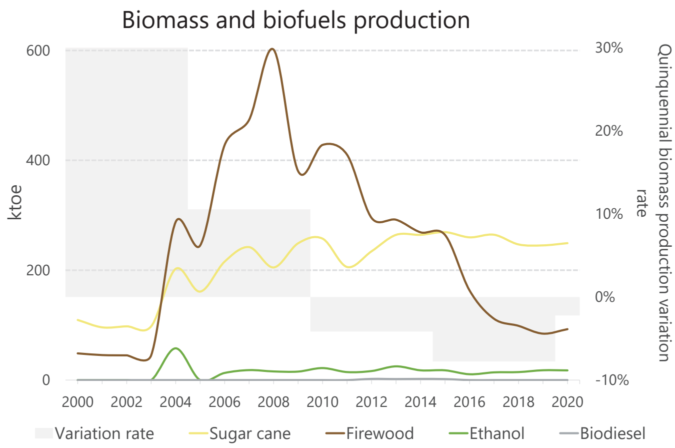




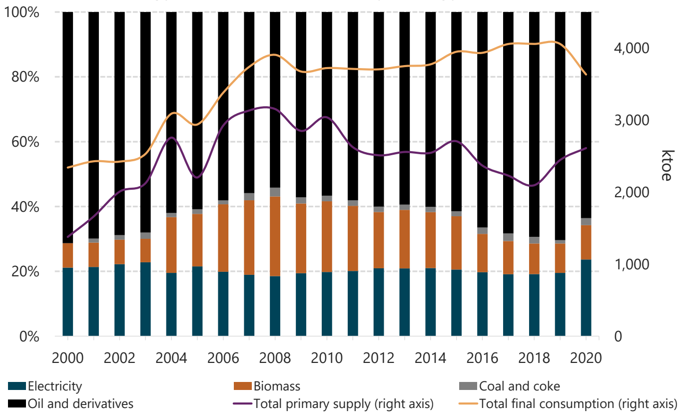




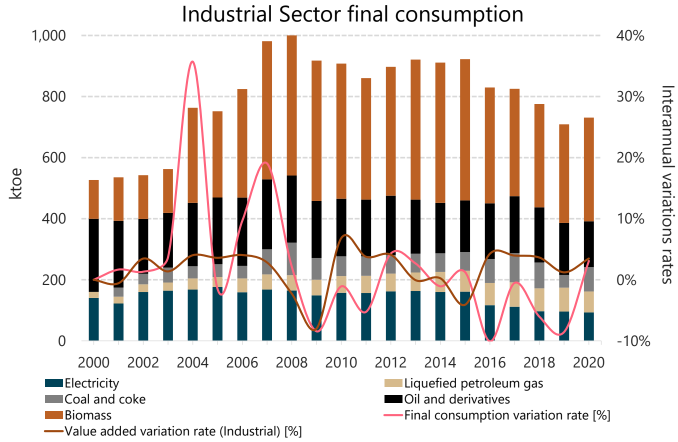
*2020 data: Reference year 2019. No fieldwork was conducted in 2020 due to the pandemic.



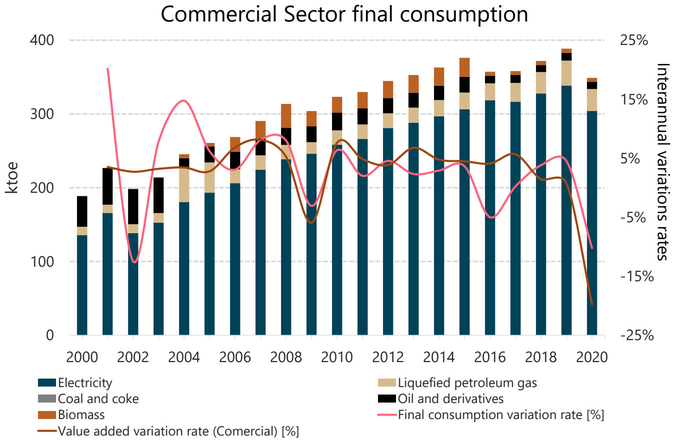
Energy final consumption by energy source



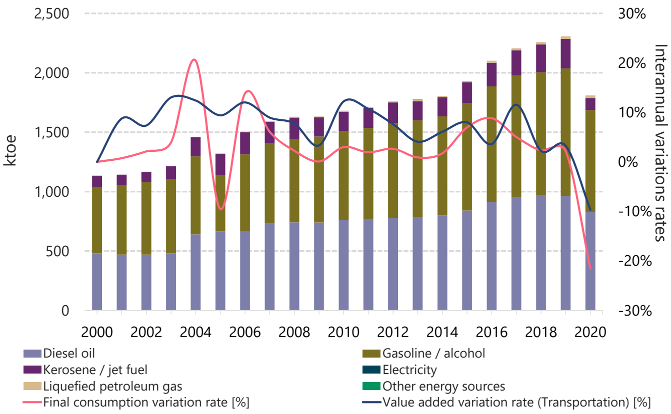
Industrial Sector final consumption



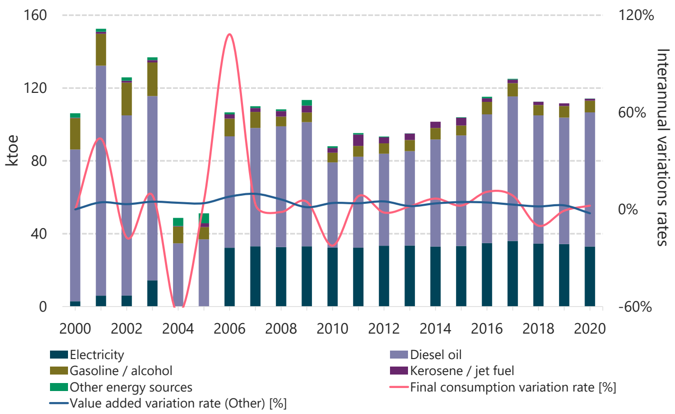
Commercial Sector final consumption



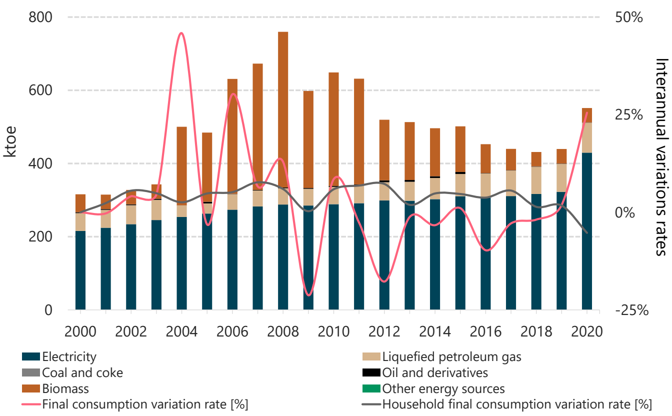
Transport Sector final consumption



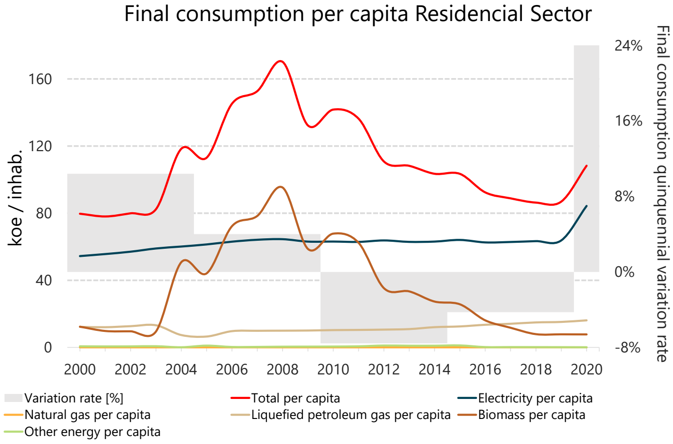
Other Sector final consumption



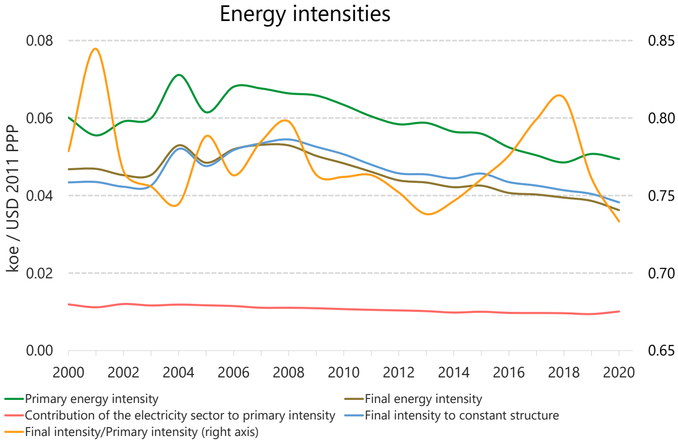
Residential Sector final consumption



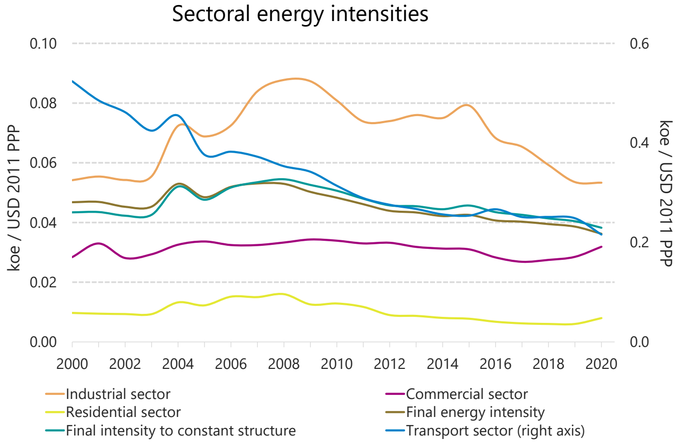
Final consumption per capita Residencial Sector



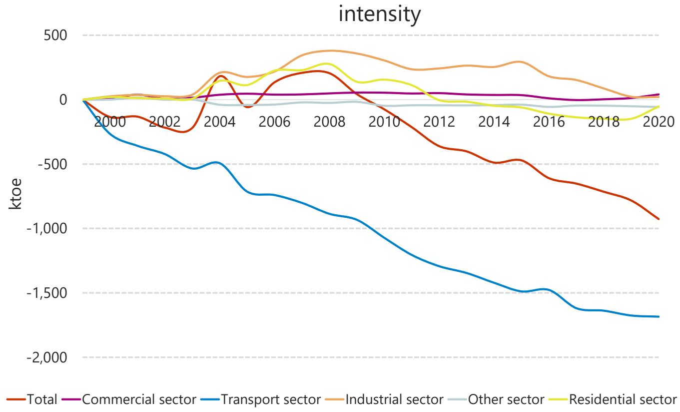
Energy intensities



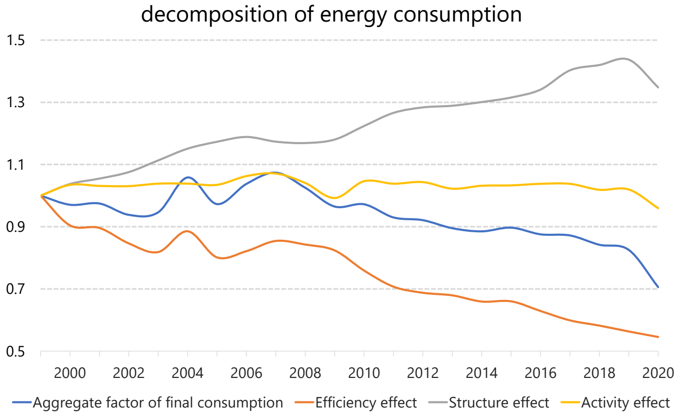
Sectoral energy intensities



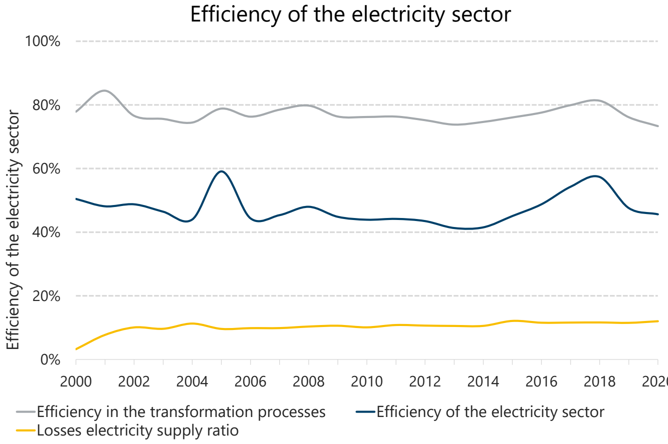
Avoided energy demand due to variations in energy intensity

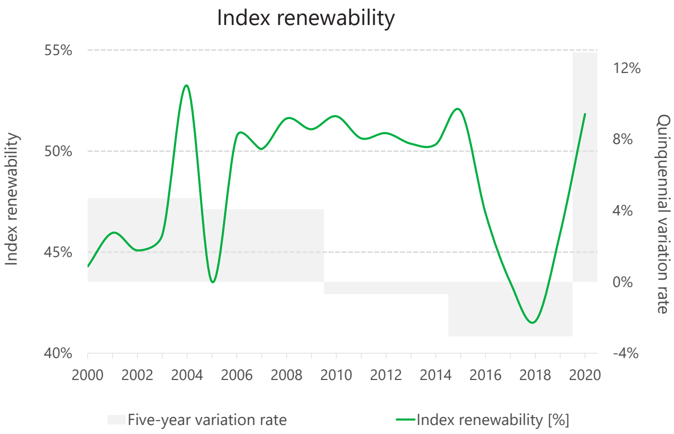


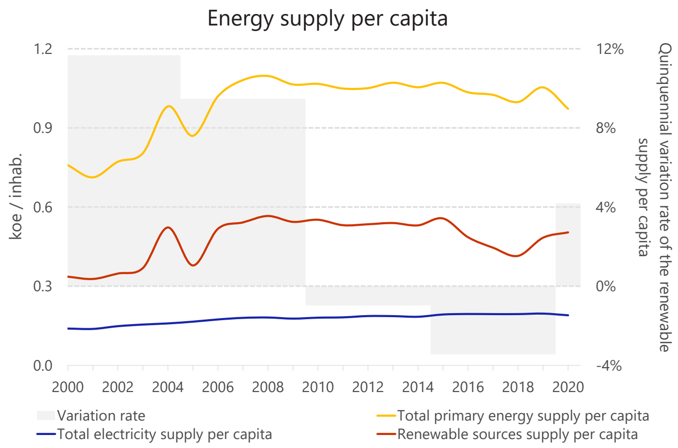
Logarithmic mean Divisia index for the structural decomposition of energy consumption

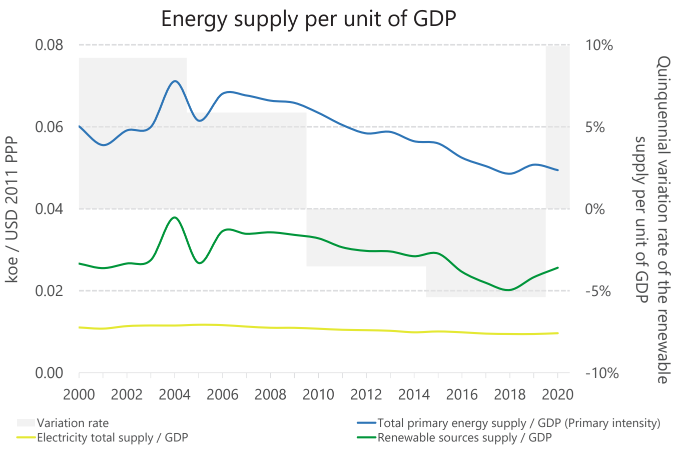


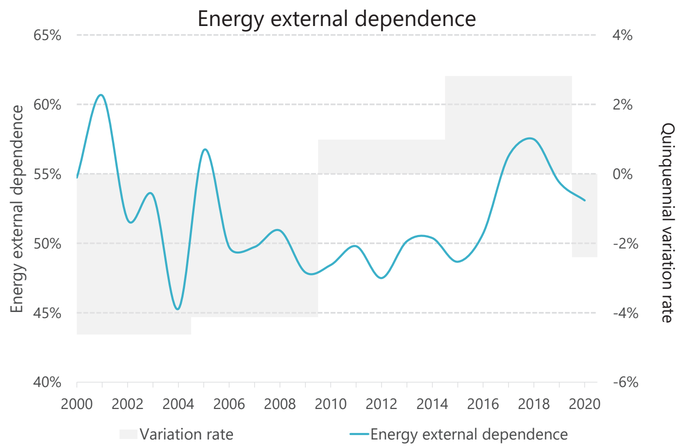
Efficiency of the electricity sector





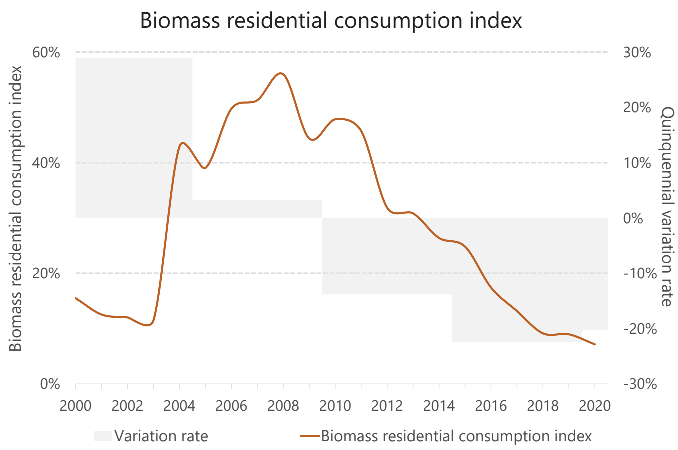


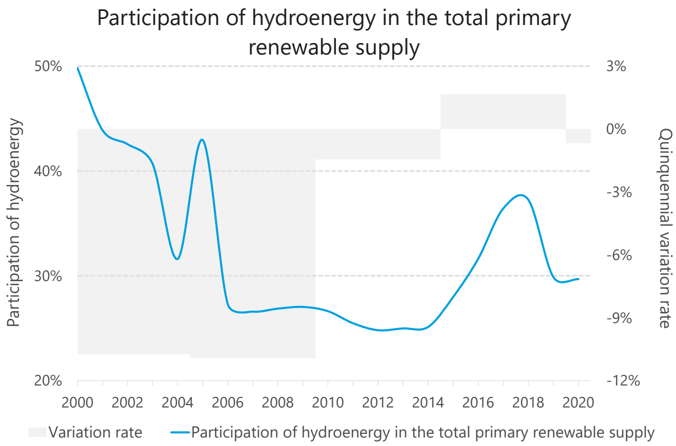


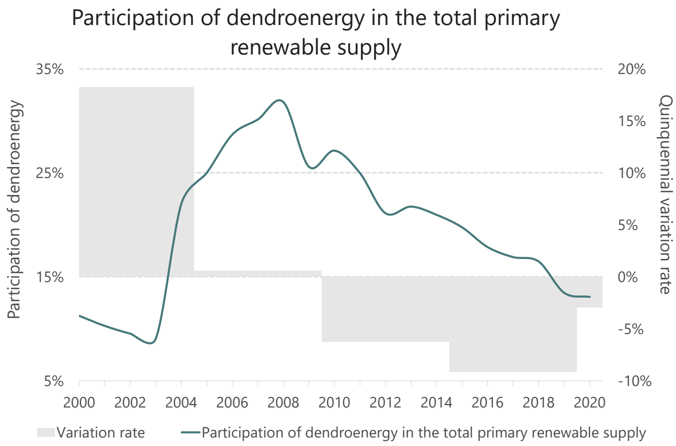


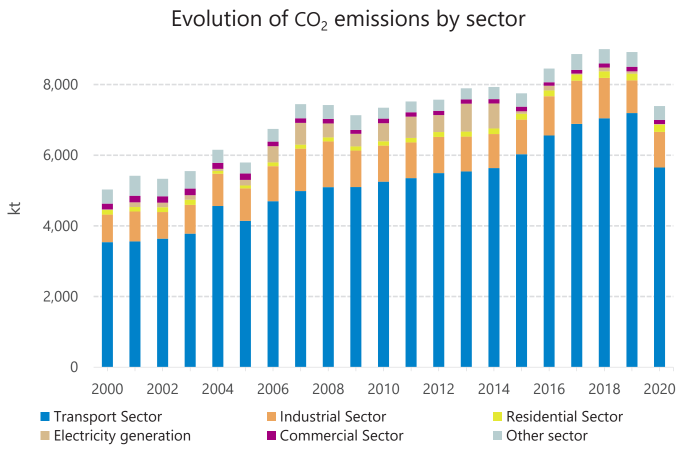
COSTA RICA

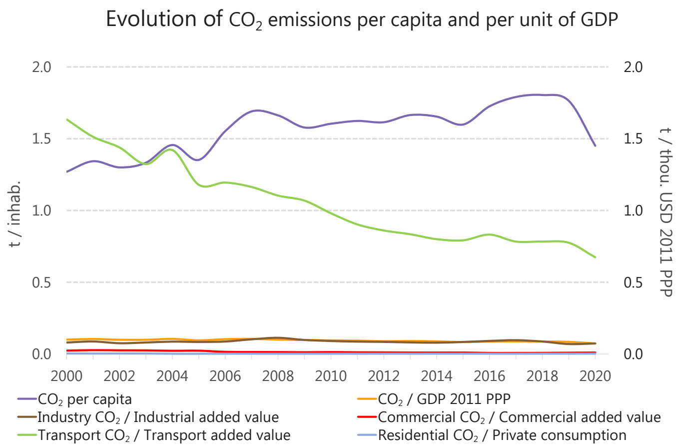
Costa Rica, managed to electrify 337 days of 2020 with renewable energy. Electricity generation based on renewable sources reached historic figures in recent years, reaching its sixth consecutive year with more than 98% of renewable electricity generation. In 2020, despite the effects of the pandemic, the country recorded 99.78% of renewable electricity production, which meant that the energy generated by fossil fuels was the lowest since 1986.

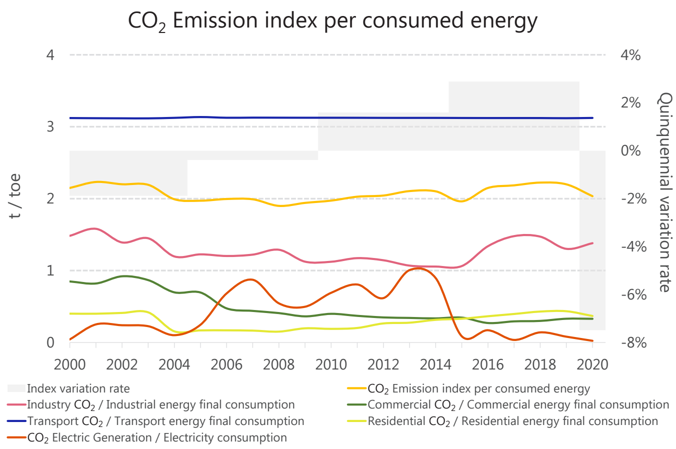


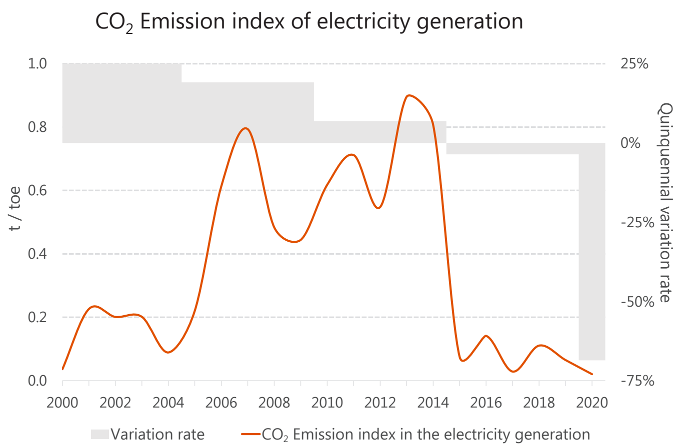

Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
50%
40%
30%
20%
3%
0%
-3%
-6%
-9%
-12%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Participation of hydroenergy in the total primary renewable supply


Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
35%
25%
15%
5%
20%
15%
10%
5%
0%
-5%
-10%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Participation of dendroenergy in the total primary renewable supply

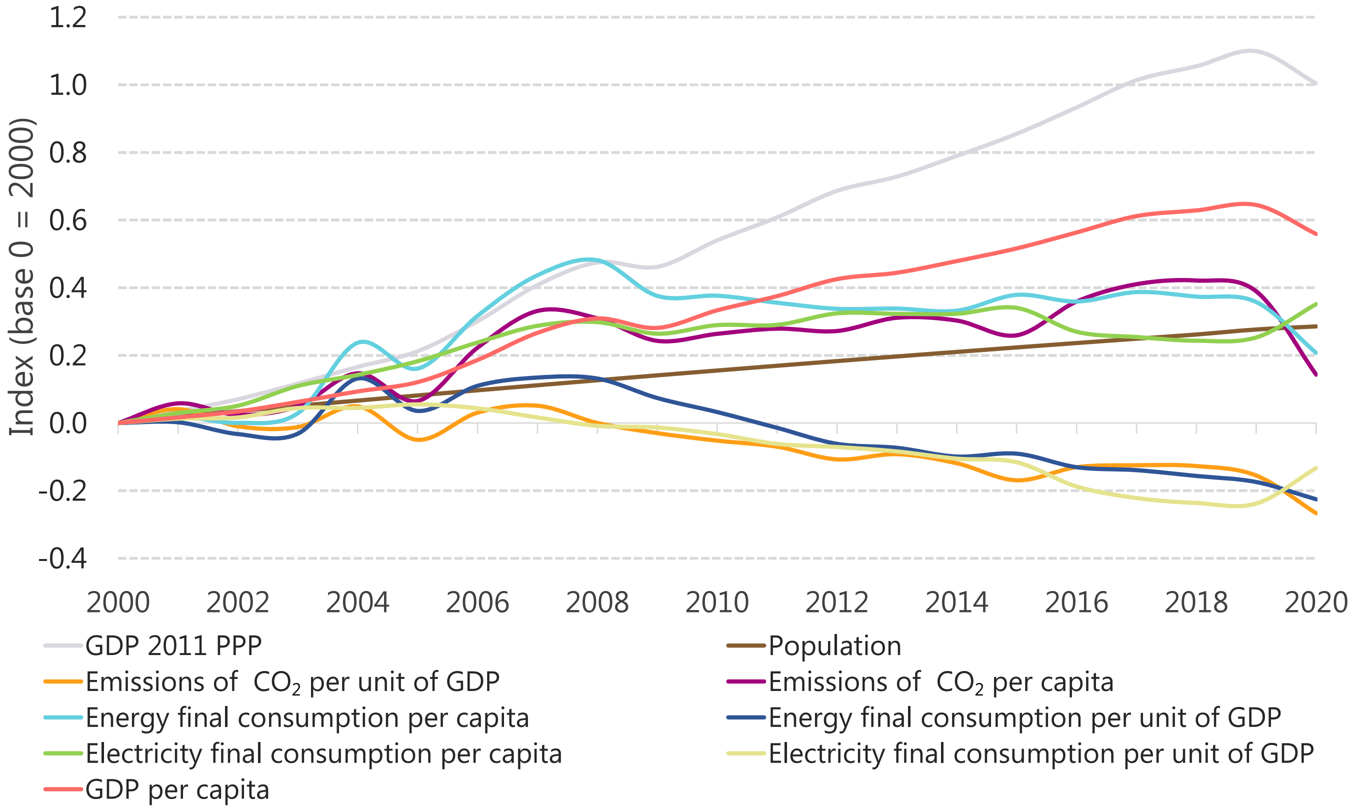

Evolution of CO_2 emissions by sector
kt
8,000
6,000
4,000
2,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector


Evolution of CO_2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
2.0
1.5
1.0
0.5
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
CO_2 per capita
CO_2 / GDP 2011 PPP
Industry CO_2 / Industrial added value
Commercial CO_2 / Commercial added value
Transport CO_2 / Transport added value
Residential CO_2 / Private consumption

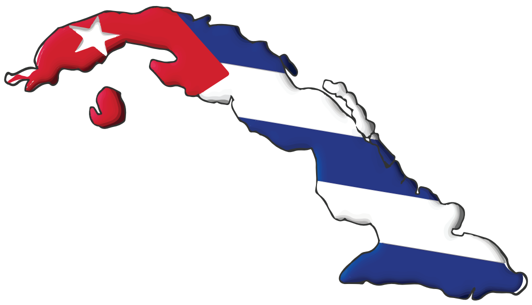

CO_2 Emission index per consumed energy
t / toe
Quinquennial variation rate
4
3
2
1
0
4%
2%
0%
-2%
-4%
-6%
-8%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Index variation rate
CO_2 Emission index per consumed energy
Industry CO_2 / Industrial energy final consumption
Commercial CO_2 / Commercial energy final consumption
Transport CO_2 / Transport energy final consumption
Residential CO_2 / Residential energy final consumption
CO_2 Electric Generation / Electricity consumption


CO_2 Emission index of electricity generation
t / toe
Quinquennial variation rate
1.0
0.8
0.6
0.4
0.2
0.0
25%
0%
-25%
-50%
-75%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
CO_2 Emission index in the electricity generation

Summary of the main energy indicators



COSTA RICA



CUBA

General Information 2020

Population (thousand inhab.)	11,327
Area (km²)	109,884
Population Density (inhab. / km²)	103
Urban Population (%)	77
GDP USD 2010 (MUSD)	70,725
GDP USD 2011 PPP (MUSD)	278,566
GDP per capita (thou. USD 2011 PPP / inhab.)	25

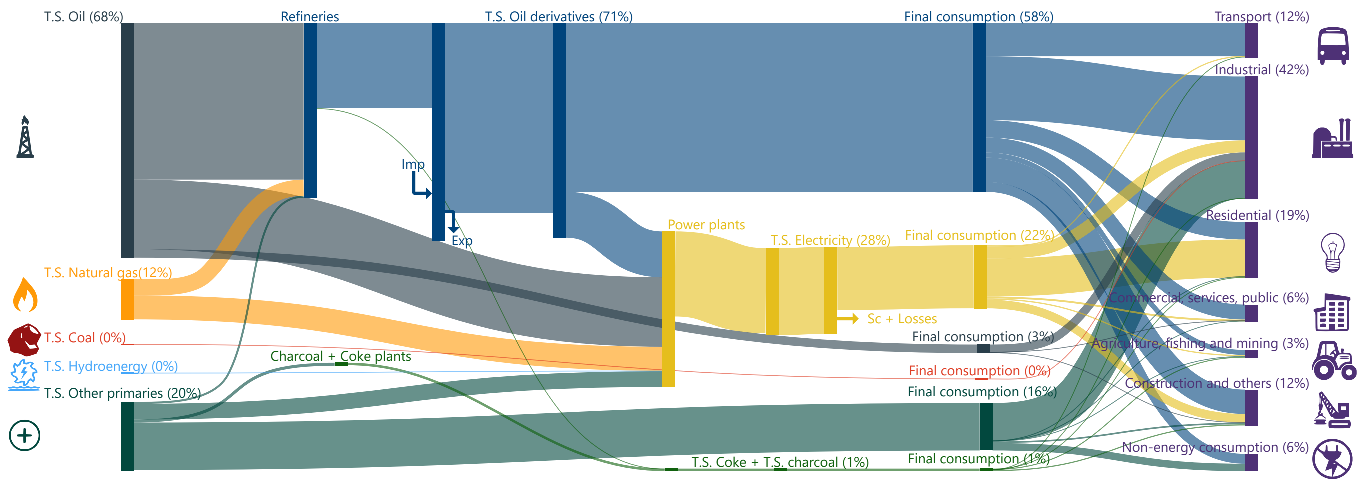
Energy Sector 2019

Final consumption in the Transport Sector	Mtep	0.72
Final consumption in the Industrial Sector	Mtep	2.56
Final consumption in the Residential Sector	Mtep	1.17
Final consumption in the Commercial and Service Sector	Mtep	0.36
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	1.27
Oil Reserves	Mbbl	70 [2]
Natural gas Reserves	Gm³	68 [2]
Coal Reserves	Mt	n.a.

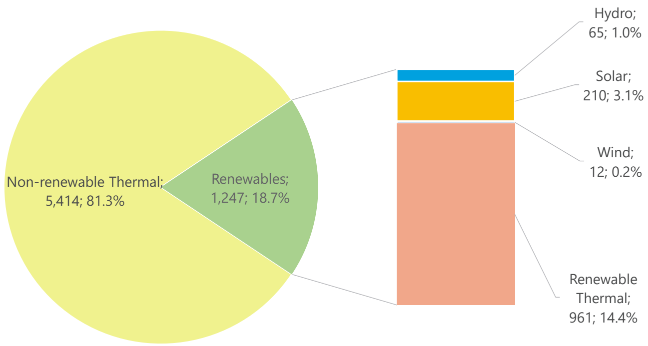
[1] Data from 2020.
[2] Data estimated by OLADE.

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
1,328 [1]	0.54	99.98 [1]	9.92	4.73	5.25	0.58	6.07	123	6.66 [1]	0.03 / 0.02
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

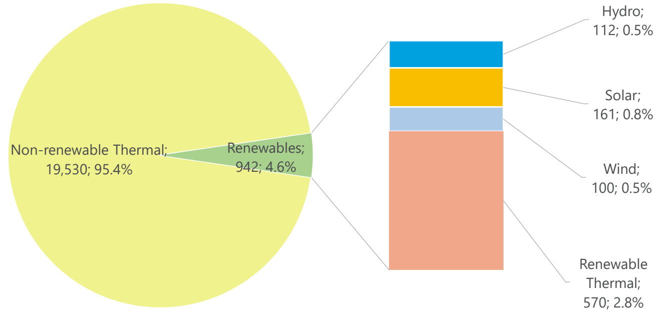
Summarized energy balance 2019



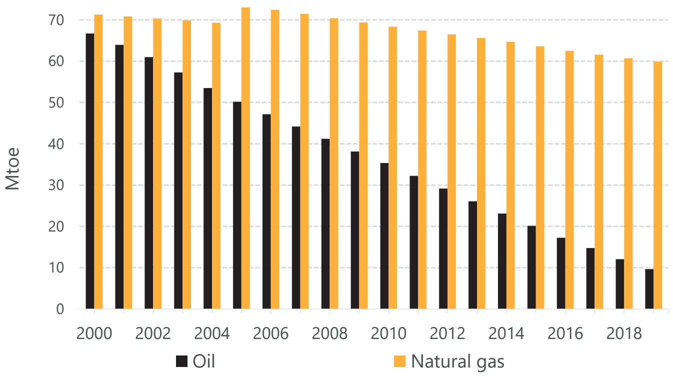
Installed power generation capacity [MW; %]
2020



Electricity generation by source [GWh; %]
2020

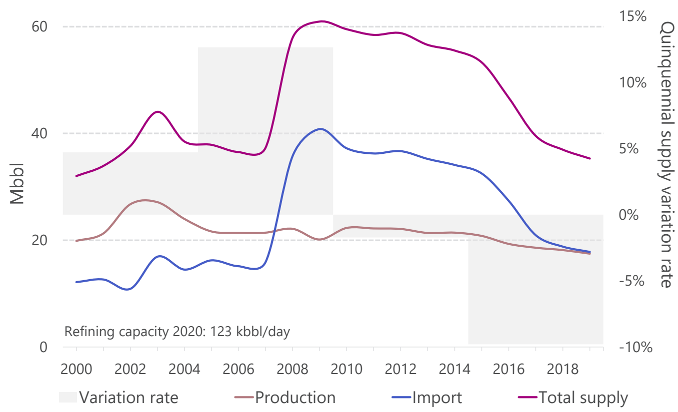


Proven reserves of oil and natural gas *

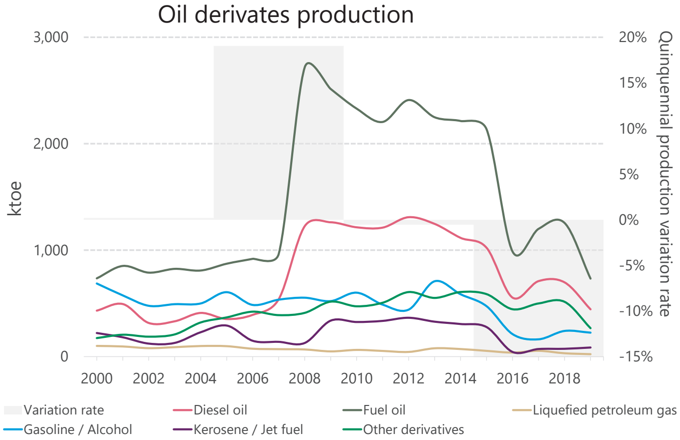


* Data estimated by OLADE

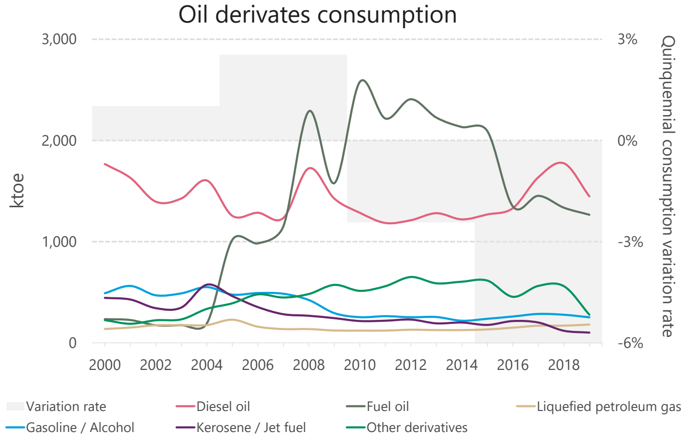
Oil supply

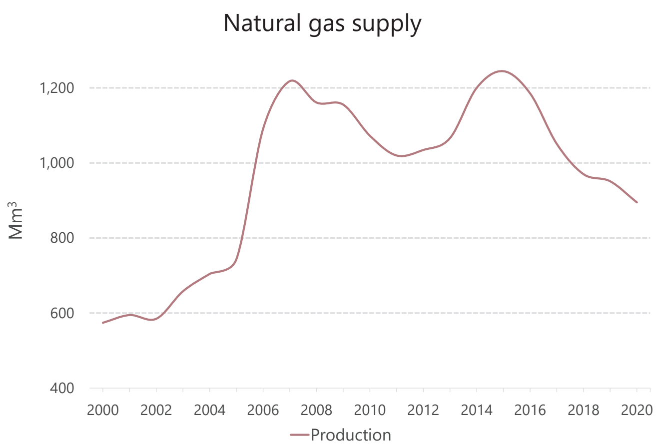


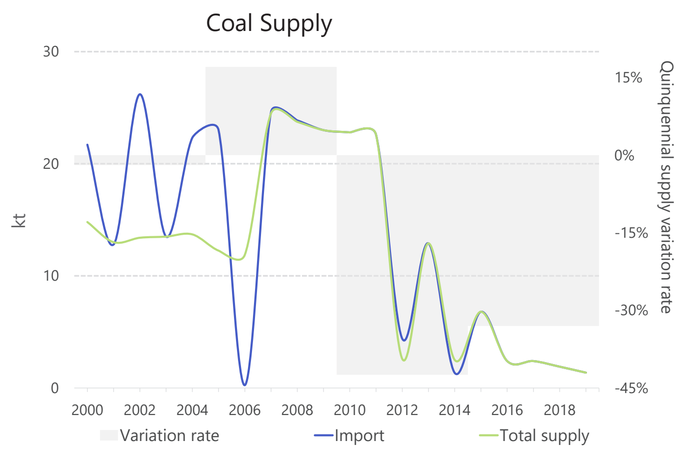
Oil derivates production

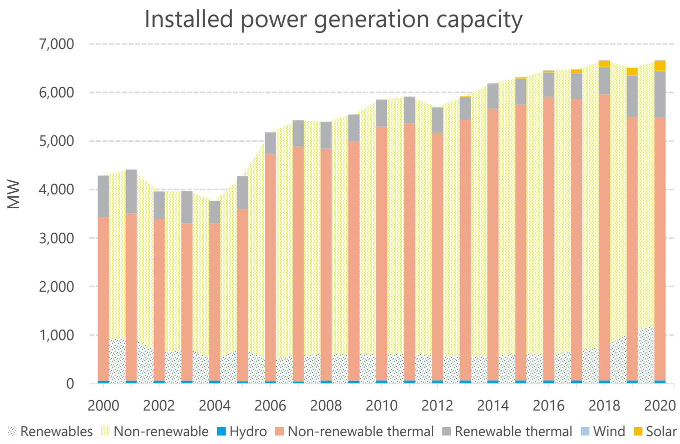


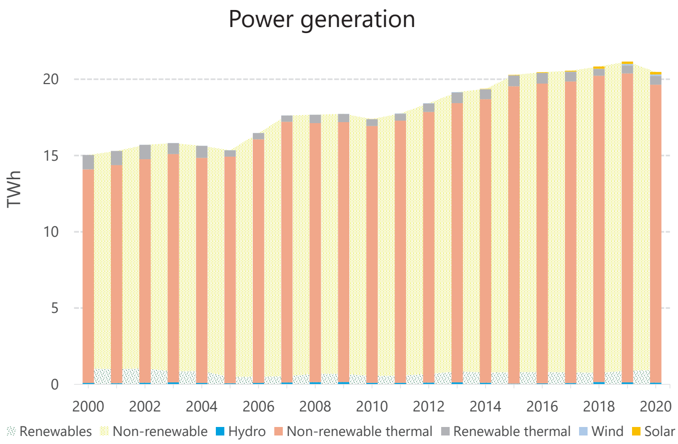
Oil derivates consumption

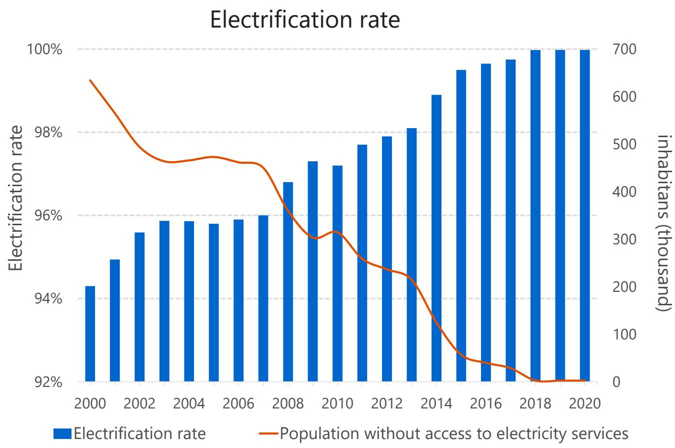


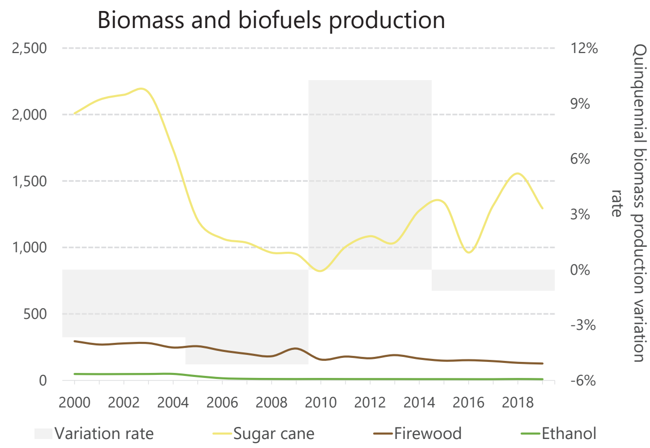

Natural gas supply
Mm³
1,200
1,000
800
600
400
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Production

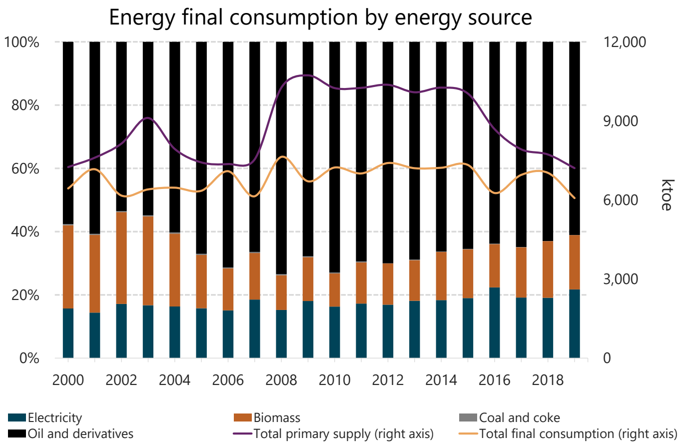

Coal Supply
kt
30
20
10
0
15%
0%
-15%
-30%
-45%
Quinquennial supply variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Variation rate
Import
Total supply

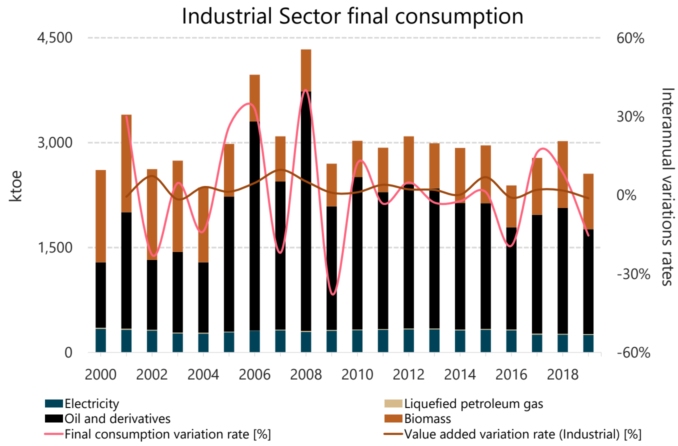

Installed power generation capacity
MW
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Wind
Solar

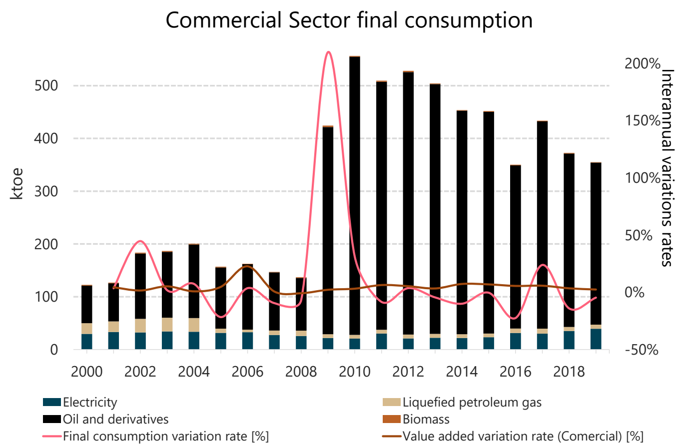

Power generation
TWh
20
15
10
5
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Wind
Solar

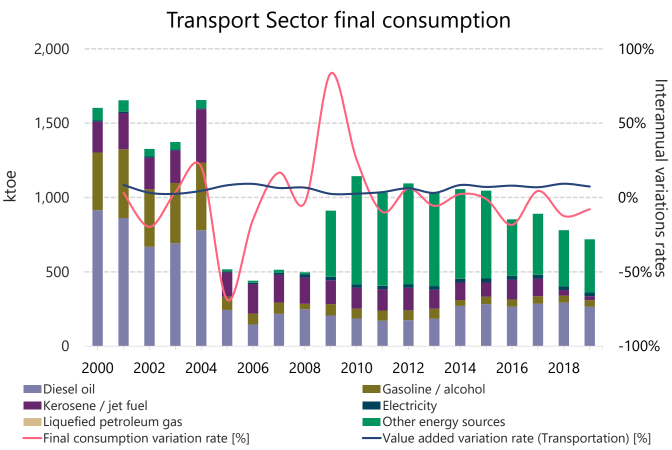

Electrification rate
Electrification rate
100%
98%
96%
94%
92%
inhabitants (thousand)
700
600
500
400
300
200
100
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electrification rate
Population without access to electricity services

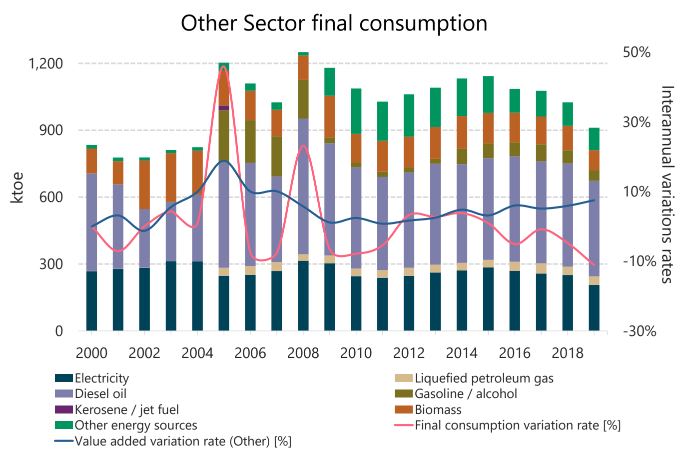

Biomass and biofuels production
ktoe
2,500
2,000
1,500
1,000
500
0
12%
9%
6%
3%
0%
-3%
-6%
Quinquennial biomass production variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Variation rate
Sugar cane
Firewood
Ethanol

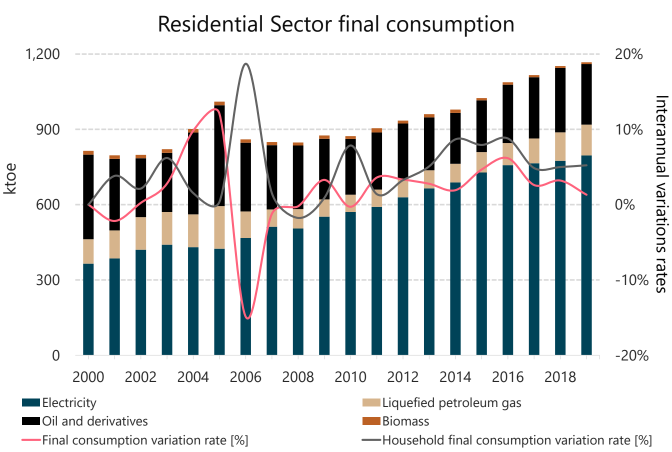

Energy final consumption by energy source
100%
80%
60%
40%
20%
0%
12,000
9,000
6,000
3,000
0
ktoe
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Electricity
Oil and derivatives
Biomass
Total primary supply (right axis)
Coal and coke
Total final consumption (right axis)


Industrial Sector final consumption
4,500
3,000
1,500
0
ktoe
60%
30%
0%
-30%
-60%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Electricity
Oil and derivatives
Final consumption variation rate [%]
Liquefied petroleum gas
Biomass
Value added variation rate (Industrial) [%]

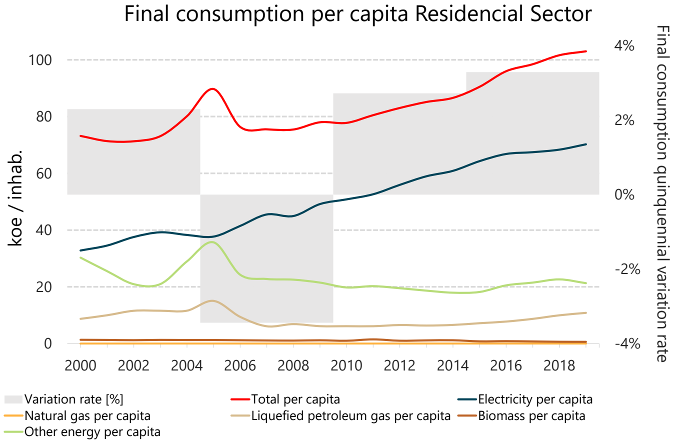

Commercial Sector final consumption
500
400
300
200
100
0
ktoe
200%
150%
100%
50%
0%
-50%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Electricity
Oil and derivatives
Final consumption variation rate [%]
Liquefied petroleum gas
Biomass
Value added variation rate (Comercial) [%]


Transport Sector final consumption
2,000
1,500
1,000
500
0
ktoe
100%
50%
0%
-50%
-100%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Diesel oil
Kerosene / jet fuel
Liquefied petroleum gas
Final consumption variation rate [%]
Gasoline / alcohol
Electricity
Other energy sources
Value added variation rate (Transportation) [%]

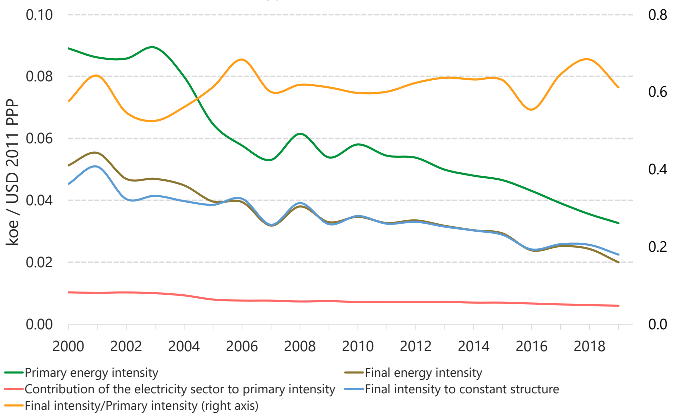

Other Sector final consumption
1,200
900
600
300
0
ktoe
50%
30%
10%
-10%
-30%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Electricity
Diesel oil
Kerosene / jet fuel
Other energy sources
Value added variation rate (Other) [%]
Liquefied petroleum gas
Gasoline / alcohol
Biomass
Final consumption variation rate [%]


Residential Sector final consumption
1,200
900
600
300
0
ktoe
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Electricity
Oil and derivatives
Final consumption variation rate [%]
Liquefied petroleum gas
Biomass
Household final consumption variation rate [%]

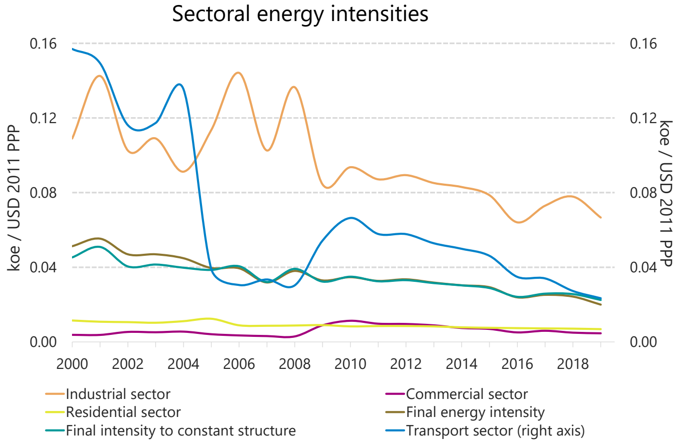
Final consumption per capita Residencial Sector



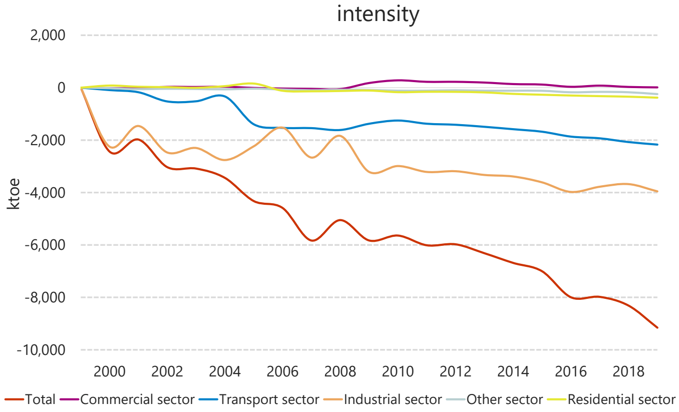
Energy intensities



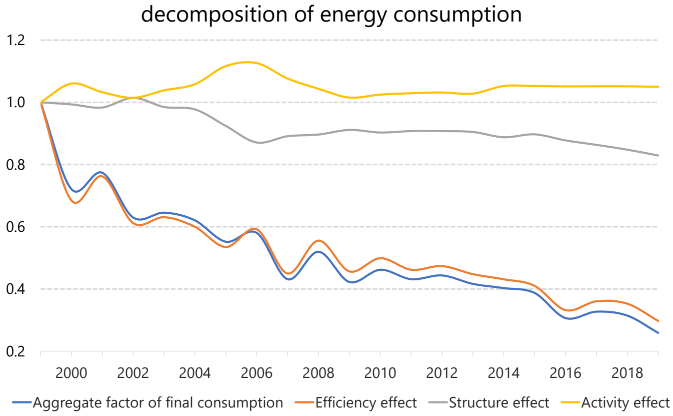
Sectoral energy intensities



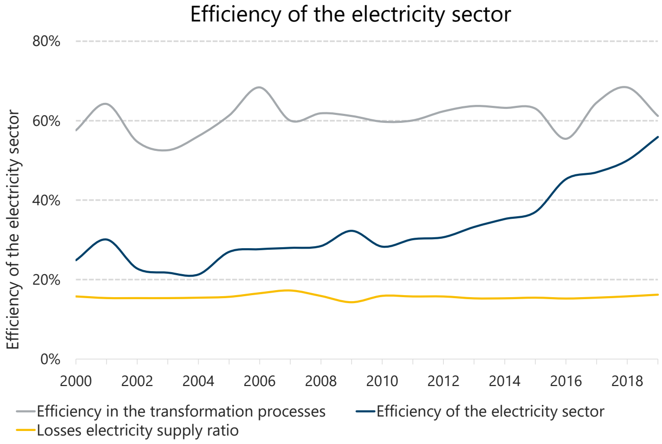
Avoided energy demand due to variations in energy intensity



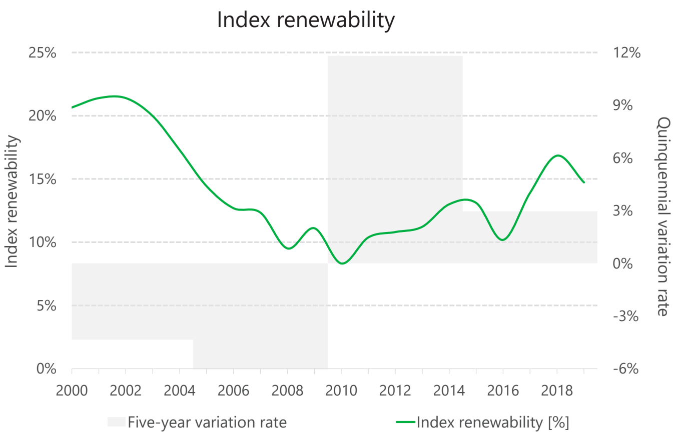
Logarithmic mean Divisia index for the structural decomposition of energy consumption

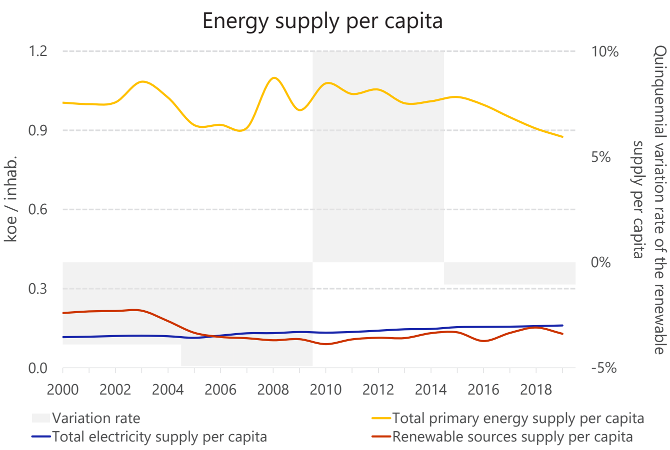


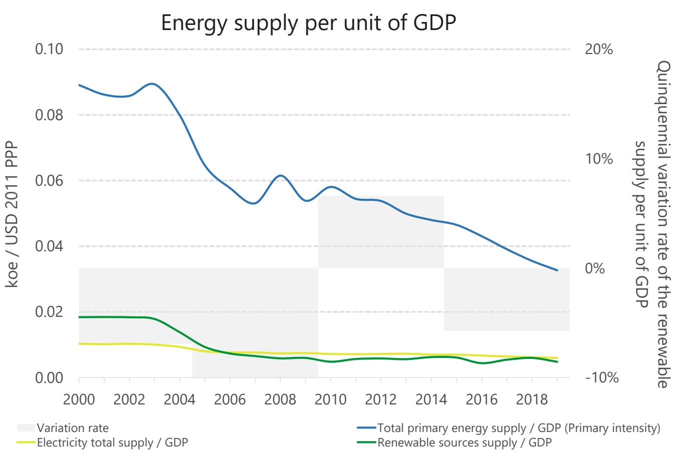
Efficiency of the electricity sector

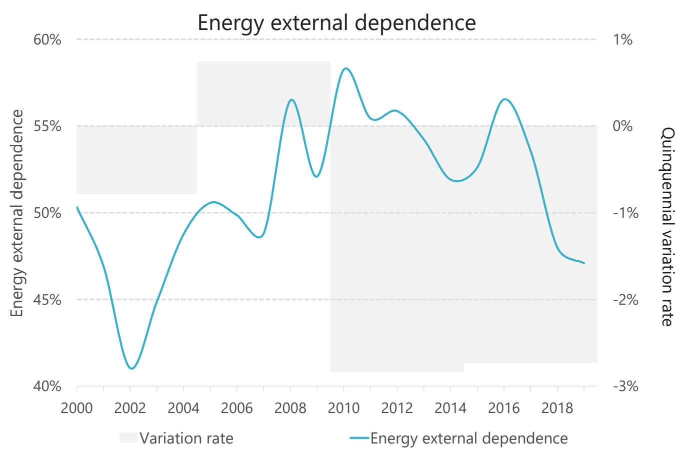


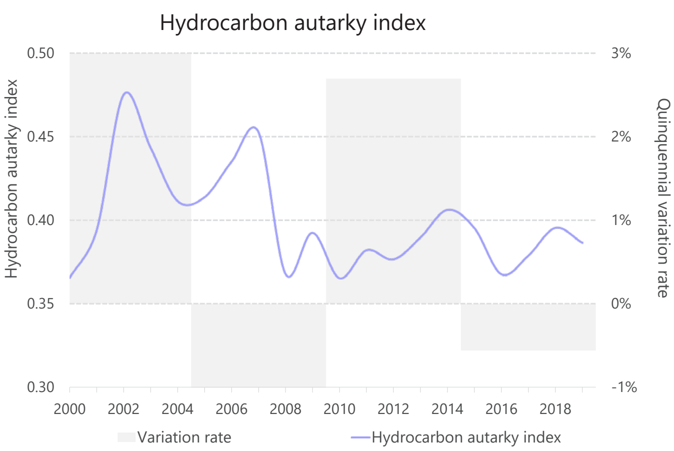
CUBA

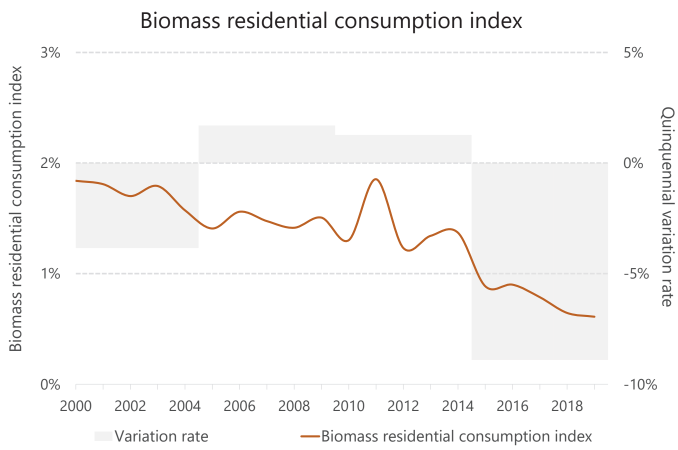

Index renewability
Index renewability
Quinquennial variation rate
25%
20%
15%
10%
5%
0%
12%
9%
6%
3%
0%
-3%
-6%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Five-year variation rate
Index renewability [%]


Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
1.2
0.9
0.6
0.3
0.0
10%
5%
0%
-5%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita

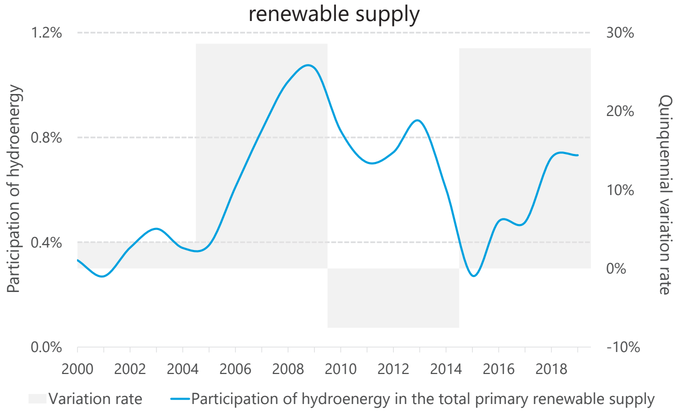

Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
0.10
0.08
0.06
0.04
0.02
0.00
20%
10%
0%
-10%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Variation rate
Electricity total supply / GDP
Total primary energy supply / GDP (Primary intensity)
Renewable sources supply / GDP


Energy external dependence
Energy external dependence
Quinquennial variation rate
60%
55%
50%
45%
40%
1%
0%
-1%
-2%
-3%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Variation rate
Energy external dependence

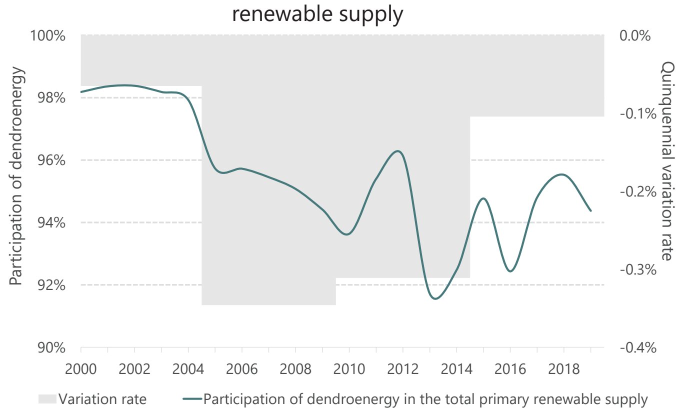

Hydrocarbon autarky index
Hydrocarbon autarky index
Quinquennial variation rate
0.50
0.45
0.40
0.35
0.30
3%
2%
1%
0%
-1%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Variation rate
Hydrocarbon autarky index


Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
3%
2%
1%
0%
5%
0%
-5%
-10%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018
Variation rate
Biomass residential consumption index

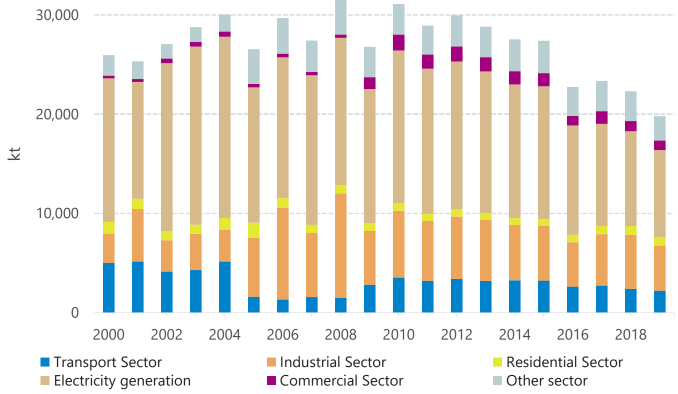
Participation of hydroenergy in the total primary renewable supply



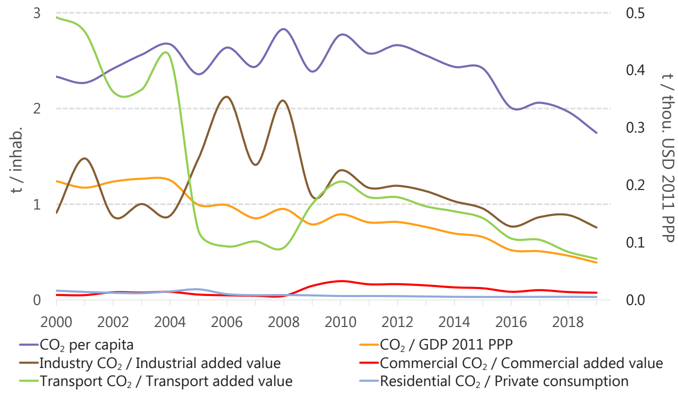
Participation of dendroenergy in the total primary renewable supply



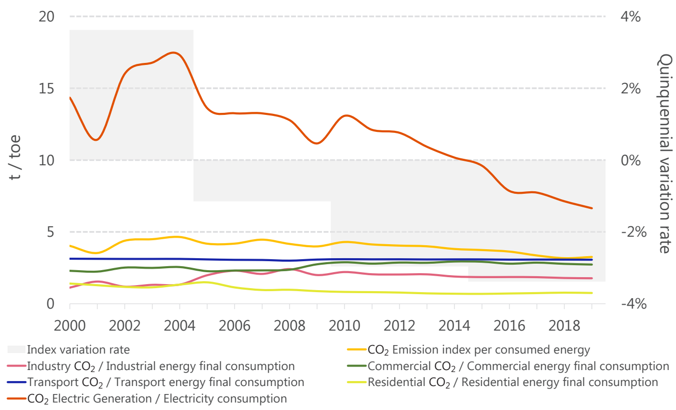
Evolution of CO_2 emissions by sector



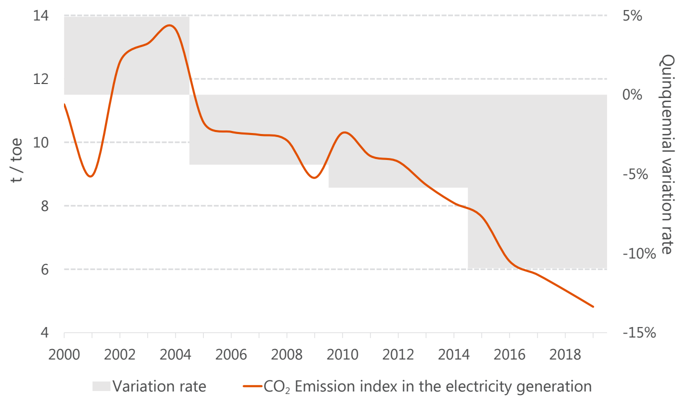
Evolution of CO_2 emissions per capita and per unit of GDP



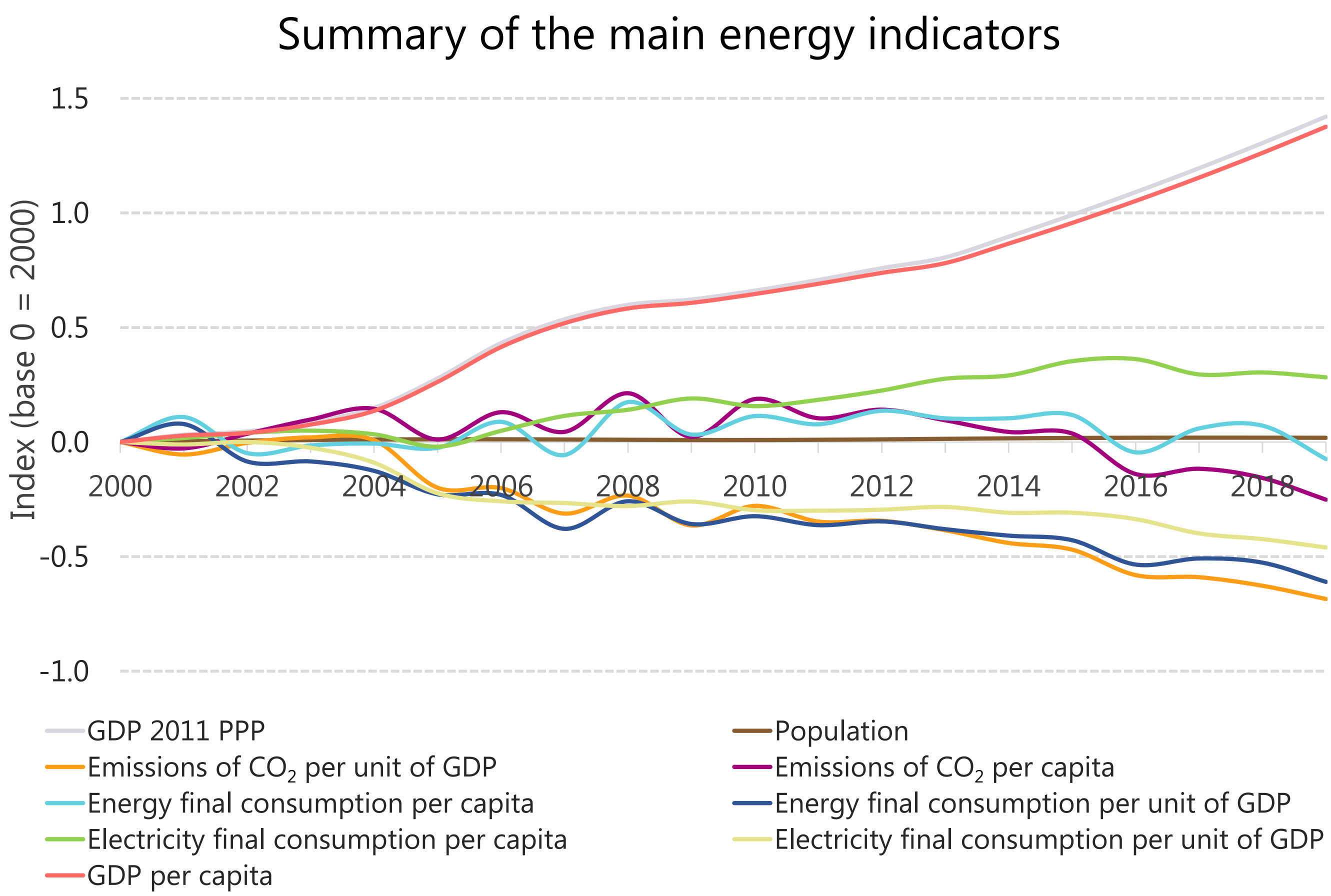
CO_2 Emission index per consumed energy



CO_2 Emission index of electricity generation



CUBA

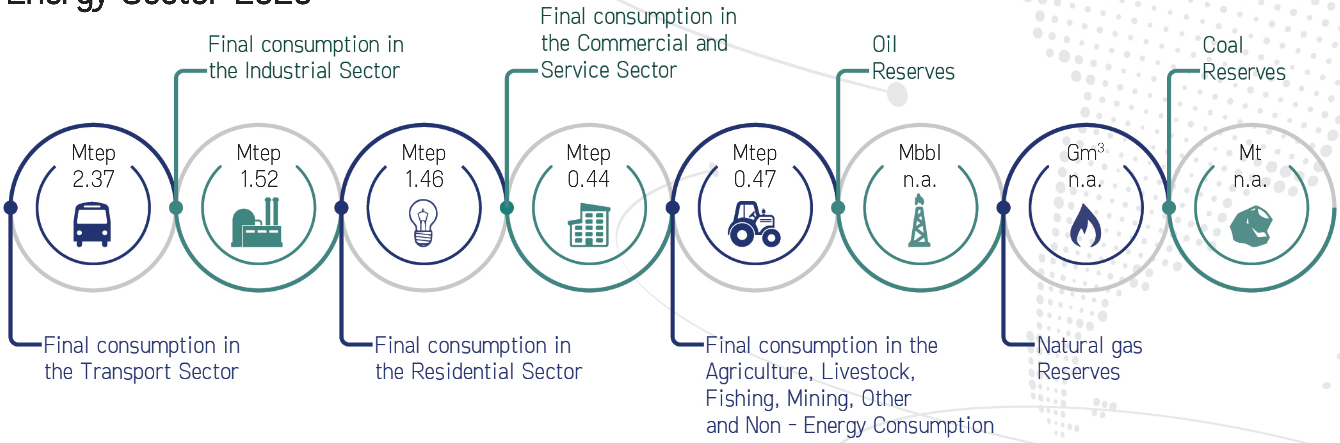

Summary of the main energy indicators
Index (base 0 = 2000)
1.5
1.0
0.5
0.0
-0.5
-1.0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

DOMINICAN REPUBLIC

General Information 2020

Population (thousand inhab.)	10,448 [1]
Area (km²)	48,442
Population Density (inhab. / km²)	216
Urban Population (%)	82
GDP USD 2010 (MUSD)	80,163
GDP USD 2011 PPP (MUSD)	184,447
GDP per capita (thou. USD 2011 PPP / inhab.)	18

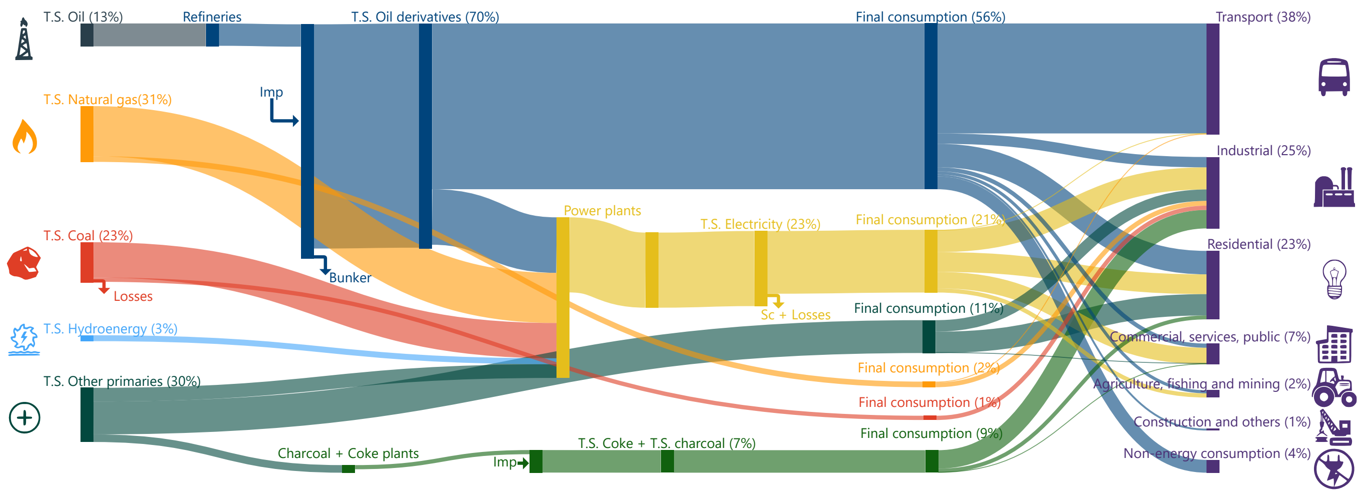
Energy Sector 2020*

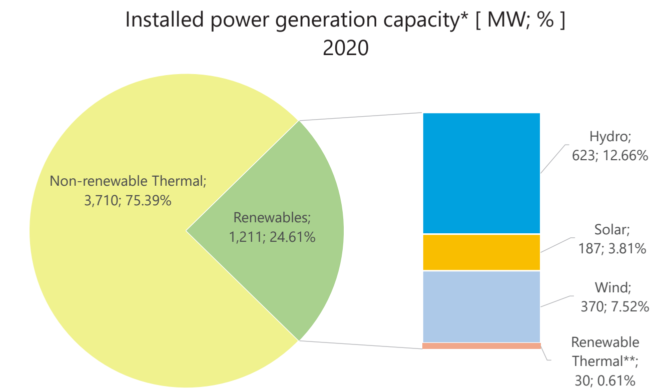


[1] CNE's own estimates.
[2] National Energy Information System - CNE, 2019 data.
[3] Exports include charcoal, AVTUR bunker and natural gas re-export.
[4] Annual Report 2020, Coordinating Body of the National Interconnected Electric System of the Dominican Republic.
Note(*): The energy supply and demand data for 2020 were estimated by OLADE.

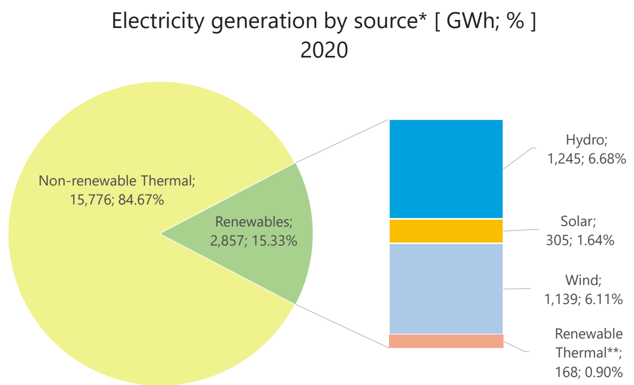
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
1,489	0.60	97.86 [2]	8.54	1.28	7.52	0.28 [3]	6.27	50	4.92 [4]	0.05 / 0.03
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

Summarized energy balance 2020





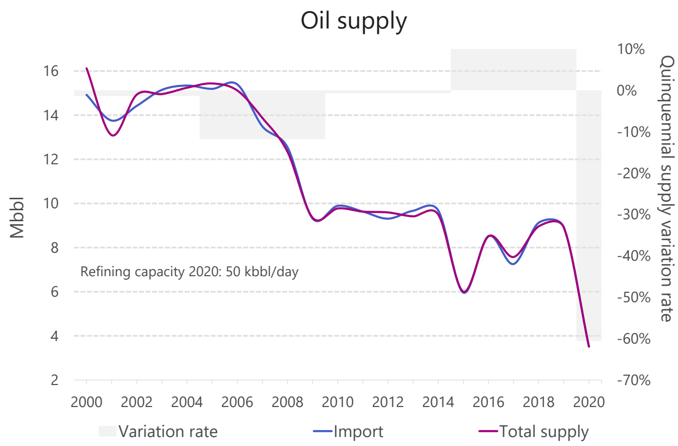
(*) Source: Annual Report 2020, Coordinating Body, the data correspond to gross installed capacity of the SENI.
(**): Renewable Thermal includes the San Pedro BioEnergy Unit.



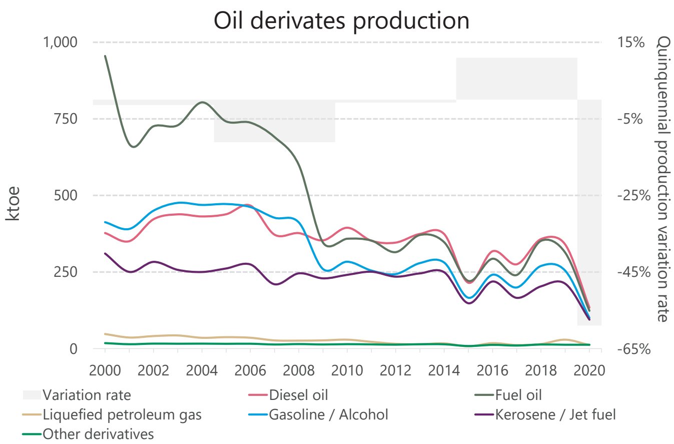
(*) Source: Annual Report 2020, Coordinating Body, the data corresponds to gross generation of the SENI.
(**): Renewable thermal energy corresponds to biomass.

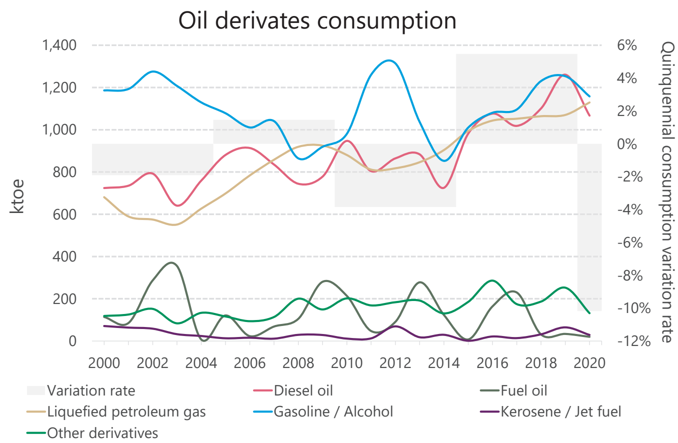
In the Dominican Republic, the Coordinating Agency of the Interconnected Electric System (OC-SENI) launched its Solar and Wind Energy Generation Forecasting Service, which will ensure the massive integration of renewable energies in an efficient and sustainable manner over time. This service makes it possible to establish how much renewable generation will enter the electricity system and thus know how much conventional generation is necessary to complement the rest of the demand, thus strengthening the main pillars of the electricity market, such as planning, trust and certainty, while correcting the dispersion of information in this area.

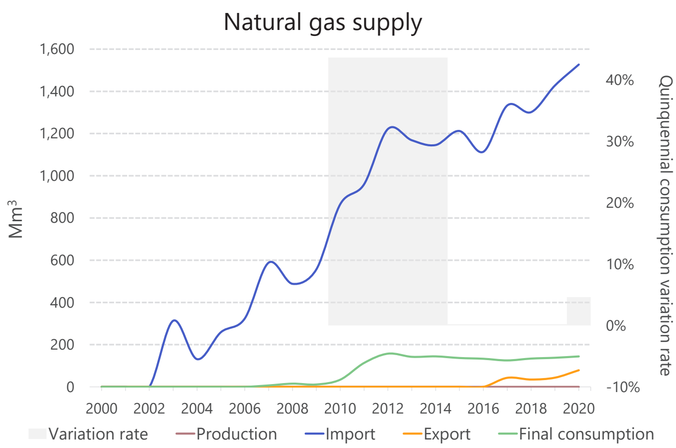
Additionally, the Ministry of Energy and Mines of the Dominican Republic (MEM) reopened the Renewable Energy Theme Park located in Ciudad Juan Bosch, a space in which clean energy is generated with various technologies. The park was in the phase of completion of works that were delayed due to the effects of the pandemic. The theme park offers the opportunity to learn about renewable energy sources in a half-hour tour.

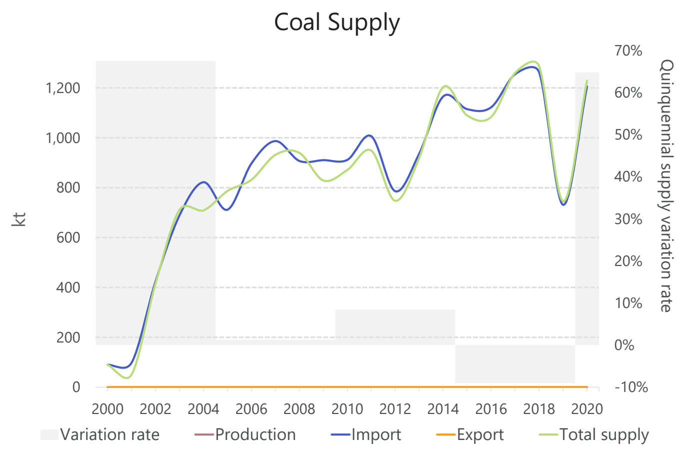


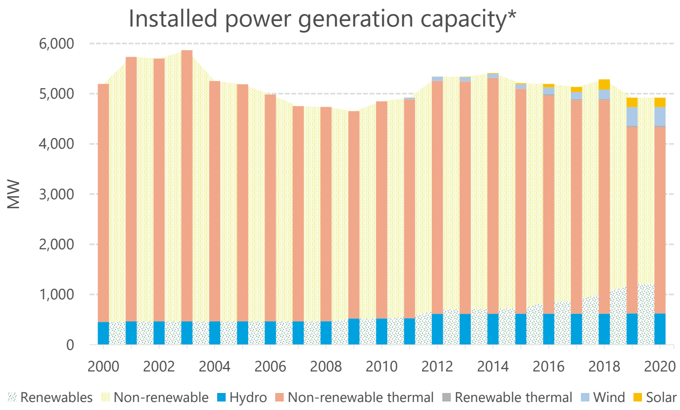
DOMINICAN REPUBLIC



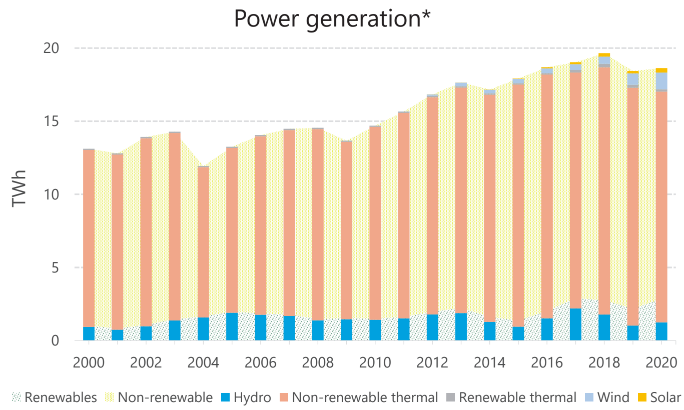




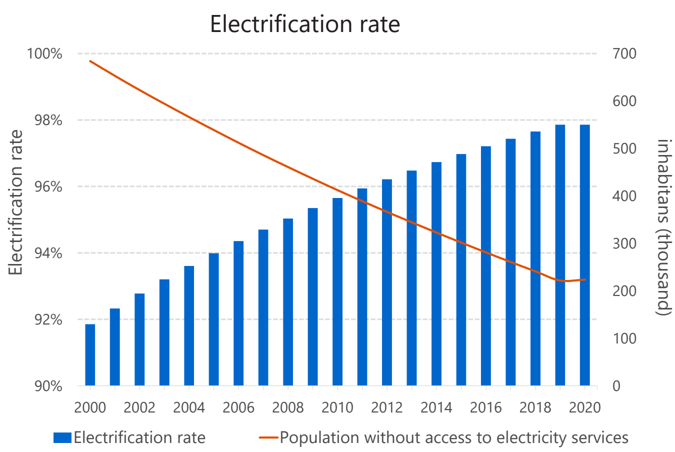


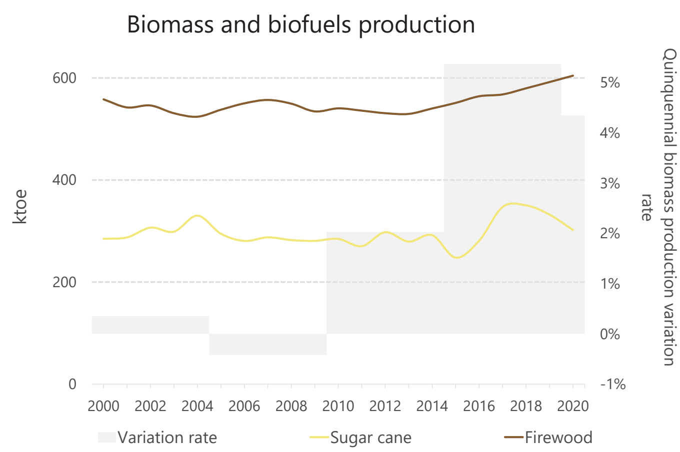


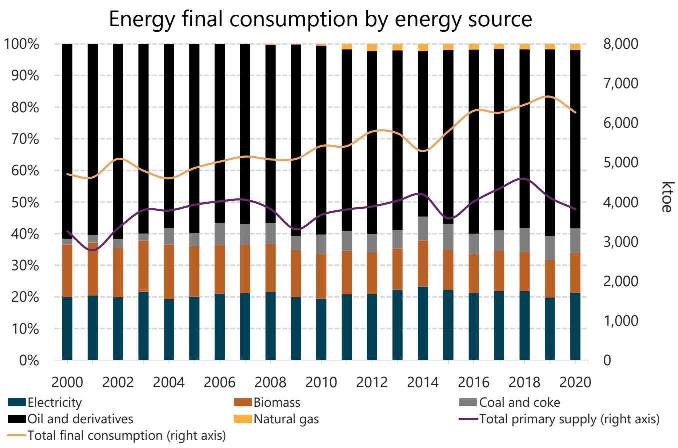
(*) 2000 - 2018: National installed capacity - CNE (*) 2019 - 2020: Source OC - Annual Report, installed capacity - SENI.

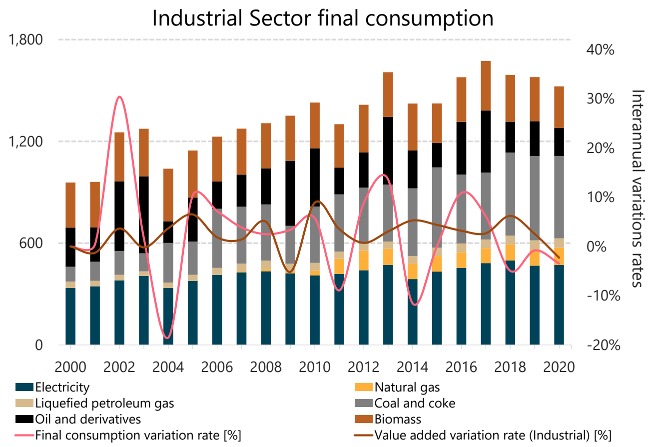


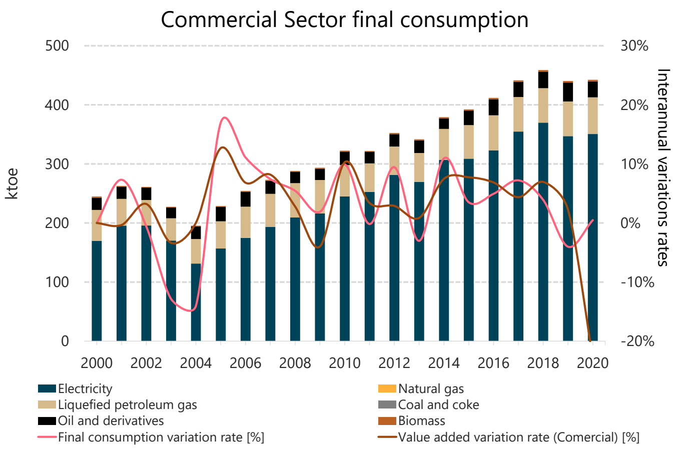
(*) 2000 -2018: National gross generation - CNE. (*) 2019 - 2020: Source OC - Annual Report, gross generation - SENI.

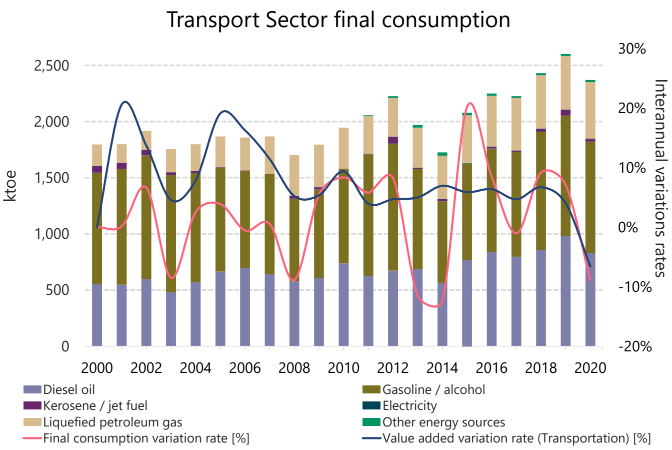


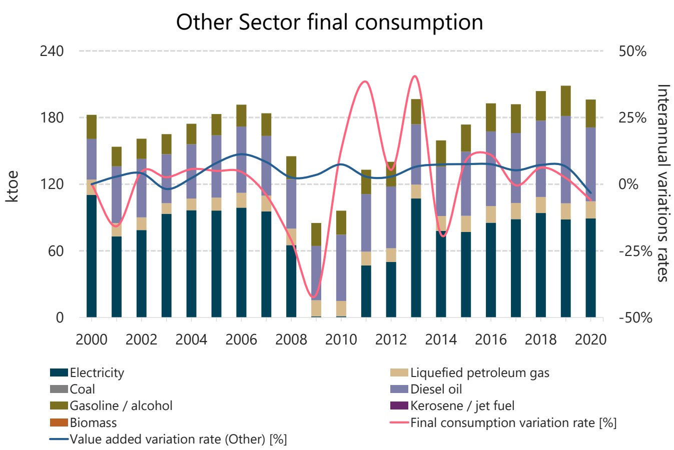


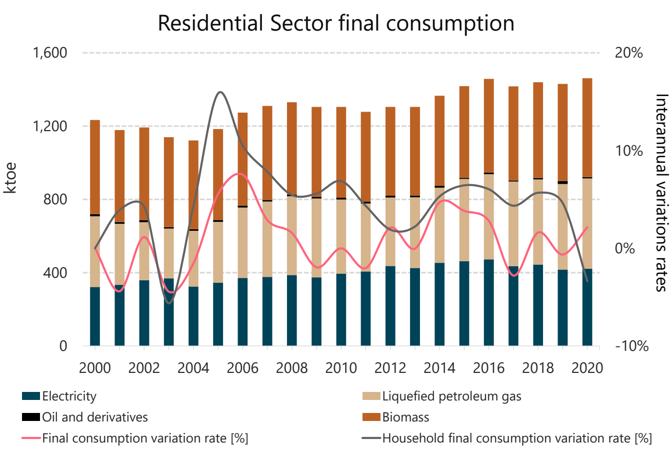

Energy final consumption by energy source
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
ktoe
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Biomass
Coal and coke
Oil and derivatives
Natural gas
Total primary supply (right axis)
Total final consumption (right axis)

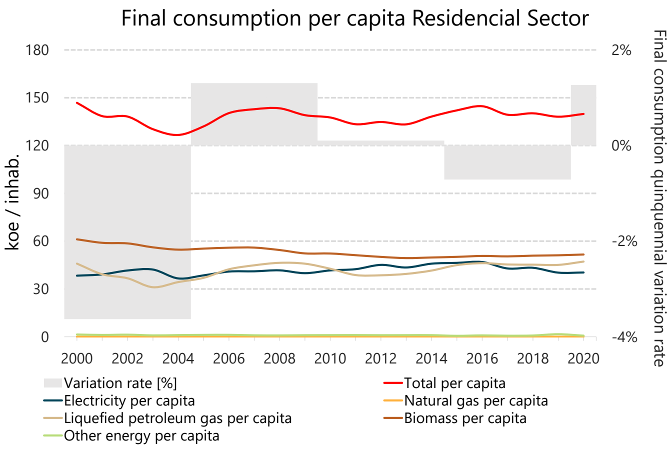

Industrial Sector final consumption
1,800
1,200
600
0
ktoe
40%
30%
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Natural gas
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]

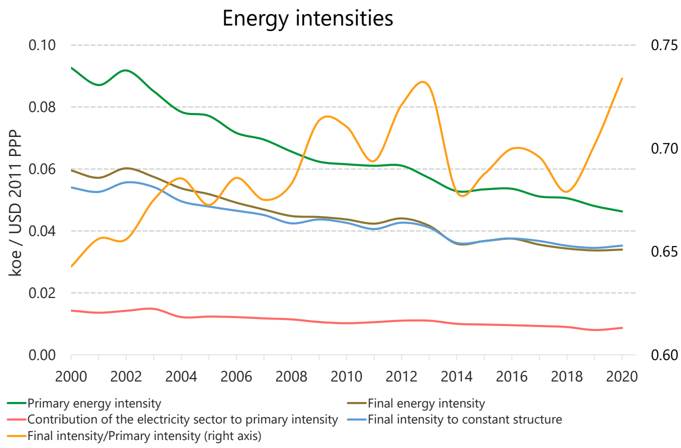

Commercial Sector final consumption
500
400
300
200
100
0
ktoe
30%
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Natural gas
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]

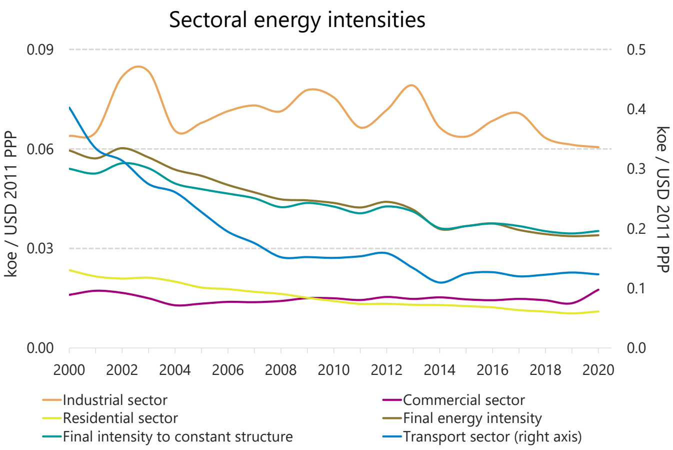

Transport Sector final consumption
2,500
2,000
1,500
1,000
500
0
ktoe
30%
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Electricity
Liquefied petroleum gas
Other energy sources
Final consumption variation rate [%]
Value added variation rate (Transportation) [%]

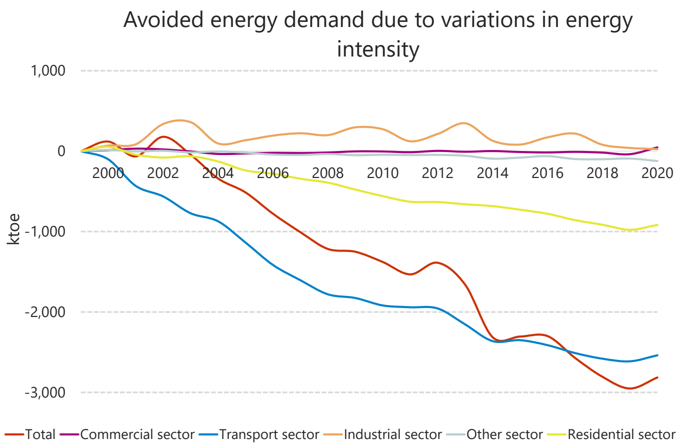

Other Sector final consumption
240
180
120
60
0
ktoe
50%
25%
0%
-25%
-50%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Coal
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Biomass
Final consumption variation rate [%]
Value added variation rate (Other) [%]

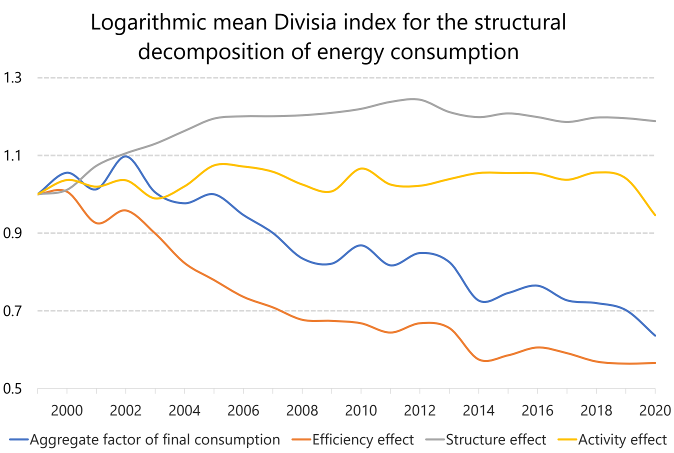

Residential Sector final consumption
1,600
1,200
800
400
0
ktoe
20%
10%
0%
-10%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Household final consumption variation rate [%]

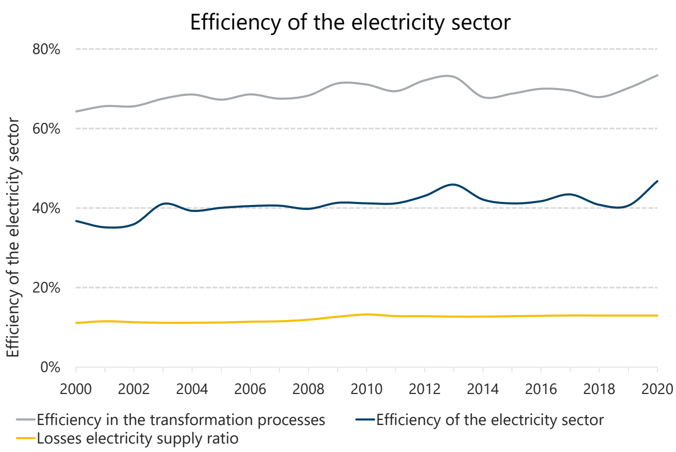

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
Variation rate [%]
Total per capita
Electricity per capita
Natural gas per capita
Liquefied petroleum gas per capita
Biomass per capita
Other energy per capita


Energy intensities
koe / USD 2011 PPP
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

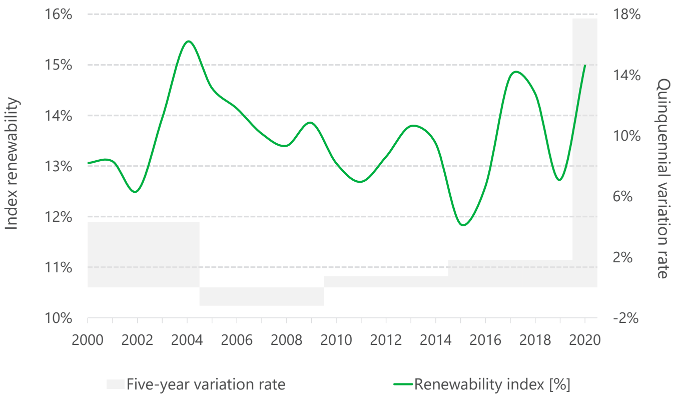

Sectoral energy intensities
koe / USD 2011 PPP
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)


Avoided energy demand due to variations in energy intensity
ktoe
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

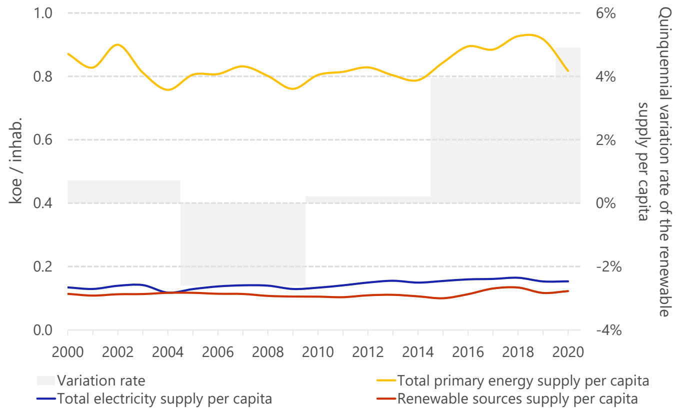

Logarithmic mean Divisia index for the structural decomposition of energy consumption
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect


Efficiency of the electricity sector
Efficiency of the electricity sector
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

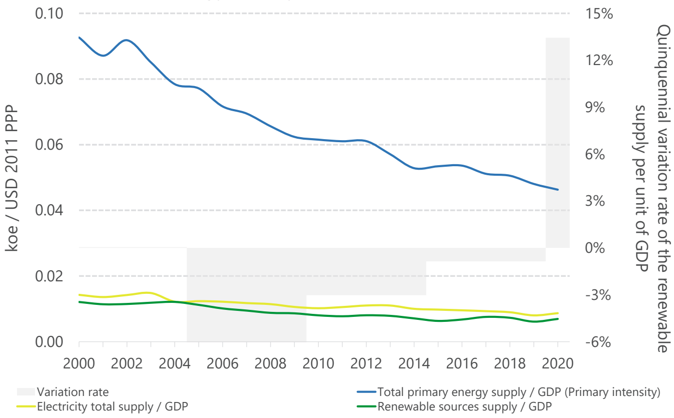
Index renewability



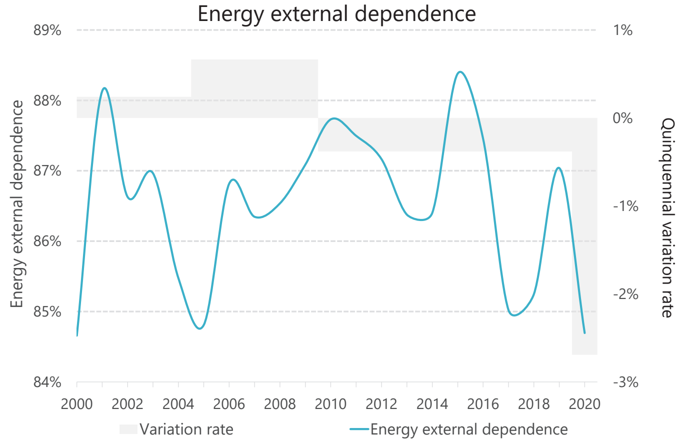
Energy supply per capita



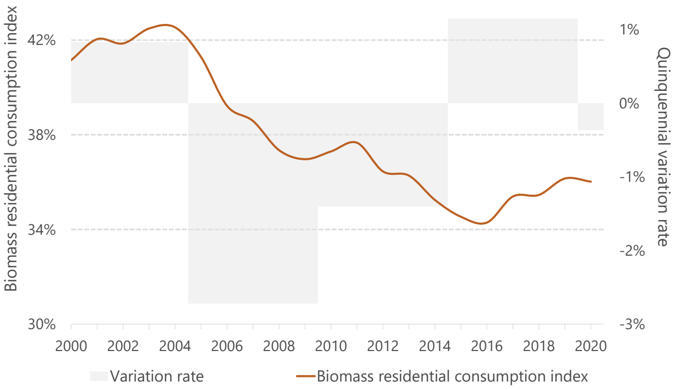
Energy supply per unit of GDP



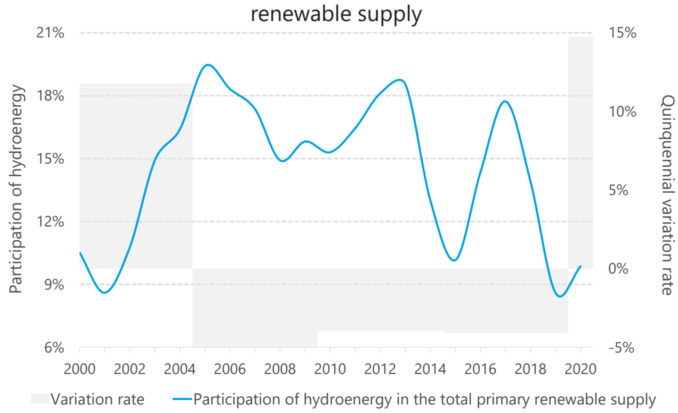
Energy external dependence



Biomass residential consumption index

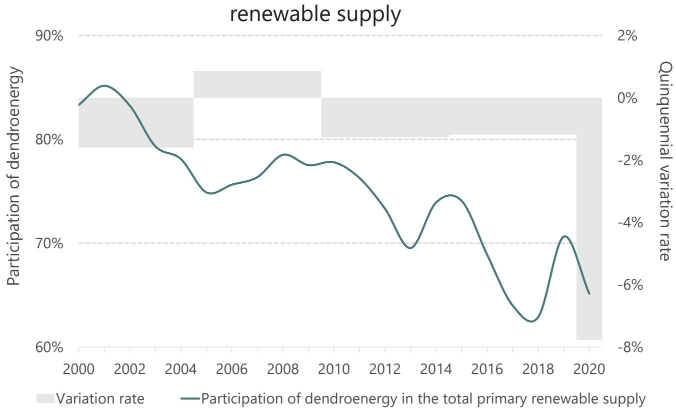


Participation of hydroenergy in the total primary renewable supply

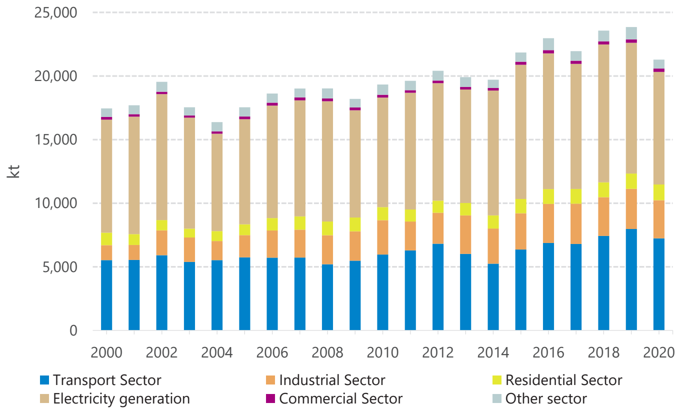


DOMINICAN REPUBLIC

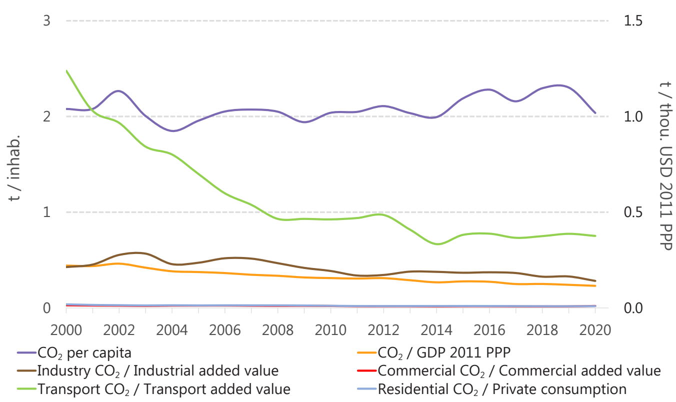
Participation of dendroenergy in the total primary renewable supply



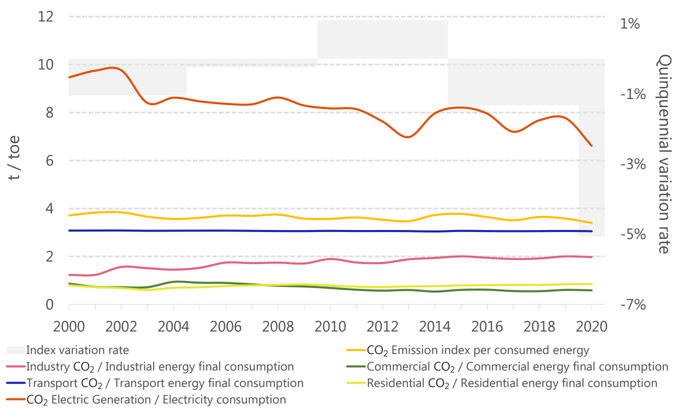
Evolution of CO_2 emissions by sector



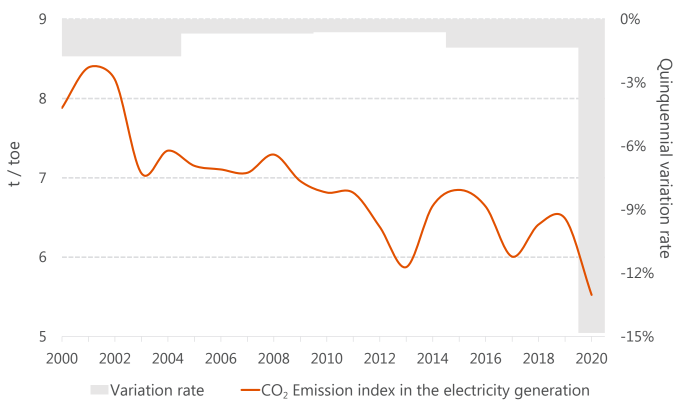
Evolution of CO_2 emissions per capita and per unit of GDP

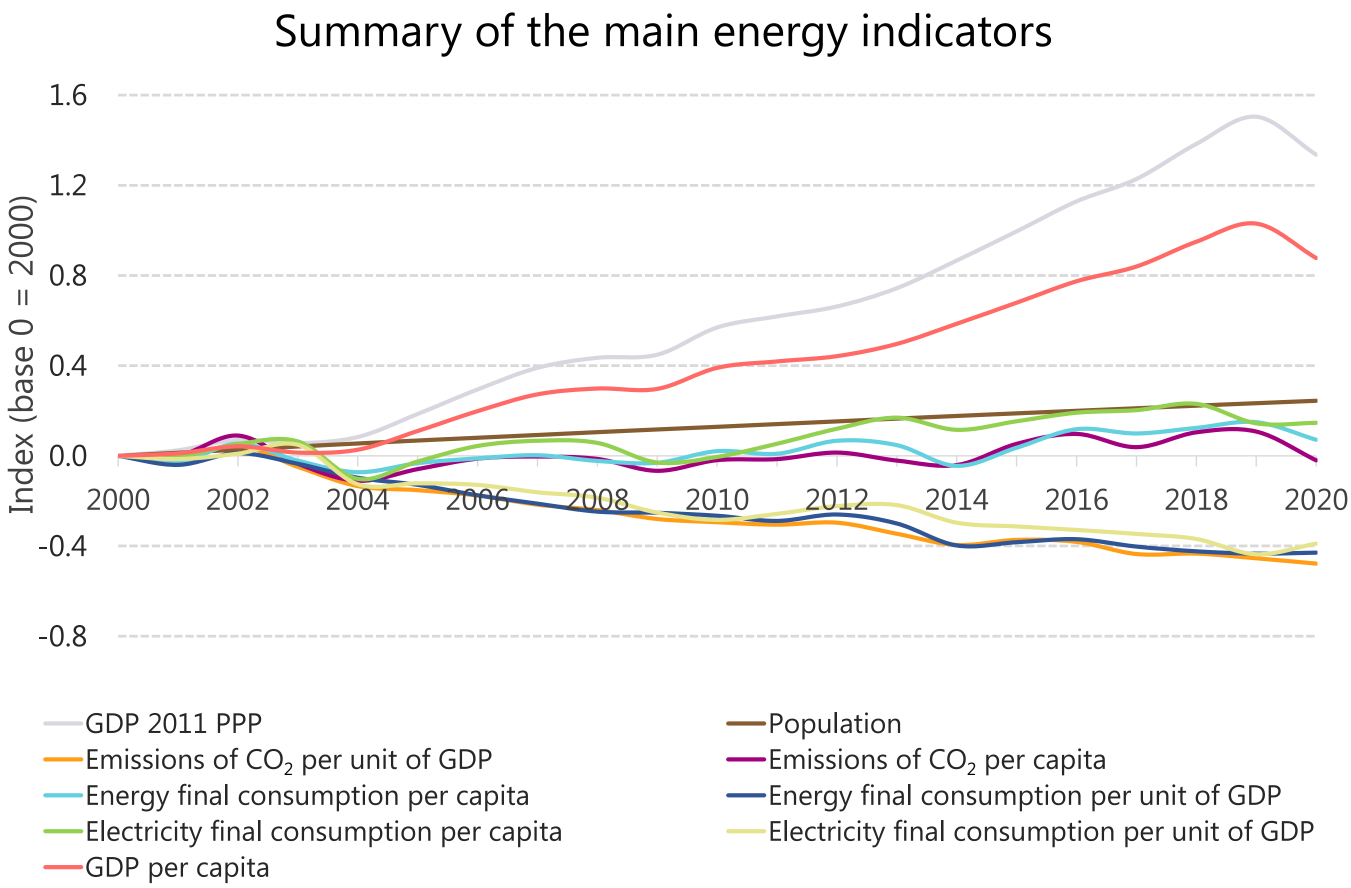


CO_2 Emission index per consumed energy



CO_2 Emission index of electricity generation





Summary of the main energy indicators
Index (base 0 = 2000)
1.6
1.2
0.8
0.4
0.0
-0.4
-0.8
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

ECUADOR

General Information 2020

Population (thousand inhab.)	17,643 [1]
Area (km^2)	256,370
Population Density (inhab. / km^2)	69
Urban Population (%)	64
GDP USD 2010 (MUSD)	81,658 [1]
GDP USD 2011 PPP (MUSD)	182,239 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	10

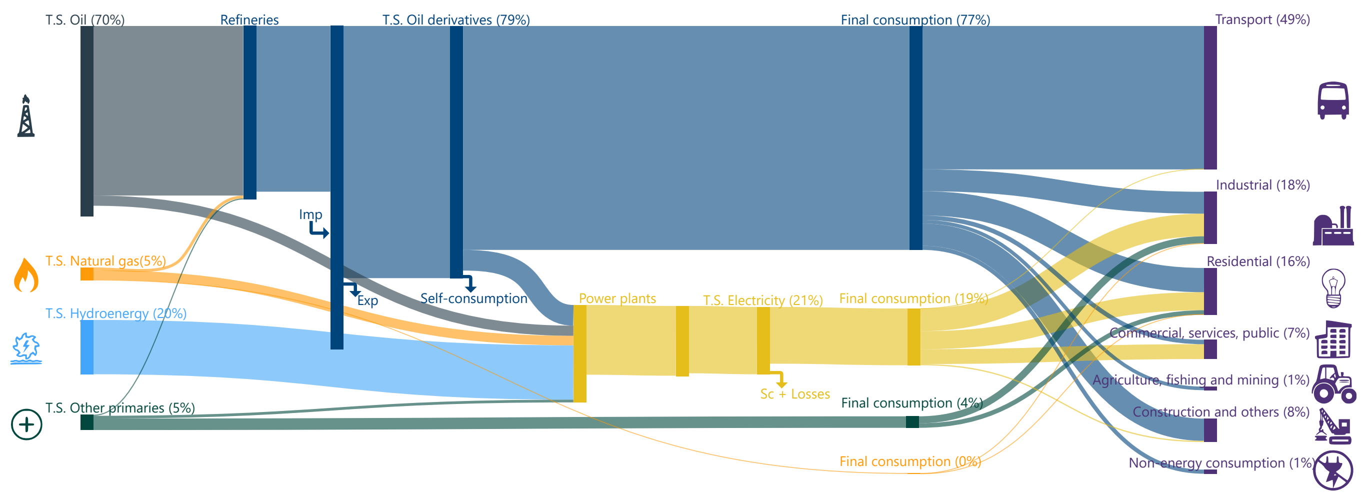
Energy Sector 2020

Final consumption in the Transport Sector	Mtep 5.53 [3]
Final consumption in the Industrial Sector	Mtep 2.00
Final consumption in the Residential Sector	Mtep 1.80
Final consumption in the Commercial and Service Sector	Mtep 0.74
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep 1.20
Oil Reserves	Mbbl 1,338
Natural gas Reserves	Gm^3 4
Coal Reserves	Mt n.a.

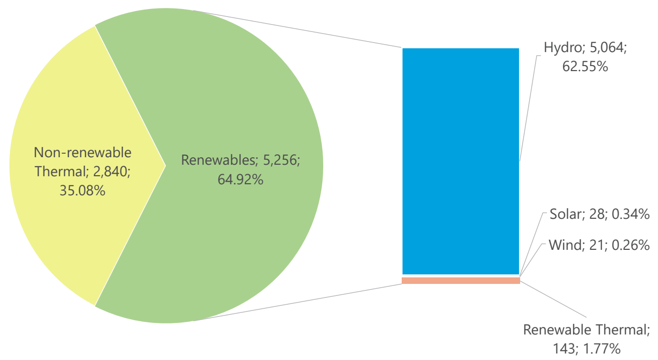
[1] Source: ECLAC.
[2] Source: World Bank.
[3] Includes bunker.
[4] Calculated as the relationship between Total Energy Supply and PPP GDP.
[5] Calculated as the relationship between Final Energy Consumption and PPP GDP.

kWh / inhab.	1,441	Electricity consumption per capita
toe / inhab.	0.64	Final energy consumption per capita
%	97.20	Electrification rate
Mtoe	13.72	Total energy supply
Mtoe	28.27	Total energy production
Mtoe	6.10	Total energy imports
Mtoe	20.44	Total energy exports
Mtoe	11.28	Total final energy consumption
kbbl / day	175	Refining capacity
GW	8.10	Installed power generation capacity
koe / USD 2011 PPP	0.08 [4] / 0.06 [5]	Primary energy intensity and final energy intensity

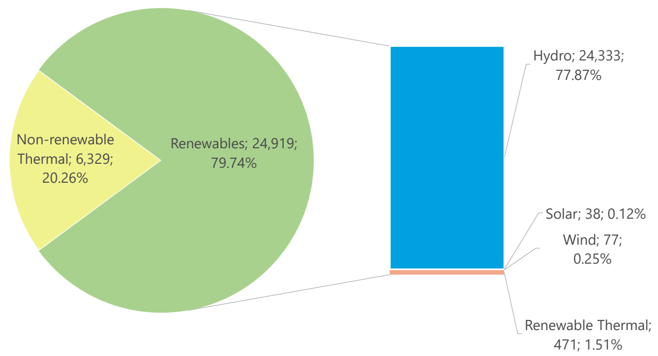
Summarized energy balance 2020



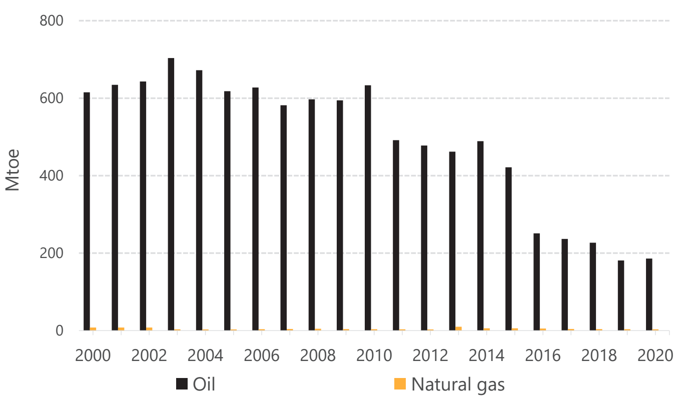
Installed power generation capacity [MW; %]
2020



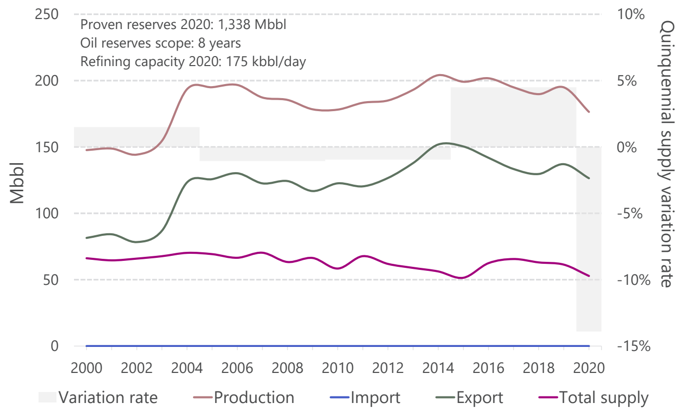
Electricity generation by source [GWh; %]
2020



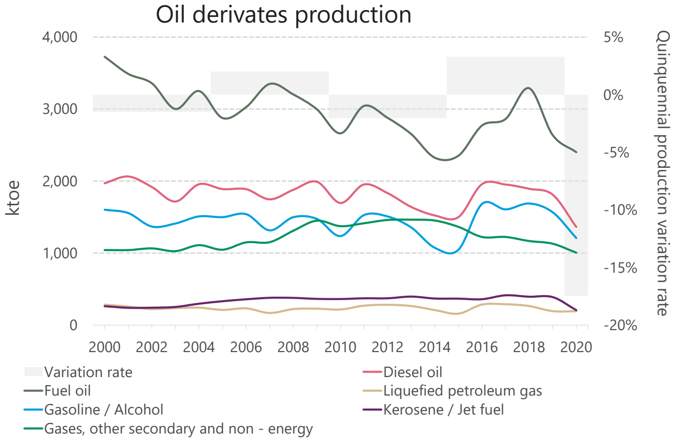
Proven reserves of oil and natural gas



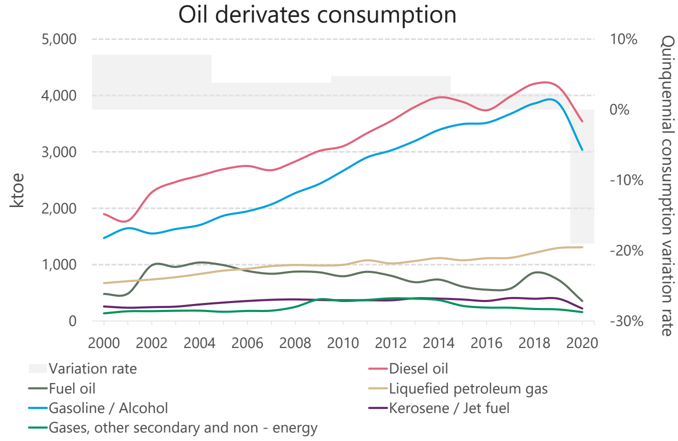
Oil supply



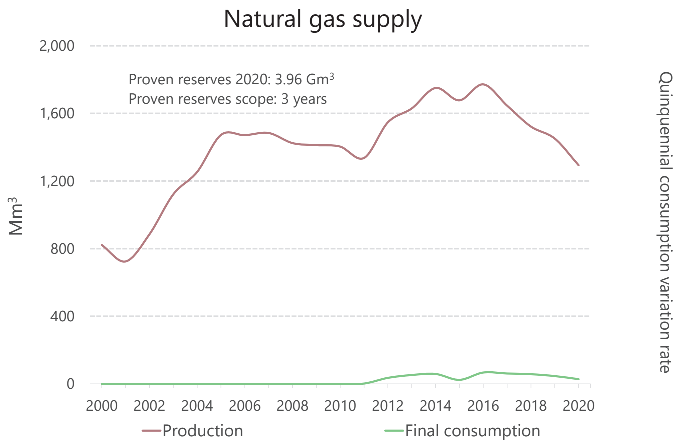
Oil derivates production



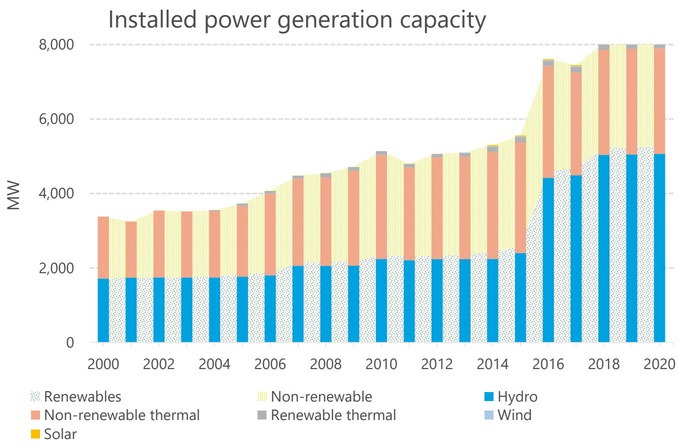
Oil derivates consumption

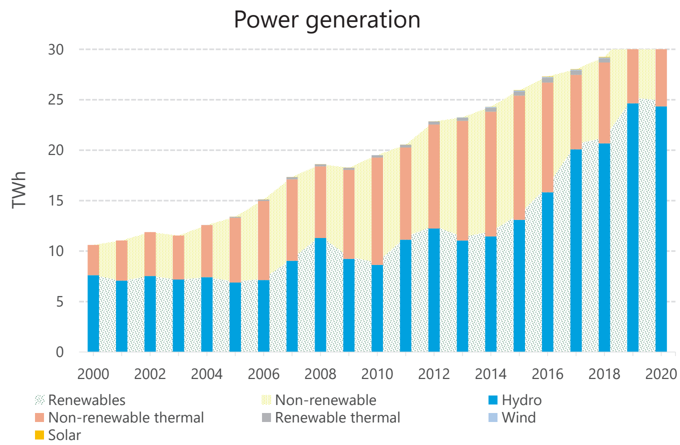


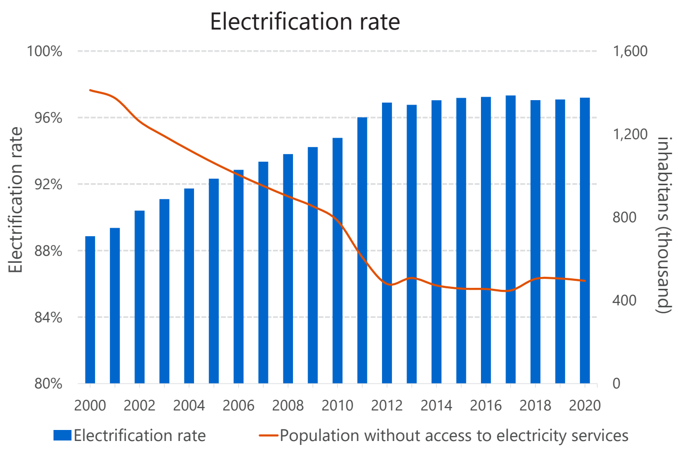
ECUADOR

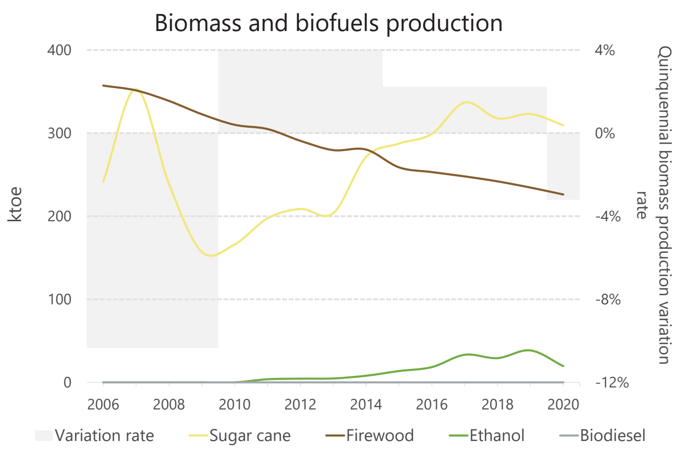


In 2020, 92% of the country's power generation came from hydroelectric plants. 7% from thermal and 1% from non-conventional sources (photovoltaic, wind, biomass, biogas, geothermal, among others). This production, marked by environmentally friendly energies, was able to satisfy the national demand for electricity, as well as the export of electrons to neighboring countries (Colombia and Peru).

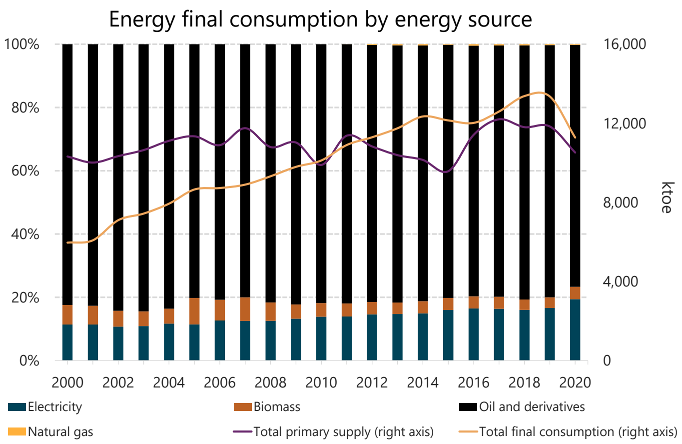


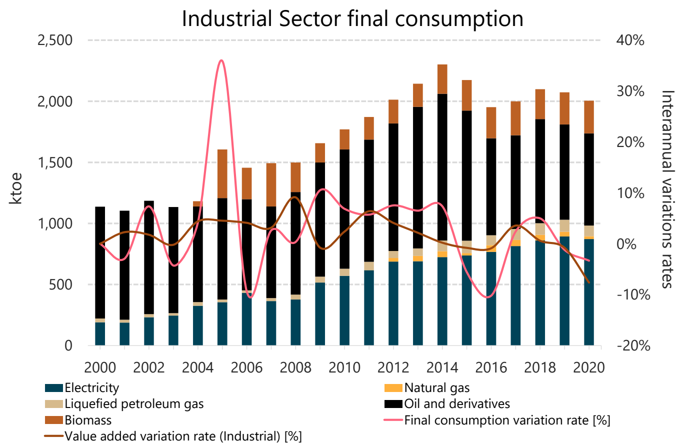


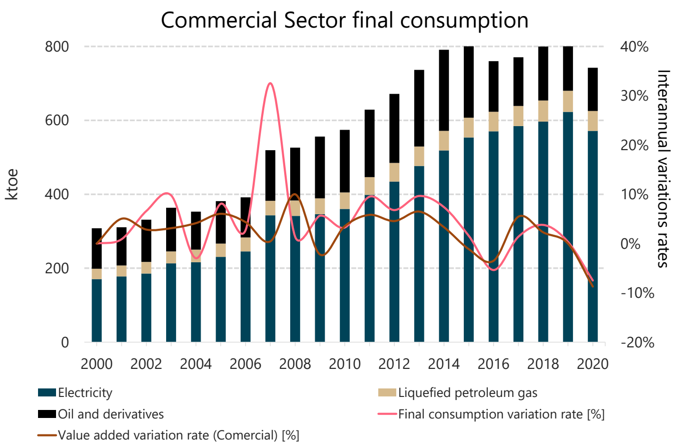


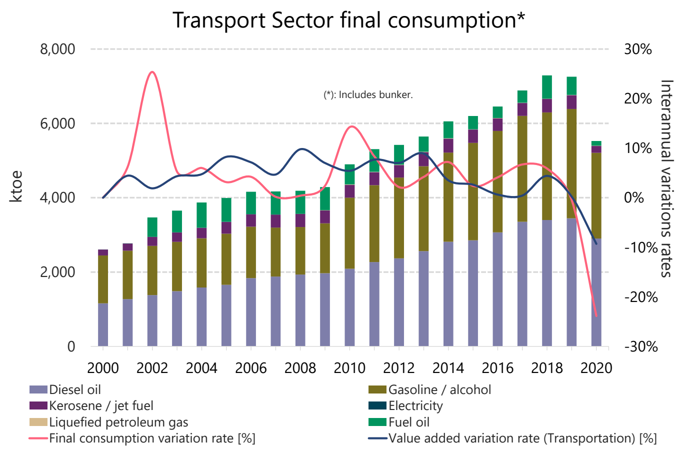


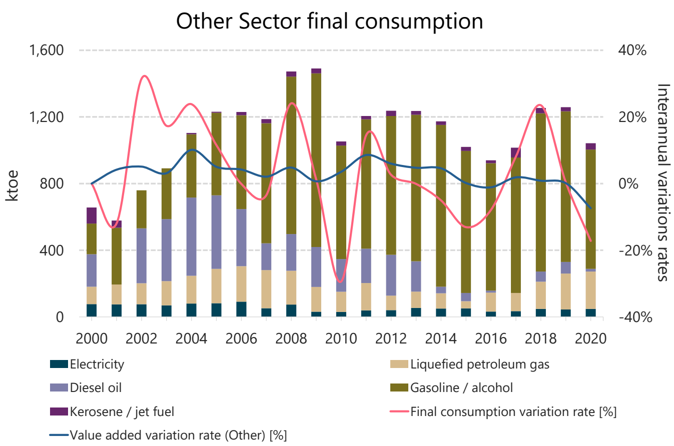
ECUADOR

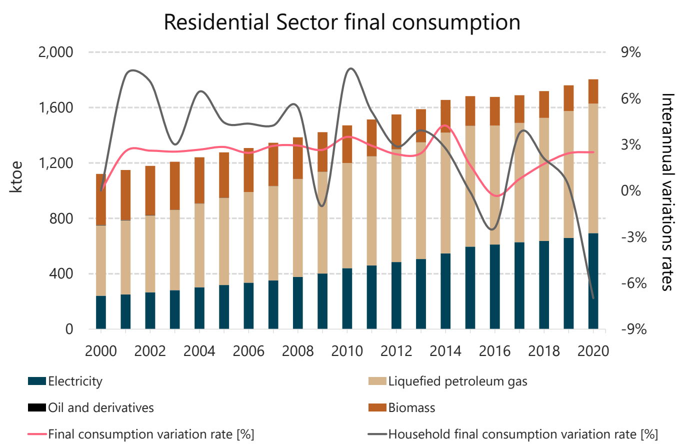

Energy final consumption by energy source
ktoe
Electricity
Biomass
Oil and derivatives
Natural gas
Total primary supply (right axis)
Total final consumption (right axis)

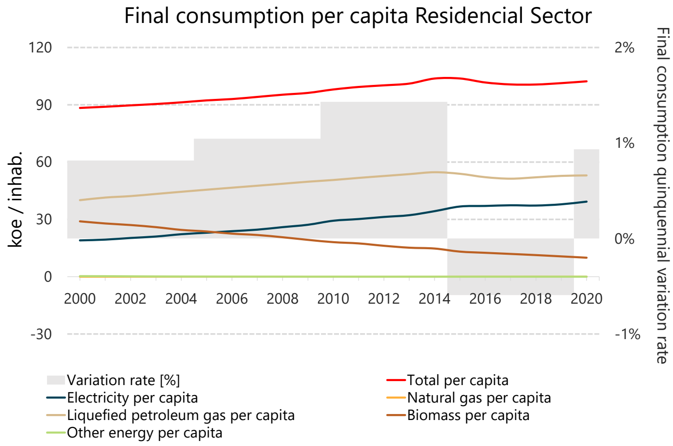

Industrial Sector final consumption
ktoe
Interannual variations rates
Electricity
Natural gas
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]

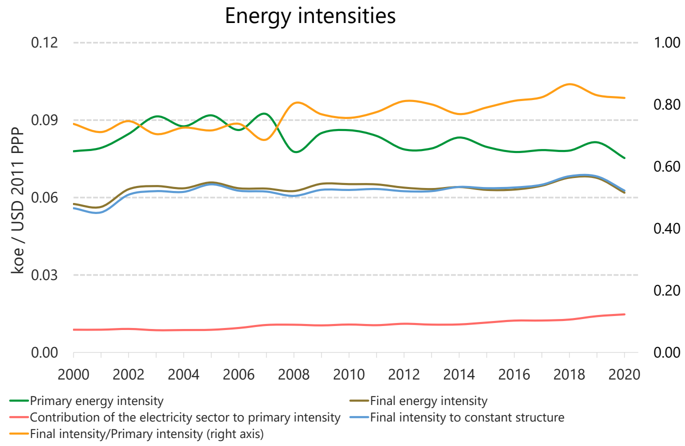

Commercial Sector final consumption
ktoe
Interannual variations rates
Electricity
Liquefied petroleum gas
Oil and derivatives
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]

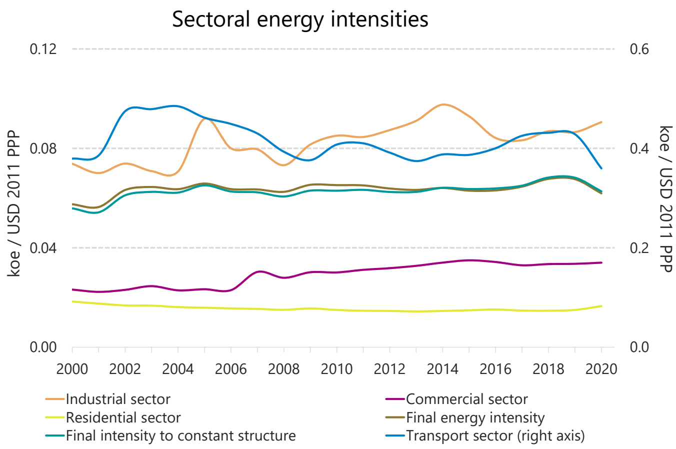

Transport Sector final consumption*
(*): Includes bunker.
ktoe
Interannual variations rates
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Electricity
Liquefied petroleum gas
Fuel oil
Final consumption variation rate [%]
Value added variation rate (Transportation) [%]

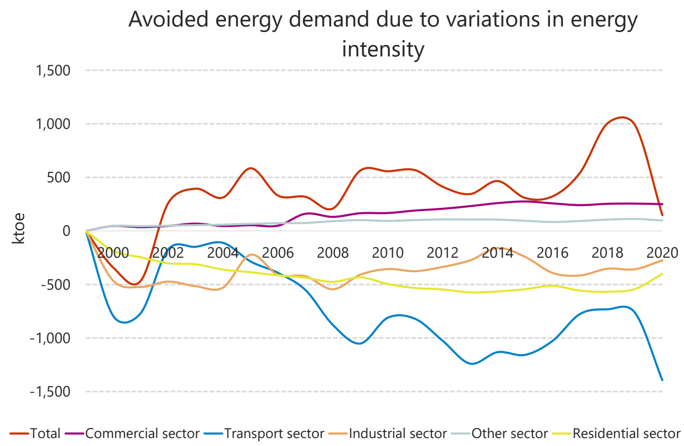

Other Sector final consumption
ktoe
Interannual variations rates
Electricity
Liquefied petroleum gas
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Final consumption variation rate [%]
Value added variation rate (Other) [%]

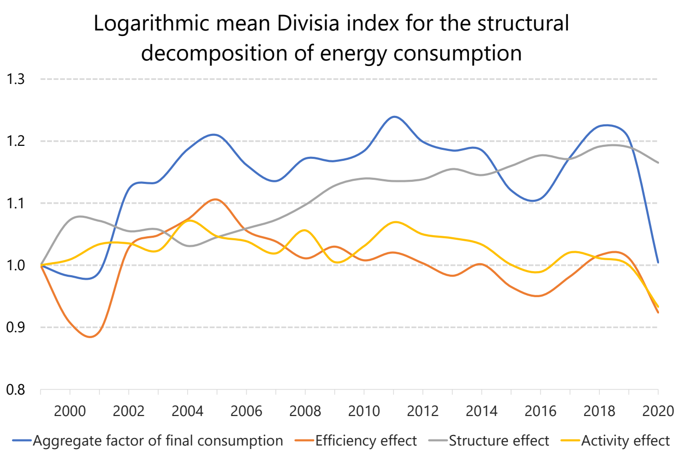

Residential Sector final consumption
ktoe
Interannual variations rates
Electricity
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Household final consumption variation rate [%]

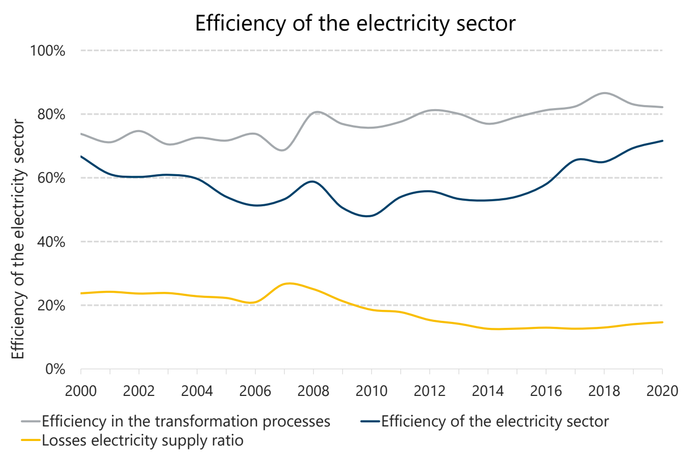

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
120
90
60
30
0
-30
2%
1%
0%
-1%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate [%]
Total per capita
Electricity per capita
Natural gas per capita
Liquefied petroleum gas per capita
Biomass per capita
Other energy per capita


Energy intensities
koe / USD 2011 PPP
0.12
0.09
0.06
0.03
0.00
1.00
0.80
0.60
0.40
0.20
0.00
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

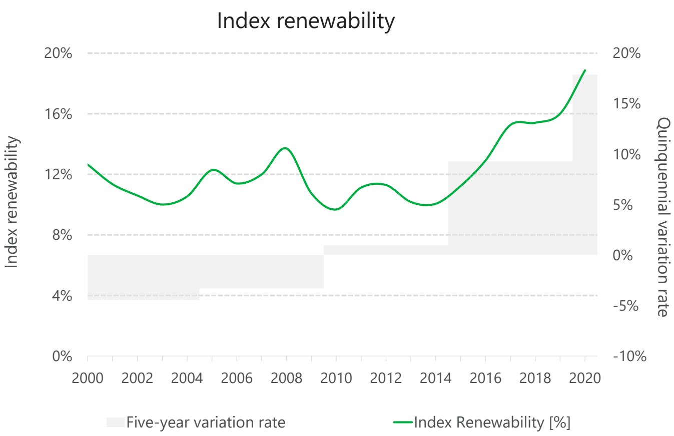

Sectoral energy intensities
koe / USD 2011 PPP
koe / USD 2011 PPP
0.12
0.08
0.04
0.00
0.6
0.4
0.2
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)

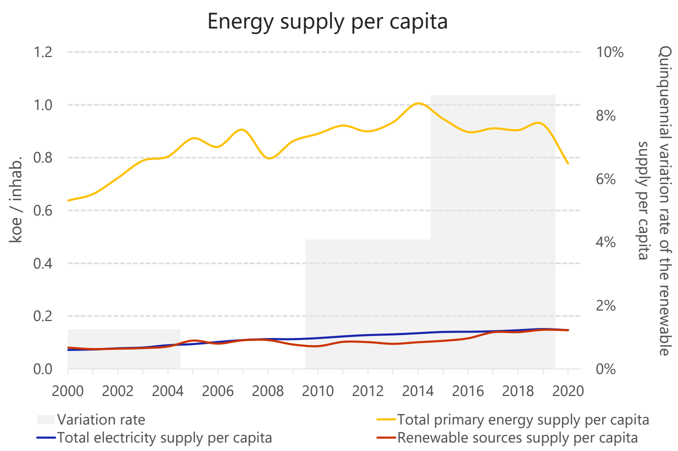

Avoided energy demand due to variations in energy intensity
ktoe
1,500
1,000
500
0
-500
-1,000
-1,500
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

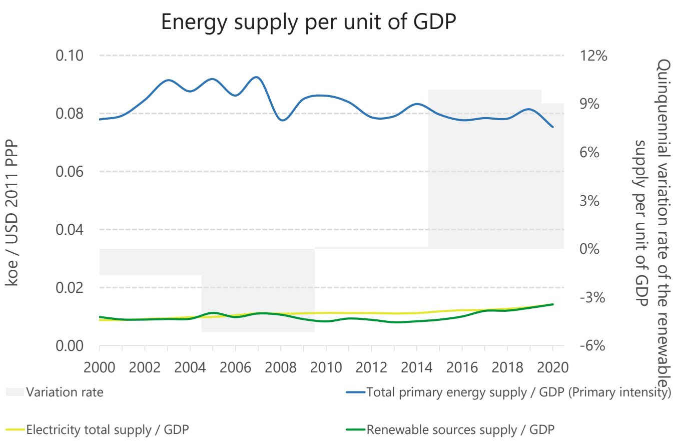

Logarithmic mean Divisia index for the structural decomposition of energy consumption
1.3
1.2
1.1
1.0
0.9
0.8
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect

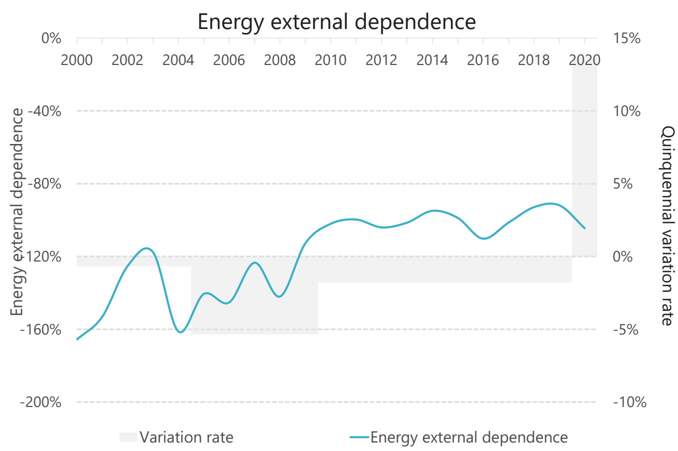

Efficiency of the electricity sector
Efficiency of the electricity sector
100%
80%
60%
40%
20%
0%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

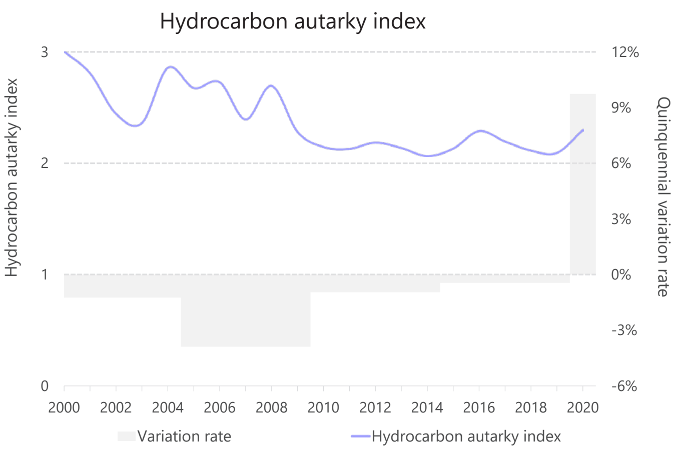
ECUADOR

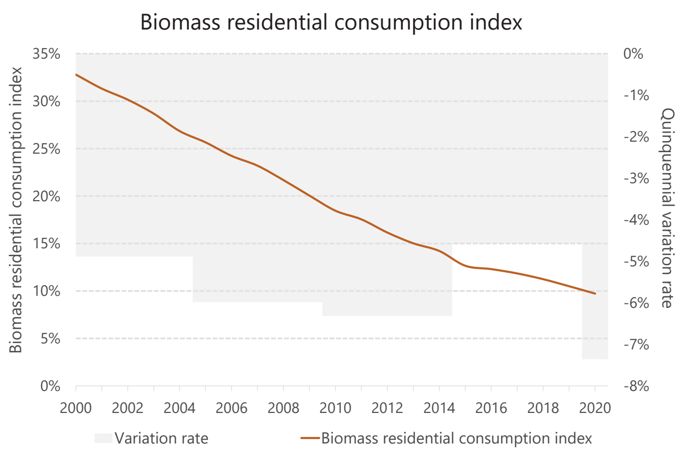

Index renewability
Index renewability
Quinquennial variation rate
Five-year variation rate
Index Renewability [%]

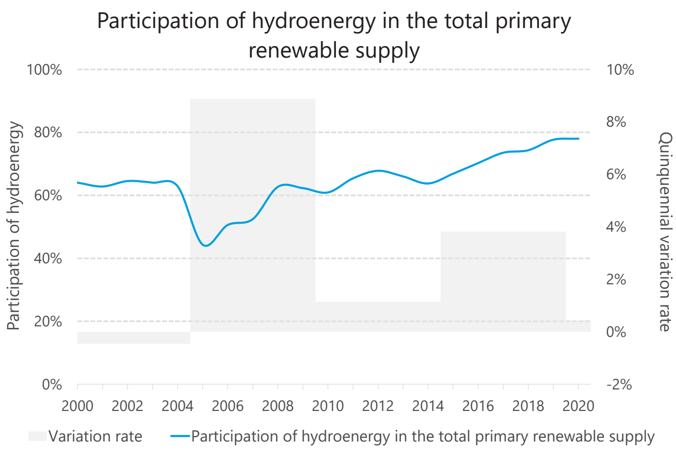

Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita

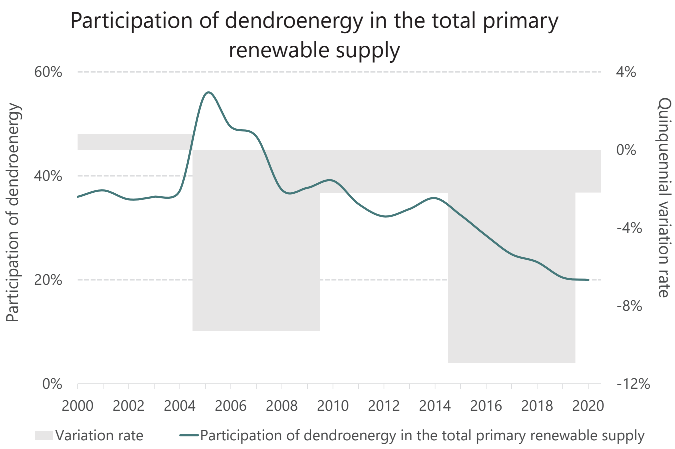

Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP

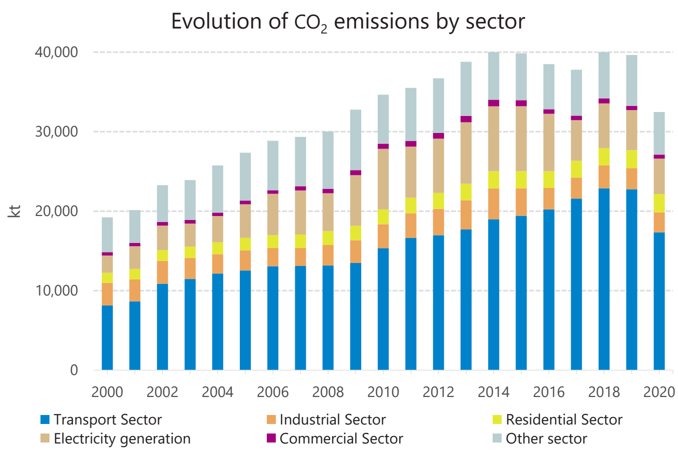

Energy external dependence
Energy external dependence
Quinquennial variation rate
Variation rate
Energy external dependence

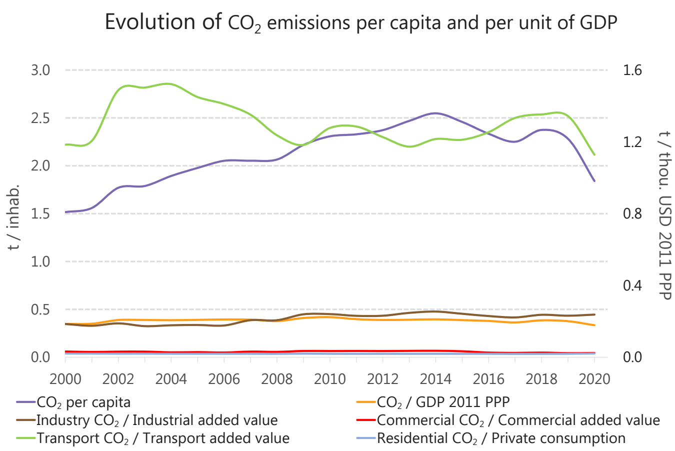

Hydrocarbon autarky index
Hydrocarbon autarky index
Quinquennial variation rate
Variation rate
Hydrocarbon autarky index

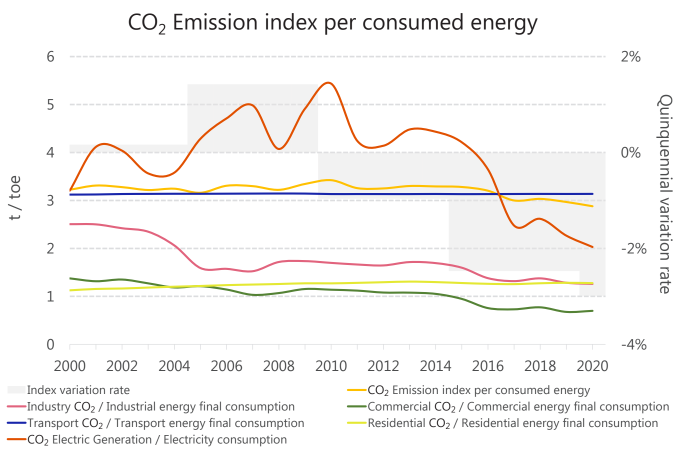

Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
Variation rate
Biomass residential consumption index

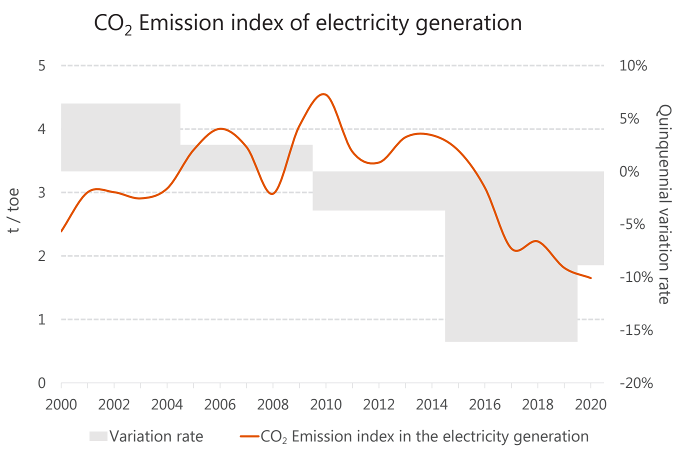

Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
Variation rate
Participation of hydroenergy in the total primary renewable supply


Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
Variation rate
Participation of dendroenergy in the total primary renewable supply


Evolution of CO2 emissions by sector
kt
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector


Evolution of CO2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
CO2 per capita
CO2 / GDP 2011 PPP
Industry CO2 / Industrial added value
Commercial CO2 / Commercial added value
Transport CO2 / Transport added value
Residential CO2 / Private consumption


CO2 Emission index per consumed energy
t / toe
Quinquennial variation rate
Index variation rate
CO2 Emission index per consumed energy
Industry CO2 / Industrial energy final consumption
Commercial CO2 / Commercial energy final consumption
Transport CO2 / Transport energy final consumption
Residential CO2 / Residential energy final consumption
CO2 Electric Generation / Electricity consumption


CO2 Emission index of electricity generation
t / toe
Quinquennial variation rate
Variation rate
CO2 Emission index in the electricity generation

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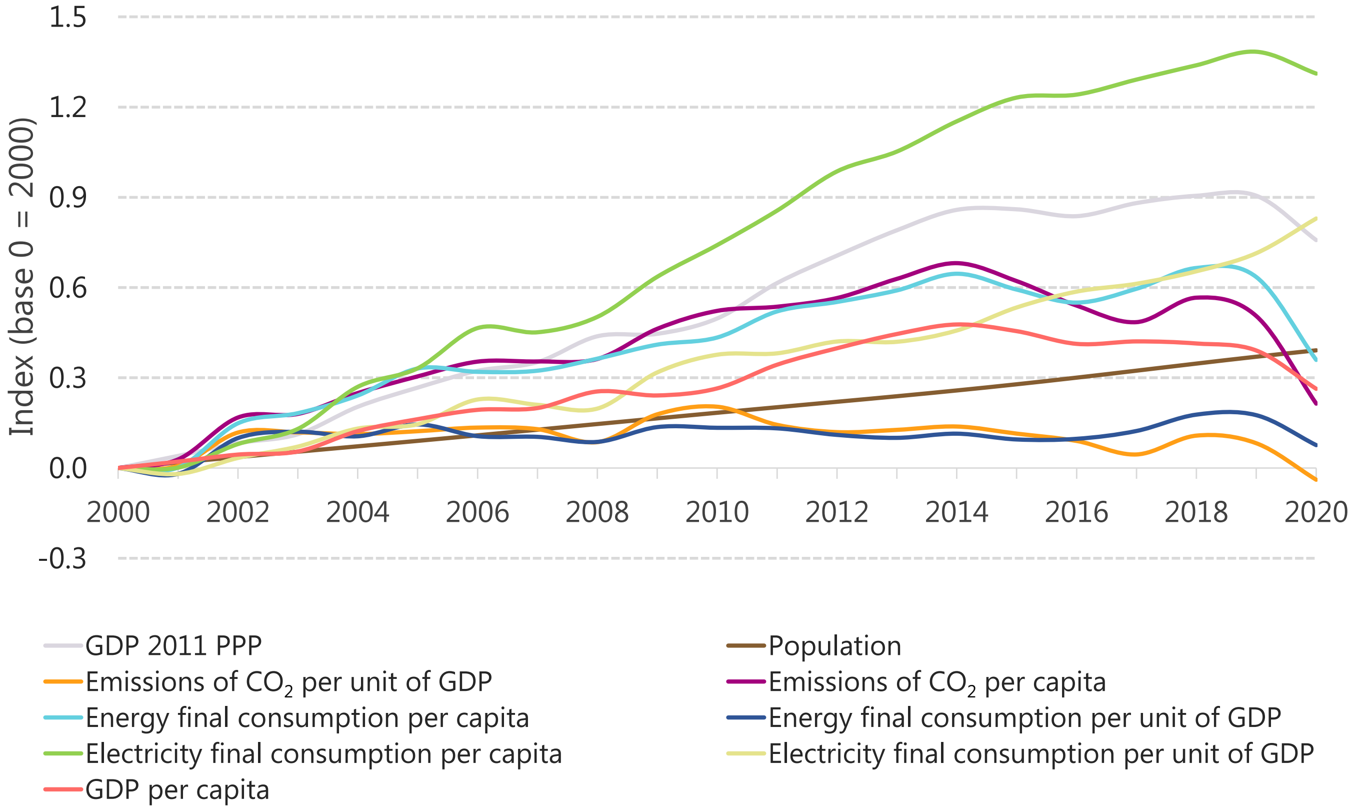
Summary of the main energy indicators



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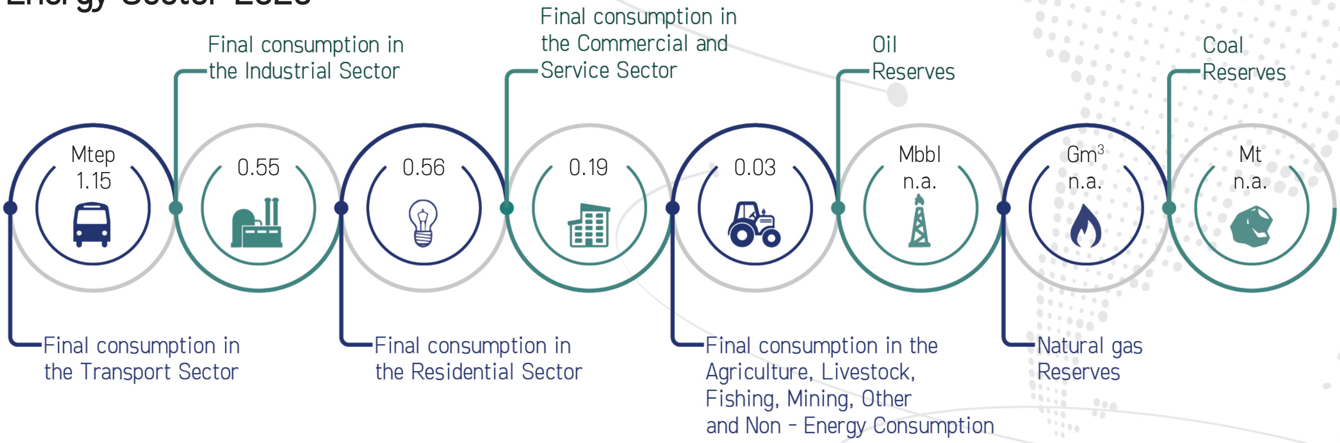
EL SALVADOR

General Information 2020

Population (thousand inhab.)	6,321 [1]
Area (km²)	21,040
Population Density (inhab. / km²)	300
Urban Population (%)	62
GDP USD 2010 (MUSD)	21,271
GDP USD 2011 PPP (MUSD)	52,256
GDP per capita (thou. USD 2011 PPP / inhab.)	8

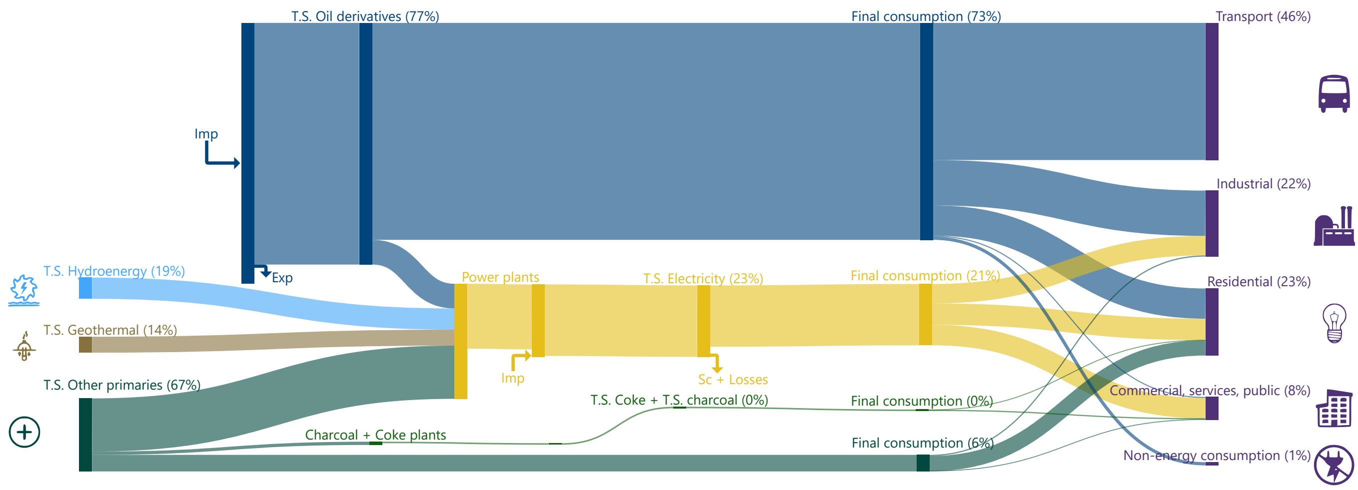
Energy Sector 2020



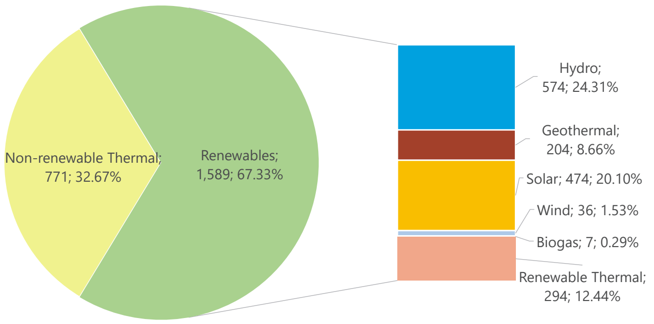
[1] General Directorate of Statistics and Census - El Salvador.

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
947	0.39	97.80	3.01	0.93	2.26	0.17	2.49	n.a.	2.36	0.06 / 0.05
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

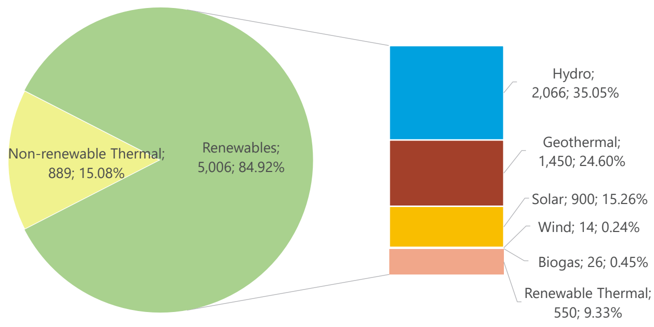
Summarized energy balance 2020



Installed power generation capacity [MW; %]
2020

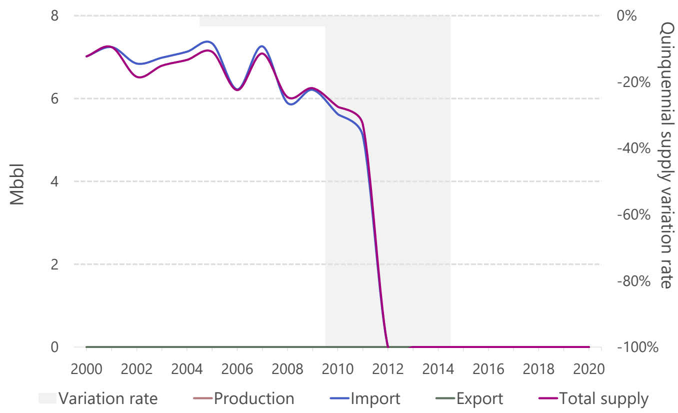


Electricity generation by source [GWh; %]
2020



In September 2012, the Salvadoran Refinery(RASA) in Acajutlá closed its operations.

Oil supply



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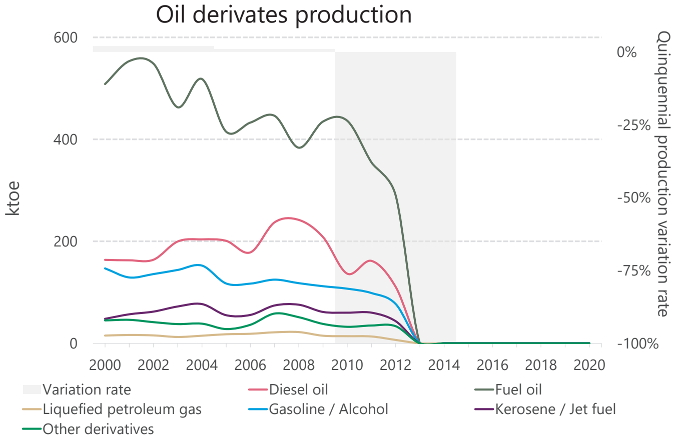
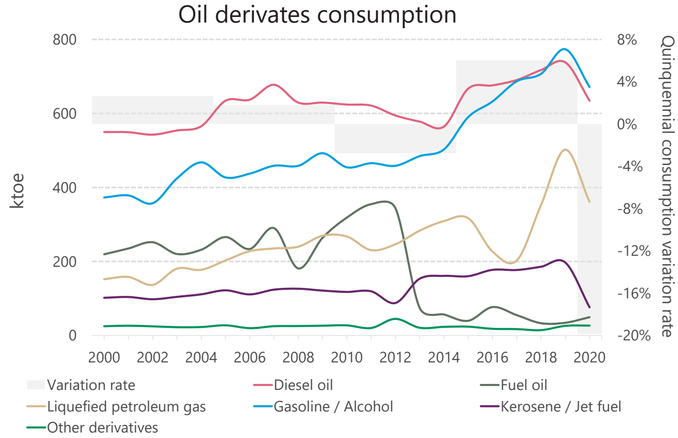
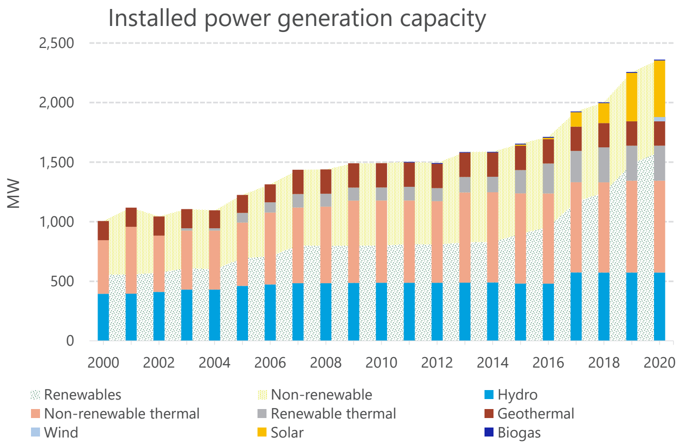
Oil derivates production



Oil derivates consumption



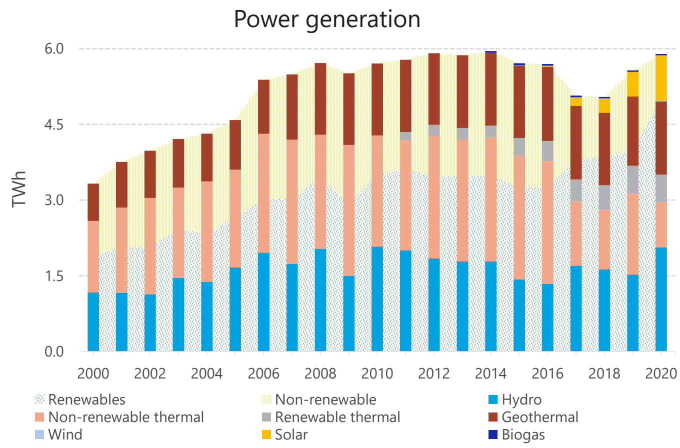


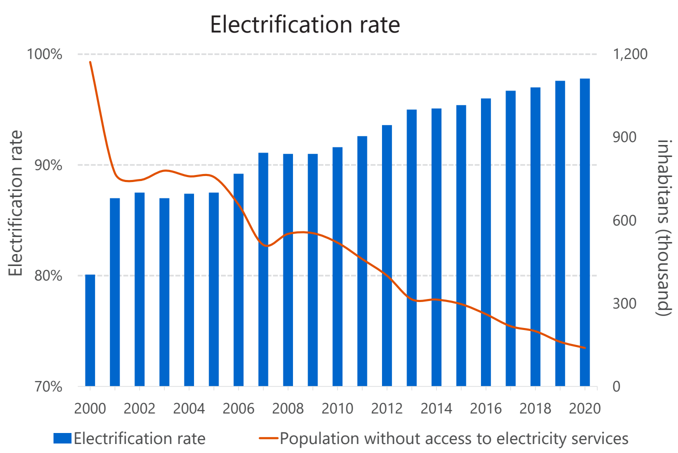
In April 2020, two solar photovoltaic generation plants began commercial operation in the wholesale electricity market, adding 110 MW to El Salvador's generation capacity. The largest of these are the **Albireo I and II** plants, which are part of the Capella Solar Park, each with 50 MW, totaling 100 MW.

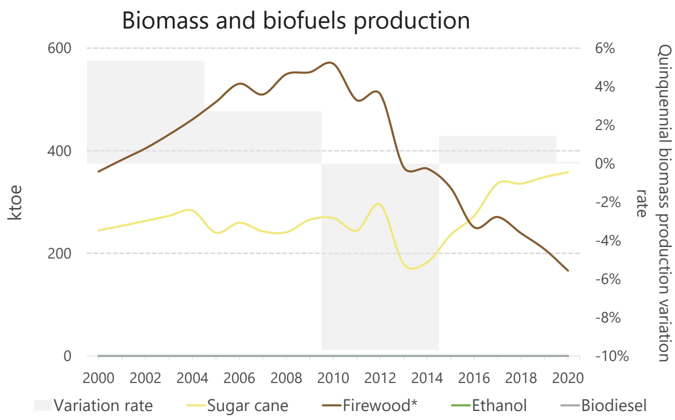
Likewise, in the first half of 2020, the 10 MW **Sonsonate Solar** plant entered into commercial operation, which has fixed facilities on the ground.

The installed solar generation capacity of El Salvador in 2020 was 474.46 MW.

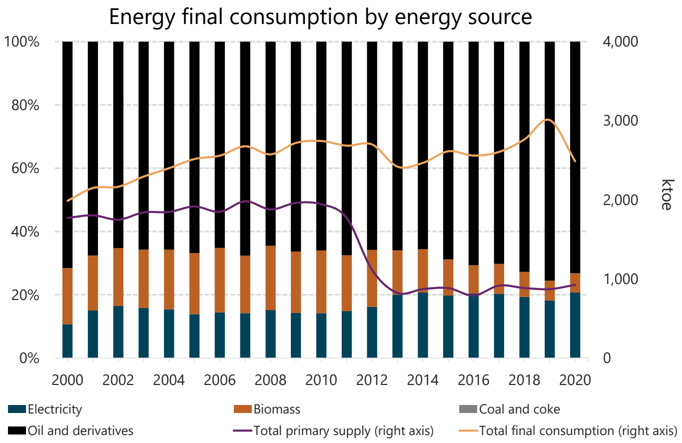
The Ventus wind farm in 2020 was under construction and at the end of December had 12 wind turbines installed, of which the energy from 10 wind turbines was being marketed to the Wholesale Electricity Market, having an available capacity of 36 MW of the total 54 MW.

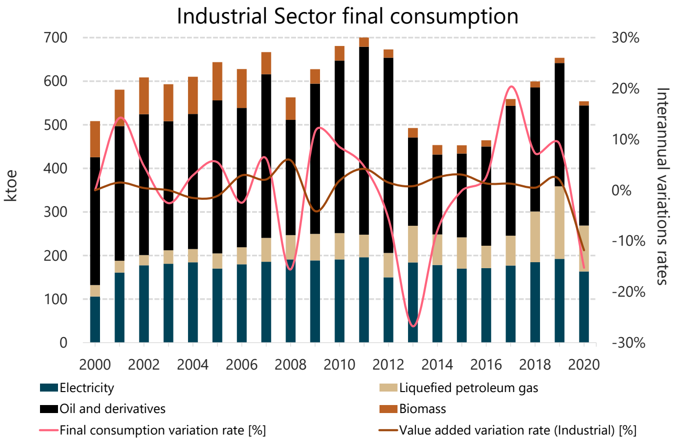


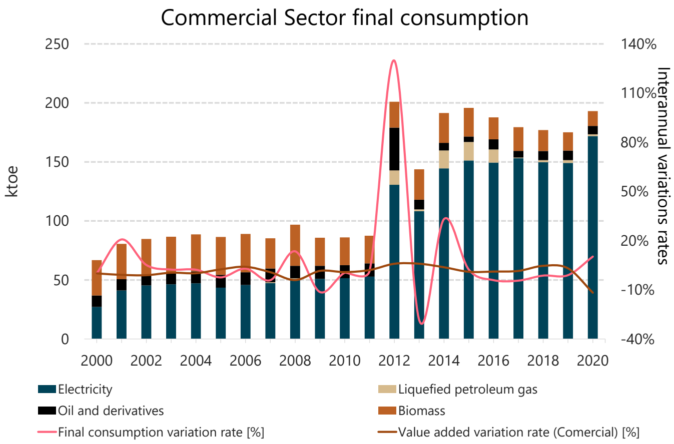


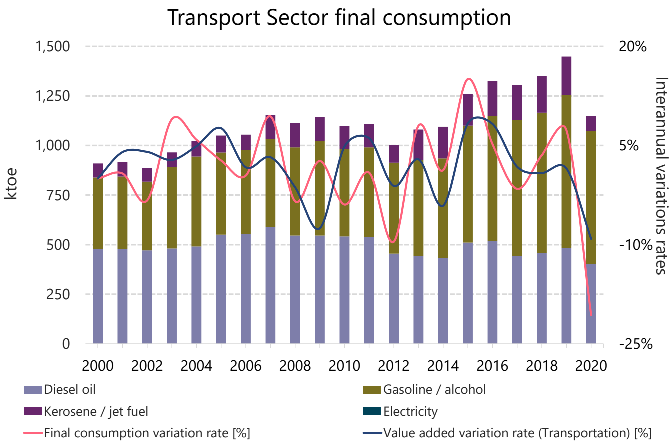


(*): Firewood production data were estimated by OLADE

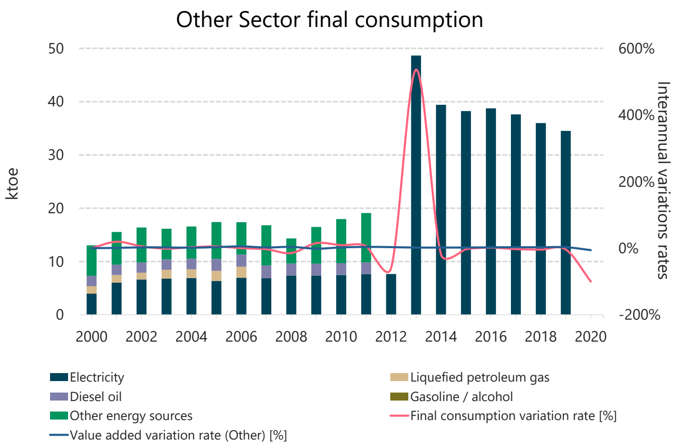

Energy final consumption by energy source
ktoe
Electricity
Biomass
Coal and coke
Oil and derivatives
Total primary supply (right axis)
Total final consumption (right axis)

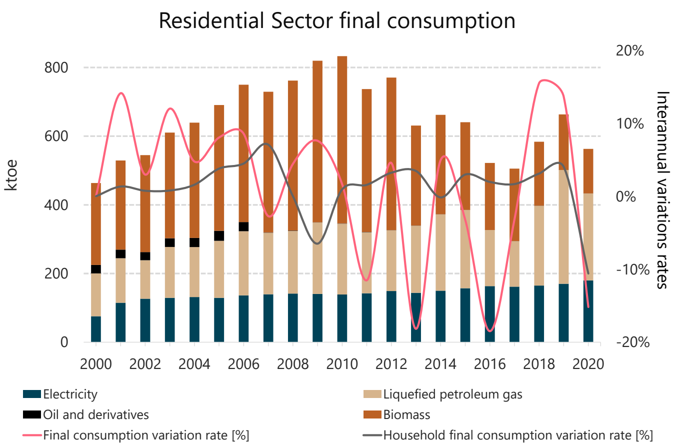

Industrial Sector final consumption
ktoe
Interannual variations rates
Electricity
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]

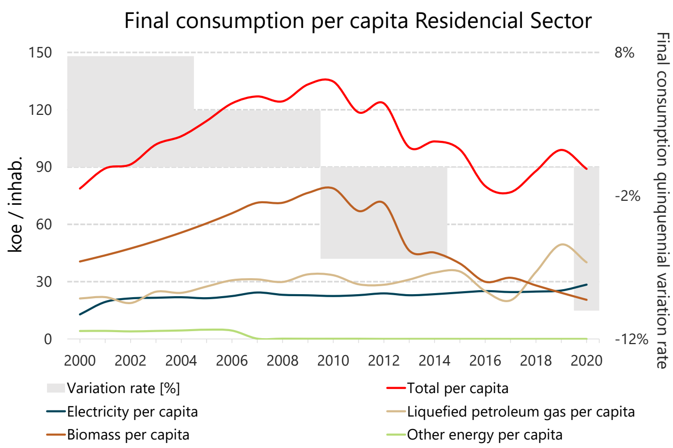

Commercial Sector final consumption
ktoe
Interannual variations rates
Electricity
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]

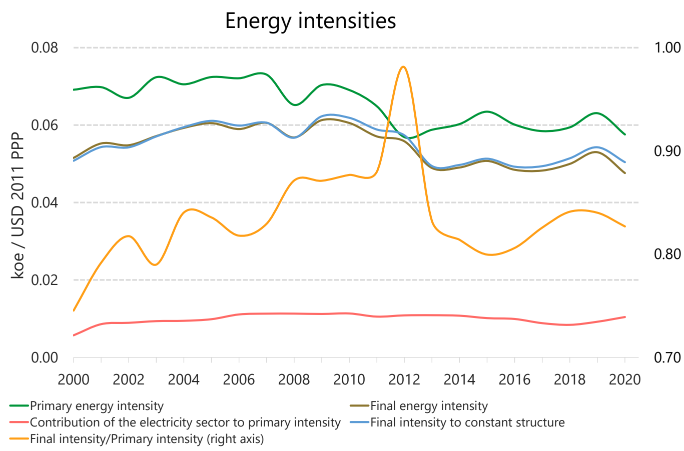

Transport Sector final consumption
ktoe
Interannual variations rates
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Electricity
Final consumption variation rate [%]
Value added variation rate (Transportation) [%]

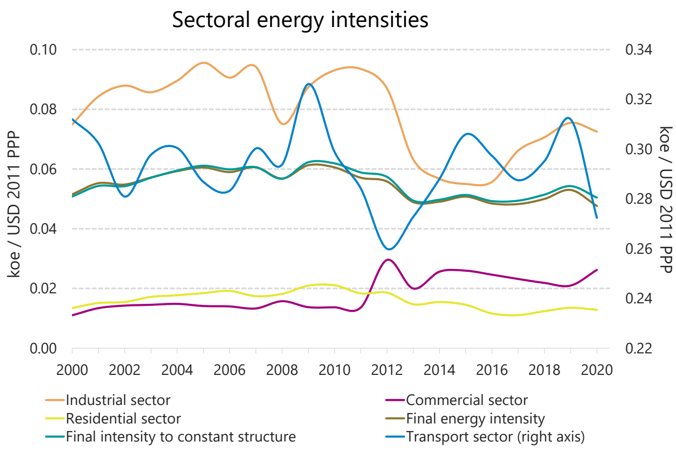
EL SALVADOR

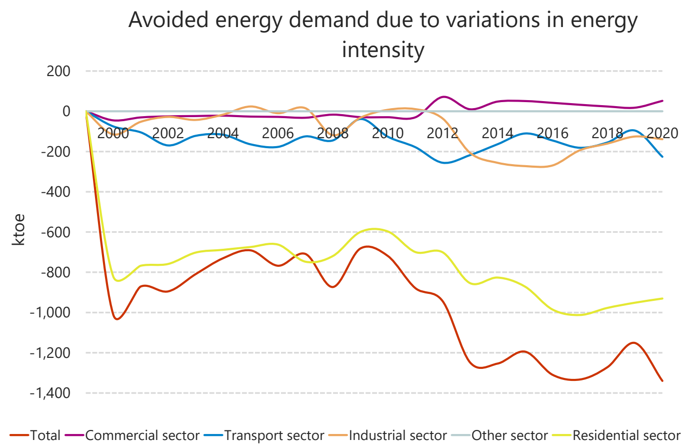

Other Sector final consumption
ktoe
Interannual variations rates
Electricity
Liquefied petroleum gas
Diesel oil
Gasoline / alcohol
Other energy sources
Final consumption variation rate [%]
Value added variation rate (Other) [%]

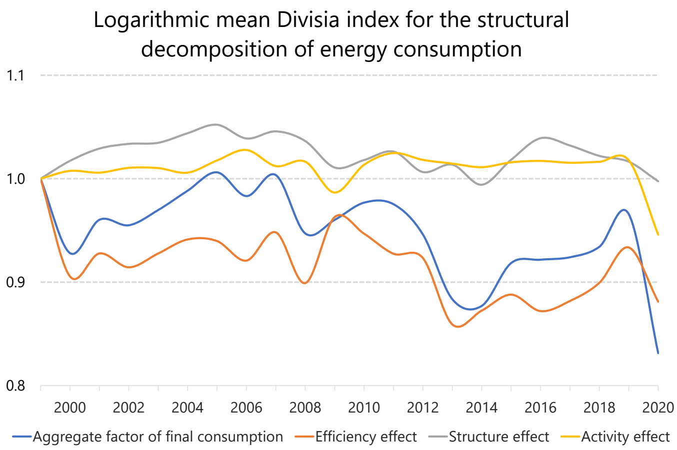

Residential Sector final consumption
ktoe
Interannual variations rates
Electricity
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Household final consumption variation rate [%]

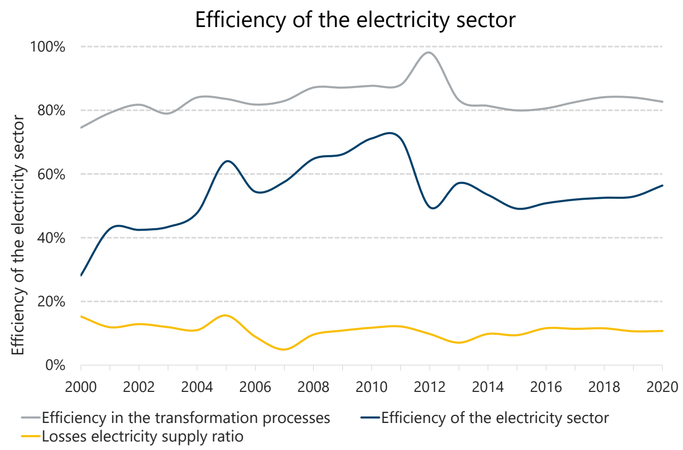

Final consumption per capita Residencial Sector
150
120
90
60
30
0
koe / inhab.
8%
-2%
-12%
Final consumption quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate [%]
Total per capita
Electricity per capita
Liquefied petroleum gas per capita
Biomass per capita
Other energy per capita

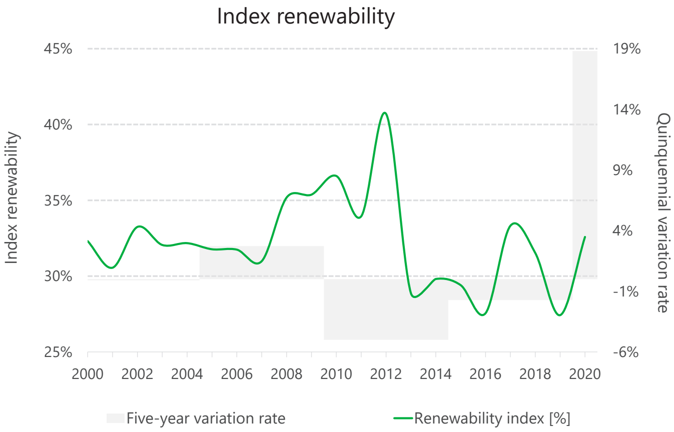

Energy intensities
0.08
0.06
0.04
0.02
0.00
koe / USD 2011 PPP
1.00
0.90
0.80
0.70
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

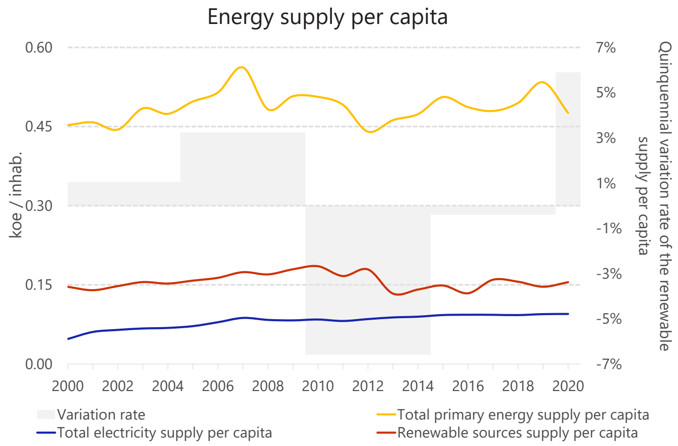

Sectoral energy intensities
0.10
0.08
0.06
0.04
0.02
0.00
koe / USD 2011 PPP
0.34
0.32
0.30
0.28
0.26
0.24
0.22
koe / USD 2011 PPP
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)

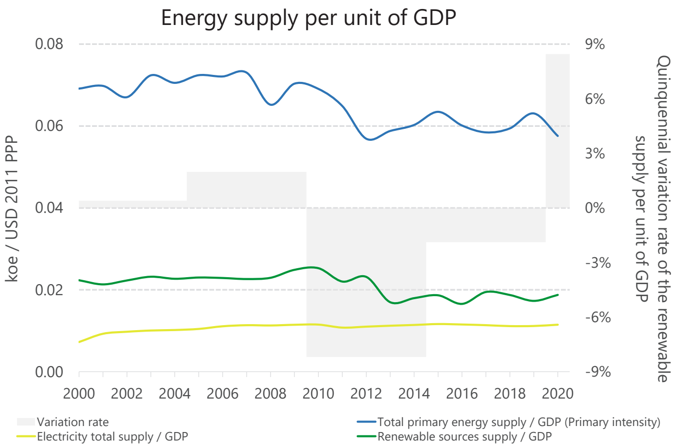

Avoided energy demand due to variations in energy intensity
200
0
-200
-400
-600
-800
-1,000
-1,200
-1,400
ktoe
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

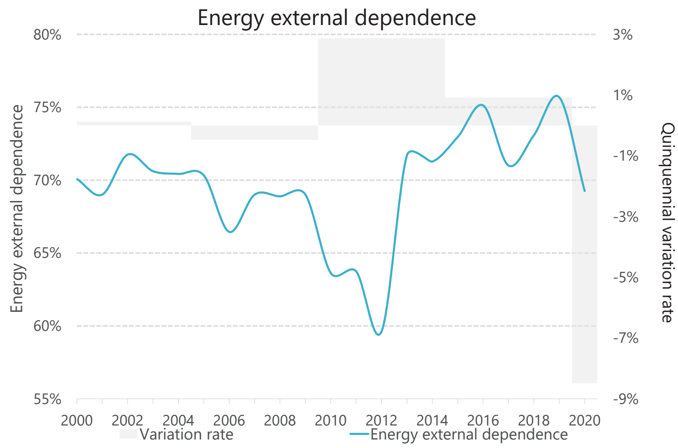

Logarithmic mean Divisia index for the structural decomposition of energy consumption
1.1
1.0
0.9
0.8
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect


Efficiency of the electricity sector
100%
80%
60%
40%
20%
0%
Efficiency of the electricity sector
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

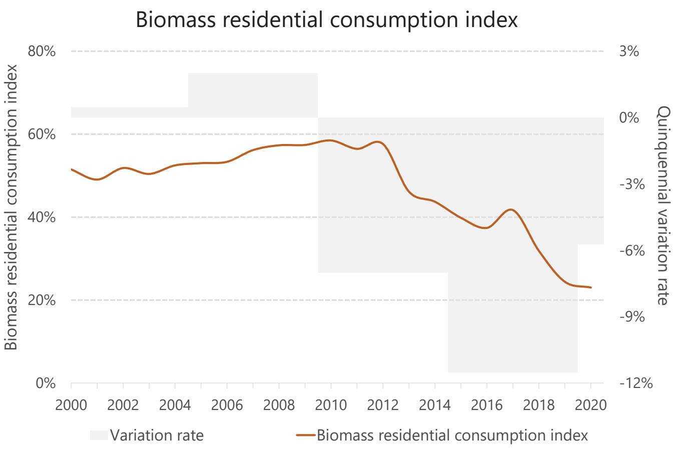

Index renewability
Index renewability
45%
40%
35%
30%
25%
19%
14%
9%
4%
-1%
-6%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Five-year variation rate
Renewability index [%]

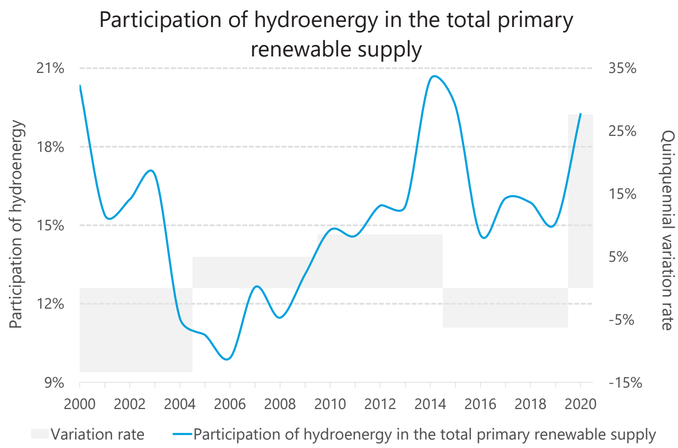

Energy supply per capita
koe / inhab.
0.60
0.45
0.30
0.15
0.00
7%
5%
3%
1%
-1%
-3%
-5%
-7%
Quinquennial variation rate of the renewable supply per capita
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Total electricity supply per capita
Total primary energy supply per capita
Renewable sources supply per capita


Energy supply per unit of GDP
koe / USD 2011 PPP
0.08
0.06
0.04
0.02
0.00
9%
6%
3%
0%
-3%
-6%
-9%
Quinquennial variation rate of the renewable supply per unit of GDP
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Electricity total supply / GDP
Total primary energy supply / GDP (Primary intensity)
Renewable sources supply / GDP

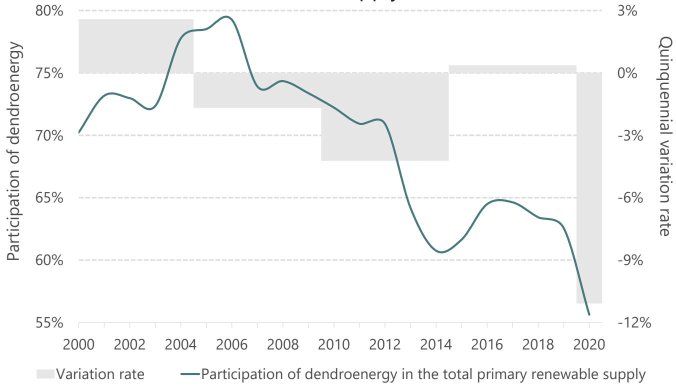

Energy external dependence
Energy external dependence
80%
75%
70%
65%
60%
55%
3%
1%
-1%
-3%
-5%
-7%
-9%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Energy external dependence

EL SALVADOR

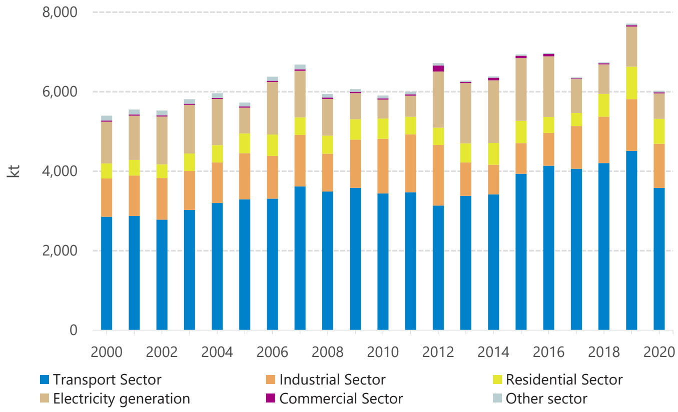

Biomass residential consumption index
Biomass residential consumption index
80%
60%
40%
20%
0%
3%
0%
-3%
-6%
-9%
-12%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Biomass residential consumption index


Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
21%
18%
15%
12%
9%
35%
25%
15%
5%
-5%
-15%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Participation of hydroenergy in the total primary renewable supply

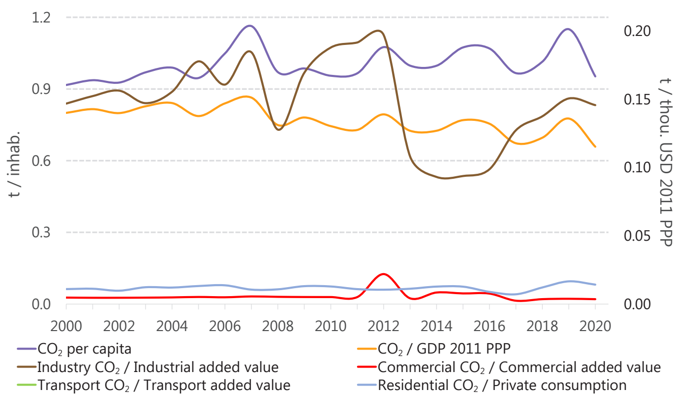
Participation of dendroenergy in the total primary renewable supply



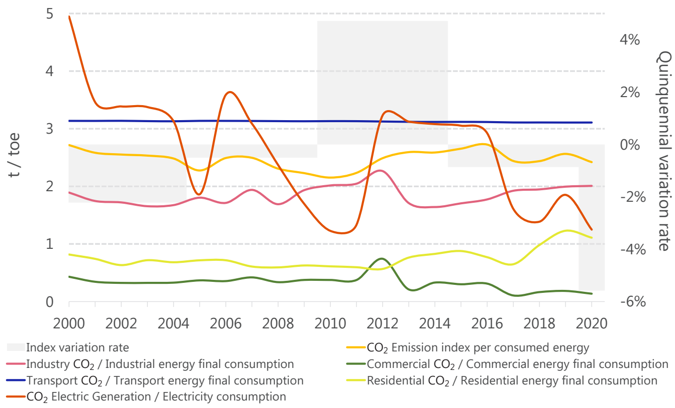
Evolution of CO_2 emissions by sector



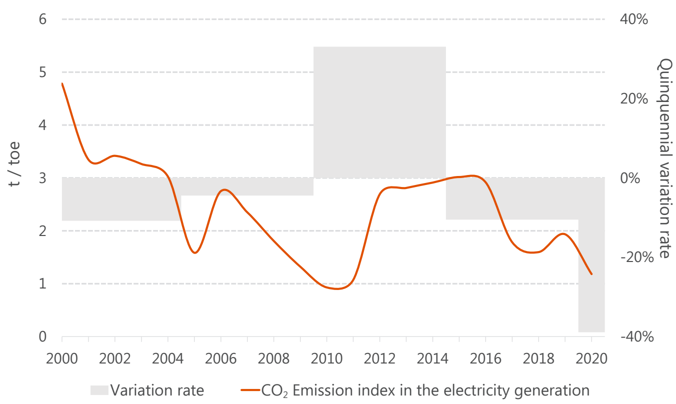
Evolution of CO_2 emissions per capita and per unit of GDP



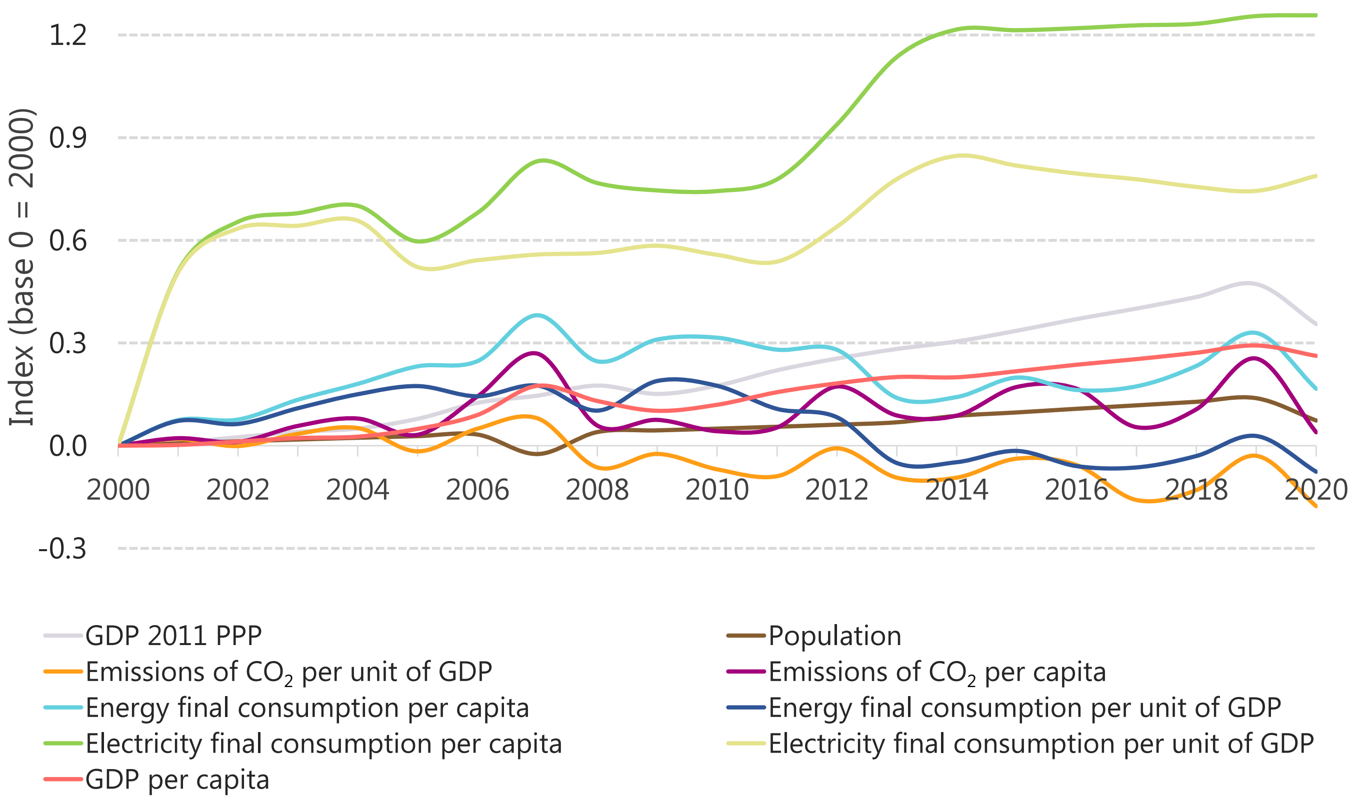
CO_2 Emission index per consumed energy



CO_2 Emission index of electricity generation



Summary of the main energy indicators



GRENADA

General Information 2020

Population (thousand inhab.)	113 [1]
Area (km^2)	340
Population Density (inhab. / km^2)	331
Urban Population (%)	37
GDP USD 2010 (MUSD)	882 [1]
GDP USD 2011 PPP (MUSD)	1,695 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	15

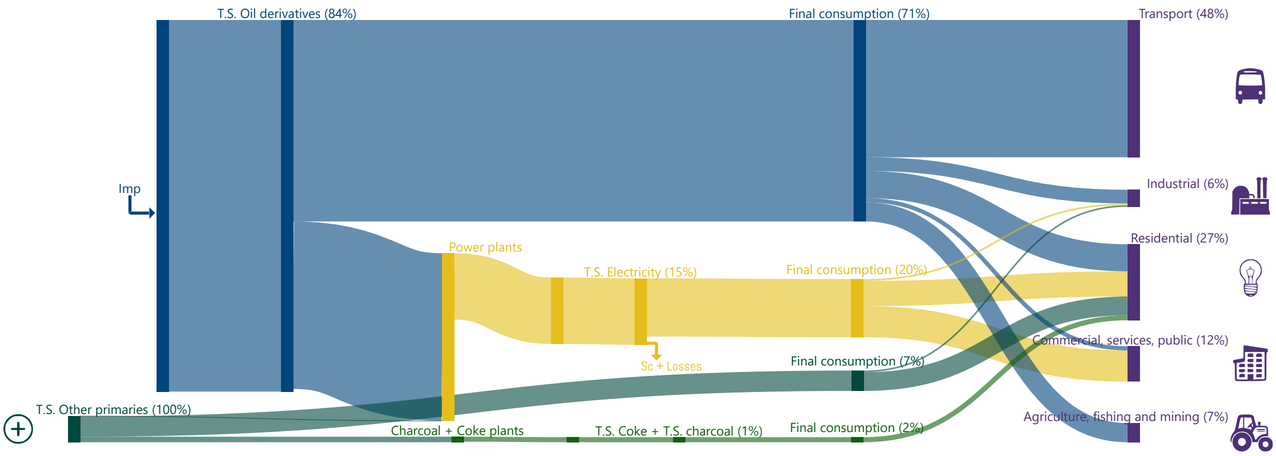
Energy Sector 2020

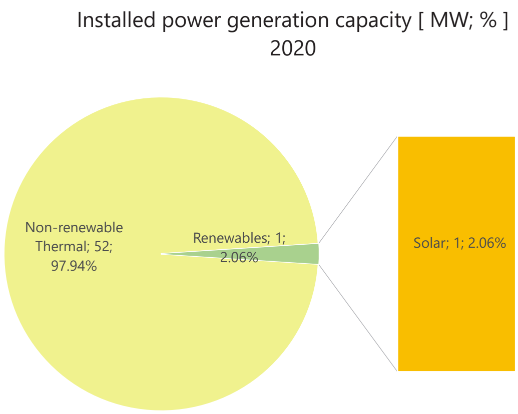
Final consumption in the Transport Sector	Mtep	0.04
Final consumption in the Industrial Sector	Mtep	0.00
Final consumption in the Residential Sector	Mtep	0.02
Final consumption in the Commercial and Service Sector	Mtep	0.01
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	0.01
Oil Reserves	Mbbl	n.a.
Natural gas Reserves	Gm^3	n.a.
Coal Reserves	Mt	n.a.

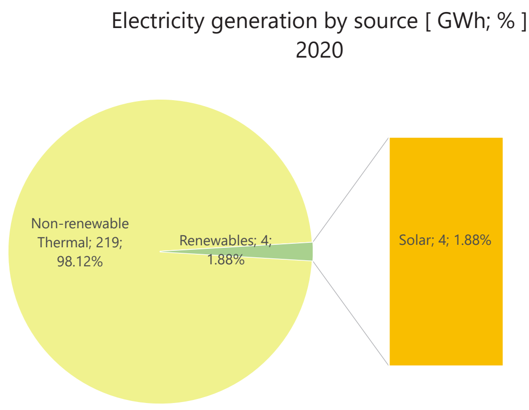
[1] Source: ECLAC.
[2] Source: World Bank.
Note: The supply and demand data for 2020 correspond to estimates made by OLADE.

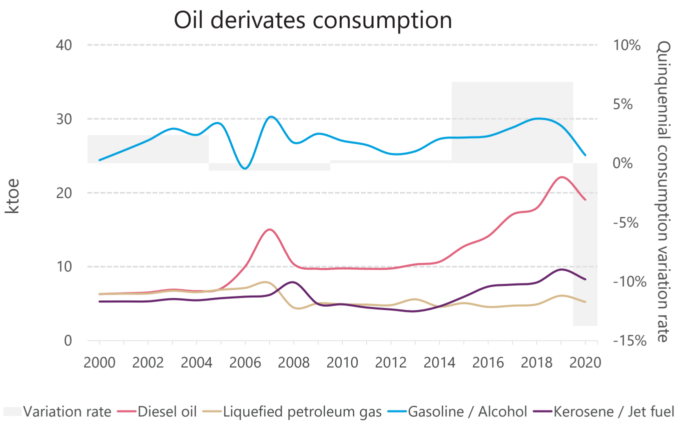
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
1,734	0.73	94.70	0.11	0.01	0.11	0.00	0.08	n.a.	0.05	0.07 / 0.05
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

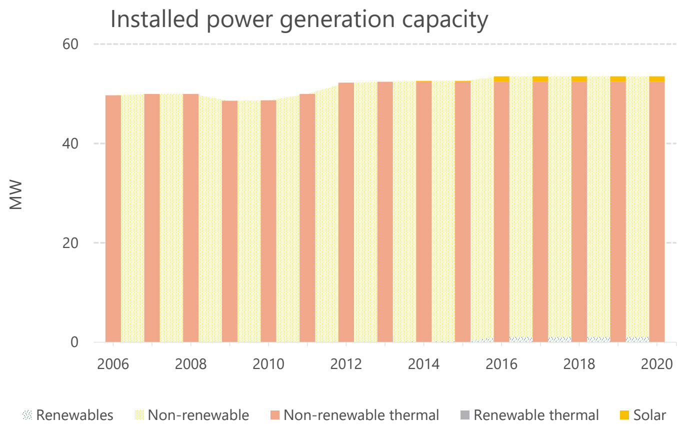
Summarized energy balance 2020




Installed power generation capacity [MW; %]
2020
Non-renewable Thermal; 52; 97.94%
Renewables; 1; 2.06%
Solar; 1; 2.06%


Electricity generation by source [GWh; %]
2020
Non-renewable Thermal; 219; 98.12%
Renewables; 4; 1.88%
Solar; 4; 1.88%


Oil derivates consumption
ktoe
Quinquennial consumption variation rate
Variation rate
Diesel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel


Installed power generation capacity
MW
Renewables
Non-renewable
Non-renewable thermal
Renewable thermal
Solar

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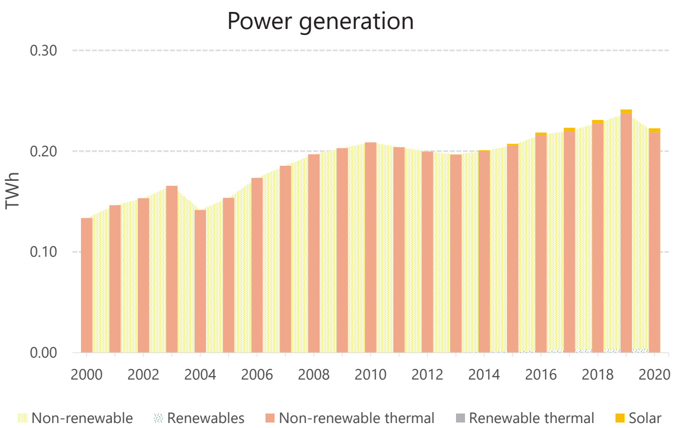
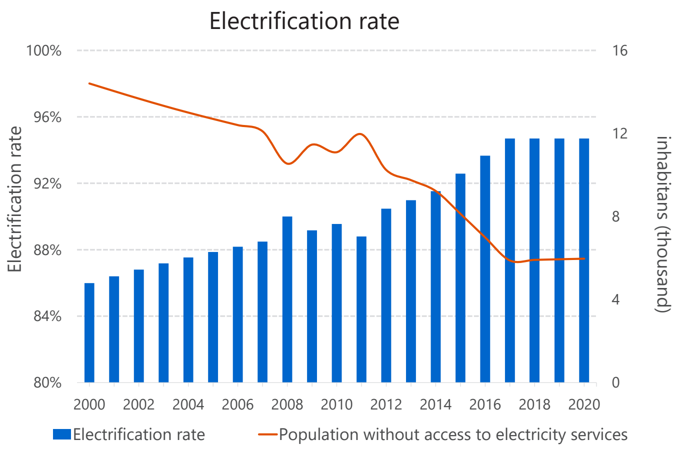
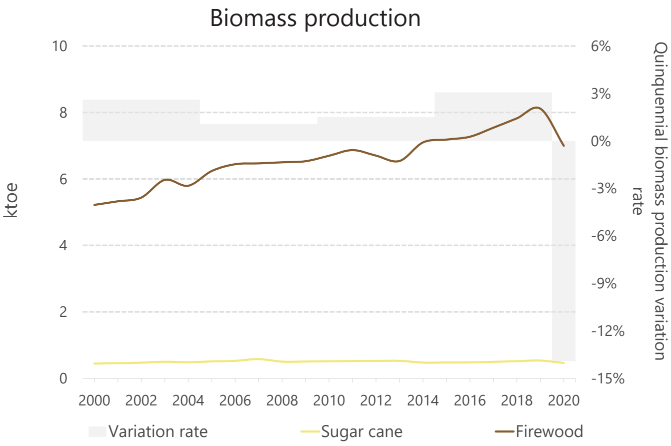
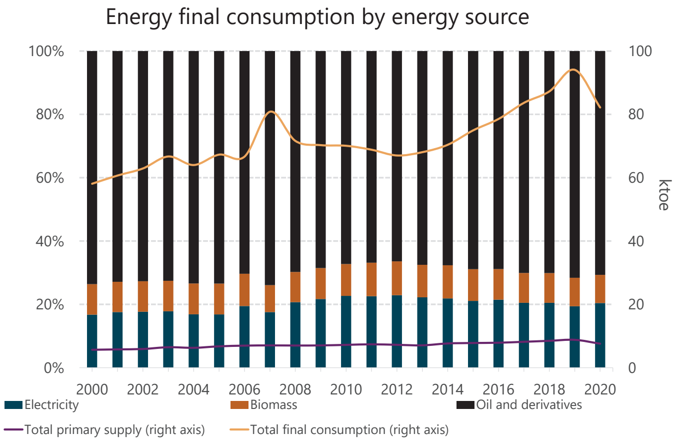

Power generation
TWh
Non-renewable
Renewables
Non-renewable thermal
Renewable thermal
Solar

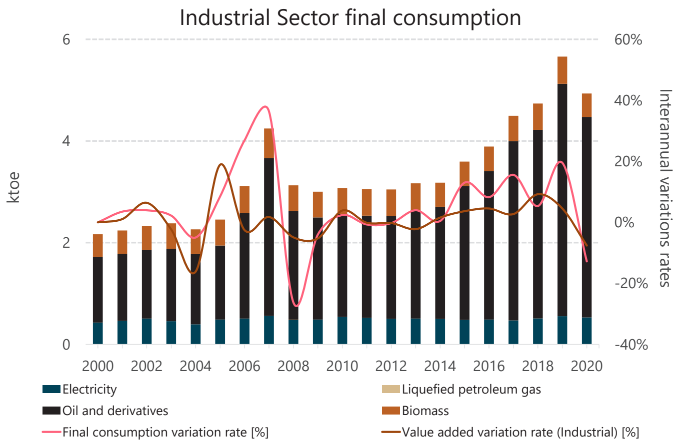

Electrification rate
Electrification rate
inhabitans (thousand)
Electrification rate
Population without access to electricity services



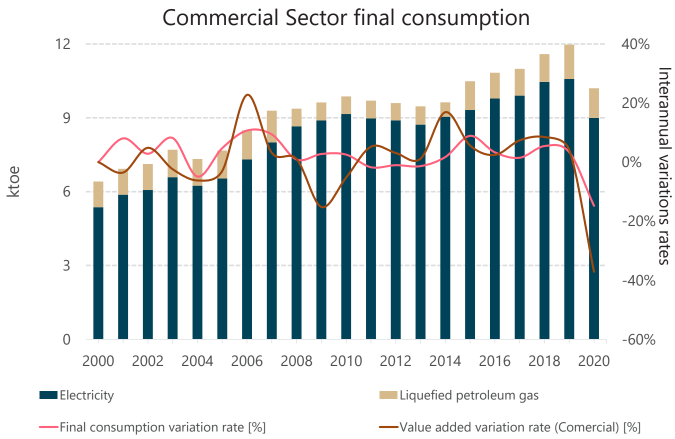
Biomass production
ktoe
Quinquennial biomass production variation rate
10
8
6
4
2
0
6%
3%
0%
-3%
-6%
-9%
-12%
-15%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Sugar cane
Firewood



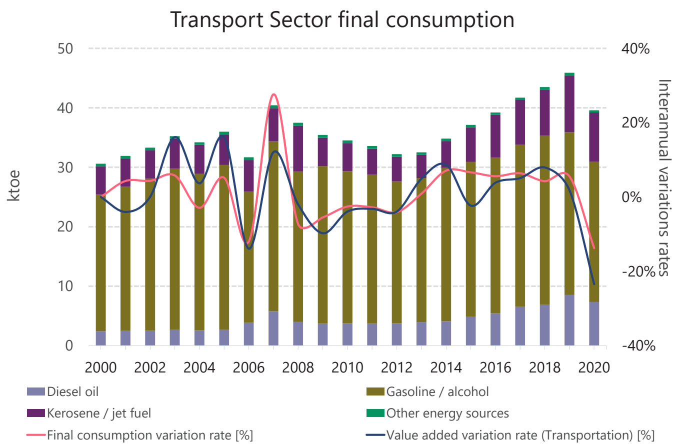
Energy final consumption by energy source
100%
80%
60%
40%
20%
0%
100
80
60
40
20
0
ktoe
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Biomass
Oil and derivatives
Total primary supply (right axis)
Total final consumption (right axis)



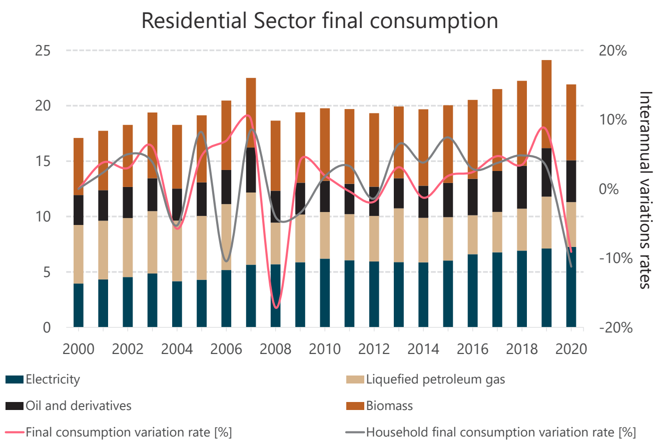
Industrial Sector final consumption
ktoe
Interannual variations rates
6
4
2
0
60%
40%
20%
0%
-20%
-40%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Oil and derivatives
Final consumption variation rate [%]
Liquefied petroleum gas
Biomass
Value added variation rate (Industrial) [%]



Commercial Sector final consumption
ktoe
Interannual variations rates
12
9
6
3
0
40%
20%
0%
-20%
-40%
-60%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Final consumption variation rate [%]
Liquefied petroleum gas
Value added variation rate (Comercial) [%]



Transport Sector final consumption
ktoe
Interannual variations rates
50
40
30
20
10
0
40%
20%
0%
-20%
-40%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Diesel oil
Kerosene / jet fuel
Final consumption variation rate [%]
Gasoline / alcohol
Other energy sources
Value added variation rate (Transportation) [%]



Residential Sector final consumption
ktoe
Interannual variations rates
25
20
15
10
5
0
20%
10%
0%
-10%
-20%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Oil and derivatives
Final consumption variation rate [%]
Liquefied petroleum gas
Biomass
Household final consumption variation rate [%]

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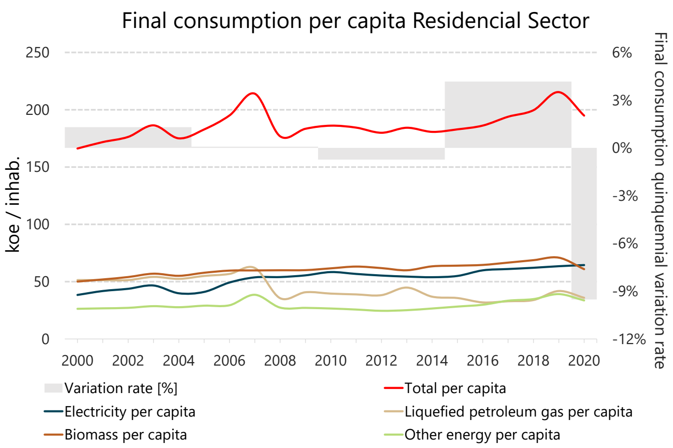
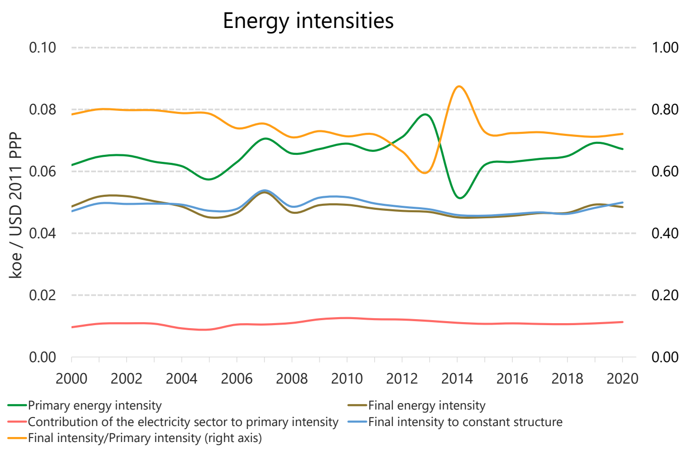
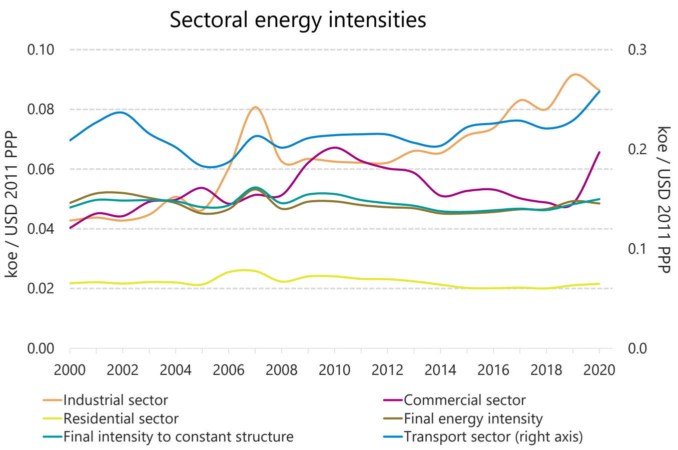
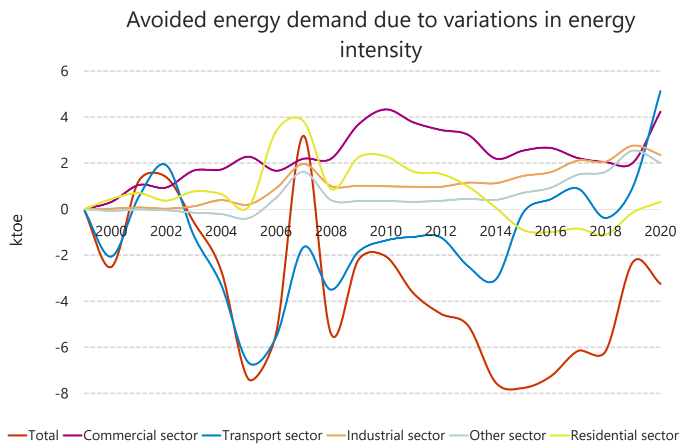
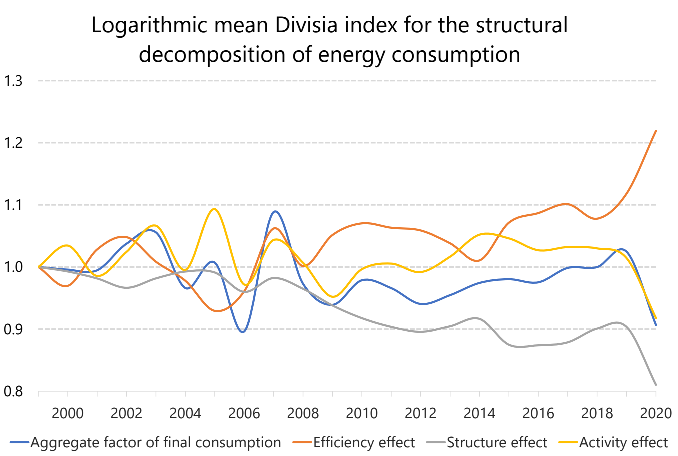
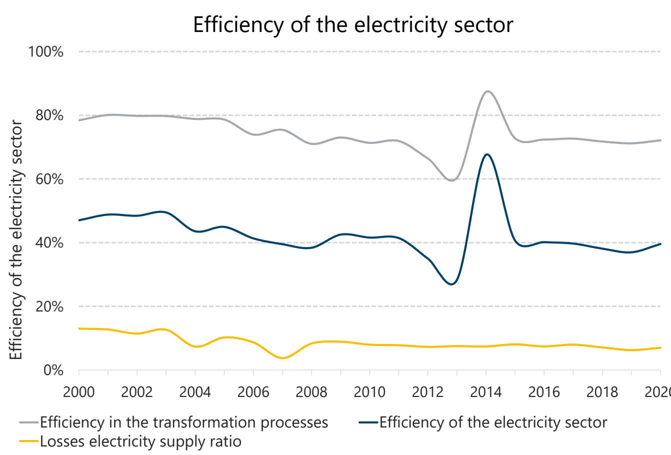

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
Variation rate [%]
Total per capita
Electricity per capita
Liquefied petroleum gas per capita
Biomass per capita
Other energy per capita

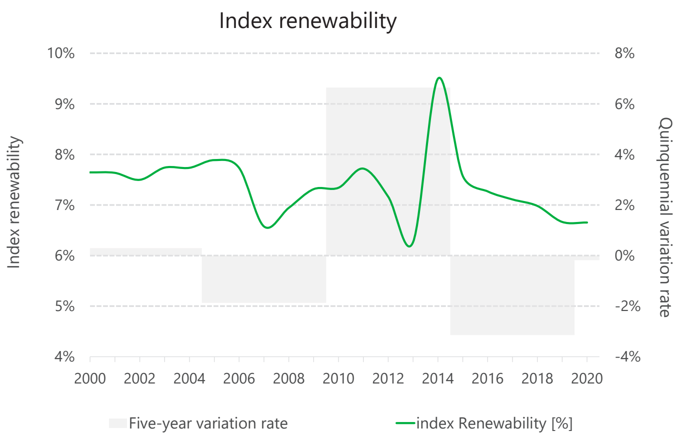

Energy intensities
koe / USD 2011 PPP
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

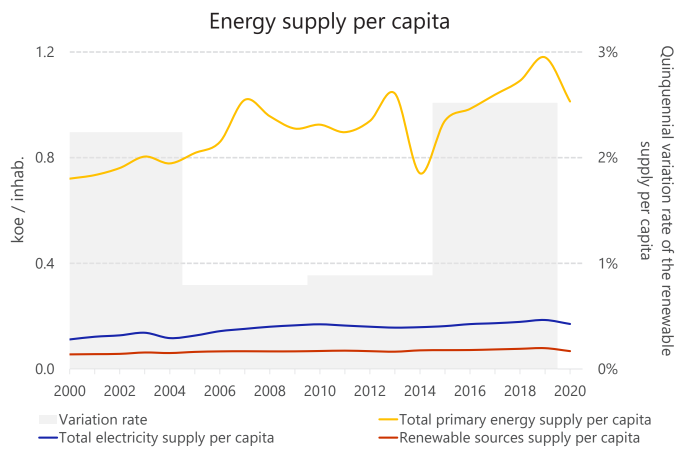

Sectoral energy intensities
koe / USD 2011 PPP
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)

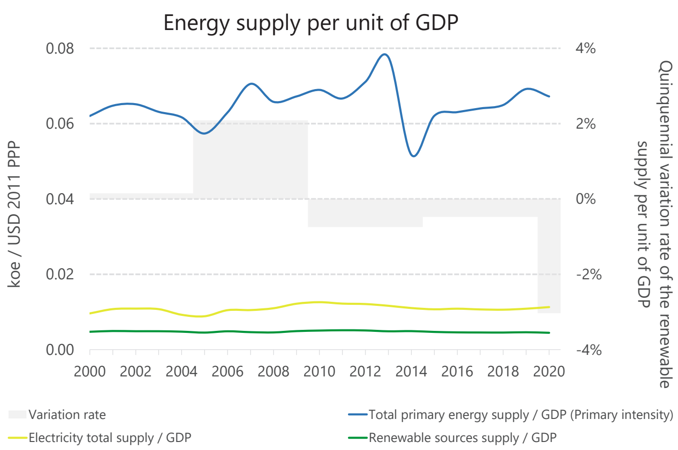

Avoided energy demand due to variations in energy intensity
ktoe
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

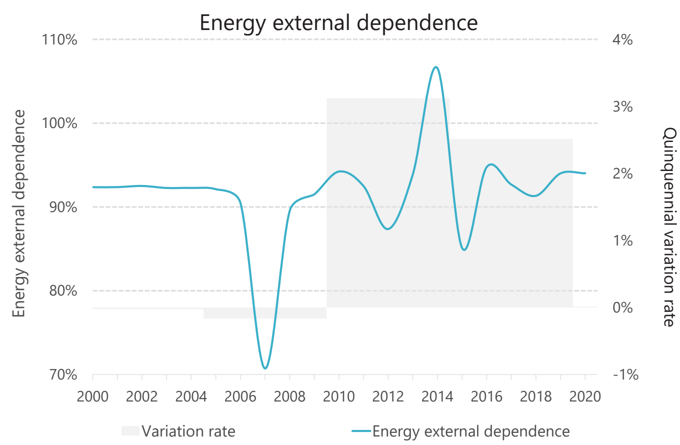

Logarithmic mean Divisia index for the structural decomposition of energy consumption
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect

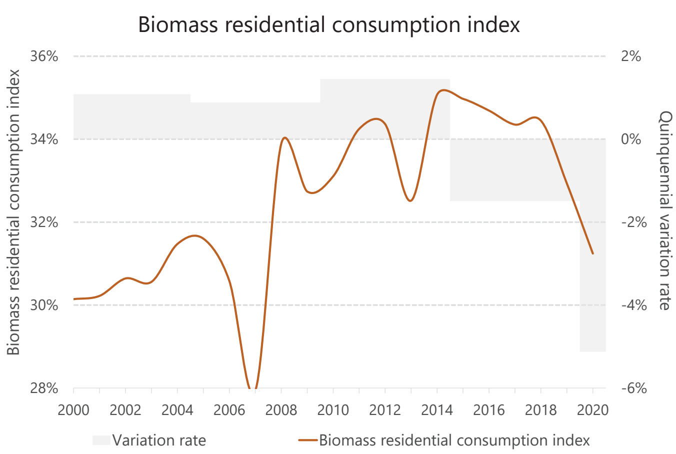

Efficiency of the electricity sector
Efficiency of the electricity sector
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

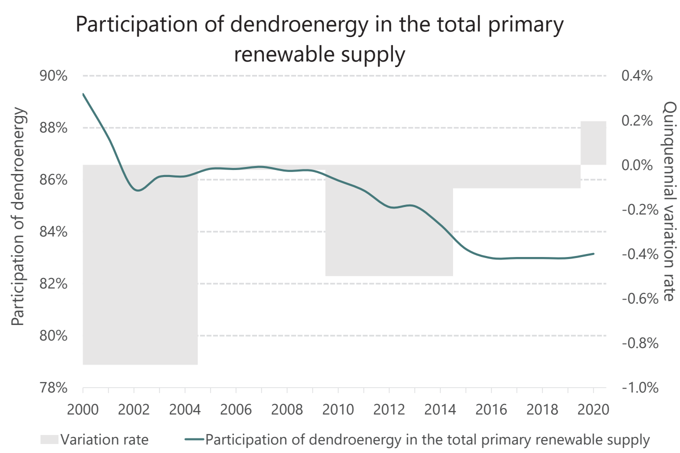

Index renewability
Index renewability
Quinquennial variation rate
Five-year variation rate
index Renewability [%]


Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita


Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP


Energy external dependence
Energy external dependence
Quinquennial variation rate
Variation rate
Energy external dependence


Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
Variation rate
Biomass residential consumption index


Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
Variation rate
Participation of dendroenergy in the total primary renewable supply

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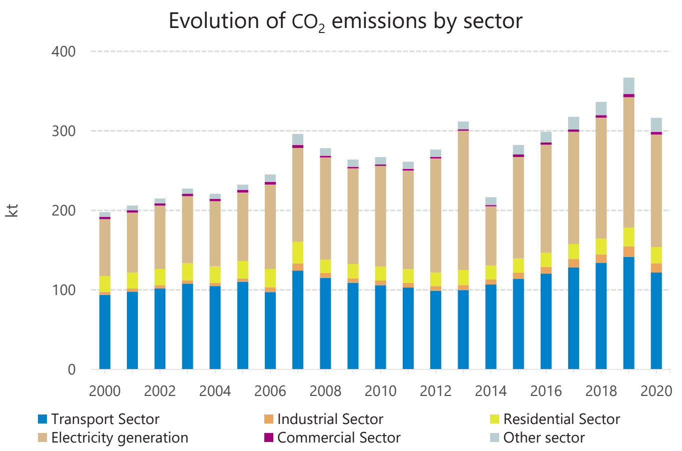
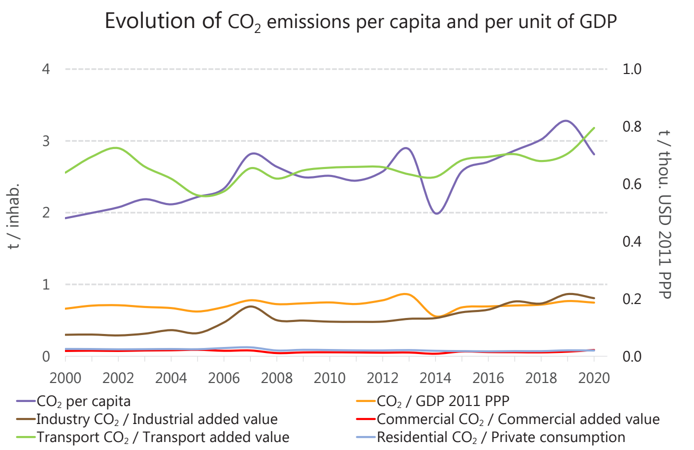
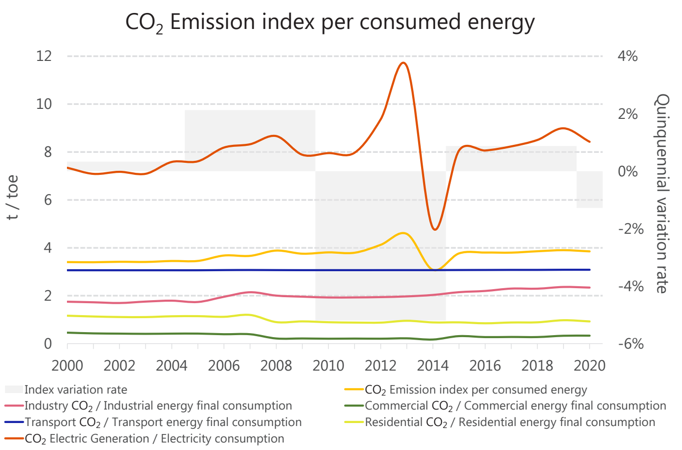


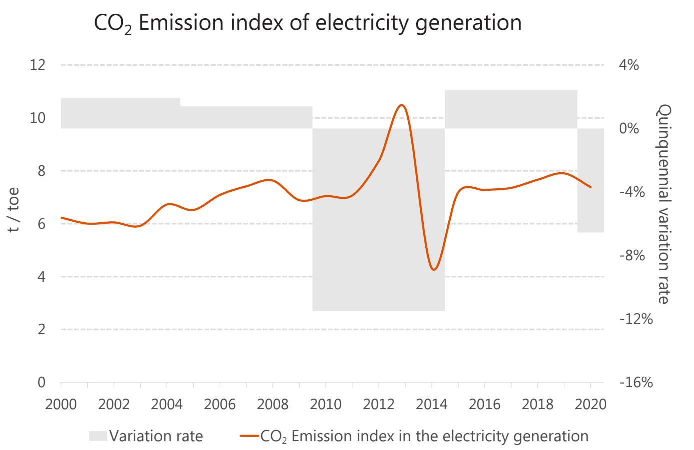
Evolution of CO_2 emissions by sector
kt
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector



Evolution of CO_2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
CO_2 per capita
CO_2 / GDP 2011 PPP
Industry CO_2 / Industrial added value
Commercial CO_2 / Commercial added value
Transport CO_2 / Transport added value
Residential CO_2 / Private consumption

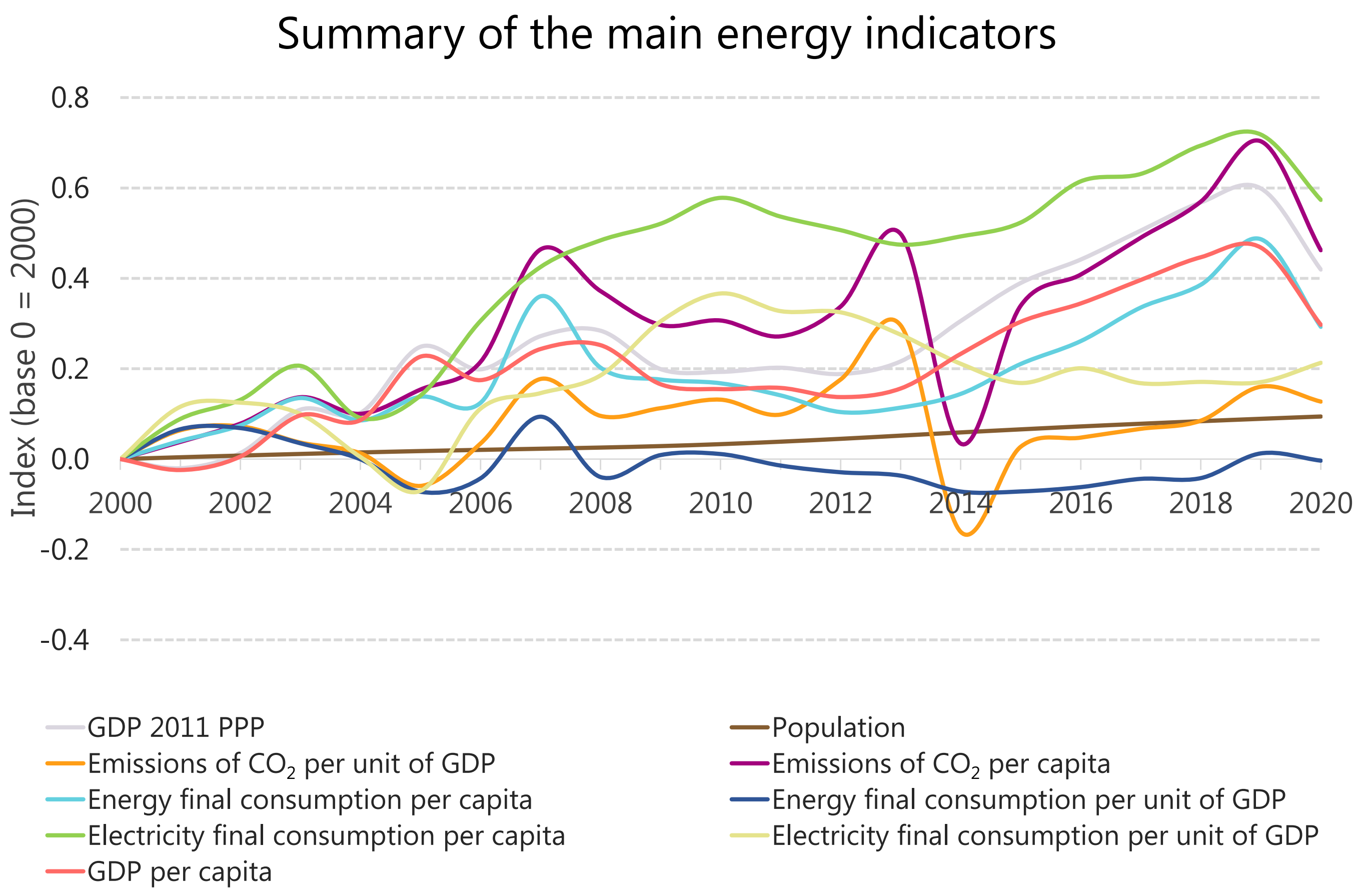


CO_2 Emission index per consumed energy
t / toe
Quinquennial variation rate
Index variation rate
CO_2 Emission index per consumed energy
Industry CO_2 / Industrial energy final consumption
Commercial CO_2 / Commercial energy final consumption
Transport CO_2 / Transport energy final consumption
Residential CO_2 / Residential energy final consumption
CO_2 Electric Generation / Electricity consumption



CO_2 Emission index of electricity generation
t / toe
Quinquennial variation rate
Variation rate
CO_2 Emission index in the electricity generation

GRENADA


Summary of the main energy indicators
Index (base 0 = 2000)
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

GRENADA

GUATEMALA

General Information 2020

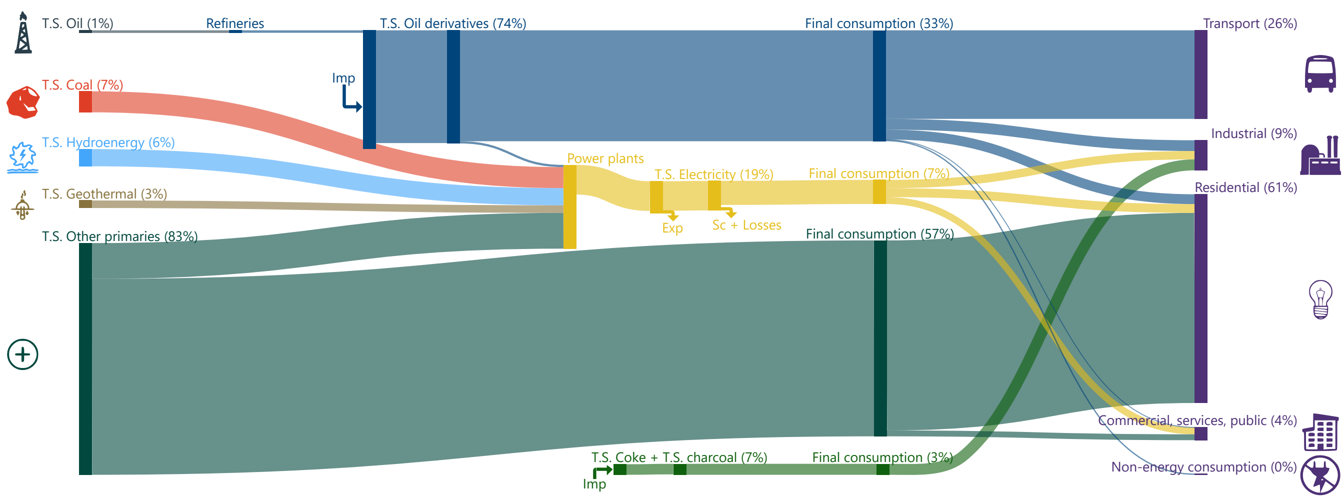
Population (thousand inhab.)	16,858
Area (km^2)	108,889
Population Density (inhab. / km^2)	155
Urban Population (%)	52
GDP USD 2010 (MUSD)	55,026
GDP USD 2011 PPP (MUSD)	141,497
GDP per capita (thou. USD 2011 PPP / inhab.)	8.4

Energy Sector 2020

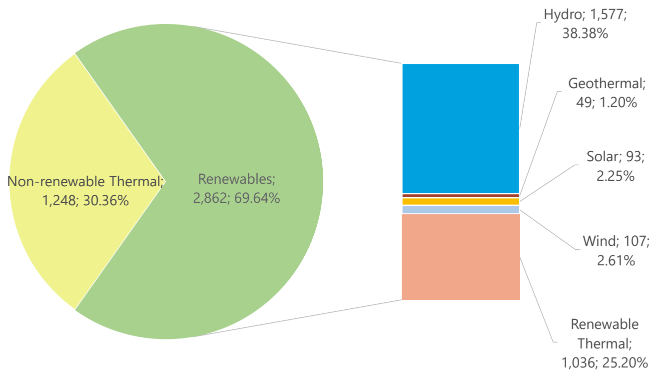
Final consumption in the Transport Sector	Mtep	3.29
Final consumption in the Industrial Sector	Mtep	1.12
Final consumption in the Residential Sector	Mtep	7.74
Final consumption in the Commercial and Service Sector	Mtep	0.49
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	0.05
Oil Reserves	Mbbl	93.8
Natural gas Reserves	Gm^3	5.5
Coal Reserves	Mt	n.a

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
615	0.75	88.95	14.89	9.90	5.57	0.51	12.68	4.2	4.11	0.11 / 0.09
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

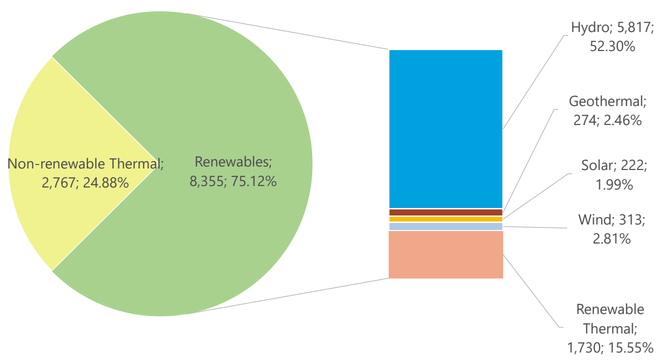
Summarized energy balance 2020



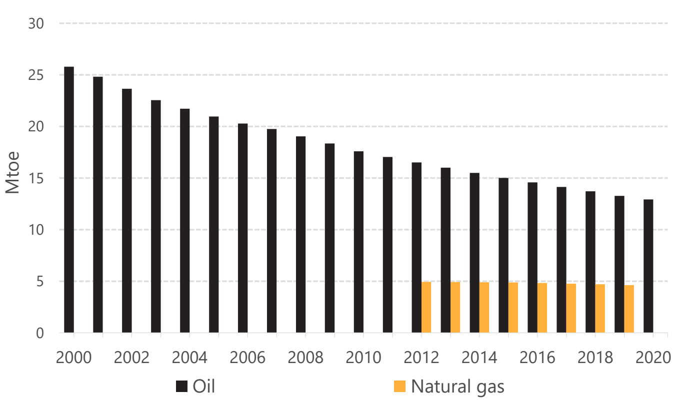
Installed power generation capacity [MW; %]
2020



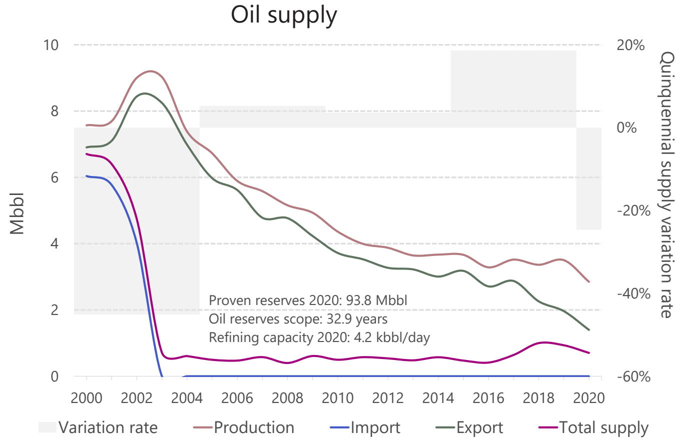
Electricity generation by source [GWh; %]
2020



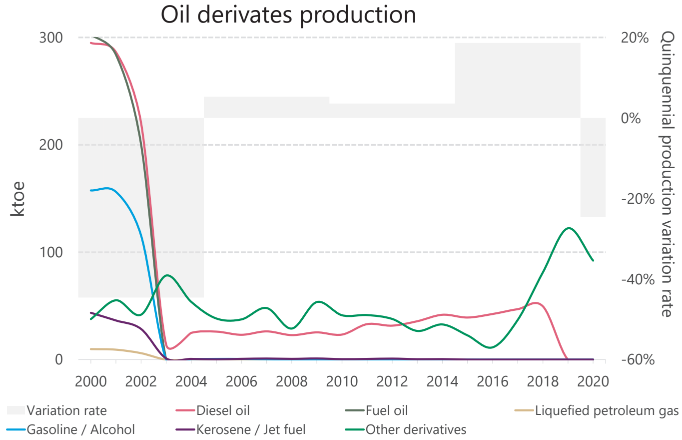
Proven reserves of oil and natural.



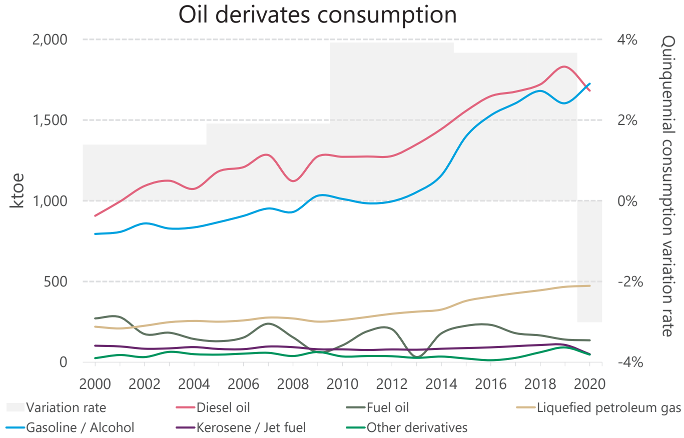
Oil supply



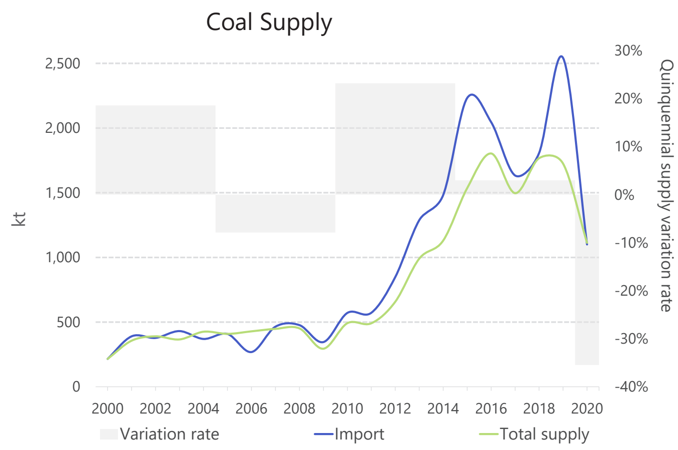
Oil derivates production

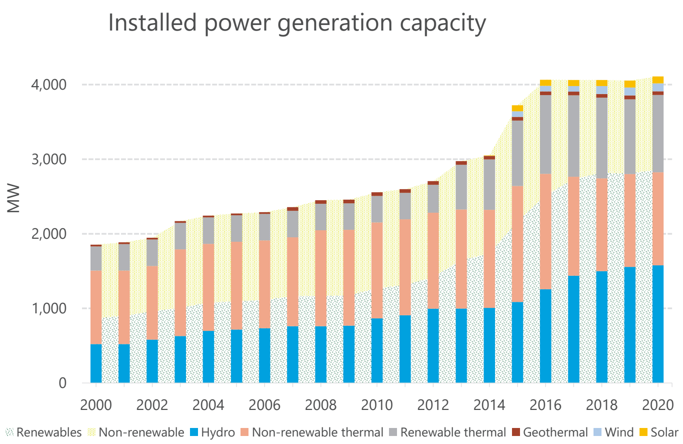


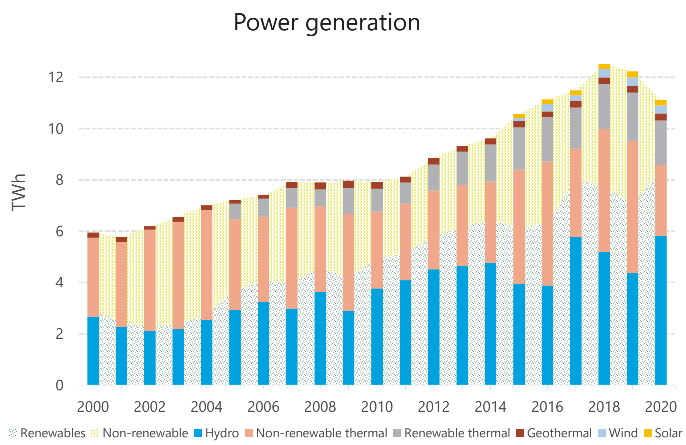
Oil derivates consumption

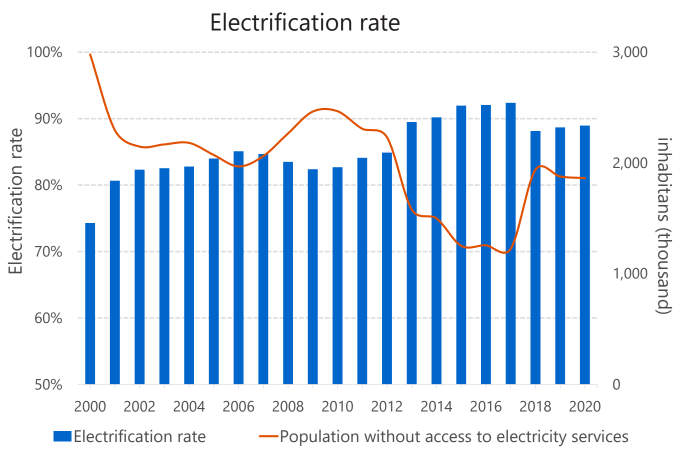


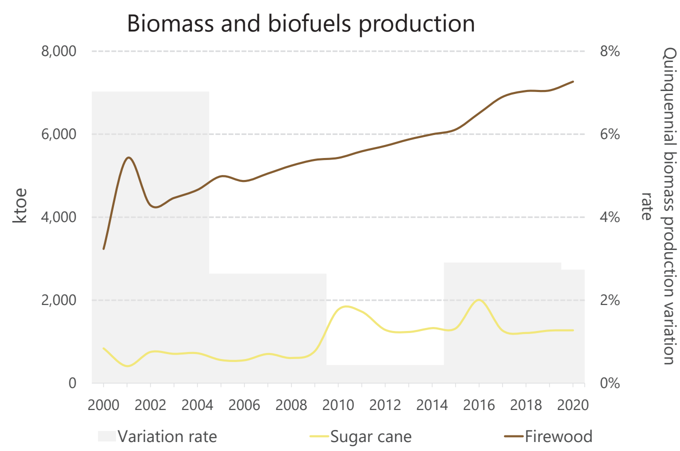
Guatemala announced the entry into operation of the Hidrosan II hydropower plant, with a capacity of 1.5 MW, and the Los Encuentros hydropower plant with 1.25 MW, both in the Department of Chimaltenango.

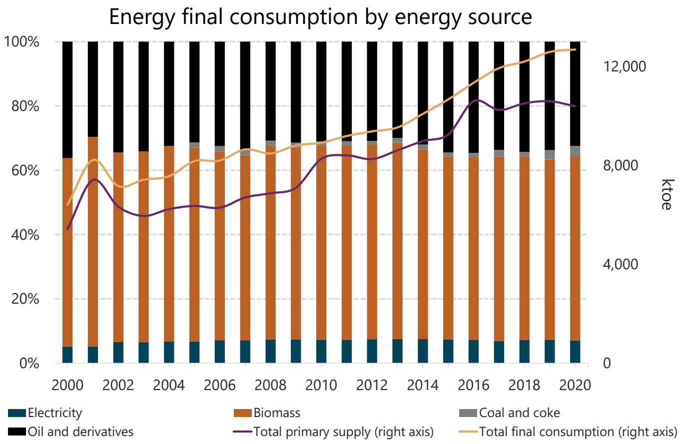


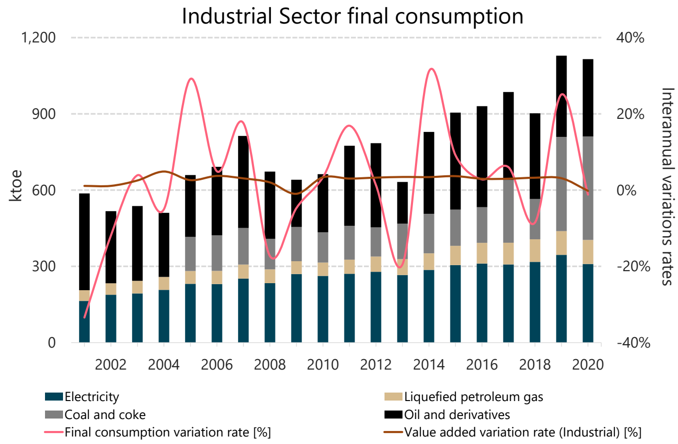


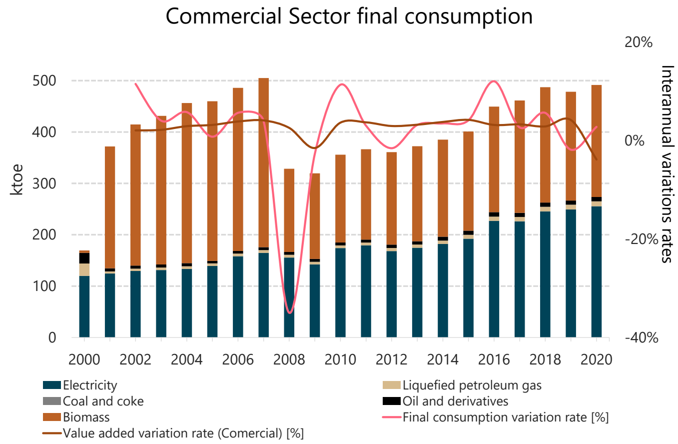


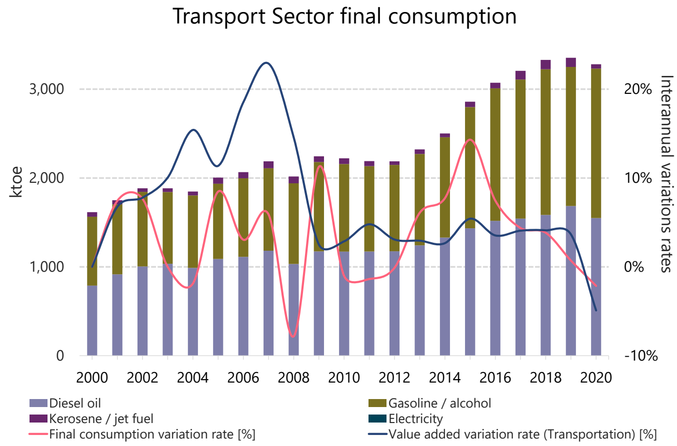




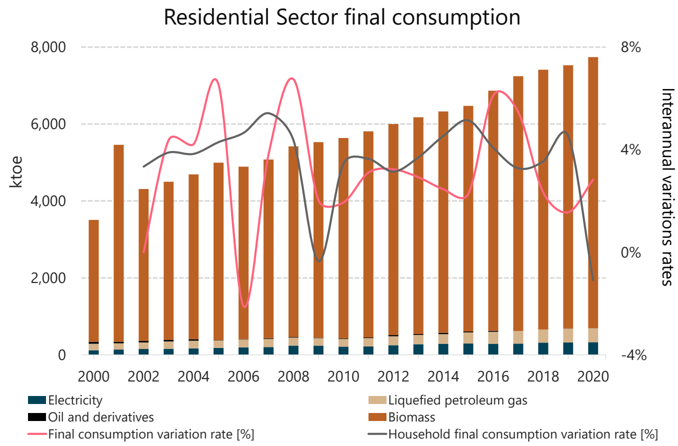




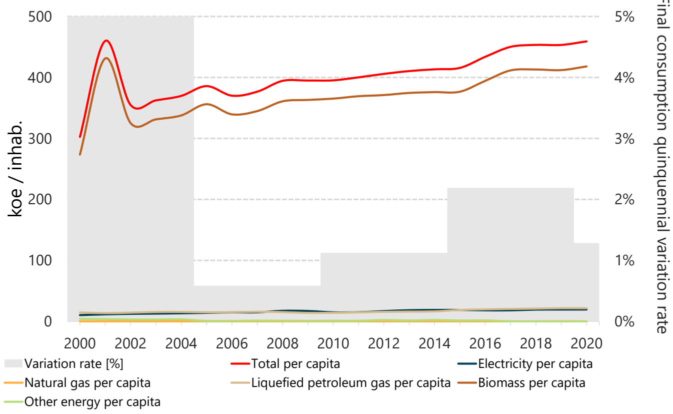




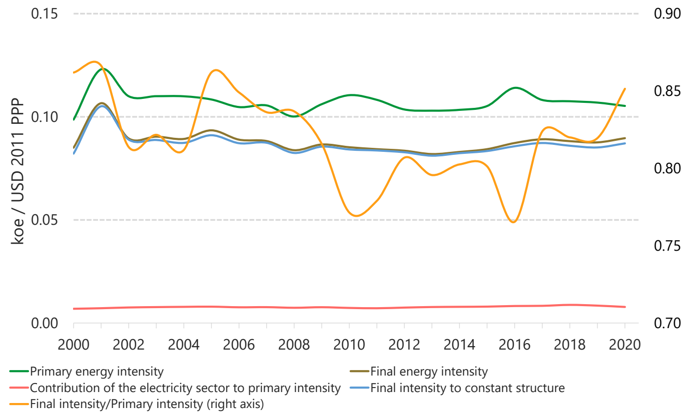
Guatemala reported that 41% of the new electricity generation capacity installed in 2020 uses a renewable resource.



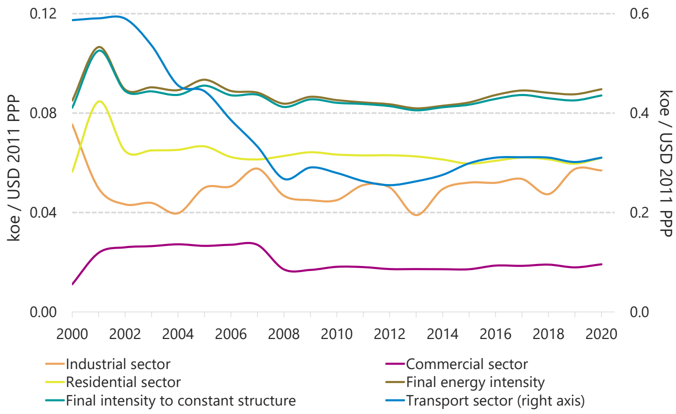
Final consumption per capita Residencial Sector



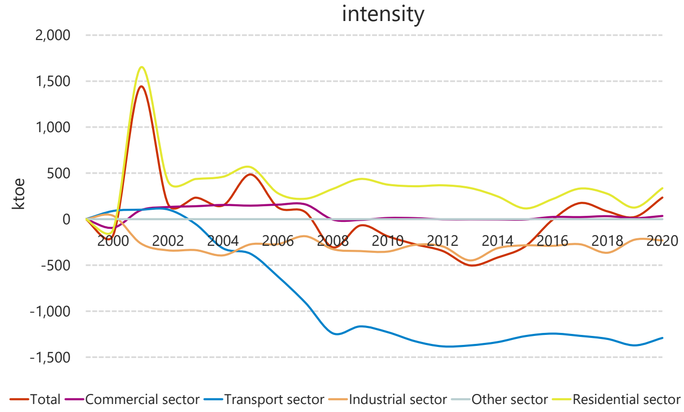
Energy intensities



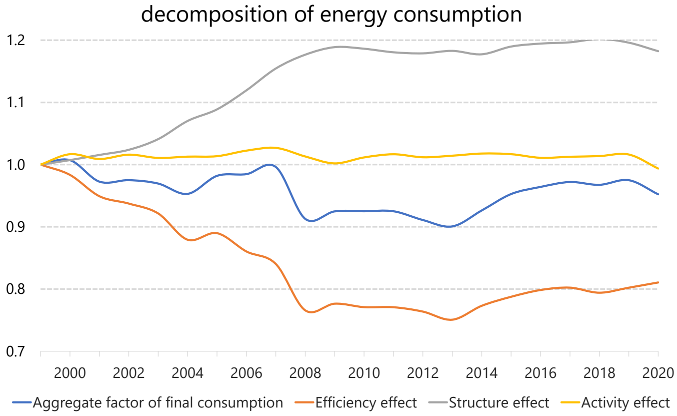
Sectoral energy intensities



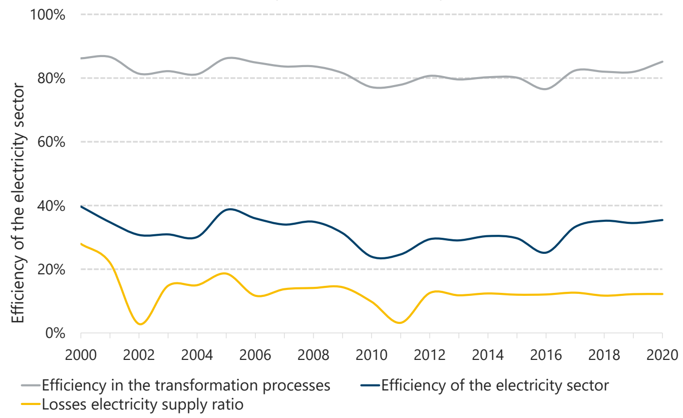
Avoided energy demand due to variations in energy intensity

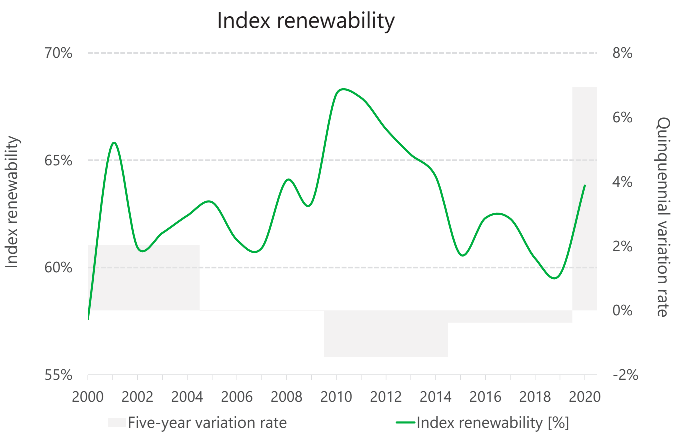


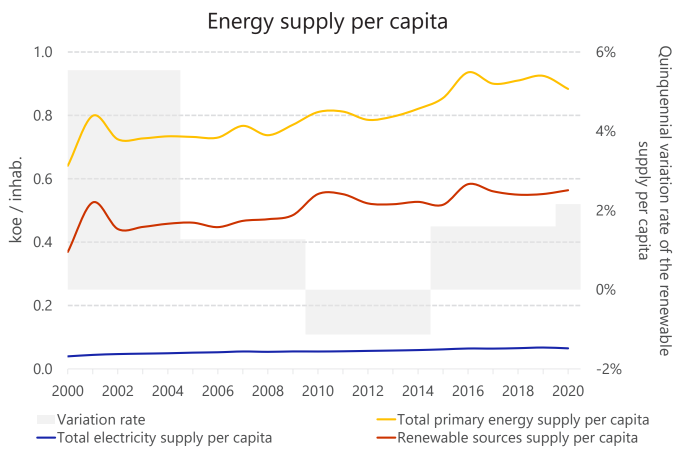
Logarithmic mean Divisia index for the structural decomposition of energy consumption

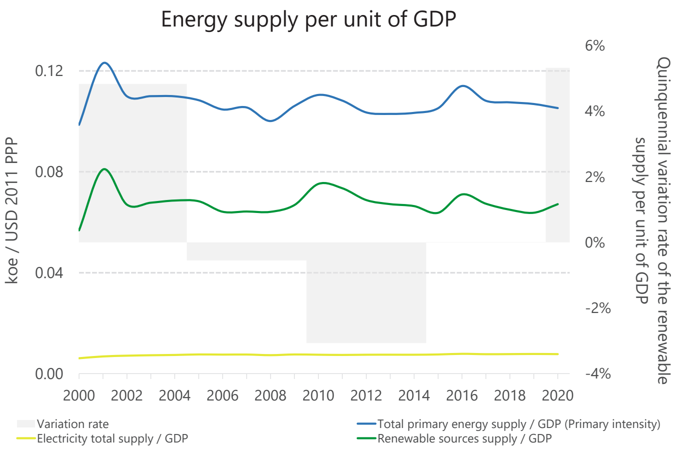


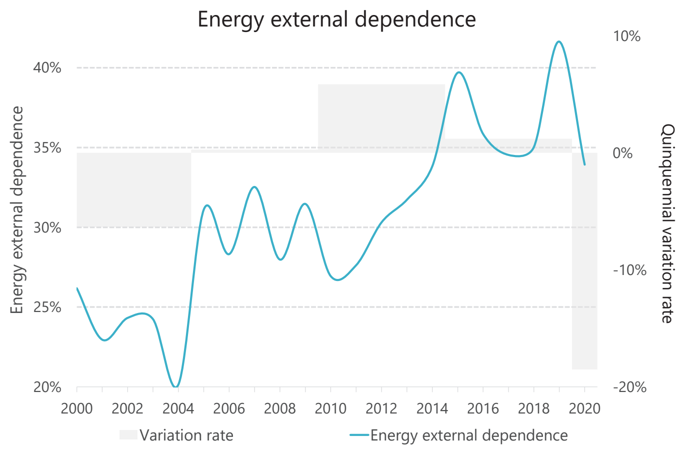
Efficiency of the electricity sector

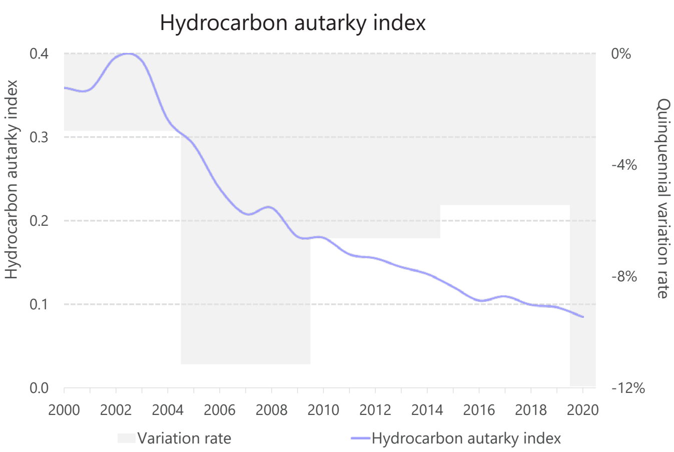


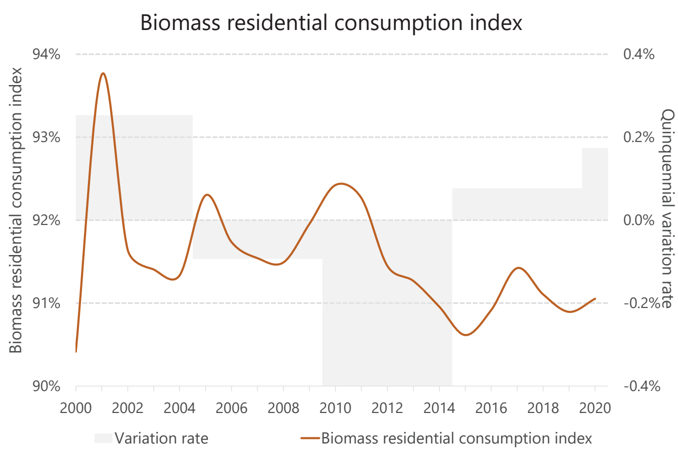

Index renewability
70%
65%
60%
55%
8%
6%
4%
2%
0%
-2%
Index renewability
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Five-year variation rate
Index renewability [%]


Energy supply per capita
1.0
0.8
0.6
0.4
0.2
0.0
6%
4%
2%
0%
-2%
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita

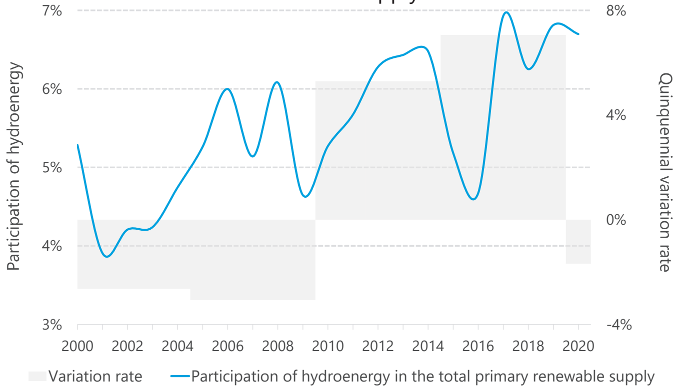

Energy supply per unit of GDP
0.12
0.08
0.04
0.00
6%
4%
2%
0%
-2%
-4%
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP


Energy external dependence
40%
35%
30%
25%
20%
10%
0%
-10%
-20%
Energy external dependence
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Energy external dependence

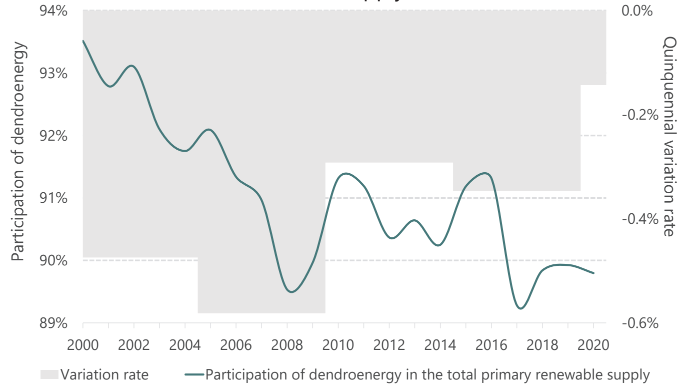

Hydrocarbon autarky index
0.4
0.3
0.2
0.1
0.0
0%
-4%
-8%
-12%
Hydrocarbon autarky index
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Hydrocarbon autarky index


Biomass residential consumption index
94%
93%
92%
91%
90%
0.4%
0.2%
0.0%
-0.2%
-0.4%
Biomass residential consumption index
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Biomass residential consumption index

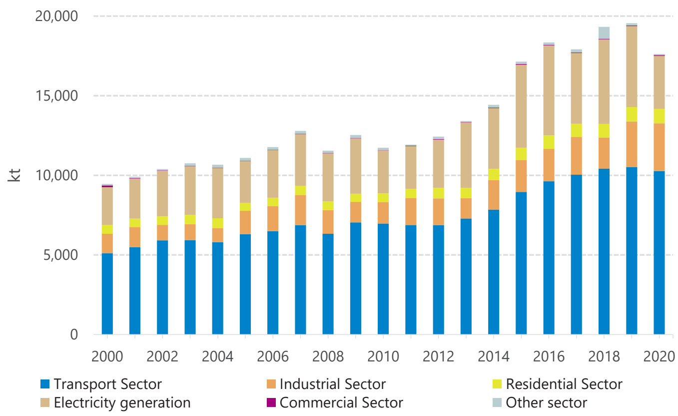
Participation of hydroenergy in the total primary renewable supply



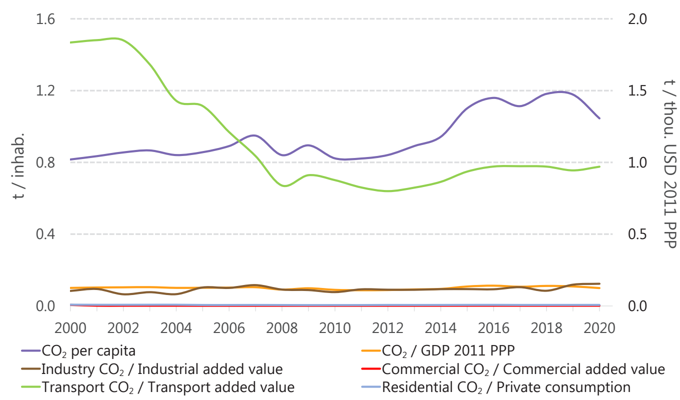
Participation of dendroenergy in the total primary renewable supply



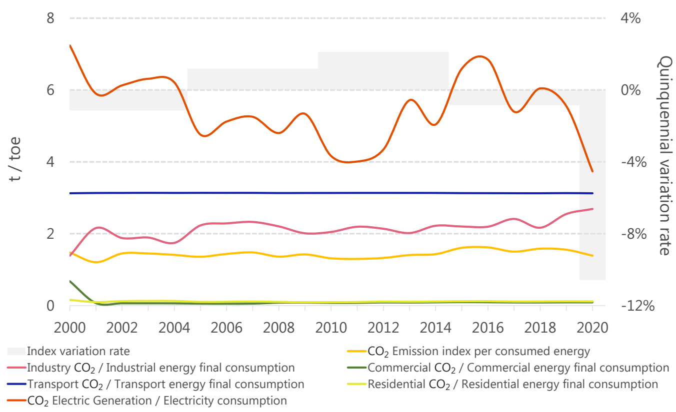
Evolution of CO_2 emissions by sector



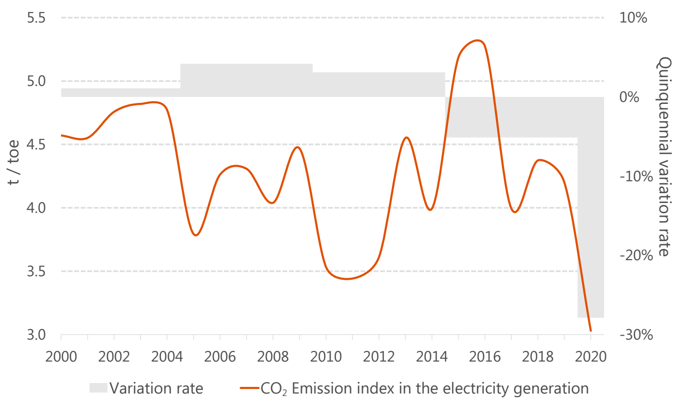
Evolution of CO_2 emissions per capita and per unit of GDP



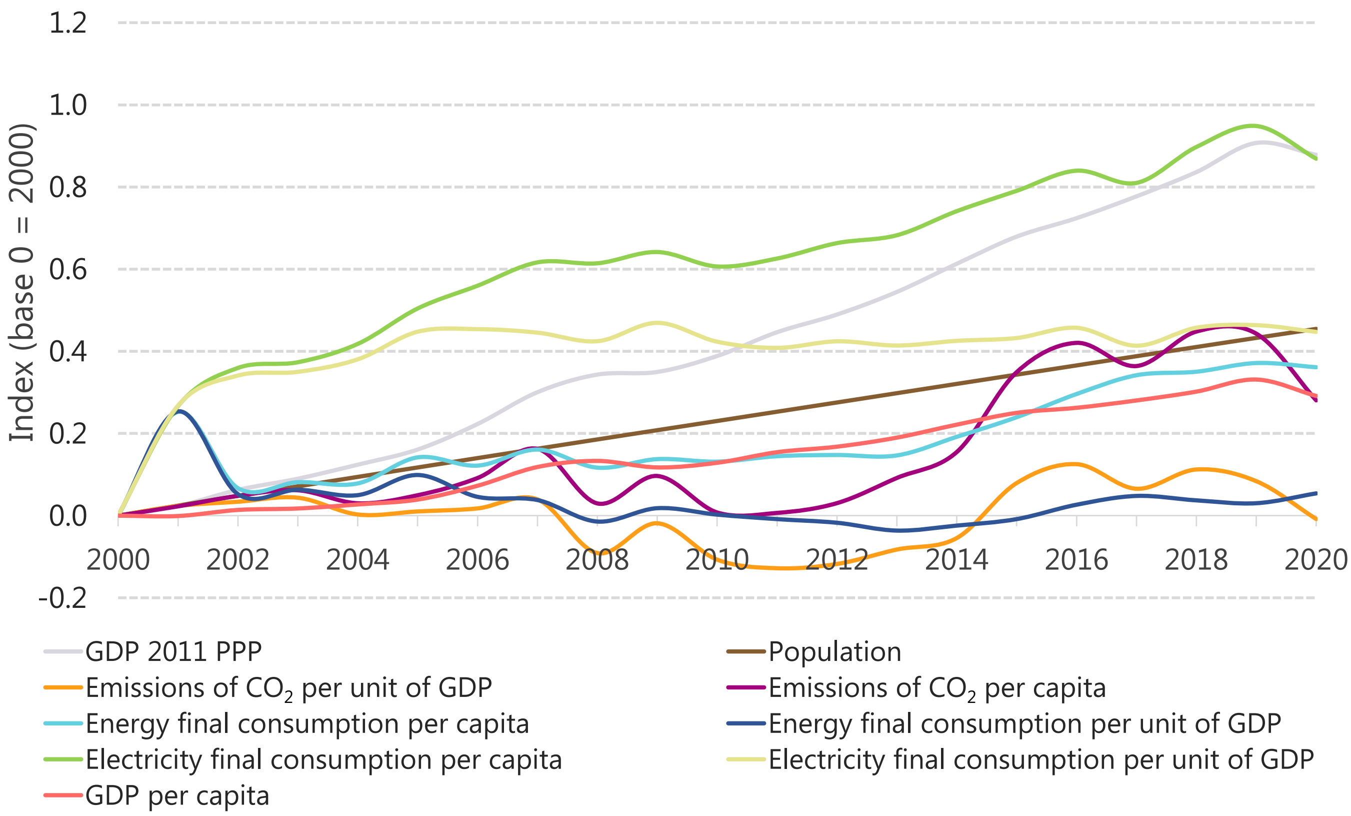
CO_2 Emission index per consumed energy



CO_2 Emission index of electricity generation



Summary of the main energy indicators



GUATEMALA

GUYANA

General Information 2020

Population (thousand inhab.)	787 [1]
Area (km^2)	214,970
Population Density (inhab. / km^2)	4
Urban Population (%)	27
GDP USD 2010 (MUSD)	6,859 [1]
GDP USD 2011 PPP (MUSD)	14,693 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	19

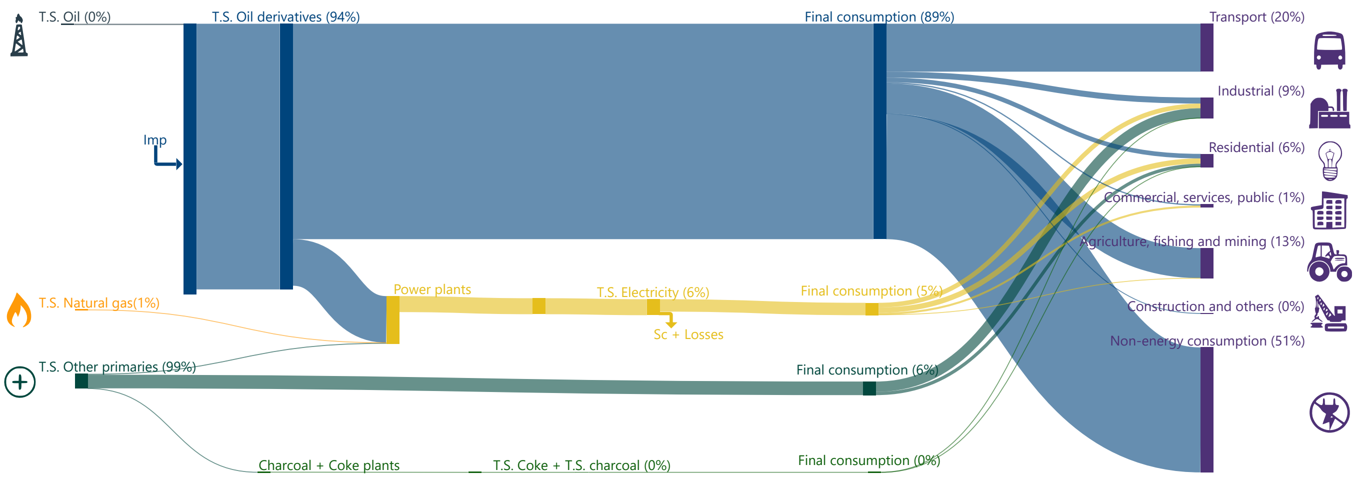
Energy Sector 2020

Final consumption in the Transport Sector	Mtep	0.29
Final consumption in the Industrial Sector	Mtep	0.13
Final consumption in the Residential Sector	Mtep	0.08
Final consumption in the Commercial and Service Sector	Mtep	0.02
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	0.95
Oil Reserves	Mbbl	9,000 [3]
Natural gas Reserves	Gm^3	369 [4]
Coal Reserves	Mt	n.a.

[1] Source: ECLAC.
[2] Source: World Bank.
[3] Source: Ministry of Natural Resources.
[4] Data corresponding to 2019.

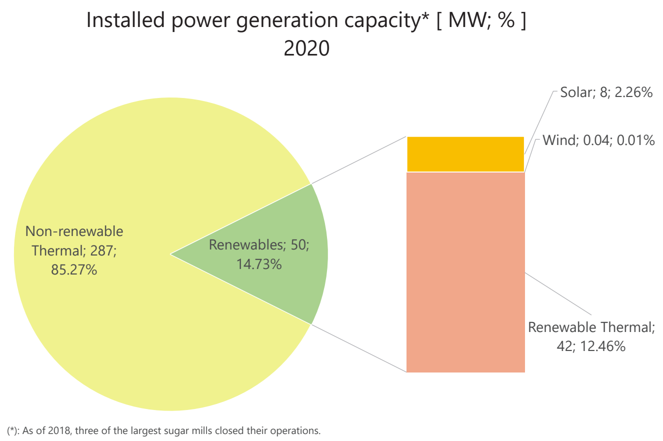
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
1,120	1.88	91.44	1.69	3.87	1.66	3.73	1.48	0.00	0.34	0.12 / 0.10
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

Summarized energy balance 2020

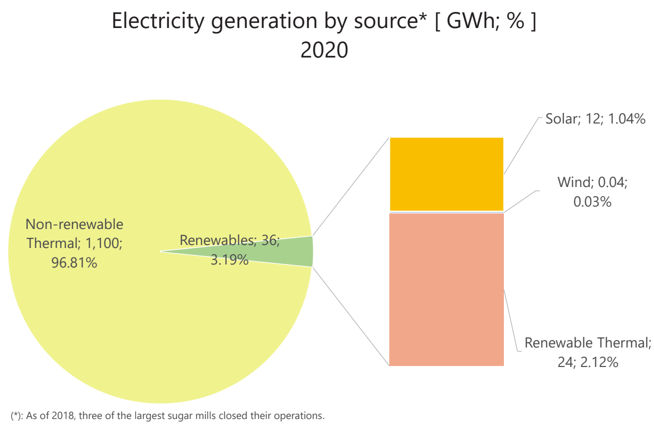


* Corresponds to firewood + sugarcane and derivatives

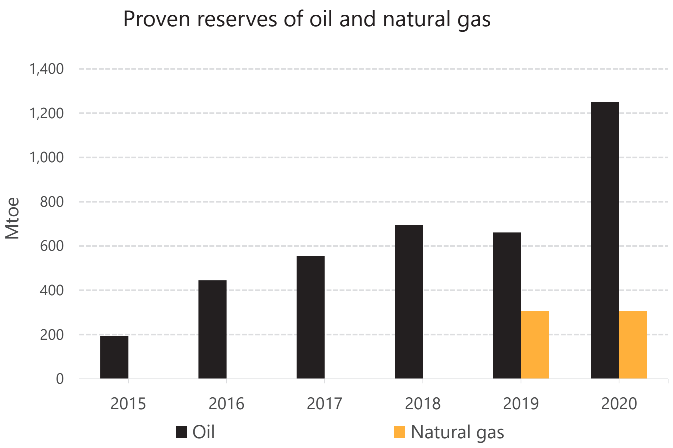
GUYANA



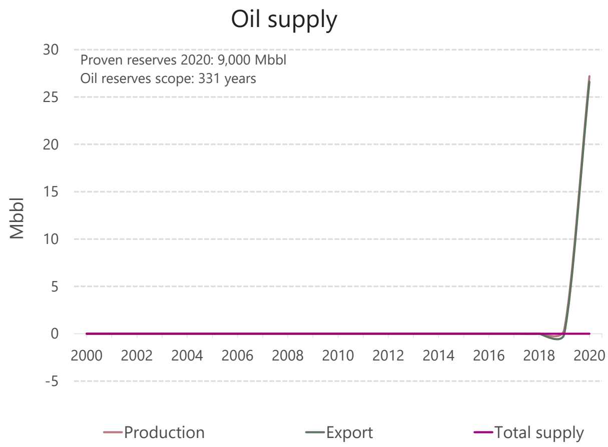
Installed power generation capacity* [MW; %]
2020
Non-renewable Thermal; 287; 85.27%
Renewables; 50; 14.73%
Solar; 8; 2.26%
Wind; 0.04; 0.01%
Renewable Thermal; 42; 12.46%
(*): As of 2018, three of the largest sugar mills closed their operations.



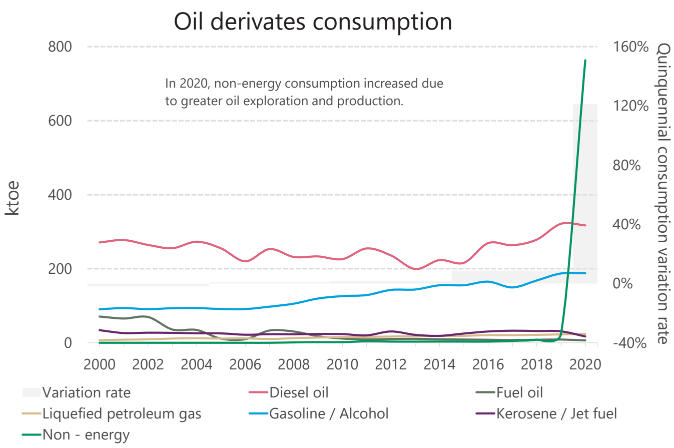
Electricity generation by source* [GWh; %]
2020
Non-renewable Thermal; 1,100; 96.81%
Renewables; 36; 3.19%
Solar; 12; 1.04%
Wind; 0.04; 0.03%
Renewable Thermal; 24; 2.12%
(*): As of 2018, three of the largest sugar mills closed their operations.



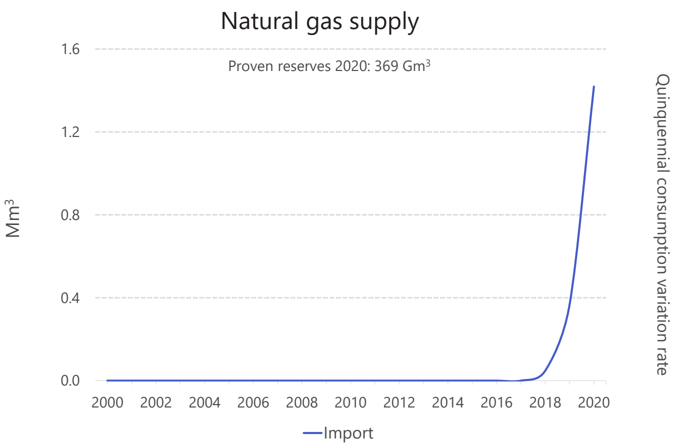
Proven reserves of oil and natural gas
Mtoe
1,400
1,200
1,000
800
600
400
200
0
2015
2016
2017
2018
2019
2020
Oil
Natural gas



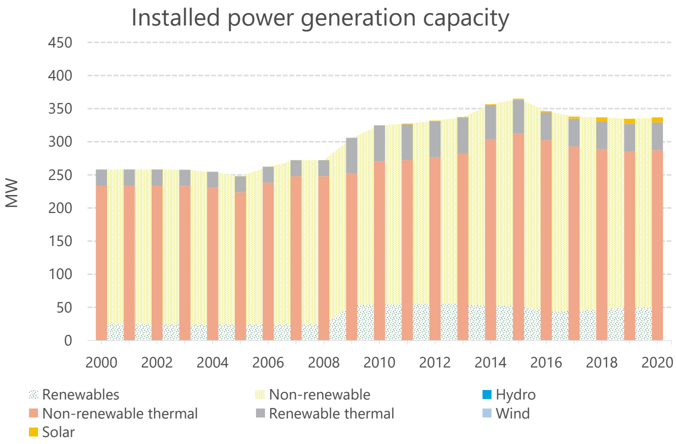
Oil supply
Proven reserves 2020: 9,000 Mbbl
Oil reserves scope: 331 years
Mbbl
30
25
20
15
10
5
0
-5
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Production
Export
Total supply



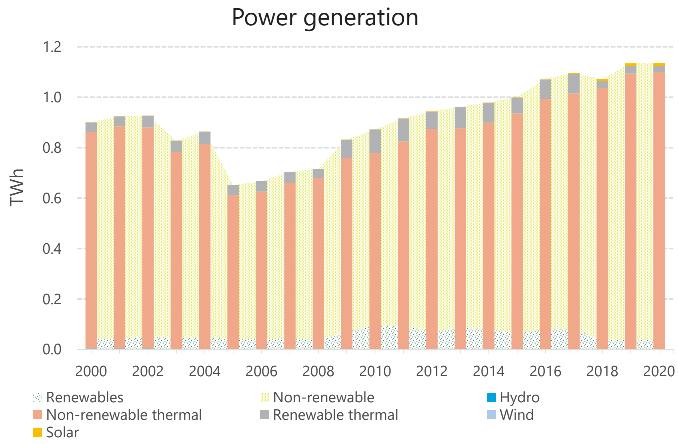
Oil derivates consumption
In 2020, non-energy consumption increased due to greater oil exploration and production.
ktoe
800
600
400
200
0
160%
120%
80%
40%
0%
-40%
Quinquennial consumption variation rate
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Non - energy



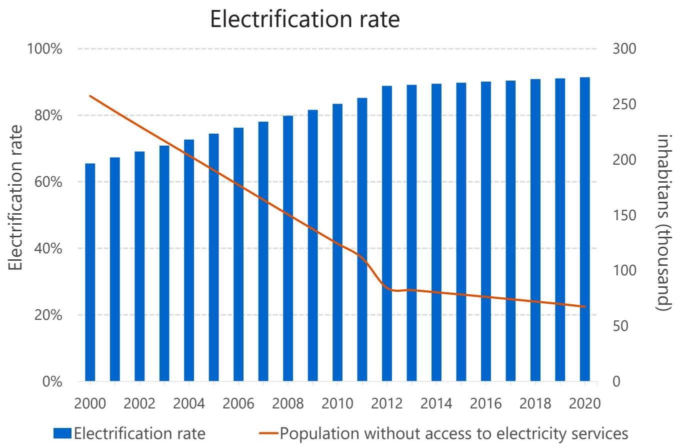
Natural gas supply
Proven reserves 2020: 369 Gm³
Mm³
1.6
1.2
0.8
0.4
0.0
Quinquennial consumption variation rate
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Import



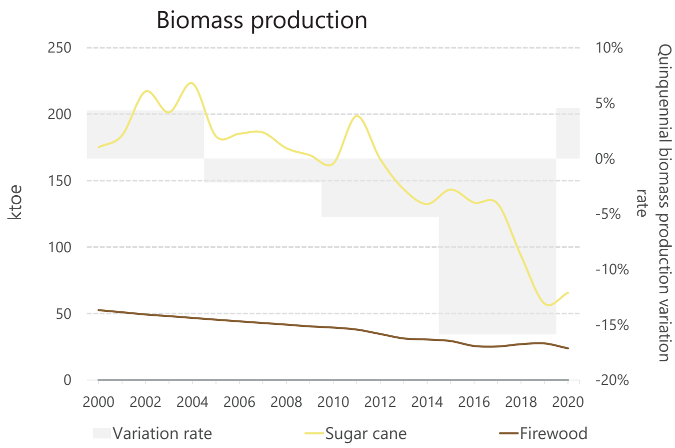
Installed power generation capacity
MW
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Wind
Solar



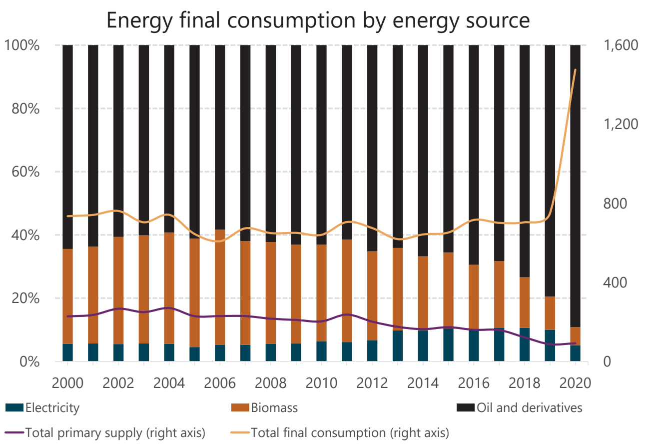
Power generation
TWh
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Wind
Solar



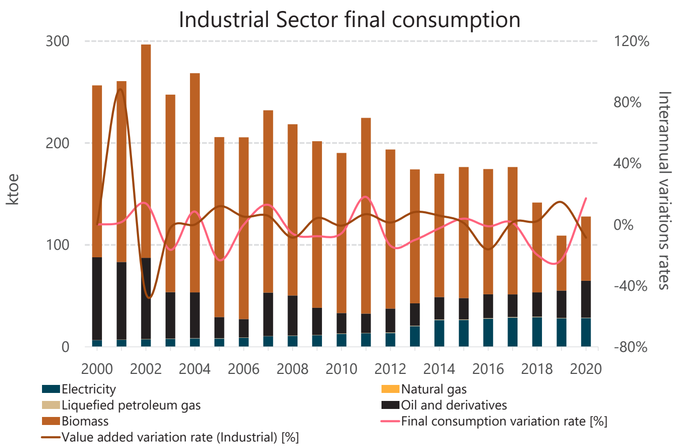
Electrification rate
Electrification rate
inhabitants (thousand)
Electrification rate
Population without access to electricity services



Biomass production
ktoe
Quinquennial biomass production variation rate
Variation rate
Sugar cane
Firewood

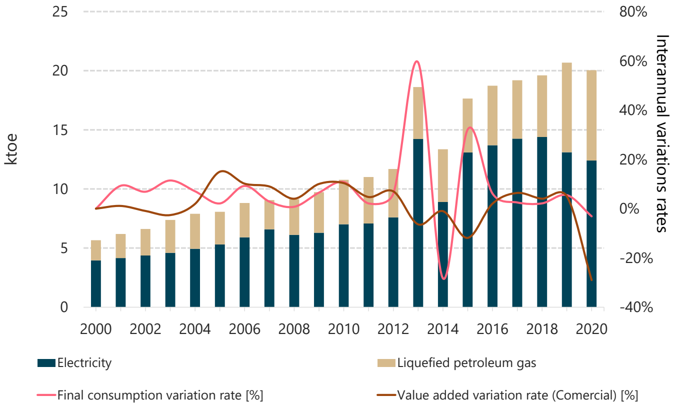


Energy final consumption by energy source
ktoe
Electricity
Biomass
Oil and derivatives
Total primary supply (right axis)
Total final consumption (right axis)

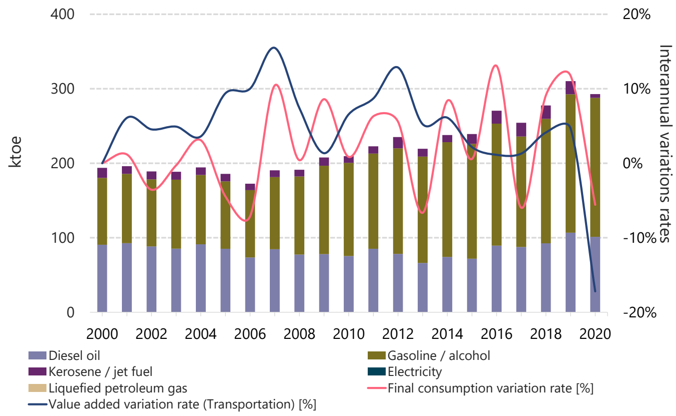


Industrial Sector final consumption
ktoe
Interannual variations rates
Electricity
Natural gas
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]

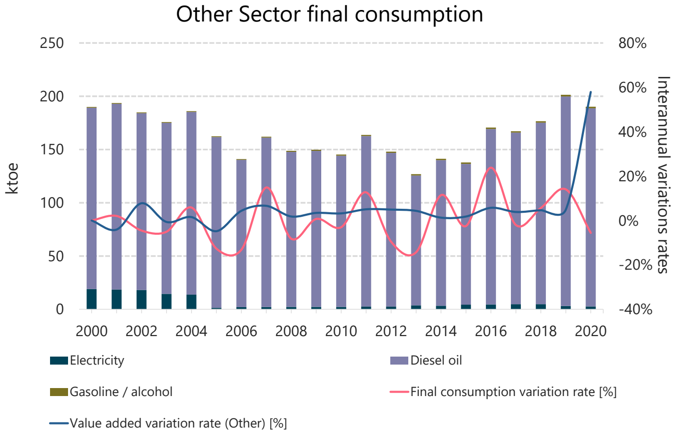
Commercial Sector final consumption



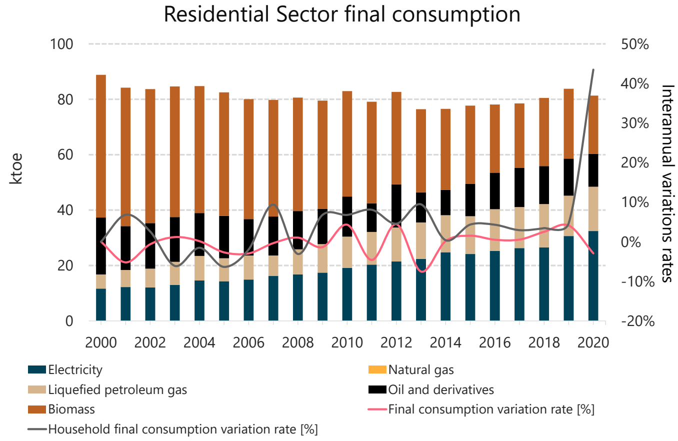
Transport Sector final consumption



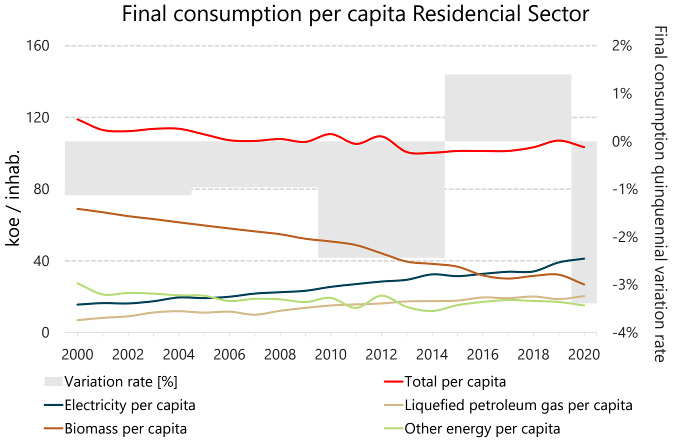
Other Sector final consumption



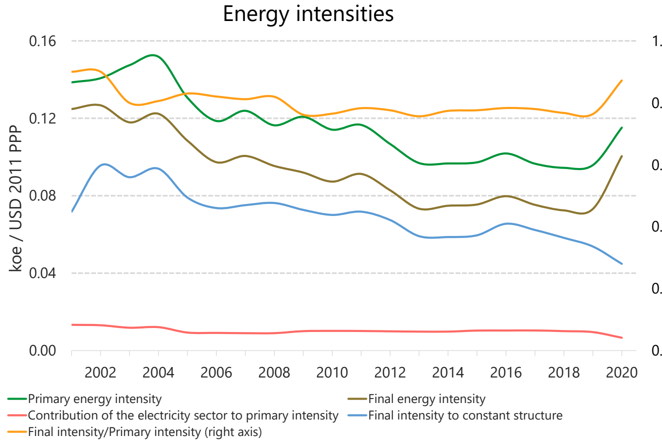
Residential Sector final consumption

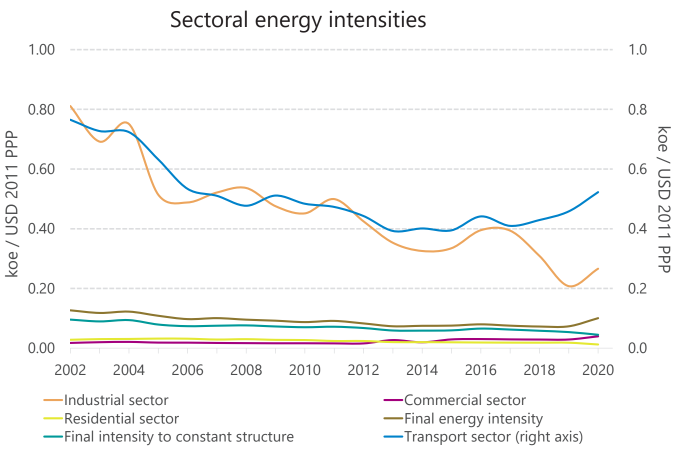


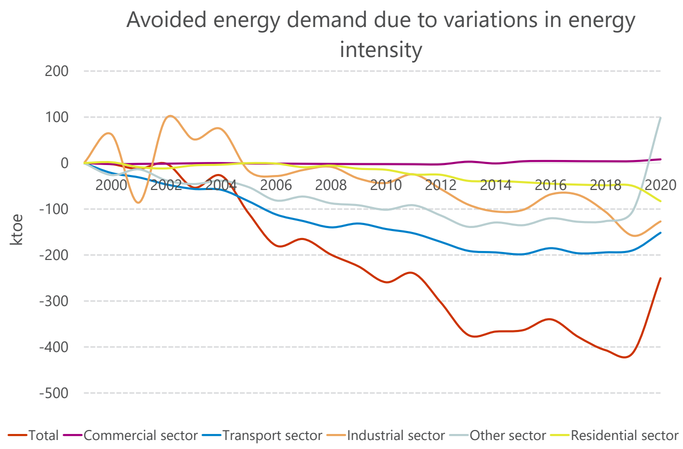
Final consumption per capita Residencial Sector

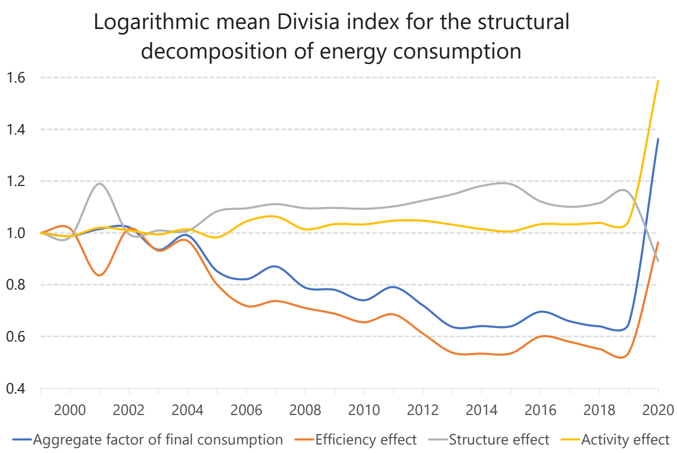


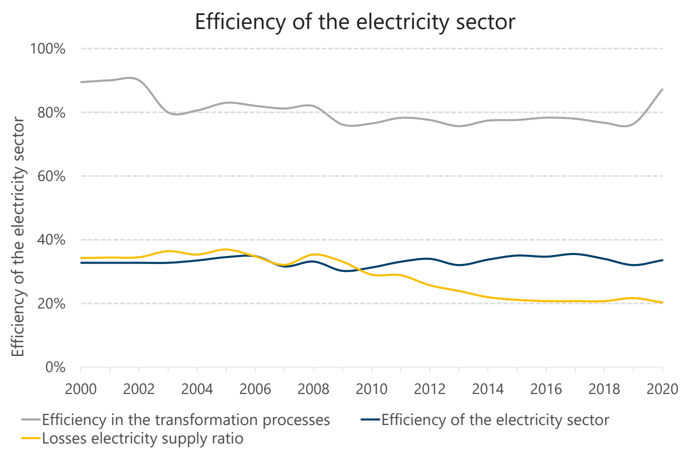
Energy intensities

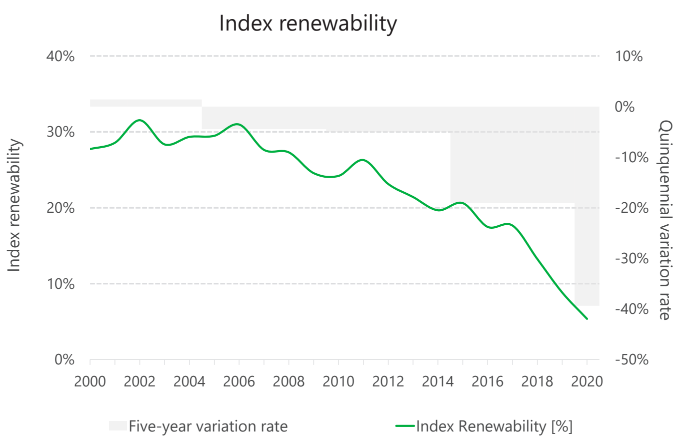


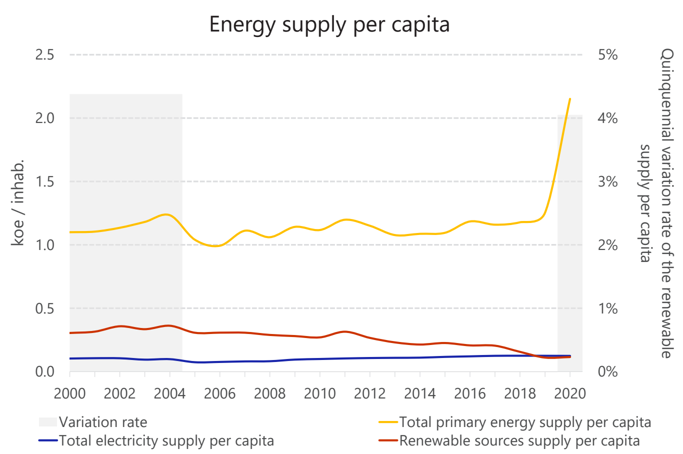

Sectoral energy intensities
koe / USD 2011 PPP
koe / USD 2011 PPP
1.00
0.80
0.60
0.40
0.20
0.00
1.0
0.8
0.6
0.4
0.2
0.0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)


Avoided energy demand due to variations in energy intensity
ktoe
200
100
0
-100
-200
-300
-400
-500
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

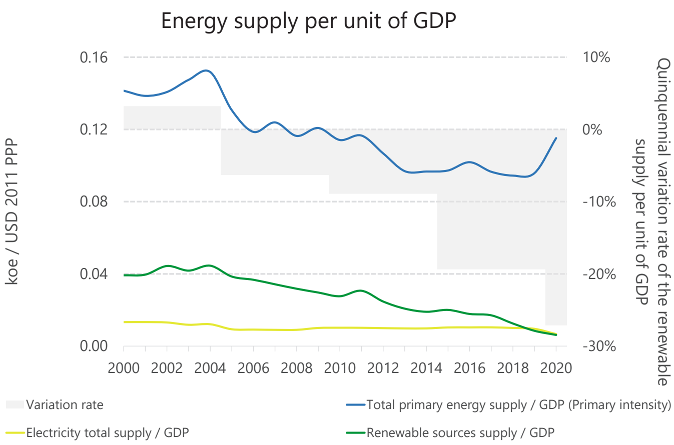

Logarithmic mean Divisia index for the structural decomposition of energy consumption
1.6
1.4
1.2
1.0
0.8
0.6
0.4
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect

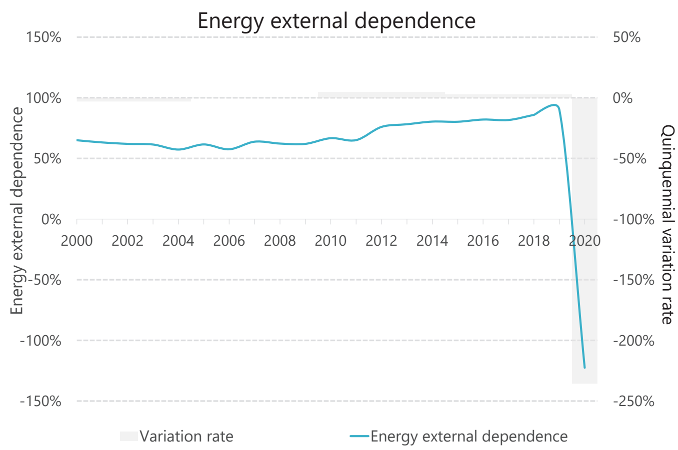

Efficiency of the electricity sector
Efficiency of the electricity sector
100%
80%
60%
40%
20%
0%
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

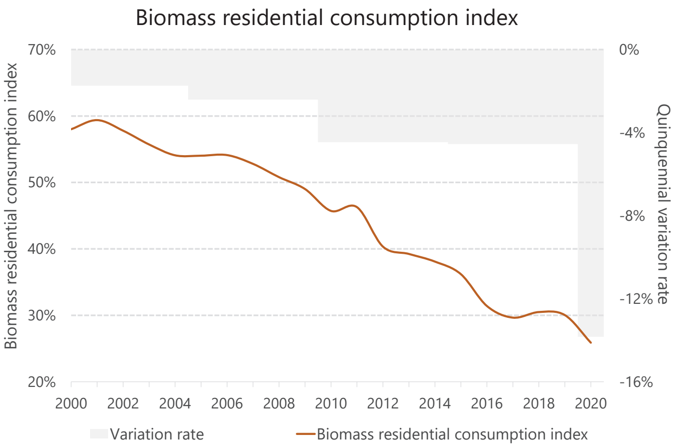

Index renewability
Index renewability
Quinquennial variation rate
40%
30%
20%
10%
0%
10%
0%
-10%
-20%
-30%
-40%
-50%
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Five-year variation rate
Index Renewability [%]

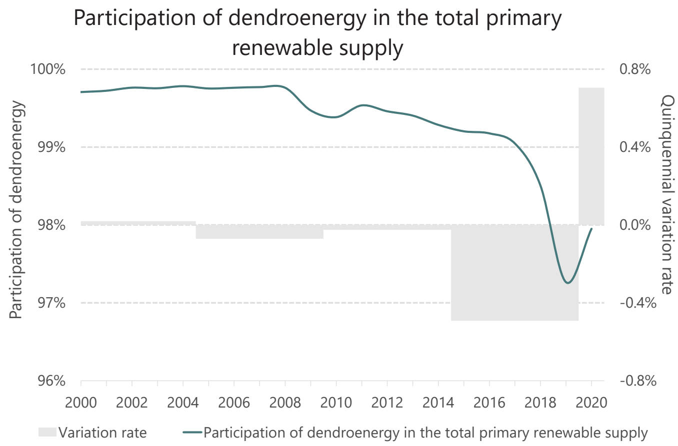

Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
2.5
2.0
1.5
1.0
0.5
0.0
5%
4%
3%
2%
1%
0%
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita

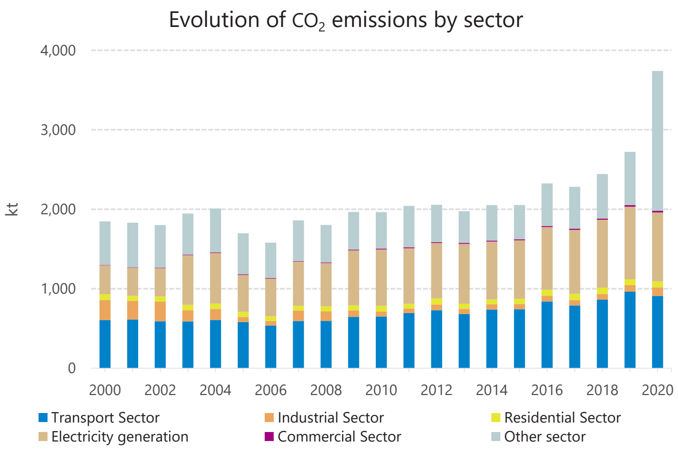
GUYANA

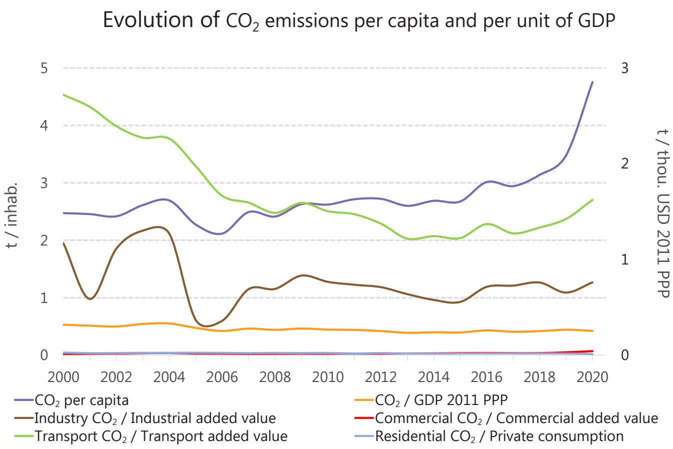

Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP

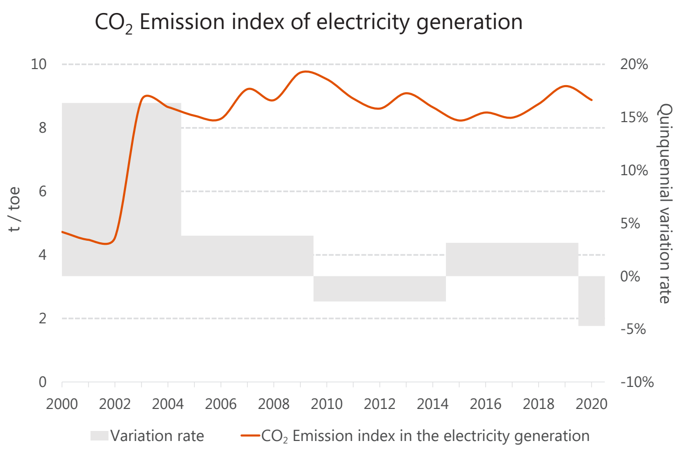

Energy external dependence
Energy external dependence
Quinquennial variation rate
Variation rate
Energy external dependence


Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
Variation rate
Biomass residential consumption index

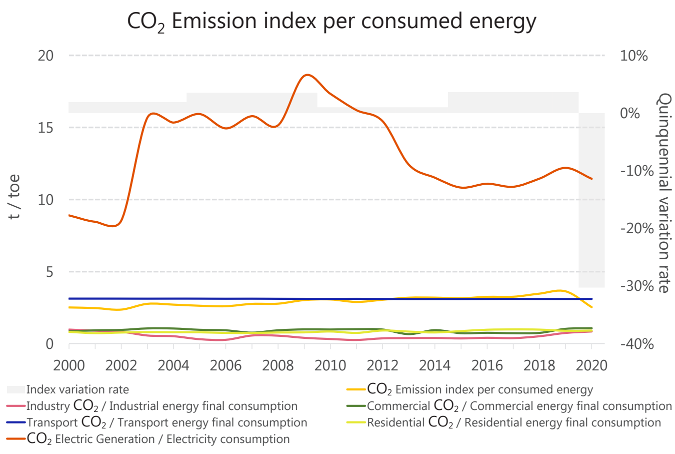

Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
Variation rate
Participation of dendroenergy in the total primary renewable supply


Evolution of CO_2 emissions by sector
kt
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector

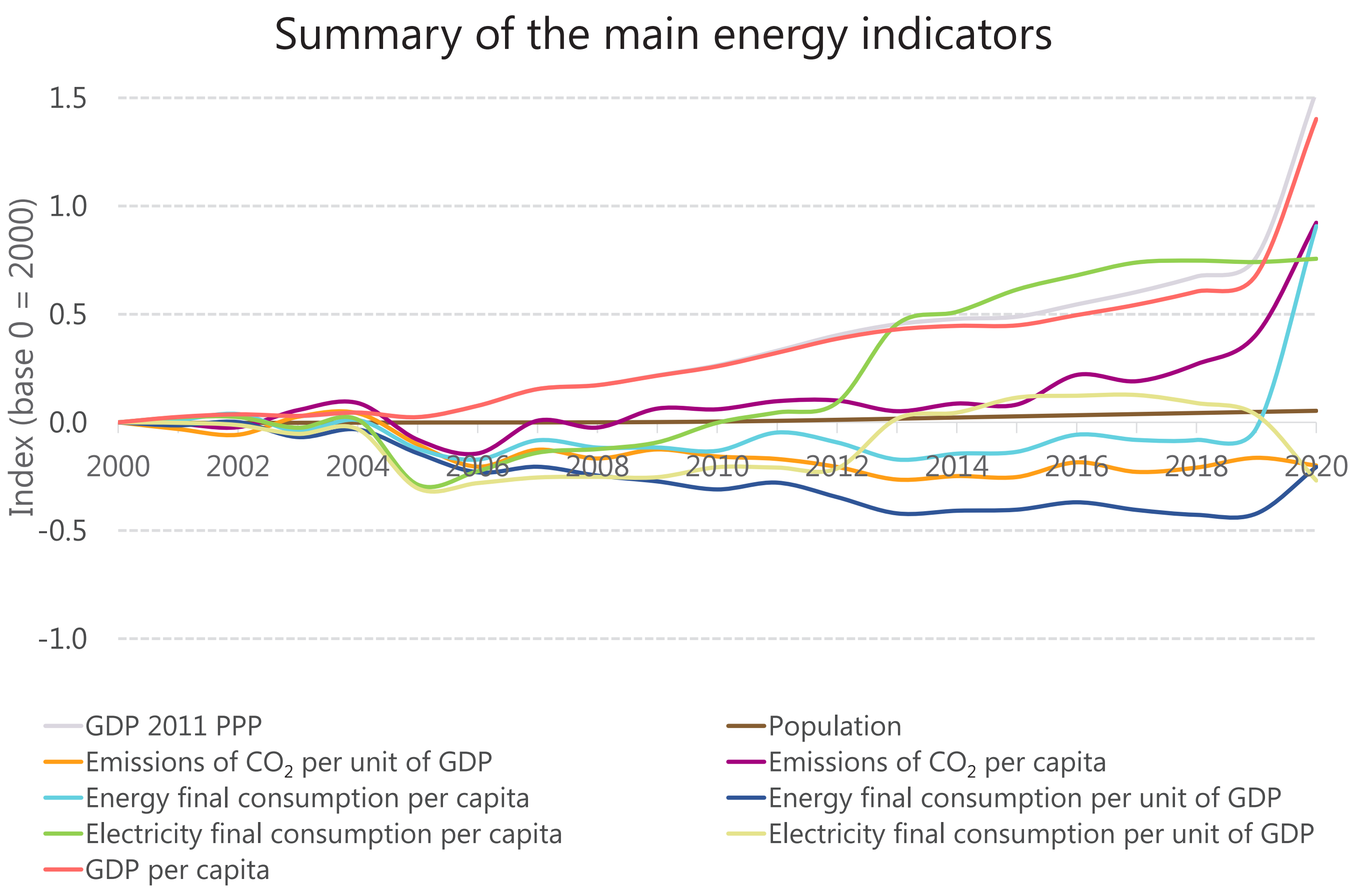

Evolution of CO_2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
CO_2 per capita
CO_2 / GDP 2011 PPP
Industry CO_2 / Industrial added value
Commercial CO_2 / Commercial added value
Transport CO_2 / Transport added value
Residential CO_2 / Private consumption



CO_2 Emission index of electricity generation
t / toe
Quinquennial variation rate
Variation rate
CO_2 Emission index in the electricity generation



CO_2 Emission index per consumed energy
t / toe
Quinquennial variation rate
Index variation rate
Industry CO_2 / Industrial energy final consumption
Transport CO_2 / Transport energy final consumption
CO_2 Electric Generation / Electricity consumption
CO_2 Emission index per consumed energy
Commercial CO_2 / Commercial energy final consumption
Residential CO_2 / Residential energy final consumption



Summary of the main energy indicators
Index (base 0 = 2000)
GDP 2011 PPP
Emissions of CO_2 per unit of GDP
Energy final consumption per capita
Electricity final consumption per capita
GDP per capita
Population
Emissions of CO_2 per capita
Energy final consumption per unit of GDP
Electricity final consumption per unit of GDP

GUYANA

HAITI

General Information 2020

Population (thousand inhab.)	11,403 [1]
Area (km^2)	27,750
Population Density (inhab. / km^2)	411
Urban Population (%)	57
GDP USD 2010 (MUSD)	13,931 [1]
GDP USD 2011 PPP (MUSD)	31,620 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	3

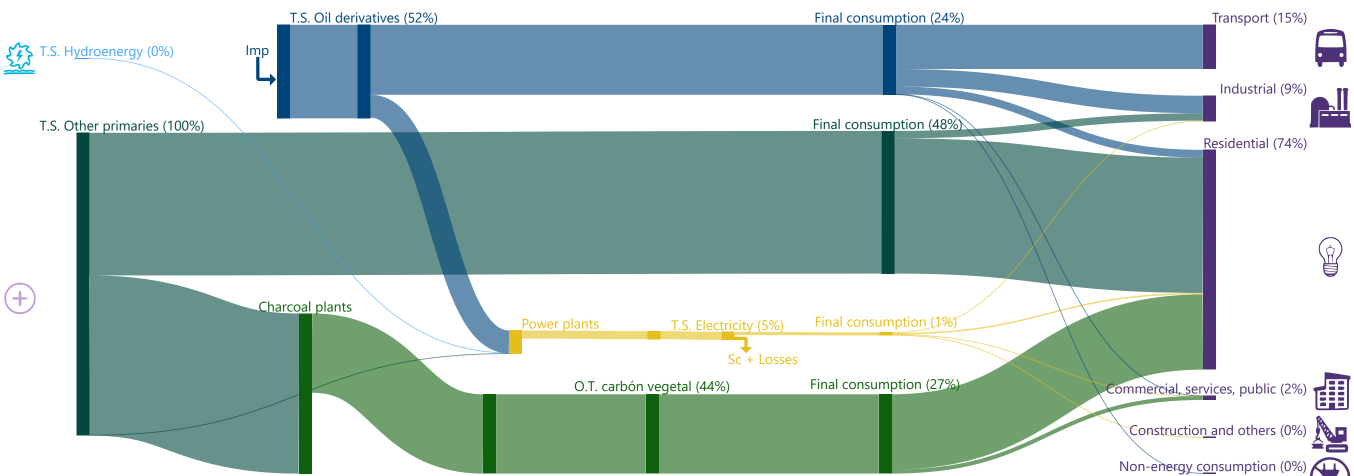
Energy Sector 2020

- Final consumption in the Transport Sector: Mtep 0.49
- Final consumption in the Industrial Sector: Mtep 0.29
- Final consumption in the Residential Sector: Mtep 2.45
- Final consumption in the Commercial and Service Sector: Mtep 0.05
- Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption: Mtep 0.01
- Oil Reserves: Mbbl n.a.
- Natural gas Reserves: Gm^3 n.a.
- Coal Reserves: Mt 9

[1] Source: ECLAC.
[2] Source: World Bank.
Note: The supply and demand data for the period 2000 - 2020 correspond to estimates made by OLADE.

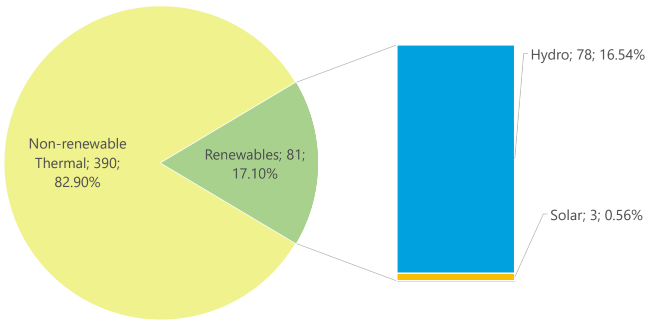
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
37	0.29	45.37 [2]	4.43	3.44	1.04	0.00	3.30	n.a.	0.47	0.14 / 0.10
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

Summarized energy balance 2020

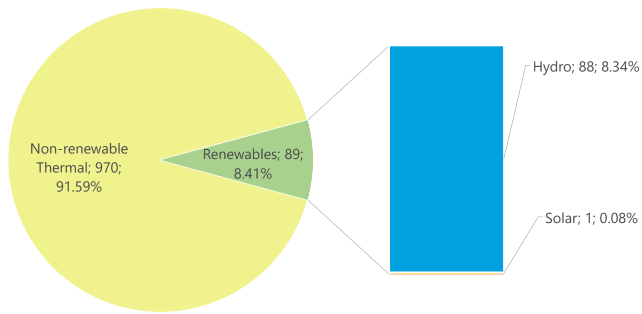


* Corresponds to firewood + sugarcane and derivatives

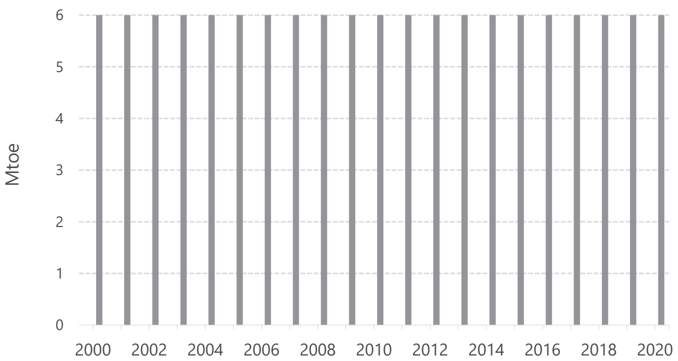
Installed power generation capacity [MW; %]
2020



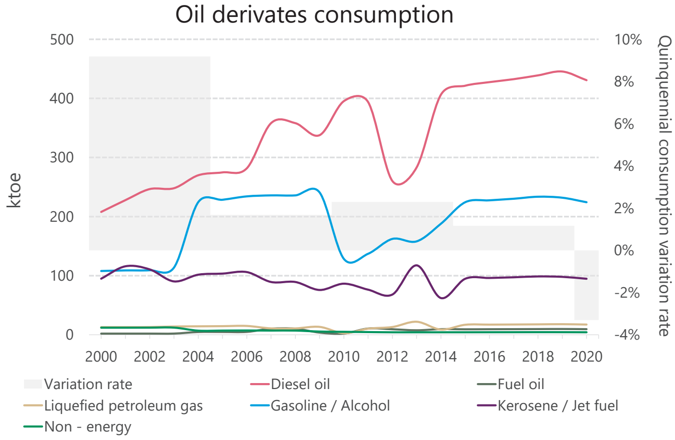
Electricity generation by source [GWh; %]
2020



Proven reserves of coal



Oil derivates consumption



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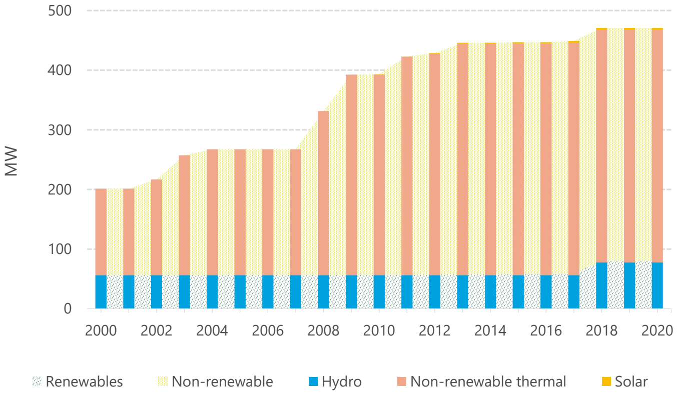
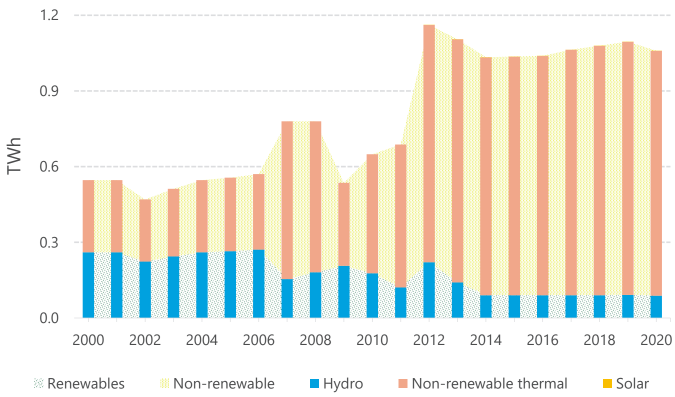
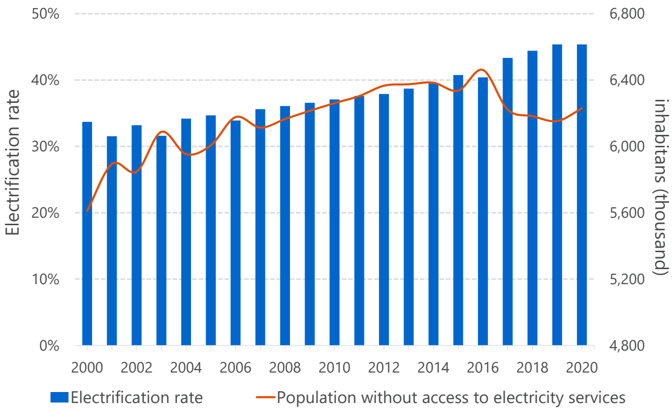
Installed power generation capacity



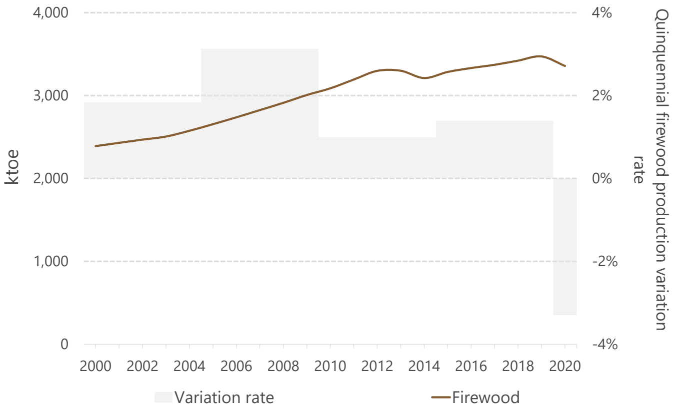
Power generation



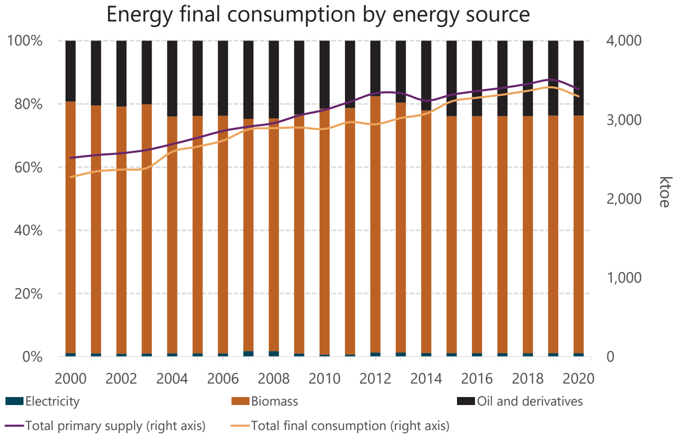
Electrification rate



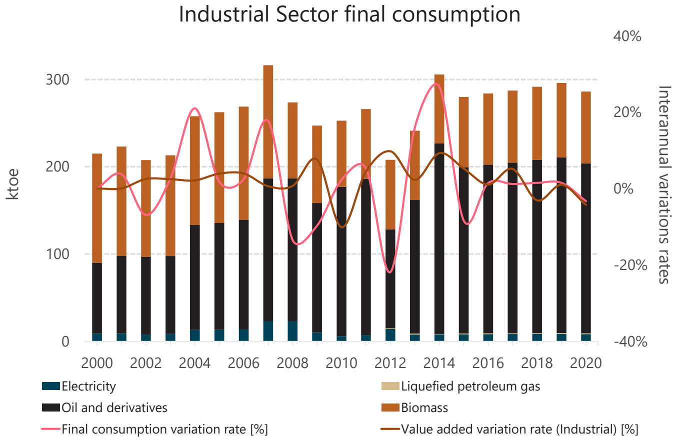
Firewood production



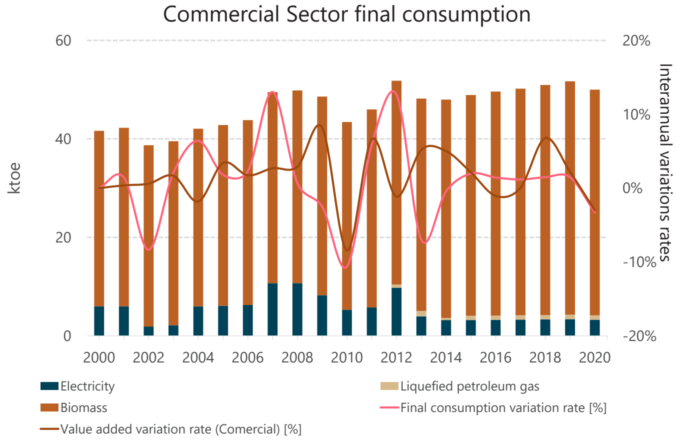
Energy final consumption by energy source



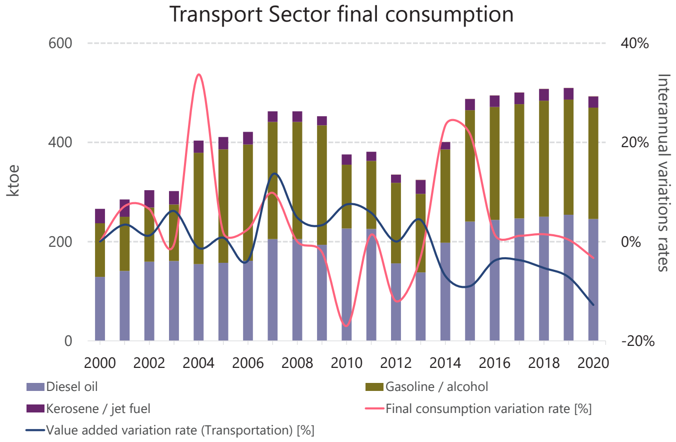
Industrial Sector final consumption



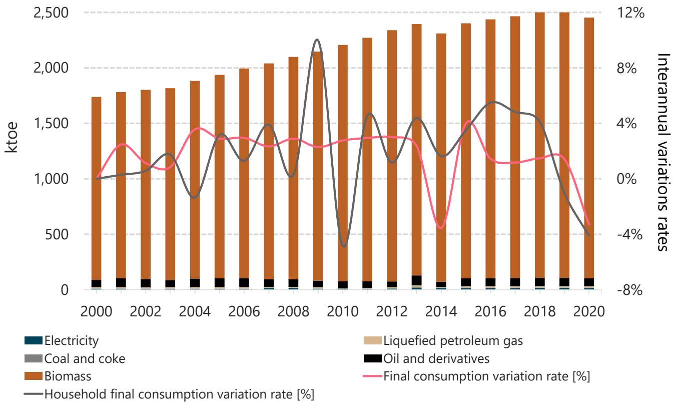
Commercial Sector final consumption



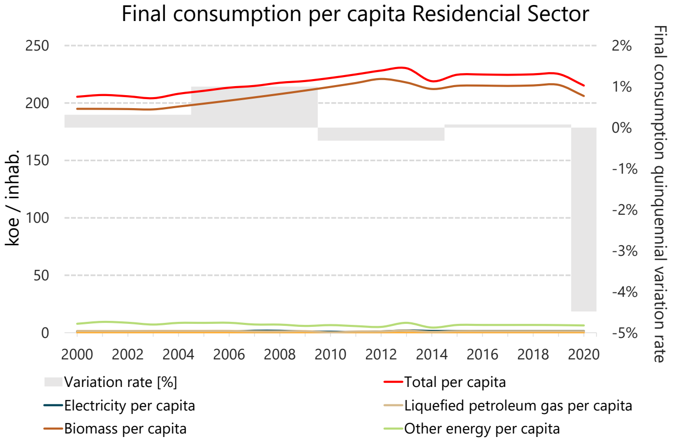
Transport Sector final consumption



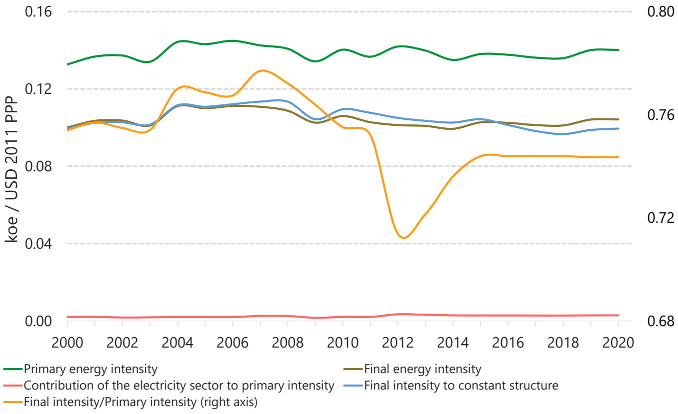
Residential Sector final consumption



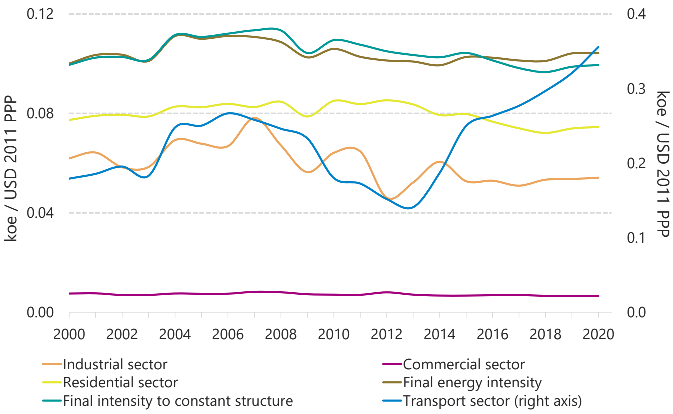
Final consumption per capita Residencial Sector



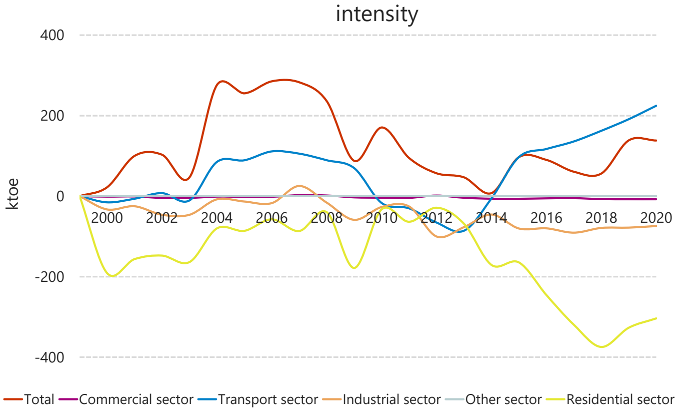
Energy intensities



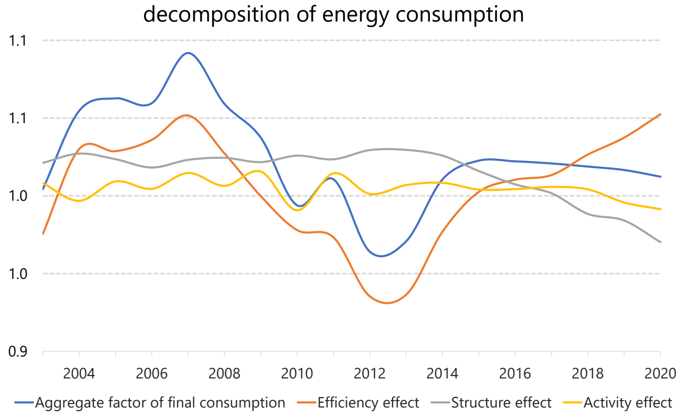
Sectoral energy intensities

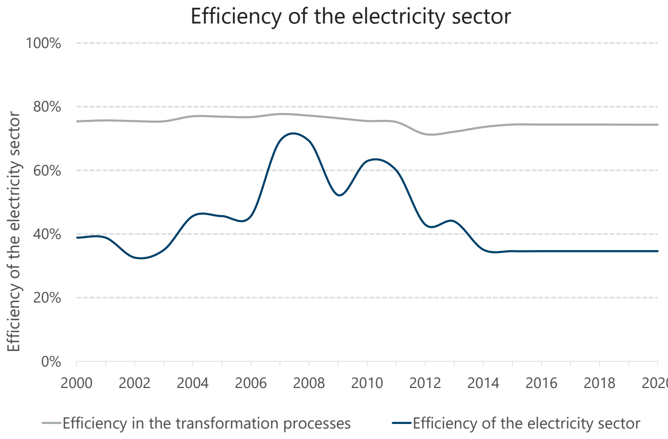


Avoided energy demand due to variations in energy intensity

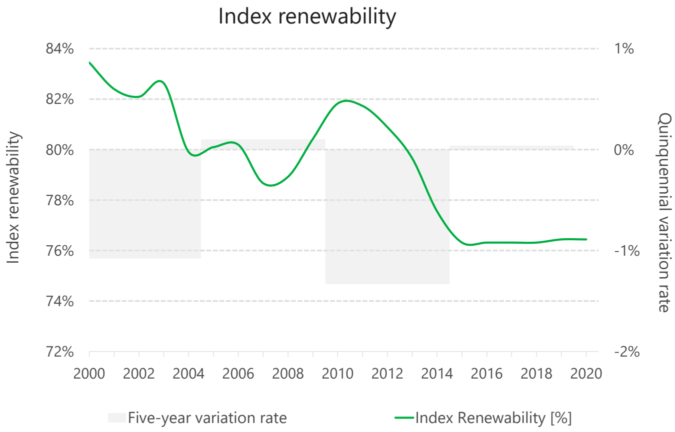


Logarithmic mean Divisia index for the structural decomposition of energy consumption

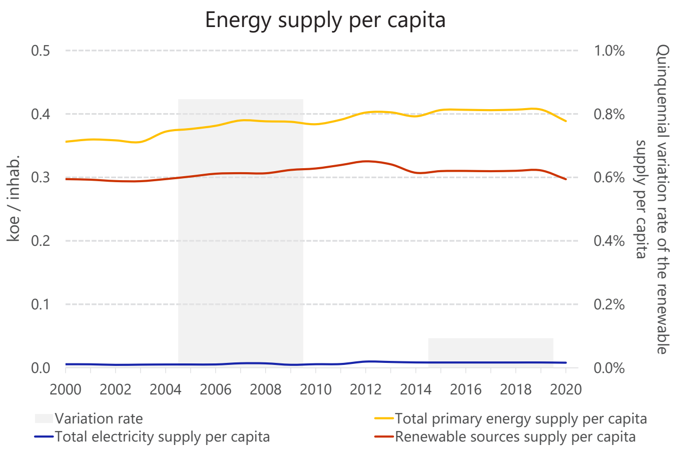




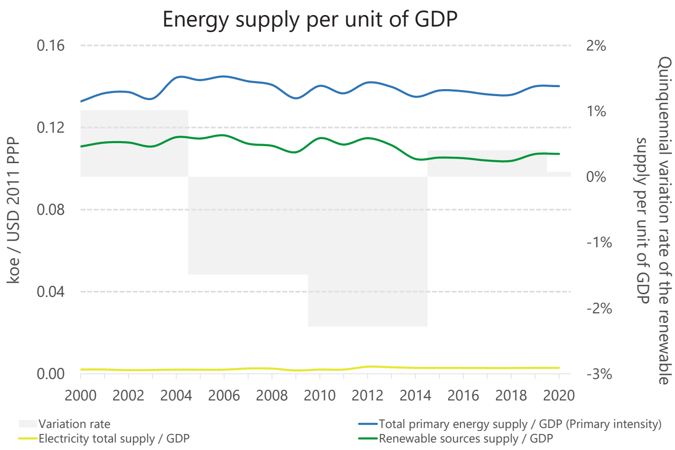
Efficiency of the electricity sector
100%
80%
60%
40%
20%
0%
Efficiency of the electricity sector
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Efficiency in the transformation processes
Efficiency of the electricity sector



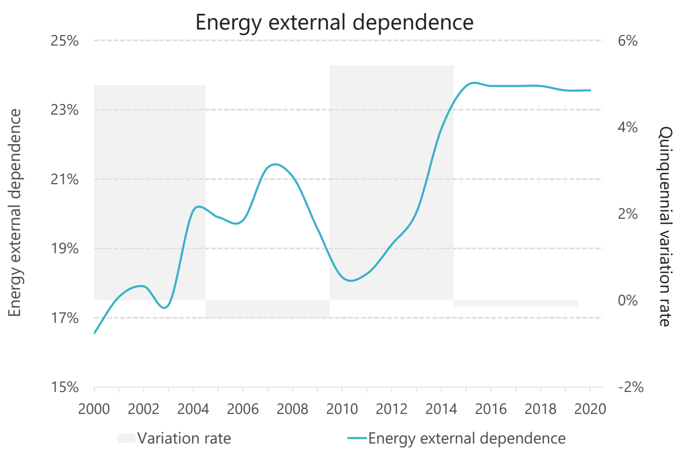
Index renewability
84%
82%
80%
78%
76%
74%
72%
Index renewability
1%
0%
-1%
-2%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Five-year variation rate
Index Renewability [%]



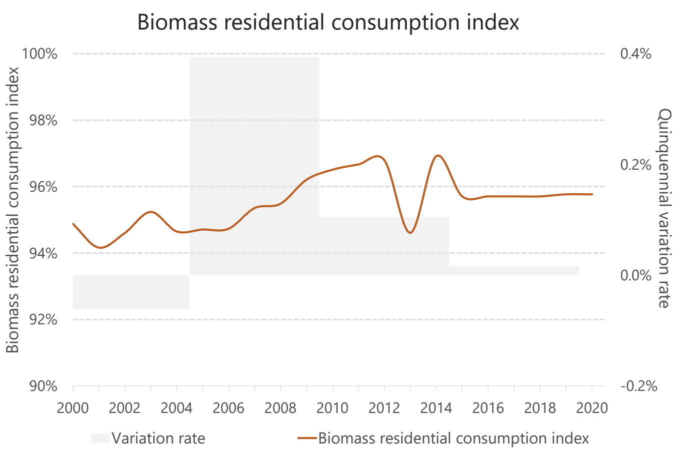
Energy supply per capita
0.5
0.4
0.3
0.2
0.1
0.0
koe / inhab.
1.0%
0.8%
0.6%
0.4%
0.2%
0.0%
Quinquennial variation rate of the renewable supply per capita
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita



Energy supply per unit of GDP
0.16
0.12
0.08
0.04
0.00
koe / USD 2011 PPP
2%
1%
0%
-1%
-2%
-3%
Quinquennial variation rate of the renewable supply per unit of GDP
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP

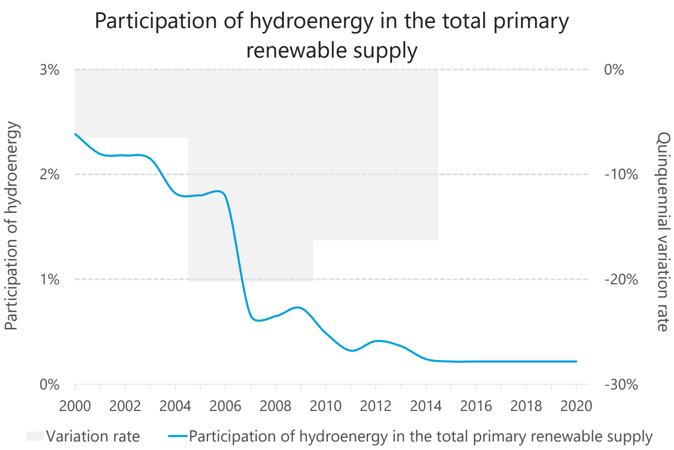


Energy external dependence
25%
23%
21%
19%
17%
15%
Energy external dependence
6%
4%
2%
0%
-2%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Energy external dependence

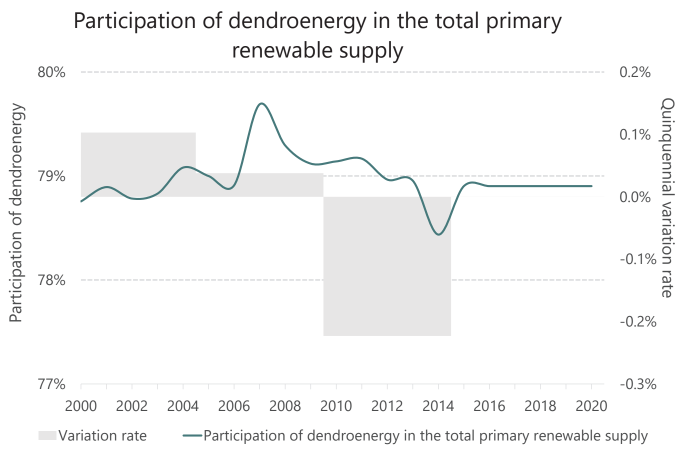


Biomass residential consumption index
100%
98%
96%
94%
92%
90%
Biomass residential consumption index
0.4%
0.2%
0.0%
-0.2%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Biomass residential consumption index

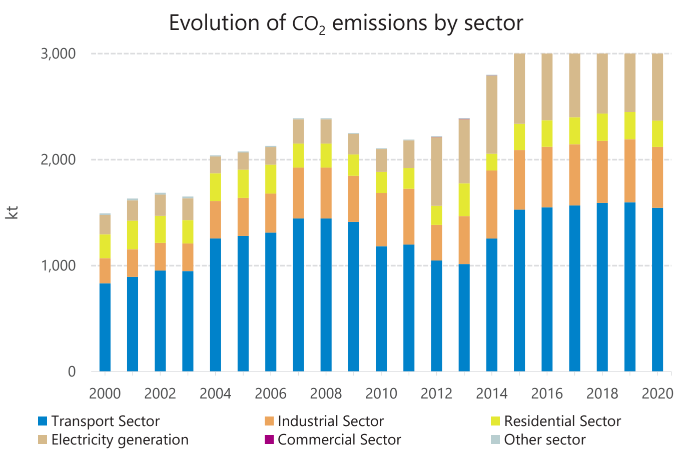
HAITI



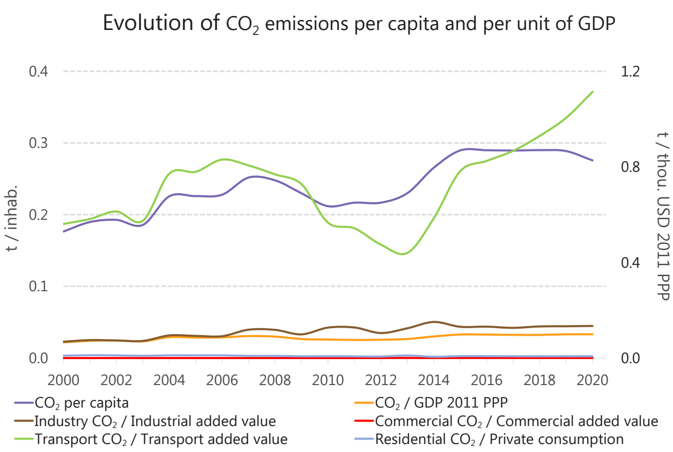
Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
Variation rate
Participation of hydroenergy in the total primary renewable supply



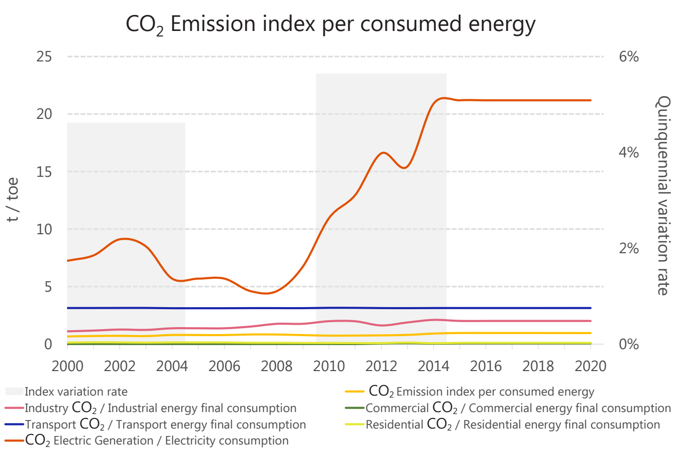
Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
Variation rate
Participation of dendroenergy in the total primary renewable supply



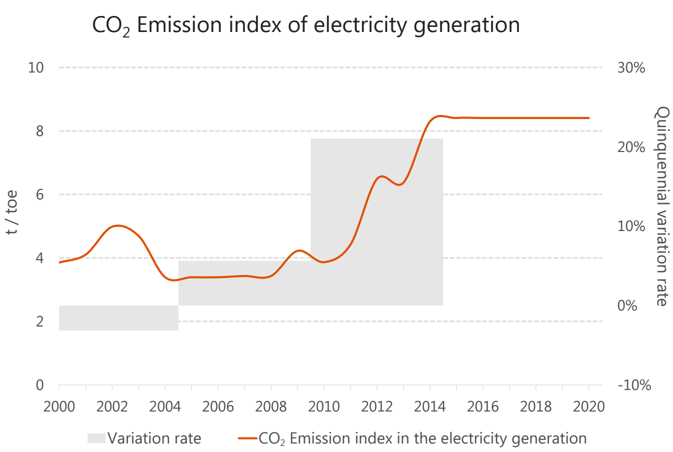
Evolution of CO2 emissions by sector
kt
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector



Evolution of CO2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
CO2 per capita
CO2 / GDP 2011 PPP
Industry CO2 / Industrial added value
Commercial CO2 / Commercial added value
Transport CO2 / Transport added value
Residential CO2 / Private consumption



CO2 Emission index per consumed energy
t / toe
Quinquennial variation rate
Index variation rate
CO2 Emission index per consumed energy
Industry CO2 / Industrial energy final consumption
Commercial CO2 / Commercial energy final consumption
Transport CO2 / Transport energy final consumption
Residential CO2 / Residential energy final consumption
CO2 Electric Generation / Electricity consumption



CO2 Emission index of electricity generation
t / toe
Quinquennial variation rate
Variation rate
CO2 Emission index in the electricity generation

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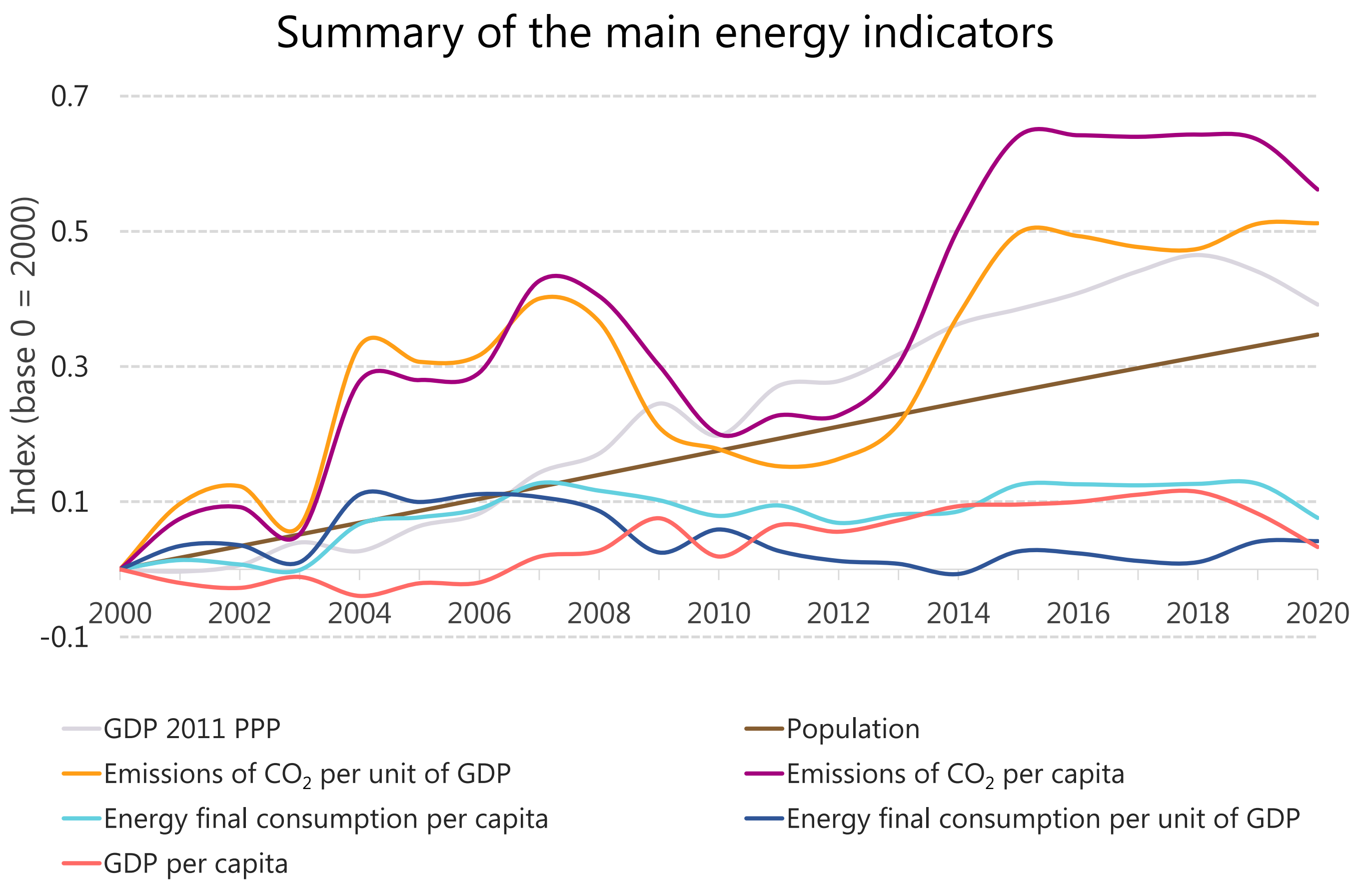


Summary of the main energy indicators
Index (base 0 = 2000)
0.7
0.5
0.3
0.1
-0.1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
GDP per capita

HAITI

HONDURAS

General Information 2020

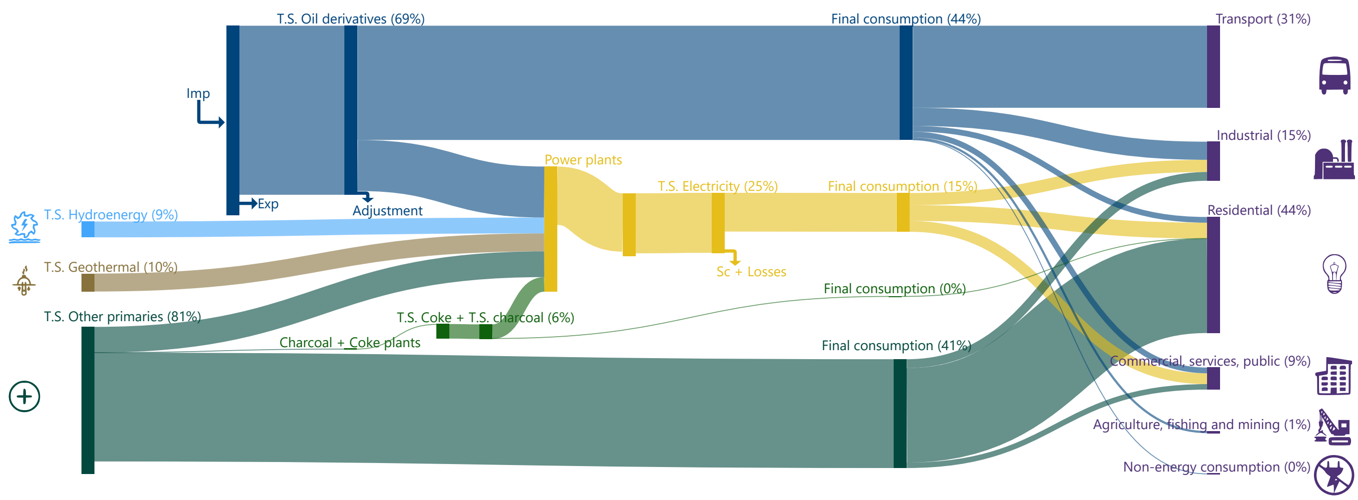
Population (thousand inhab.)	9,363
Area (km^2)	112,492
Population Density (inhab. / km^2)	83
Urban Population (%)	55
GDP USD 2010 (MUSD)	19,914
GDP USD 2011 PPP (MUSD)	50,894
GDP per capita (thou. USD 2011 PPP / inhab.)	5.4

Energy Sector 2020

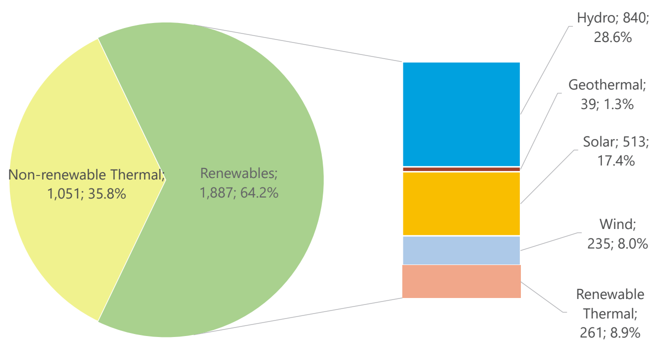
Final consumption in the Transport Sector	Mtep	1.21
Final consumption in the Industrial Sector	Mtep	0.57
Final consumption in the Residential Sector	Mtep	1.71
Final consumption in the Commercial and Service Sector	Mtep	0.32
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	0.04
Oil Reserves	Mbbl	n.a.
Natural gas Reserves	Gm^3	n.a.
Coal Reserves	Mt	n.a.

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
708	0.41	85.02	5.37	2.66	3.07	0.34	3.85	n.a.	2.94	0.11 / 0.08
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

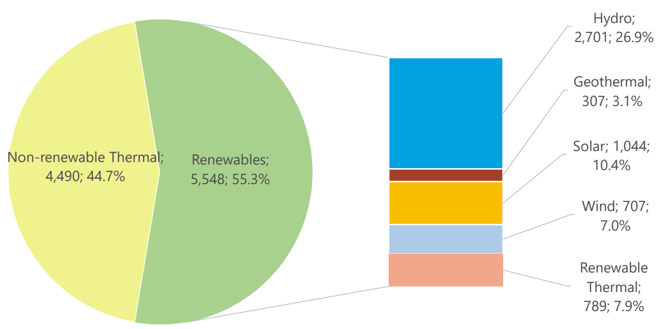
Summarized energy balance 2020



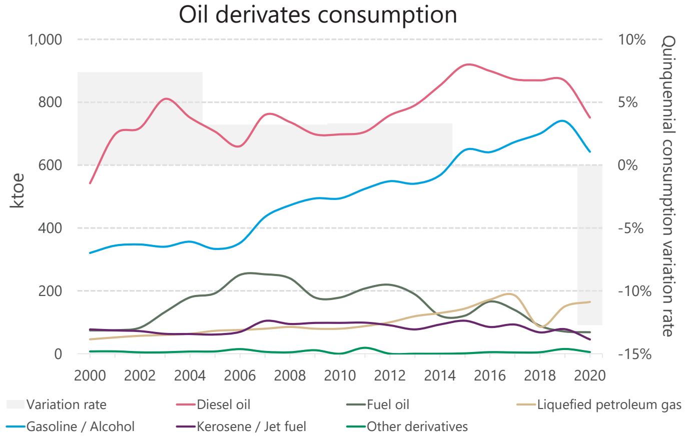
Installed power generation capacity [MW; %] 2020



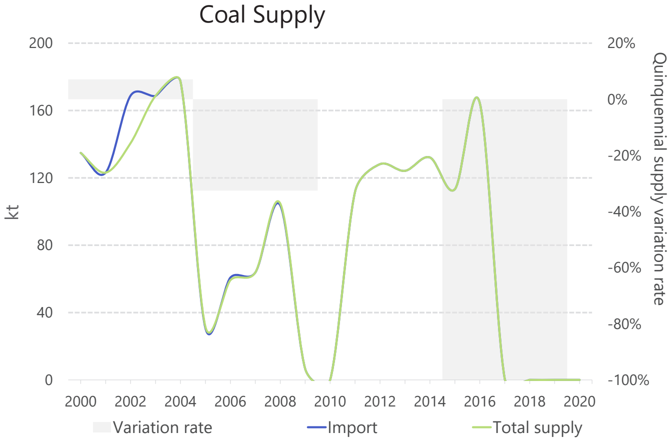
Electricity generation by source [GWh; %] 2020



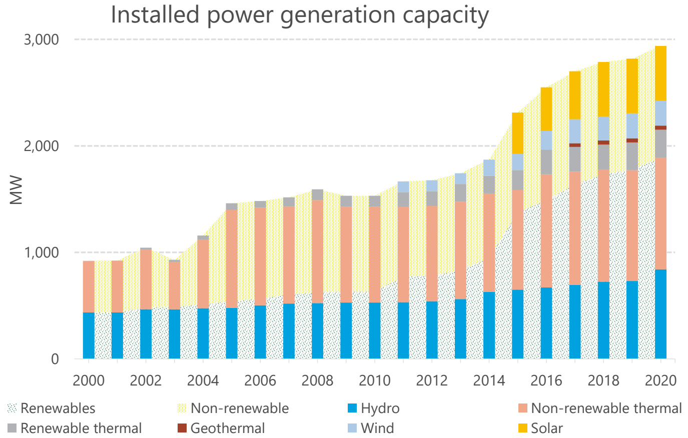
Oil derivates consumption



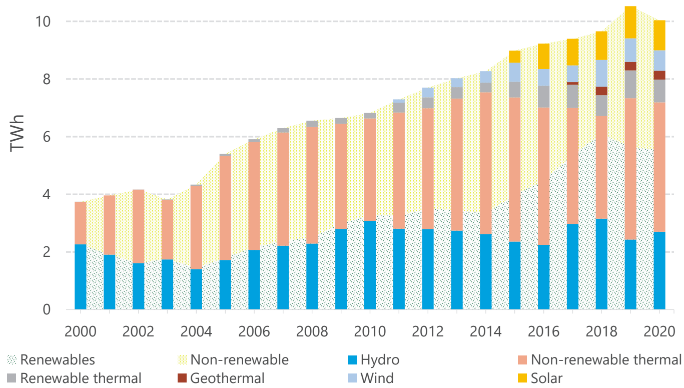
Coal Supply



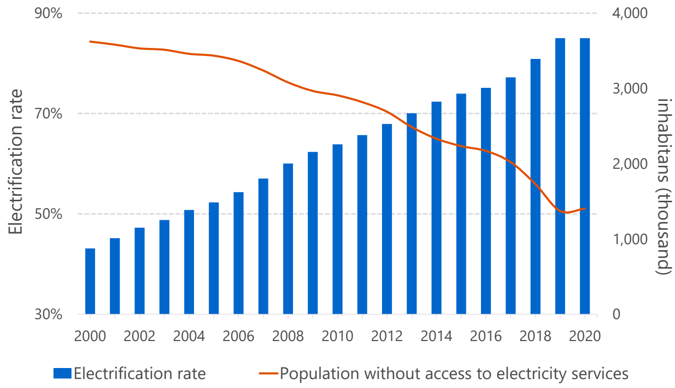
Installed power generation capacity



Power generation

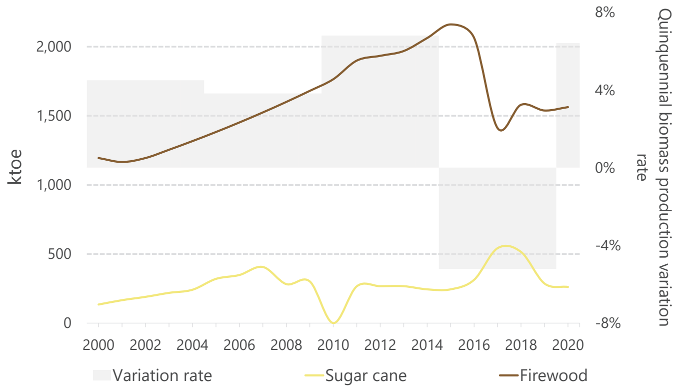


Electrification rate



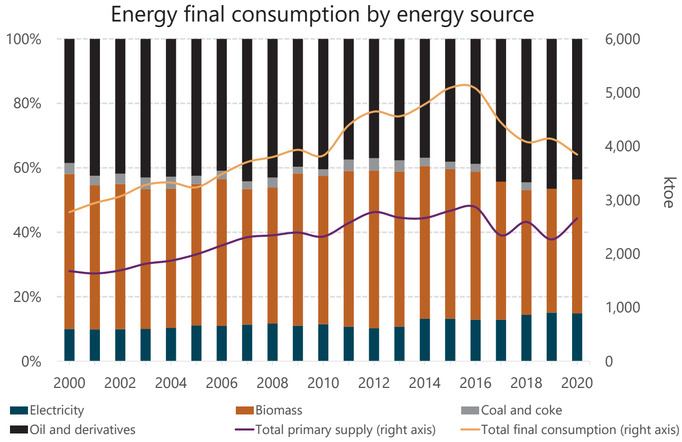
* As of 2019, the calculation methodology, now carried out by the Energy Secretariat, was changed.

Biomass and biofuels production *

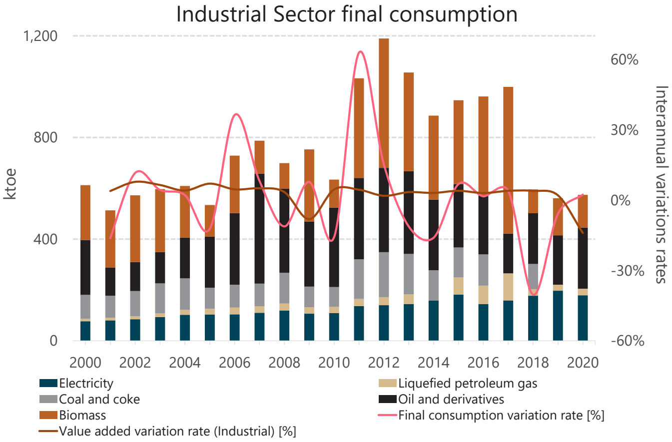


* As of 2017, the methodology that improves the estimation of firewood consumption is modified.

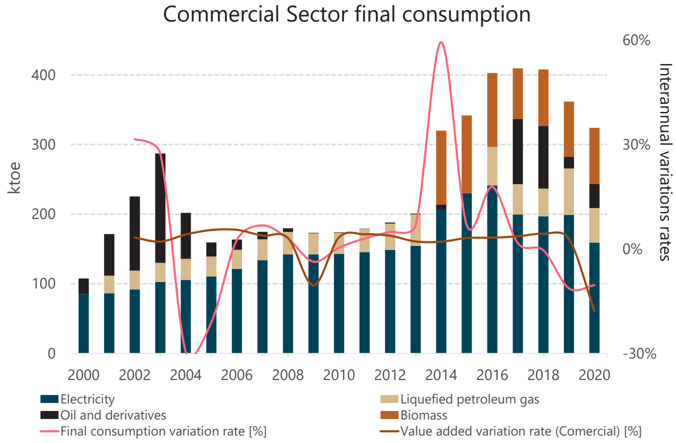
Energy final consumption by energy source



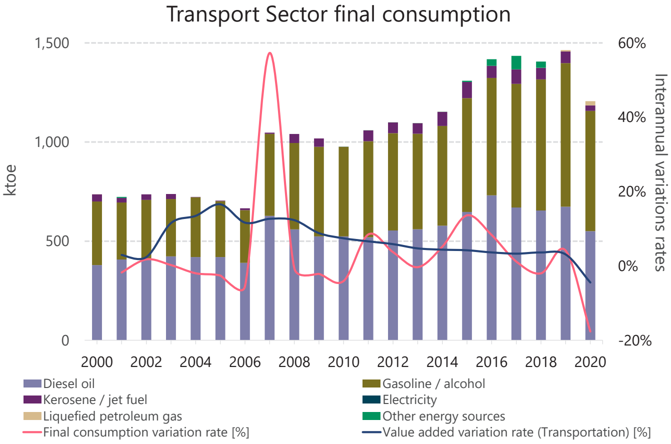
Industrial Sector final consumption



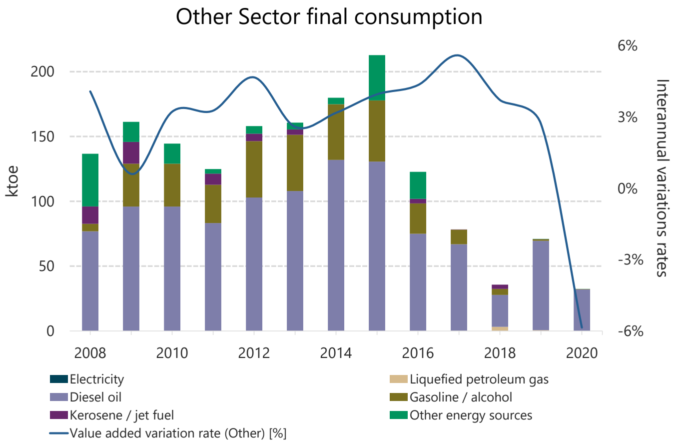
Commercial Sector final consumption

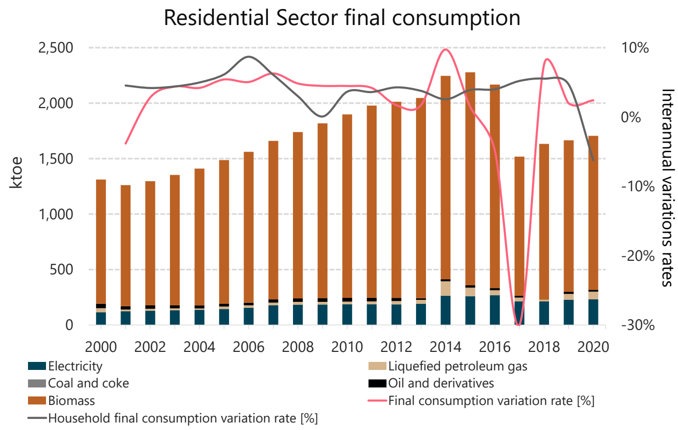


Transport Sector final consumption

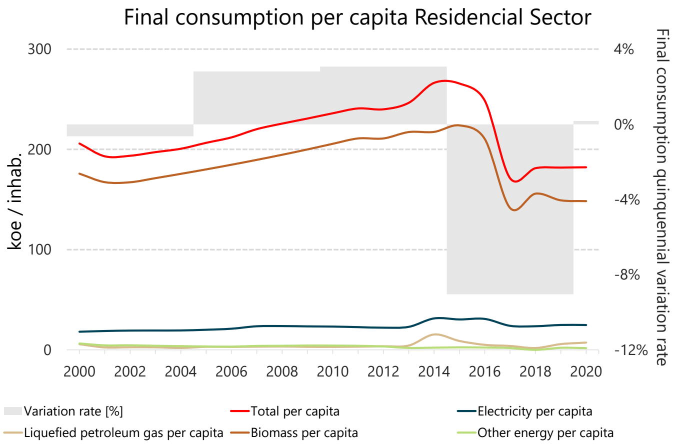


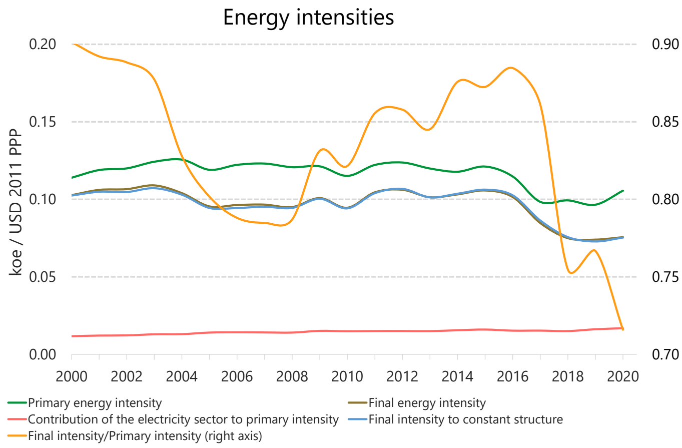
HONDURAS



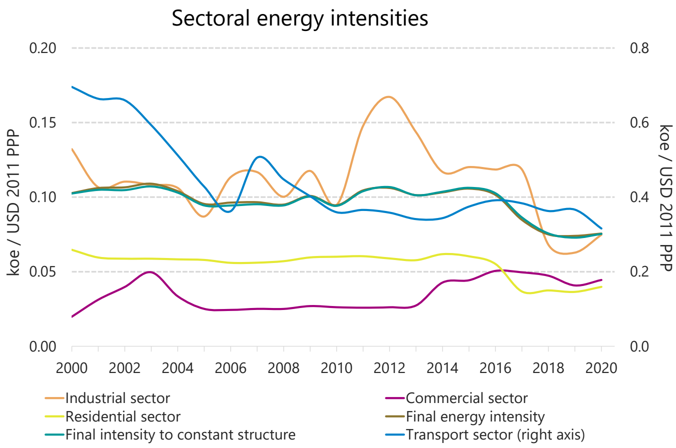


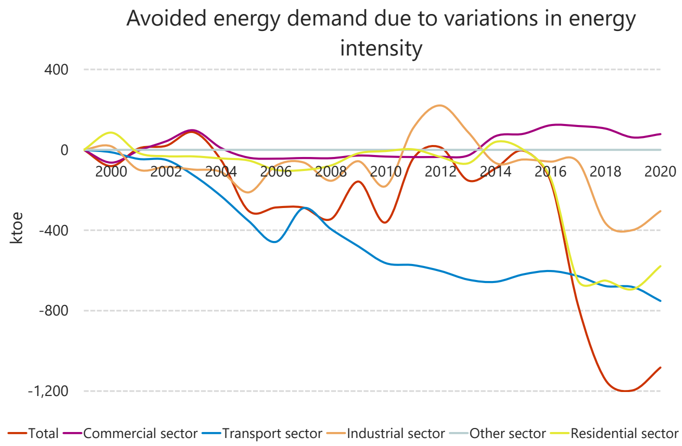
* As of 2017, the methodology that improves the estimation of firewood consumption is modified.

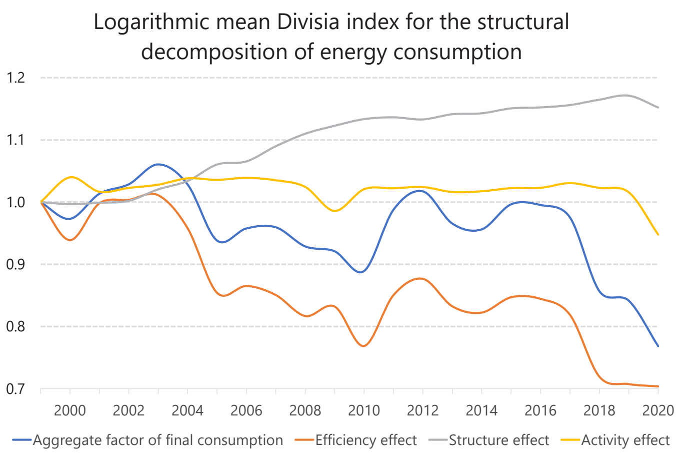


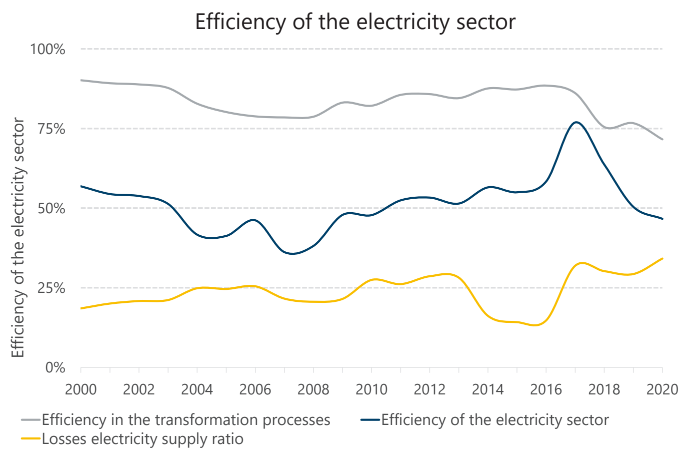


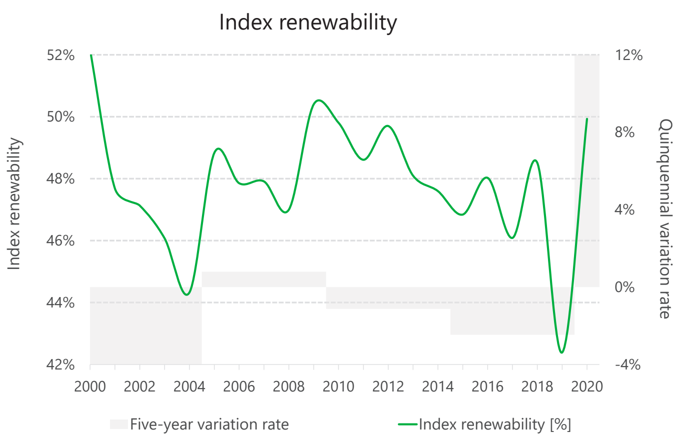
HONDURAS

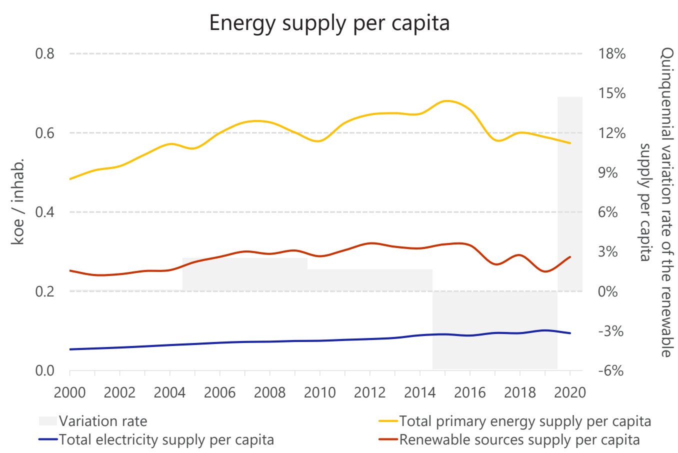


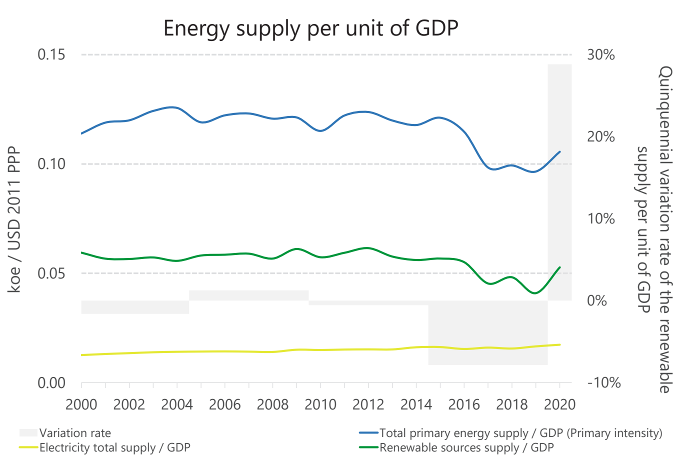


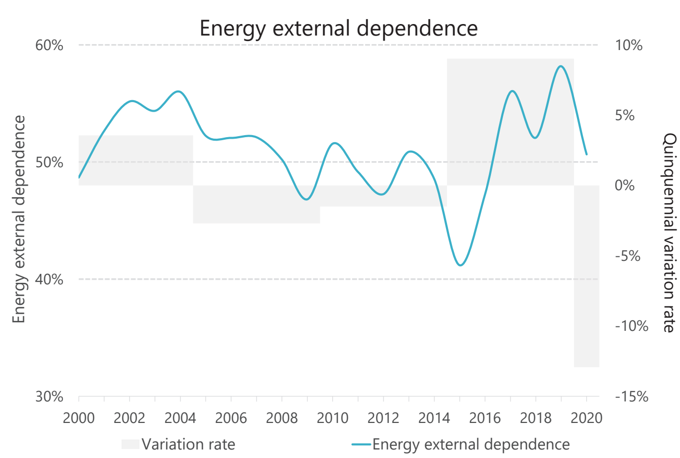

Logarithmic mean Divisia index for the structural decomposition of energy consumption
1.2
1.1
1.0
0.9
0.8
0.7
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect


Efficiency of the electricity sector
Efficiency of the electricity sector
100%
75%
50%
25%
0%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio


Index renewability
Index renewability
52%
50%
48%
46%
44%
42%
12%
8%
4%
0%
-4%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Five-year variation rate
Index renewability [%]

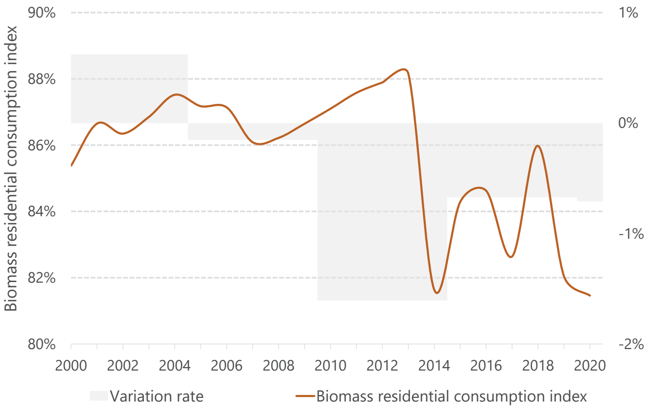

Energy supply per capita
koe / inhab.
0.8
0.6
0.4
0.2
0.0
18%
15%
12%
9%
6%
3%
0%
-3%
-6%
Quinquennial variation rate of the renewable supply per capita
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Total electricity supply per capita
Total primary energy supply per capita
Renewable sources supply per capita


Energy supply per unit of GDP
koe / USD 2011 PPP
0.15
0.10
0.05
0.00
30%
20%
10%
0%
-10%
Quinquenial variation rate of the renewable supply per unit of GDP
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Electricity total supply / GDP
Total primary energy supply / GDP (Primary intensity)
Renewable sources supply / GDP

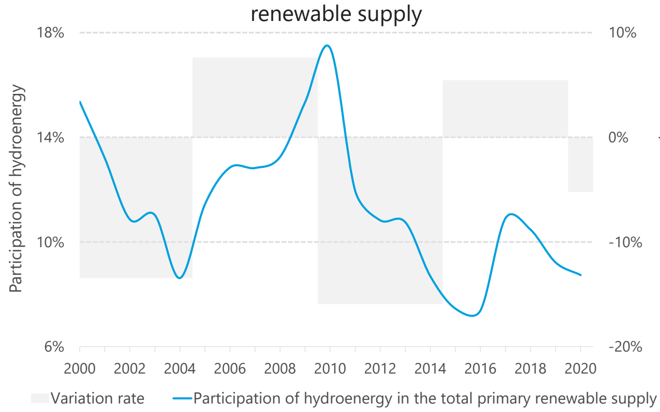

Energy external dependence
Energy external dependence
60%
50%
40%
30%
10%
5%
0%
-5%
-10%
-15%
Quinquennial variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Energy external dependence

HONDURAS

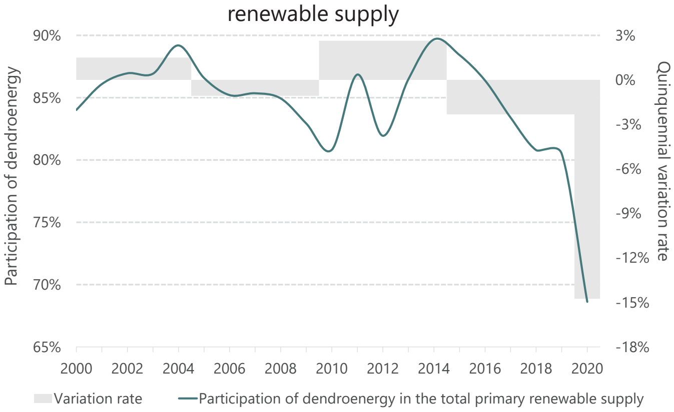
Biomass residential consumption index



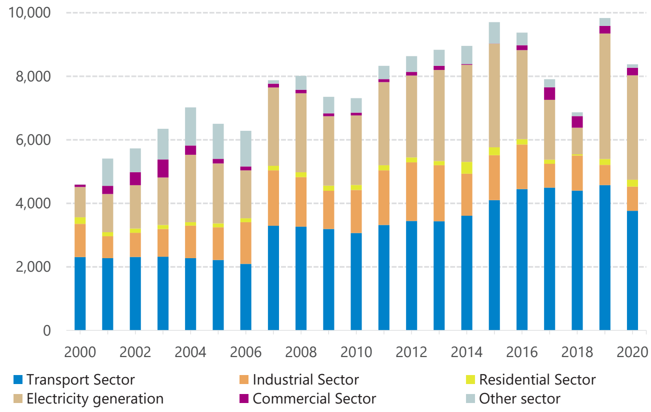
Participation of hydroenergy in the total primary renewable supply



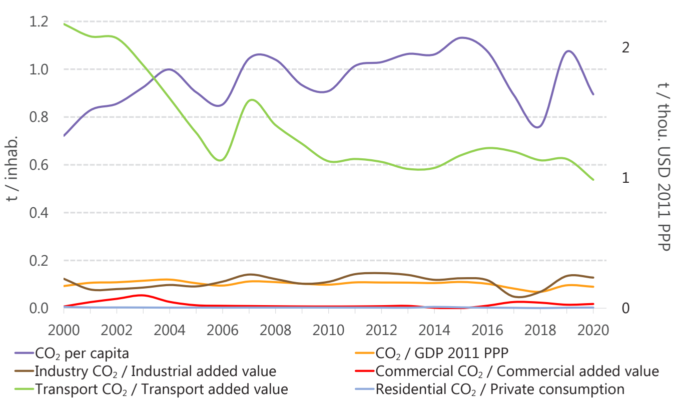
Participation of dendroenergy in the total primary renewable supply



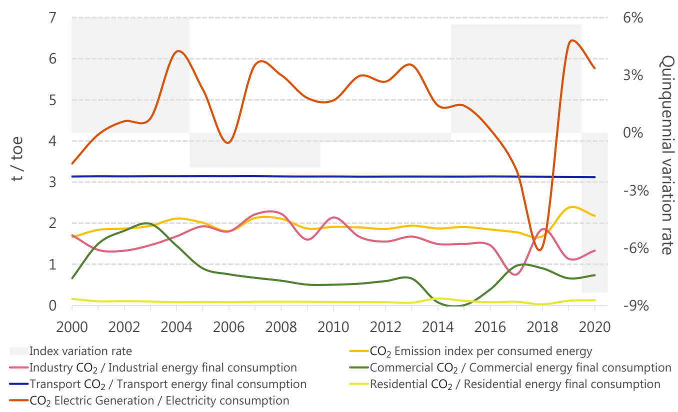
Evolution of CO_2 emissions by sector

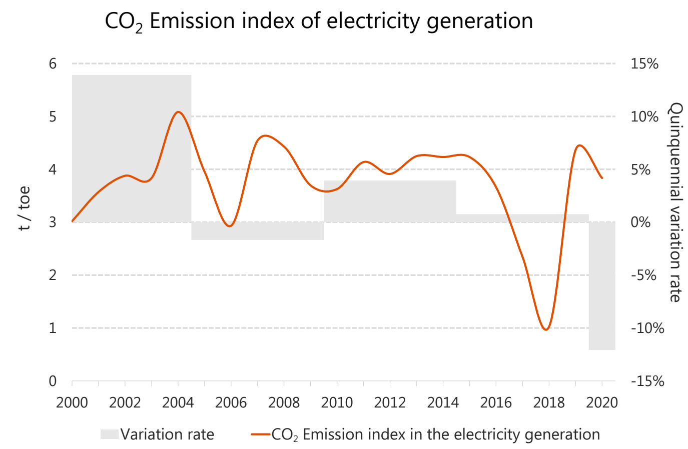


Evolution of CO_2 emissions per capita and per unit of GDP

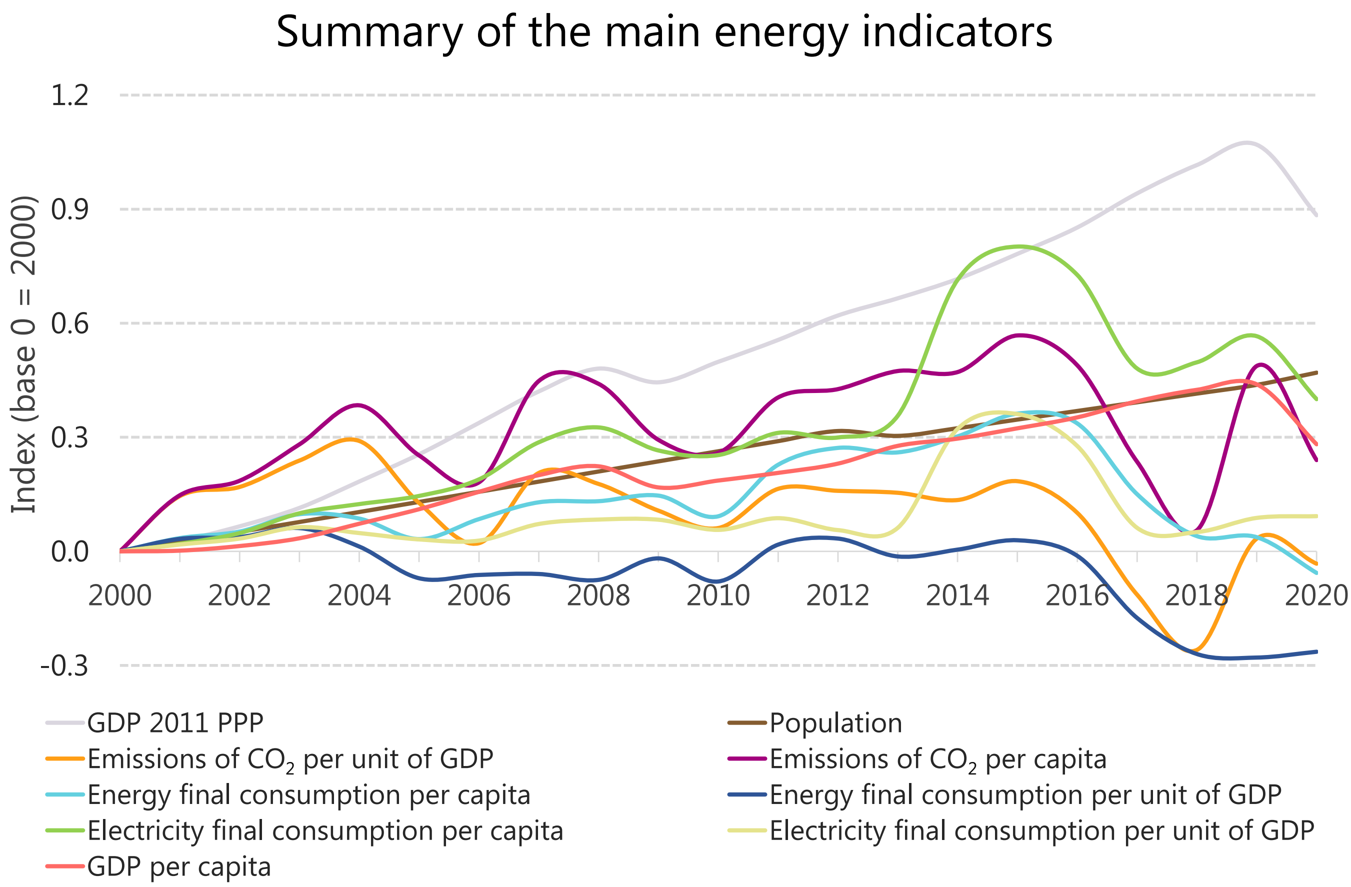


CO_2 Emission index per consumed energy





CO_2 Emission index of electricity generation
t / toe
Quinquennial variation rate
6
5
4
3
2
1
0
15%
10%
5%
0%
-5%
-10%
-15%
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
CO_2 Emission index in the electricity generation



Summary of the main energy indicators
Index (base 0 = 2000)
1.2
0.9
0.6
0.3
0.0
-0.3
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

JAMAICA

General Information 2020

Population (thousand inhab.)	2,961 [1]
Area (km^2)	10,990
Population Density (inhab. / km^2)	269
Urban Population (%)	56
GDP USD 2010 (MUSD)	12,945 [1]
GDP USD 2011 PPP (MUSD)	25,885 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	9

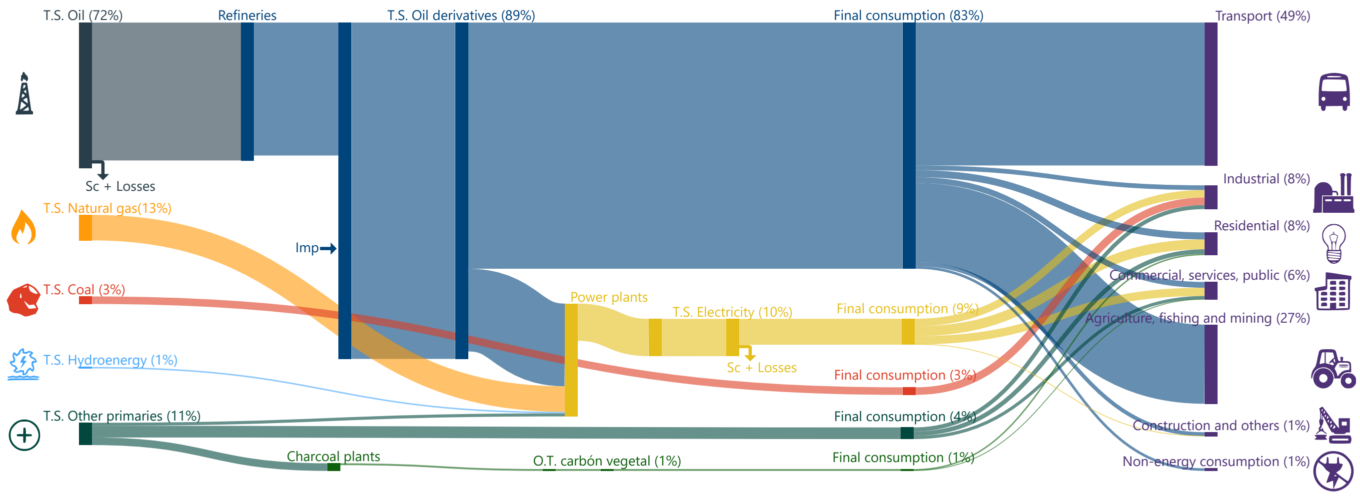
Energy Sector 2020

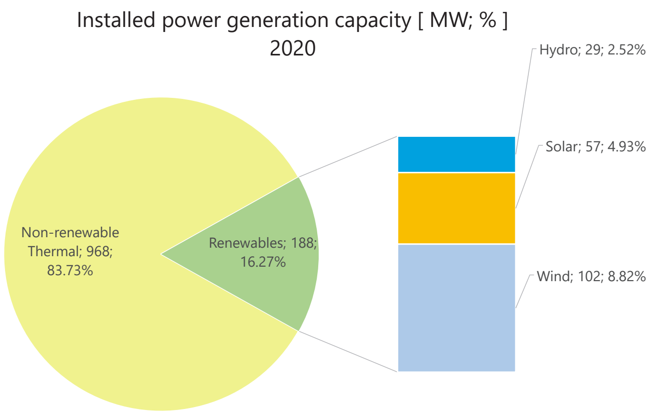
Final consumption in the Transport Sector	Mtep	1.31
Final consumption in the Industrial Sector	Mtep	0.22
Final consumption in the Residential Sector	Mtep	0.21
Final consumption in the Commercial and Service Sector	Mtep	0.16
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	0.79
Oil Reserves	Mbbl	n.a.
Natural gas Reserves	Gm^3	n.a.
Coal Reserves	Mt	n.a.

[1] Source: ECLAC.
[2] Source: World Bank.
Note: Data for 2020 are preliminary and subject to country revision.

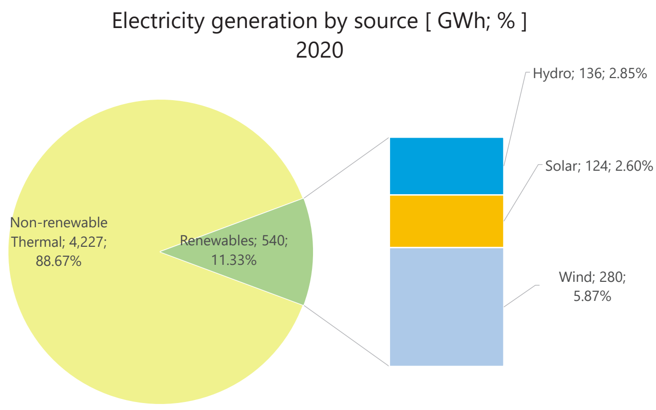
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
929	0.90	97.50	3.64	0.22	0.21	0.16	0.79	35	1.16	0.14 / 0.10
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

Summarized energy balance 2020

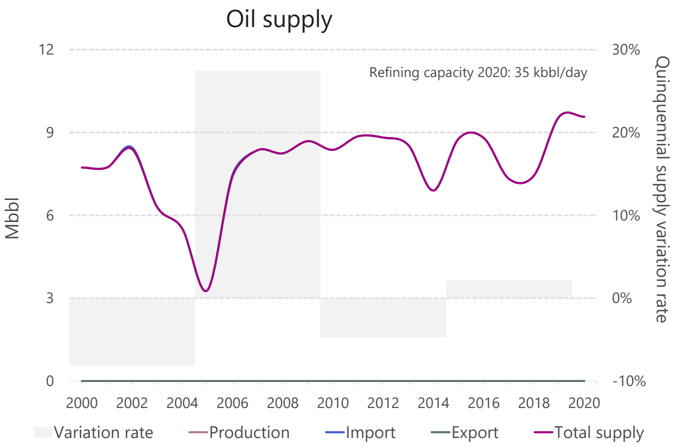




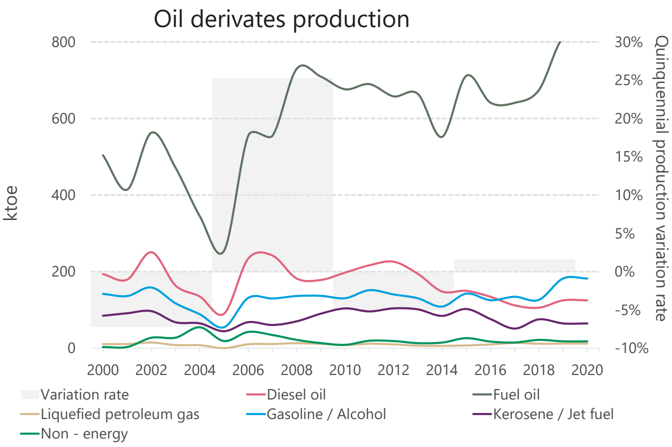
Installed power generation capacity [MW; %]
2020
Hydro; 29; 2.52%
Solar; 57; 4.93%
Wind; 102; 8.82%
Non-renewable Thermal; 968; 83.73%
Renewables; 188; 16.27%



Electricity generation by source [GWh; %]
2020
Hydro; 136; 2.85%
Solar; 124; 2.60%
Wind; 280; 5.87%
Non-renewable Thermal; 4,227; 88.67%
Renewables; 540; 11.33%

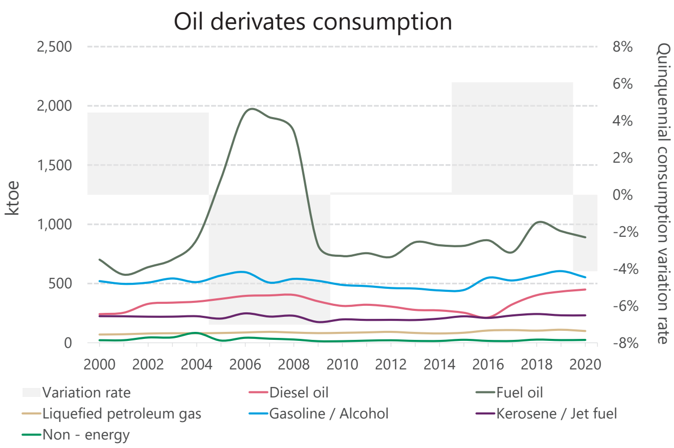


Oil supply
Refining capacity 2020: 35 kbbl/day
Mbbl
Quinquennial supply variation rate
Variation rate
Production
Import
Export
Total supply

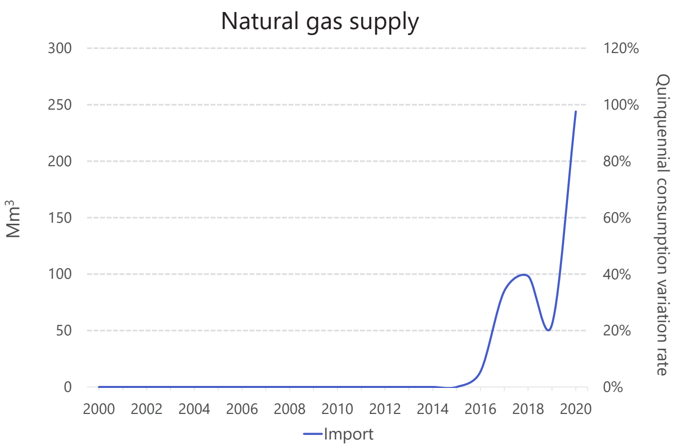


Oil derivates production
ktoe
Quinquennial production variation rate
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Non - energy

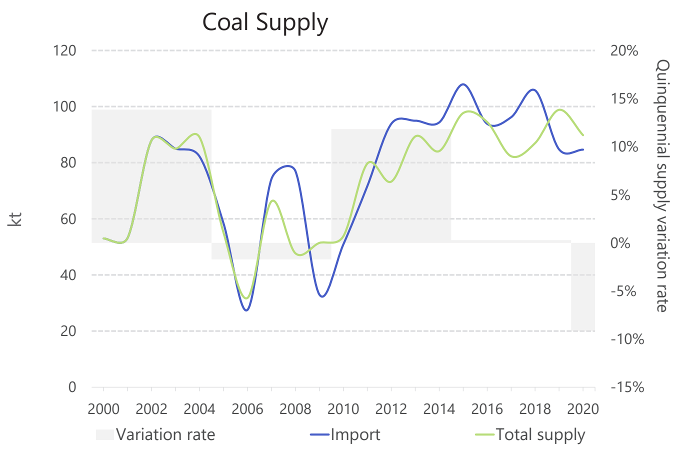
JAMAICA

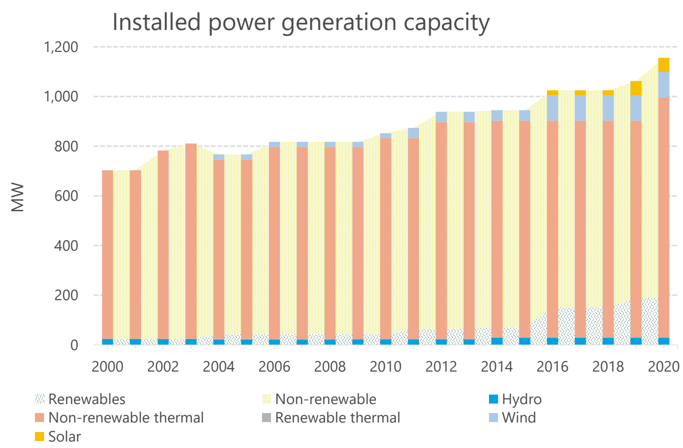


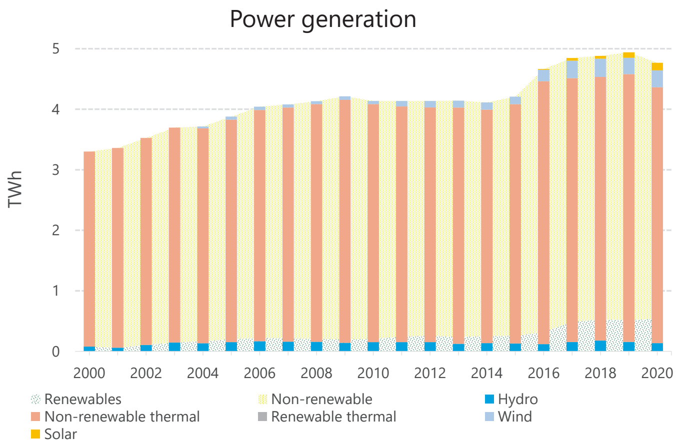
Oil derivates consumption
ktoe
Quinquennial consumption variation rate
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Non - energy

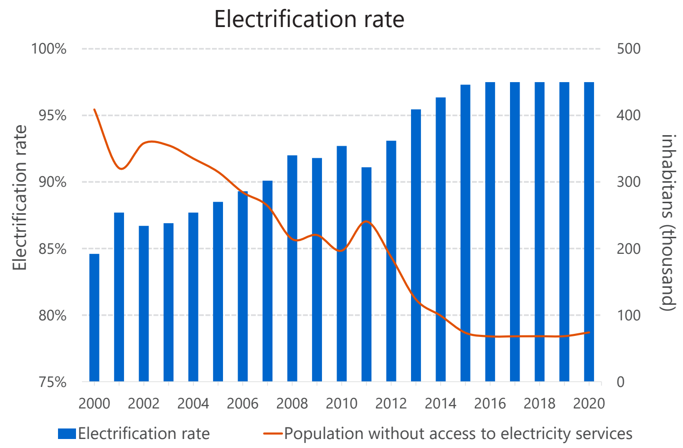


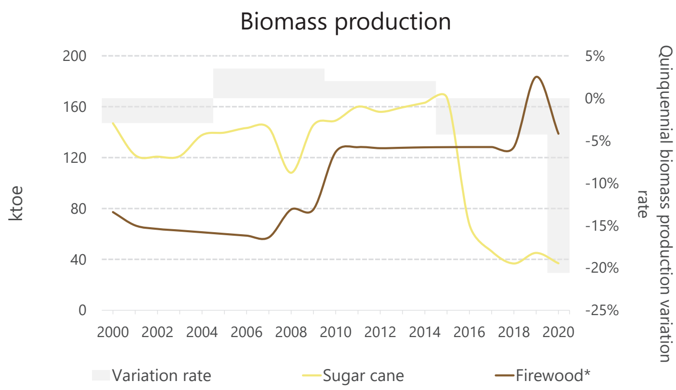
Natural gas supply
Mm^3
Quinquennial consumption variation rate
Import



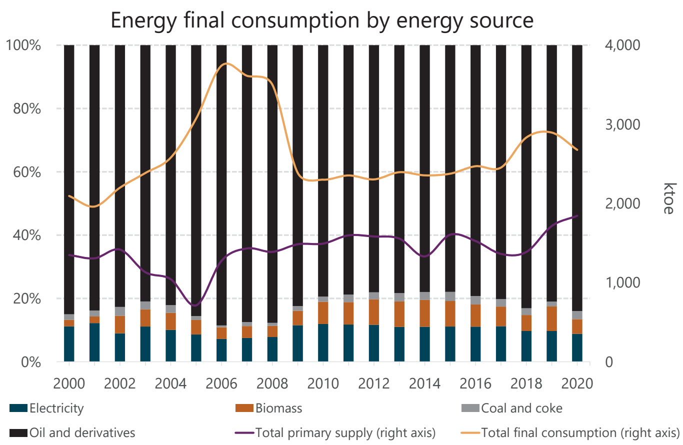


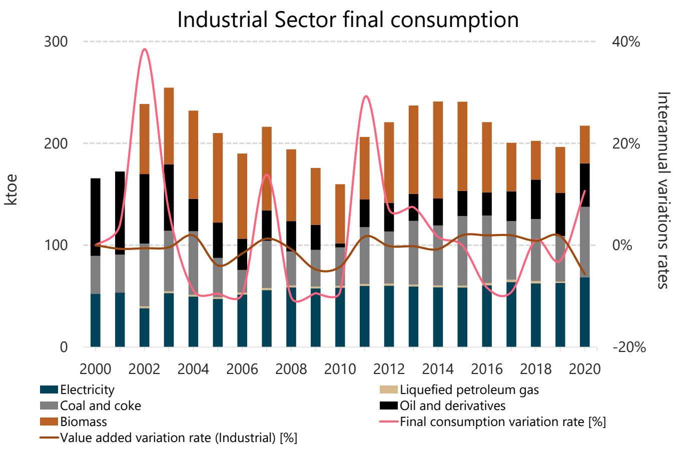


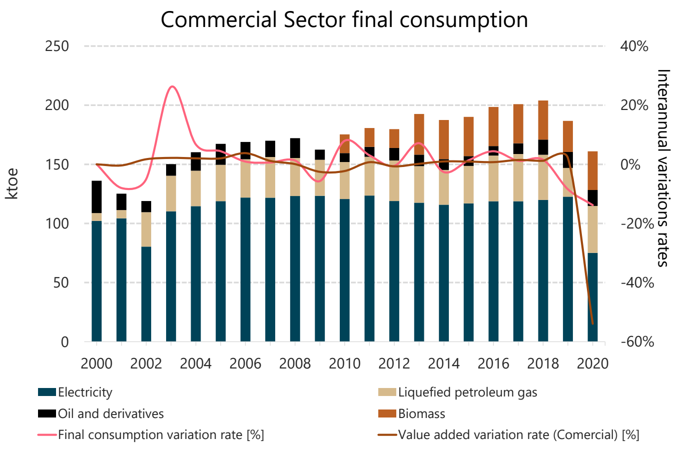


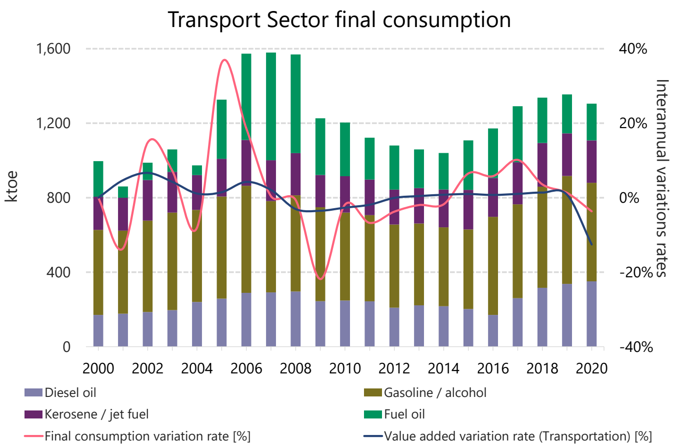


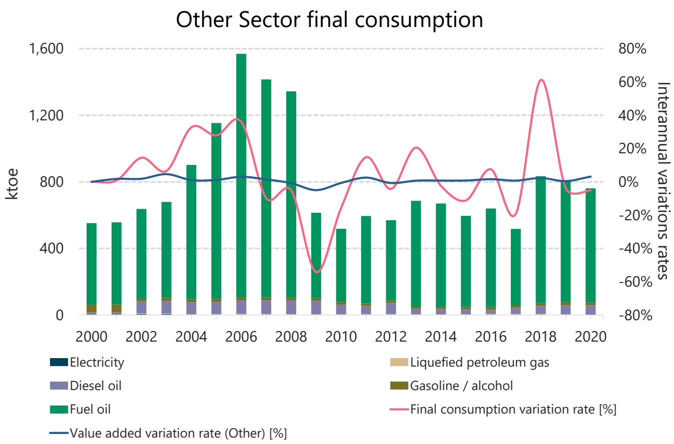
(*): The increase in the firewood production in 2019 is due to the Petroleum Corporation of Jamaica conducting an assessment and survey that concluded in 2014. This study identified the increased use of firewood and charcoal. The information was incorporated into the 2019 National Energy Balance.

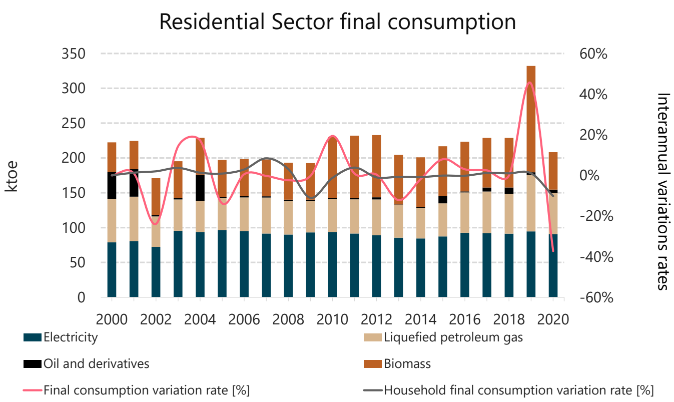




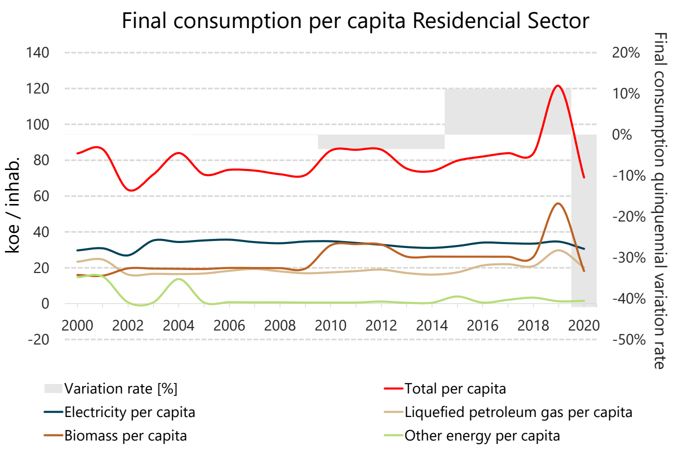




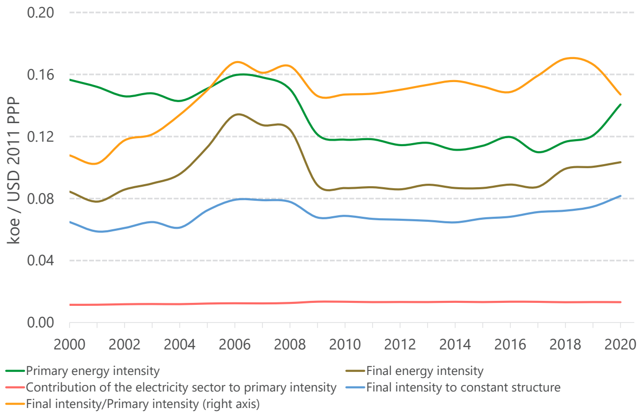




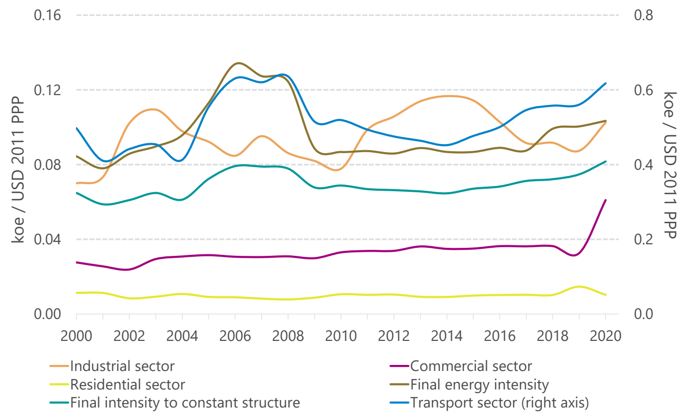
(*): The increase in residential consumption in 2019 is due to the Petroleum Corporation of Jamaica conducting an assessment and survey that concluded in 2014. This study identified the increased use of firewood and charcoal. The information was incorporated into the 2019



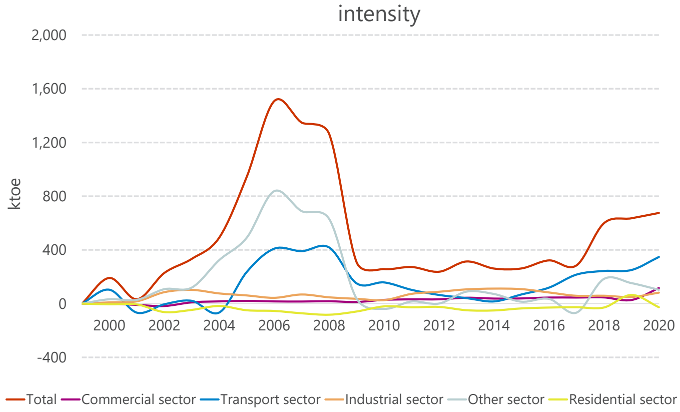
Energy intensities



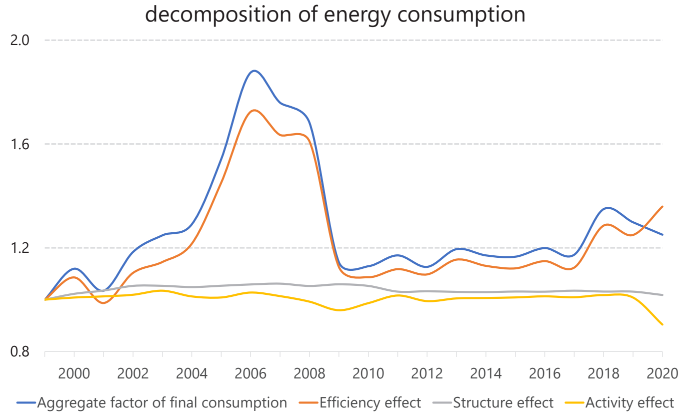
Sectoral energy intensities



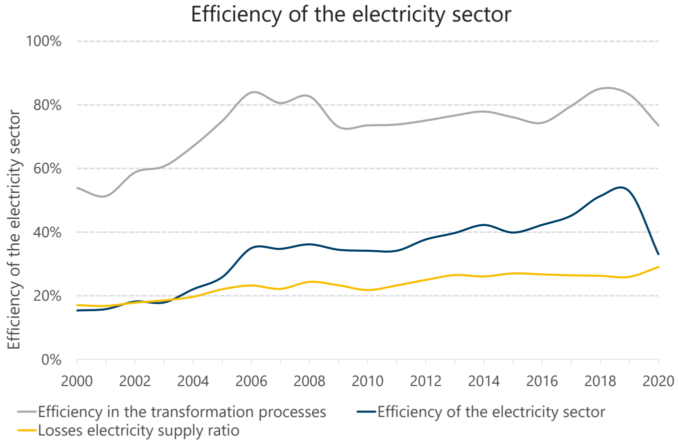
Avoided energy demand due to variations in energy intensity



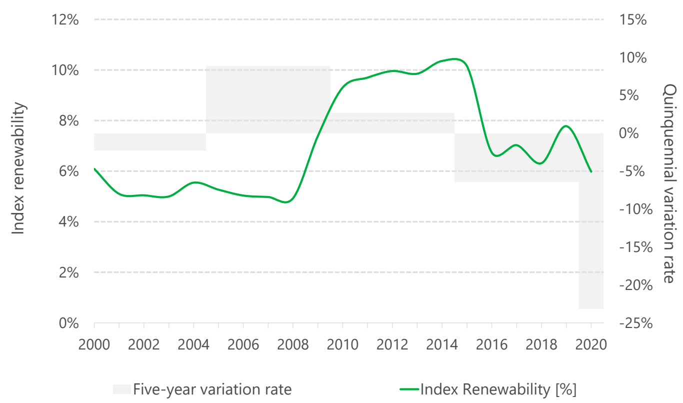
Logarithmic mean Divisia index for the structural decomposition of energy consumption



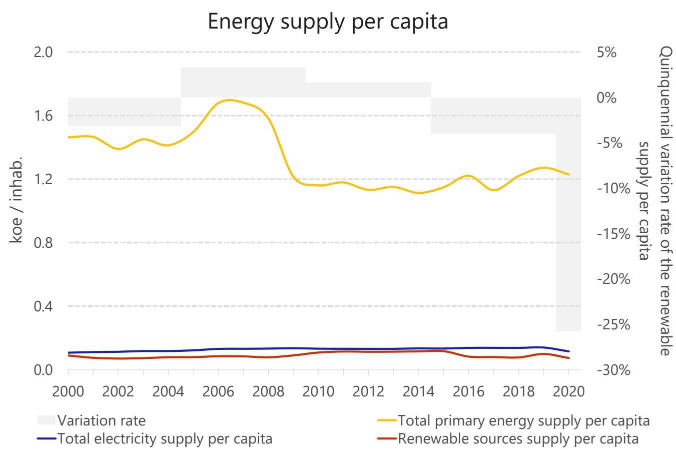
Efficiency of the electricity sector



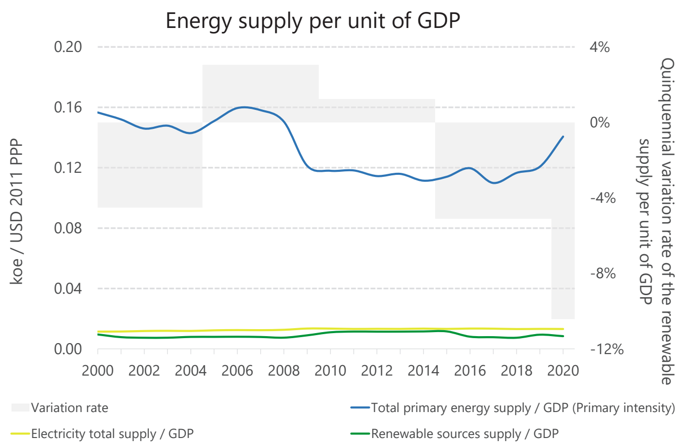
Index renewability



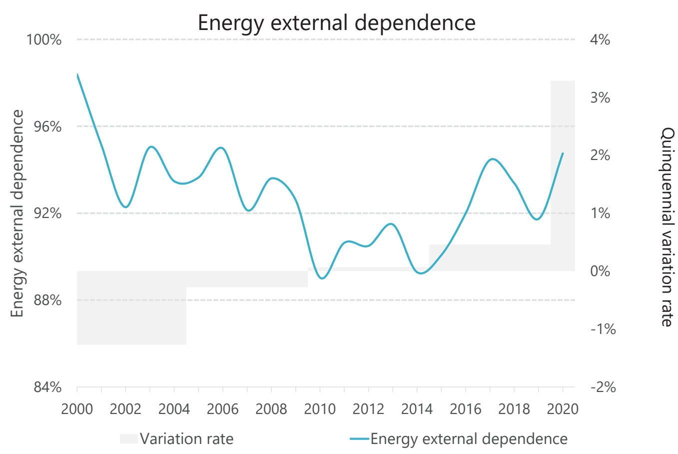
JAMAICA



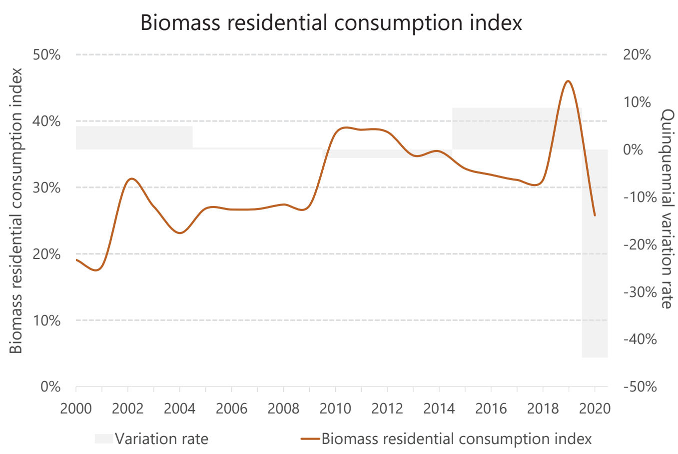
Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita



Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP

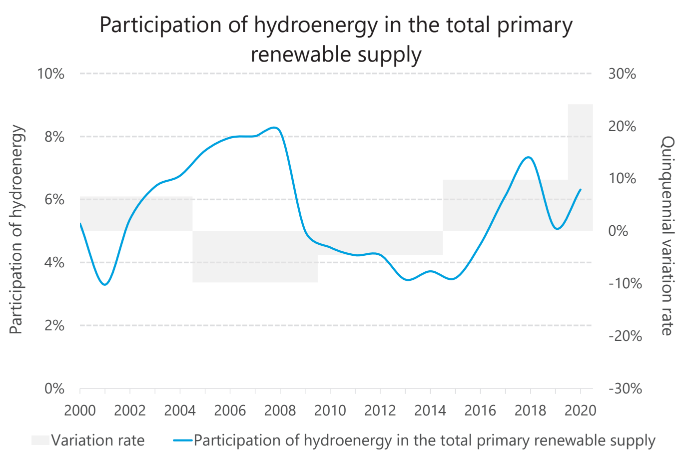


Energy external dependence
Energy external dependence
Quinquennial variation rate
Variation rate
Energy external dependence

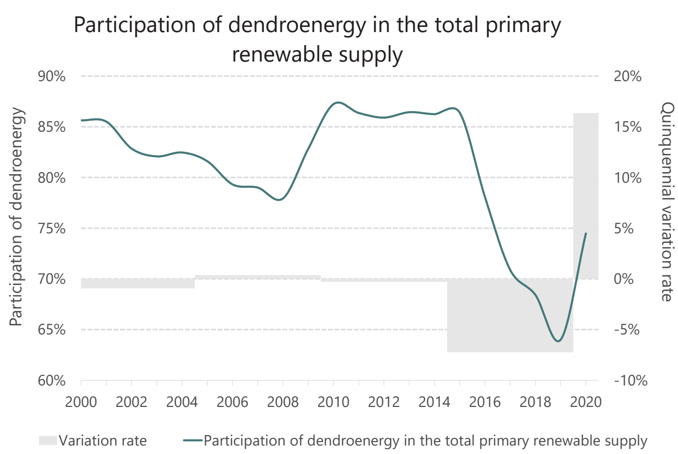


Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
Variation rate
Biomass residential consumption index

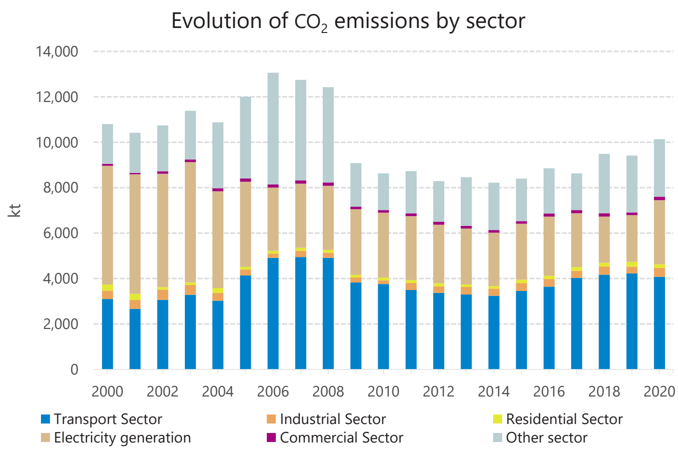
JAMAICA



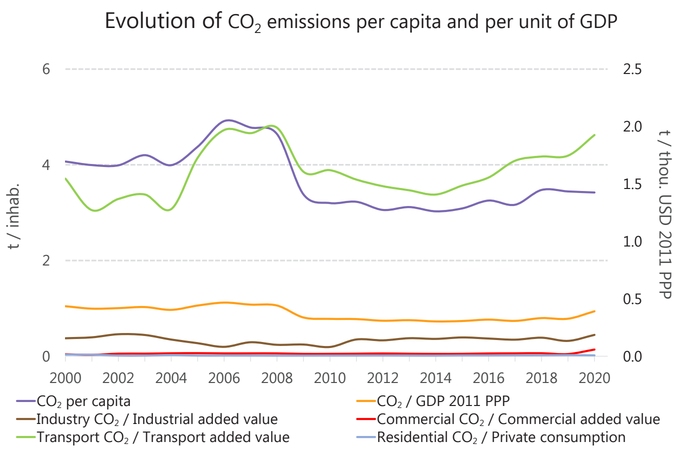
Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
Variation rate
Participation of hydroenergy in the total primary renewable supply



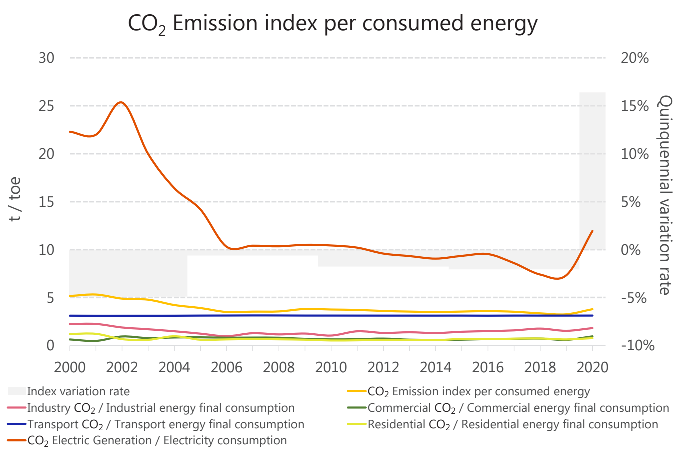
Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
Variation rate
Participation of dendroenergy in the total primary renewable supply



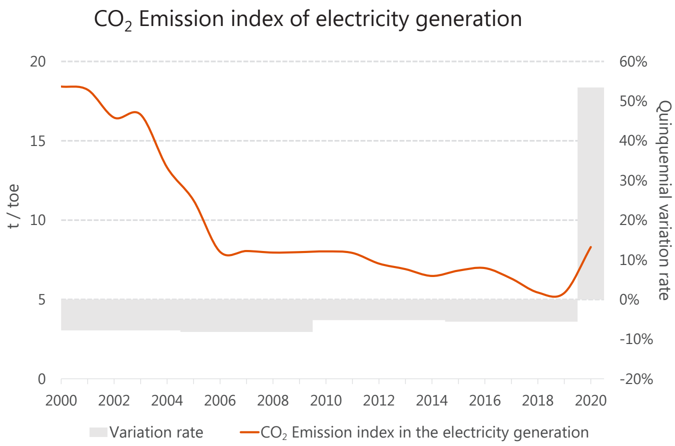
Evolution of CO_2 emissions by sector
kt
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector



Evolution of CO_2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
CO_2 per capita
CO_2 / GDP 2011 PPP
Industry CO_2 / Industrial added value
Commercial CO_2 / Commercial added value
Transport CO_2 / Transport added value
Residential CO_2 / Private consumption



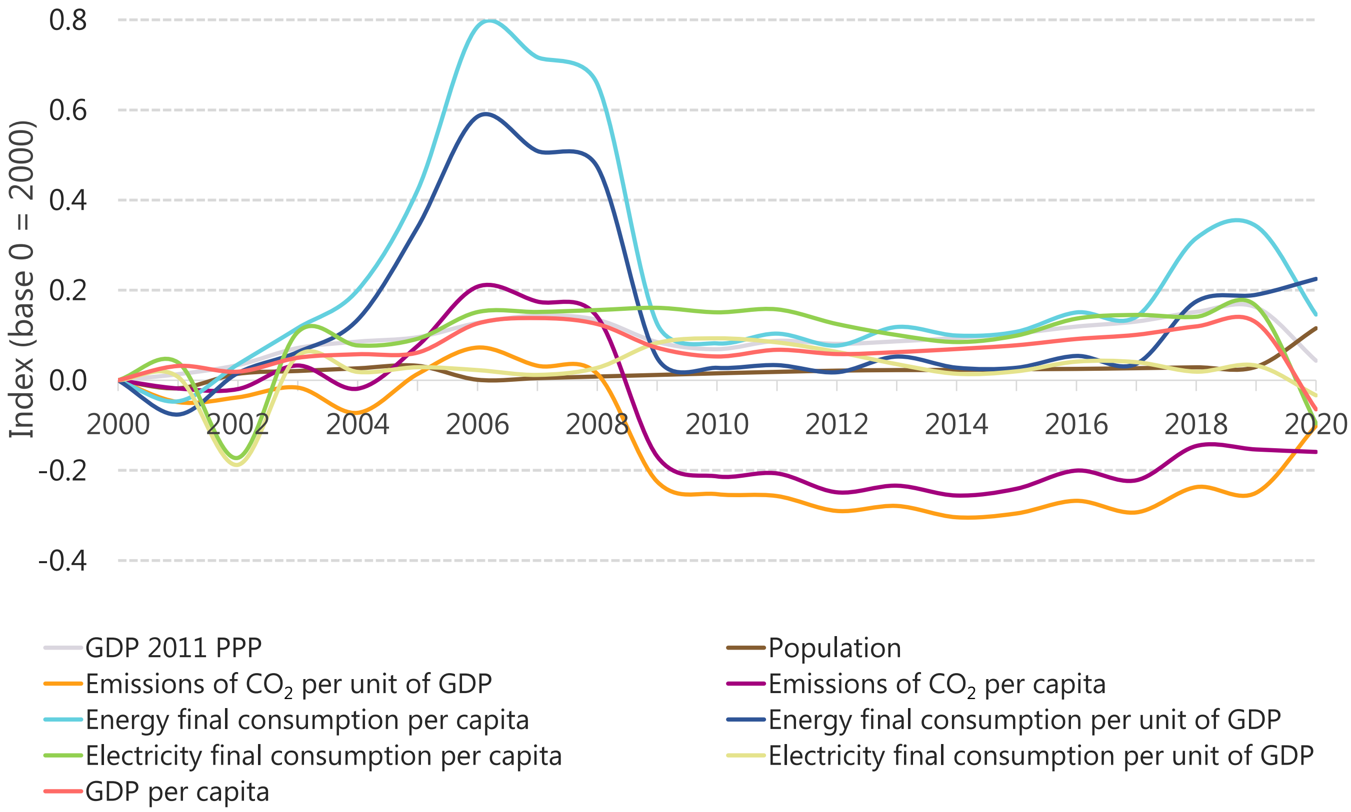
CO_2 Emission index per consumed energy
t / toe
Quinquennial variation rate
Index variation rate
CO_2 Emission index per consumed energy
Industry CO_2 / Industrial energy final consumption
Commercial CO_2 / Commercial energy final consumption
Transport CO_2 / Transport energy final consumption
Residential CO_2 / Residential energy final consumption
CO_2 Electric Generation / Electricity consumption



CO_2 Emission index of electricity generation
t / toe
Quinquennial variation rate
Variation rate
CO_2 Emission index in the electricity generation

JAMAICA

Summary of the main energy indicators



JAMAICA

MEXICO

General Information 2020

Population (thousand inhab.)	128,933 [1]
Area (km^2)	1,964,375
Population Density (inhab. / km^2)	66
Urban Population (%)	81
GDP USD 2010 (MUSD)	1,199,576
GDP USD 2011 PPP (MUSD)	2,306,317
GDP per capita (thou. USD 2011 PPP / inhab.)	18

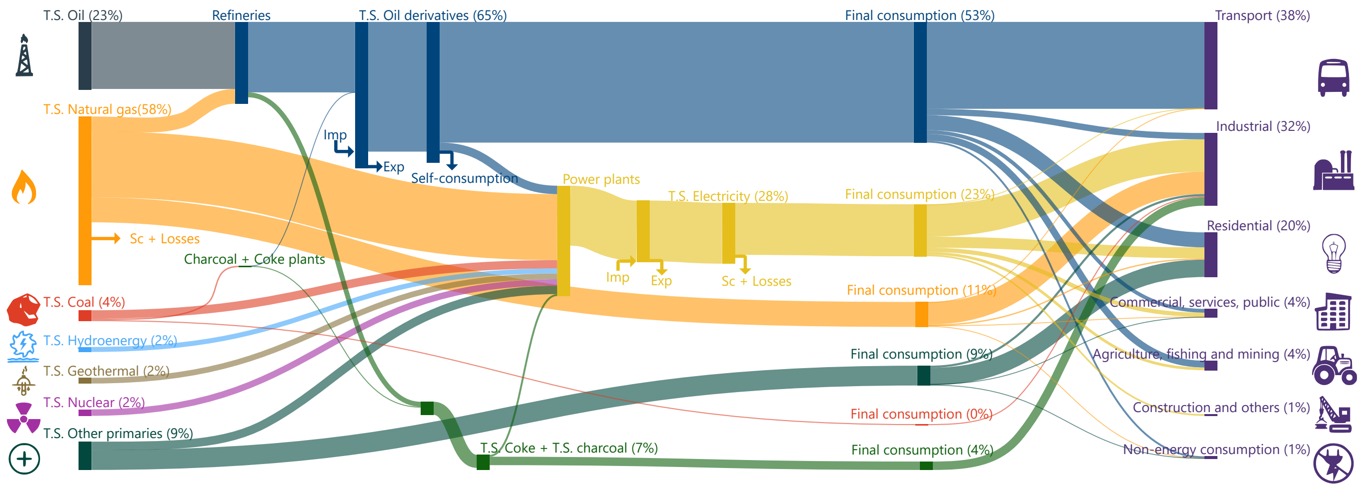
Energy Sector 2020 *

Final consumption in the Transport Sector	Mtep	40.72
Final consumption in the Industrial Sector	Mtep	33.96
Final consumption in the Residential Sector	Mtep	20.84
Final consumption in the Commercial and Service Sector	Mtep	4.08
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	6.41
Oil Reserves	Mbbl	6,347 [3]
Natural gas Reserves	Gm^3	263 [3]
Coal Reserves	Mt	1,211 [4]

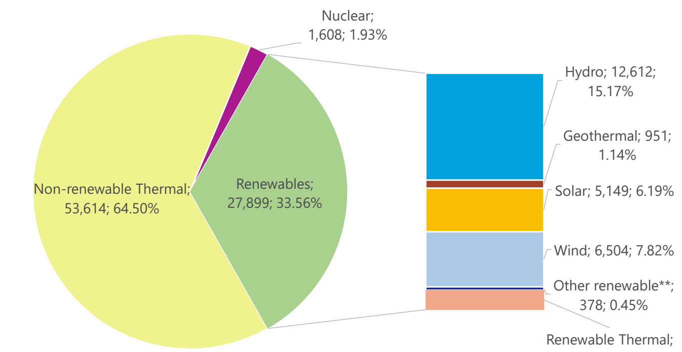
[1] ECLAC.
[2] PRODESEN 2021 - 2035 Report.
[3] Pemex institutional database and National Hydrocarbons Commission.
[4] BP Statistical Review of World Energy.
[5] PEMEX, 2020 Figures.
[6] SENER, PRODESEN 2021 - 2035 Report.
Note (*): The supply and demand data correspond to the publication of the 2020 Energy Balance, SENER.

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
2,190	0.82	99.08 [2]	174.19	168.68	85.29	68.30	106.01	1,640 [5]	83.12 [6]	0.08 / 0.05
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

Summarized energy balance 2020

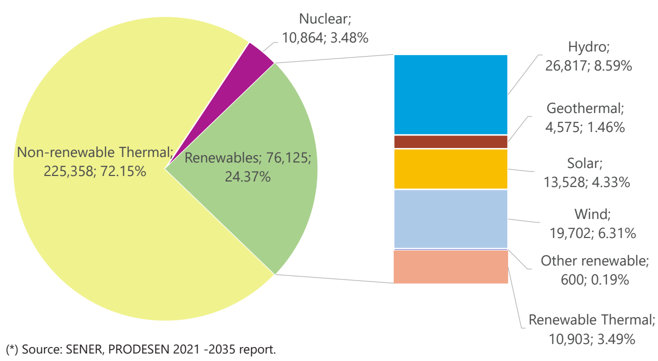


Installed power generation capacity [MW; %] 2020*



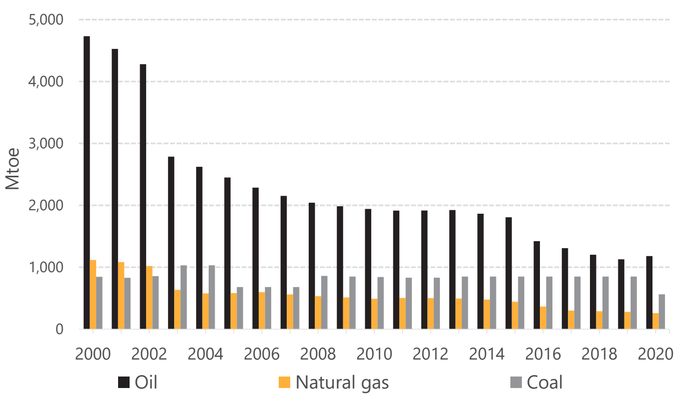
(*) Source: SENER, PRODESEN 2021 -2035 report.
(**) Corresponds to biogas.

Electricity generation by source [GWh; %] 2020*

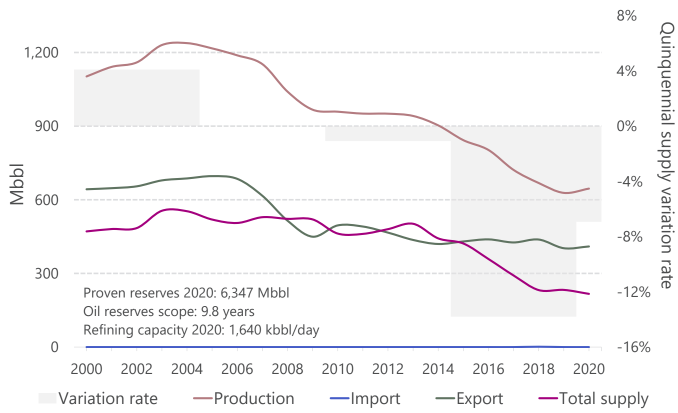


(*) Source: SENER, PRODESEN 2021 -2035 report.

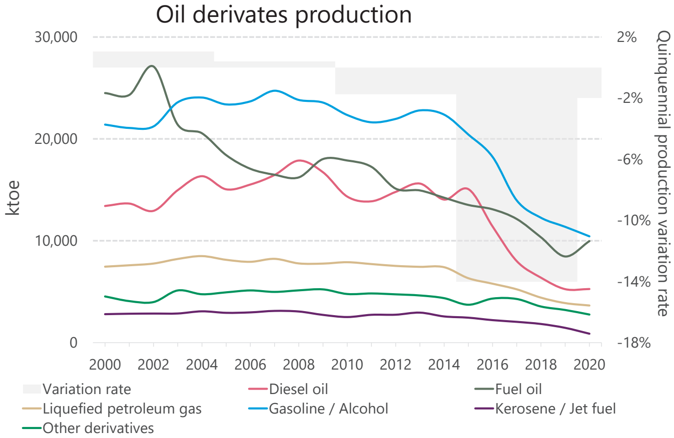
Proven reserves of oil, natural gas and coal



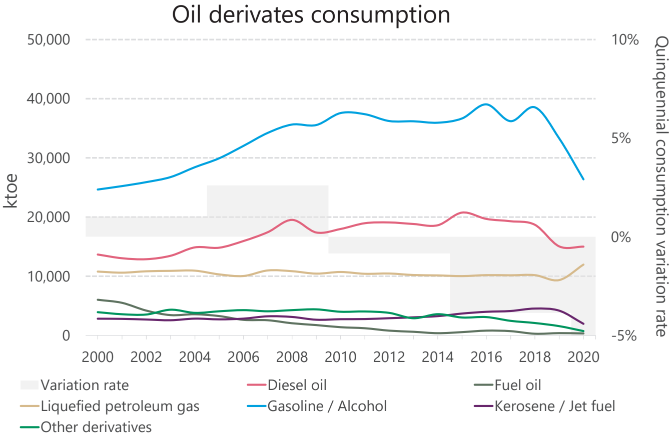
Oil supply



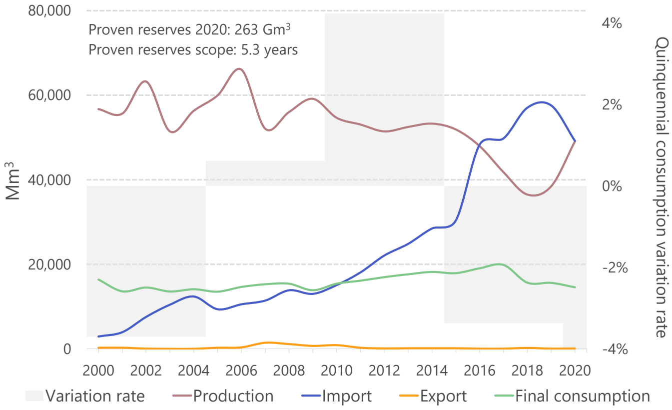
Oil derivates production



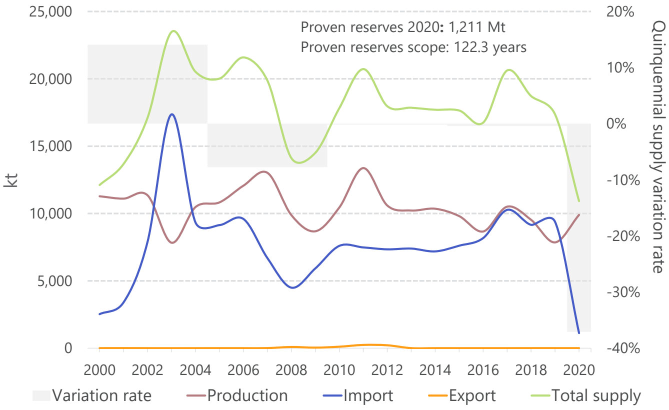
Oil derivates consumption



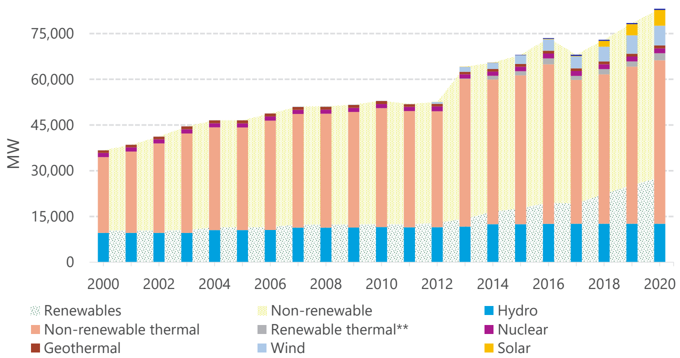
Natural gas supply



Coal Supply

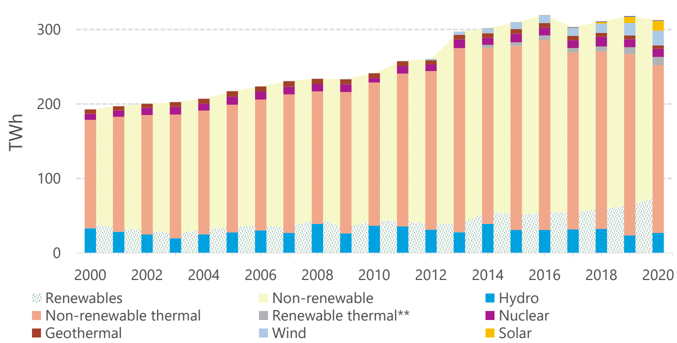


Installed power generation capacity*



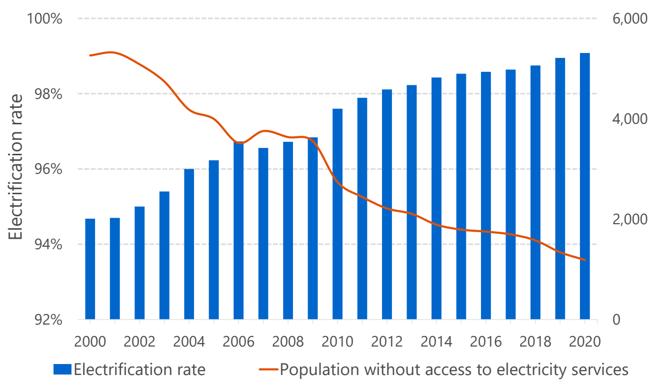
(**): Includes efficient cogeneration, regenerative brakes and bioenergy. (*) 2020: SENER, PRODESEN 2021 - 2035 report.
Note: As of 2013, the data includes renewable thermal and biogas.

Power generation*



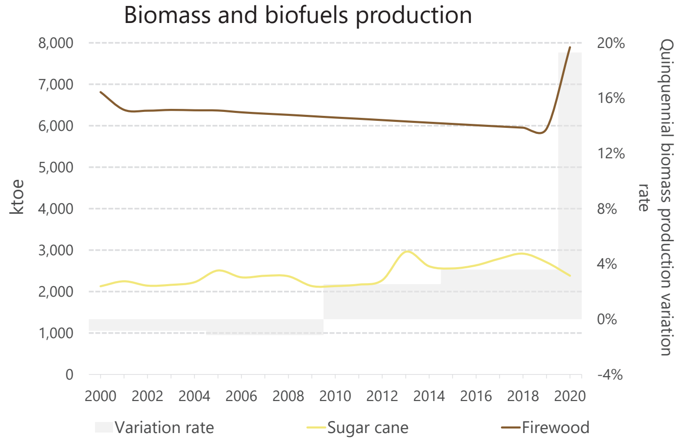
(**): Includes efficient cogeneration, regenerative brakes and bioenergy. (*) 2020: SENER, PRODESEN 2021 - 2035 report.
Note: As of 2013, the data includes renewable thermal and biogas.

Electrification rate

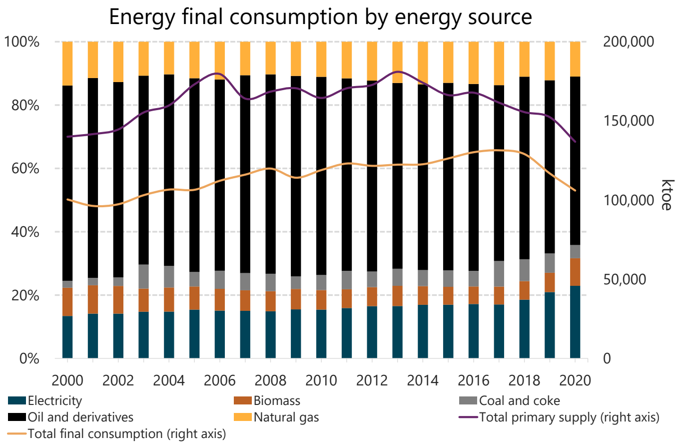


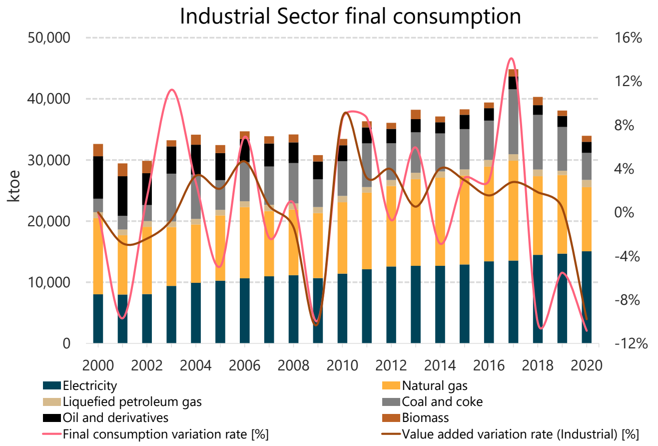
(*) 2020: SENER, PRODESEN 2021 - 2035 report.

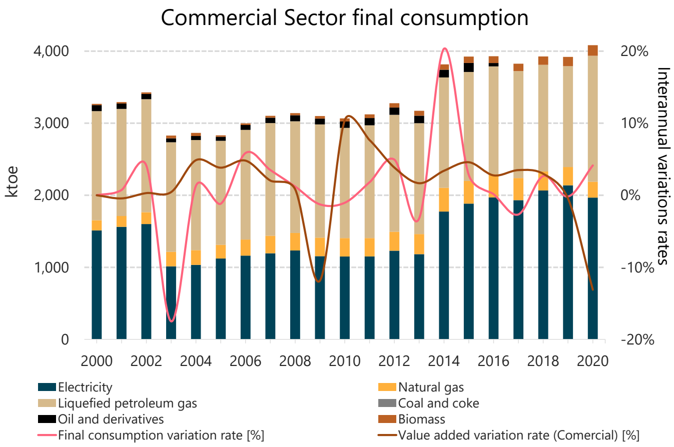
Biomass and biofuels production

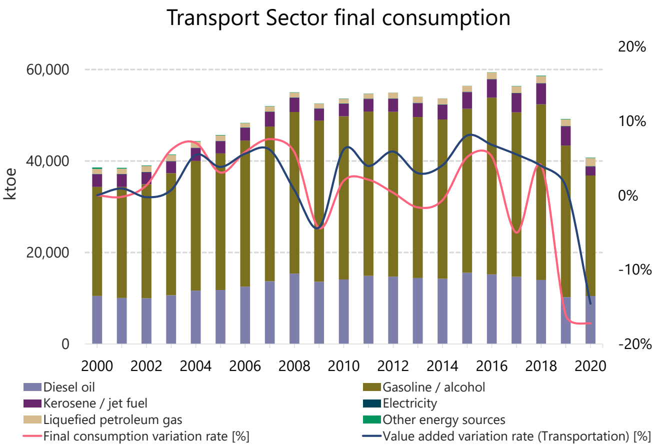


MEXICO

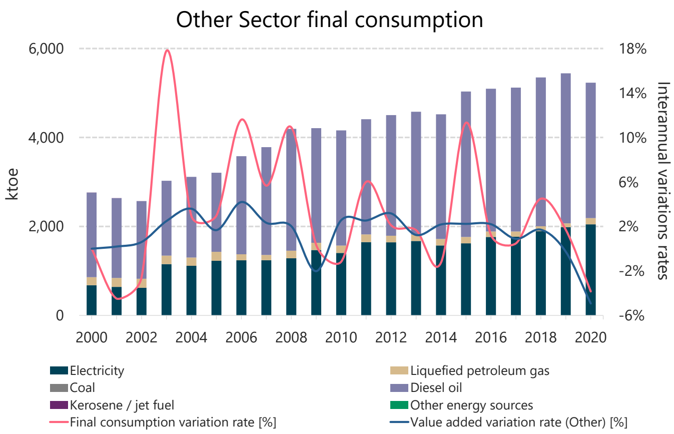

Energy final consumption by energy source
100%
80%
60%
40%
20%
0%
200,000
150,000
100,000
50,000
0
ktoe
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Oil and derivatives
Total final consumption (right axis)
Biomass
Natural gas
Coal and coke
Total primary supply (right axis)

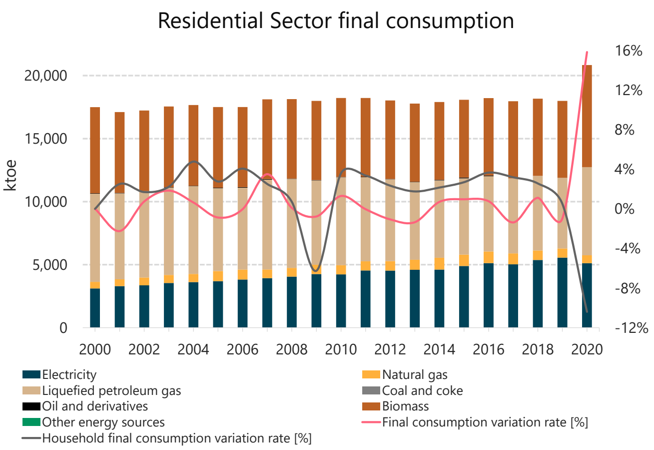

Industrial Sector final consumption
50,000
40,000
30,000
20,000
10,000
0
ktoe
16%
12%
8%
4%
0%
-4%
-8%
-12%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Final consumption variation rate [%]
Natural gas
Coal and coke
Biomass
Value added variation rate (Industrial) [%]


Commercial Sector final consumption
4,000
3,000
2,000
1,000
0
ktoe
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Final consumption variation rate [%]
Natural gas
Coal and coke
Biomass
Value added variation rate (Comercial) [%]

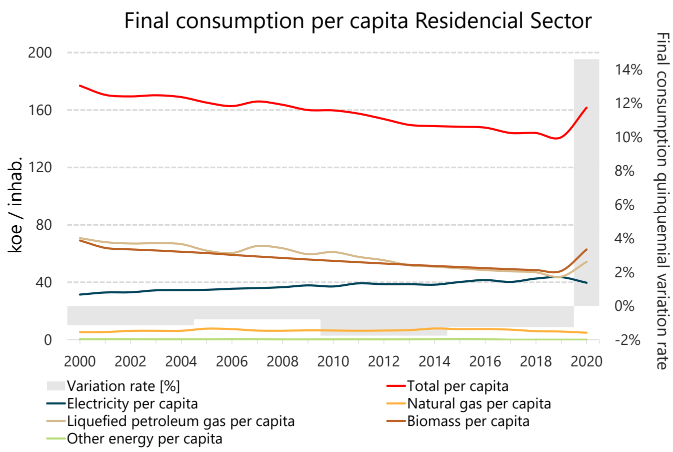

Transport Sector final consumption
60,000
40,000
20,000
0
ktoe
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Diesel oil
Kerosene / jet fuel
Liquefied petroleum gas
Final consumption variation rate [%]
Gasoline / alcohol
Electricity
Other energy sources
Value added variation rate (Transportation) [%]

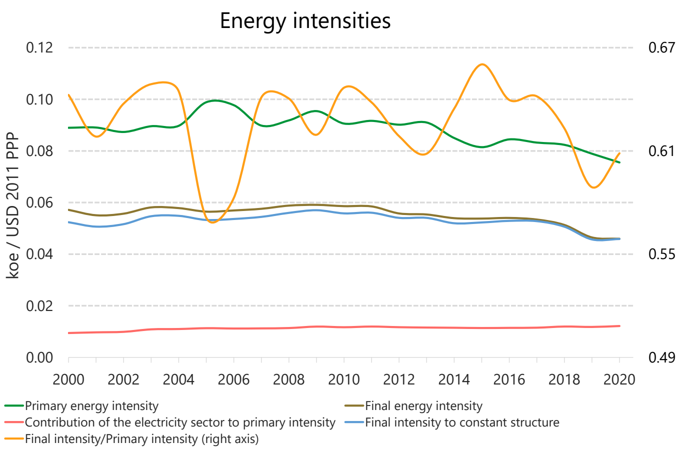
MEXICO

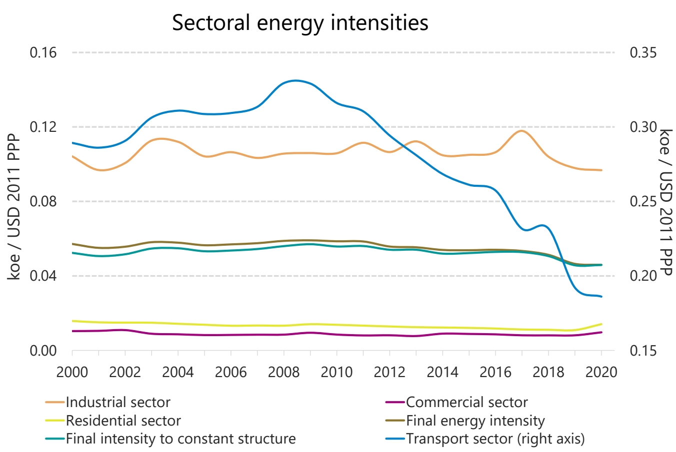

Other Sector final consumption
6,000
4,000
2,000
0
ktoe
18%
14%
10%
6%
2%
-2%
-6%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Coal
Kerosene / jet fuel
Final consumption variation rate [%]
Liquefied petroleum gas
Diesel oil
Other energy sources
Value added variation rate (Other) [%]

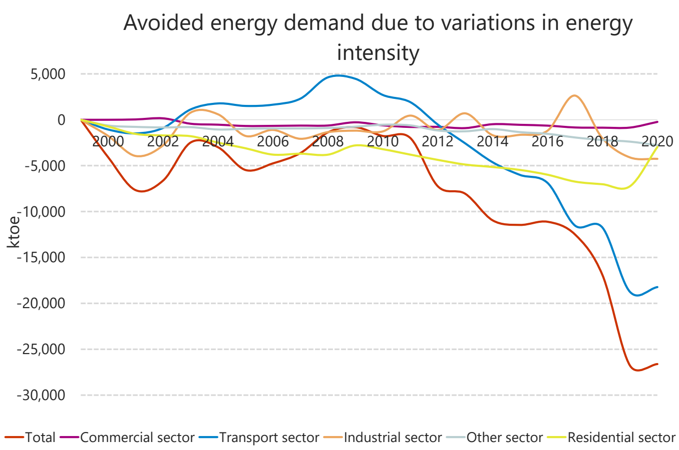

Residential Sector final consumption
20,000
15,000
10,000
5,000
0
ktoe
16%
12%
8%
4%
0%
-4%
-8%
-12%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Other energy sources
Household final consumption variation rate [%]
Natural gas
Coal and coke
Biomass
Final consumption variation rate [%]

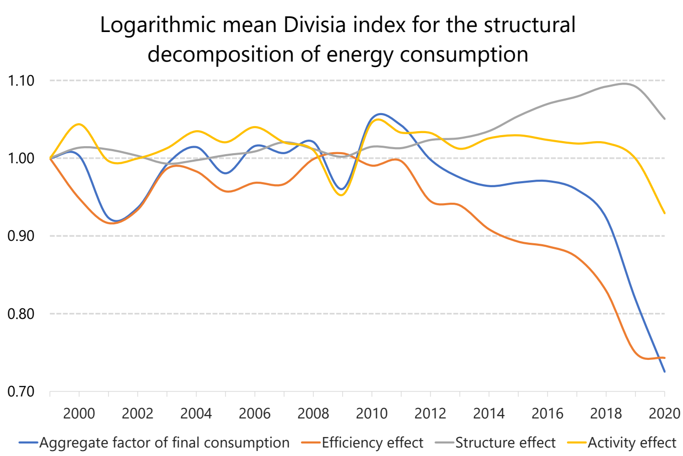
MEXICO

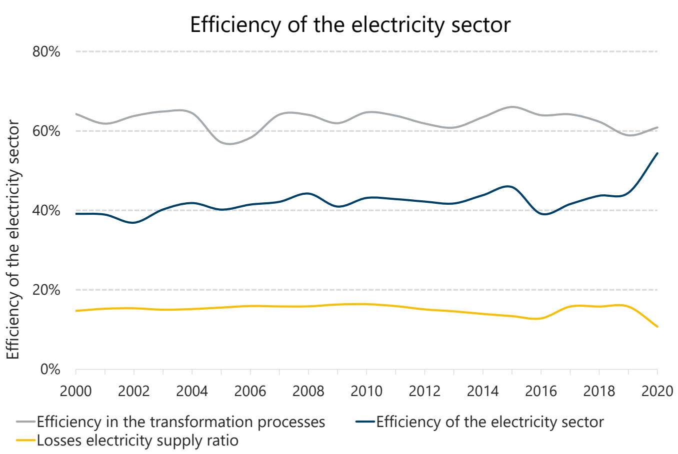

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
200
160
120
80
40
0
14%
12%
10%
8%
6%
4%
2%
0%
-2%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate [%]
Total per capita
Electricity per capita
Natural gas per capita
Liquefied petroleum gas per capita
Biomass per capita
Other energy per capita

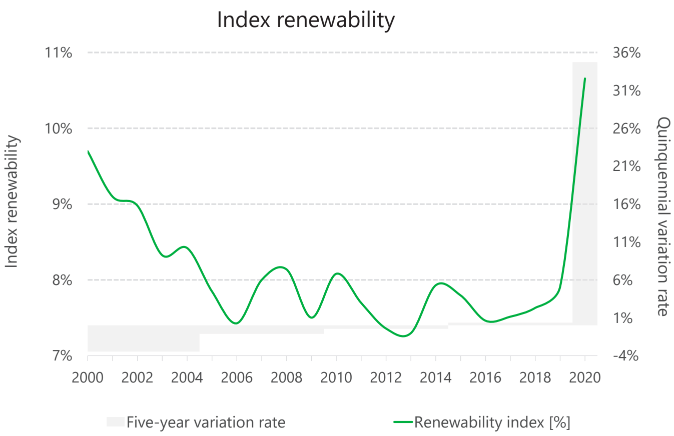

Energy intensities
koe / USD 2011 PPP
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.67
0.61
0.55
0.49
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)


Sectoral energy intensities
koe / USD 2011 PPP
koe / USD 2011 PPP
0.16
0.12
0.08
0.04
0.00
0.35
0.30
0.25
0.20
0.15
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)

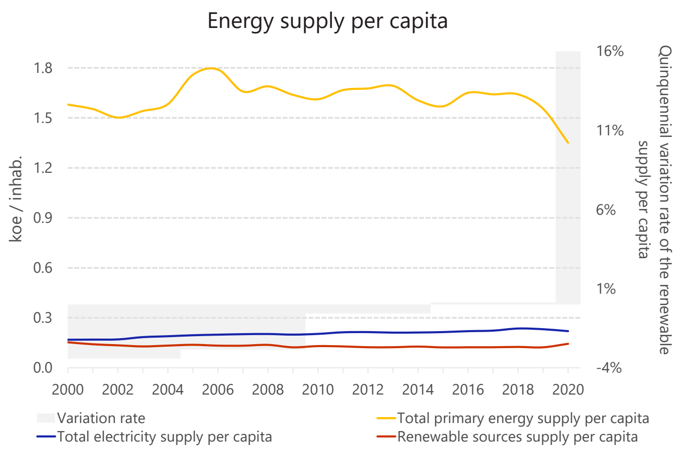

Avoided energy demand due to variations in energy intensity
ktoe
5,000
0
-5,000
-10,000
-15,000
-20,000
-25,000
-30,000
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector


Logarithmic mean Divisia index for the structural decomposition of energy consumption
1.10
1.00
0.90
0.80
0.70
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect

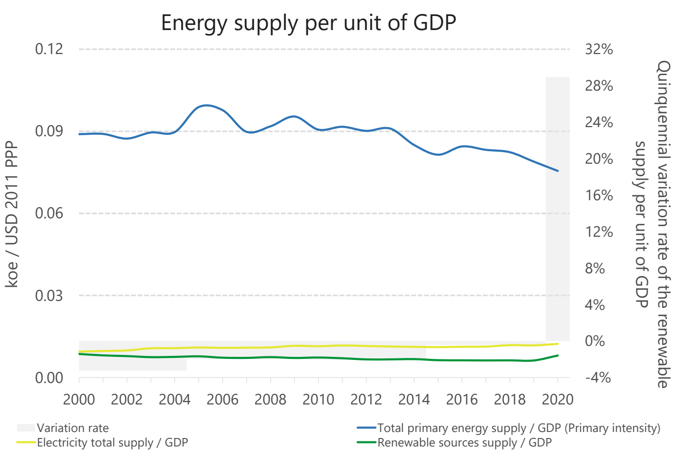

Efficiency of the electricity sector
Efficiency of the electricity sector
80%
60%
40%
20%
0%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio



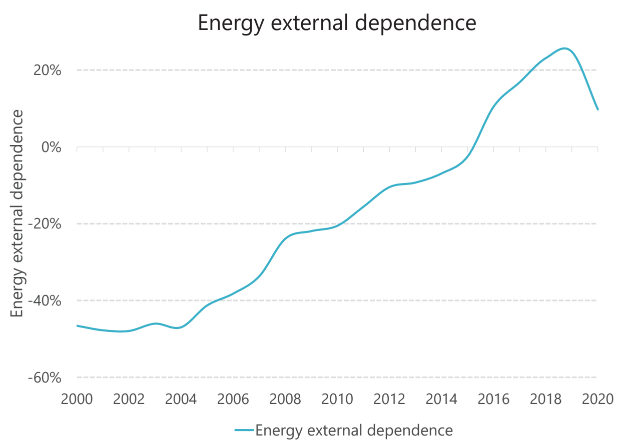
Index renewability
Index renewability
Quinquennial variation rate
Five-year variation rate
Renewability index [%]



Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
Variation rate
Total electricity supply per capita
Total primary energy supply per capita
Renewable sources supply per capita

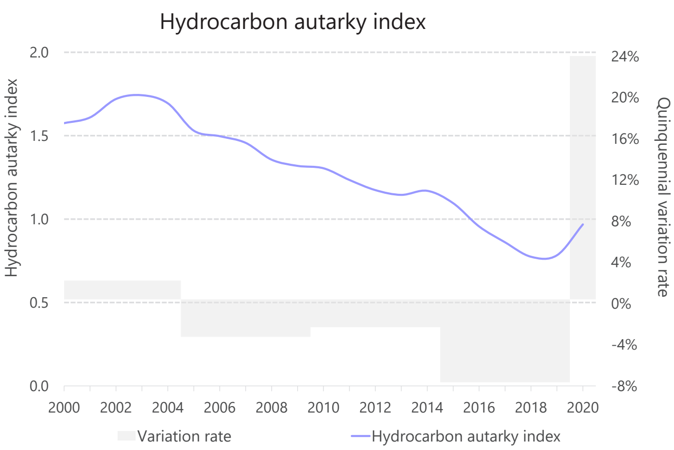


Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Electricity total supply / GDP
Total primary energy supply / GDP (Primary intensity)
Renewable sources supply / GDP

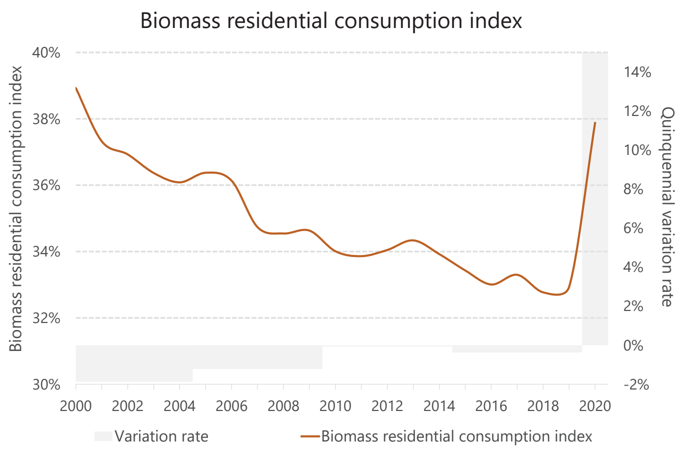


Energy external dependence
Energy external dependence
Energy external dependence

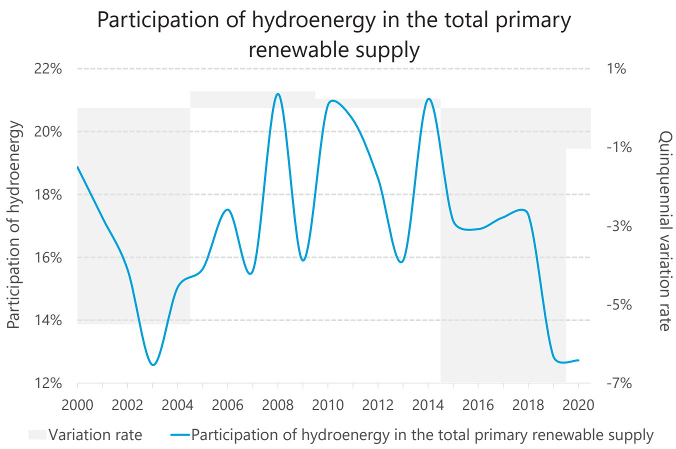
MEXICO



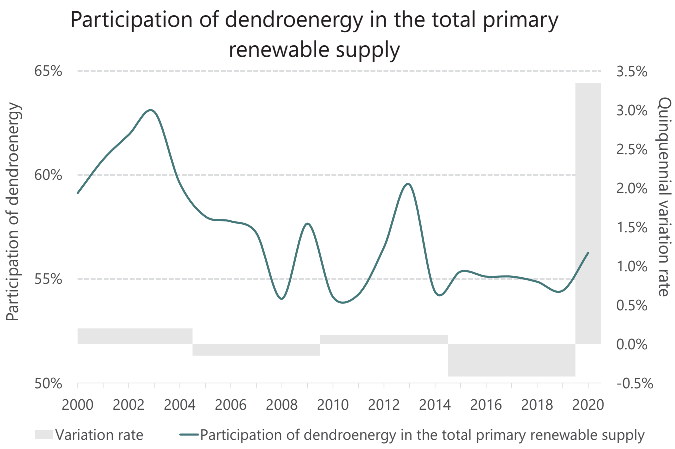
Hydrocarbon autarky index
Hydrocarbon autarky index
Quinquennial variation rate
Variation rate
Hydrocarbon autarky index



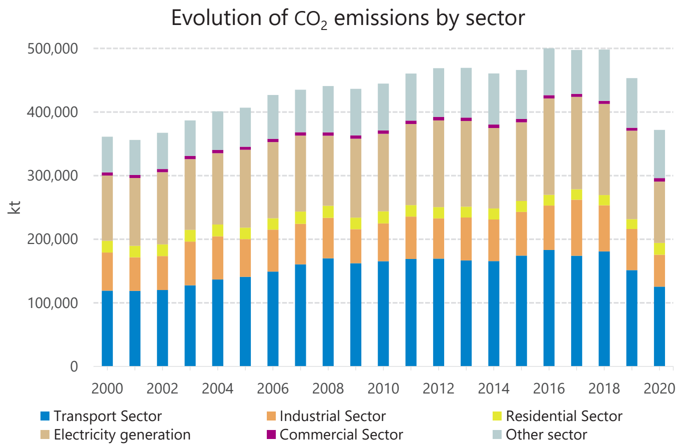
Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
Variation rate
Biomass residential consumption index



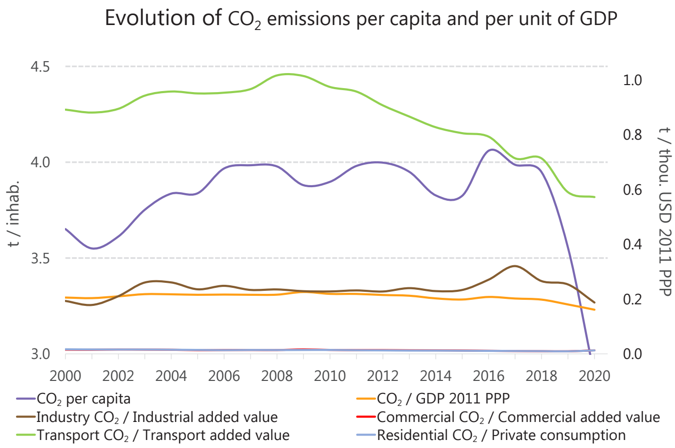
Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
Variation rate
Participation of hydroenergy in the total primary renewable supply



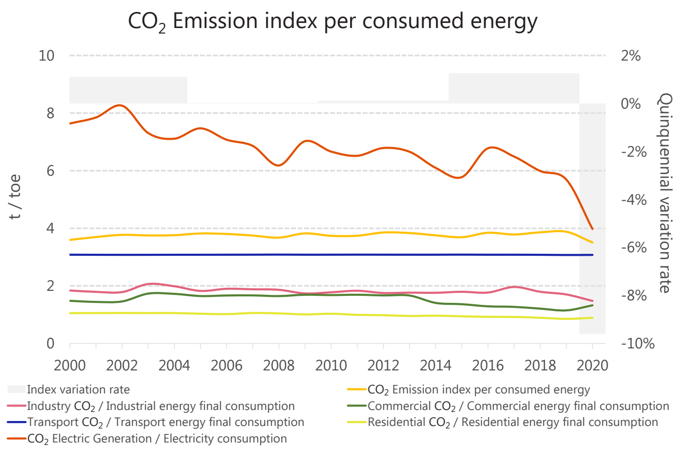
Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
Variation rate
Participation of dendroenergy in the total primary renewable supply



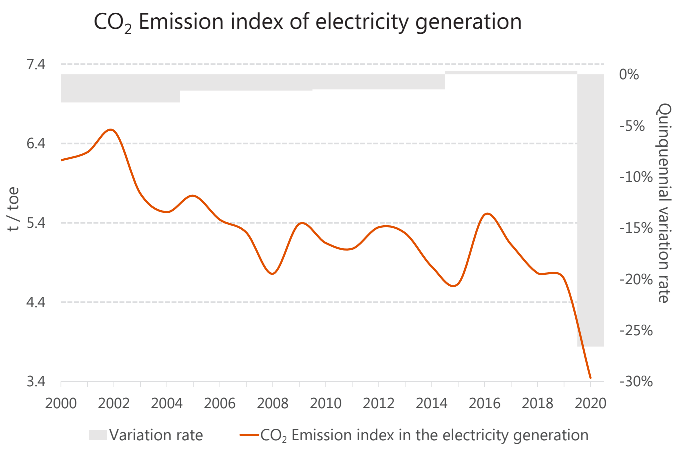
Evolution of CO_2 emissions by sector
kt
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector



Evolution of CO_2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
CO_2 per capita
CO_2 / GDP 2011 PPP
Industry CO_2 / Industrial added value
Commercial CO_2 / Commercial added value
Transport CO_2 / Transport added value
Residential CO_2 / Private consumption



CO_2 Emission index per consumed energy
t / toe
Quinquennial variation rate
Index variation rate
CO_2 Emission index per consumed energy
Industry CO_2 / Industrial energy final consumption
Commercial CO_2 / Commercial energy final consumption
Transport CO_2 / Transport energy final consumption
Residential CO_2 / Residential energy final consumption
CO_2 Electric Generation / Electricity consumption



CO_2 Emission index of electricity generation
t / toe
Quinquennial variation rate
Variation rate
CO_2 Emission index in the electricity generation

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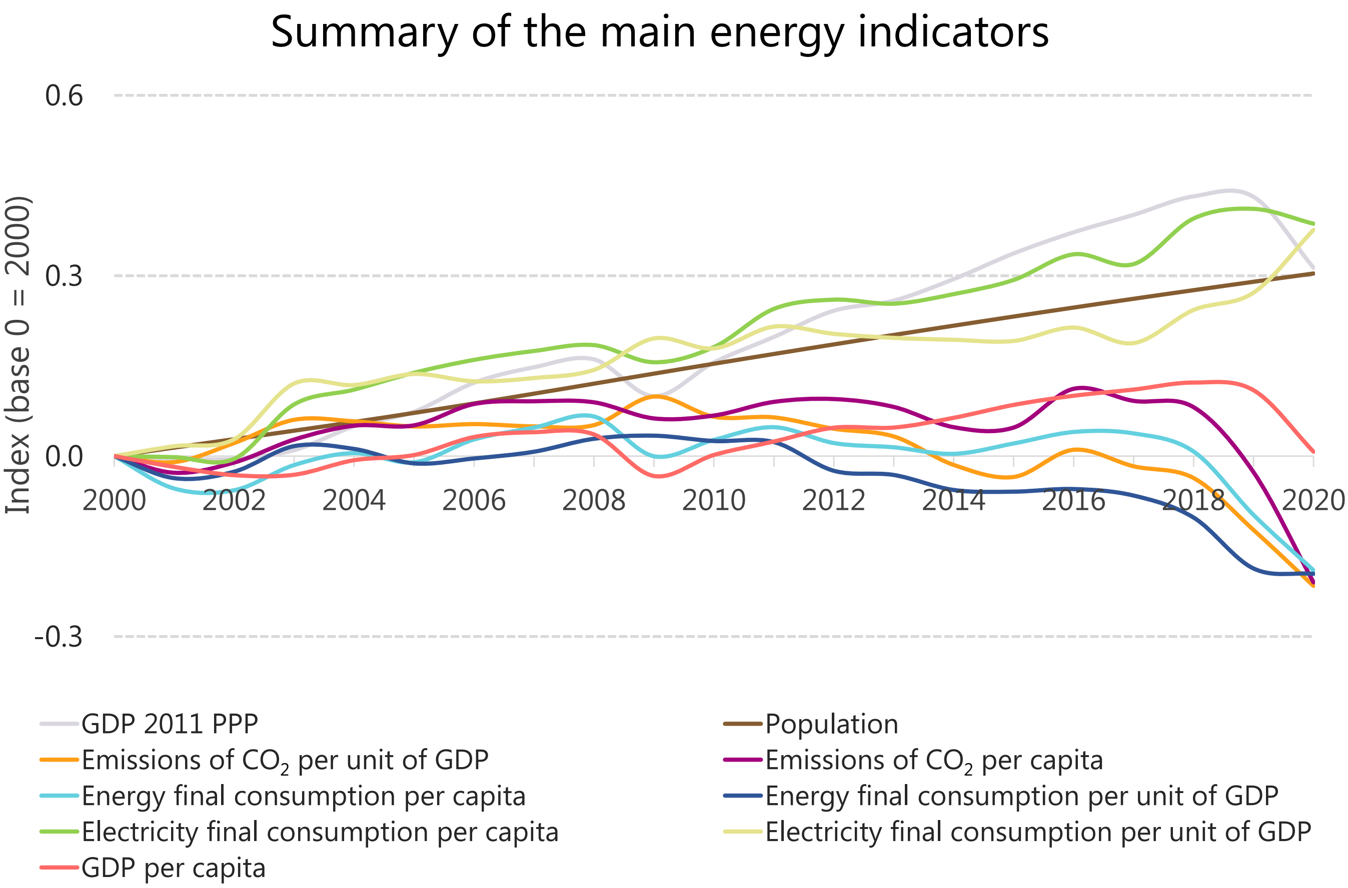
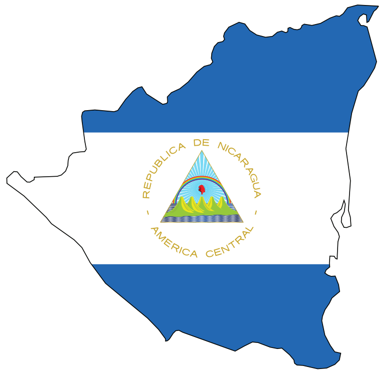

Summary of the main energy indicators
0.6
0.3
0.0
-0.3
Index (base 0 = 2000)
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

MEXICO

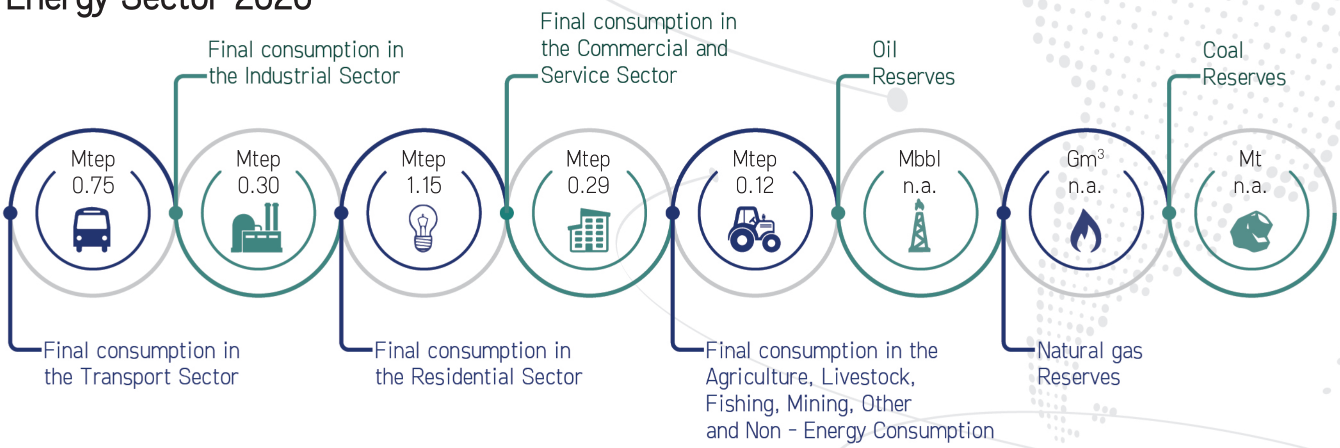
NICARAGUA



General Information 2020

Population (thousand inhab.)	6,625 [1]
Area (km²)	130,370
Population Density (inhab. / km²)	51
Urban Population (%)	59
GDP USD 2010 (MUSD)	11,406 [1]
GDP USD 2011 PPP (MUSD)	34,979 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	5

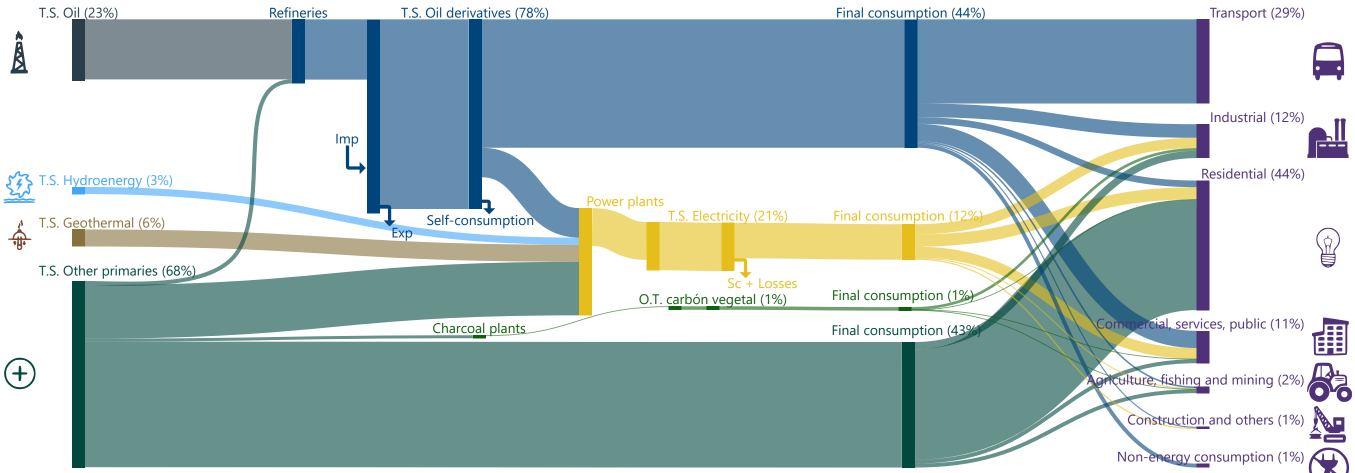
Energy Sector 2020



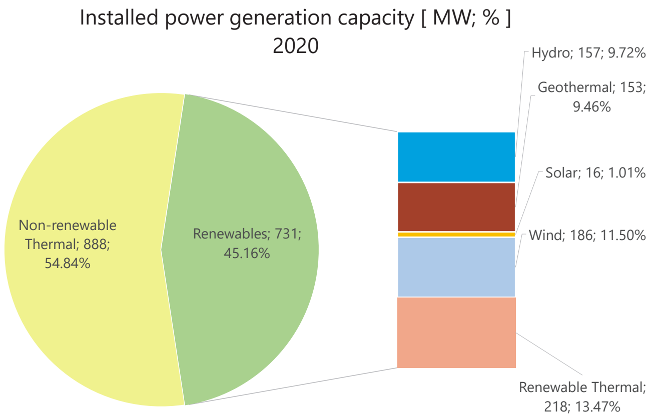
[1] Source: ECLAC.
[2] Source: World Bank.
Note: The supply and demand information for 2020 in this publication is preliminary and is subject to review by the country.

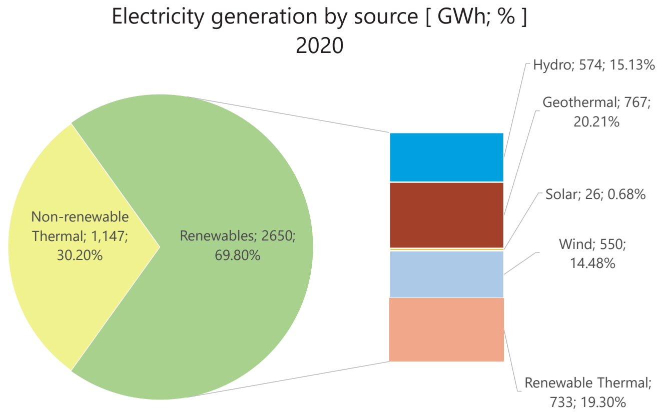
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
555	0.39	98.50	3.63	1.98	1.85	0.04	2.60	n.a.	1.62	0.10 / 0.07
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

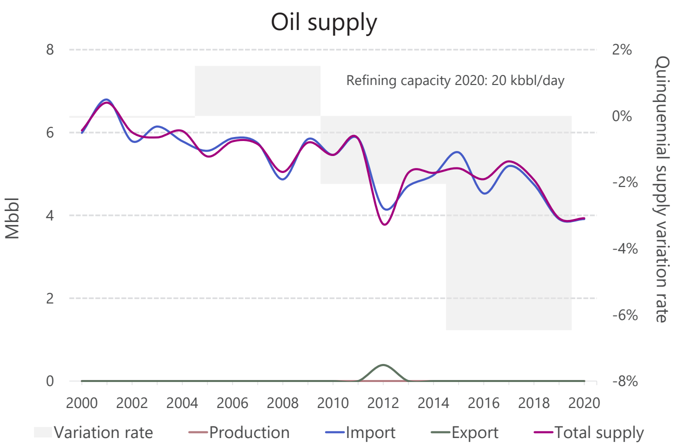
Summarized energy balance 2020

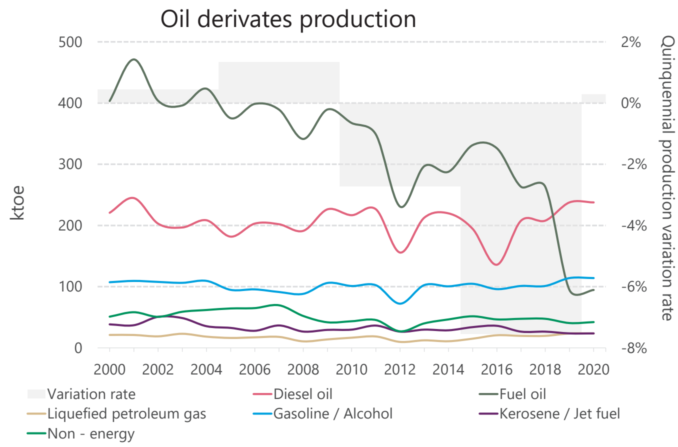


* Corresponds to wind, solar and vegetable waste (rice husks, coffee and peanuts)

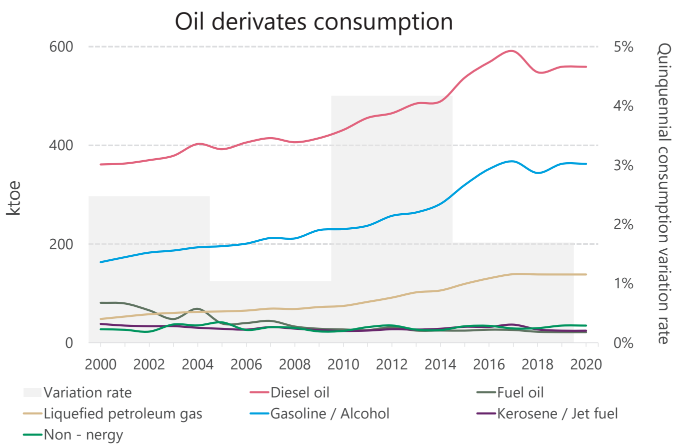

Installed power generation capacity [MW; %]
2020
Hydro; 157; 9.72%
Geothermal; 153; 9.46%
Solar; 16; 1.01%
Wind; 186; 11.50%
Renewable Thermal; 218; 13.47%
Non-renewable Thermal; 888; 54.84%
Renewables; 731; 45.16%

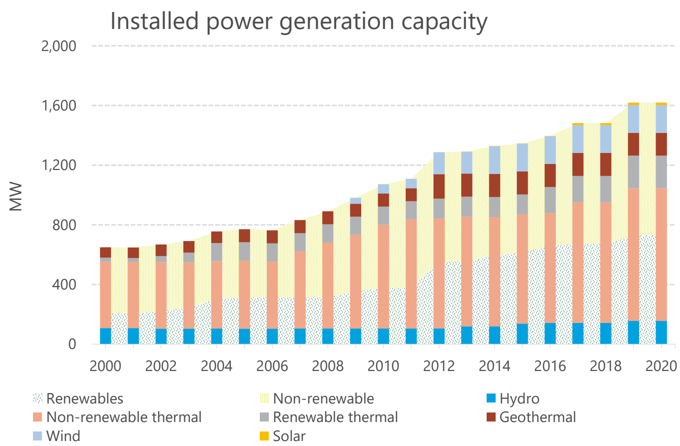

Electricity generation by source [GWh; %]
2020
Hydro; 574; 15.13%
Geothermal; 767; 20.21%
Solar; 26; 0.68%
Wind; 550; 14.48%
Renewable Thermal; 733; 19.30%
Non-renewable Thermal; 1,147; 30.20%
Renewables; 2650; 69.80%

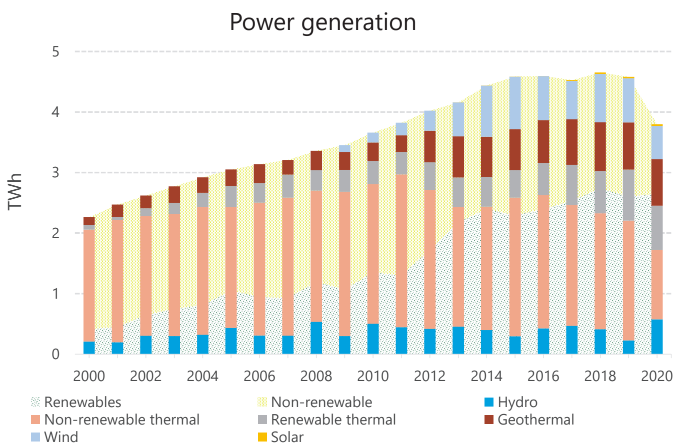

Oil supply
Refining capacity 2020: 20 kbbl/day
Mbbl
Quinquennial supply variation rate
Variation rate
Production
Import
Export
Total supply

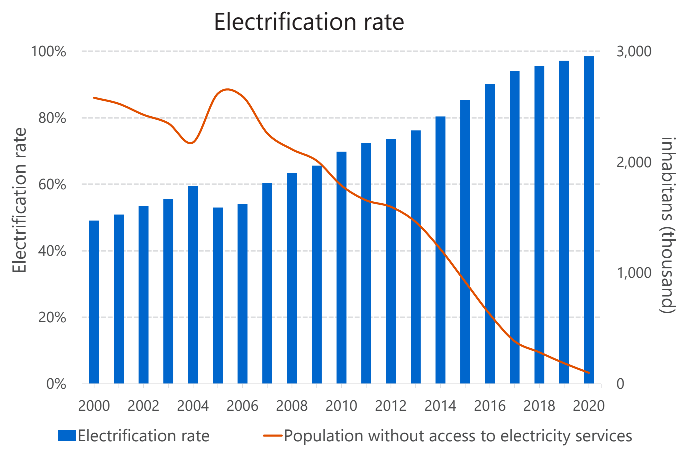

Oil derivates production
ktoe
Quinquennial production variation rate
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Non - energy

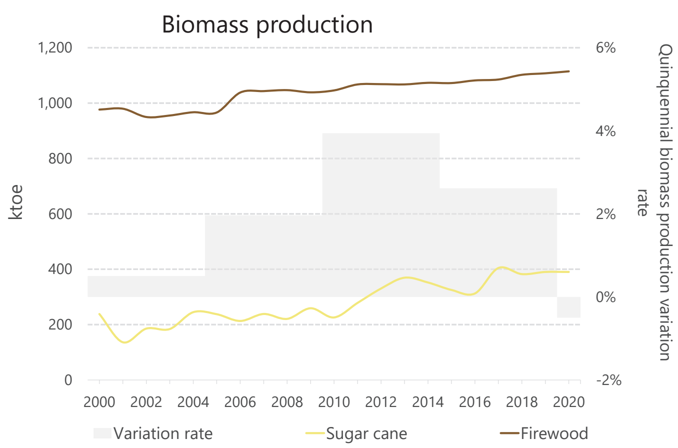
NICARAGUA

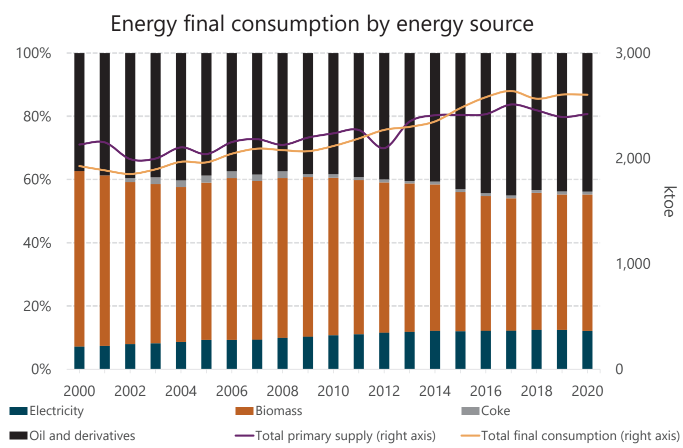

Oil derivates consumption
ktoe
Quinquennial consumption variation rate
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Non - nergy

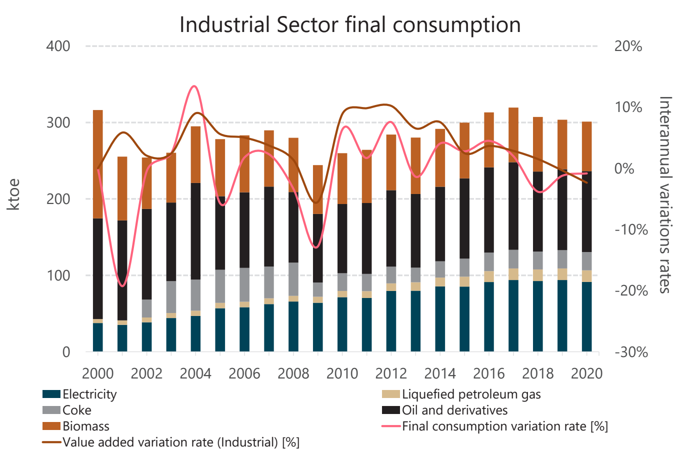

Installed power generation capacity
MW
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Geothermal
Wind
Solar

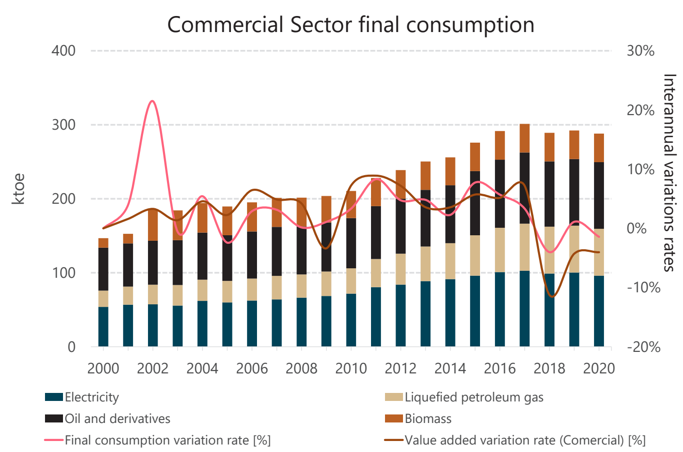

Power generation
TWh
5
4
3
2
1
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Geothermal
Wind
Solar


Electrification rate
Electrification rate
100%
80%
60%
40%
20%
0%
inhabitans (thousand)
3,000
2,000
1,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electrification rate
Population without access to electricity services

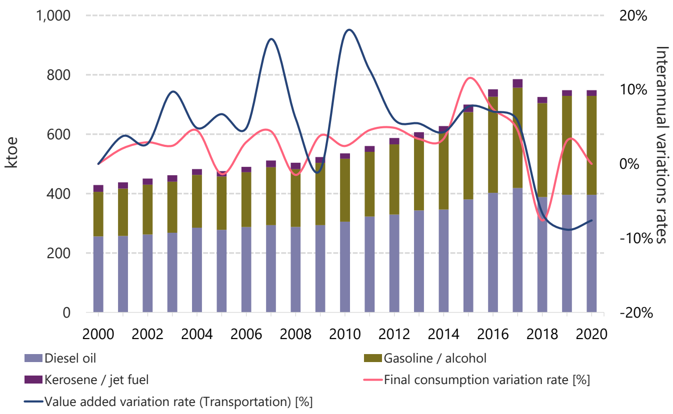

Biomass production
ktoe
1,200
1,000
800
600
400
200
0
Quinquennial biomass production variation rate
6%
4%
2%
0%
-2%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Sugar cane
Firewood


Energy final consumption by energy source
100%
80%
60%
40%
20%
0%
ktoe
3,000
2,000
1,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Biomass
Coke
Oil and derivatives
Total primary supply (right axis)
Total final consumption (right axis)

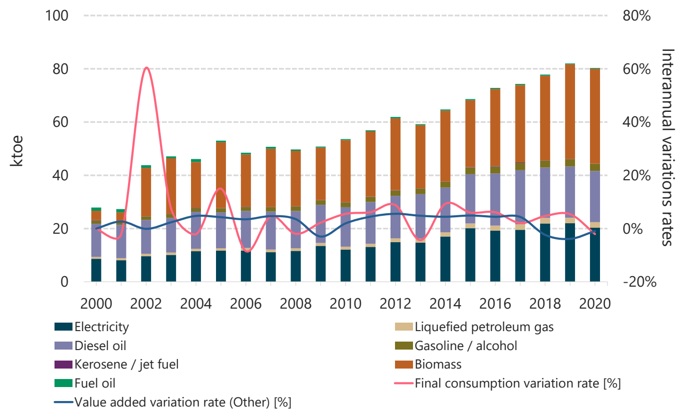

Industrial Sector final consumption
ktoe
400
300
200
100
0
Interannual variations rates
20%
10%
0%
-10%
-20%
-30%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]


Commercial Sector final consumption
ktoe
400
300
200
100
0
Interannual variations rates
30%
20%
10%
0%
-10%
-20%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]

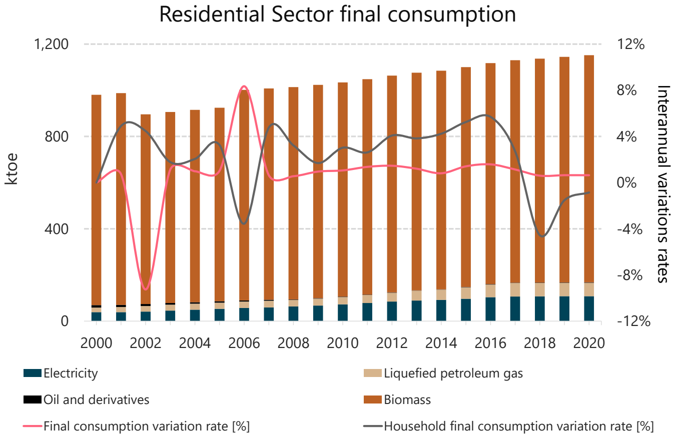
Transport Sector final consumption



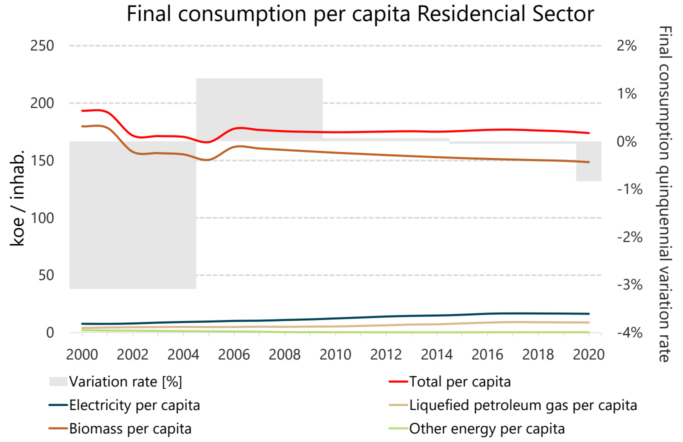
Other Sector final consumption



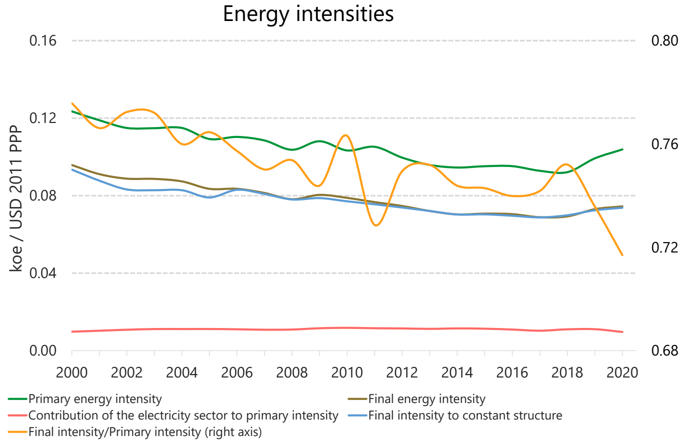
Residential Sector final consumption



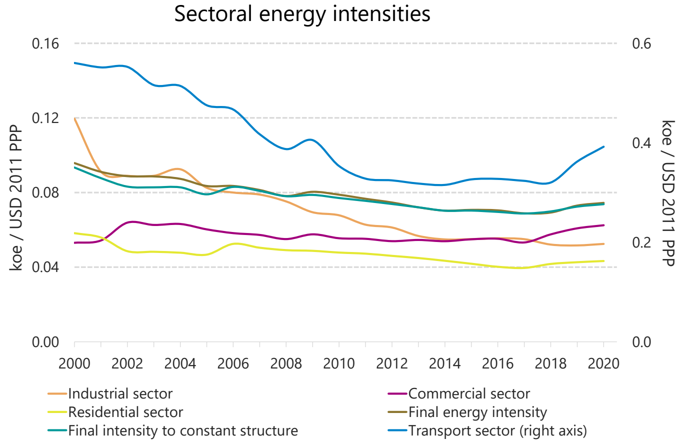
Final consumption per capita Residencial Sector

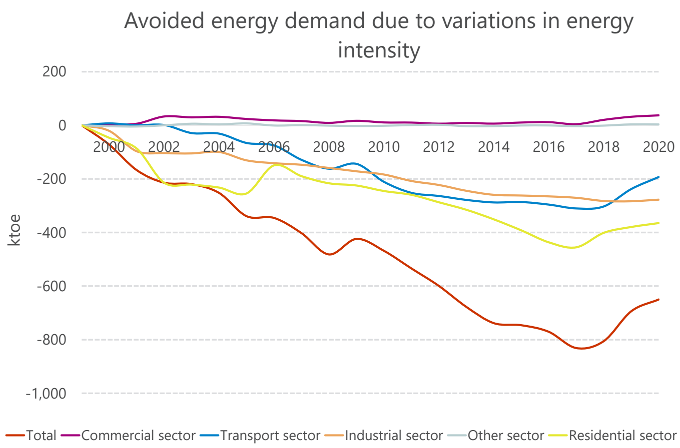


Energy intensities

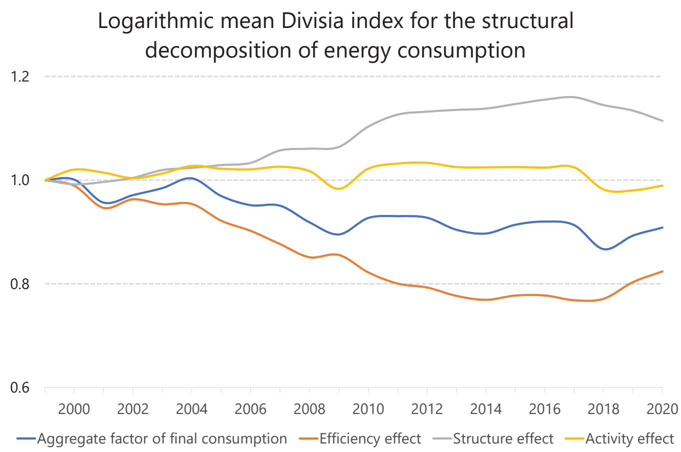


Sectoral energy intensities

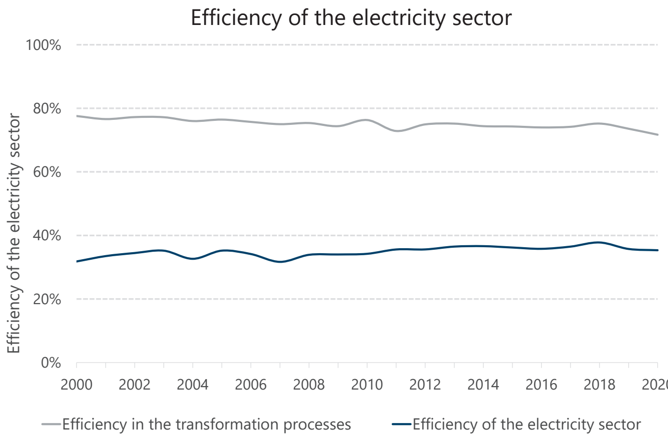




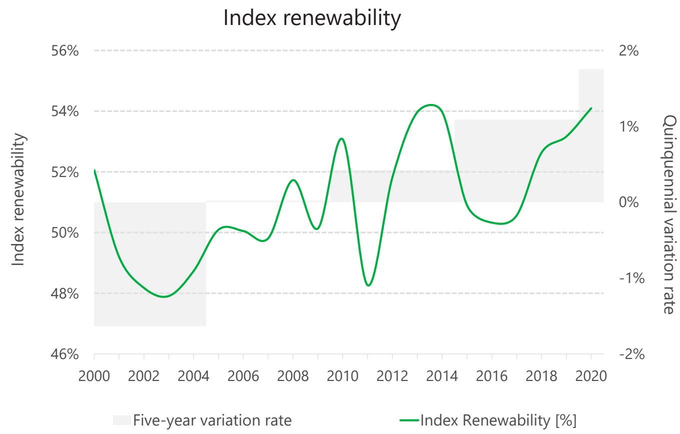
Avoided energy demand due to variations in energy intensity
ktoe
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector



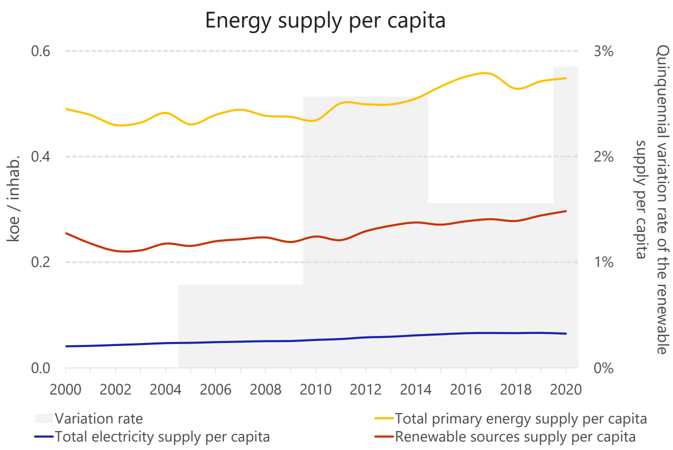
Logarithmic mean Divisia index for the structural decomposition of energy consumption
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect



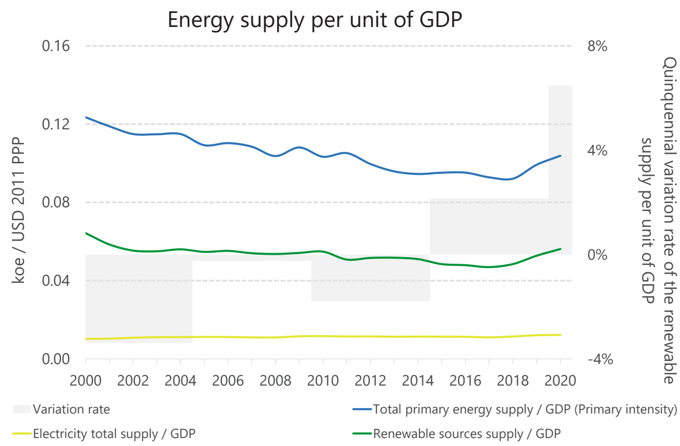
Efficiency of the electricity sector
Efficiency of the electricity sector
Efficiency in the transformation processes
Efficiency of the electricity sector



Index renewability
Index renewability
Quinquennial variation rate
Five-year variation rate
Index Renewability [%]



Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita



Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP

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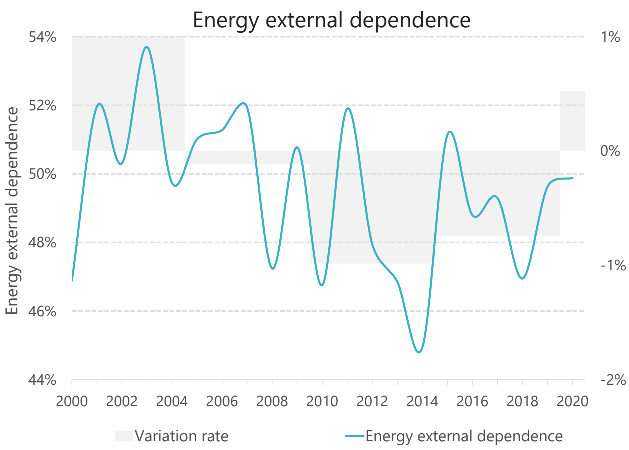
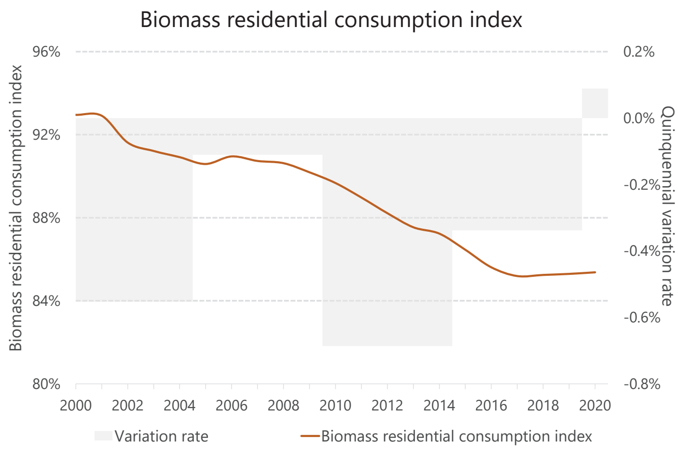
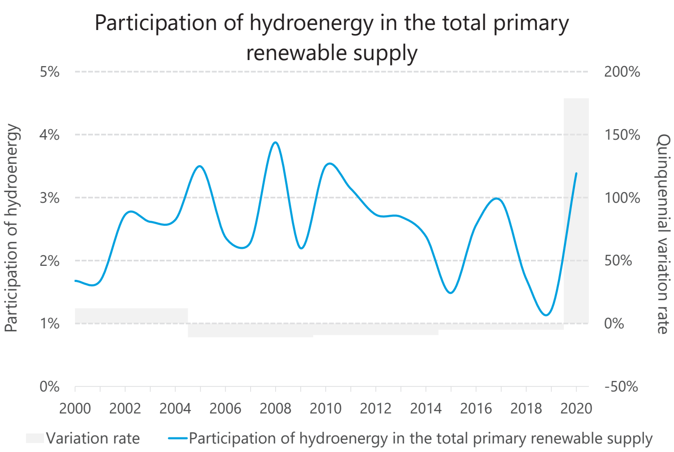
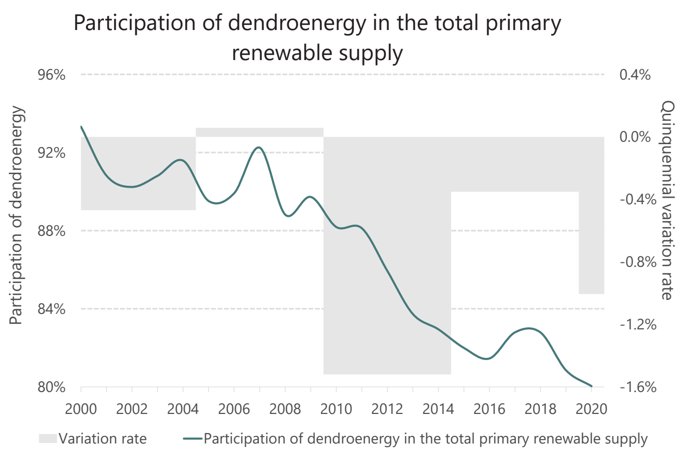
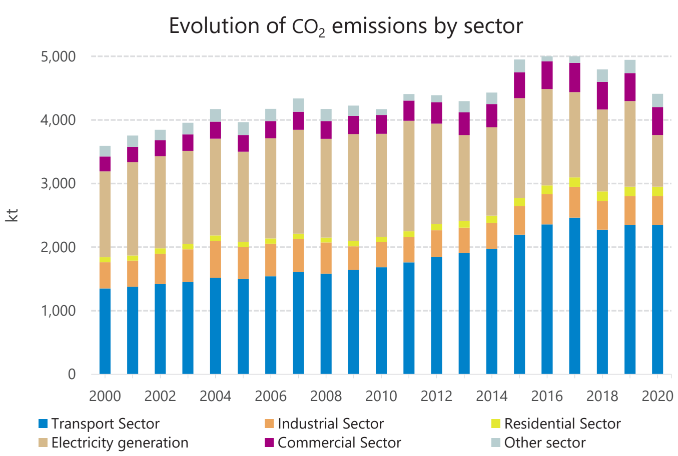
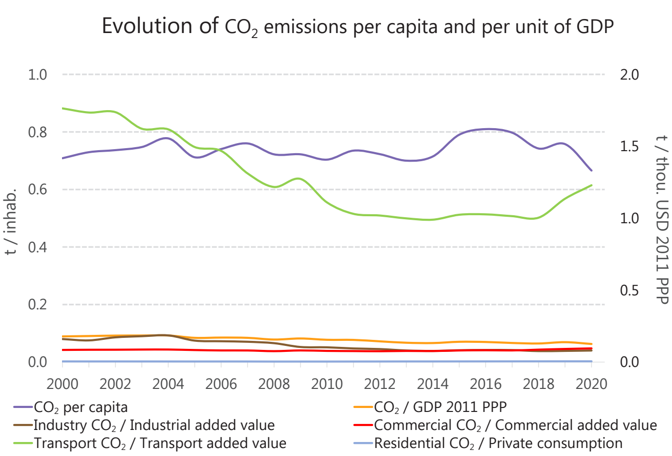

Energy external dependence
Energy external dependence
Quinquennial variation rate
54%
52%
50%
48%
46%
44%
1%
0%
-1%
-2%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Energy external dependence


Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
96%
92%
88%
84%
80%
0.2%
0.0%
-0.2%
-0.4%
-0.6%
-0.8%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Biomass residential consumption index

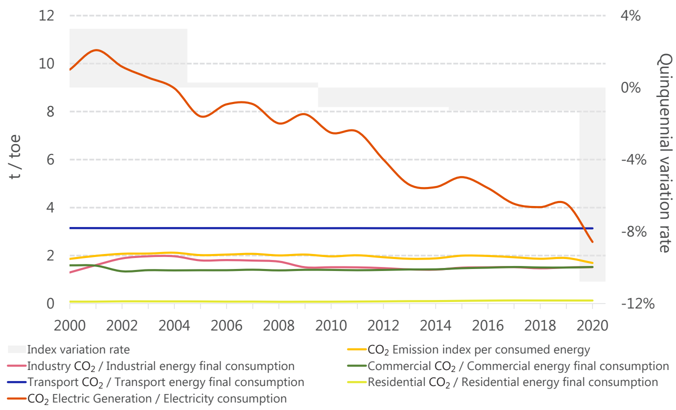

Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
5%
4%
3%
2%
1%
0%
200%
150%
100%
50%
0%
-50%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Participation of hydroenergy in the total primary renewable supply


Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
96%
92%
88%
84%
80%
0.4%
0.0%
-0.4%
-0.8%
-1.2%
-1.6%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Participation of dendroenergy in the total primary renewable supply

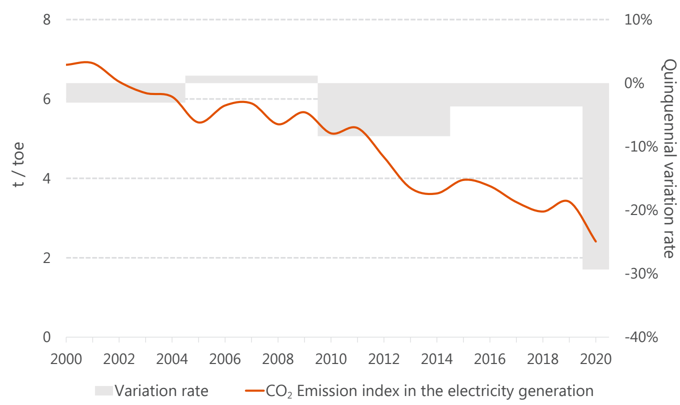

Evolution of CO2 emissions by sector
kt
5,000
4,000
3,000
2,000
1,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector


Evolution of CO2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
1.0
0.8
0.6
0.4
0.2
0.0
2.0
1.5
1.0
0.5
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
CO2 per capita
CO2 / GDP 2011 PPP
Industry CO2 / Industrial added value
Commercial CO2 / Commercial added value
Transport CO2 / Transport added value
Residential CO2 / Private consumption

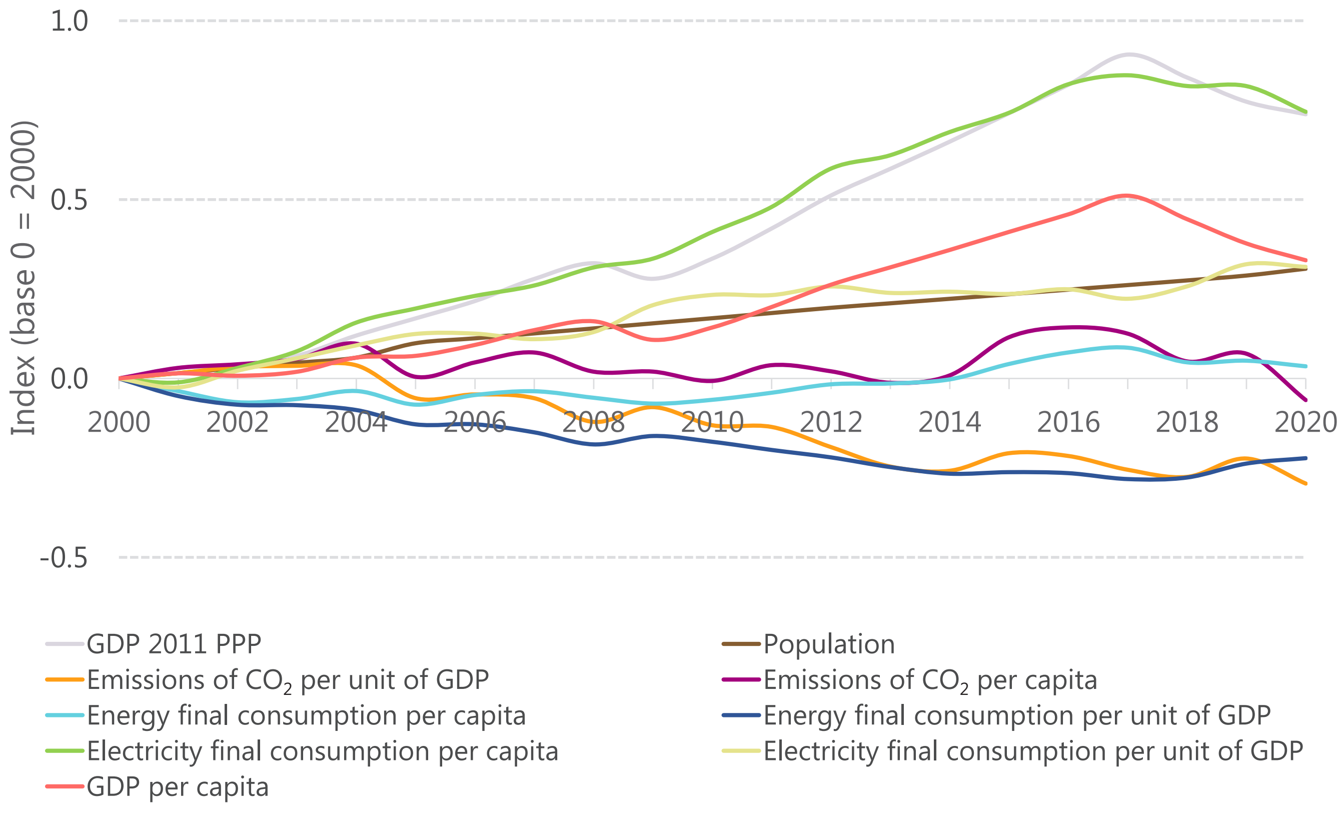
CO_2 Emission index per consumed energy



CO_2 Emission index of electricity generation



Summary of the main energy indicators



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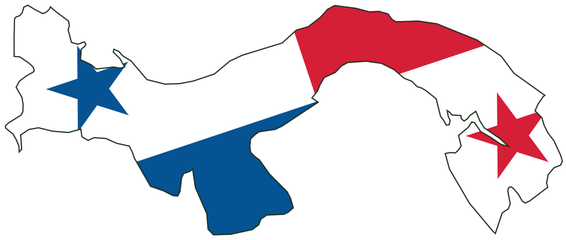
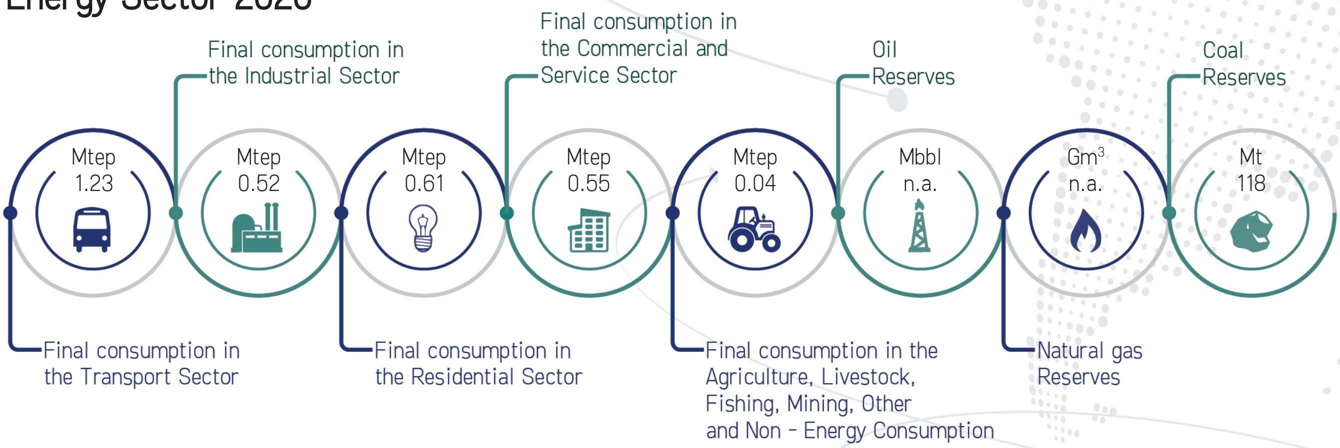


General Information 2020

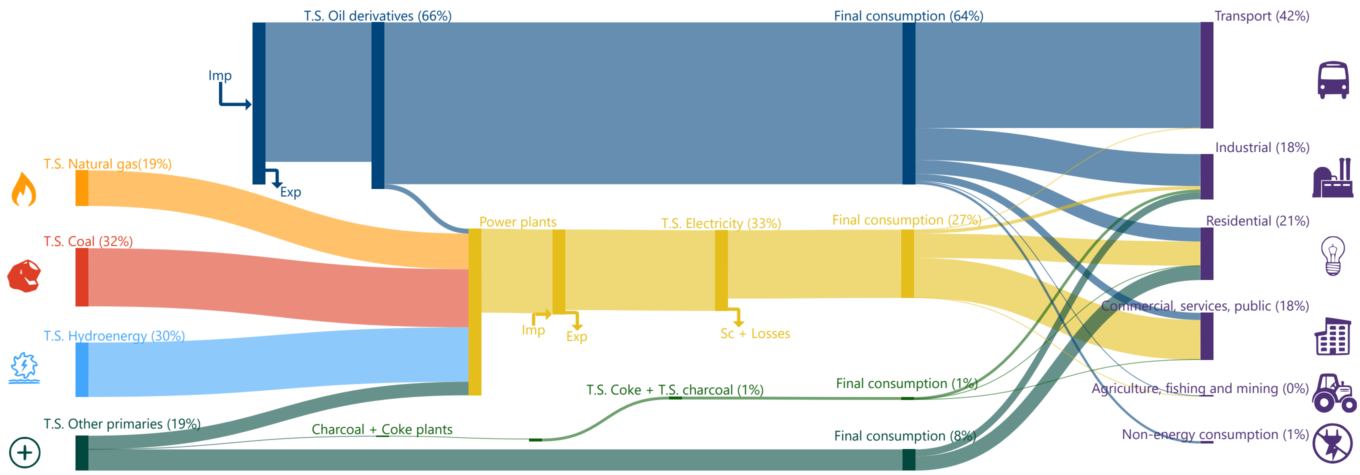
Population (thousand inhab.)	4,315
Area (km^2)	75,420
Population Density (inhab. / km^2)	57
Urban Population (%)	68
GDP USD 2010 (MUSD)	41,470
GDP USD 2011 PPP (MUSD)	109,517
GDP per capita (thou. USD 2011 PPP / inhab.)	25

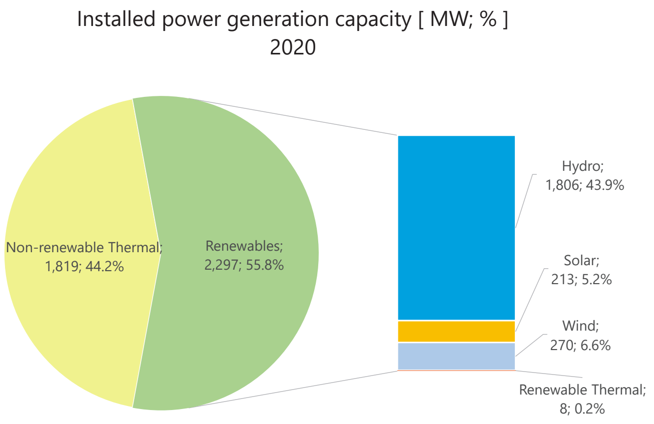
Energy Sector 2020

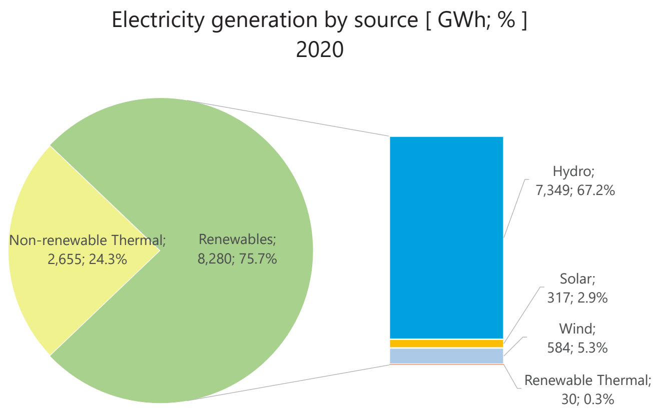


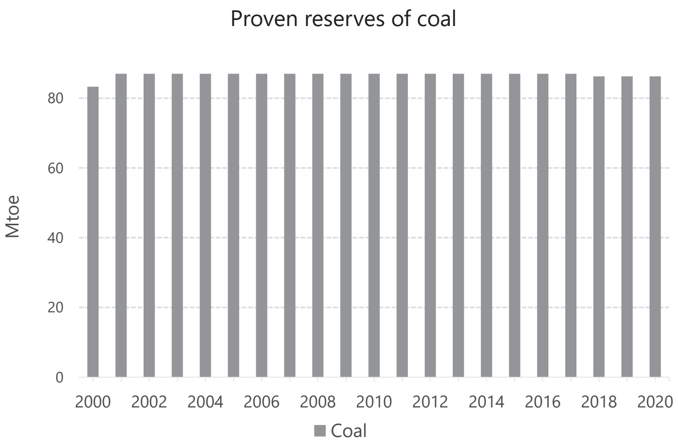
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
2,140	0.68	94.35	4.01	1.04	3.01	0.31	2.95	n.a.	4.12	0.04 / 0.03
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

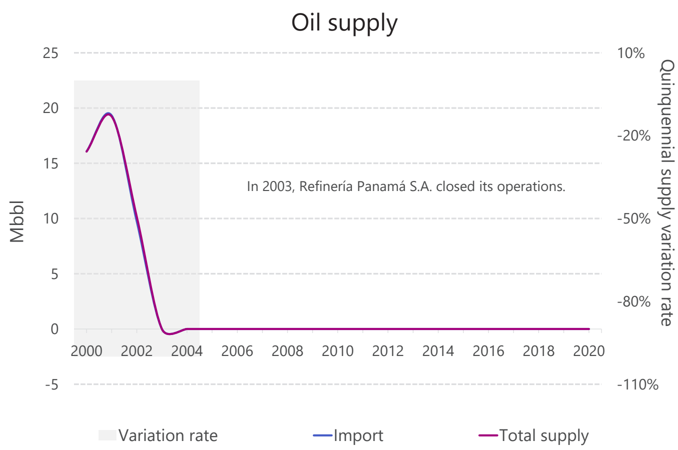
Summarized energy balance 2020




Installed power generation capacity [MW; %]
2020
Non-renewable Thermal; 1,819; 44.2%
Renewables; 2,297; 55.8%
Hydro; 1,806; 43.9%
Solar; 213; 5.2%
Wind; 270; 6.6%
Renewable Thermal; 8; 0.2%


Electricity generation by source [GWh; %]
2020
Non-renewable Thermal; 2,655; 24.3%
Renewables; 8,280; 75.7%
Hydro; 7,349; 67.2%
Solar; 317; 2.9%
Wind; 584; 5.3%
Renewable Thermal; 30; 0.3%


Proven reserves of coal
Mtoe
0
20
40
60
80
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Coal


Oil supply
Mbbl
25
20
15
10
5
0
-5
10%
-20%
-50%
-80%
-110%
Quinquennial supply variation rate
In 2003, Refinería Panamá S.A. closed its operations.
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Import
Total supply

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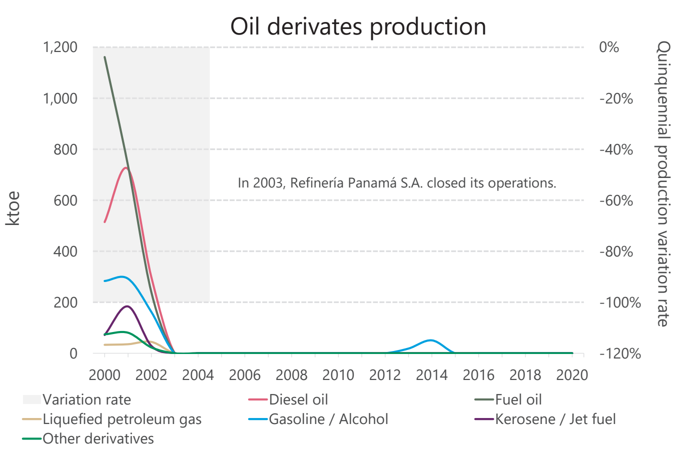
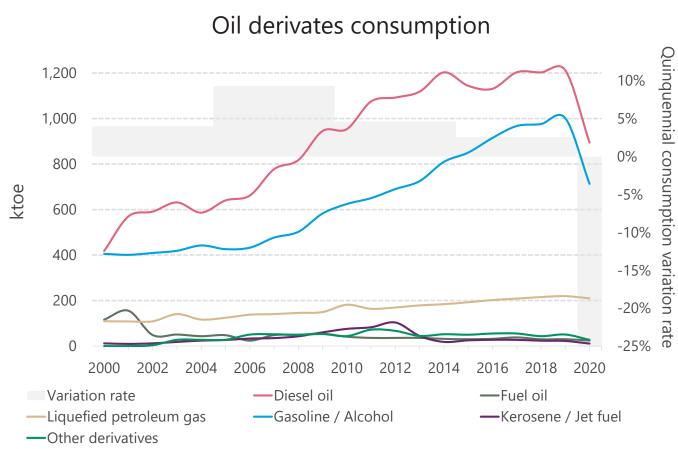
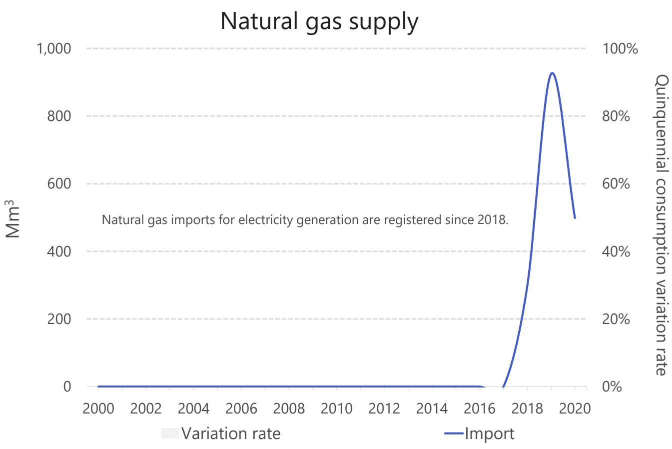
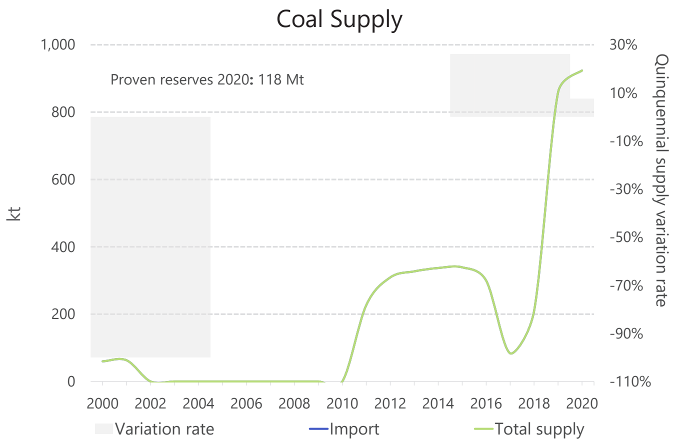
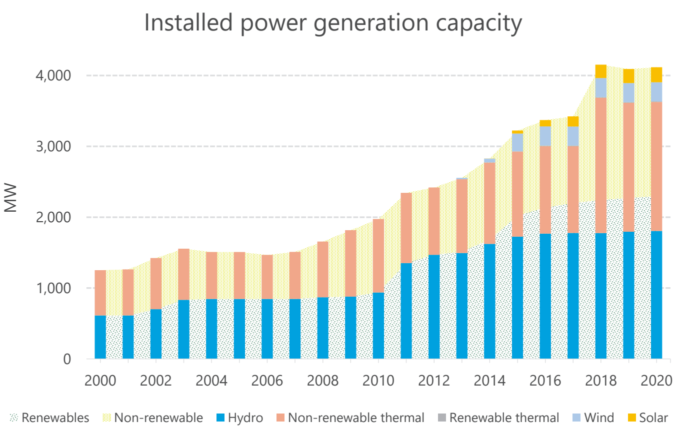
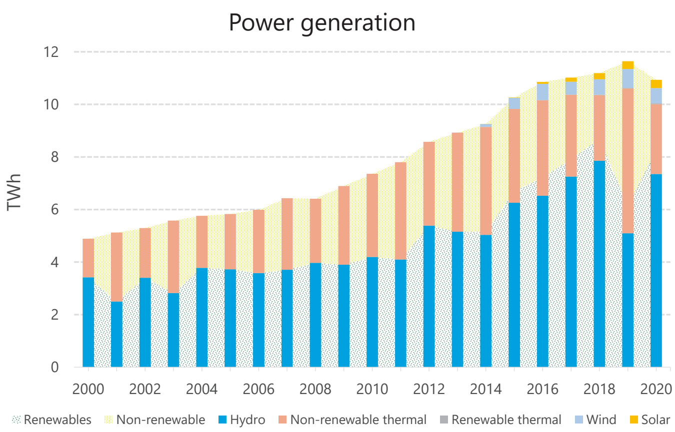

Oil derivates production
ktoe
1,200
1,000
800
600
400
200
0
0%
-20%
-40%
-60%
-80%
-100%
-120%
Quinquennial production variation rate
In 2003, Refinería Panamá S.A. closed its operations.
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Other derivatives

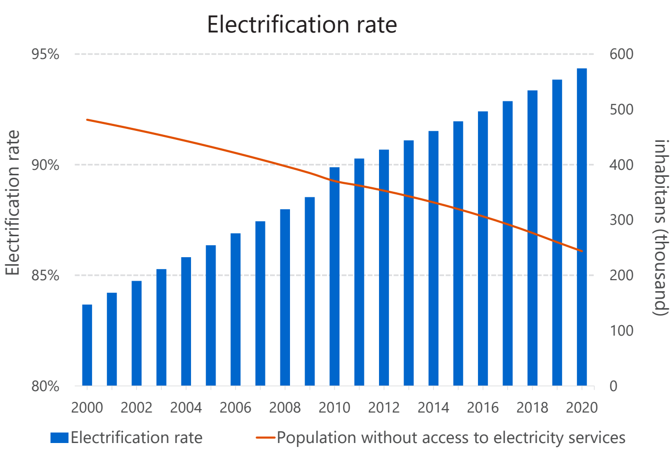

Oil derivates consumption
ktoe
1,200
1,000
800
600
400
200
0
10%
5%
0%
-5%
-10%
-15%
-20%
-25%
Quinquennial consumption variation rate
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Other derivatives

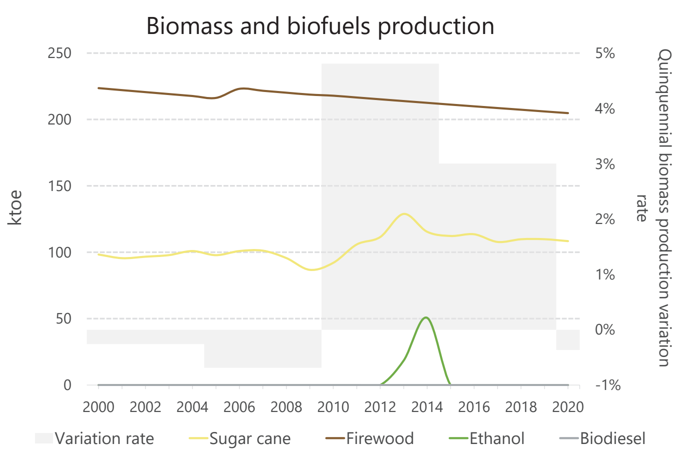

Natural gas supply
Mm³
Quinquennial consumption variation rate
Natural gas imports for electricity generation are registered since 2018.
Variation rate
Import


Coal Supply
kt
Quinquennial supply variation rate
Proven reserves 2020: 118 Mt
Variation rate
Import
Total supply


Installed power generation capacity
MW
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Wind
Solar


Power generation
TWh
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Wind
Solar


Electrification rate
Electrification rate
inhabitans (thousand)
Electrification rate
Population without access to electricity services


Biomass and biofuels production
ktoe
Quinquennial biomass production variation rate
Variation rate
Sugar cane
Firewood
Ethanol
Biodiesel

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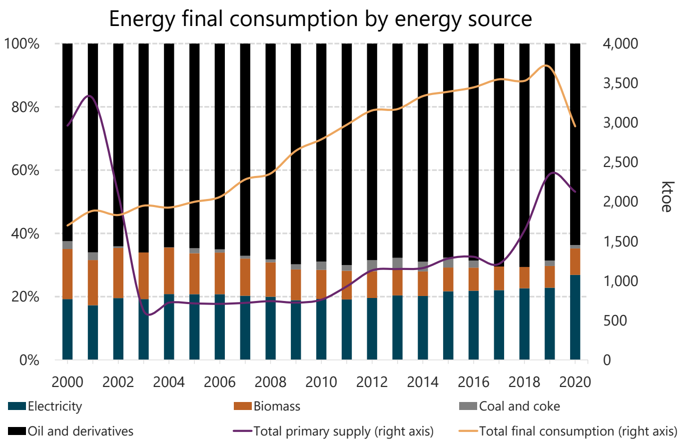
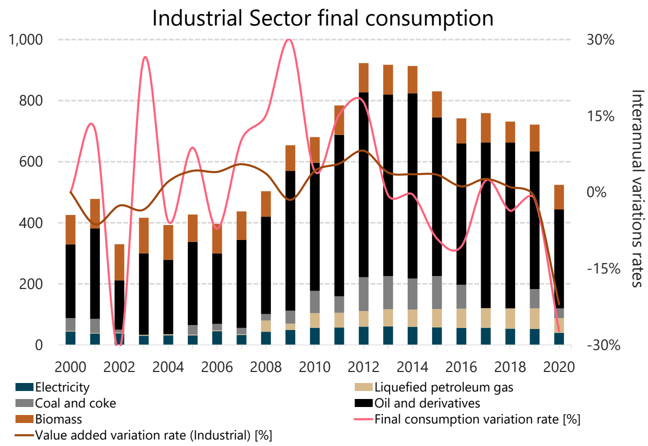
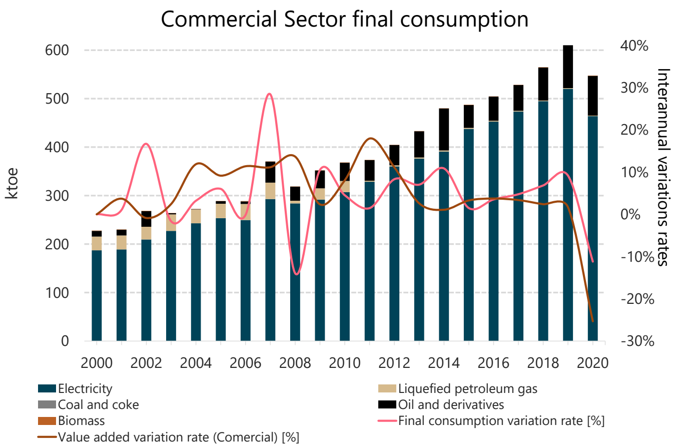
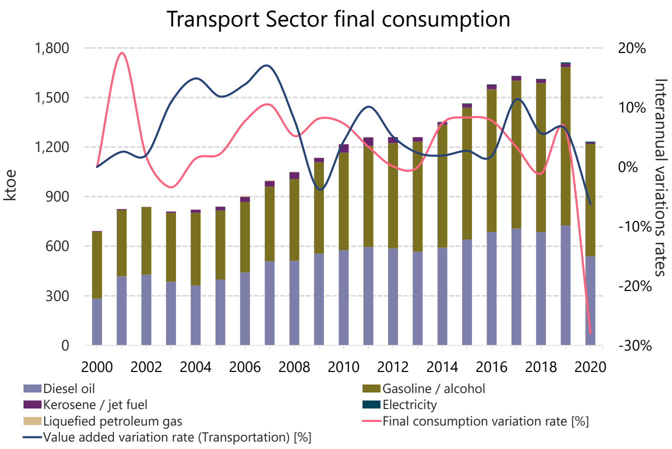
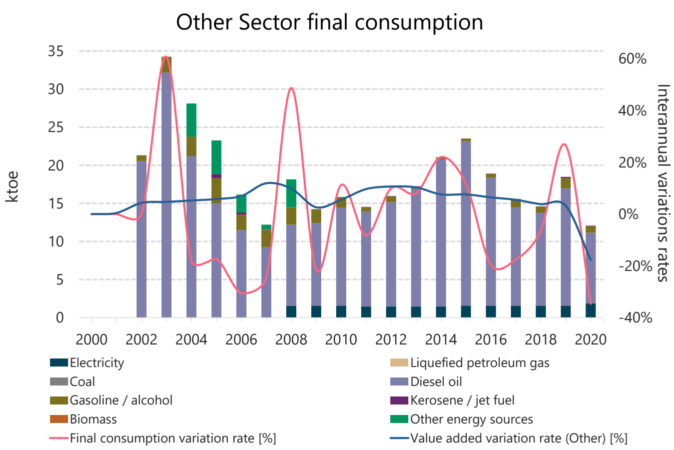
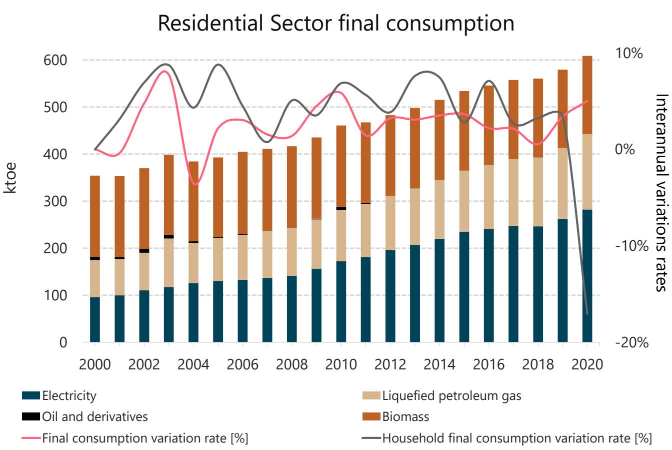

Energy final consumption by energy source
100%
80%
60%
40%
20%
0%
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
ktoe
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Biomass
Coal and coke
Oil and derivatives
Total primary supply (right axis)
Total final consumption (right axis)

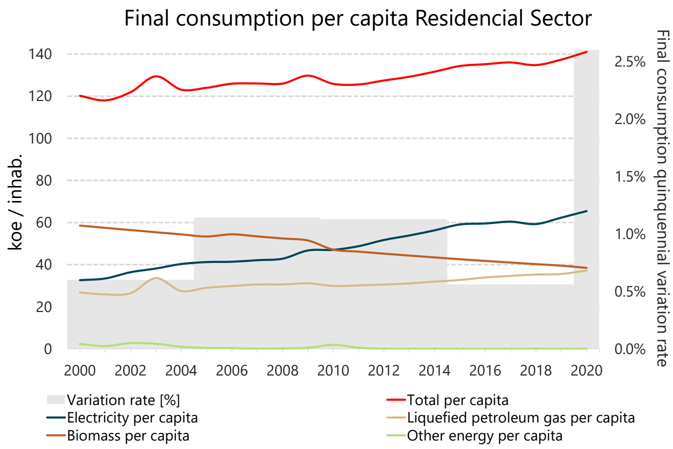

Industrial Sector final consumption
1,000
800
600
400
200
0
ktoe
30%
15%
0%
-15%
-30%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]

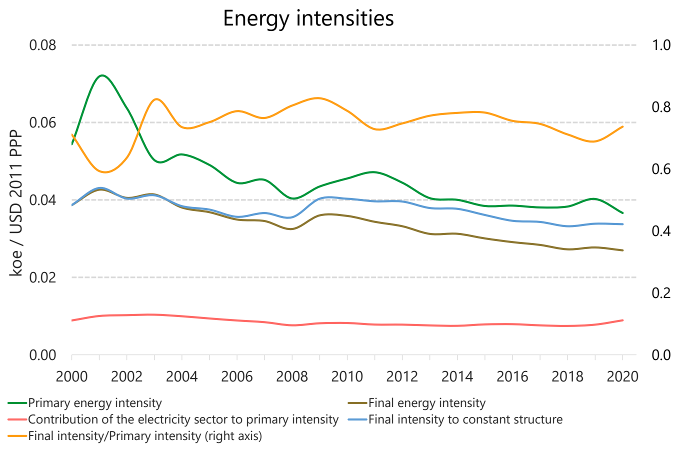

Commercial Sector final consumption
600
500
400
300
200
100
0
ktoe
40%
30%
20%
10%
0%
-10%
-20%
-30%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]

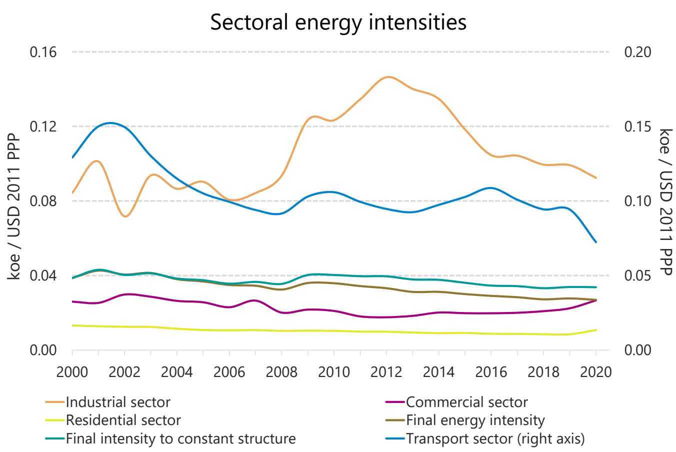

Transport Sector final consumption
1,800
1,500
1,200
900
600
300
0
ktoe
20%
10%
0%
-10%
-20%
-30%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Electricity
Liquefied petroleum gas
Final consumption variation rate [%]
Value added variation rate (Transportation) [%]

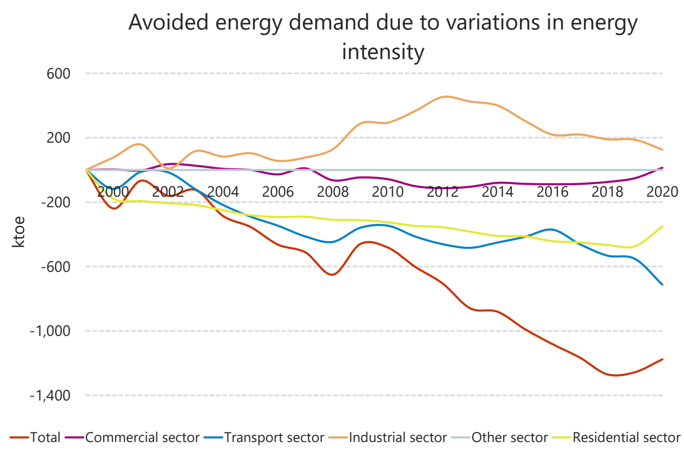

Other Sector final consumption
35
30
25
20
15
10
5
0
ktoe
60%
40%
20%
0%
-20%
-40%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Coal
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Biomass
Other energy sources
Final consumption variation rate [%]
Value added variation rate (Other) [%]

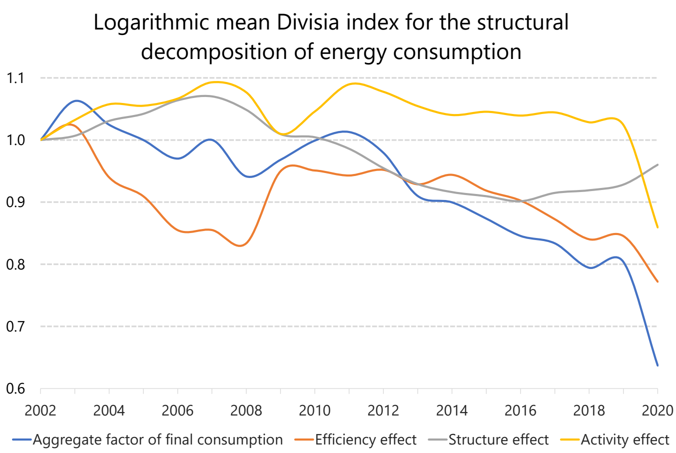

Residential Sector final consumption
600
500
400
300
200
100
0
ktoe
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Household final consumption variation rate [%]

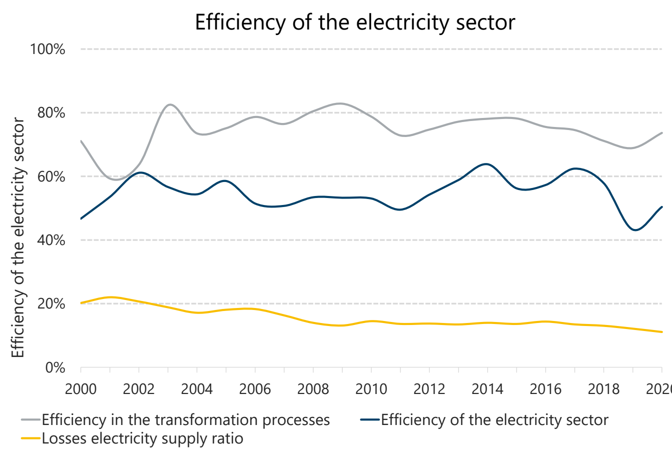

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
Variation rate [%]
Total per capita
Electricity per capita
Liquefied petroleum gas per capita
Biomass per capita
Other energy per capita

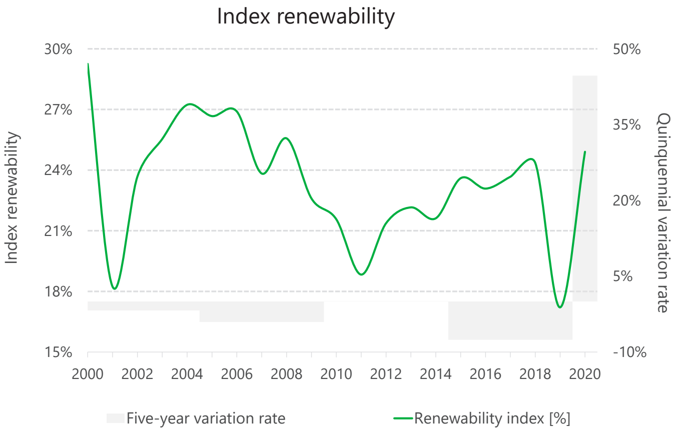

Energy intensities
koe / USD 2011 PPP
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

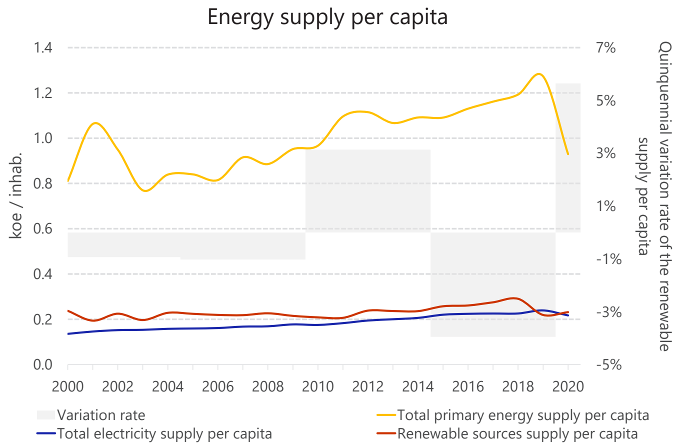

Sectoral energy intensities
koe / USD 2011 PPP
koe / USD 2011 PPP
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)

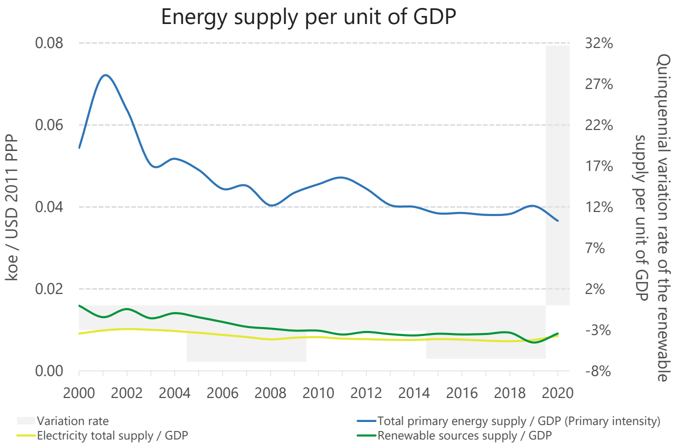

Avoided energy demand due to variations in energy intensity
ktoe
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

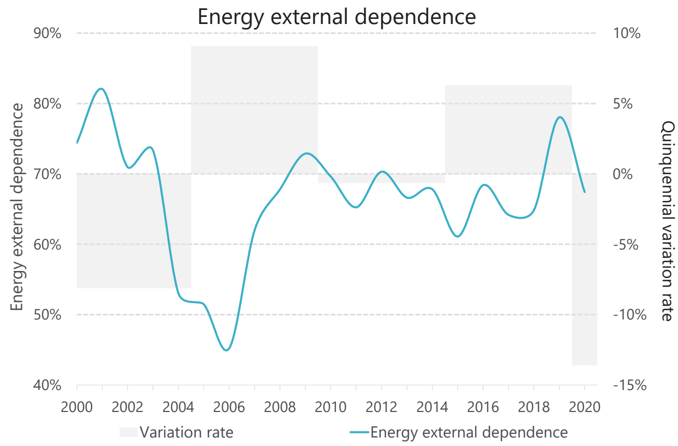

Logarithmic mean Divisia index for the structural decomposition of energy consumption
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect


Efficiency of the electricity sector
Efficiency of the electricity sector
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

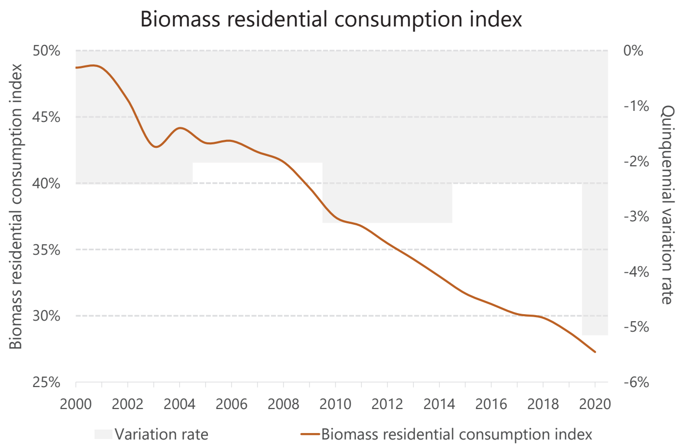


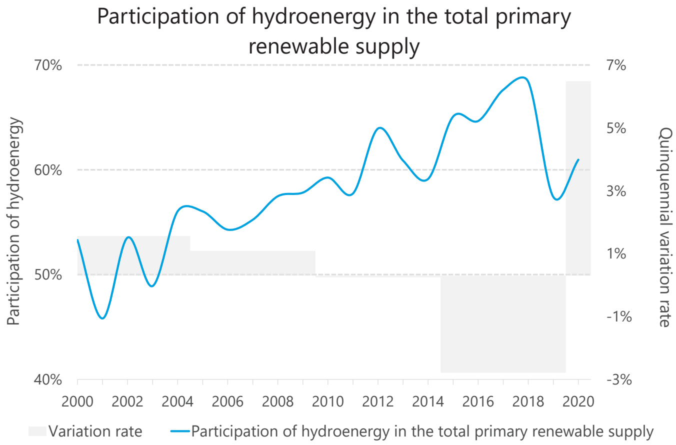




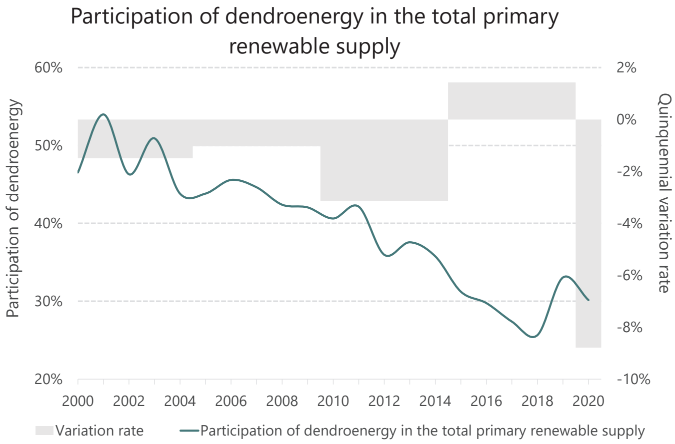


Panama started operations of the Dacona Star, Fotovoltaica Santiago and Eco Solar photovoltaic plants, with capacities of 240 kW, 4,980 kW and 9,900 kW respectively, for a total of 15,120 kW.

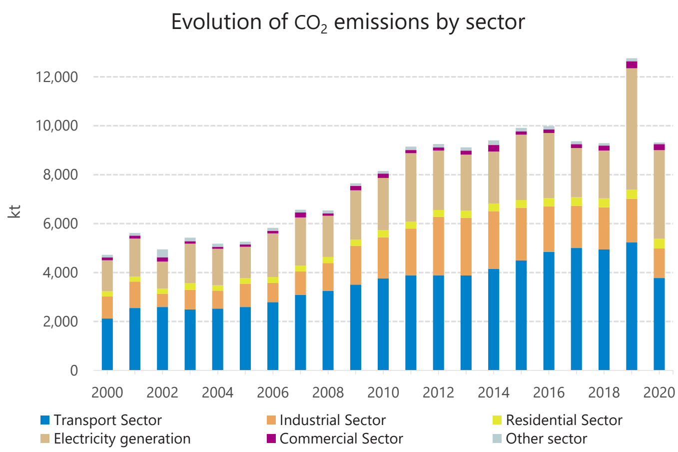




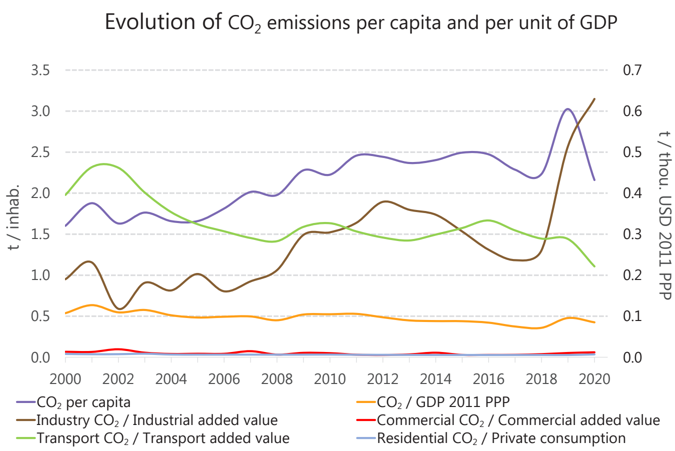
Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
Variation rate
Participation of hydroenergy in the total primary renewable supply



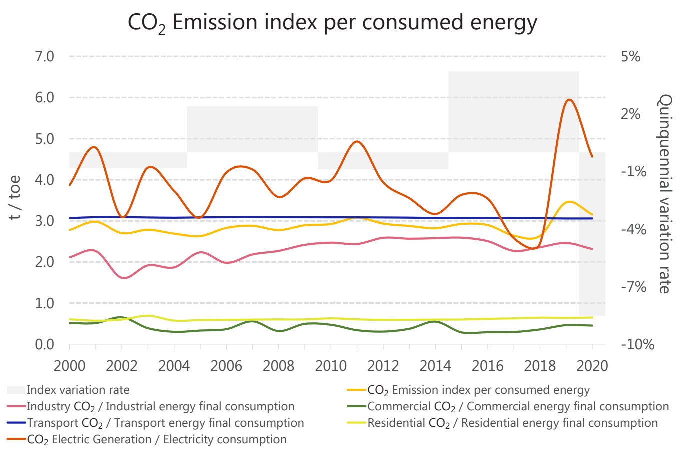
Participation of dendroenergy in the total primary renewable supply
Participation of dendroenergy
Quinquennial variation rate
Variation rate
Participation of dendroenergy in the total primary renewable supply



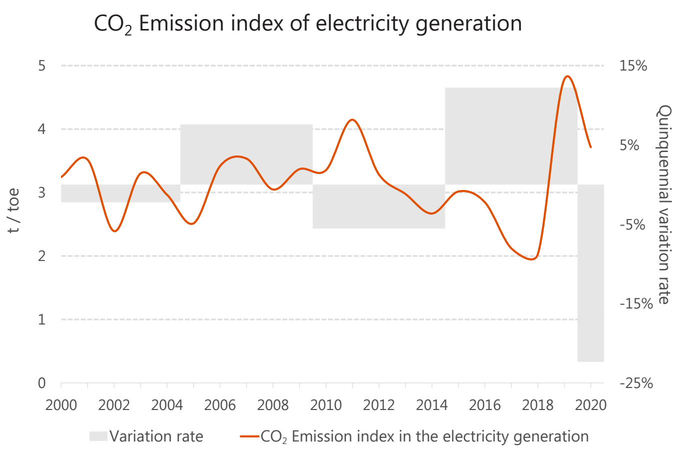
Evolution of CO_2 emissions by sector
kt
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector



Evolution of CO_2 emissions per capita and per unit of GDP
t / inhab.
t / thou. USD 2011 PPP
CO_2 per capita
CO_2 / GDP 2011 PPP
Industry CO_2 / Industrial added value
Commercial CO_2 / Commercial added value
Transport CO_2 / Transport added value
Residential CO_2 / Private consumption



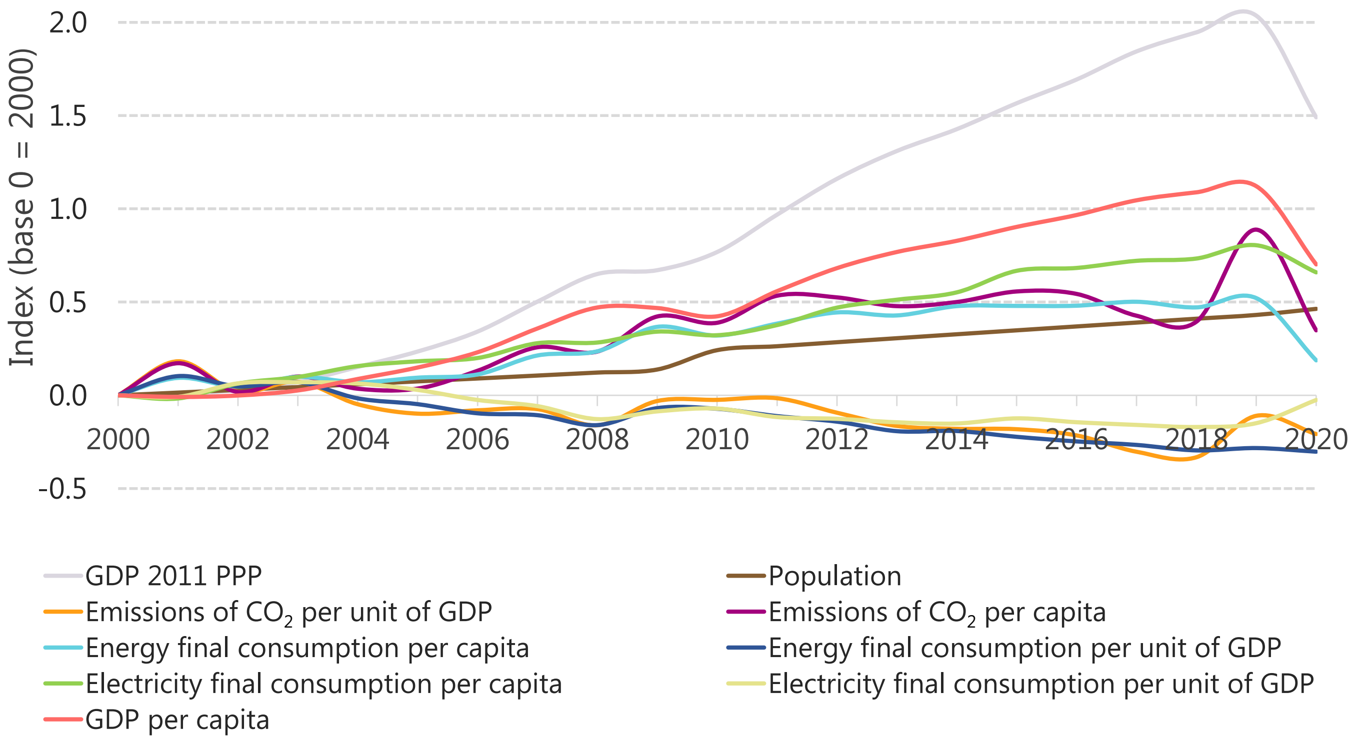
CO_2 Emission index per consumed energy
t / toe
Quinquennial variation rate
Index variation rate
CO_2 Emission index per consumed energy
Industry CO_2 / Industrial energy final consumption
Commercial CO_2 / Commercial energy final consumption
Transport CO_2 / Transport energy final consumption
Residential CO_2 / Residential energy final consumption
CO_2 Electric Generation / Electricity consumption



CO_2 Emission index of electricity generation
t / toe
Quinquennial variation rate
Variation rate
CO_2 Emission index in the electricity generation

PANAMA

Summary of the main energy indicators



PANAMA

PARAGUAY

General Information 2020

Population (thousand inhab.)	7,253 [1]
Area (km²)	406,752
Population Density (inhab. / km²)	18
Urban Population (%)	63
GDP USD 2010 (MUSD)	36,839 [2]
GDP USD 2011 PPP (MUSD)	87,983 [3]
GDP per capita (thou. USD 2011 PPP / inhab.)	12

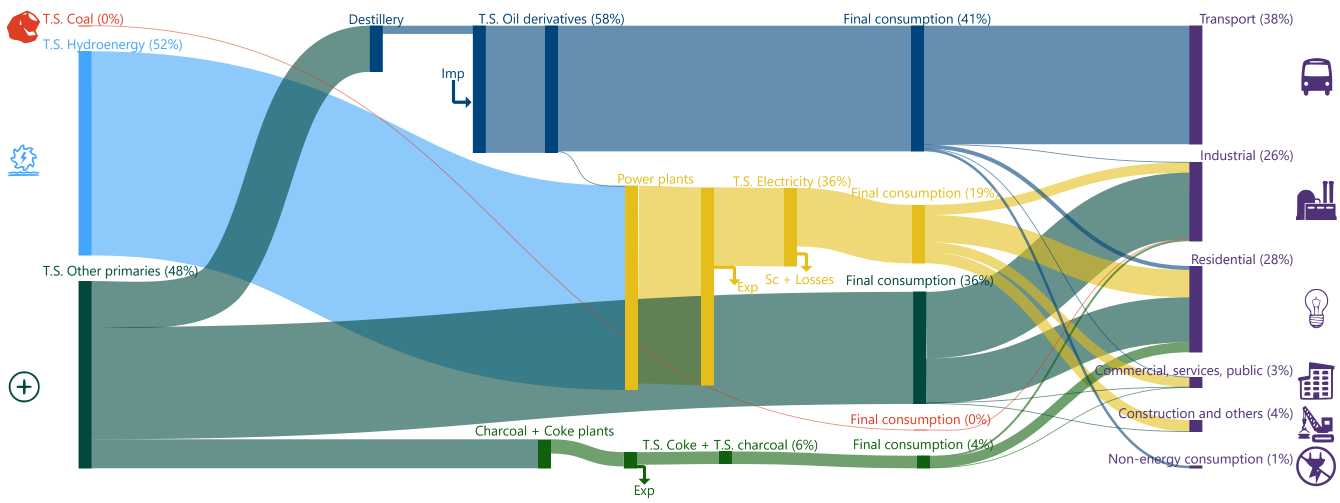
Energy Sector 2020

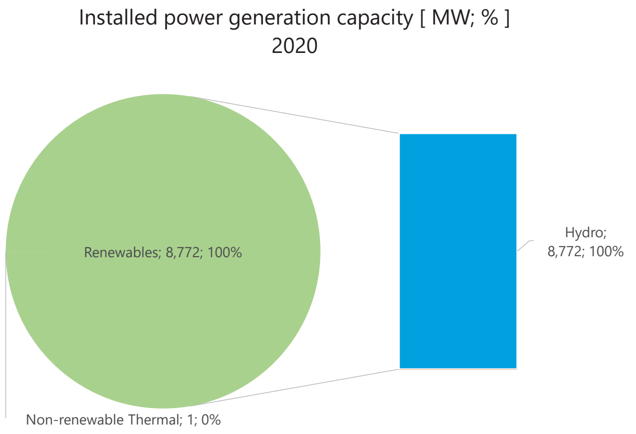
Final consumption in the Transport Sector	Mtep	2.39
Final consumption in the Industrial Sector	Mtep	1.59
Final consumption in the Residential Sector	Mtep	1.74
Final consumption in the Commercial and Service Sector	Mtep	0.22
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	0.29
Oil Reserves	Mbbl	n.a.
Natural gas Reserves	Gm³	n.a.
Coal Reserves	Mt	n.a.

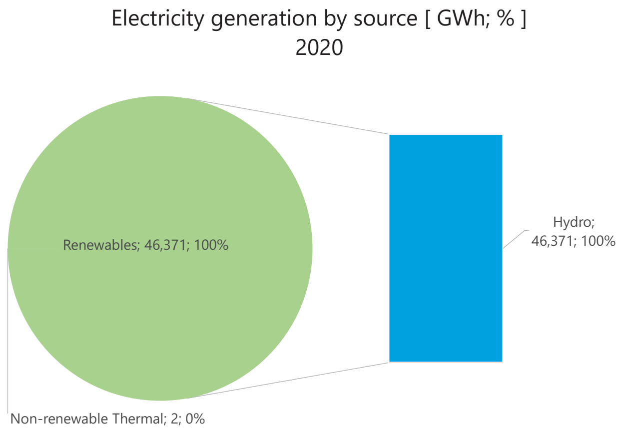
[1] National Statistics Institute (INE).
[2] ECLAC.
[3] World Bank.
[4] The "Villa Elisa" refinery is inactive but has not been dismantled, corresponding to 2005.
Note: The country updated the density of firewood to 768.8 kg/m³ based on recent studies and was applied for the period 2016-2020.

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
1,892	0.86	99.60	7.83	7.99	2.44	2.48	6.23	7.50 [4]	8.77	0.09 / 0.07
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

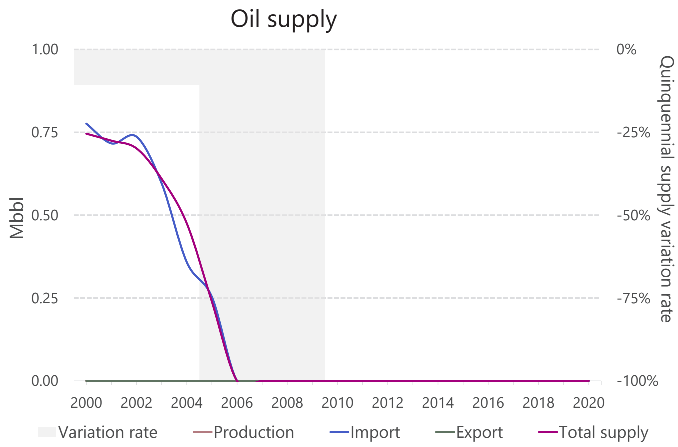
Summarized energy balance 2020

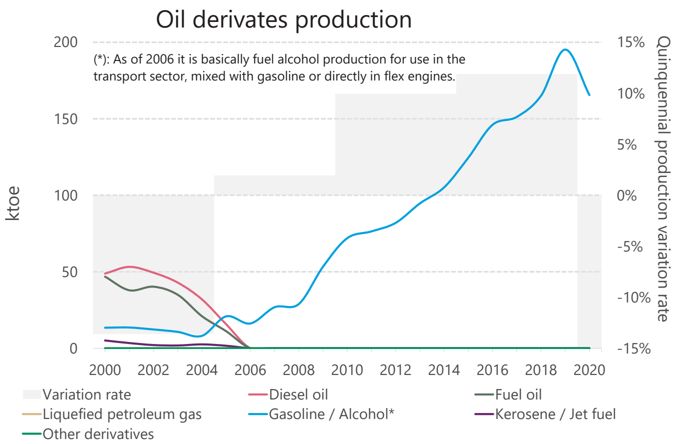


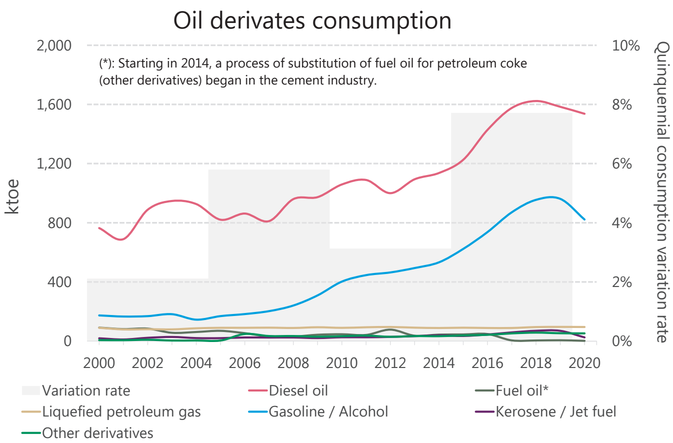




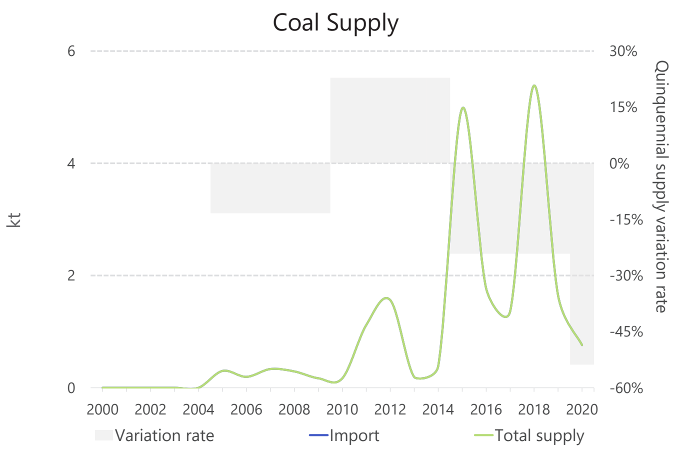
2005 was the last year of operations of the “Villa Elisa” refinery. Its refining capacity is 7.5 kbbl/day; it should be noted that the refinery has been inactive since that year, but it has not been dismantled. It is currently part of the industrial infrastructure of the state-owned company **PETROPAR**.

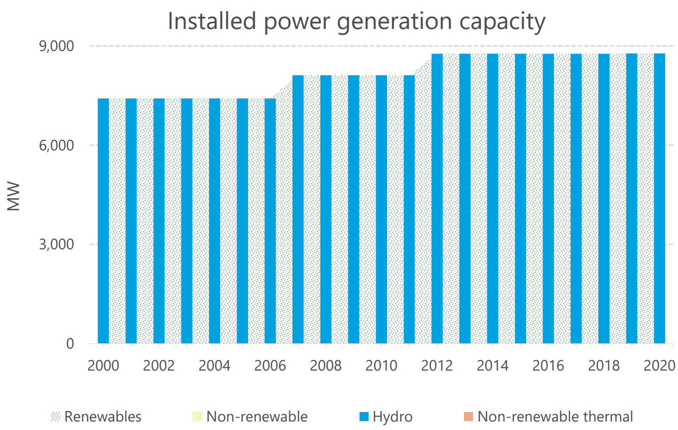


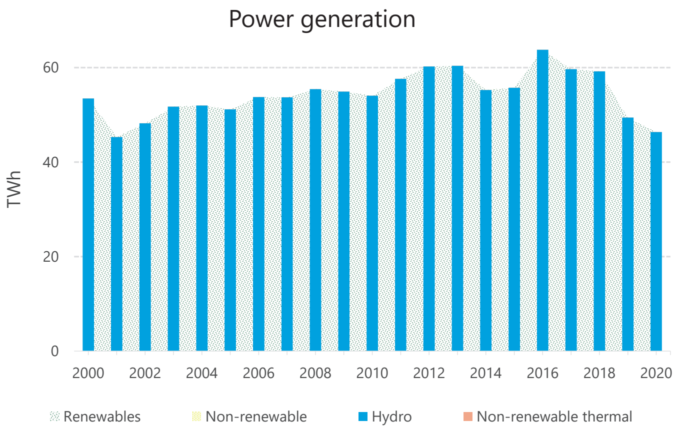


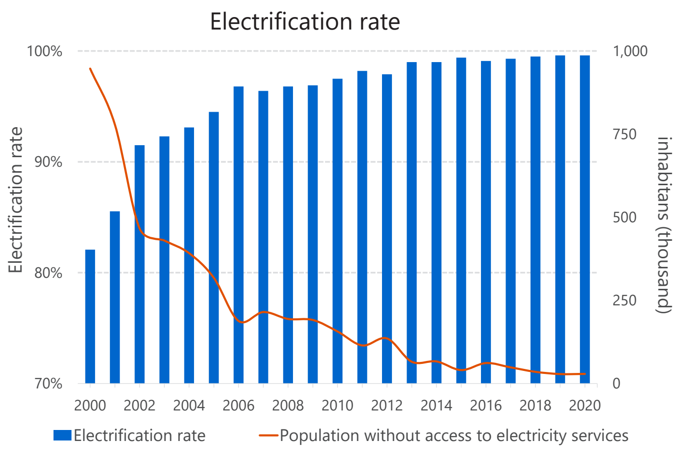


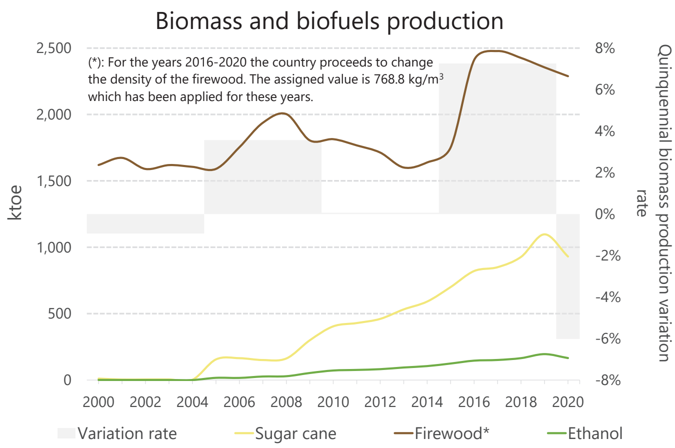
In 2020, both binational power plants, Itaipú Binacional (Paraguay - Brazil) and the Entidad Binacional Yacyretá (Paraguay - Argentina), will increase the rate of GWh generated per million cubic meters of turbined water, reflecting the response to the tense situation presented this year in terms of water availability. In the specific case of ITAIPU, the index increases by 1.3% compared to the previous year, while the EBY increases it by 1.5% compared to 2019.





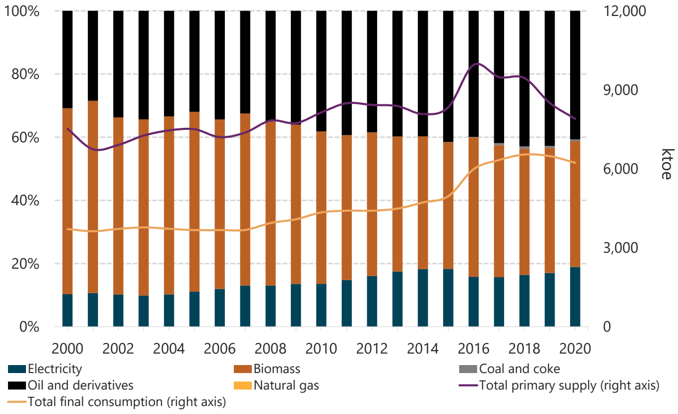




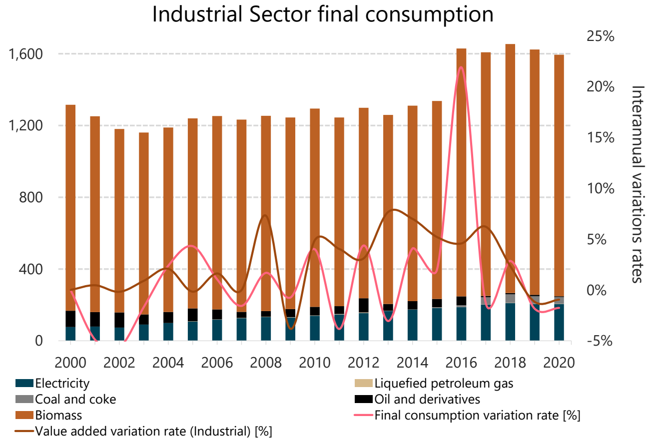


PARAGUAY

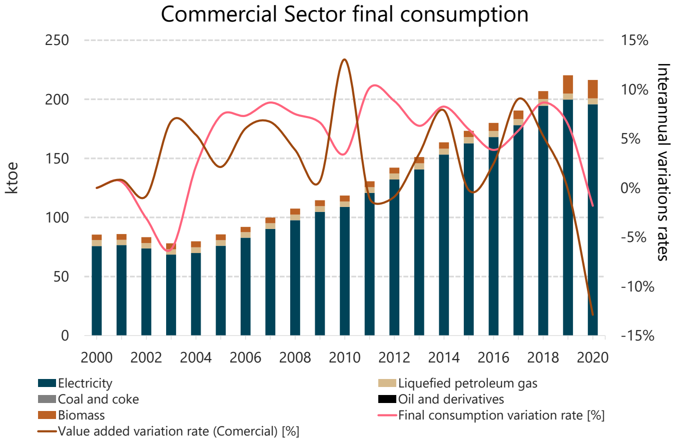
Energy final consumption by energy source



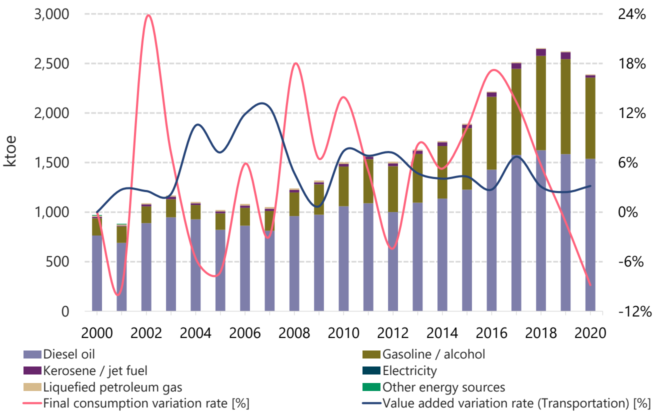
Industrial Sector final consumption



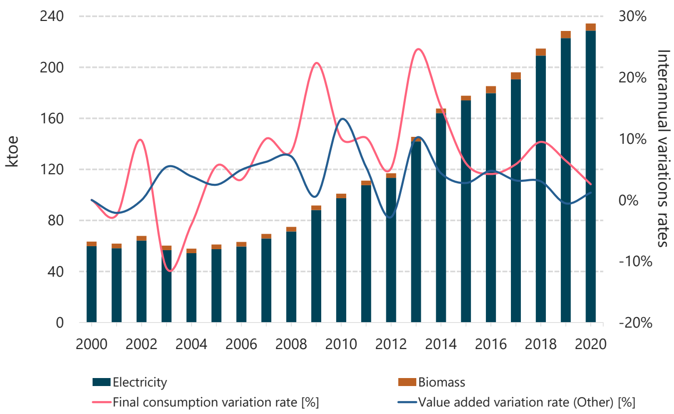
Commercial Sector final consumption



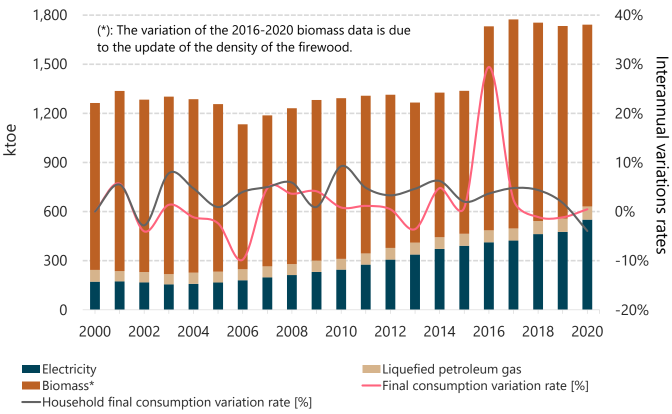
Transport Sector final consumption



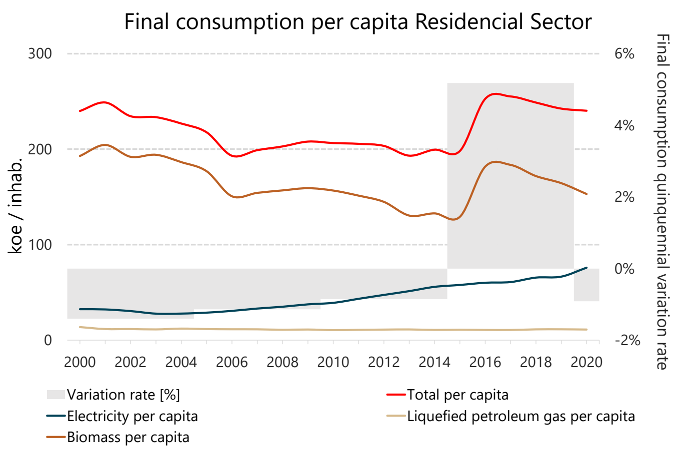
Other Sector final consumption



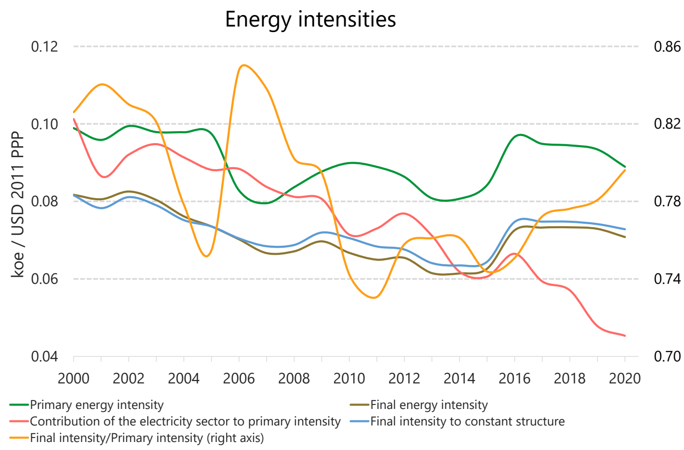
Residential Sector final consumption



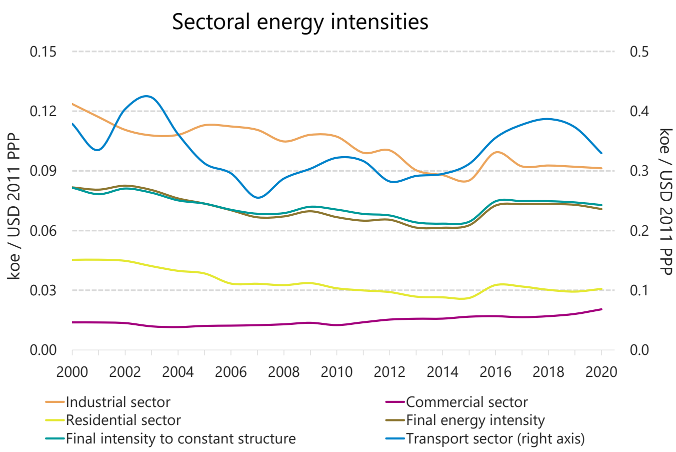
PARAGUAY



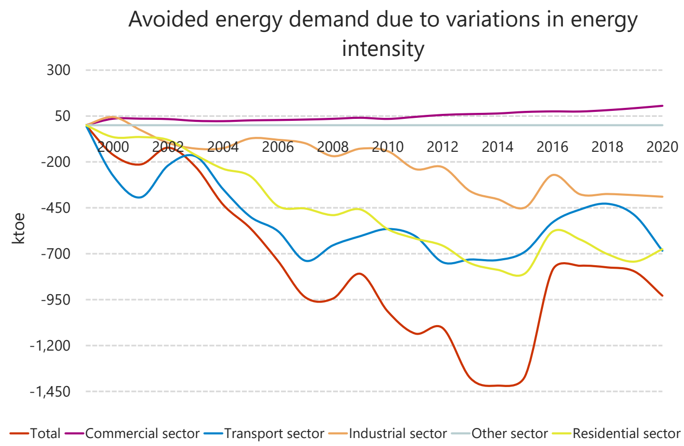
Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
Variation rate [%]
Total per capita
Electricity per capita
Liquefied petroleum gas per capita
Biomass per capita



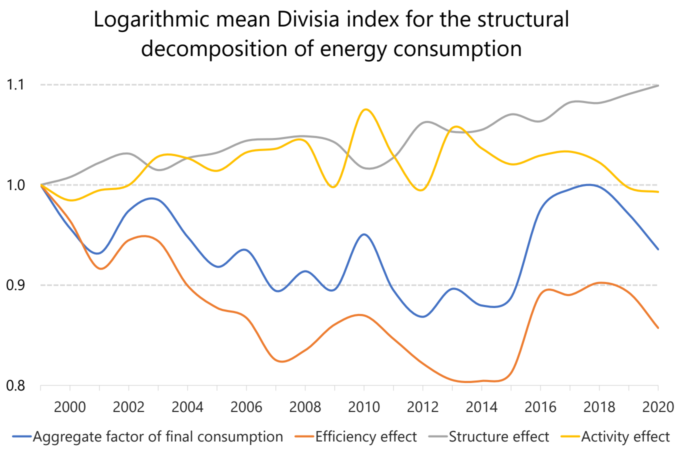
Energy intensities
koe / USD 2011 PPP
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)



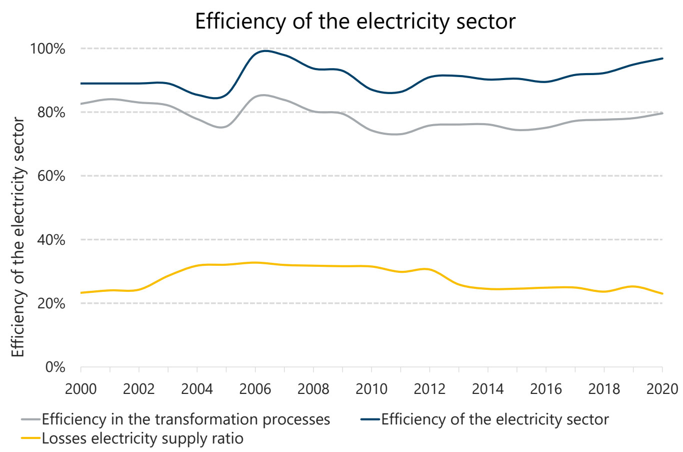
Sectoral energy intensities
koe / USD 2011 PPP
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)



Avoided energy demand due to variations in energy intensity
ktoe
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

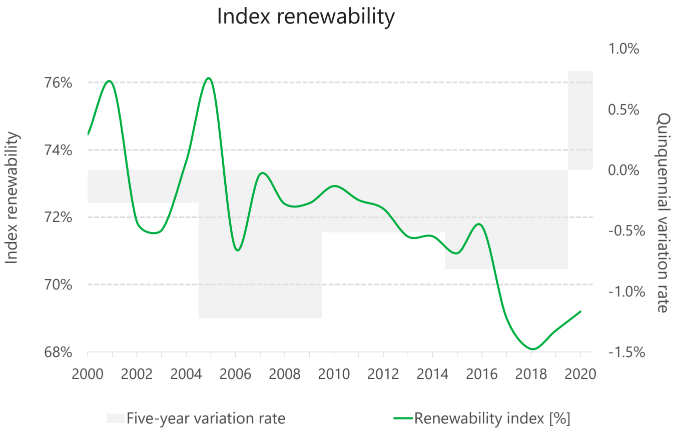


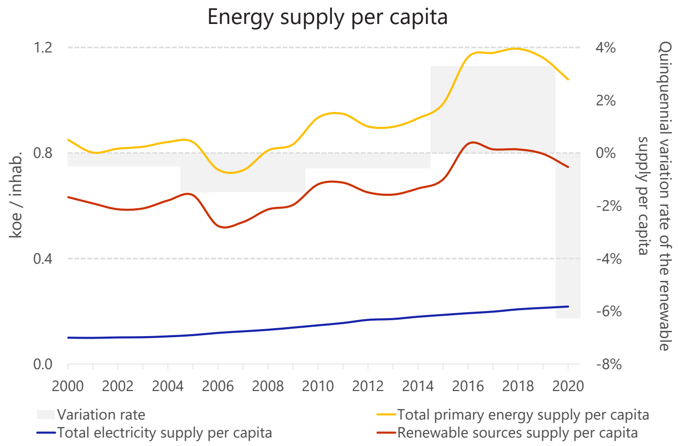
Logarithmic mean Divisia index for the structural decomposition of energy consumption
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect

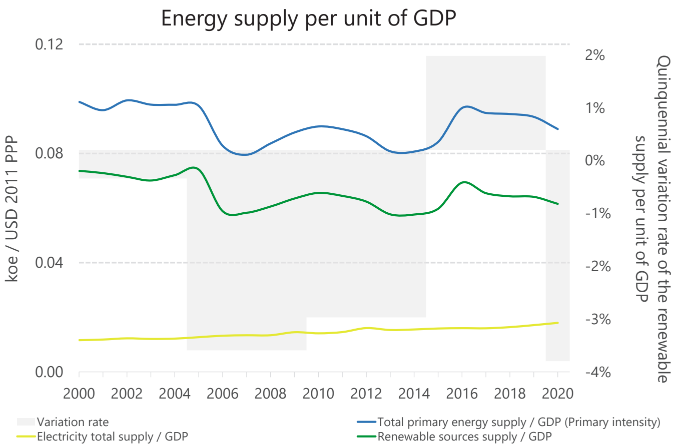


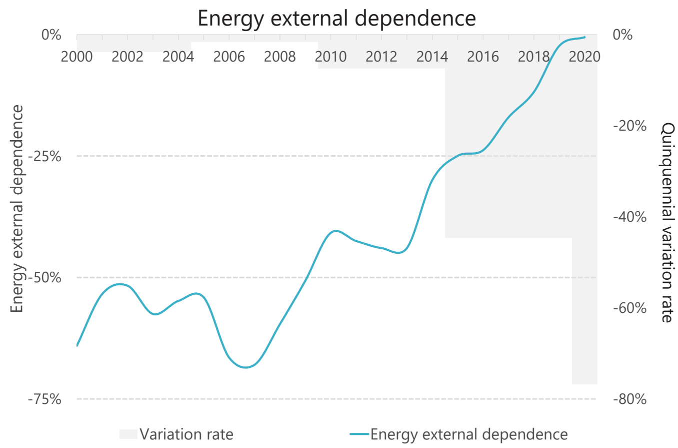
Efficiency of the electricity sector
Efficiency of the electricity sector
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

PARAGUAY



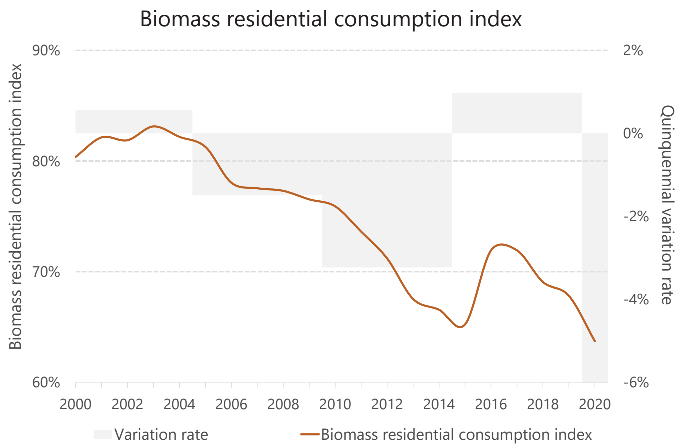


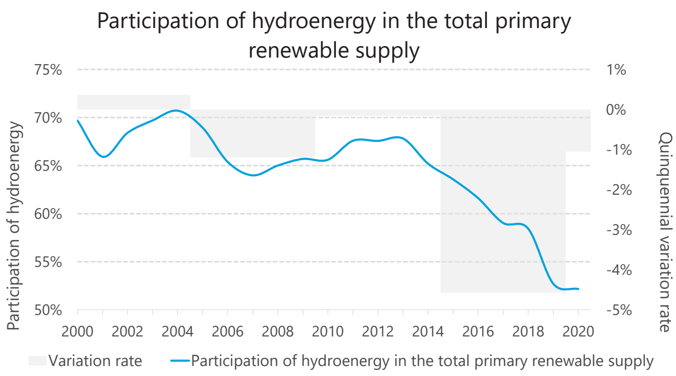




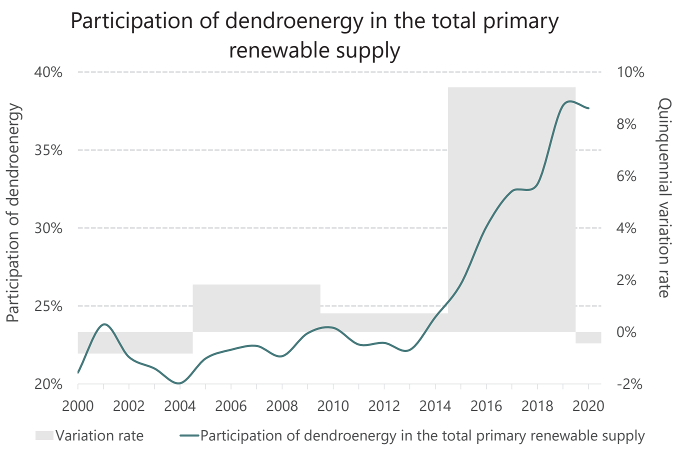
PARAGUAY

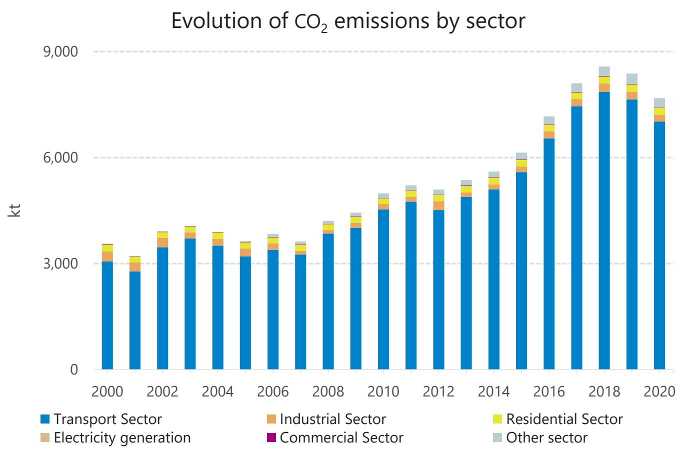
Hydroelectric power represents the majority of Paraguay's electricity generation, accounting for about 99.9% of installed electricity capacity. Paraguay is highly dependent on the hydrological conditions of the rivers that feed the country's main hydroelectric power plants, around 60% of the total gross generation was exported in 2020.

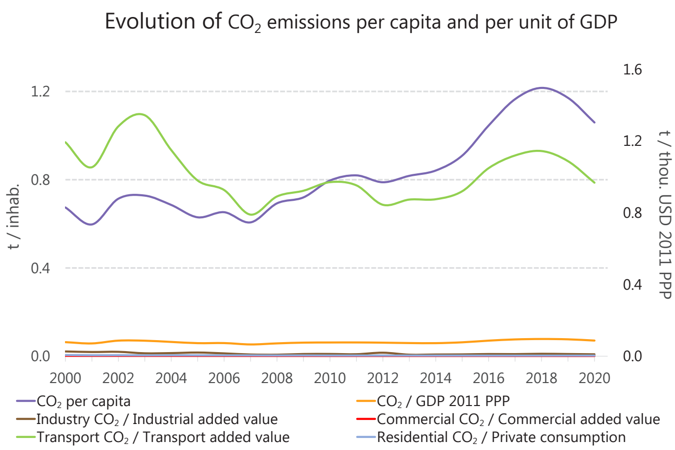


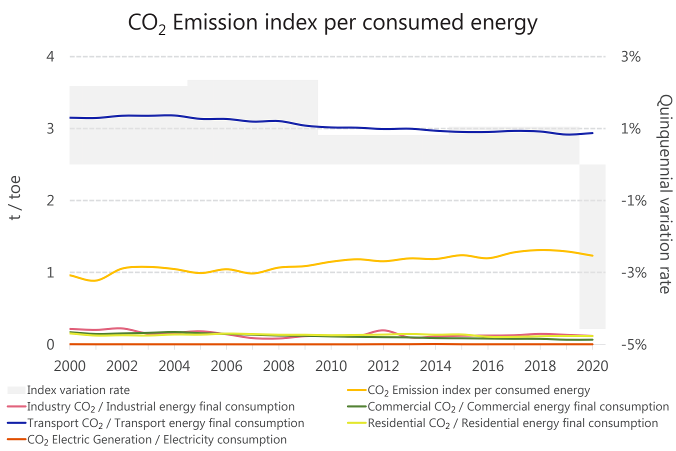


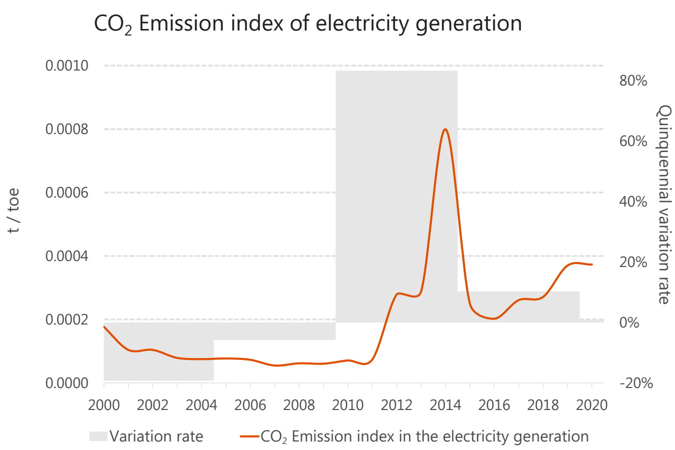
The share behavior of hydropower in the last period of the series is due to the aforementioned change in the value of the density of firewood. As the firewood had a higher value, it increased its share, decreasing that of hydroenergy. To this must be added the decrease in water availability.

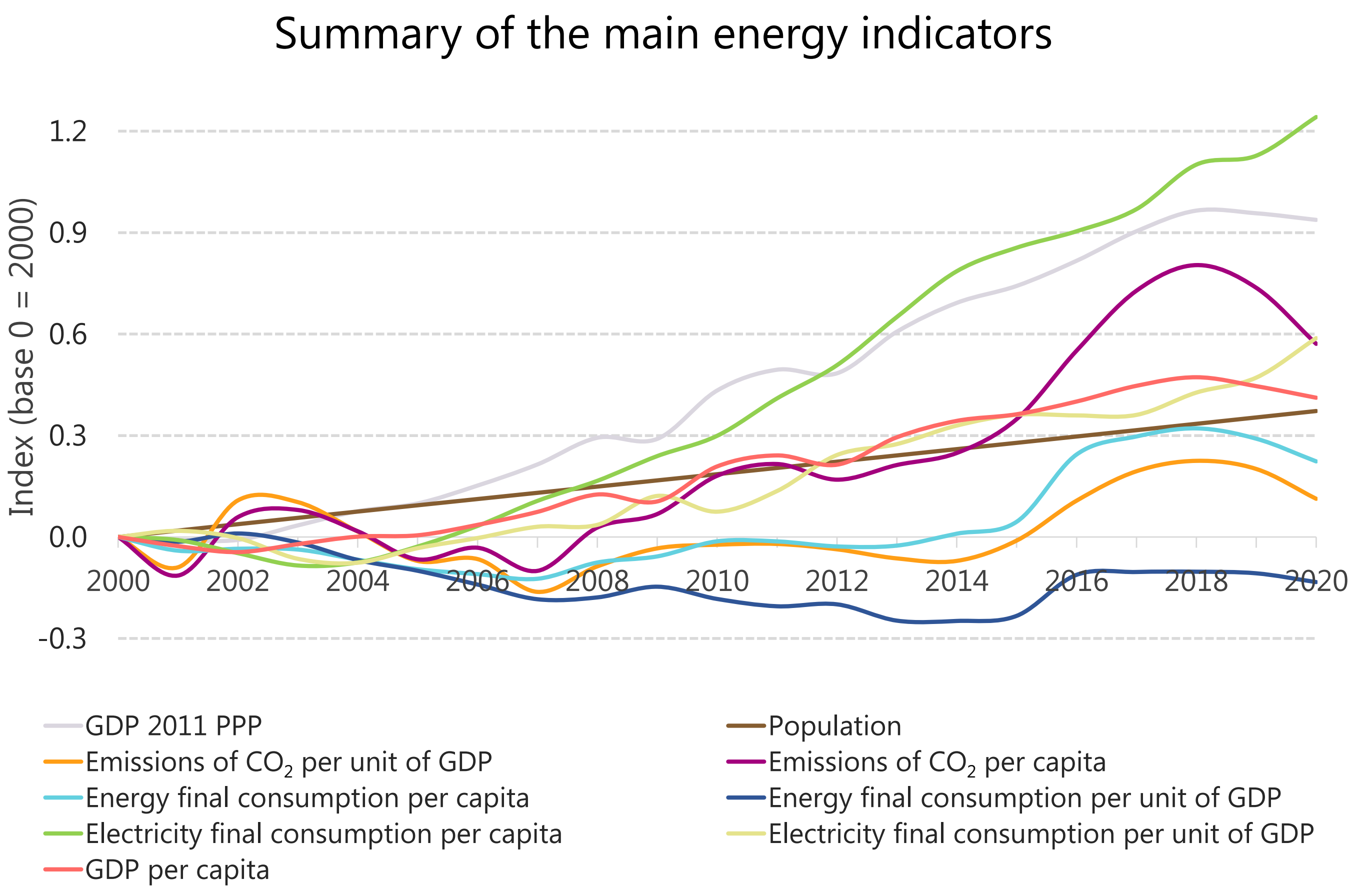











Summary of the main energy indicators
Index (base 0 = 2000)
1.2
0.9
0.6
0.3
0.0
-0.3
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

PARAGUAY

PERU

General Information 2020

Population (thousand inhab.)	32,972 [1]
Area (km^2)	1,285,220
Population Density (inhab. / km^2)	26
Urban Population (%)	78
GDP USD 2010 (MUSD)	187,456 [1]
GDP USD 2011 PPP (MUSD)	371,291
GDP per capita (thou. USD 2011 PPP / inhab.)	11 [2]

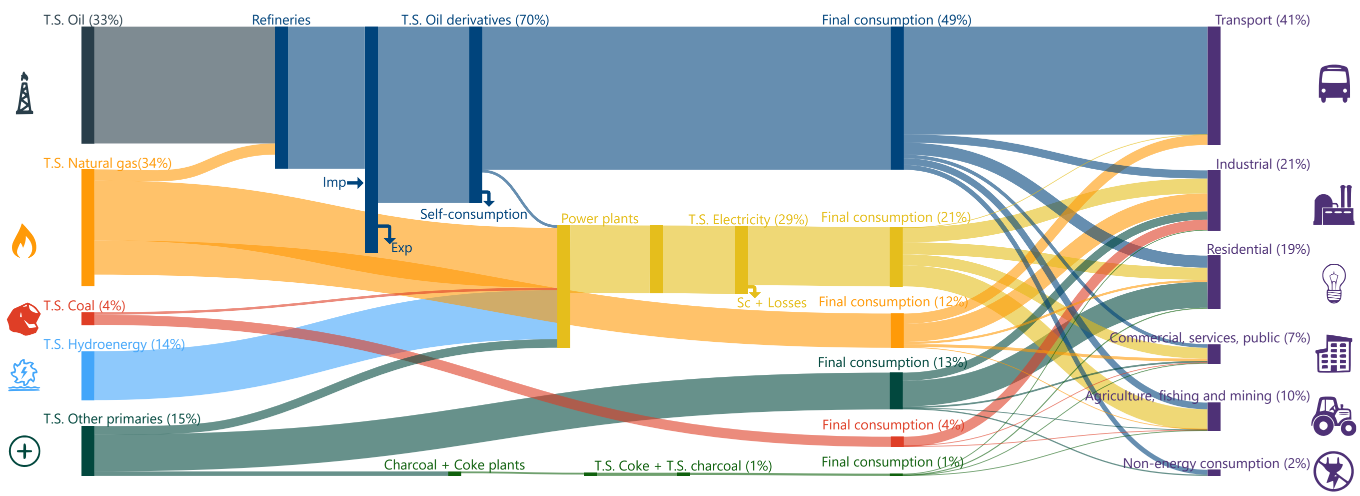
Energy Sector 2020

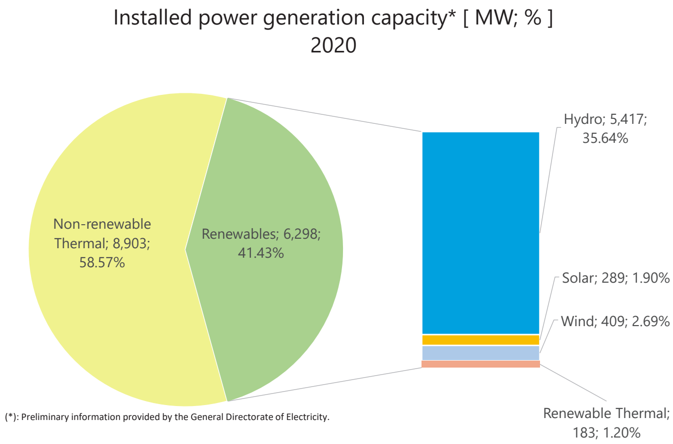
Final consumption in the Transport Sector	Mtep	7.92
Final consumption in the Industrial Sector	Mtep	3.83
Final consumption in the Residential Sector	Mtep	3.56
Final consumption in the Commercial and Service Sector	Mtep	1.31
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	2.31
Oil Reserves	Mbbl	345 [4]
Natural gas Reserves	Gm^3	300 [4]
Coal Reserves	Mt	7 [5]

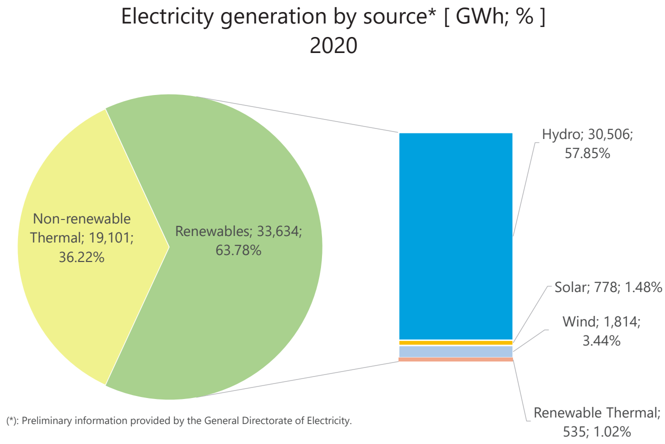
[1] Source: ECLAC.
[2] Source: World Bank.
[3] Data corresponding to the year 2018.
[4] Data corresponding to the year 2018.
[5] Data corresponding to the year 2017.
[6] Preliminary data provided by the General Directorate of Electricity.
Note: The supply and demand data for the year 2020 corresponds to estimates made by OLADE, subject to review by the country.

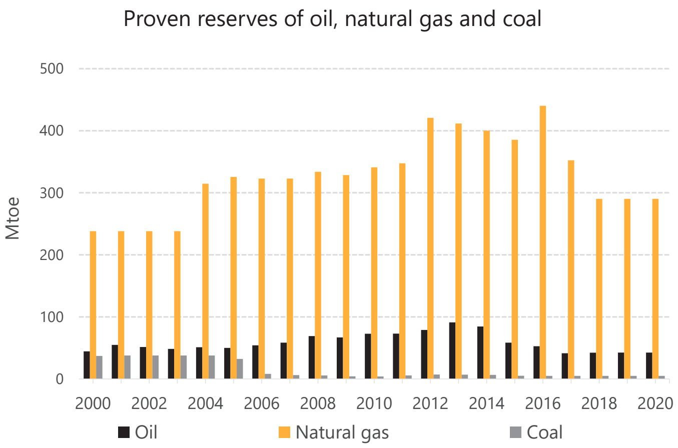
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
1,396	0.57	97.00 [3]	24.22	30.53	8.17	10.04	18.93	215	15.20 [6]	0.07 / 0.05
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

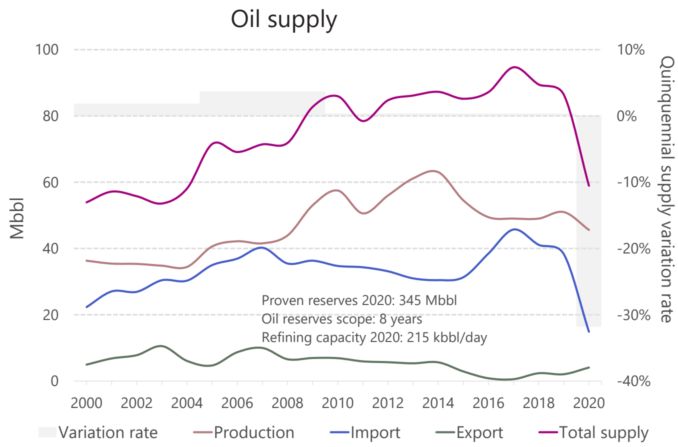
Summarized energy balance 2020

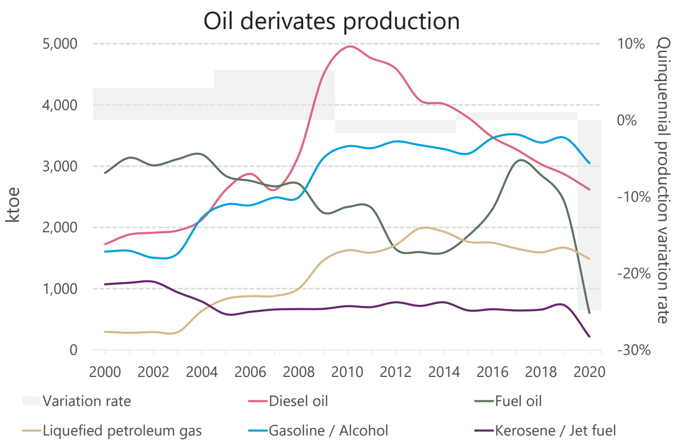


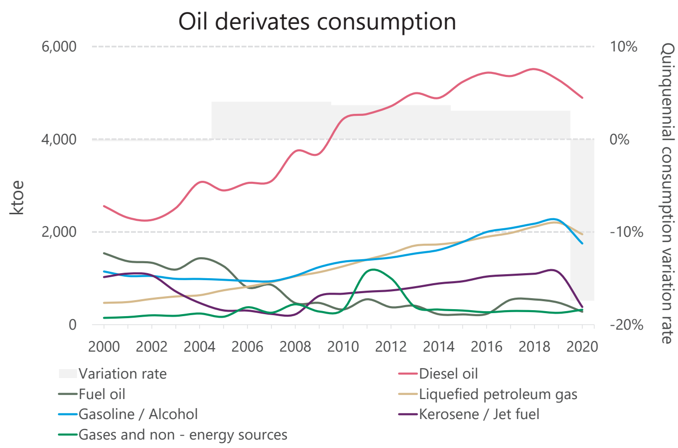

Installed power generation capacity* [MW; %]
2020
Non-renewable Thermal; 8,903; 58.57%
Renewables; 6,298; 41.43%
Hydro; 5,417; 35.64%
Solar; 289; 1.90%
Wind; 409; 2.69%
Renewable Thermal; 183; 1.20%
(*): Preliminary information provided by the General Directorate of Electricity.

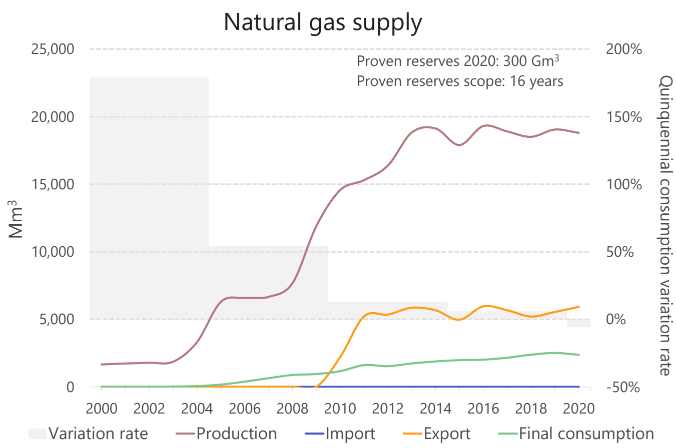

Electricity generation by source* [GWh; %]
2020
Non-renewable Thermal; 19,101; 36.22%
Renewables; 33,634; 63.78%
Hydro; 30,506; 57.85%
Solar; 778; 1.48%
Wind; 1,814; 3.44%
Renewable Thermal; 535; 1.02%
(*): Preliminary information provided by the General Directorate of Electricity.


Proven reserves of oil, natural gas and coal
Mtoe
Oil
Natural gas
Coal

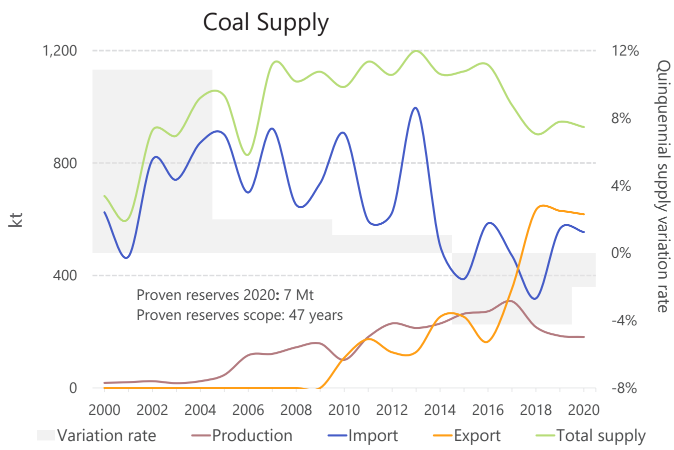

Oil supply
Mbbl
Quinquennial supply variation rate
Proven reserves 2020: 345 Mbbl
Oil reserves scope: 8 years
Refining capacity 2020: 215 kbbl/day
Variation rate
Production
Import
Export
Total supply


Oil derivates production
ktoe
Quinquennial production variation rate
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel

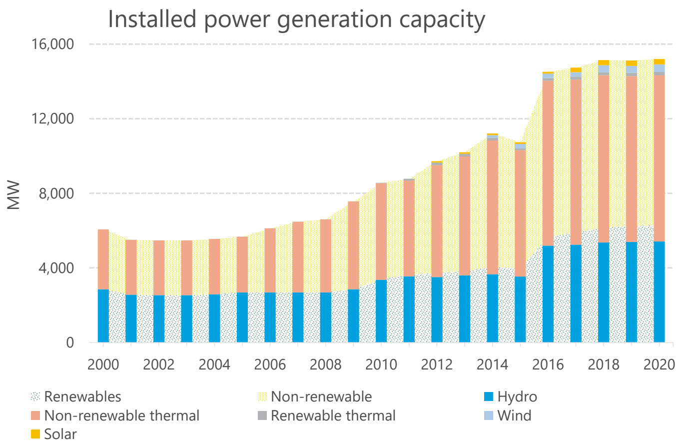

Oil derivates consumption
ktoe
Quinquennial consumption variation rate
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Gases and non - energy sources



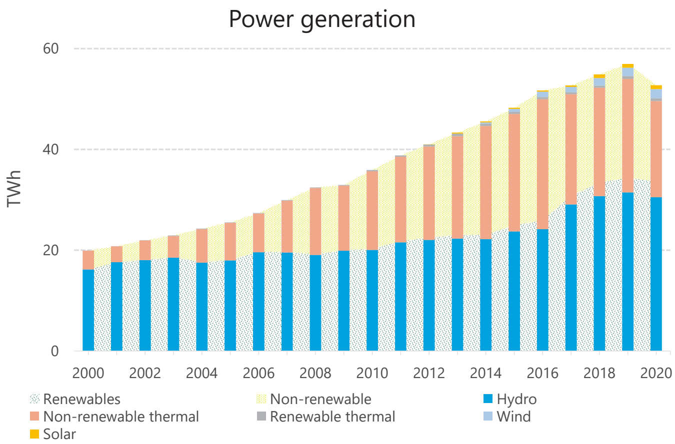
Natural gas supply
Proven reserves 2020: 300 Gm³
Proven reserves scope: 16 years
Mm³
Quinquennial consumption variation rate
25,000
20,000
15,000
10,000
5,000
0
200%
150%
100%
50%
0%
-50%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Production
Import
Export
Final consumption



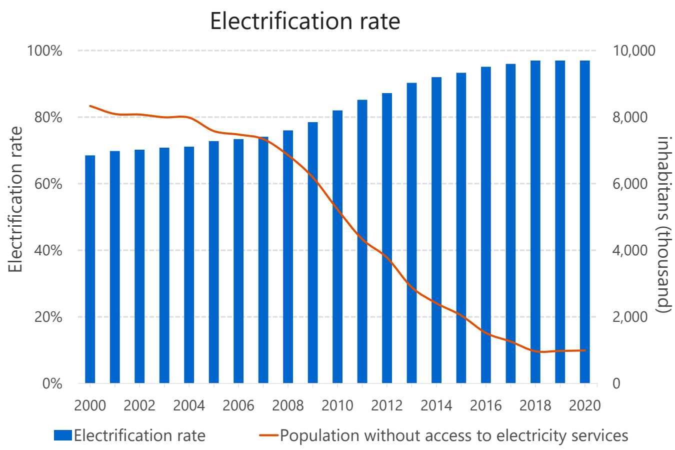
Coal Supply
Proven reserves 2020: 7 Mt
Proven reserves scope: 47 years
kt
Quinquennial supply variation rate
1,200
800
400
0
12%
8%
4%
0%
-4%
-8%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Production
Import
Export
Total supply



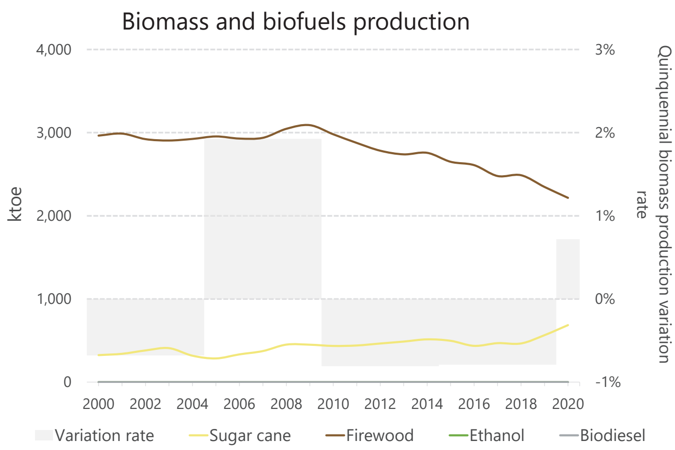
Installed power generation capacity
MW
16,000
12,000
8,000
4,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Wind
Solar



Power generation
TWh
60
40
20
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Wind
Solar

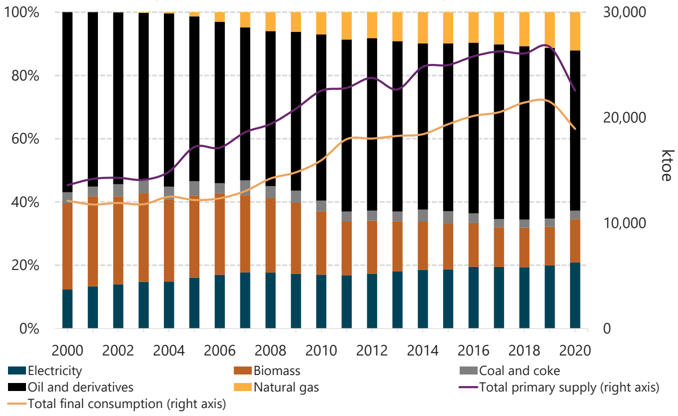


Electrification rate
Electrification rate
inhabitans (thousand)
100%
80%
60%
40%
20%
0%
10,000
8,000
6,000
4,000
2,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electrification rate
Population without access to electricity services

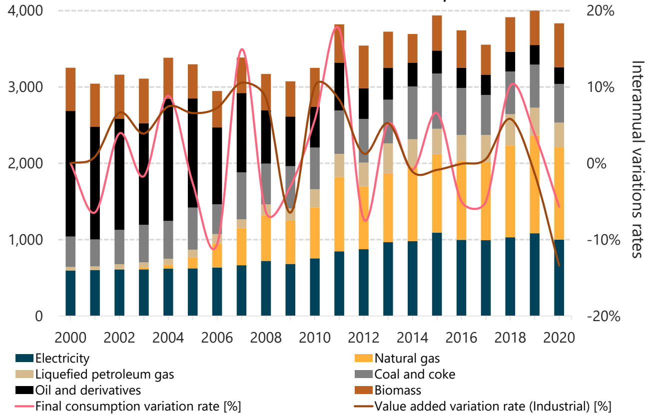


Biomass and biofuels production
ktoe
Quinquennial biomass production variation rate
4,000
3,000
2,000
1,000
0
3%
2%
1%
0%
-1%
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Variation rate
Sugar cane
Firewood
Ethanol
Biodiesel

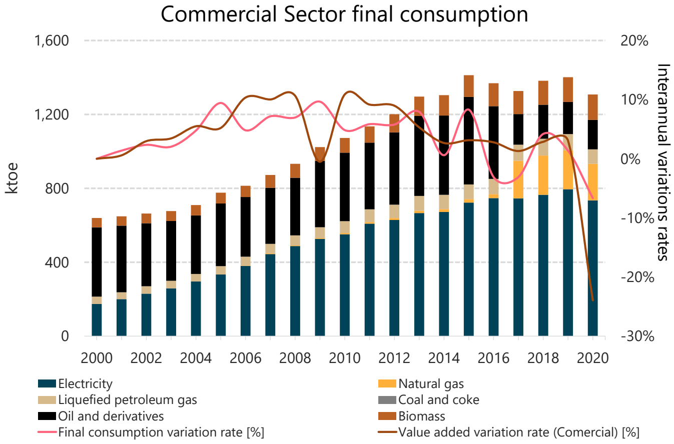
Energy final consumption by energy source



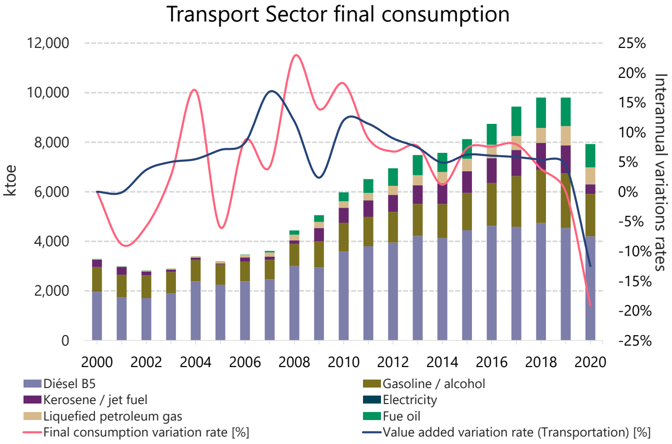
Industrial Sector final consumption



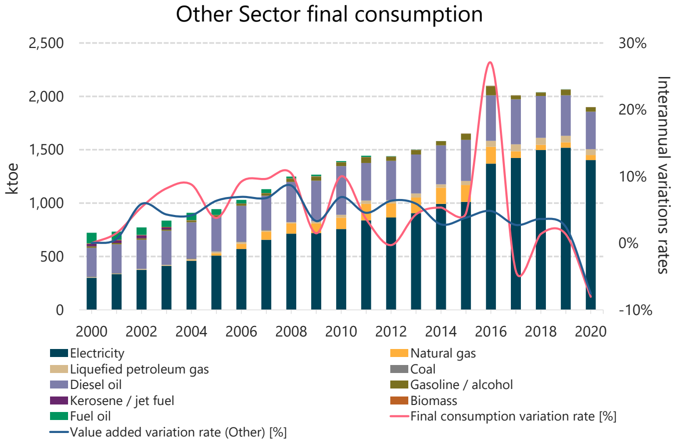
Commercial Sector final consumption



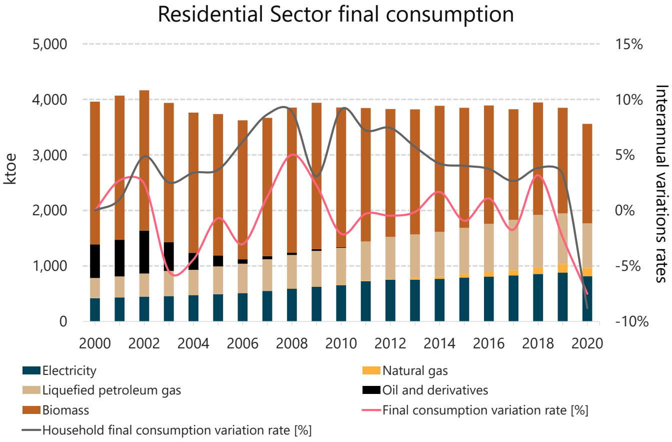
Transport Sector final consumption

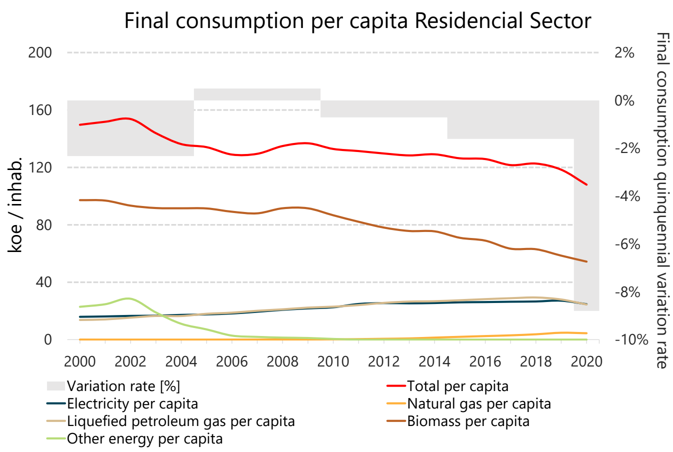


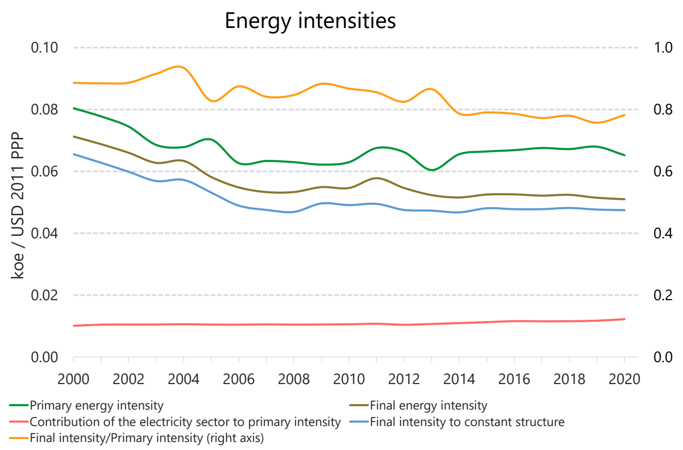
Other Sector final consumption

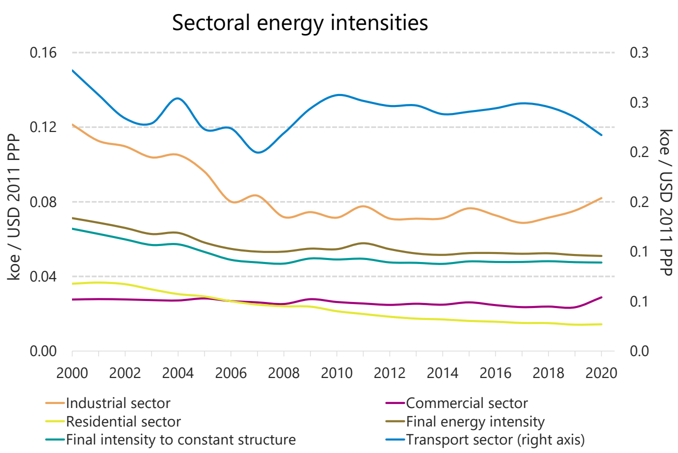


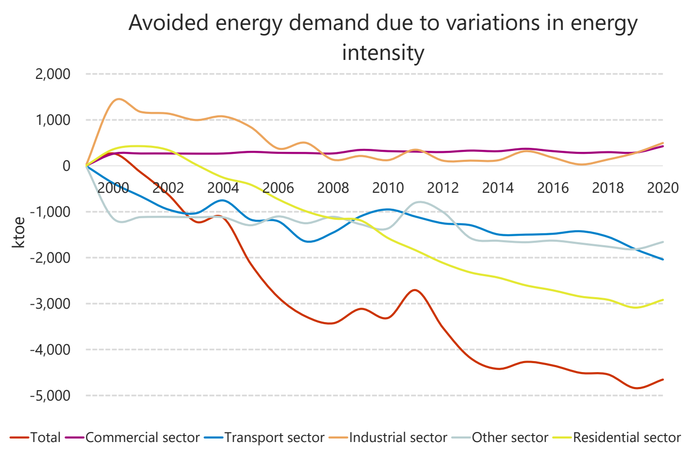
Residential Sector final consumption

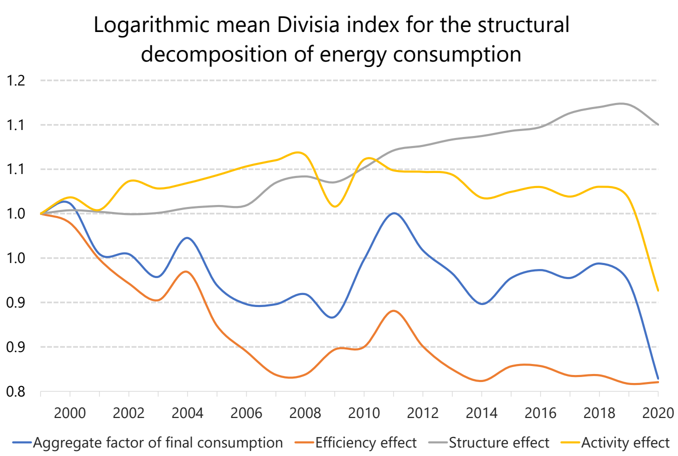


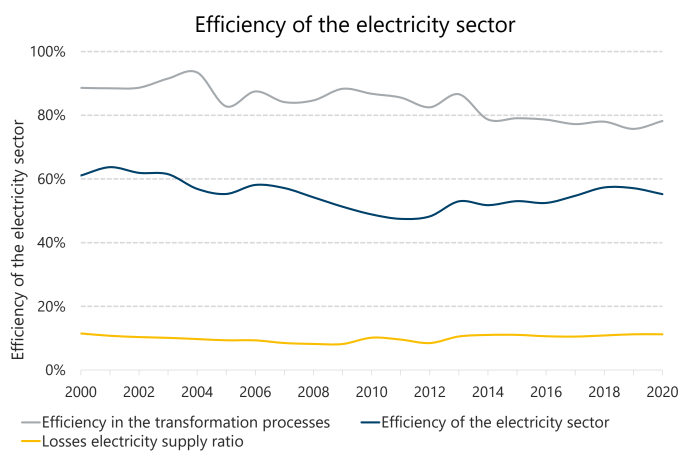

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
Variation rate [%]
Total per capita
Electricity per capita
Natural gas per capita
Liquefied petroleum gas per capita
Biomass per capita
Other energy per capita


Energy intensities
koe / USD 2011 PPP
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

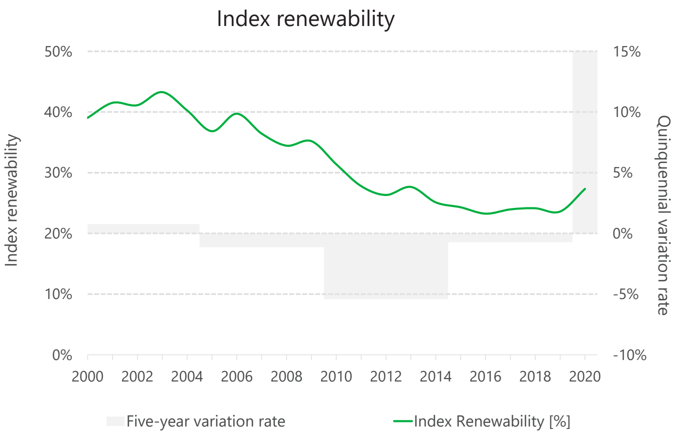

Sectoral energy intensities
koe / USD 2011 PPP
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)

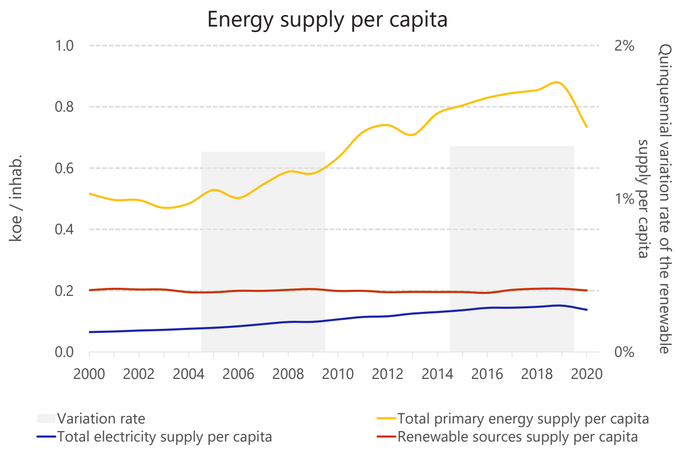

Avoided energy demand due to variations in energy intensity
ktoe
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

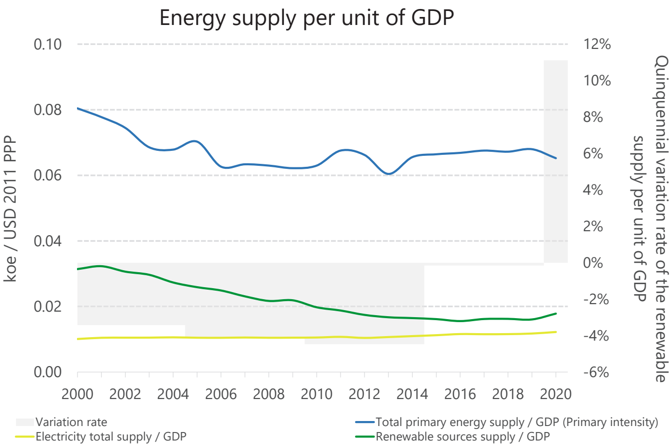

Logarithmic mean Divisia index for the structural decomposition of energy consumption
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect

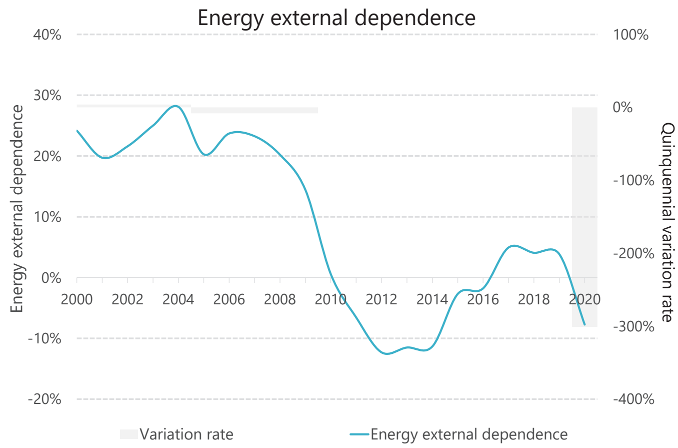

Efficiency of the electricity sector
Efficiency of the electricity sector
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

PERU

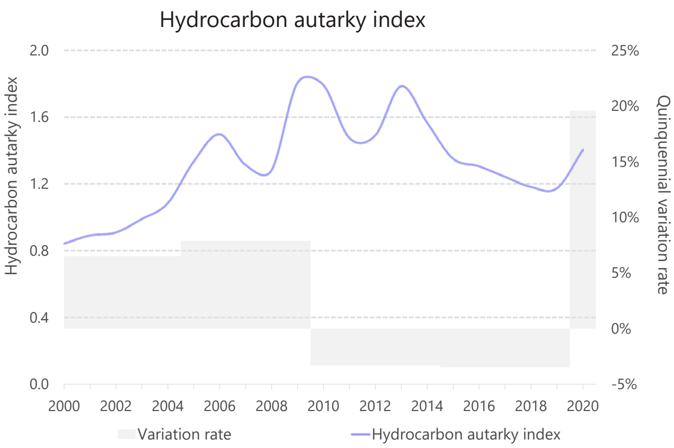

Index renewability
Index renewability
Quinquennial variation rate
Five-year variation rate
Index Renewability [%]

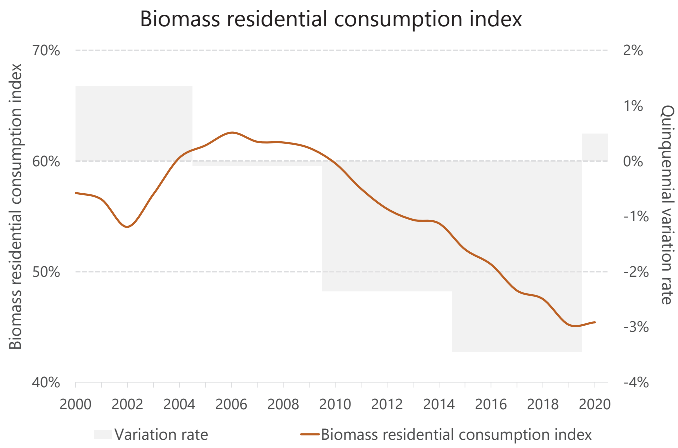

Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita


Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP


Energy external dependence
Energy external dependence
Quinquennial variation rate
Variation rate
Energy external dependence

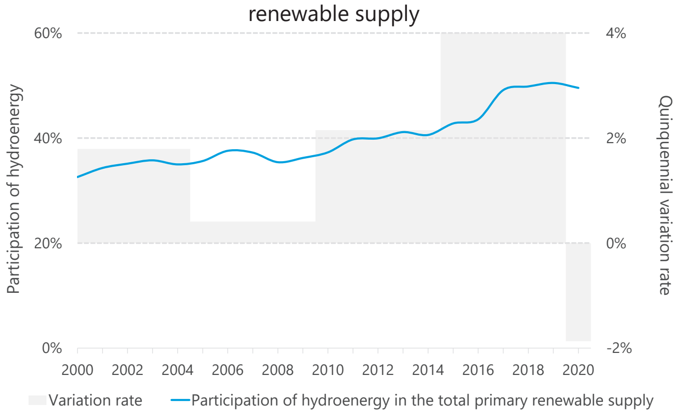
PERU


Hydrocarbon autarky index
Hydrocarbon autarky index
Quinquennial variation rate
Variation rate
Hydrocarbon autarky index

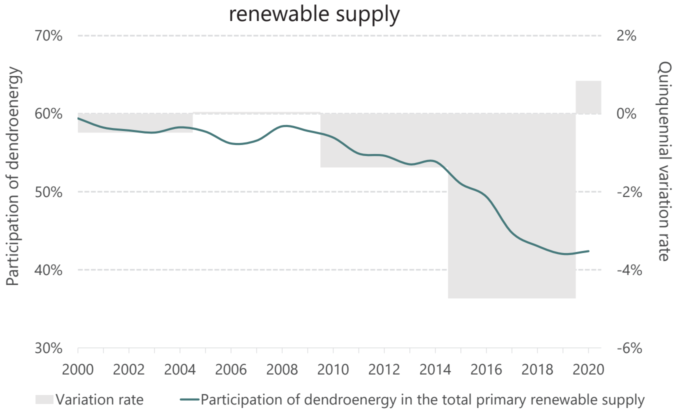

Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
Variation rate
Biomass residential consumption index

PERU

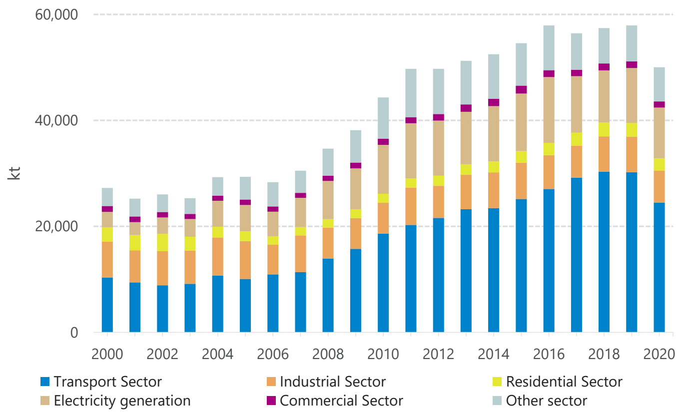
Participation of hydroenergy in the total primary renewable supply



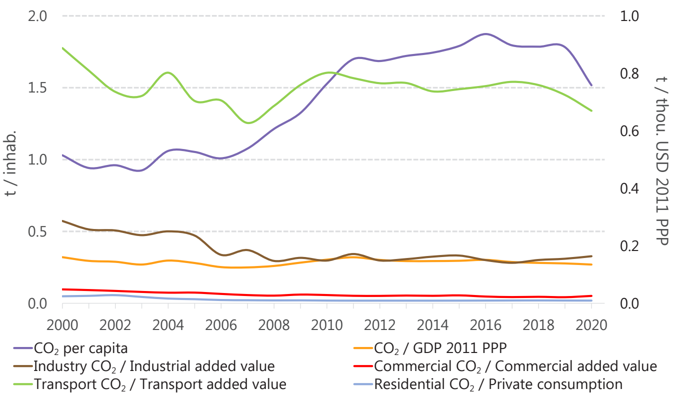
Participation of dendroenergy in the total primary renewable supply



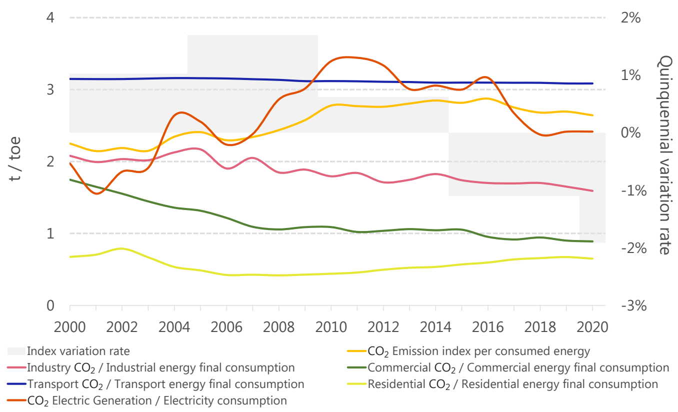
Evolution of CO_2 emissions by sector



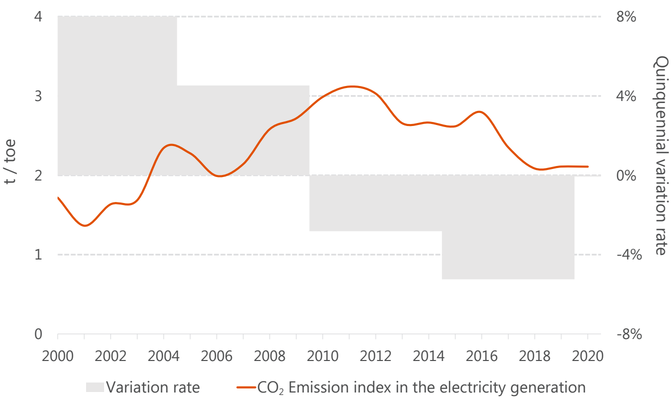
Evolution of CO_2 emissions per capita and per unit of GDP



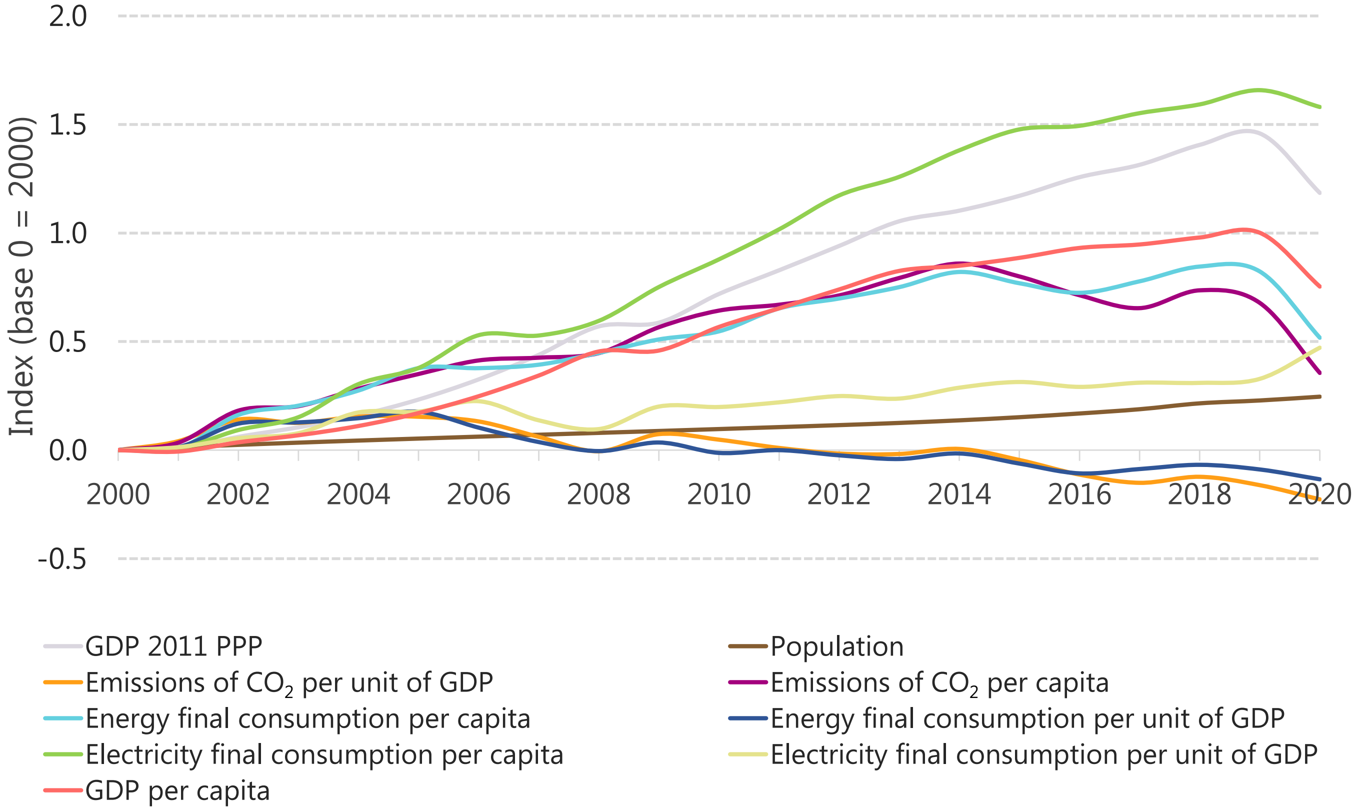
CO_2 Emission index per consumed energy



CO_2 Emission index of electricity generation



Summary of the main energy indicators



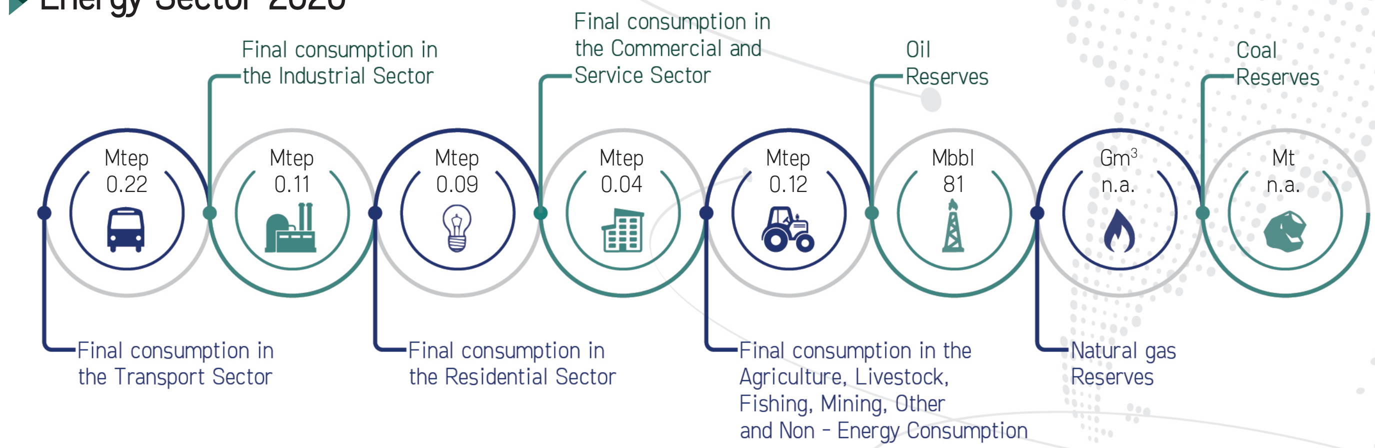
PERU

SURINAME

General Information 2020

Population (thousand inhab.)	587 [1]
Area (km²)	163,820
Population Density (inhab. / km²)	4
Urban Population (%)	66
GDP USD 2010 (MUSD)	4,440 [1]
GDP USD 2011 PPP (MUSD)	9,463 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	16

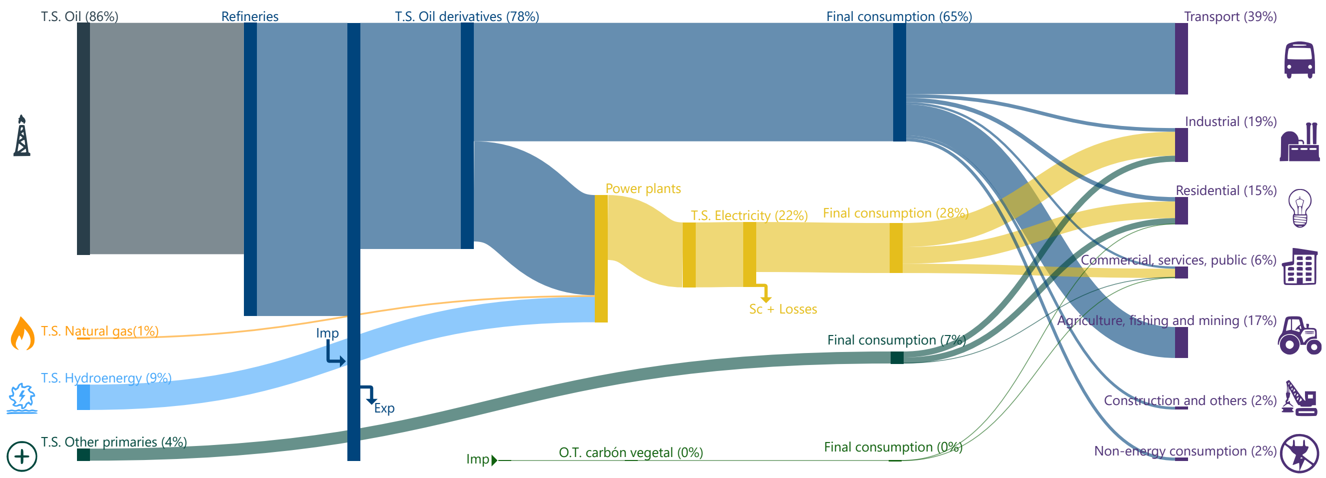
Energy Sector 2020

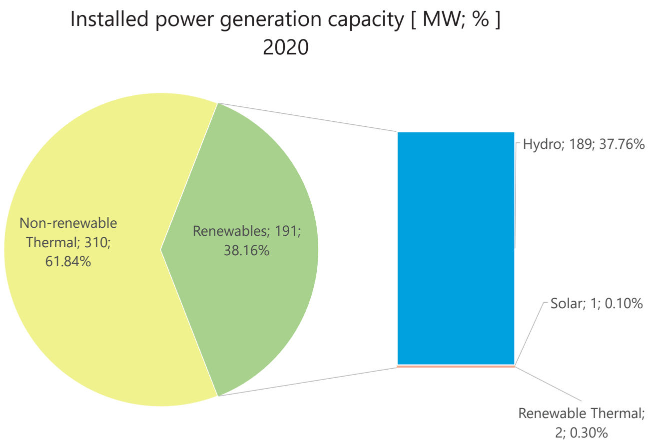


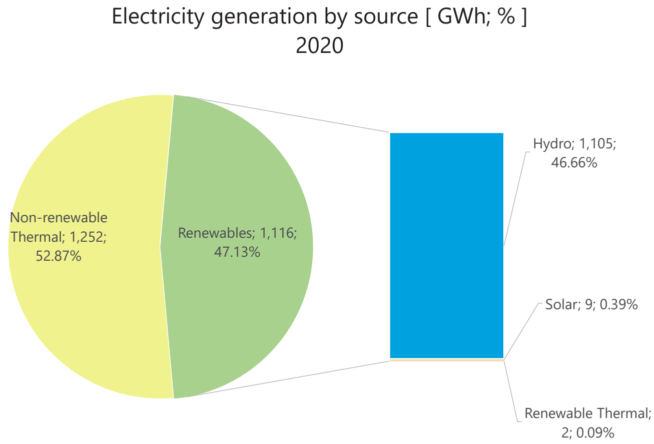
[1] Source: ECLAC.
[2] Source: World Bank.
Note: The supply and demand data for 2020 correspond to estimates made by OLADE.

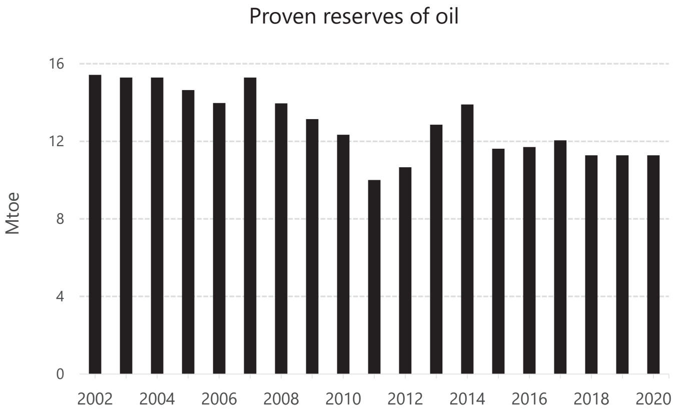
kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
3,108	0.97	90.34	0.62	0.86	0.43	0.66	0.57	15	0.50	0.07 / 0.06
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

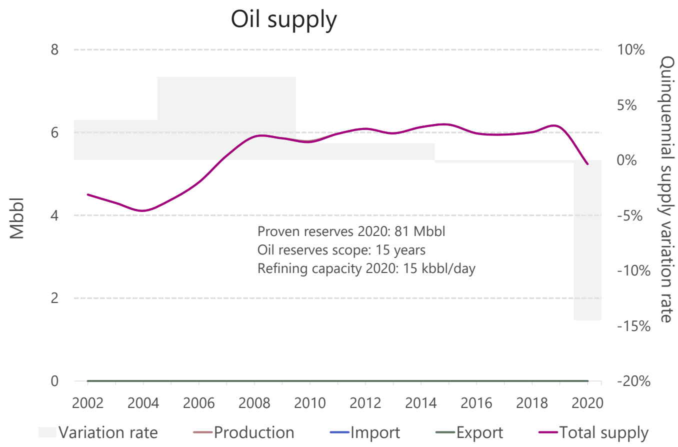
Summarized energy balance 2020

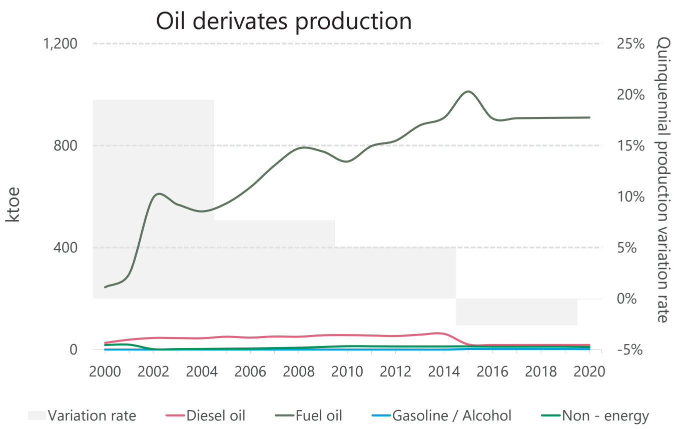


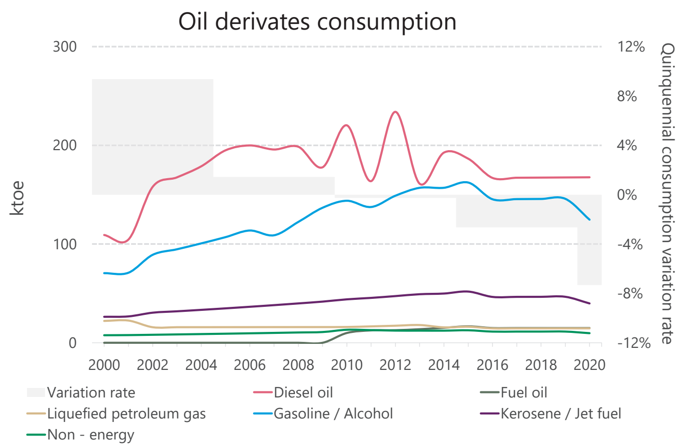

Installed power generation capacity [MW; %]
2020
Non-renewable Thermal; 310; 61.84%
Renewables; 191; 38.16%
Hydro; 189; 37.76%
Solar; 1; 0.10%
Renewable Thermal; 2; 0.30%


Electricity generation by source [GWh; %]
2020
Non-renewable Thermal; 1,252; 52.87%
Renewables; 1,116; 47.13%
Hydro; 1,105; 46.66%
Solar; 9; 0.39%
Renewable Thermal; 2; 0.09%

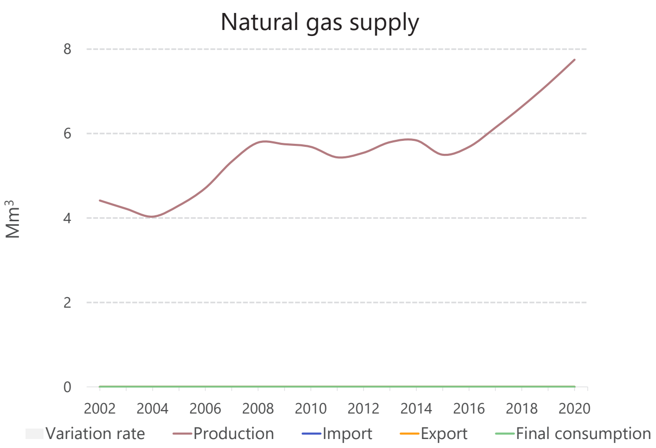

Proven reserves of oil
Mtoe
16
12
8
4
0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020


Oil supply
Mbbl
Quinquennial supply variation rate
Proven reserves 2020: 81 Mbbl
Oil reserves scope: 15 years
Refining capacity 2020: 15 kbbl/day
Variation rate
Production
Import
Export
Total supply

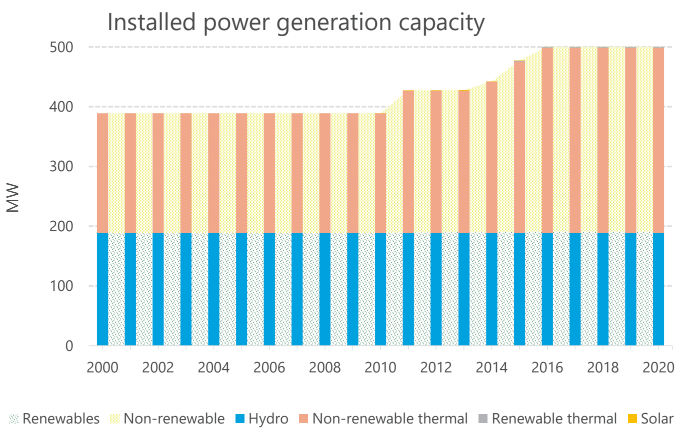

Oil derivates production
ktoe
Quinquennial production variation rate
Variation rate
Diesel oil
Fuel oil
Gasoline / Alcohol
Non - energy


Oil derivates consumption
ktoe
Quinquennial consumption variation rate
Variation rate
Diesel oil
Fuel oil
Liquefied petroleum gas
Gasoline / Alcohol
Kerosene / Jet fuel
Non - energy

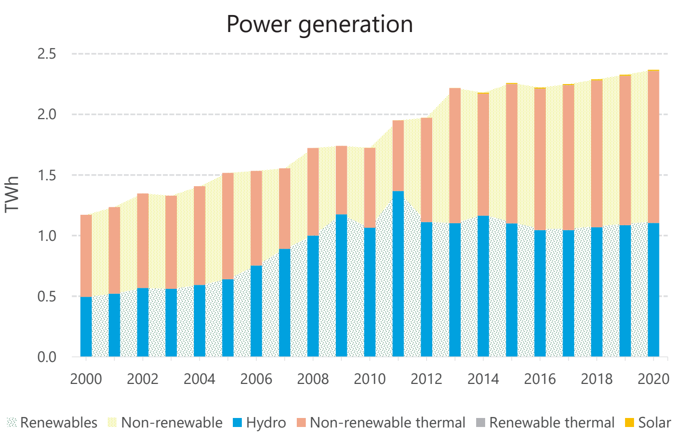
SURINAME



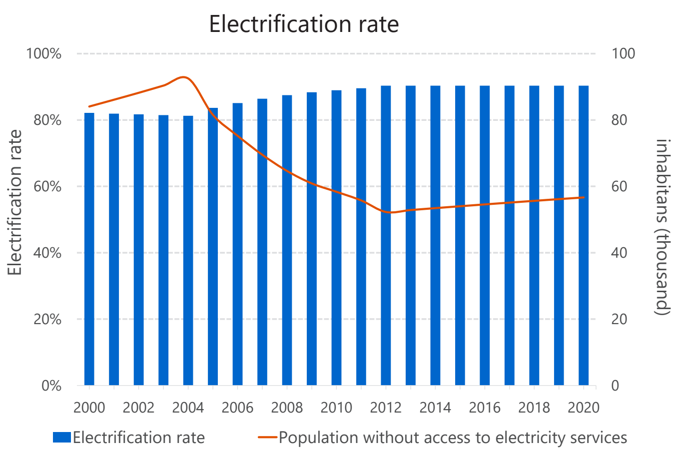
Natural gas supply
Mm³
8
6
4
2
0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Production
Import
Export
Final consumption



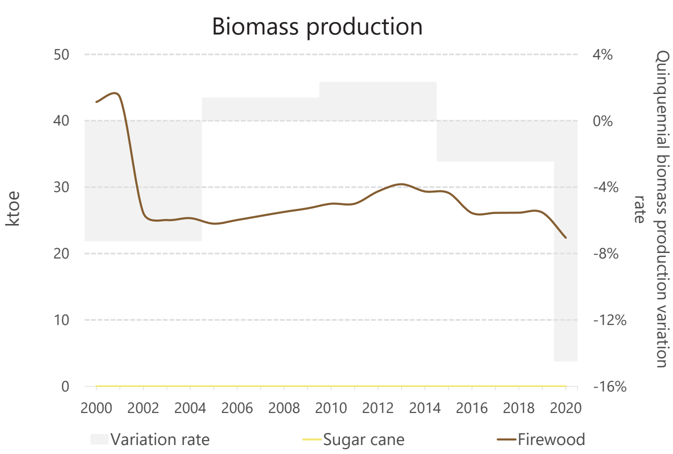
Installed power generation capacity
MW
500
400
300
200
100
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Solar



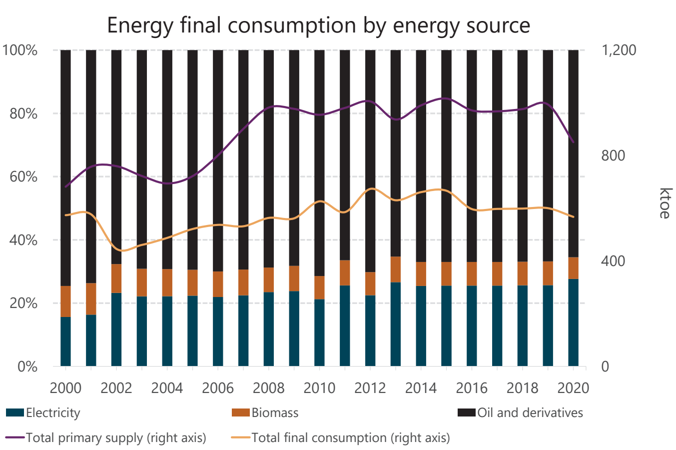
Power generation
TWh
2.5
2.0
1.5
1.0
0.5
0.0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Renewables
Non-renewable
Hydro
Non-renewable thermal
Renewable thermal
Solar



Electrification rate
Electrification rate
inhabitants (thousand)
100%
80%
60%
40%
20%
0%
100
80
60
40
20
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Electrification rate
Population without access to electricity services

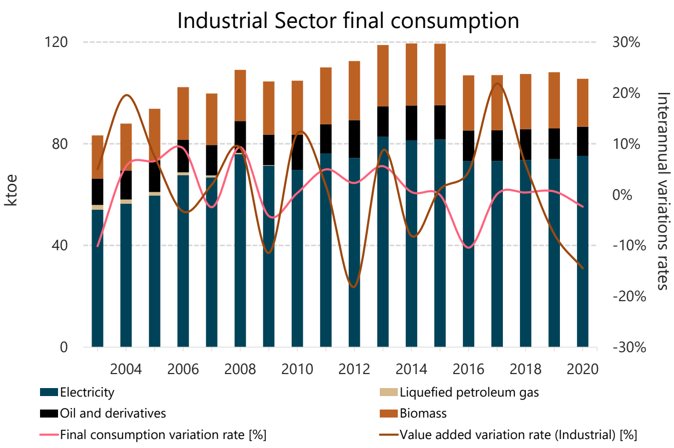


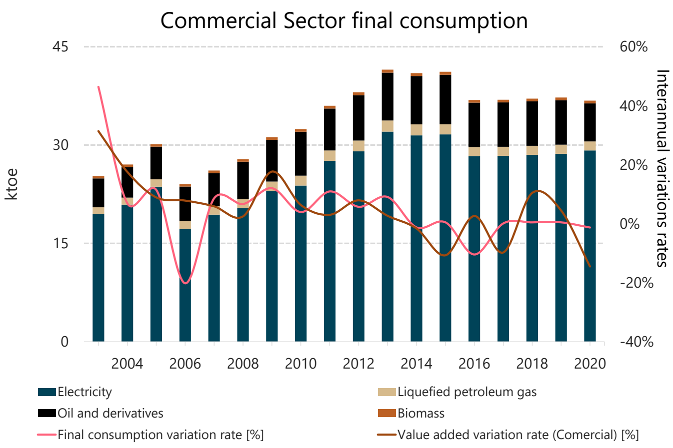
Biomass production
ktoe
Quinquennial biomass production variation rate
50
40
30
20
10
0
4%
0%
-4%
-8%
-12%
-16%
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
Sugar cane
Firewood

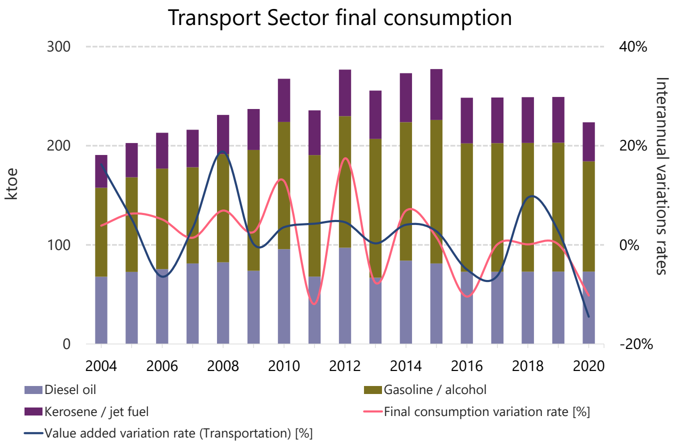


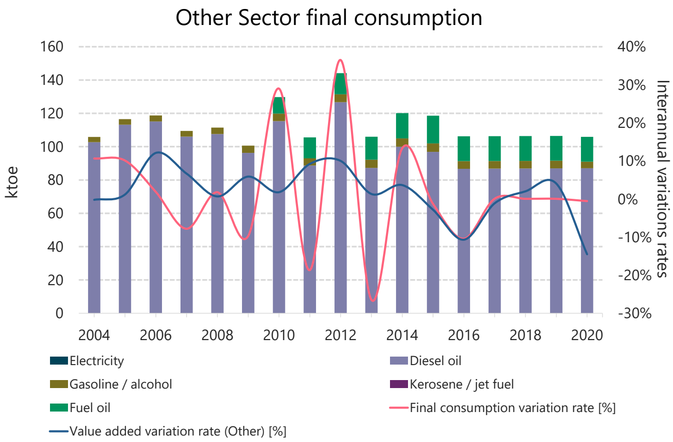
Energy final consumption by energy source
ktoe
100%
80%
60%
40%
20%
0%
1,200
800
400
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Electricity
Biomass
Oil and derivatives
Total primary supply (right axis)
Total final consumption (right axis)

SURINAME

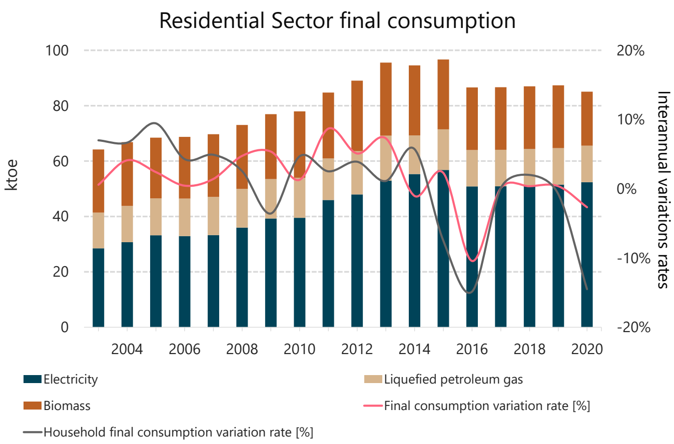

Industrial Sector final consumption
ktoe
Interannual variations rates
120
80
40
0
30%
20%
10%
0%
-10%
-20%
-30%
2004
2006
2008
2010
2012
2014
2016
2018
2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]

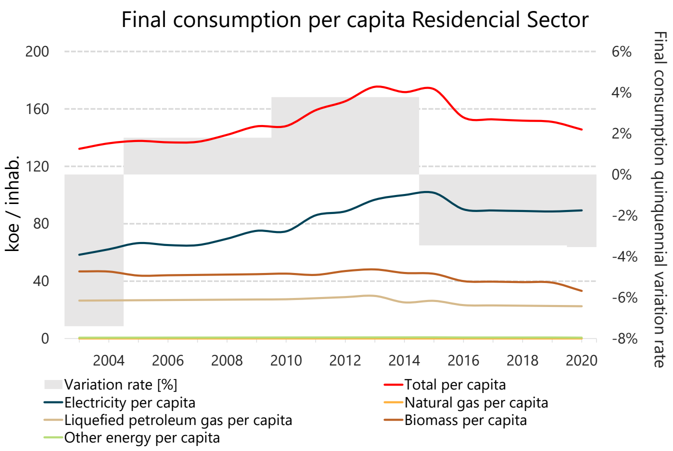

Commercial Sector final consumption
ktoe
Interannual variations rates
45
30
15
0
60%
40%
20%
0%
-20%
-40%
2004
2006
2008
2010
2012
2014
2016
2018
2020
Electricity
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]

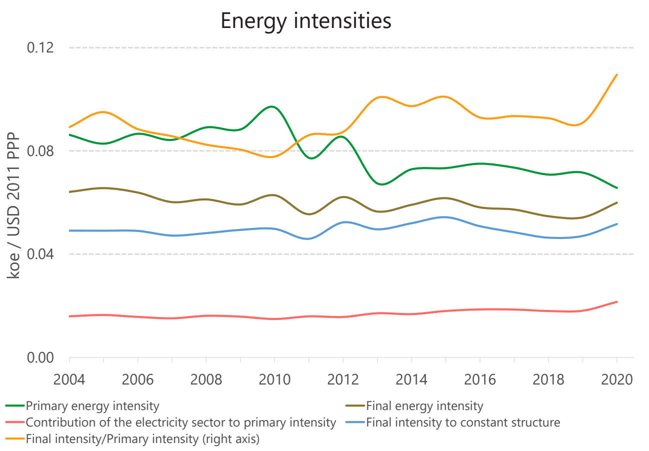

Transport Sector final consumption
ktoe
Interannual variations rates
300
200
100
0
40%
20%
0%
-20%
2004
2006
2008
2010
2012
2014
2016
2018
2020
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Final consumption variation rate [%]
Value added variation rate (Transportation) [%]

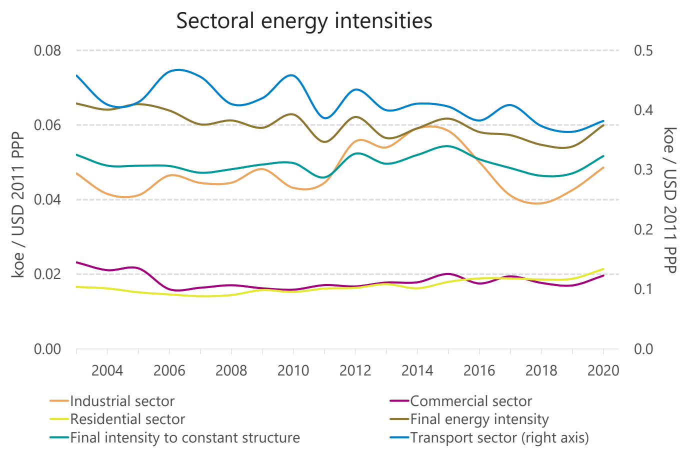

Other Sector final consumption
ktoe
Interannual variations rates
160
140
120
100
80
60
40
20
0
40%
30%
20%
10%
0%
-10%
-20%
-30%
2004
2006
2008
2010
2012
2014
2016
2018
2020
Electricity
Diesel oil
Gasoline / alcohol
Kerosene / jet fuel
Fuel oil
Final consumption variation rate [%]
Value added variation rate (Other) [%]

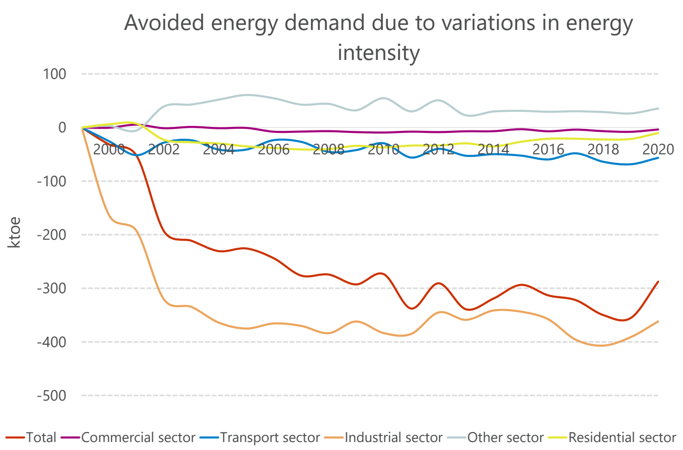
SURINAME

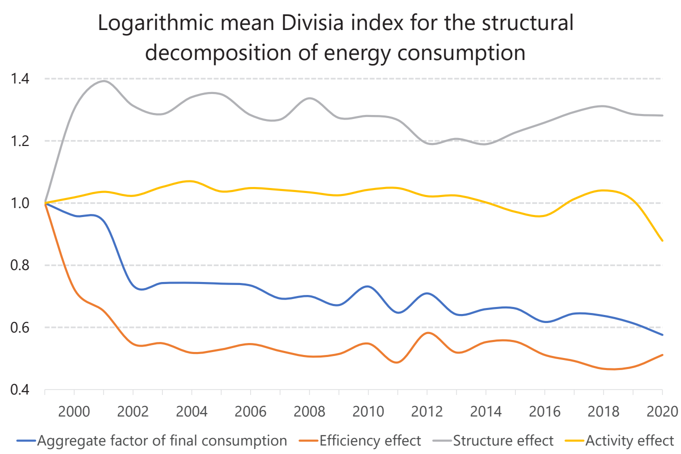

Residential Sector final consumption
ktoe
Interannual variations rates
100
80
60
40
20
0
20%
10%
0%
-10%
-20%
2004
2006
2008
2010
2012
2014
2016
2018
2020
Electricity
Liquefied petroleum gas
Biomass
Final consumption variation rate [%]
Household final consumption variation rate [%]

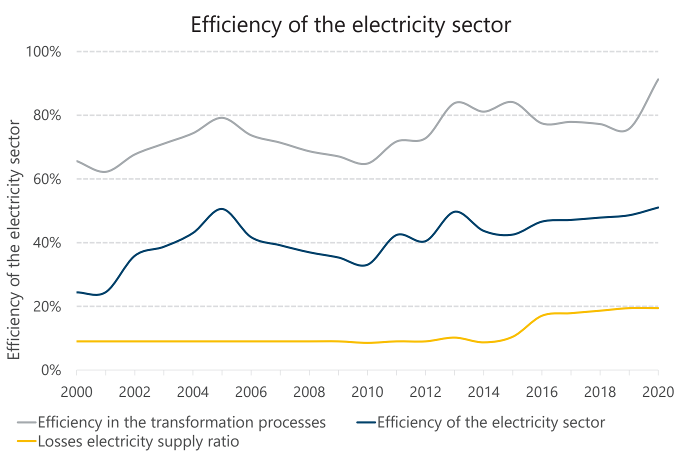

Final consumption per capita Residencial Sector
koe / inhab.
Final consumption quinquennial variation rate
200
160
120
80
40
0
6%
4%
2%
0%
-2%
-4%
-6%
-8%
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate [%]
Total per capita
Electricity per capita
Natural gas per capita
Liquefied petroleum gas per capita
Biomass per capita
Other energy per capita

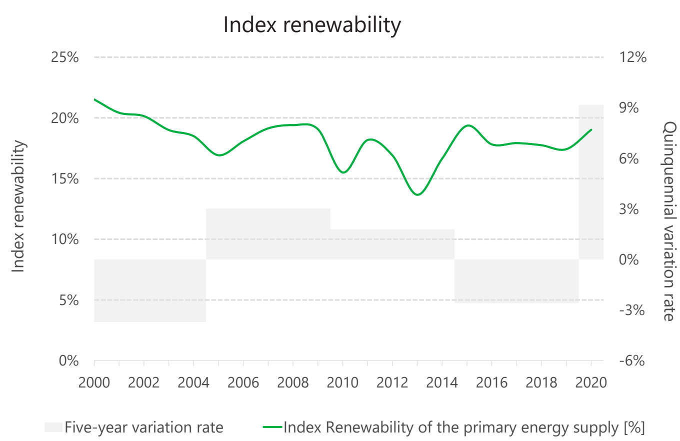

Energy intensities
0.12
0.08
0.04
0.00
koe / USD 2011 PPP
1.0
0.8
0.6
0.4
0.2
0.0
2004
2006
2008
2010
2012
2014
2016
2018
2020
Primary energy intensity
Final energy intensity
Contribution of the electricity sector to primary intensity
Final intensity to constant structure
Final intensity/Primary intensity (right axis)

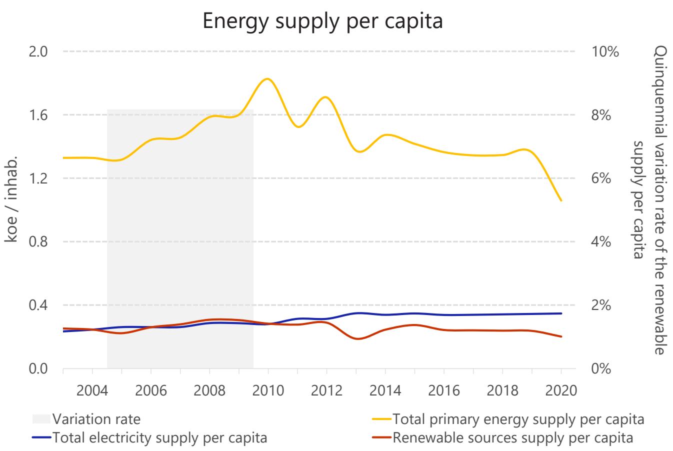

Sectoral energy intensities
0.08
0.06
0.04
0.02
0.00
koe / USD 2011 PPP
0.5
0.4
0.3
0.2
0.1
0.0
koe / USD 2011 PPP
2004
2006
2008
2010
2012
2014
2016
2018
2020
Industrial sector
Commercial sector
Residential sector
Final energy intensity
Final intensity to constant structure
Transport sector (right axis)

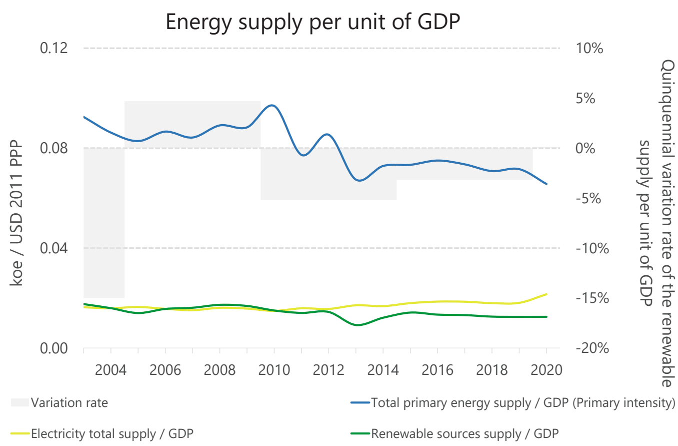

Avoided energy demand due to variations in energy intensity
100
0
-100
-200
-300
-400
-500
ktoe
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Total
Commercial sector
Transport sector
Industrial sector
Other sector
Residential sector

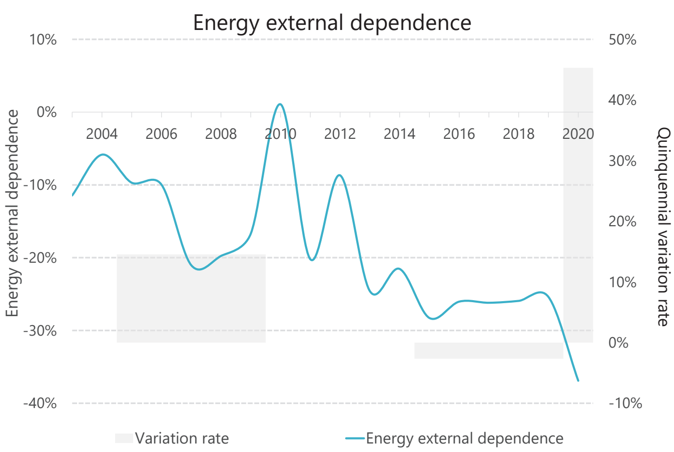

Logarithmic mean Divisia index for the structural decomposition of energy consumption
1.4
1.2
1.0
0.8
0.6
0.4
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Aggregate factor of final consumption
Efficiency effect
Structure effect
Activity effect

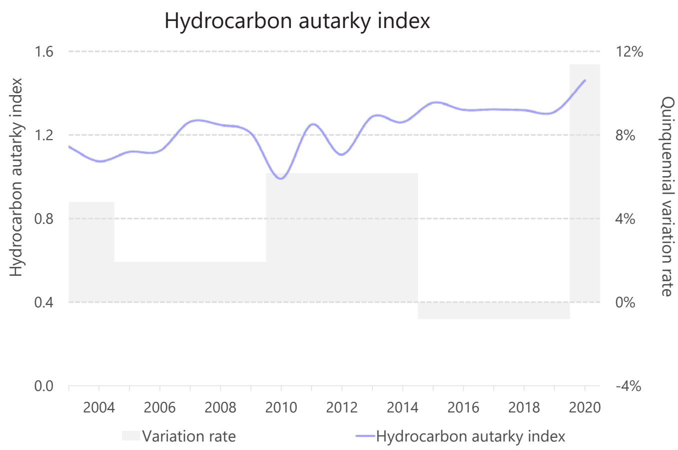

Efficiency of the electricity sector
100%
80%
60%
40%
20%
0%
Efficiency of the electricity sector
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Efficiency in the transformation processes
Efficiency of the electricity sector
Losses electricity supply ratio

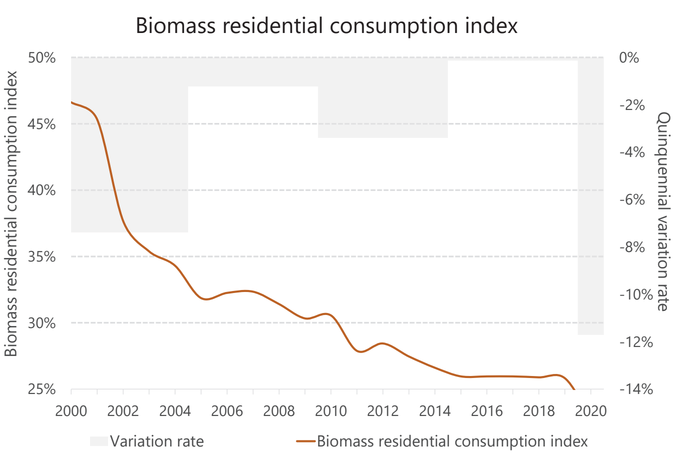

Index renewability
25%
20%
15%
10%
5%
0%
Index renewability
12%
9%
6%
3%
0%
-3%
-6%
Quinquennial variation rate
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Five-year variation rate
Index Renewability of the primary energy supply [%]

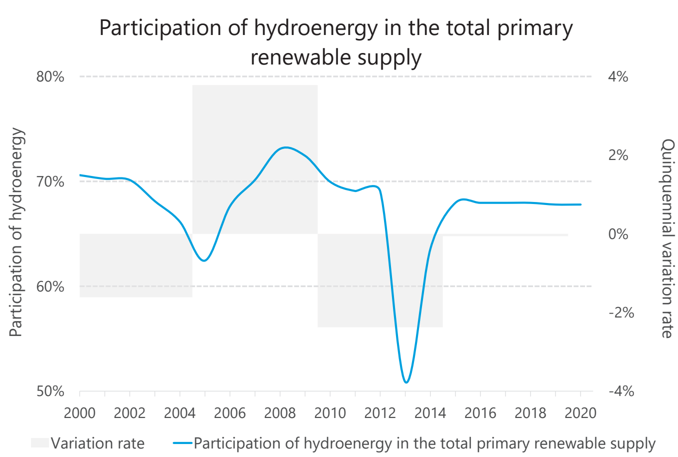

Energy supply per capita
koe / inhab.
Quinquennial variation rate of the renewable supply per capita
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita


Energy supply per unit of GDP
koe / USD 2011 PPP
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP

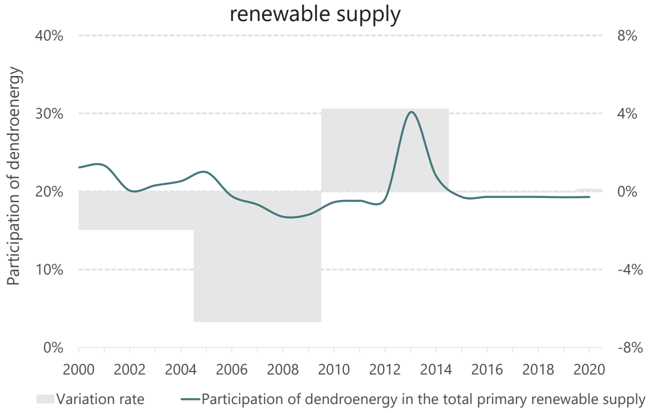

Energy external dependence
Energy external dependence
Quinquennial variation rate
Variation rate
Energy external dependence


Hydrocarbon autarky index
Hydrocarbon autarky index
Quinquennial variation rate
Variation rate
Hydrocarbon autarky index

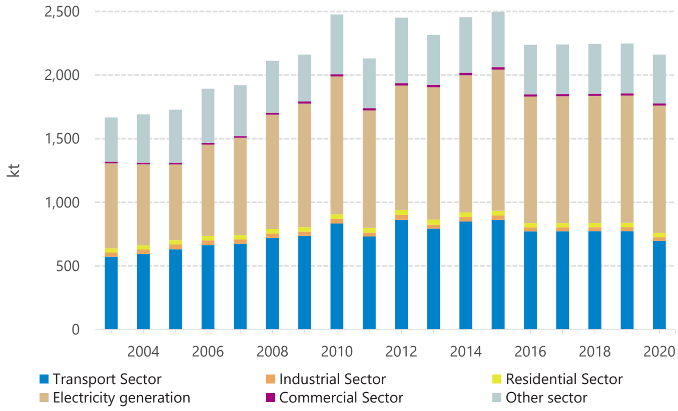

Biomass residential consumption index
Biomass residential consumption index
Quinquennial variation rate
Variation rate
Biomass residential consumption index


Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
Quinquennial variation rate
Variation rate
Participation of hydroenergy in the total primary renewable supply

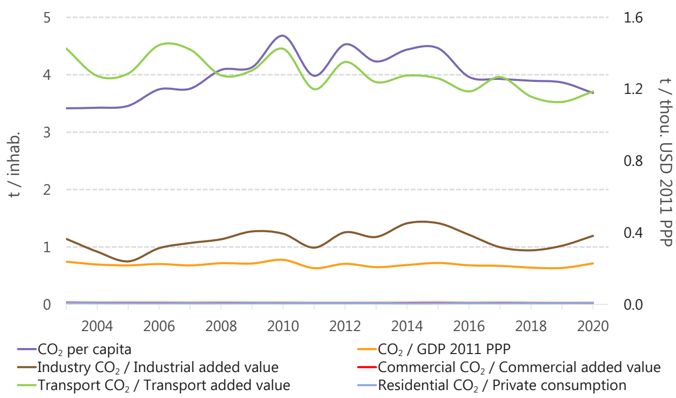
Participation of dendroenergy in the total primary renewable supply



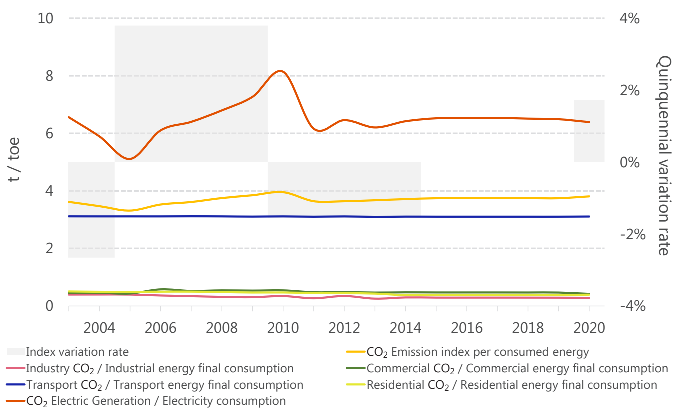
Evolution of CO_2 emissions by sector



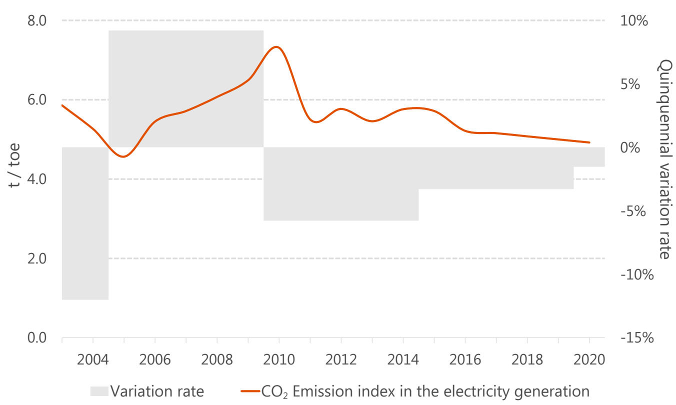
Evolution of CO_2 emissions per capita and per unit of GDP



CO_2 Emission index per consumed energy



CO_2 Emission index of electricity generation



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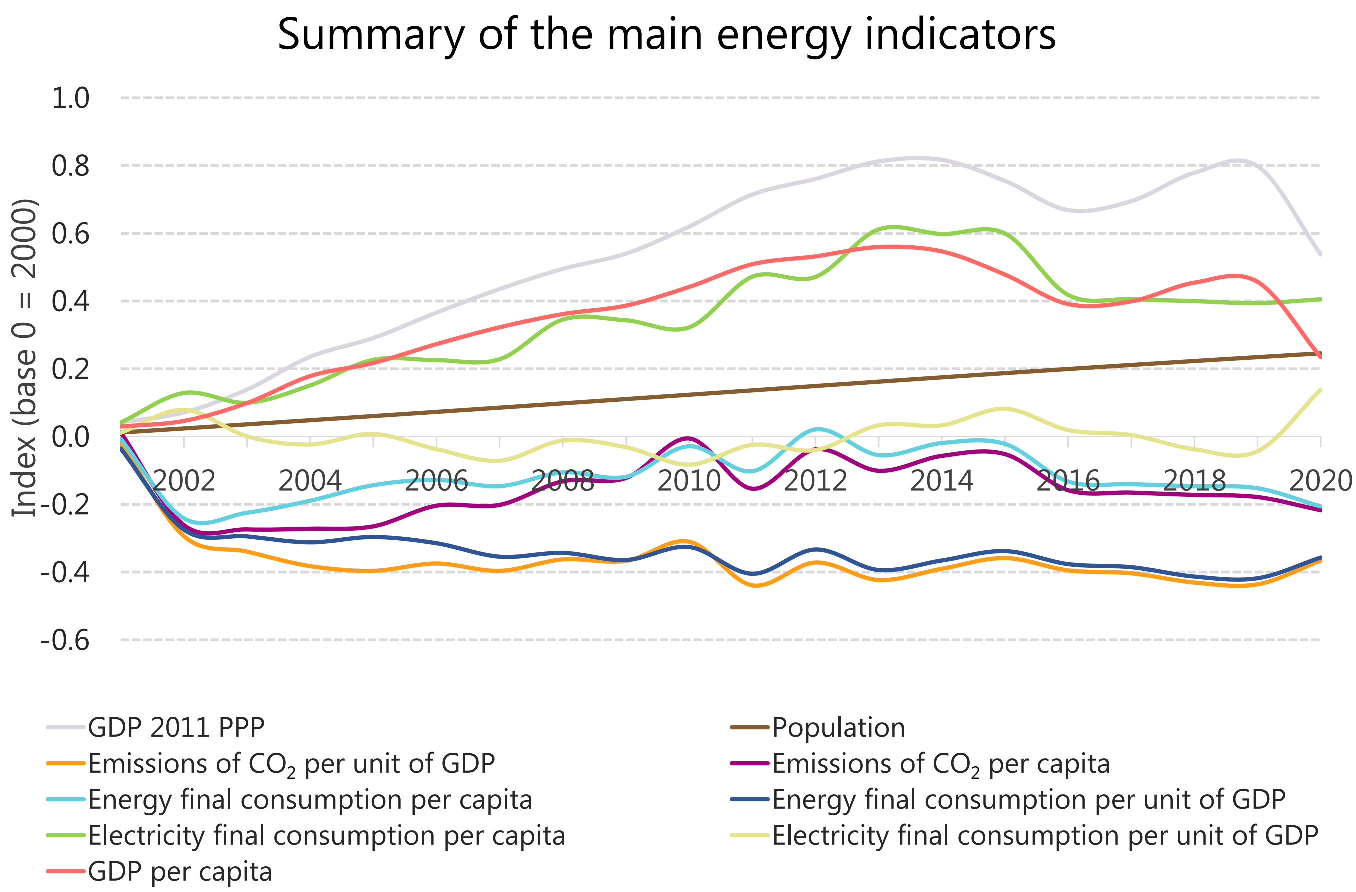
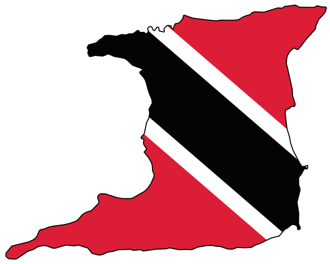

Summary of the main energy indicators
Index (base 0 = 2000)
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
-0.6
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Population
Emissions of CO2 per unit of GDP
Emissions of CO2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

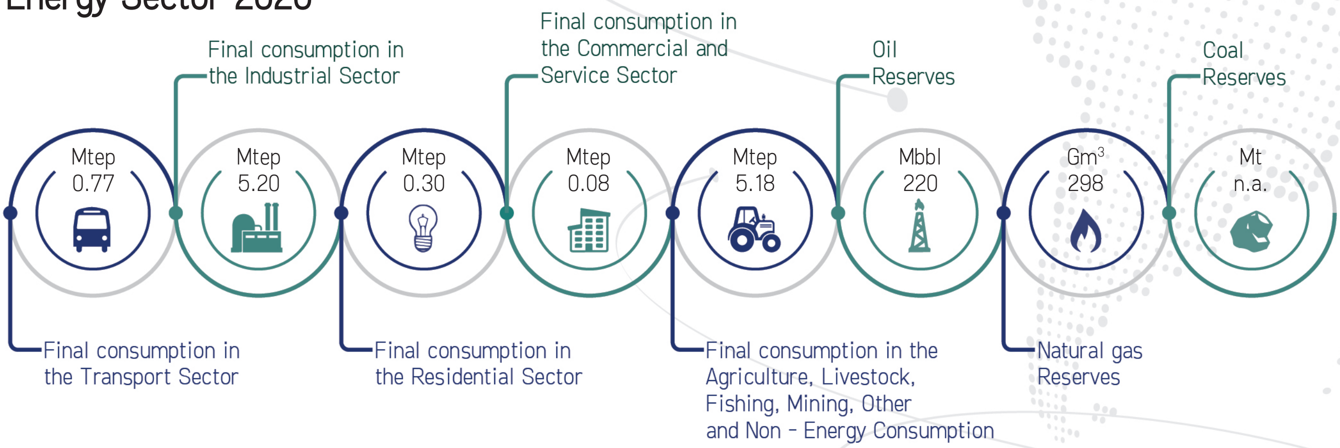
TRINIDAD & TOBAGO



General Information 2020

Population (thousand inhab.)	1,399 [1]
Area (km^2)	5,130
Population Density (inhab. / km^2)	273
Urban Population (%)	53
GDP USD 2010 (MUSD)	19,184 [1]
GDP USD 2011 PPP (MUSD)	33,207 [2]
GDP per capita (thou. USD 2011 PPP / inhab.)	24

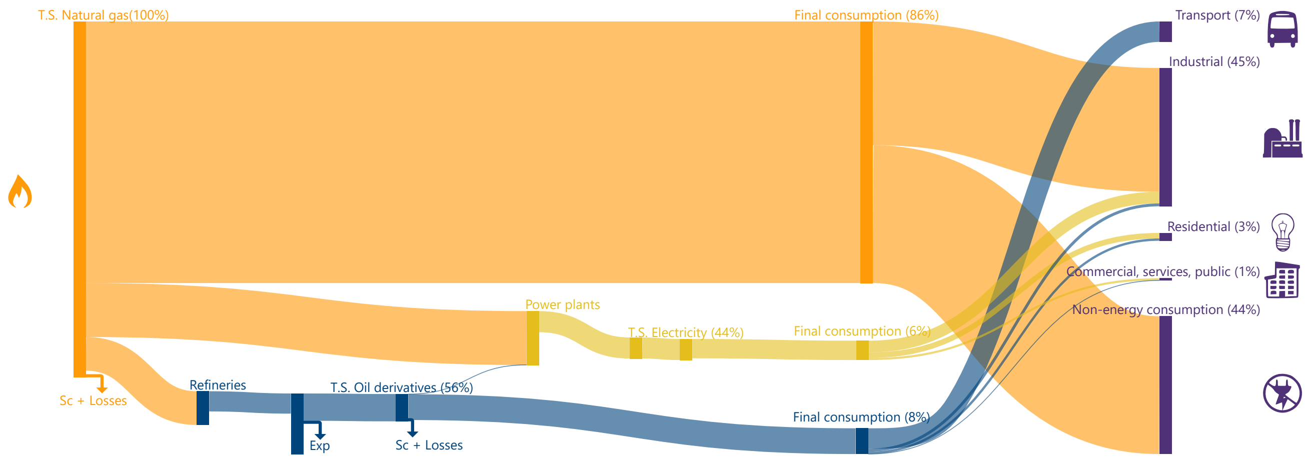
Energy Sector 2020



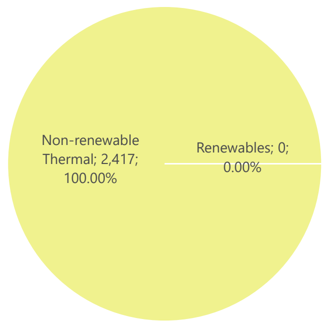
[1] Source: ECLAC.
[2] Source: World Bank.
Note: The supply and demand data corresponding to 2020 presented in this publication are preliminary and are subject to review by the country.

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
6,047	8.24	99.60	13.69	28.98	1.52	15.65	11.54	0.00	2.42	0.41 / 0.35
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

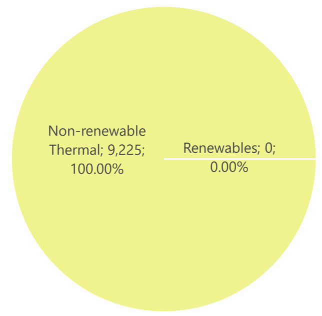
Summarized energy balance 2020



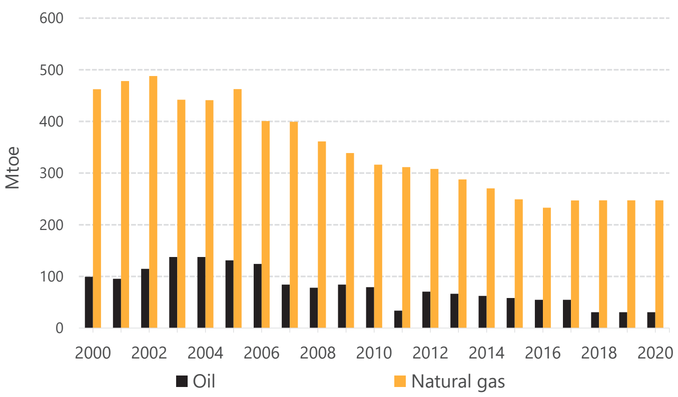
Installed power generation capacity [MW; %]
2020



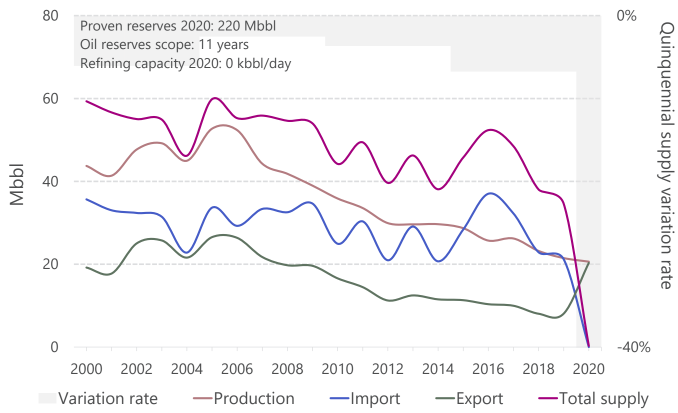
Electricity generation by source [GWh; %]
2020



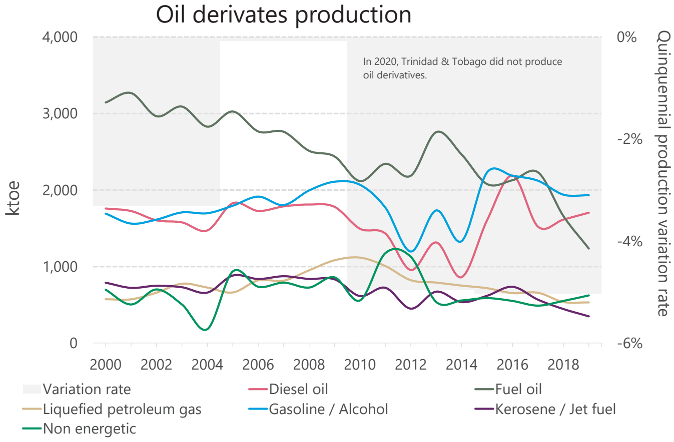
Proven reserves of oil and natural gas



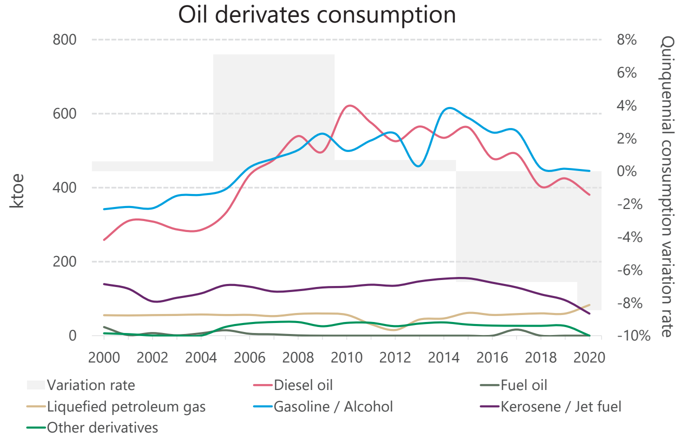
Oil supply

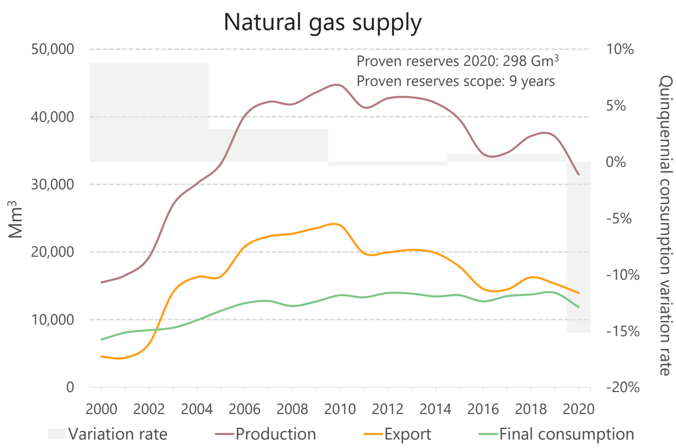


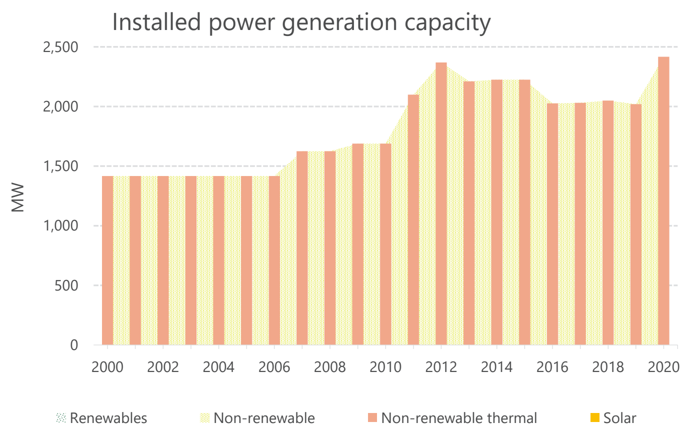
Oil derivates production

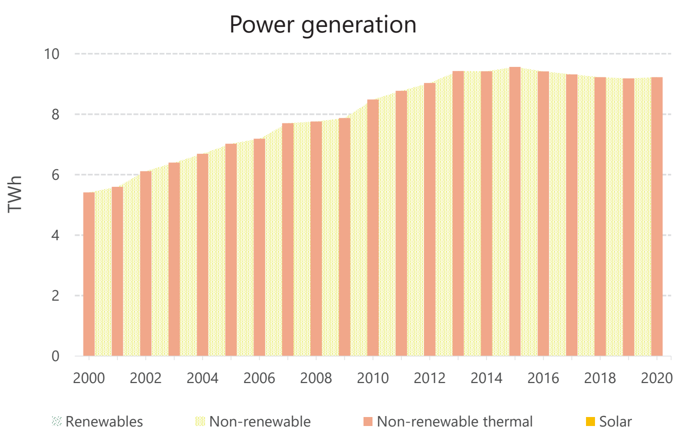


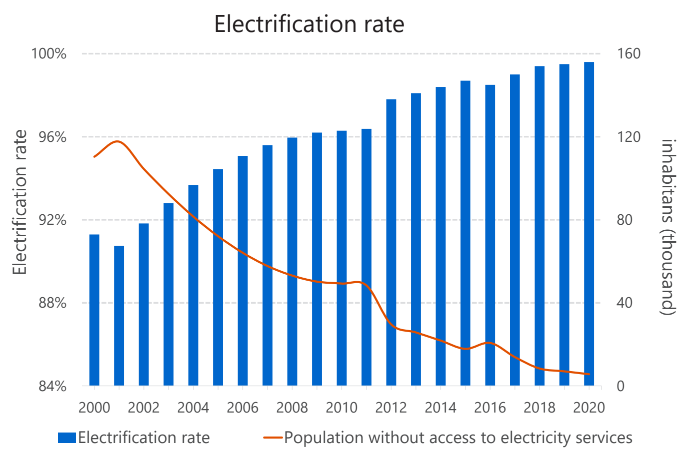
Oil derivates consumption

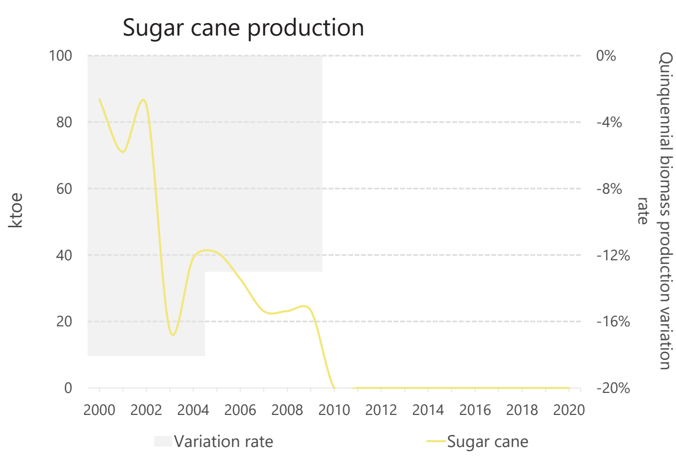


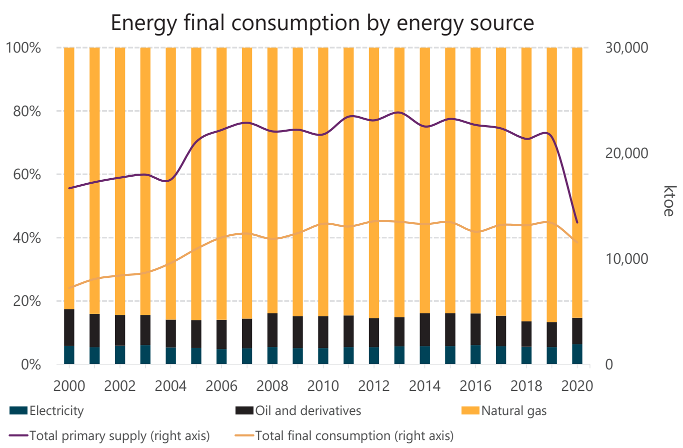

Natural gas supply
Proven reserves 2020: 298 Gm^3
Proven reserves scope: 9 years
Mm^3
Quinquennial consumption variation rate
Variation rate
Production
Export
Final consumption


Installed power generation capacity
MW
Renewables
Non-renewable
Non-renewable thermal
Solar

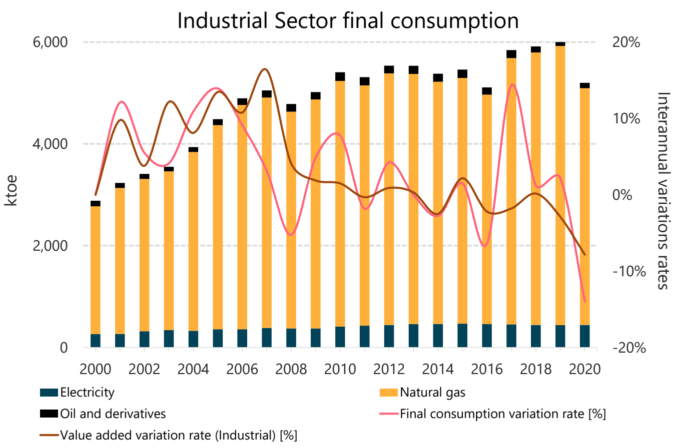

Power generation
TWh
Renewables
Non-renewable
Non-renewable thermal
Solar

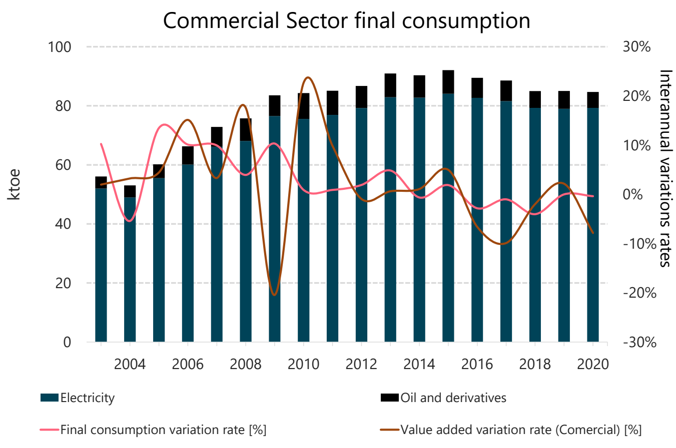

Electrification rate
Electrification rate
inhabitans (thousand)
Electrification rate
Population without access to electricity services

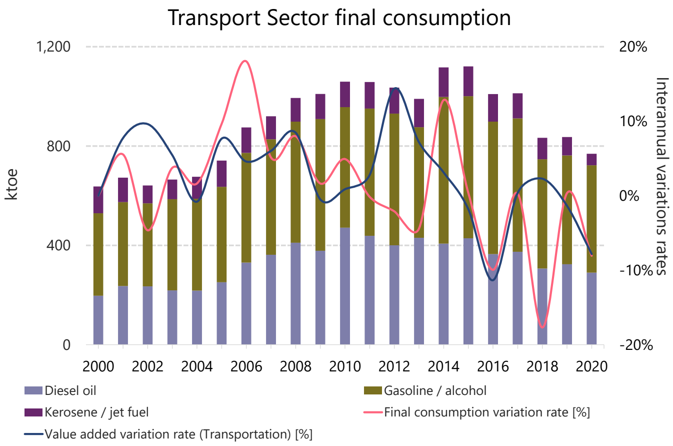

Sugar cane production
ktoe
Quinquennial biomass production variation rate
Variation rate
Sugar cane

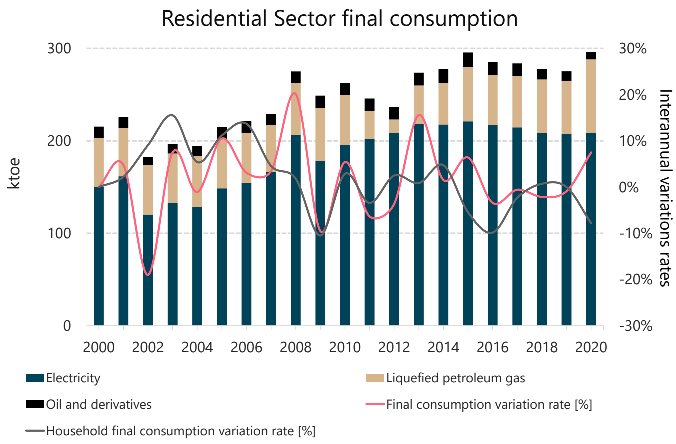

Energy final consumption by energy source
ktoe
Electricity
Oil and derivatives
Natural gas
Total primary supply (right axis)
Total final consumption (right axis)

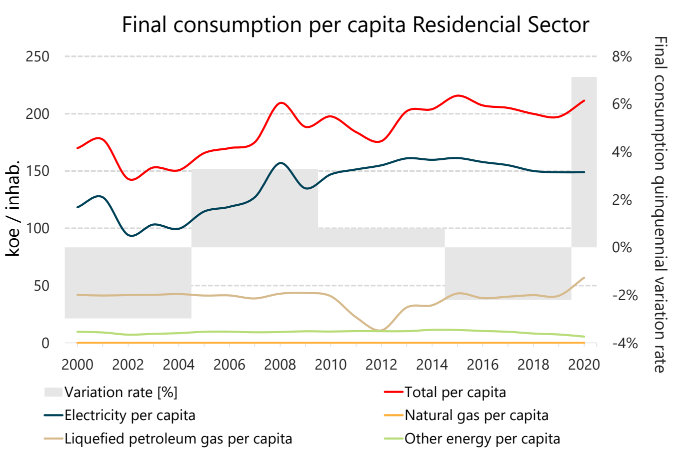
TRINIDAD & TOBAGO

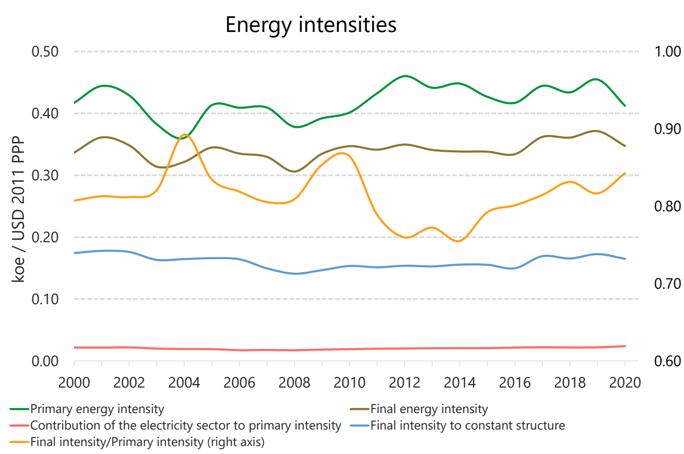




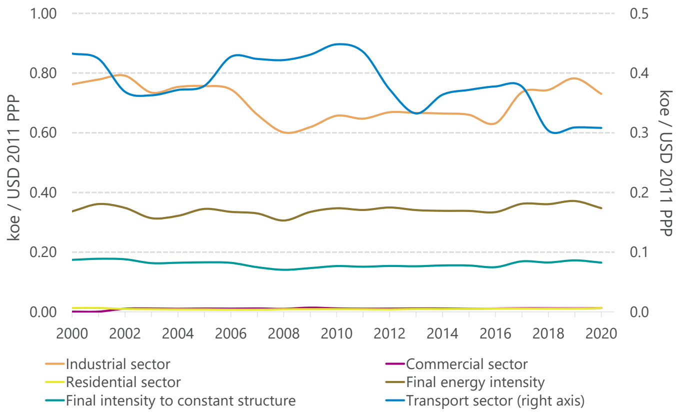




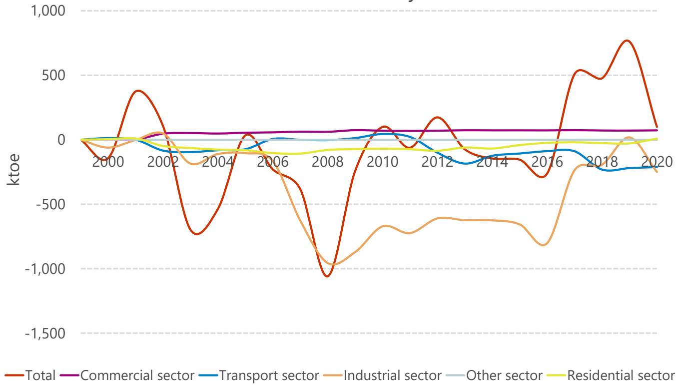




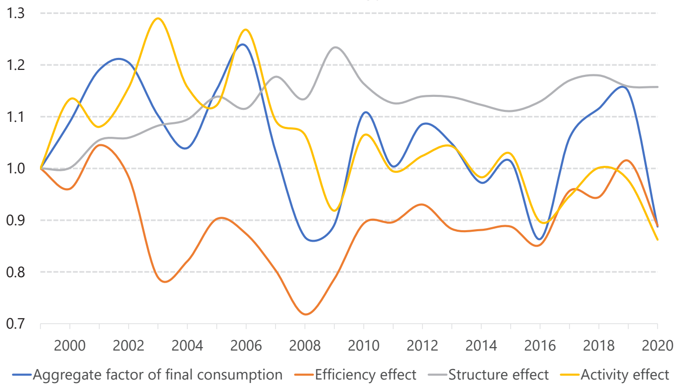
Sectoral energy intensities



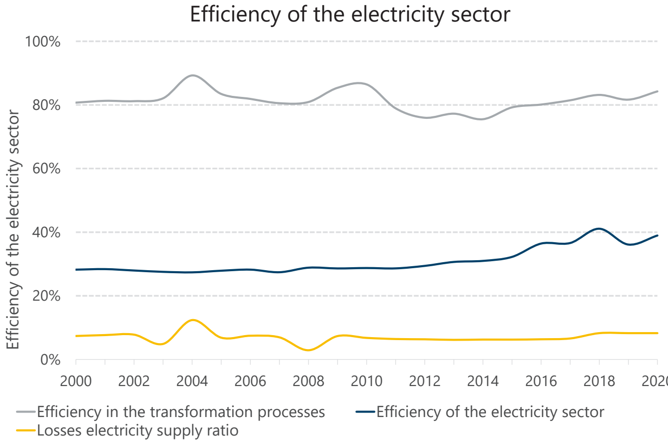
Avoided energy demand due to variations in energy intensity



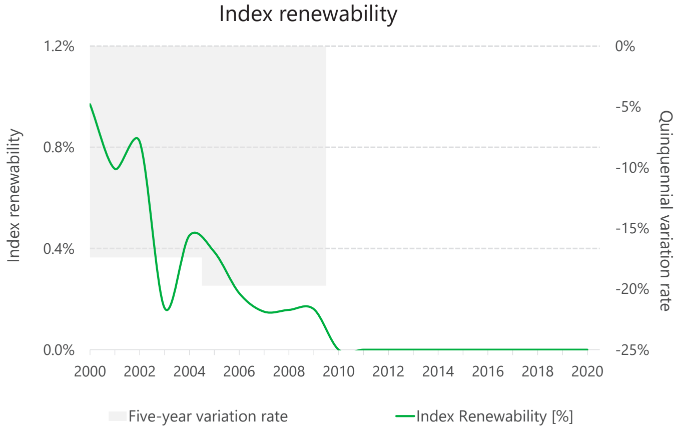
Logarithmic mean Divisia index for the structural decomposition of energy consumption



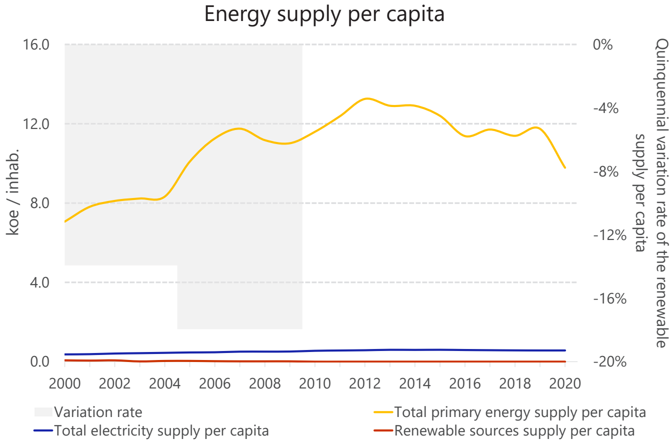
Efficiency of the electricity sector



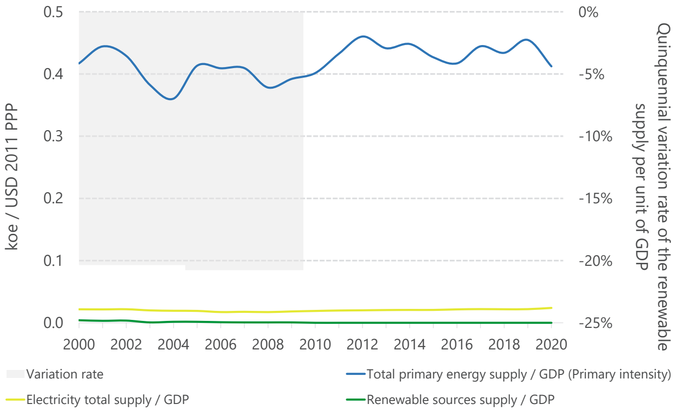
Index renewability



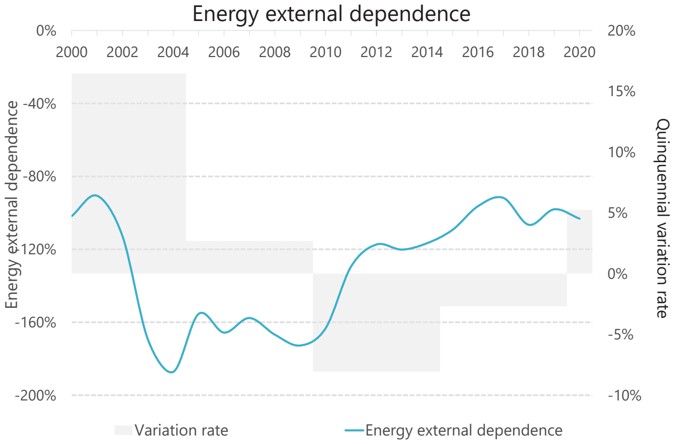
Energy supply per capita



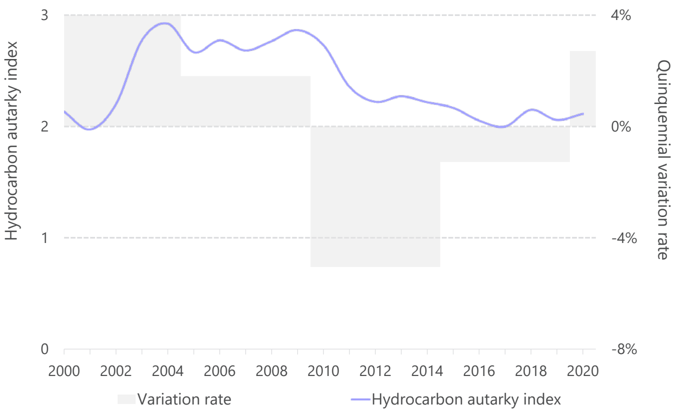
Energy supply per unit of GDP



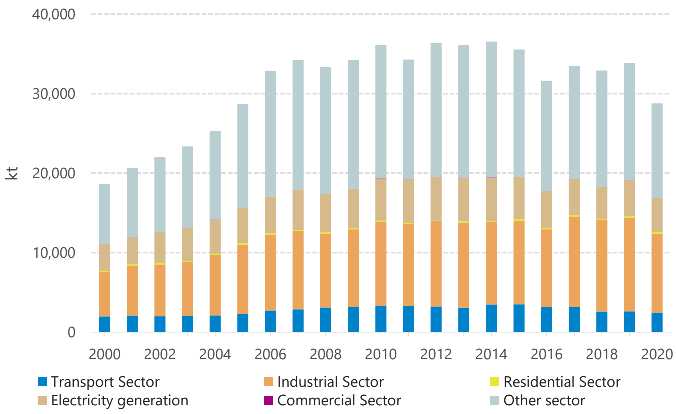
Energy external dependence



Hydrocarbon autarky index

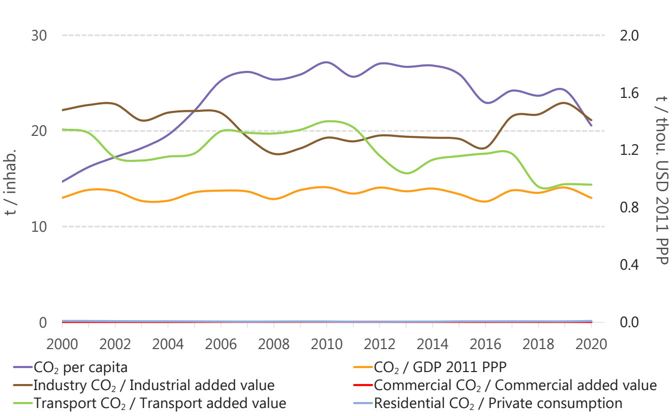


Evolution of CO_2 emissions by sector

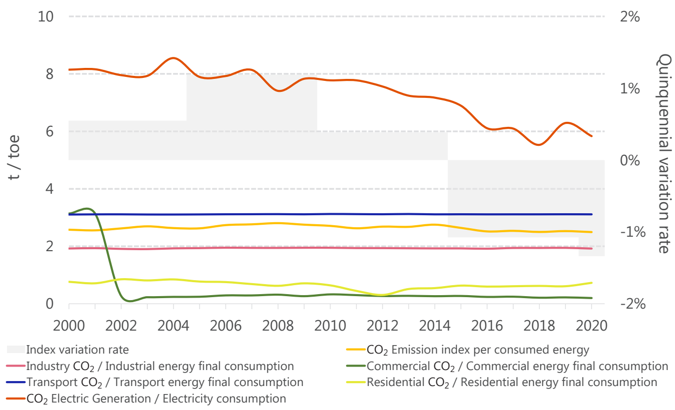


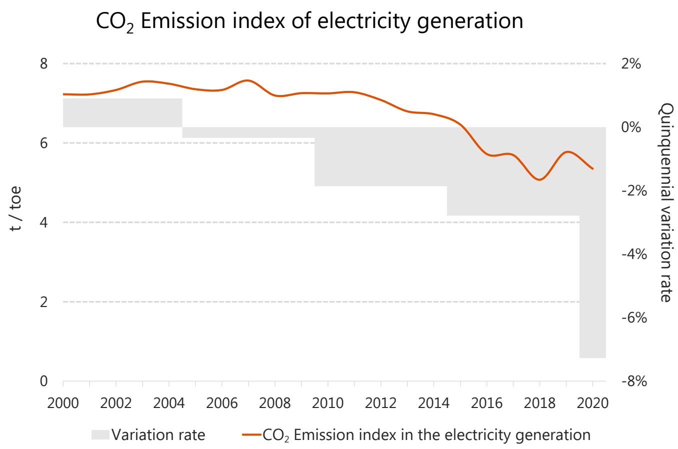
TRINIDAD & TOBAGO

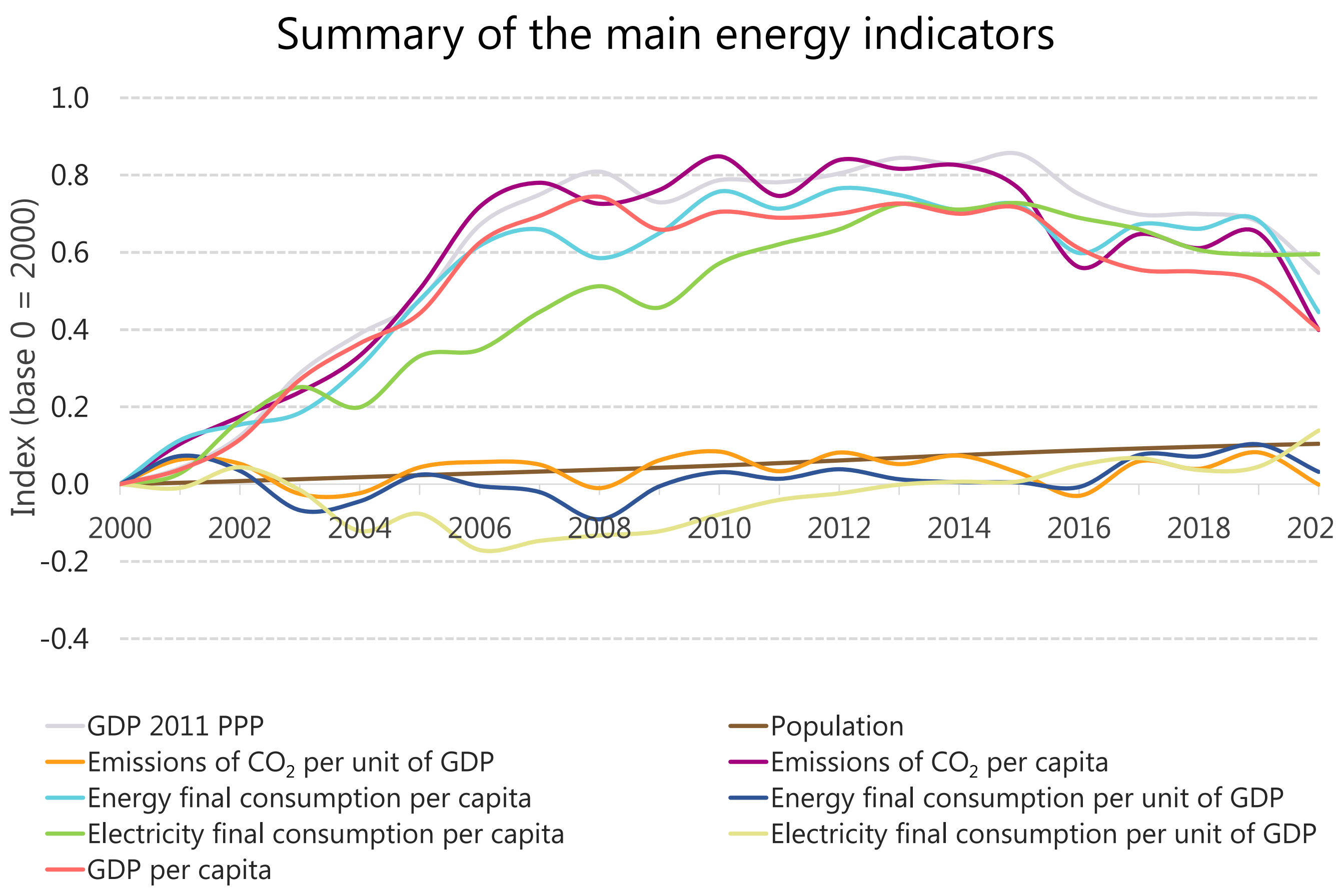
Evolution of CO_2 emissions per capita and per unit of GDP



CO_2 Emission index per consumed energy




CO2 Emission index of electricity generation
t / toe
Quinquennial variation rate
8
6
4
2
0
2%
0%
-2%
-4%
-6%
-8%
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
Variation rate
CO2 Emission index in the electricity generation


Summary of the main energy indicators
Index (base 0 = 2000)
1.0
0.8
0.6
0.4
0.2
0.0
-0.2
-0.4
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
GDP 2011 PPP
Emissions of CO2 per unit of GDP
Energy final consumption per capita
Electricity final consumption per capita
GDP per capita
Population
Emissions of CO2 per capita
Energy final consumption per unit of GDP
Electricity final consumption per unit of GDP

URUGUAY

General Information 2020

Population (thousand inhab.)	3,531 [1]
Area (km^2)	176,215
Population Density (inhab. / km^2)	20
Urban Population (%)	95
GDP USD 2010 (MUSD)	50,683
GDP USD 2011 PPP (MUSD)	75,062
GDP per capita (thou. USD 2011 PPP / inhab.)	21

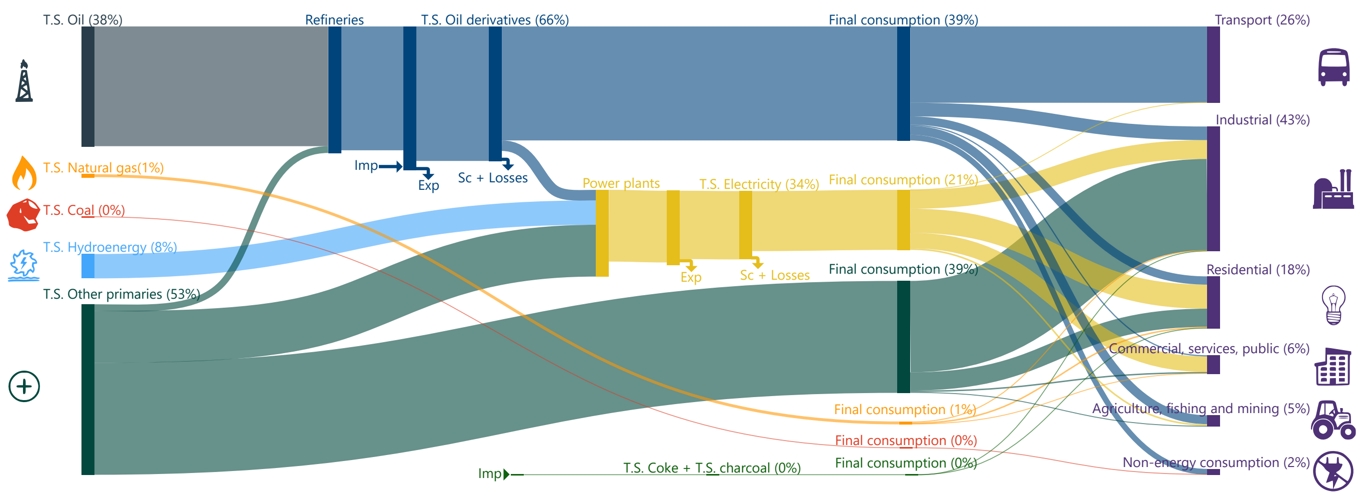
Energy Sector 2020

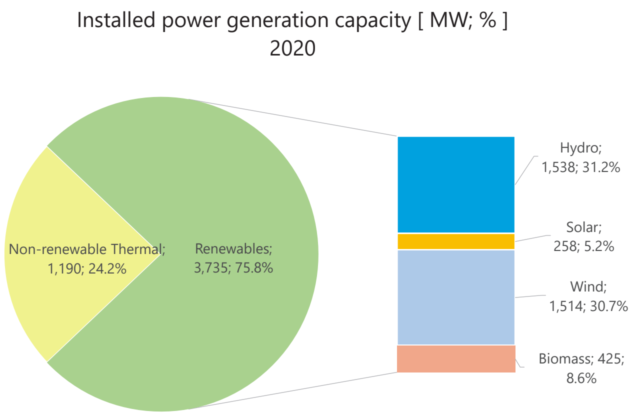
Final consumption in the Transport Sector	Mtep 1.24
Final consumption in the Industrial Sector	Mtep 2.03
Final consumption in the Residential Sector	Mtep 0.85
Final consumption in the Commercial and Service Sector	Mtep 0.30
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep 0.28
Oil Reserves	Mbbl n.a.
Natural gas Reserves	Gm^3 n.a.
Coal Reserves	Mt n.a.

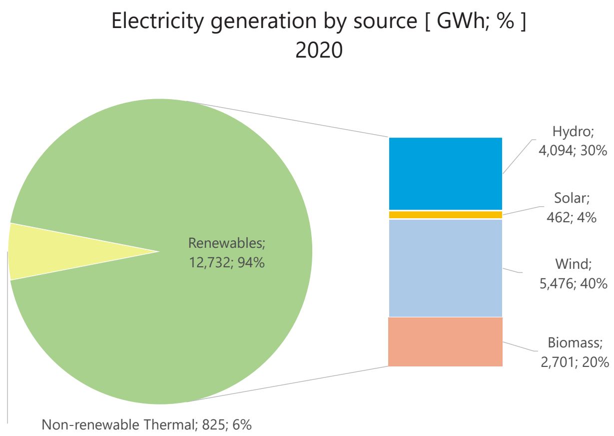
[1] National Statistical Institute (INE).
[2] Exports includes international bunker.
[3] The electrification rate corresponds to 2019.

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
3,214	1.33	99.90 [3]	5.27	3.17	2.43	0.25 [2]	4.70	50	4.92	0.07 / 0.06
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

Summarized energy balance 2020

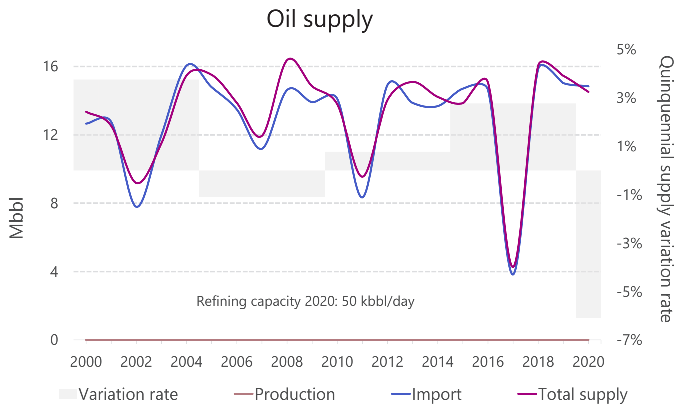




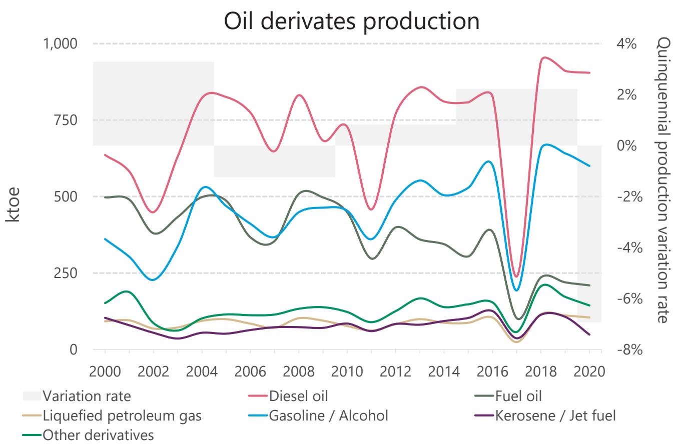


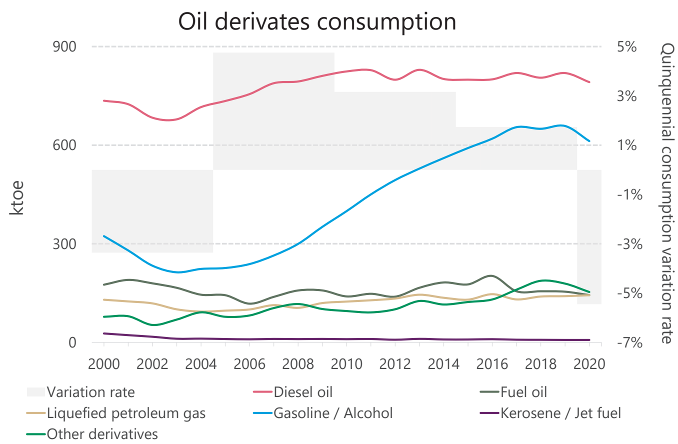
Uruguay has a “La Teja” refinery, owned by the ANCAP company, located in Montevideo, currently its refining capacity is 50 thousand barrels per day. The refinery entered into operation in 1937, it was remodeled between 1993 -1995 and there was no production in 1994, in the periods September 2002 to March 2003, September 2011 to January 2012 and much of 2017 the refinery was shut down for maintenance.

At the refinery, crude oil imports dropped from 2,044 ktoe to1,995 ktoe due to the pandemic. However, oil products increasedfrom 167 ktoe to 324 ktoe, associated with their consumption for electricity generation.

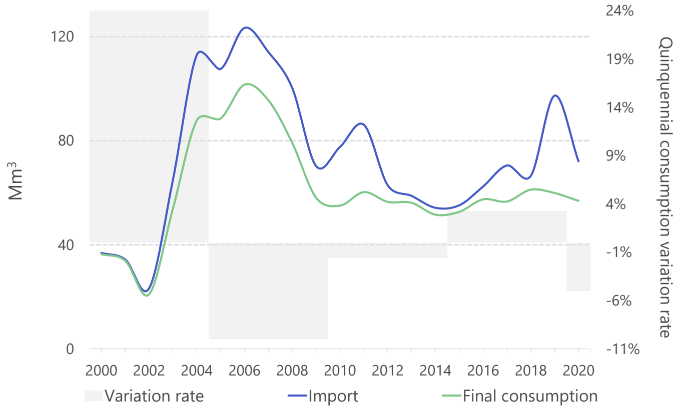


Note: Much of 2017, the refinery was shut down for maintenance.

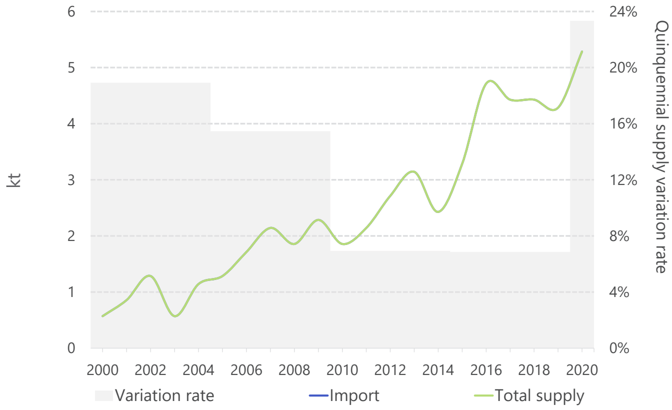




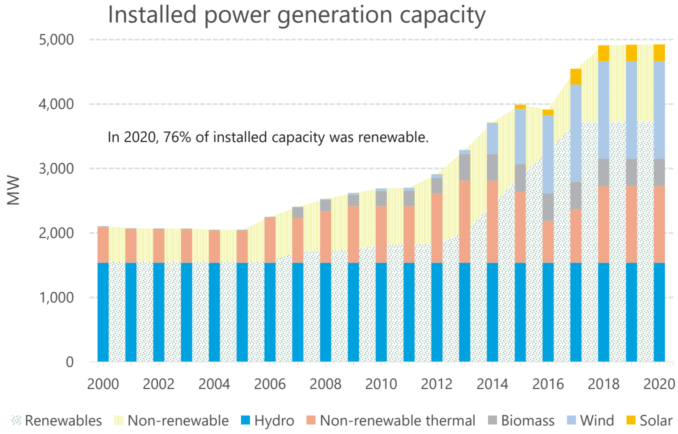
Natural gas supply



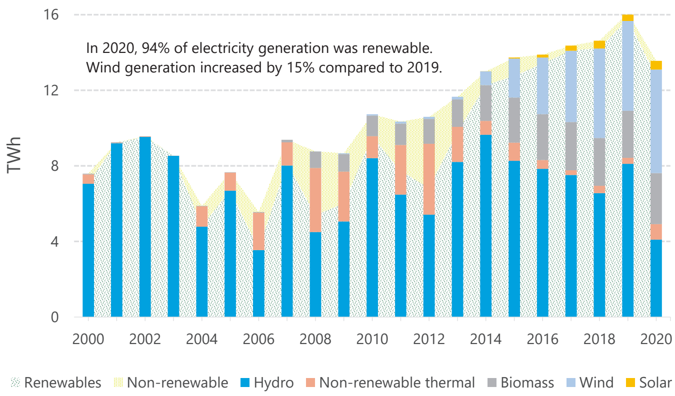
Coal Supply



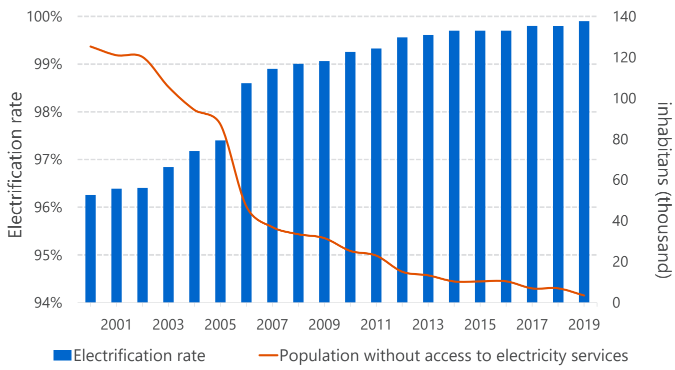
Installed power generation capacity



Power generation

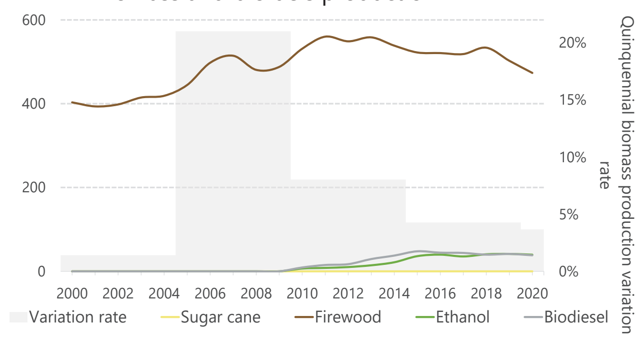


Electrification rate

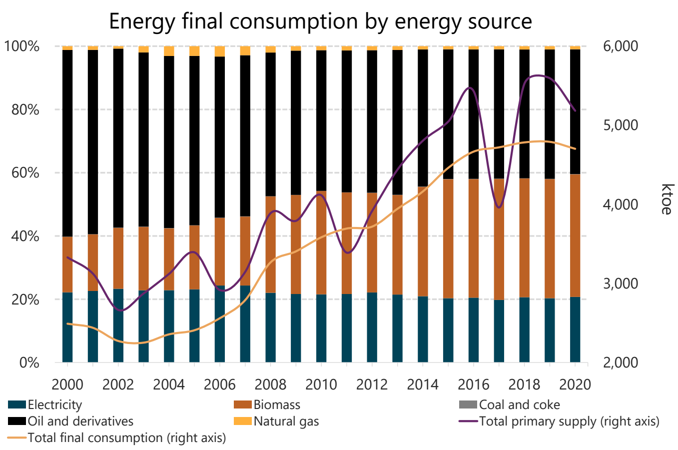


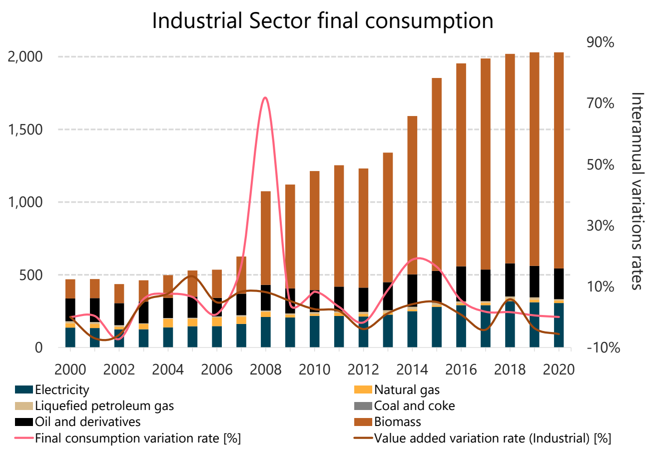
Note Data 2000 - 2005 were estimated by OLADE

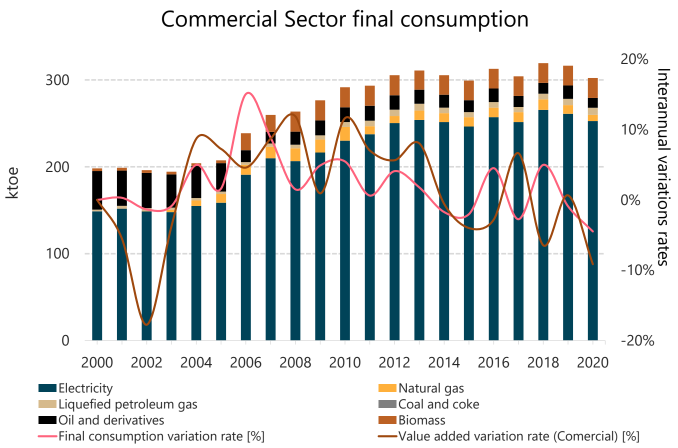
Biomass and biofuels production

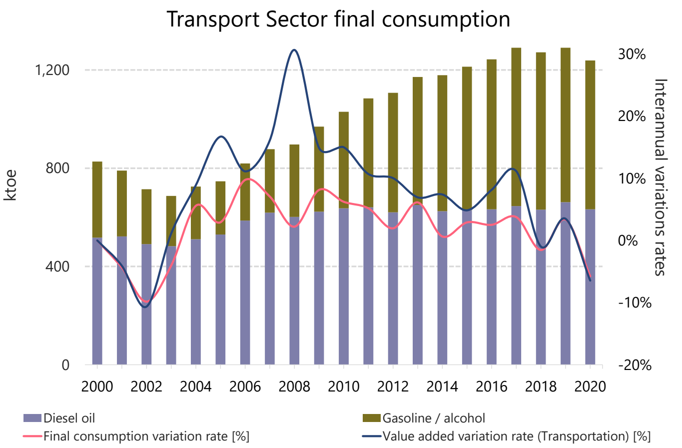


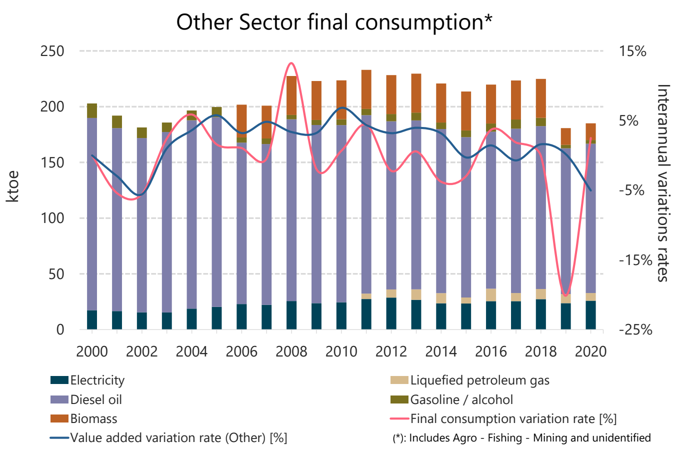
The graph does not include "Other Biomass" that takes into account, biomass residues (rice and sunflower husk, cane bagasse, black liquor, odorous gases, methanol, barley chasubles and waste from the wood industry) and biomass for biofuel production. For 2020, the production value of this source was 1,780.6 ktoe.

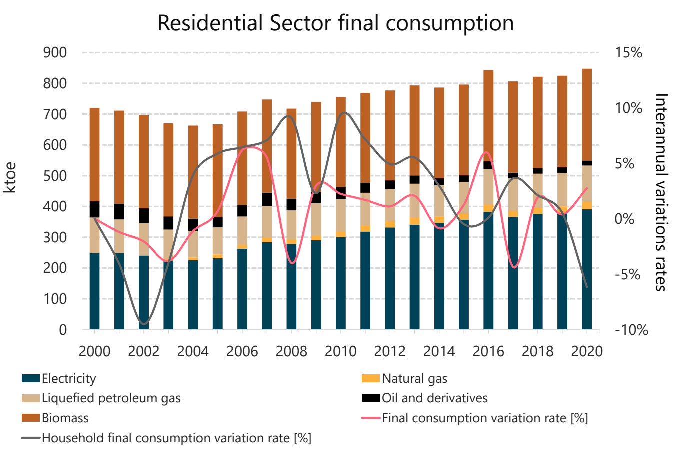

Energy final consumption by energy source
100%
80%
60%
40%
20%
0%
6,000
5,000
4,000
3,000
2,000
ktoe
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Biomass
Coal and coke
Oil and derivatives
Natural gas
Total primary supply (right axis)
Total final consumption (right axis)


Industrial Sector final consumption
2,000
1,500
1,000
500
0
ktoe
90%
70%
50%
30%
10%
-10%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Natural gas
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Industrial) [%]

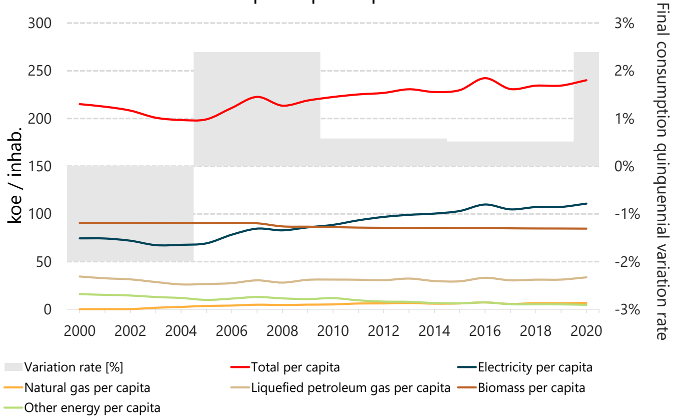

Commercial Sector final consumption
300
200
100
0
ktoe
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Natural gas
Liquefied petroleum gas
Coal and coke
Oil and derivatives
Biomass
Final consumption variation rate [%]
Value added variation rate (Comercial) [%]


Transport Sector final consumption
1,200
800
400
0
ktoe
30%
20%
10%
0%
-10%
-20%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Diesel oil
Gasoline / alcohol
Final consumption variation rate [%]
Value added variation rate (Transportation) [%]

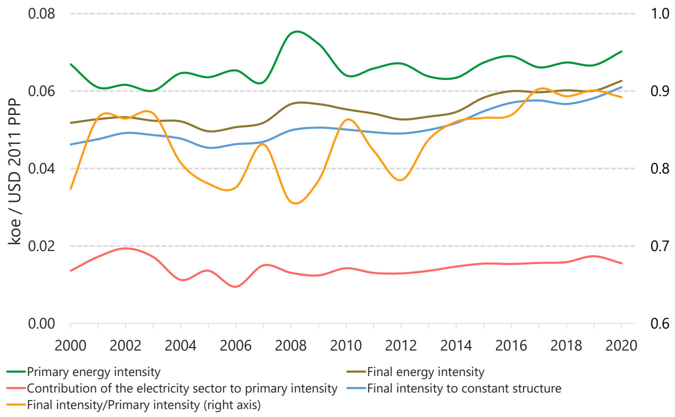

Other Sector final consumption*
250
200
150
100
50
0
ktoe
15%
5%
-5%
-15%
-25%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Liquefied petroleum gas
Diesel oil
Gasoline / alcohol
Biomass
Final consumption variation rate [%]
Value added variation rate (Other) [%]
(*): Includes Agro - Fishing - Mining and unidentified


Residential Sector final consumption
900
800
700
600
500
400
300
200
100
0
ktoe
15%
10%
5%
0%
-5%
-10%
Interannual variations rates
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020
Electricity
Natural gas
Liquefied petroleum gas
Oil and derivatives
Biomass
Final consumption variation rate [%]
Household final consumption variation rate [%]

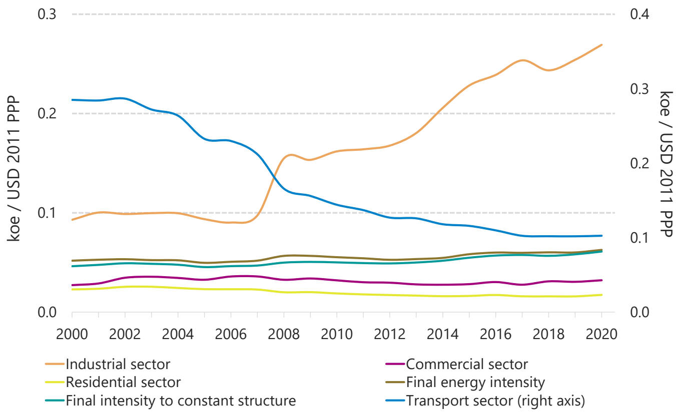
Final consumption per capita Residencial Sector



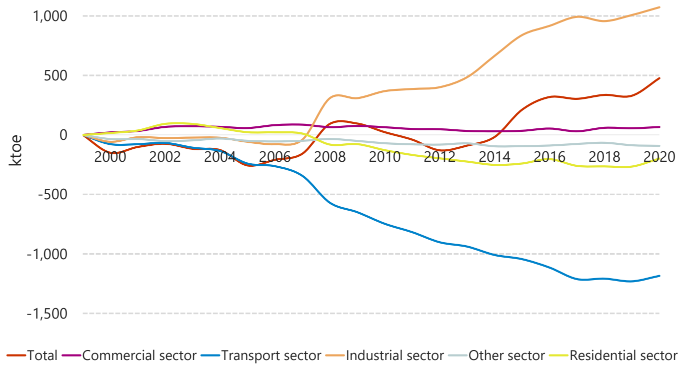
Energy intensities



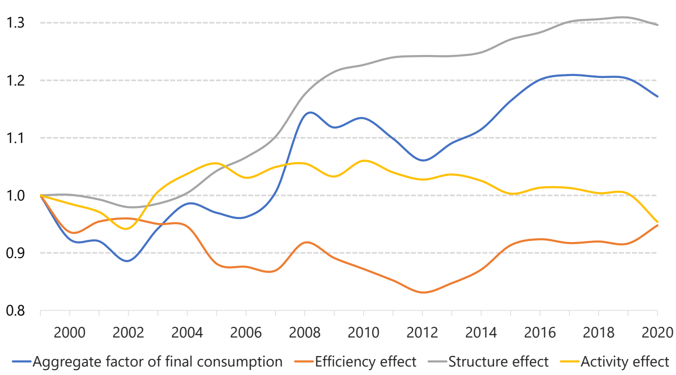
Sectoral energy intensities



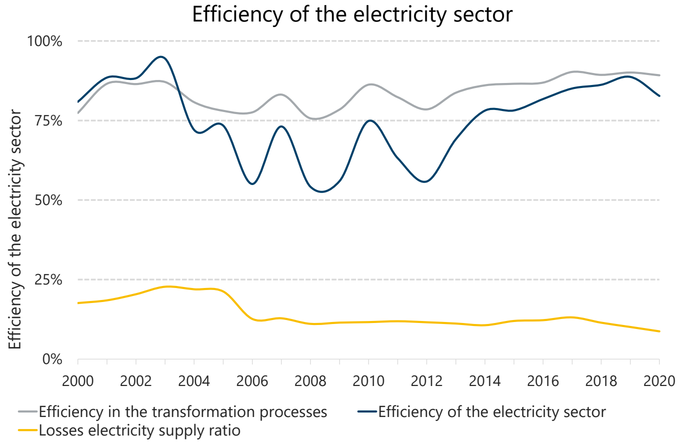
Avoided energy demand due to variations in energy intensity

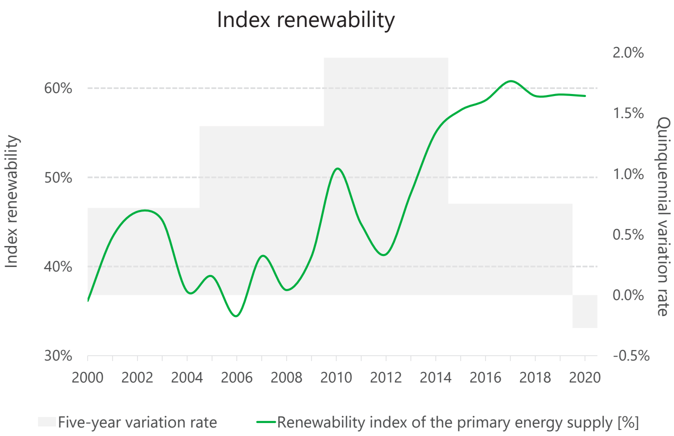


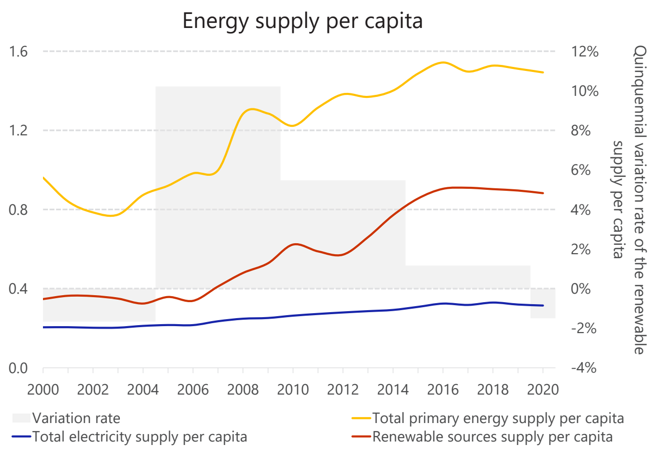
Logarithmic mean Divisia index for the structural decomposition of energy consumption

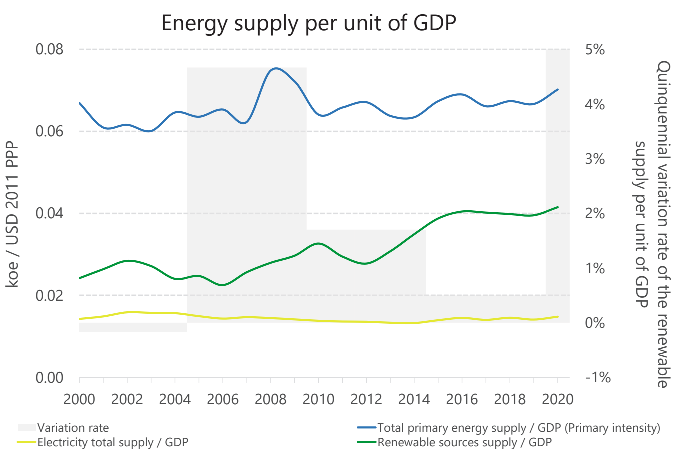


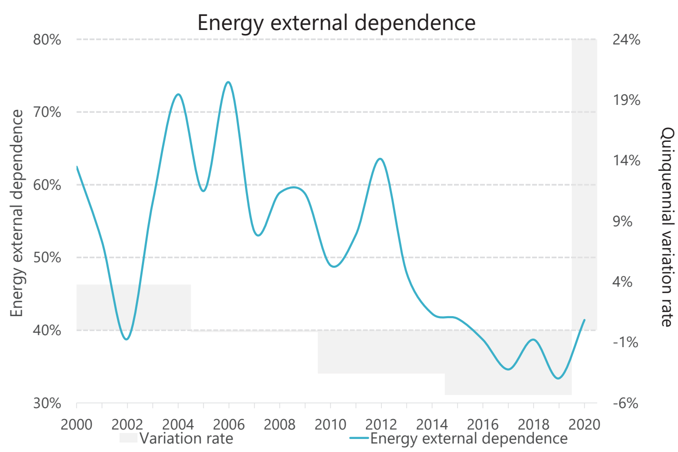
Efficiency of the electricity sector







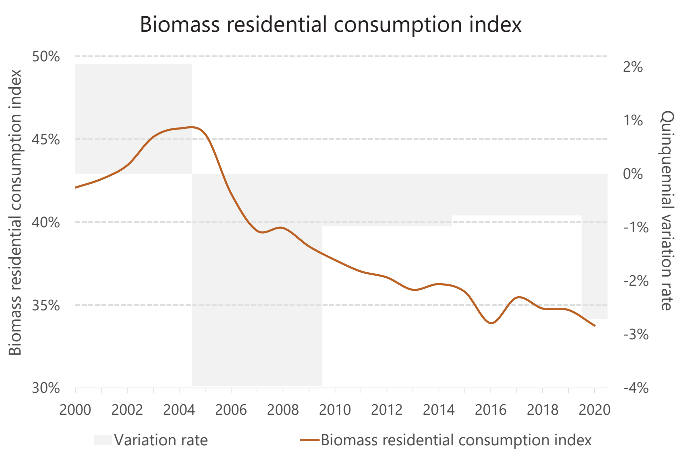




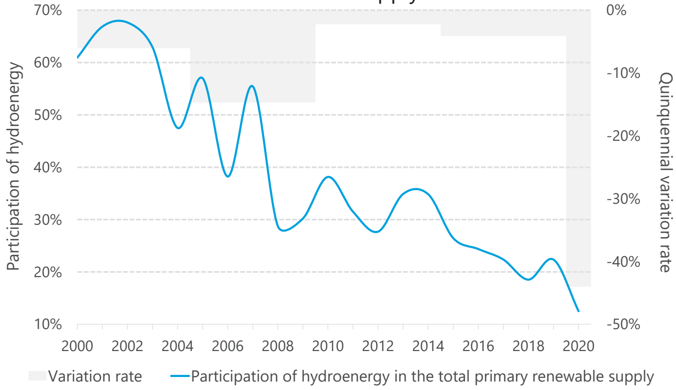
Energy matrix diversification_first transition

The year 2020 was one of the years with the lowest hydroelectricity in the last 35 years, only surpassed by 2006, as a direct consequence of the diversification process of the generation matrix carried out by Uruguay, even in these extreme conditions, it was possible to supply the demand using only 6% of fossil fuels.

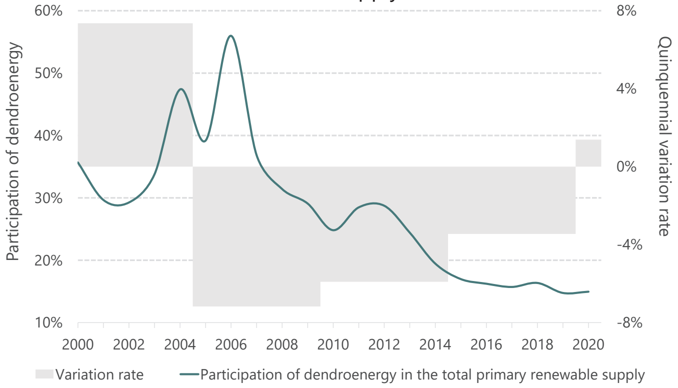
In 2020, for the first time in more than 40 years, hydroelectric generation was NOT the main source of electricity generation. In 2020 for the first time, the main source of electricity generation was wind power, contributing 40% of total generation.



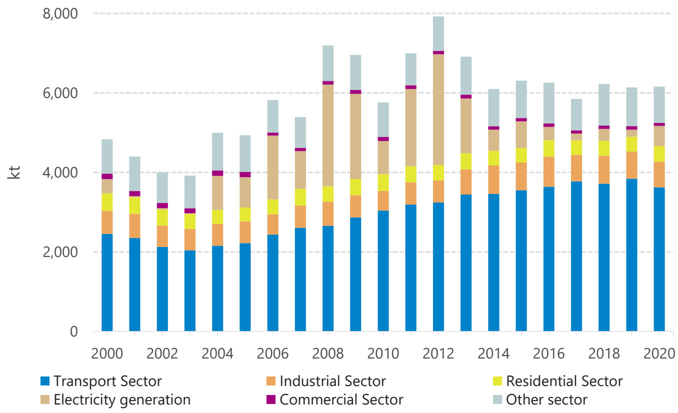
Participation of hydroenergy in the total primary renewable supply



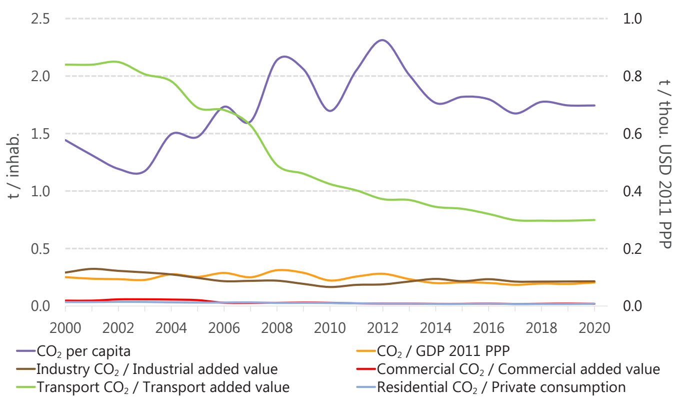
Participation of dendroenergy in the total primary renewable supply



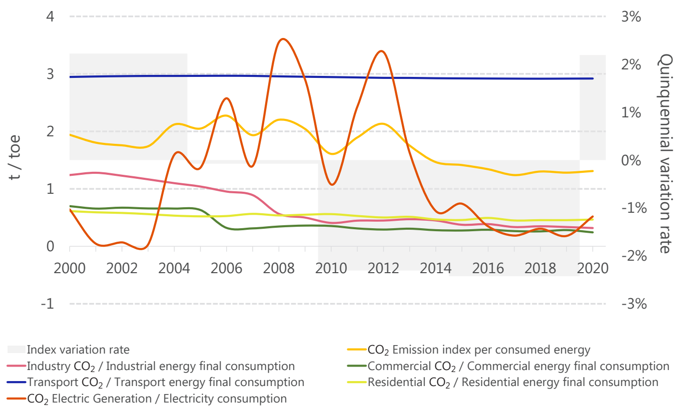
Evolution of CO_2 emissions by sector



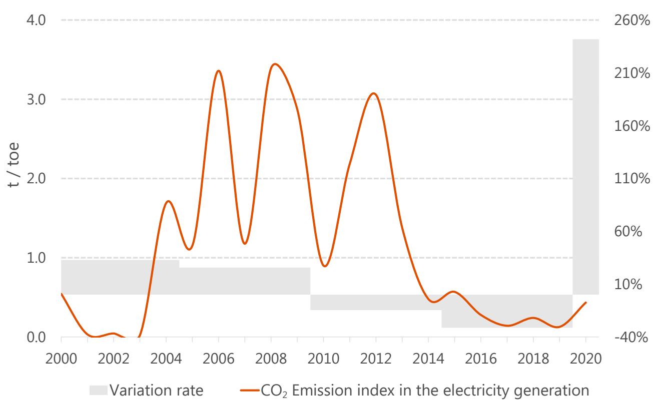
Evolution of CO_2 emissions per capita and per unit of GDP



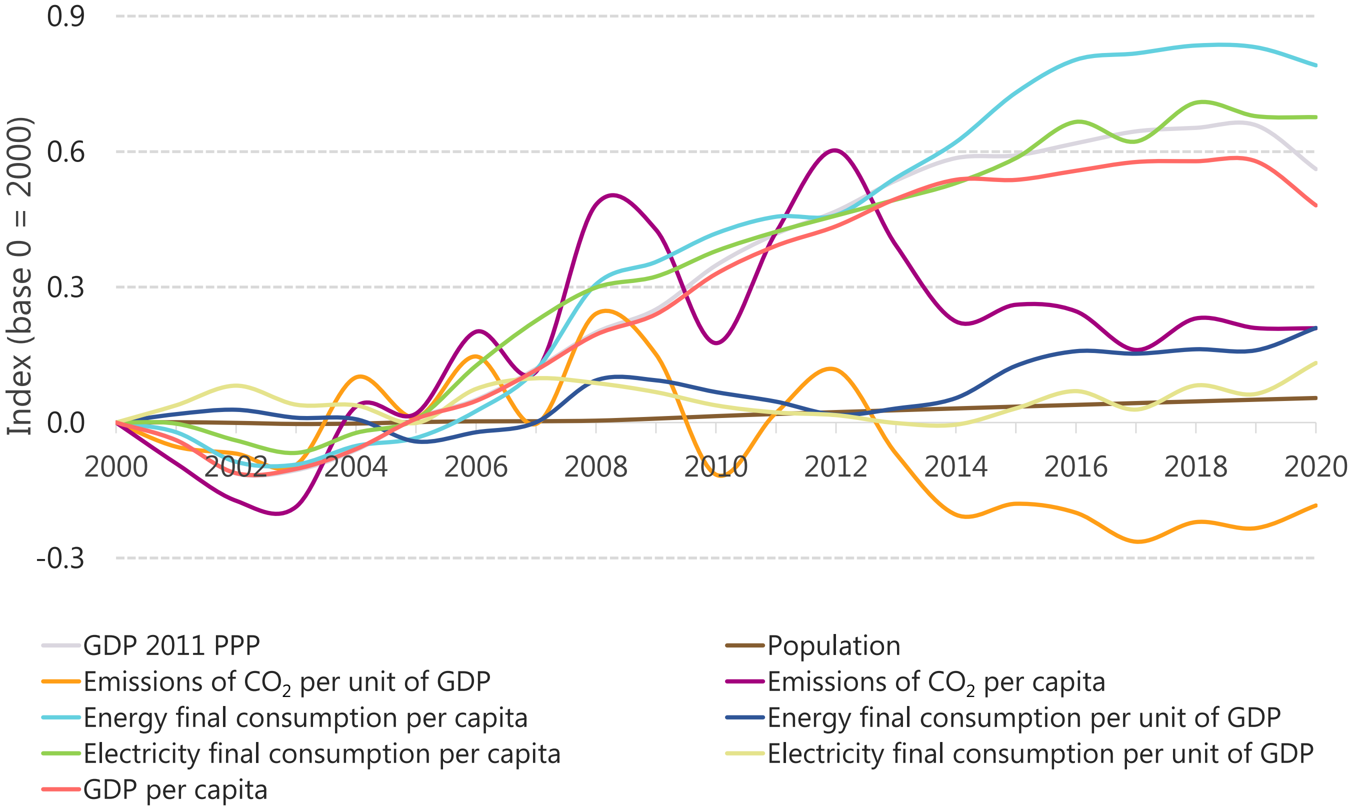
CO_2 Emission index per consumed energy



CO_2 Emission index of electricity generation



Summary of the main energy indicators



URUGUAY

VENEZUELA

General Information 2020

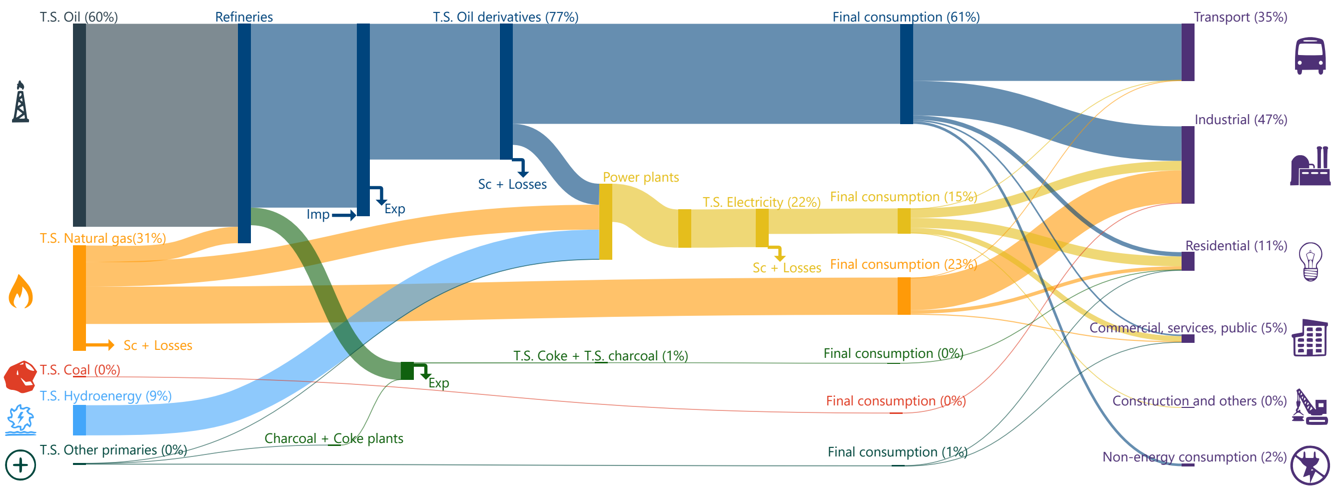
Population (thousand inhab.)	28,436
Area (km²)	912,050
Population Density (inhab. / km²)	31
Urban Population (%)	88
GDP USD 2010 (MUSD)	81,247
GDP USD 2011 PPP (MUSD)	295,399
GDP per capita (thou. USD 2011 PPP / inhab.)	10

Energy Sector 2013

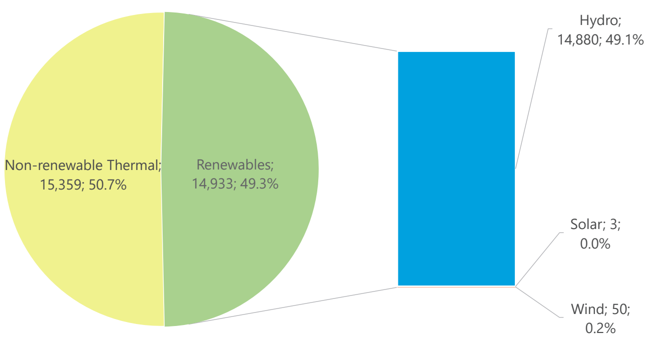
Final consumption in the Transport Sector	Mtep	16.72
Final consumption in the Industrial Sector	Mtep	22.57
Final consumption in the Residential Sector	Mtep	5.42
Final consumption in the Commercial and Service Sector	Mtep	2.39
Final consumption in the Agriculture, Livestock, Fishing, Mining, Other and Non - Energy Consumption	Mtep	0.85
Oil Reserves	Mbbl	298,353
Natural gas Reserves	Gm^3	5,581
Coal Reserves	Mt	1,767

kWh / inhab.	toe / inhab.	%	Mtoe	Mtoe	Mtoe	Mtoe	Mtoe	kbbl / day	GW	koe / USD 2011 PPP
2,917	1.61	98.94	79.43	191.17	5.29	123.82	47.95	1,303	30.29	0.15 / 0.09
Electricity consumption per capita	Final energy consumption per capita	Electrification rate	Total energy supply	Total energy production	Total energy imports	Total energy exports	Total final energy consumption	Refining capacity	Installed power generation capacity	Primary energy intensity and final energy intensity

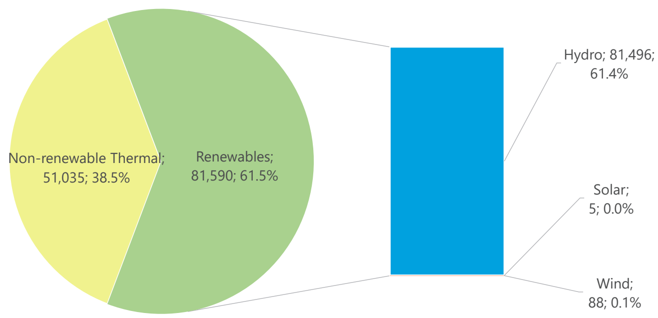
Summarized energy balance 2013



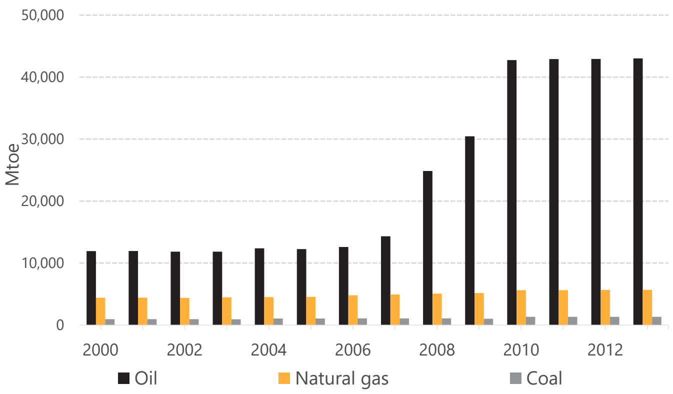
Installed power generation capacity [MW; %]
2013



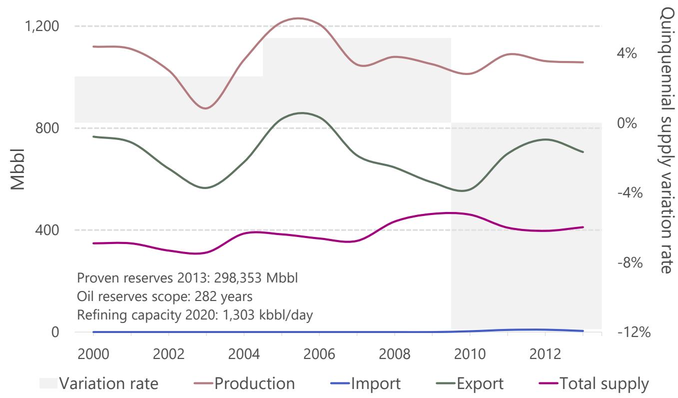
Electricity generation by source [GWh; %]
2013



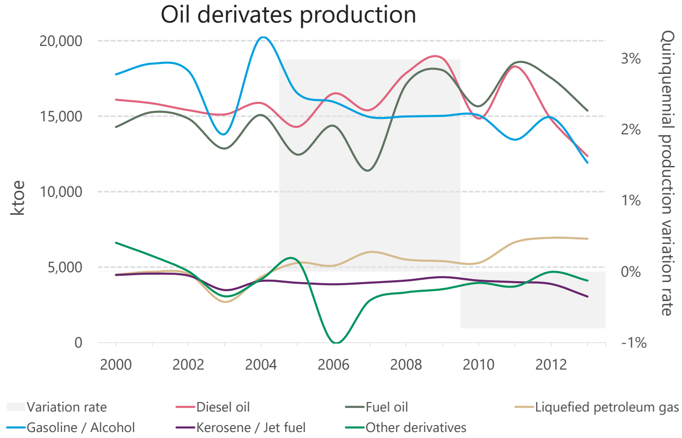
Proven reserves of oil, natural gas and coal



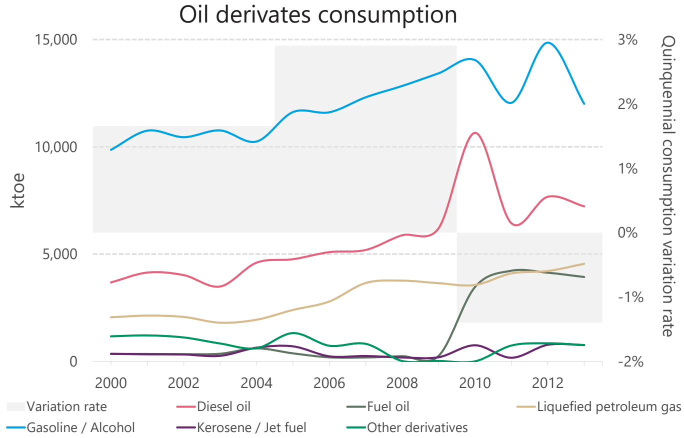
Oil supply

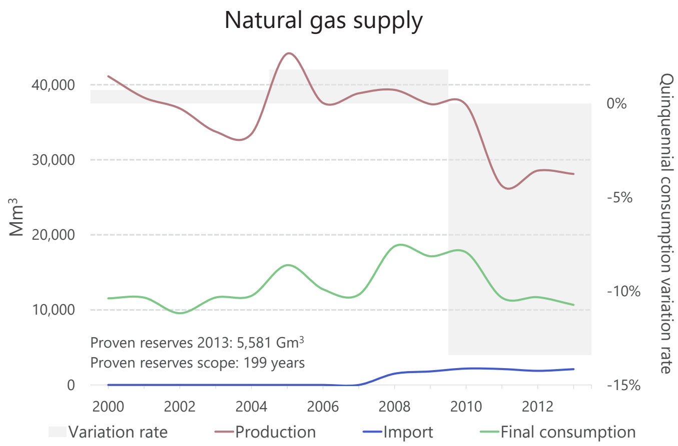


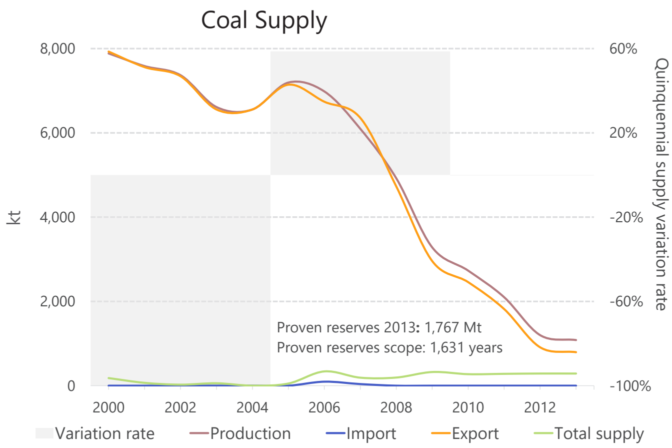
Oil derivates production

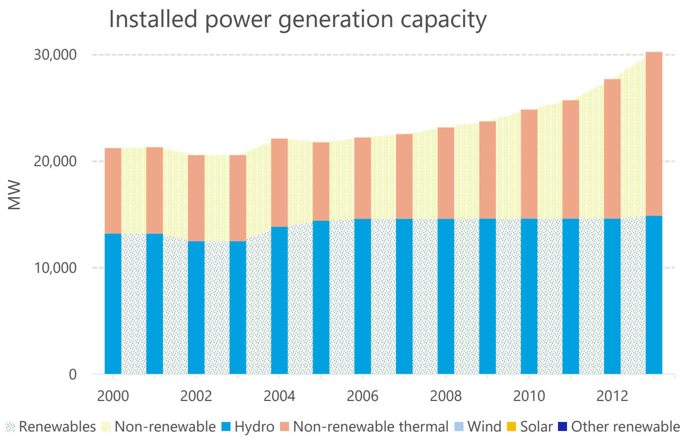


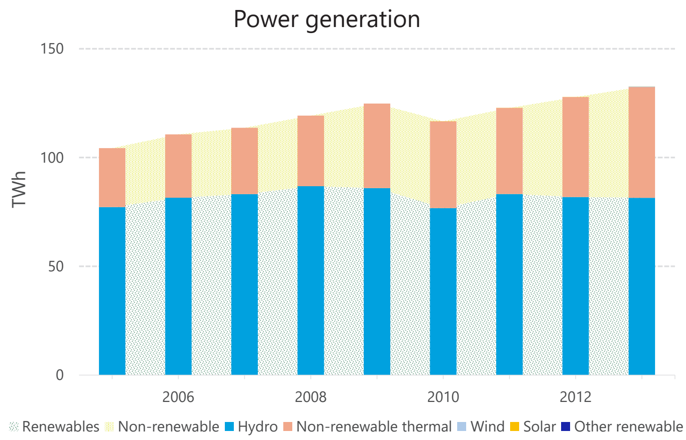
Oil derivates consumption

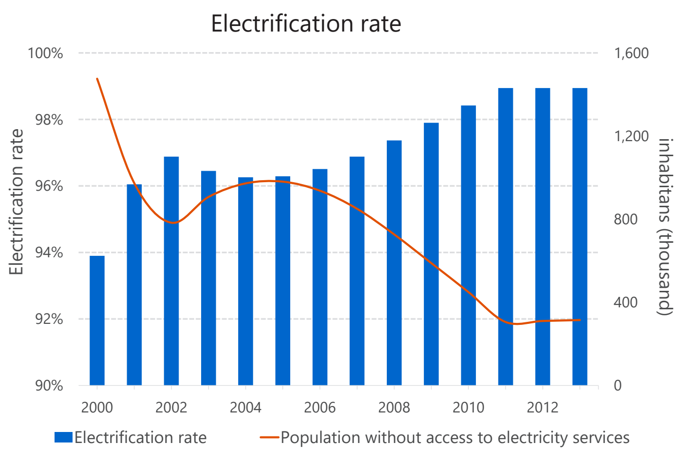


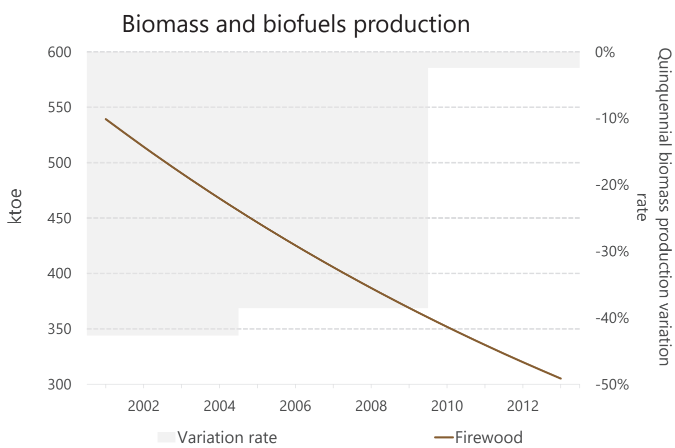

Natural gas supply
40,000
30,000
20,000
10,000
0
Mm3
0%
-5%
-10%
-15%
Quinquennial consumption variation rate
Proven reserves 2013: 5,581 Gm3
Proven reserves scope: 199 years
2000
2002
2004
2006
2008
2010
2012
Variation rate
Production
Import
Final consumption


Coal Supply
8,000
6,000
4,000
2,000
0
kt
60%
20%
-20%
-60%
-100%
Quinquennial supply variation rate
Proven reserves 2013: 1,767 Mt
Proven reserves scope: 1,631 years
2000
2002
2004
2006
2008
2010
2012
Variation rate
Production
Import
Export
Total supply

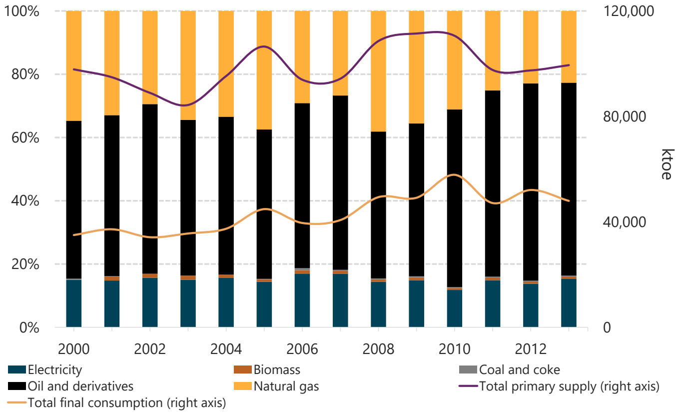

Installed power generation capacity
30,000
20,000
10,000
0
MW
2000
2002
2004
2006
2008
2010
2012
Renewables
Non-renewable
Hydro
Non-renewable thermal
Wind
Solar
Other renewable


Power generation
150
100
50
0
TWh
2006
2008
2010
2012
Renewables
Non-renewable
Hydro
Non-renewable thermal
Wind
Solar
Other renewable

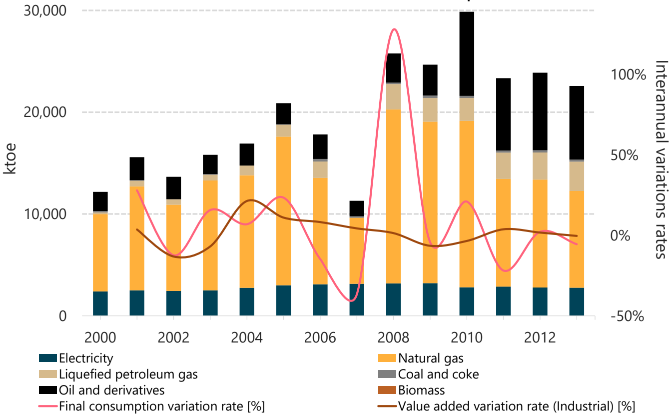

Electrification rate
100%
98%
96%
94%
92%
90%
Electrification rate
1,600
1,200
800
400
0
inhabitants (thousand)
2000
2002
2004
2006
2008
2010
2012
Electrification rate
Population without access to electricity services


Biomass and biofuels production
600
550
500
450
400
350
300
ktoe
0%
-10%
-20%
-30%
-40%
-50%
Quinquennial biomass production variation rate
2002
2004
2006
2008
2010
2012
Variation rate
Firewood

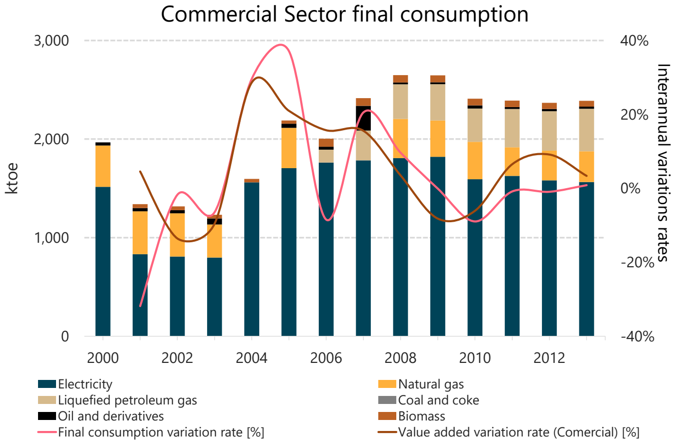
Energy final consumption by energy source



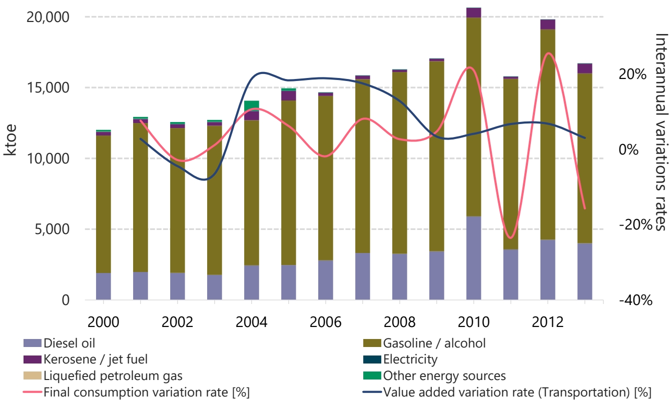
Industrial Sector final consumption



Commercial Sector final consumption



Transport Sector final consumption



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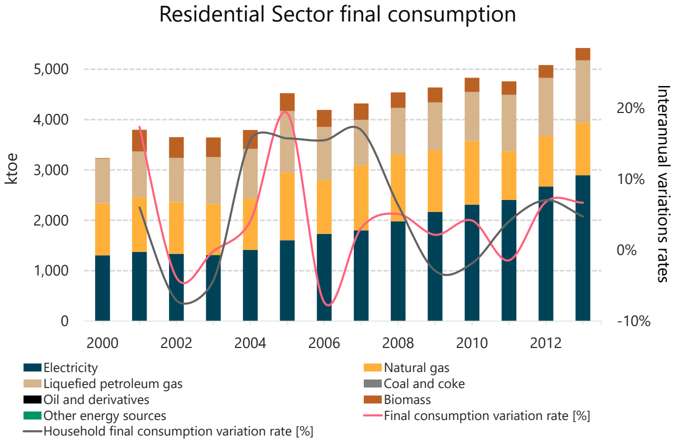
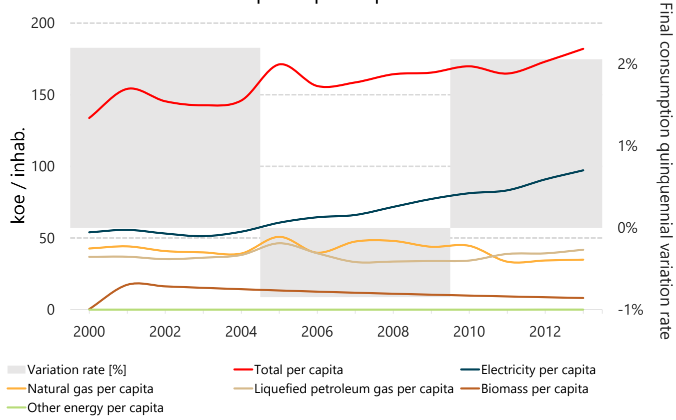
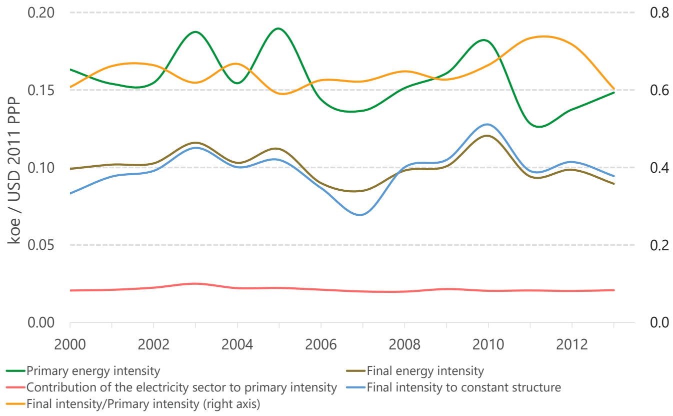
Residential Sector final consumption



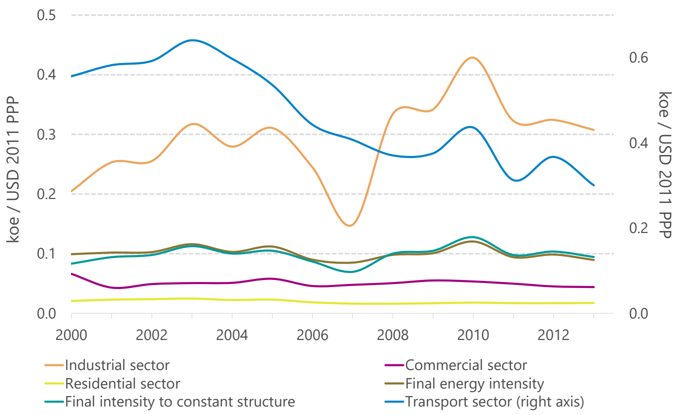
Final consumption per capita Residencial Sector



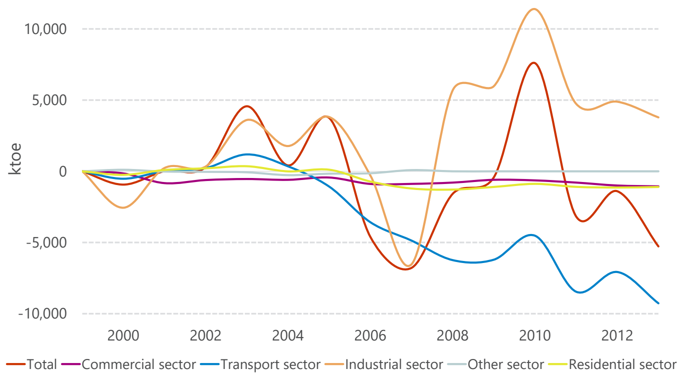
Energy intensities



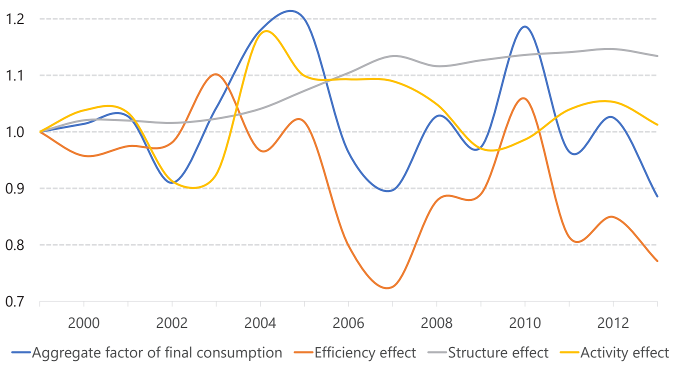
Sectoral energy intensities



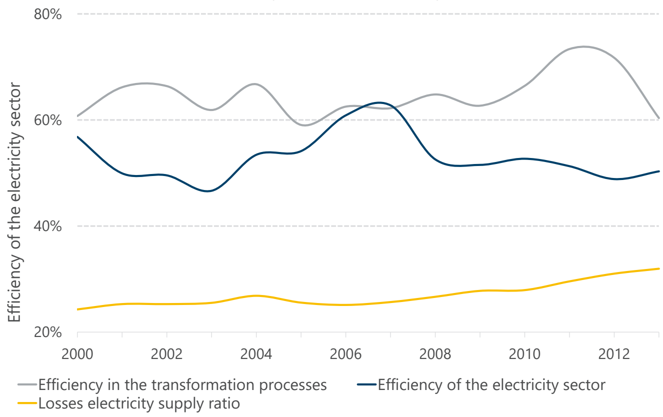
Avoided energy demand due to variations in energy intensity



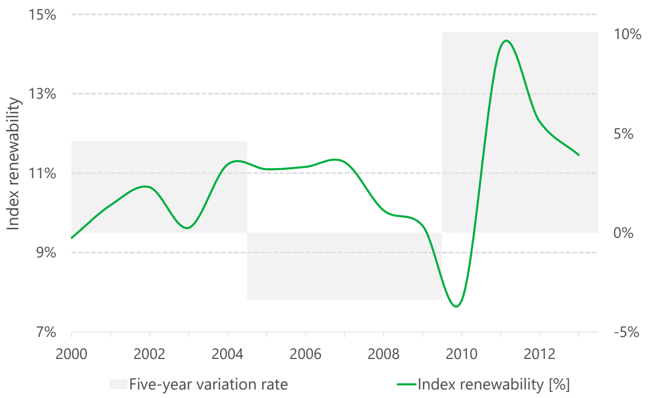
Logarithmic mean Divisia index for the structural decomposition of energy consumption



Efficiency of the electricity sector



Index renewability



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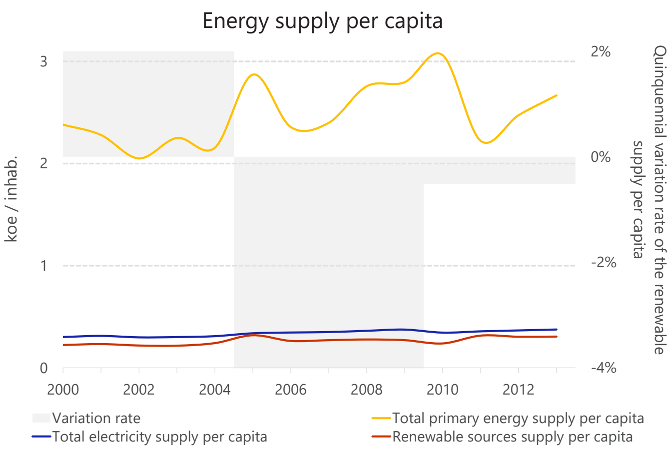
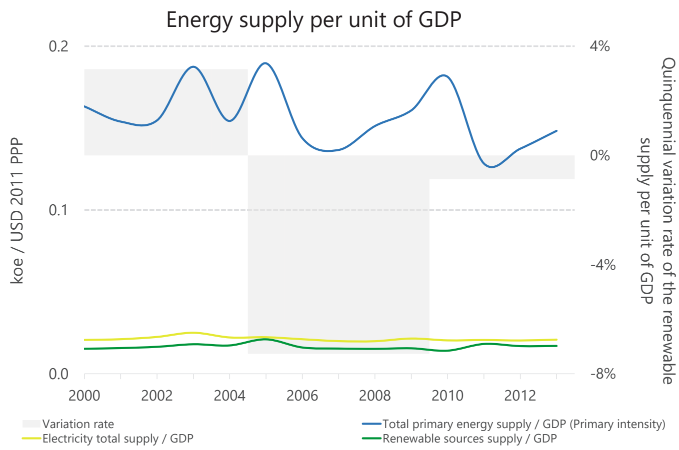
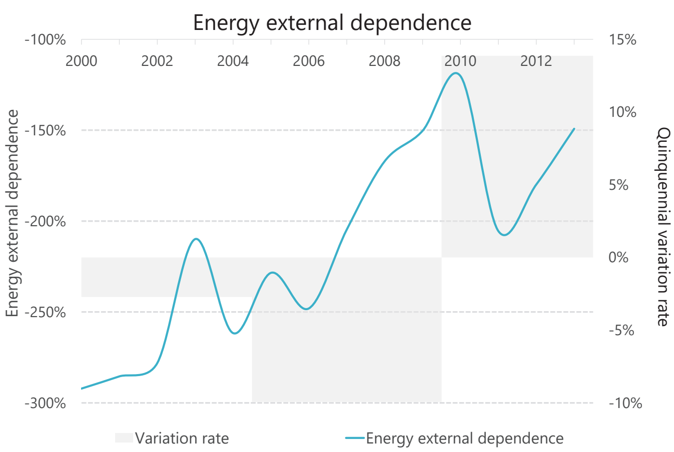
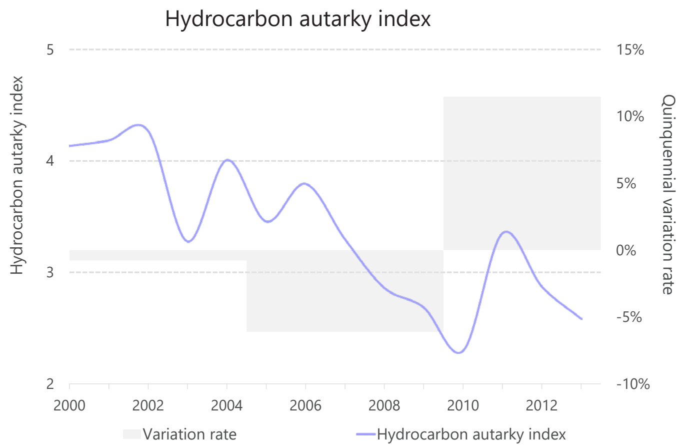
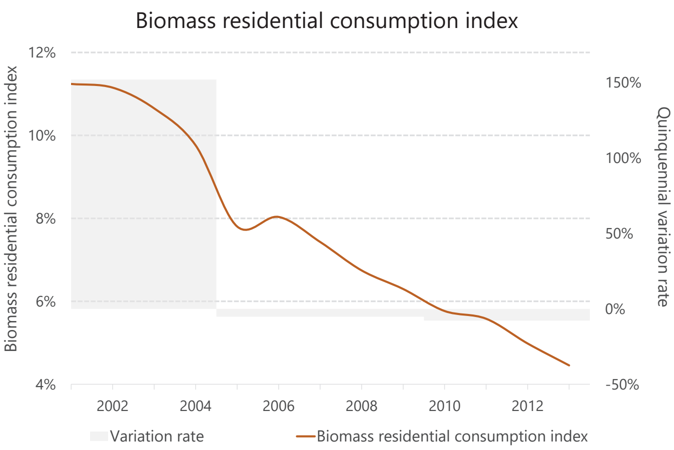
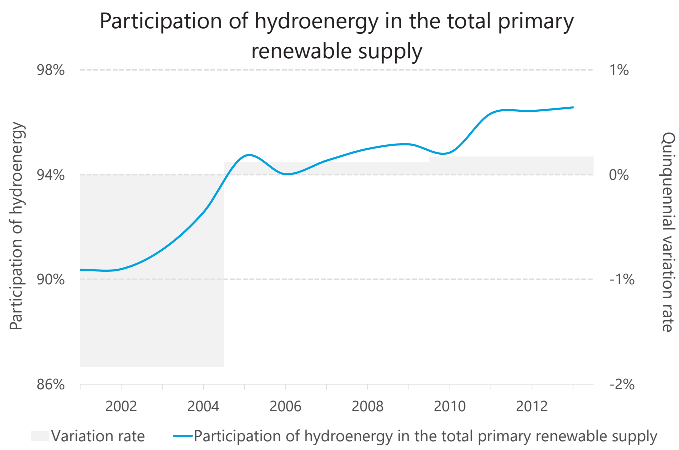

Energy supply per capita
koe / inhab.
0
1
2
3
2000
2002
2004
2006
2008
2010
2012
2%
0%
-2%
-4%
Quinquennial variation rate of the renewable supply per capita
Variation rate
Total primary energy supply per capita
Total electricity supply per capita
Renewable sources supply per capita

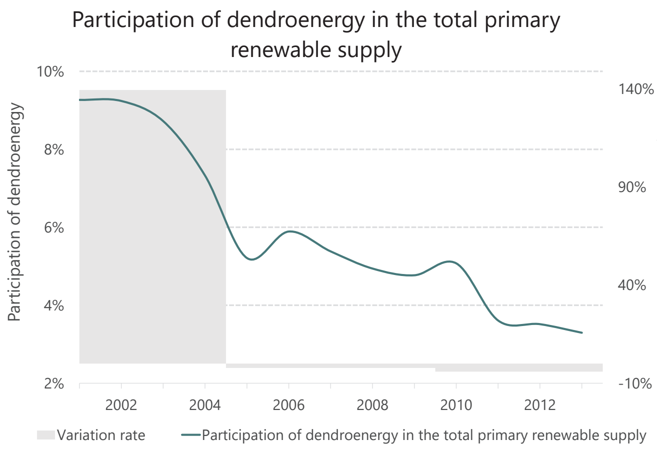

Energy supply per unit of GDP
koe / USD 2011 PPP
0.0
0.1
0.2
2000
2002
2004
2006
2008
2010
2012
4%
0%
-4%
-8%
Quinquennial variation rate of the renewable supply per unit of GDP
Variation rate
Total primary energy supply / GDP (Primary intensity)
Electricity total supply / GDP
Renewable sources supply / GDP

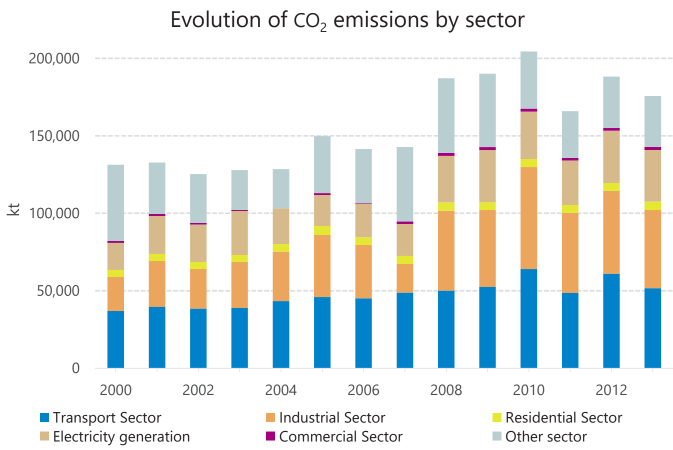

Energy external dependence
Energy external dependence
-100%
-150%
-200%
-250%
-300%
2000
2002
2004
2006
2008
2010
2012
15%
10%
5%
0%
-5%
-10%
Quinquennial variation rate
Variation rate
Energy external dependence

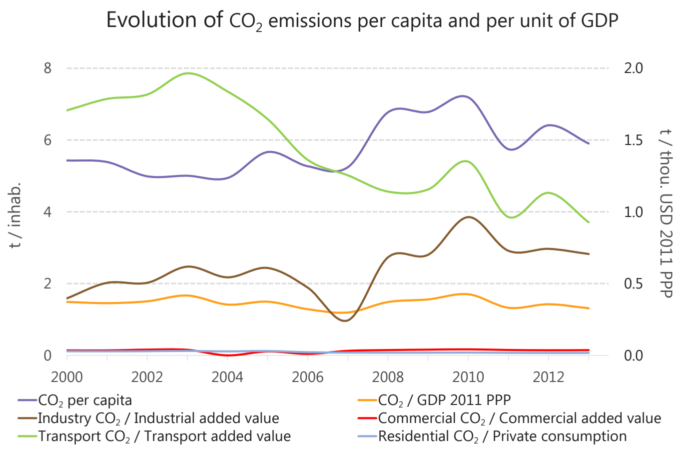

Hydrocarbon autarky index
Hydrocarbon autarky index
5
4
3
2
2000
2002
2004
2006
2008
2010
2012
15%
10%
5%
0%
-5%
-10%
Quinquennial variation rate
Variation rate
Hydrocarbon autarky index

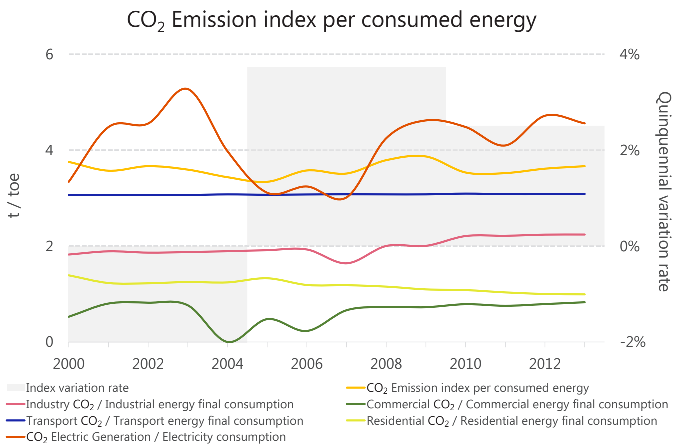

Biomass residential consumption index
Biomass residential consumption index
12%
10%
8%
6%
4%
2002
2004
2006
2008
2010
2012
150%
100%
50%
0%
-50%
Quinquennial variation rate
Variation rate
Biomass residential consumption index

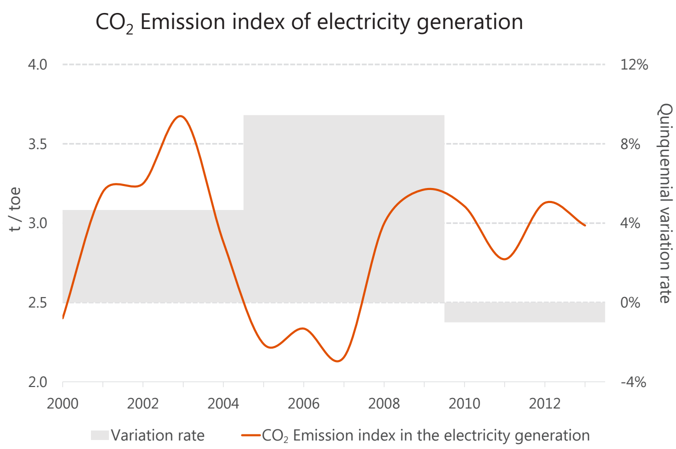

Participation of hydroenergy in the total primary renewable supply
Participation of hydroenergy
98%
94%
90%
86%
2002
2004
2006
2008
2010
2012
1%
0%
-1%
-2%
Quinquennial variation rate
Variation rate
Participation of hydroenergy in the total primary renewable supply

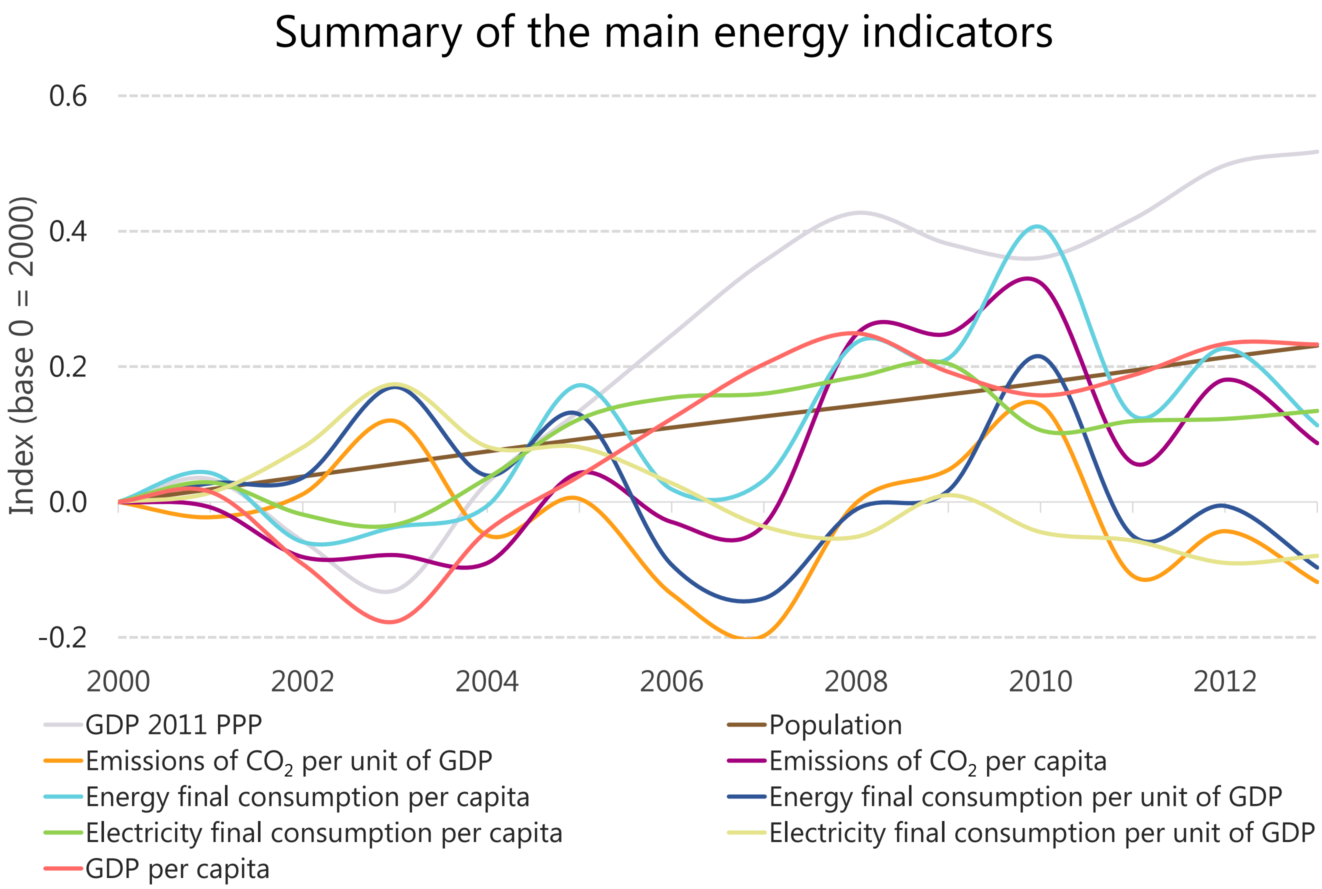

Participation of dendroenergy in the total primary renewable supply
10%
8%
6%
4%
2%
140%
90%
40%
-10%
Participation of dendroenergy
Quinquennial variation rate
2002
2004
2006
2008
2010
2012
Variation rate
Participation of dendroenergy in the total primary renewable supply


Evolution of CO_2 emissions by sector
200,000
150,000
100,000
50,000
0
kt
2000
2002
2004
2006
2008
2010
2012
Transport Sector
Industrial Sector
Residential Sector
Electricity generation
Commercial Sector
Other sector


Evolution of CO_2 emissions per capita and per unit of GDP
8
6
4
2
0
2.0
1.5
1.0
0.5
0.0
t / inhab.
t / thou. USD 2011 PPP
2000
2002
2004
2006
2008
2010
2012
CO_2 per capita
CO_2 / GDP 2011 PPP
Industry CO_2 / Industrial added value
Commercial CO_2 / Commercial added value
Transport CO_2 / Transport added value
Residential CO_2 / Private consumption


CO_2 Emission index per consumed energy
6
4
2
0
4%
2%
0%
-2%
t / toe
Quinquennial variation rate
2000
2002
2004
2006
2008
2010
2012
Index variation rate
CO_2 Emission index per consumed energy
Industry CO_2 / Industrial energy final consumption
Commercial CO_2 / Commercial energy final consumption
Transport CO_2 / Transport energy final consumption
Residential CO_2 / Residential energy final consumption
CO_2 Electric Generation / Electricity consumption


CO_2 Emission index of electricity generation
4.0
3.5
3.0
2.5
2.0
12%
8%
4%
0%
-4%
t / toe
Quinquennial variation rate
2000
2002
2004
2006
2008
2010
2012
Variation rate
CO_2 Emission index in the electricity generation



Summary of the main energy indicators
Index (base 0 = 2000)
0.6
0.4
0.2
0.0
-0.2
2000
2002
2004
2006
2008
2010
2012
GDP 2011 PPP
Population
Emissions of CO_2 per unit of GDP
Emissions of CO_2 per capita
Energy final consumption per capita
Energy final consumption per unit of GDP
Electricity final consumption per capita
Electricity final consumption per unit of GDP
GDP per capita

VENEZUELA

Legislation, regulation and energy policy

Legislation, regulation and energy policy 2020

1. INSTITUTIONAL

For operational reasons, the government of **Argentina** carried out a strategic reorganization and incorporated the issue of national energy policy in the Ministry of Economy, transferring the competencies related to the development, proposal and execution of national energy policy from the Ministry of Productive Development to the Ministry of Economy.

Brazil's Ministry of Mines and Energy (MME), in partnership with the Energy Research Company (EPE), published the National Energy Plan to 2050 (PNE). Among the most optimistic projections of this planning instrument are the great opportunities for the country to become a net energy exporter. Likewise, it is expected that between 45 and 50% of the energy matrix and between 80 and 85% of the electricity generation matrix will be renewable. To this end, the renewable energy strategy has four main objectives: energy security, adequate return on investment, availability of access to the population and socio-environmental criteria. The Oil and Natural Gas Exploration and Production Bidding Improvement Program (BidSIM) and its Interministerial Executive Committee were also instituted, focused on increasing the competitiveness and attractiveness of the areas to be offered in the bidding rounds. In addition, the Regulations of the Law creating the National Environmental Fund, an accounting and financial entity designed to support projects aimed at the rational and sustainable use of natural resources, including the maintenance, improvement or recovery of environmental quality, with a view to improving the quality of life of the Brazilian population, were issued. Furthermore, a decree created the Low Carbon Industry Technical Committee, an advisory body designed to promote the coordination of public and private organizations and entities to implement, monitor and review public policies, initiatives and projects that encourage the transition to a low-carbon economy in the country's industrial sector.

In the framework of the virtual summit "Chile 2020: Green Hydrogen Summit," the **Chilean** government presented the green hydrogen strategy aimed at developing this industry and placing the country, by 2040, among the world's leading producers and exporters of this renewable fuel, contributing to the development of clean and affordable energy, as well as to the goal of a zero-emissions country by 2050. The strategy sets out the economic estimates that allow the production of hydrogen from renewable energies at a low cost, and its potential uses in areas such as power generation, fossil fuel substitution, ammonia production and synthetic fuels, among others. In addition, the pillars of action that guide this industrial policy and the action plan established by the Ministry of Energy to develop the industry are explained, especially in terms of regulations, public-private alliances, territorial approach to policies, and the role of academia in the development of human, scientific and technological capital. In addition, the "Scientific Ministerial Advisory Committee on Climate Change" was established by decree to advise and support the head of the Ministry of Science, Technology, Knowledge and Innovation in the field of climate change.

Costa Rica approved the update of the VII National Energy Plan 2015-2030 (VII PNE) aimed at aligning this instrument to current national events and public policies. In addition to the new governmental provisions, the adaptation reflects the international commitments and processes in which the country participates in the energy sector, including the accession process to the Organization for Economic Cooperation and Development (OECD). The updated version of the VII PNE foresees renewed actions and goals for 2030. On the other hand, within the framework of the Law to punish the seizure and illegal introduction of oil-derived fuels and their blends, the National Fuel System was declared of public interest, since they are strategic assets for the nation.

In **El Salvador**, the General Superintendence of Electricity and Telecommunications (SIGET) approved the "Transitory Provisions to the Regulations for the Operation of the Transmission System and the Wholesale Market Based on Production Costs", aimed at providing the Unidad de Transacciones, S.A. de C.V., during the "National State of Emergency of the COVID-19 Pandemic", with the necessary tools to fulfill its essential function of operating the Wholesale Electricity Market, as well as the transmission system.

Within the framework of an institutional optimization aimed at guaranteeing the efficiency, effectiveness and economy of the Public Administration in the main areas of the energy and non-renewable natural resources sector, **Ecuador** decreed the merger of the Mining Regulation and Control Agency, the Electricity Regulation and Control Agency and the Hydrocarbons Regulation and Control Agency into a single entity called "Energy and Non-Renewable Natural Resources Regulation and Control Agency." On the other hand, criteria and standards were established to manage the operation process of the Single Statistical Information System of the Electricity Sector (SISDAT 2.0), an official source of statistical and geographic information, and a support tool for decision-making in the electricity sector. This measure responds to the need to establish, update and formalize the guidelines and responsibilities for the integral management of the Single Statistical Information System of the Ecuadorian Electric Sector, with the due interaction of the electric companies, the National Electricity Operator (CENACE) and in general all the participants of the electric sector in the activities inherent to the public electric energy service and the general public lighting service.

Mexico approved the Energy Sector Program for the period 2020- 2024, a guiding planning instrument aimed at achieving and maintaining sustainable energy self-sufficiency to meet the energy demand of the population with domestic production; strengthening the State's productive enterprises as guarantors of energy security and sovereignty, to trigger a multiplier effect in the private sector; organize the scientific, technological and industrial capacities necessary for the energy transition; raise the level of efficiency and sustainability in the production and use of energy; ensure universal access to energy; and strengthen the national energy sector to constitute the basis for the country's development. It also approved the Sector Program for the Environment and Natural Resources (Promarnat) 2020-2024 aimed at promoting the conservation, protection, restoration and sustainable use of ecosystems and their biodiversity; strengthening climate action in order to move towards a low-carbon economy and the resilience of the population, ecosystems, productive systems and strategic infrastructure; and strengthening environmental governance by ensuring access to environmental justice with a territorial and human rights approach. In the institutional area, an adjustment was made to the agreement to create the State's productive Company, a subsidiary of Petróleos Mexicanos, called PEMEX transformación industrial, in charge of refining, transforming, processing, importing, exporting, marketing, selling to the public, manufacturing and selling hydrocarbons, oil products, natural gas and petrochemicals. The reform includes the production, distribution and commercialization of ammonia, its derivatives and fertilizers. In addition, the amendment to the organic bylaws of the subsidiary productive companies of the Federal Electricity Commission, called CFE Generación I and V, was approved, in order to group functions according to the basic structure and organization. On the other hand, the elimination of the Public Trust Fund to Promote the Development of National Suppliers and Contractors of the Energy Industry and the CONACYT Sectoral Fund (Ministry of Energy - Hydrocarbons - Energy Sustainability), and the corresponding repeal of the articles that made reference to it, implied amendments to the Hydrocarbons Law, the Electricity Industry Law and the Law of the Mexican Oil Fund for Stabilization and Development.

The **Nicaraguan** Parliament approved the laws creating four state-owned companies that, under the sectoral leadership of the Ministry of Energy and Mines (MEM), will manage the import, storage, distribution and commercialization of gas and hydrocarbons: Nicaraguan Company of Hydrocarbon Storage and Distribution Plants, ENIPLANH, in charge of promoting and carrying out hydrocarbon storage and distribution activities; the National Company of Exploration and Exploitation of Hydrocarbons, ENIH, in charge of promoting and carrying out hydrocarbon exploration and exploitation; ENIGAS, legal successor without solution of continuity of PETROGAS, in charge of promoting investment in the activities of commercialization, storage, transportation and distribution of Liquefied Petroleum Gas (LPG), construction and/or operation of LPG cylinder filling or bottling plants using PETROGAS as commercial brand; and the Nicaraguan Company of Import, Transportation and Commercialization of Hydrocarbons, ENICOM, in charge of promoting and carrying out the activities of import, transportation and commercialization of hydrocarbons, and other related activities. Amendments were also approved to the law creating the Electricity Transmission Company ENATREL and to the law reforming the executive decree creating the Nicaraguan Electricity Company (ENEL), which establishes the restructuring of the boards of directors of both companies to ensure that, through the definition of the corporate policy of both companies, elements are incorporated to assist the State in the provision of basic public services, such as energy.

Likewise, with the purpose of transforming the Nicaraguan Electricity Company (ENEL) into a Decentralized Entity of the Executive Branch, attached to the Ministry of Energy and Mines, so that it enjoys technical, administrative and financial autonomy, the Law amending the Decree creating the Nicaraguan Electricity Company (ENEL) was approved. The amendment states that ENEL may not be privatized and that it is no longer subject to the Civil Service and Administrative Career Law, but is based on the relationship between the company and its employees under the provisions of the Labor Code in force.

Based on the commitments assumed in the framework of the Sustainable Development Goals (SDGs) of the United Nations in general, and SDG 7 in particular, and the Paris Agreement, **Panama** approved by resolution, the Strategic Guidelines of the Energy Transition Agenda 2020-2030, whose goals include the implementation of programs associated with changes in the behavior of energy consumers, the incorporation of modern and less polluting fuels, the reduction of electricity generation with fossil fuel sources to make way for natural gas, non-conventional renewable technologies, and the development of electric mobility. The document constitutes a road map for a new development system that, without depleting available energy sources and natural resources, improves the quality of life of the population and takes measures to preserve the planet. With the Energy Transition Agenda, it is planned to electrify the communities established within the Multidimensional Poverty Index. The initiative is committed to the use of renewable energy sources and a modern and intelligent distribution network to promote socio-economic development. To monitor and support the implementation of the guidelines, the National Energy Transition Council is created as an advisory, consultation and accountability body, with the participation of the public and private sectors. On the other hand, the National Energy Secretariat published a Resolution that proposes to adopt measures aimed at guaranteeing in the energy sector, the efficient, continuous and uninterrupted provision of public electricity and fuel services, before the National Emergency Declaration as a result of the effects generated by the COVID-19 pandemic. To such effects it is resolved to present or update the contingency plans that correspond to the circumstances, to make regulatory adjustments in the electricity sector to guarantee the continuity and quality of service and mitigate the economic impacts of the pandemic, to temporarily establish a Management and Continuity Committee to evaluate risks and coordinate actions, to determine the import parity prices of liquid oil products and liquefied gas, on a transitory basis, every 7 days and not every 14 days as planned while the exceptional conditions generated by the pandemic continue, to recommend energy saving measures, among others.

In order to contribute to reducing deforestation, the adverse effects on biodiversity and the illegal use of energy sources, **Paraguay** approved the Regulations that establish the Regimes for the Certification, Control and Promotion of the Use of Bioenergy from Forest Plantations or Managed Native Forests, to ensure the sustainability of these renewable resources within the national territory. For such purposes, the National Biomass Certification Program (PNCB) is created as a scheme that will govern the processes and procedures for the certification of biomass from forest plantations or native forests operated for energy purposes, which will be attached to the Vice Ministry of Mines and Energy of the Ministry of Public Works and Communications. The Program consists of a voluntary national initiative that sets a standard for the certification of biomass and its products, based on four basic principles: compliance with current labor, tax, forestry and environmental laws; origin of the biomass; production chain and traceability of the products; and marketing of biomass. The Program is oriented to the certification of the sustainable management and chain of custody of the production of biomass for energy purposes in such a way that, as a result of this process, the market can offer the final consumers certified biomass. The Regulation provides for the creation of a Biomass Certification Committee that will act as the governing body of the program, policies, plans, programs and institution building.

In order to promote the effective governance of the national mining energy sector, the "Mining and Energy Management Committees" were created in **Peru** as a coordination and articulation mechanism, with regional scope, competent to adopt decisions aimed at achieving the sustainable development of mining and energy activities. These committees will be in charge of identifying development and social welfare projects for the benefit of the populations related to mining and energy operations, identifying good practices aimed at promoting a better relationship between the companies and the populations settled around the development of their operations, promoting progress in the fulfillment of the commitments assumed by the sector, among other related and related matters. In addition, the 2021-2030 Transmission Plan was approved.

In November 2020, with the support of ECLAC, the Sustainable Energy Strategy 2030 of the **SICA** countries **(Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama and Dominican Republic)** was published, a document that proposes a set of regional actions aimed at ensuring the energy supply of the SICA countries in quality, quantity and diversity of sources, the provision of affordable modern energy services for the entire population and the rational and efficient use of energy in production chains to ensure sustainable development, considering social equity, economic growth, economic growth, compatibility with the environment and governance. With the Energy Strategy 2030, the SICA countries intend to guide the sustainable development of the Central American sub-region, complying with international and regional commitments, especially those concerning the energy sector in the 2030 Agenda for Sustainable Development, the Paris Agreement on climate change and the Alliance for Sustainable Development (ALIDES). Similarly, at the subsector level, the energy integration commitments established in the Framework Treaty of the Central American Electricity Market have been taken into account.

Under the Urgent Consideration Law (LUC), **Uruguay** created the Ministry of the Environment, which is responsible for executing and implementing national environmental policy, sustainable development, conservation and use of natural resources; formulating, implementing, supervising and evaluating national environmental protection and environmental management plans; and promoting environmental awareness among citizens. In this sense, the Climate Change Secretariat, created in 2015, is abolished. On the other hand, in order to grant functional and organic independence, the legal regime of the Energy and Water Services Regulatory Unit (URSEA) was modified, establishing it as a decentralized service of the Executive Branch. In this sense, it is provided that this decentralized service assumes the performance through the integration of its Board of Directors, constituted on August 20, 2020. In addition, a Decree called for the convening of a committee of experts, which will operate within the Ministry of Industry, Energy and Mining (MIEM) and the Presidency of the Republic, to discuss and approve a proposal for a comprehensive review of the fuel market. The Committee shall receive the different stakeholders in the fuel market, interest groups and the public in general, in order to hear their proposals, suggestions or observations.

2. ELECTRICITY

2.1 Generation, transmission and distribution

Within the framework of the emergency declared by the COVID-19 pandemic, **Brazil** made the COVID Account viable, conceived as a structured market operation to preserve the sustainability of an infrastructure sector, meeting the short-term needs of the electricity sector caused by the pandemic, such as the reduction of consumers' ability to pay and the impacts on capacity distribution companies and other sector agents. The credit operation established by the COVID Account is structured in the form of a syndicated loan backed by tariff assets transiting through the Energy Development Account to enable its low cost. Therefore, this account addresses the problems experienced by distributors, guaranteeing them the necessary economic resources to compensate for the temporary loss of income as a result of the pandemic; it protects the rest of the industry chain by allowing distributors to continue fulfilling their contracts; and, ultimately, the end consumer, by saving him/her from rate increases in a context of global crisis, reduced ability to pay and reduced family budgets. On the other hand, a law was published amending Law No. 9,427 of 1996, to establish a fine to be paid on behalf of the end users of the electric energy service, for damages due to interruption in the supply of electric energy by the company providing the public service of electric energy distribution. The referred fine will be subject to a minimum and maximum value, and may be paid as a credit in the electricity bill or in cash, within a term not exceeding 3 (three) months after the calculation period; it will be applied when the quality indicators of the service provided are not met and will not apply, among other situations, when: the interruption is caused by a failure in the installations of the consumption unit; in case of suspension due to non-compliance of the user. On the other hand, the regulation that establishes the provisions applicable to the means of generation connected to the National Electric System facilities with power surpluses of less than or equal to 9,000 kW, called "Means of small scale generation," was published. This regulation focuses on regulating the procedure for the interconnection of these means to the distribution networks, as well as the determination and costs of additional works, the methodologies to establish the limits to the connection and the injections of energy and power, among other technical regulations. On the other hand, appreciating that in 2016 a new electricity transmission system was established, an independent coordinating body of the national electricity system was created, and various amendments were introduced to the General Law on Electric Services, in order to ensure the due and effective implementation of the provisions in force, the Regulation applicable to the processes of qualification, valuation, pricing and remuneration of the facilities of the electricity transmission or transport systems for electricity systems with installed generation capacity greater than or equal to 200 MW was approved.

In **Colombia**, in order to guarantee the effective application of the income tax deduction to promote research, development and investment in the field of electricity production with Non-Conventional Energy Sources (FNCE) and efficient energy management, the procedure for the Mining and Energy Planning Unit (UPME) to issue the corresponding certification as a requirement for the deduction to apply was developed by decree. This deduction implies that taxpayers who directly make investments in this sense will be entitled to deduct from their income fifty percent (50%) of the total value of the investment made.

In order to guarantee clear, effective and efficient rules for the reliable operation of the National Electric System (SEN) in **Mexico**, the Energy Regulatory Commission issued the Official Standard that establishes the metrological specifications, test methods and conformity assessment procedures that meters and measurement transformers used for electricity supply must comply with. In addition, in order to improve the incremental needs of satisfying the energy demand of end users under conditions of sufficiency and security of dispatch, the "Agreement whereby the Policy of Reliability, Security, Continuity and Quality in the National Electric System is issued" was published. In general terms, the new policy establishes the guidelines to comply with the provisions of the Electricity Industry Law ("LIE") in terms of guaranteeing the electricity supply, under the reliability principle, and mandates the Energy Regulatory Commission ("CRE") and the National Energy Control Center ("CENACE") to carry out the corresponding adjustments. Under the Agreement, the previous reliability policy established by the Energy Secretariat in 2017 is repealed.

The Law of Sovereign Assurance of the Guarantee of Electricity Supply to the Nicaraguan population was published in **Nicaragua**, which declares of sovereign security and national interest the totality of the shares of TSK Melfosur Internacional (TMI S.A.) in the companies Distribuidora de Electricidad del Norte, Sociedad Anónima (DISNORTE) and Distribuidora de Electricidad del Sur, Sociedad Anónima (DISSUR). For these purposes, the shareholding of TMI S.A. in DISNORTE and DISSUR becomes the total property of the State. It also adds to the powers of the National Electricity Transmission Company, ENTREL, the power to carry out the activity of electricity distribution, within the areas granted and/or assigned to it by the Ministry of Energy and Mines, as well as to hold shares. Likewise, the Electricity Industry Law is amended to allow Economic Agents engaged in the transmission activity to buy and/or sell electricity. In order to guarantee the continuity of electricity supply to the population, DISNORTE and DISSUR will be operated and managed by institutions or companies that the State, through the Ministry of Energy and Mines (MEM), authorizes for such purpose. It should be noted that DISNORTE and DISSUR will continue as companies governed by private law and, in order to guarantee the continuity of the service in an unaltered form, will maintain their commercial relationships. Within a period of no less than one year, the MEM must guarantee the participation of other suitable national and/or international operators, prioritizing the incorporation of private or mixed subjects in accordance with the laws of the Electricity Industry.

Peru, via Supreme Decree, approved provisions on charging infrastructure and electric energy supply for electric mobility, aimed at facilitating the introduction of more energy efficient transportation technologies and their charging infrastructure, to reduce hydrocarbon consumption and contribute to the reduction of Greenhouse Gas (GHG) emissions, as well as the reduction of polluting gas emissions, contributing to the fulfillment of international commitments. For such purposes it is determined that: the battery charging service for electric mobility has a commercial nature, is carried out under competitive conditions, is of public access and is provided nationwide, through the charging infrastructure; the battery charging service is exercised by natural or legal persons that demonstrate that the charging infrastructure meets the technical and safety requirements in force; the charging infrastructure accesses the electric grids and ensures interoperability, meeting the technical and safety requirements in force; the battery charging service may be provided as an additional service in fuel retail outlets, refueling stations, gas centers and NGV retail outlets. On the other hand, it is determined that when public entities need to replace their vehicle fleet, they must do so with more energy efficient technology that considers electric mobility, and the replacement of the vehicle fleet of public entities must be aligned with the objectives of the Reference Plan for the Efficient Use of Energy. It also establishes parking prioritization and energy efficiency labeling for electric vehicles. For the purposes foreseen, the Ministry of Energy and Mines will be in charge of the formulation of the sectorial energy policy and plans, as well as the Nationally Determined Contributions of the energy sector, for the integration of the charging and electric energy supply infrastructure for electric mobility as part of the National Energy Policy and its development plans. Likewise, it is established that the supervision of the electric mobility charging infrastructure with respect to the quality, safety and efficiency of the service provided to end users will be the responsibility of the Energy and Mining Investment Supervisory Agency (Osinergmin). On the other hand, the control of compliance with the technical and safety regulations in force applicable to the charging infrastructure for electric mobility will be the responsibility of the Municipalities in accordance with the provisions of the National Electricity Code - Use.

Valuing that in 2010, subscribers connected to the low voltage distribution grid were authorized to install wind, solar, biomass or mini-hydro renewable generation, and to exchange energy bidirectionally with the distribution grid; and that in 2015, the installation and operation of generating plants that operate in parallel with the Interconnection Grid without injecting electric energy, and those not connected to such grid, **Uruguay** published the Decree that authorizes Subscribers connected to the Low Voltage Distribution Grid, to generate electric energy from a battery installation that operates in parallel and that do not inject energy to the Distributor's grid. The development of this power generation activity must comply with environmental regulations relating to the installation and final disposal of batteries. The objective of this measure is focused on diversifying the generation of electric energy, considering that the use of batteries, under certain conditions, can help to make better use of the electric system. The aforementioned Decree fills a legal void since the Electric Energy Distribution Regulation in force since 2002 did not explicitly contemplate the generation connected to the Low Voltage grid, nor the use of accumulation systems (batteries) in the subscribers' installations. The National Administration of Power Plants and Electric Transmissions, the Energy and Water Services Regulatory Unit and the Ministry of Industry, Energy and Mining will carry out an evaluation of the impact of the installation of batteries in the electric system, including the relevance of the creation of a new tariff category, when 10 MW of installed power is installed or three years from the date of approval of the referred Decree.

2.2 Marketing, consumption and subsidies

As part of the initiatives implemented by the national government to mitigate the impact of the crisis that the electricity sector is going through due to the impact of the COVID-19 pandemic, **Argentina**'s National Electricity Regulatory Agency (ENRE) established new conditions to mitigate electricity costs for industries and businesses. In this sense, users of categories T2, T3 and toll that have had a drop of 50% or more of their energy demand, may request the suspension or waiver of the contracted power for the duration of the Preventive and Mandatory Social Isolation. In this regard, it was also provided that the debts that are generated during the suspension will be paid through payment plans. The measure also contemplates that users who choose to totally or partially terminate the power contract or request its readjustment will not be subject to the penalties set forth in the current regulatory framework. In addition, the National Government determined that neighborhood clubs and development associations will not have their electricity and gas services cut off in the event of default or non-payment of up to three consecutive or alternate invoices, due as from March 1, 2020. It also established the prohibition of interrupting the supply of electricity due to default or non-payment for users in vulnerable situations. Also, with the purpose of reducing the real tariff burden on households, businesses and industries and based on the provisions of the Law of Social Solidarity and Productive Reactivation within the framework of the Public Emergency, it was decided to renegotiate the current tariff revision for the providers of public utilities for the transportation and distribution of electric power and natural gas under federal jurisdiction, based on distributive equity and productive sustainability criteria aimed at reorganizing the operation of the system's regulatory entities to ensure their efficient management.

Considering the need to approve measures for the benefit of the vulnerable population to face the impact of the Coronavirus, **Bolivia** approved by decree the one-time granting of the Family Bonus and the temporary monthly reduction of 30% in the billing of electricity tariffs for consumers in the household category. With the regulation of this Decree, temporary discount ranges between 20% and 100% on the amount of energy, power, billed, applicable to consumers and/or users of the residential and/or domiciliary category, according to the amount of their monthly energy consumption, are approved. It also establishes the deferral of payment from regulated consumers to Distributors and from debtor Agents to creditor Agents of the Wholesale Electricity Market in certain invoices. In addition, temporary discounts are provided for senior citizens and beneficiaries of the dignity tariff, and the cutting of service and imposition of penalties for non-payment are temporarily prohibited. A period of three (3) months is granted after the lifting of the total quarantine for the regularization of the corresponding payments. With the publication of the exceptional law of deferral of credit payments and temporary reduction of the payment of basic services, all public, private and cooperative companies that provide basic services must guarantee their continuity. For such purposes, payments for user services should be deferred without fines or penalties, for the duration of the emergency declaration for the Coronavirus pandemic (COVID-19), and service should not be cut off for non-payment.

Brazil issued provisional measures aimed at mitigating the impacts of the pandemic on electricity tariffs. For this purpose, a three-month exemption from the payment of electricity bills was guaranteed for low-income consumers, beneficiaries of the social tariff, a measure that benefited more than 10 million families. Additionally, provisions were established to mitigate the impact on consumers' electricity bills in the medium and long term. The set of measures includes the suspension of electric service outages for non-compliance by residential consumers and essential services for a period of 90 days. In addition, measures were approved to contain the increase in expenses of the Energy Development Account - CDE with the rationalization of subsidies supported by this Account. In this context, changes are established in the incentives associated with the discounts in the Tariff for the Use of the Transmission System (TUST) and in the Tariff for the Use of the Distribution System (TUSD), covered by the CDE. Currently, subsidies favor generators from incentivized sources, free consumers and special consumers, and the costs are paid by all energy consumers in the country. The measure establishes that these discounts will be applied only to new projects or for the portion of the increase in installed capacity of projects already granted. In order to preserve the principle of predictability and respect for existing contracts, the decision does not affect grants already issued. The measure also does not affect plants classified as micro and mini distributed generation participating in the Electric Energy Compensation System, known as Distributed Generation - DG, or awarded plants that have changes in technical characteristics not associated with the expansion of installed capacity. On the other hand, in order to protect the defense of the rights of the users of public utilities, a law was published that prohibits the charging of reconnection fees for public utilities, such as electricity, and requires reconnection within a maximum period of 12 hours, counted from the consumer's request or from the payment of the debt. The proposal also prohibits the interruption of service, for debts, occurring on Friday, Saturday or Sunday, and on holidays or the eve of holidays.

Within the framework of the State of Constitutional Exception of Catastrophe due to the COVID-19 pandemic, **Chile**, by means of legislation, exceptionally provided for the application of the following measures in favor of end users of electricity and gas network services: until December 31, 2021, electricity and gas network distribution companies may not cut off the supply due to late payment to individuals, users and non-profit establishments serving the community, including micro-enterprises. Likewise, debts contracted with electricity and gas distribution companies, generated between March 2020 and December 2021, will be prorated in the number of equal and successive monthly installments to be determined by the end user at its choice (not to exceed 48) and may not include fines, interest or associated expenses. In addition, other energy measures were approved to face the State of Catastrophe due to COVID-19, such as the exceptional and temporary elimination of the "Peak Hours" measurement and the Contingency Plan for Distributors (direct assistance for the payment of energy bills of 7 million people that make up the 40% of lower income). On the other hand, the Safety Regulation for Electric Power Consumption Facilities was approved, which establishes the minimum requirements that must be considered in the design, construction, commissioning, operation, repair and maintenance of all electric power consumption facilities up to the point of connection of the end customer to the distribution network, to ensure that they operate under safe conditions for people and things. On the other hand, the Electrically Dependent Persons Law was approved, which guarantees the uninterrupted supply of electricity to persons who, for the treatment of the pathology they suffer, are hospitalized at home and need to remain physically connected, continuously or temporarily, to an element for medical use, and who require electricity supply for their operation.

It also establishes that electric companies may not charge for the use of generators and must keep a record of patients. The aforementioned law will benefit approximately 22,000 patients who are in this condition. For this purpose, concessionaires will deduct the energy consumption associated with the operation of medical devices required by an electro dependent person.

Colombia approved by decree extraordinary measures aimed at protecting consumers and public utilities through the cancellation or relief of obligations affected by the effects of the COVID-19 pandemic. In this context, considering that the electric energy sector was affected by the decrease in the collection of payments for consumption, measures were approved that imply: the allocation of resources for public utilities, in order to avoid putting at risk the continuity in the provision of electric energy and fuel gas services, and the approval of payment facilities for consumers. Among the measures approved are: the determination of the deferred payment of residential public utilities of electric energy and fuel gas, for a term of 36 months, of the cost of basic or subsistence consumption for residential users, without fines, surcharges or interest; concession to the companies providing public utilities of electric energy and fuel gas through networks (official, mixed and private) of direct credits for the financing of the deferred payment of domiciliary public utilities, compensation of the Rate for the Continuity of the Domiciliary Public Utilities of Electric Energy and Fuel Gas charged to resources of the budget of the Ministry of Mines and Energy coming from the Emergency Mitigation Fund -FOME.

Having identified the need for a regulatory update, **Ecuador** approved the replacement of the Regulation "Quality of the service of distribution and commercialization of electric energy" which establishes the indicators, indexes and limits of quality of the service of distribution and commercialization of electric energy; and defines the measurement, registration and evaluation procedures to be complied with by the electric distribution companies and consumers. On the other hand, compensation measures were approved for residential users of the electric service with consumption between 1 and 500 kWh per month according to which the electric distribution companies must replicate the billing of consumption from March to August 2019 for the same period of 2020. This provision applies to residential users who present increases in consumption during the State of Emergency declared by the Health Emergency. Additionally, users of the electrical service, who have outstanding values, will be able to access cancellation agreements of up to 36 months without interest or surcharges. These benefits are in addition to the compensations issued during the state of emergency, such as: no suspension of electricity service for non-payment, flat rate of 10.50 cents per kWh for residential users with consumption exceeding 500 kWh per month, 50% reduction in the demand rate for the commercial and industrial sector, as long as they register a demand of less than 60%.

In order to provide economic relief to the population affected by the COVID-19 pandemic, a law was published in **El Salvador** that temporarily defers the payment of bills for basic services, including electricity, without any surcharge or penalty. The aforementioned law was later amended to establish consumption ranges in the electric energy bills of the beneficiaries and to extend the benefit to the consumption of electric energy of the Water Boards, community and municipal projects and their different terms.

Panama included in the social measures adopted in response to the sanitary emergency, the suspension for four months of the payment of the public electricity service, the amount of which may be subsequently prorated over a period of three years, without generating interest or any type of impact on the credit history. The beneficiaries of this measure include low-income families, people whose employment relationship has been affected, retirees, self-employed workers, micro and small businesses whose income has been affected, as well as owners of restaurants, bars, casinos and public or private transportation services whose income has been affected.

Peru issued regulations to ensure the continuity of electricity service during the State of Emergency as a result of COVID-19, under which it provided for the rescheduling and installment of electricity and natural gas bills for the vulnerable population without interest or late payment charges for up to 24 months. In this regard, the vulnerable population is considered to be residential electricity users with a consumption of up to 300 kWh per month, those connected to non-conventional rural electricity systems supplied with photovoltaic panels (solar energy), and natural gas users with consumption of up to 20 cubic meters per month. The compensatory interests of the fractionation will be covered with resources from the Energy Social Inclusion Fund (FISE), administered by the Ministry of Energy and Mines, Minem. In this emergency scenario, the electricity companies will not be able to suspend the service. In addition, the Minem, through a Decree, extended the coverage of the Electricity Bonus to around 90 thousand new users who have contracted the electricity service under the prepaid commercial modality and to those who have collective supplies. The Electricity Bonus benefits 5.3 million users nationwide, equivalent to approximately 24 million Peruvians. It is aimed at lower income sectors, which are those with a consumption of up to 125 kWh, users in rural areas that are served with photovoltaic systems (solar panels) and those with collective metering.

Within the framework of the declaration of the state of national sanitary emergency, as a consequence of the pandemic caused by the COVID - 19 virus, and in order to maintain the electricity supply, a decree was published in **Uruguay** urging the National Administration of Power Plants and Electric Transmissions (UTE) to suspend the cuts in electricity supply due to non-payment of services to users of general and residential plans. On the other hand, valuing the convenience of continuing to promote support to the national dairy production chain, and taking advantage of energy availability; the Decree was published urging the National Administration of Power Plants and Electric Transmissions (UTE) to maintain during 2020 the commercial benefits program for dairy producers and companies or productive units of the dairy production chain, as it has been doing since 2017 with periodic renewals. The aforementioned program implies a monthly discount on the charge for energy without VAT. In addition, the National Administration of Power Plants and Electric Transmissions (UTE), at the request of the Ministry of Industry, Energy and Mining (MIEM), granted benefits to various institutions affected by the economic effects of COVID-19. To this end, the resolution approved the exemption from the payment of fixed charges and electricity power to educational and cultural institutions. In addition, hotels and restaurants were allowed to finance 70% of their invoices, without fines or surcharges, and to pay them in installments.

2.3 Rural Electrification or Universalization of electricity

In order to provide electricity to the Brazilian population living in remote regions of the Legal Amazon, **Brazil**, through a Decree, established the National Program for Universal Access and Use of Electricity in the Legal Amazon - More Light for the Amazon. Under the provisions of the Decree, service is prioritized for: low-income families registered in the Federal Government's Unified Registry of Social Programs; families benefiting from federal, state or municipal government programs aimed at social and economic development; rural settlements, indigenous communities, quilombola territories and other communities located in extractive reserves or directly impacted by power generation or transmission projects for which the concessionaire is not responsible; schools, health posts and community water wells; and families residing in conservation units.

In order to ensure correspondence to the amendments made to the General Rural Electrification Law in 2015, **Peru** approved a new Regulation that repeals the one published in 2007 and establishes the provisions relevant to planning, financing, execution, electricity rights, transfer of works, and projects for productive uses of electricity. Regarding the planning of investments in the Rural Electricity Systems (SER) and the productive uses of electricity, the new regulation seeks to optimize the planning process by broadening the objectives of the National Rural Electrification Plan (PNER), defining the scope of the long and medium term component, establishing general guidelines for its formulation, preparation, approval and updating, and modifying the prioritization criteria for the incorporation of projects in the PNER. For such purposes, the list of projects whose execution is charged to rural electrification resources is expanded, and provisions are included to establish the procedure to request and evaluate the financing of investments qualified as SER for productive uses, works to overcome deficiencies due to non-compliance with technical standards, and the costs of operation and maintenance of non-conventional renewable projects. In order to ensure that the execution of the projects and works of the PNER can be carried out in a timely manner, the new Regulation provides for a special and simplified regime to obtain the electricity rights issued by the Ministry of Energy and Mines.

3. HYDROCARBONS

3.1 Exploration, exploitation and transformation

In order to increase the competitiveness and attractiveness of the areas to be offered in the bidding rounds for oil and natural gas exploration and production, **Brazil** established the Program for the Improvement of Oil and Natural Gas Exploration and Production Bids and its Interministerial Executive Committee, responsible for improving the governance and methodology of the bidding rounds.

In order to guarantee more royalty resources for the producing areas, the law regulating the organization and operation of the General Royalties System and its regulations were published in **Colombia**. The aforementioned legal instrument determines the distribution, objectives, purposes, administration, execution, control, efficient use and destination of income from the exploitation of non-renewable natural resources, specifying the conditions of participation of its beneficiaries. Among the objectives and purposes of the General Royalty System are: to create conditions of equity in the distribution of revenues from the exploitation of non-renewable natural resources; to promote the countercyclical nature of economic policy and maintain stable public spending over time; to promote the adoption of investment mechanisms for mining and energy revenues that prioritize their distribution to the population living in poverty; to promote mechanisms for citizen participation, good government practices and territorial governance, as well as environmental protection and recovery; among others. On the other hand, the law that establishes rules and criteria aimed at prioritizing the provision of public services within the programs for the benefit of the communities, in hydrocarbon exploration and production contracts in the production stage, and in large mining contracts in the exploitation stage, was approved. Regarding hydrocarbons, it is determined that the investment in the Community Benefit Program in the exploration and production stage may not be less than 1% of the total value of the investment contained in each phase of the Minimum, Additional or Subsequent Exploratory Program. Failure to comply with the provisions of the Law will result in the imposition of sanctions or fines in the respective contracts.

New Environmental Regulations for Hydrocarbon Operations were issued in **Ecuador** to replace those approved in 2001. The aforementioned regulatory instrument extends its scope to all individuals or legal entities, public or private, national or foreign, joint ventures, consortiums or associations that carry out activities in Hydrocarbon Operations, at national level, in their different technical and operational phases. Among other provisions, it is determined that the operator that voluntarily implements infrastructure, acquires or innovates technology, and/or develops projects related to renewable energy, energy efficiency, cleaner production, good environmental practices, elimination of toxic substances, spills, discharges, emissions, sustainable use and management of environmental resources and other actions that contribute to mitigate climate change or increase resilience to climate events, biodiversity conservation, ecosystem restoration, may access environmental incentives in accordance with the Organic Environmental Code, its regulations and rules issued for this purpose.

3.2 Storage, transport, marketing and consumption

Bolivia issued the Supreme Decree that allows the Regulatory Entity of the hydrocarbons sector to fix in the short term an adequate transportation tariff that ensures the lowest cost to users, safeguarding the safety and continuity of the service through the expansion of the transportation systems in the national territory, thus repealing the last reforms made to the Regulation of Transportation of Hydrocarbons through Pipelines.

In order to prevent and avoid any type of danger in the handling of fuels or flammables, **Chile** introduced amendments to the safety regulations for facilities and operations for the production and refining, transportation, storage, distribution and supply of liquid fuels approved in 2009. Pursuant to the reforms, owners or operators of Liquid Fuels facilities that refine, produce, store, distribute and transport them, may only supply them to facilities that have: Registration Record from the Superintendency; Certification and/or Periodic Inspection of the facility and its tank and piping, as applicable, according to the regulations in force, and that at sight do not present imminent risk; any buried tank that ceases to operate for more than one (1) year or that reaches a maximum age of 30 years, counted from the date of manufacture stated on its certification plate, must be permanently closed or removed from the site; among other safety measures required for transports and containers of liquid fuels.

An Executive Decree was issued in **Ecuador** reforming the Regulation of Oil Products Price Regulation, in force since 2005. The aforementioned regulation considers a new market price system for the commercialization of fuels applicable as of July 11, 2020. For such purposes, Petroecuador will apply the setting and publication of terminal prices of extra gasoline, ecopaís (extra with ethanol) and diesel for the automotive, shrimp, tuna and fishing segments, through the technical mechanism of a mobile band of plus/minus 5%. EP Petroecuador will make calculations until the 10th of each month, based on the costs of the fuel supplier and the sales prices of the previous month, so that, as of 0h00 on the 11th, the new fuel prices will be reflected in each of the public and private service stations nationwide. The new banding system is intended to control the price of oil derivatives so that the increase or decrease in prices is no more or less than 5% with respect to the previous month's price. The system is intended to protect consumers in the event of drastic increases in the price of a barrel of West Texas Intermediate (WTI) benchmark crude oil. This new fuel price system does not contemplate the increase in the cost of gas for domestic, agricultural and vehicular use, which remain frozen, with no variations in their distribution. The new Agency for Regulation and Control of Energy and Non-Renewable Resources (ARC) will be the entity in charge of controlling the application of the band system in fuel suppliers and marketers nationwide. On the other hand, taking into account that the government authorized the private initiative the free import of fuels that comply with the Technical Quality Standards of Fuels that are marketed in the country, and therefore it was established that the Public companies must facilitate the infrastructure in exchange for the payment of a reasonable fee for volume and permanence, for the import, reception, transportation and storage, and dispatch of fuels, with its cost and margin; the Agency for Regulation and Control of Energy and Non-Renewable Natural Resources of Ecuador established the single tariff for the use of the infrastructure of the pipeline system, which the Public Company EP PETROECUADOR or whoever takes its place, will charge to the users of the pipeline systems. Likewise, the rates corresponding to the use of docks and storage use are set. Additionally, given the need for a regulatory update in line with the current economic policies of the State, a new Regulation for the Authorization of feasibility of new distribution centers of oil products and their mixtures was issued, replacing the one in force since 2018 considering that it contained provisions that limited the technical and administrative actions of the former Hydrocarbons Regulation and Control Agency (currently merged into the "Agency for Regulation and Control of Energy and Non-Renewable Natural Resources").

Taking into account that the confinement and isolation measures decreed to face the COVID-19 pandemic have generated an unprecedented decrease in the sales volumes of liquid fuels, to such an extent that in some cases the expenses involved in the logistics and handling of fuels at national level cannot be sustained, the Energy Secretariat of **Panama**, through a Resolution, adopted the procedure to authorize the temporary closing of service stations at national level, which so request.

3.3 Oil and derivatives

As part of the Household Program, the **Argentine** National Government and YPF expanded the distribution network of Liquefied Petroleum Gas cylinders from 86 to 937 service stations located throughout the country to guarantee supply at a regulated price. The Household Program is one of the public policies of the National Government for households not connected to the natural gas network. It consists, on the one hand, of fixing the maximum price of the cylinder for all users and, on the other hand, of granting a benefit to vulnerable sectors through ANSES that reaches more than 2 million households. In addition to this measure, the subsidy for the LPG cylinder was increased for 2,300,000 beneficiaries of the Household Program (retirees and workers earning less than two minimum wages and who do not have gas service through networks).

Taking into account the differences between the characteristics of petroleum-derived liquid fuels for marine use and those of liquid fuels for other uses, **Chile** published the Decree that establishes the specifications and requirements to be met by marine fuels used in diesel engines and boilers of vessels, prior to conventional treatment on board, such as sedimentation, centrifugation or filtration. The established national specifications comprise: seven categories of distillate marine fuels, referred to as marine diesel oils, including those fuels used in diesel engines for emergencies within vessels; and six categories of residual fuels, referred to as marine residual oils.

Within the framework of the State of Emergency, **Colombia** by Decree adopted measures to mitigate the economic effects generated by the COVID-19 pandemic in the transportation and infrastructure sector, in accordance with which it decreased, until December 31, 2021, the Sales Tax rate on Jet A1 gasoline and/or aviation gasoline 100/130, in order to generate favorable conditions for the reactivation of air transportation as well as to avoid a drastic reduction of both demand and supply in this essential public service; and taking into account that in order to ensure the due application of this measure, it is necessary to specify the treatment to be given to the inventories held by the retail distributors of Jet A 1 gasoline and/or aviation gasoline 100/130 upon the entry into force of the referred

Decree, in order to avoid an abrupt drop in the investments in hydrocarbons and mining, due to the decrease in demand and prices, measures were established to encourage the continuation of the investments projected by the companies and included in the contractual agreements. In this sense, taking into account that the realization of these investments depends on a large part of the income of resources for national and territorial revenues, as well as energy self-sustainability, an incentive was established aimed at granting the necessary cash flow to oil and mining companies, to avoid the suspension and/or postponement of investments to which they are obliged by contractual agreements or that were projected in the country. Among the measures approved are: reduction of the tax generated by taxable transactions, deductions or transactions that have been cancelled, rescinded or terminated; application of the Tax Reimbursement Certificate (CERT) mechanism, among others. Additionally, during the term of the Sanitary Emergency, resources from the development of natural gas infrastructure may be used for subsidies, for such purposes the available resources of the Special Fund for Natural Gas Development Quota, to finance the internal connections and meters of the infrastructure projects financed through this Fund, may be used to subsidize up to the total cost of the service. On the other hand, and with the purpose of updating and improving the regulatory framework of the hydrocarbon exploitation, refining, distribution and transportation sector, in regulatory and technical aspects that allow including environmental sustainability, improving continuity, availability and reliability of supply, amendments were made to the Regulatory Decree of the Administrative Sector of Mines and Energy of 2015, The Ministry of Mines and Energy may issue the Continuity Plan for petroleum-derived liquid fuels and their blends with biofuels and the Expansion Plan for the pipeline network, based on the projects adopted from the Indicative Plan for the Supply of Liquid Fuels of the UPME, which must contain the list of eligible projects and services required to ensure the supply and reliability of the liquid fuels chain in the short, medium and long term; and take into account the projected levels of supply and demand of crude oil, liquid fuels derived from oil and biofuels, as well as the current conditions of the supply chain infrastructure.

A law was published in **Costa Rica** to sanction illegal activities related to the illegal introduction of petroleum-derived fuels and their blends into the national territory and the illegal seizure of petroleum-derived fuels and their blends owned by the Costa Rican Oil Refinery (Recope). The aforementioned law expressly states that the exclusive import of petroleum fuels corresponds to Recope, as a public company that administers the State monopoly on the import, refining and wholesale distribution of crude oil and its derivatives; and that, therefore, any import made by a third party not authorized by Recope is illegal. According to the law, the following are foreseen as illicit activities: damage to the National Fuel System, theft of petroleum derived fuels or their mixtures, illegal transportation and distribution of petroleum derived fuels or their mixtures, illegal introduction of petroleum derived fuels or their mixtures, among others. The penalties provided for imply imprisonment in all cases. On the other hand, in order to reactivate tourism, a reduction in the sale price of jet fuel paid by airlines was established, modifying the Decree by which jet fuel subsidized liquefied petroleum gas, bunker, asphalt and asphalt emulsion, which meant a surcharge in the sale price of jet fuel paid by airlines. This payment affected the cost of airline tickets to and from Costa Rica, leading airlines to incur higher operating costs or to travel with fuel surcharges to avoid purchasing fuel in the country. As of this measure, the Public Service Regulatory Authority (ARESEP) is responsible for setting the new price of jet fuel, eliminating this subsidy, to ensure that the price of fuel is efficient and contributes to the country's competitiveness, as well as compliance with the objectives and goals of the National Tourism Development Plan of Costa Rica 2017 - 2021.

In order to adjust the current regulations to current requirements, keeping in line with national interests and good practices in the hydrocarbons industry, **Ecuador** issued a new "Regulation for the Qualification, Authorization, Renewal, Suspension and Termination of the Activities of Supply of Hydrocarbon Derivatives, Biofuels, their Mixtures, including LPG and Natural Gas."

In order to mitigate the effects caused by the COVID-19 pandemic, **Peru**, through a Decree, issued exceptional compensation measures for the beneficiaries of the Social Compensation and Promotion Program for access to LPG with resources from the Energy Social Inclusion Fund, consisting in the granting (only once) of an additional FISE Discount Voucher to active FISE Users for the purchase of an LPG cylinder of up to 10 kg. In addition, within the framework of the state of emergency declared by Decree, the Energy and Mining Investment Supervisory Agency (OSINERGMIN) was empowered to issue transitory measures to exempt agents that carry out hydrocarbon activities from complying with certain administrative provisions contained in the marketing and safety regulations. This provision responds to the need to ensure the continuity of supply and normalization of the supply of fuels and hydrocarbon derivatives. On the other hand, Liquefied Petroleum Gas (LPG) and Diesel BX were excluded from the list of products subject to the Fund for the Stabilization of Prices of Petroleum Derived Fuels. The measure is based on the need to strengthen the sustainability of the Fund, considering that the existence of bottled LPG in its scope does not adequately transfer the expected stabilization effects to the price of the LPG cylinder paid by end users, and that the existence of a differentiated price for bottled LPG in bulk and for BX Diesel for vehicle use (B5 UV Diesel) has generated price distortions and problems in the commercialization chain, which makes its control difficult. This measure facilitates the transfer of the fall in international prices of these products to the benefit of Peruvian consumers. For this decision it was also considered that the Energy Social Inclusion Fund (FISE) allocates resources for social compensation and access to LPG for vulnerable sectors, both urban and rural; and that the Social Compensation and Promotion Program for Access to LPG is being implemented, which consists in the delivery of a discount voucher for the purchase of an LPG gas cylinder of up to 10 kg, which allows providing duly targeted economic compensation to the low-income population for the purchase of bottled LPG, given the volatility of the international price of oil. Amendments to the provisions regulating the LPG commercialization chain were also approved. The reforms (applied to the Regulation for the Commercialization of Liquefied Petroleum Gas, the Safety Regulation for Installations and Transportation of Liquefied Petroleum Gas, and the Regulation for Liquefied Petroleum Gas Establishments) are aimed at: to have better precision at the time of weight control of LPG cylinders, to perfect provisions related to safety conditions applicable to fire protection systems, safety implements in LPG Bottling and Transportation Plants for a safe development in commercialization operations, to specify the scope of activities of some agents of the LPG commercialization chain.

Within the framework of the Urgent Consideration Law (LUC), **Uruguay** made reforms to the regulation of the oil and oil products market under which the Executive Branch is in charge of approving the sale price of the different fuels produced by the National Administration of Fuels, Alcohol and Portland (ANCAP), with delivery to each of its distribution plants, after a mandatory report from the Energy and Water Services Regulatory Unit (URSEA) and the National Administration of Fuels, Alcohol and Portland (ANCAP). URSEA's report must specify, for each of the products, the parity price resulting from importing the finished product and making it available at ANCAP's distribution plants, including the taxes and duties corresponding to this part of the chain. The Executive Branch will update the defined prices and the maximum retail price with a periodicity not exceeding sixty days. To this end, URSEA is entrusted with carrying out a comprehensive review of its methodology for calculating import parity prices within sixty days of the entry into force of the law. Likewise, it is determined that URSEA must have special consideration on the regulations about agro fuels, providing the necessary conditions to ensure the permanent supply to the population. For its part, the Executive Branch, within one hundred and eighty days from the effective date of the law, must submit to the General Assembly a comprehensive proposal for the revision, both legal and regulatory, of the fuel market. Subsequently, in compliance with the regulation of the reforms via Decree, the methodology for the calculation of the import parity price corresponding to fuels marketed in Uruguay is specified.

3.4 Natural Gas

In order to make immediately viable the investments aimed at increasing the production of natural gas in all the national basins and satisfy the hydrocarbon needs of the country with the product of its deposits, by means of an executive decree **Argentina** declared of national public interest and as a priority objective of the Republic the promotion of natural gas production and approved the "Plan for the Promotion of Argentine natural gas production - supply and demand scheme 2020-2024, based on a competitive system at the point of entry to the transportation system (PIST). In the PIST the price of gas will arise from market competition, in a framework of free competition, subject to conditions set by the State to ensure the objectives of the initiative, such as the obligation to invest to avoid production decline. A price ceiling is set to encourage a new level for gas in the PIST to incorporate the efficiency curve of the last five years. This Plan is based on the voluntary participation of the production companies, public distribution and sub-distribution service providers that make direct acquisitions from the production companies and the company that manages the Wholesale Electricity Market. This planning instrument also aims to protect the rights of natural gas service users; promote the development of national aggregates in the value chain of the entire gas industry; replace imports of Liquefied Natural Gas (LNG) and the consumption of liquid fuels by the national electricity system; contribute to a surplus energy balance and the development of the Government's fiscal objectives; generate long-term certainty in the hydrocarbon production and distribution sectors; provide predictability in the supply of priority demand and the thermal power generation segment; and establish a transparent, open and competitive system for the formation of the price of natural gas compatible with the objectives of the national energy policy. The Energy Secretariat of the Ministry of Economy is established as the implementing authority for the plan. The Plan provides for a total base volume of seventy million cubic meters (70 Mm^3) per day for the three hundred sixty-five (365) days of each calendar year of duration of the scheme. This base volume may be modified by the Ministry of Energy in order to ensure the optimal supply of demand. On the other hand, in order to mitigate the effects of the pandemic, by means of legislation, an extraordinary solidarity contribution was created, on an emergency basis and for one time only, to be paid by individuals and undivided partnerships residing in the country, according to their existing assets as of the effective date. 25% of the proceeds will be applied to finance natural gas exploration, development and production programs and projects, approved by the National Energy Secretariat, within the framework of the declaration of national public interest of this activity, through Integración Energética Argentina S.A., which will make these projects viable by proposing and agreeing with YPF S.A., on an exclusive basis, the different execution modalities. Integración Energética Argentina S.A. must reinvest the profits from these projects in new natural gas projects for a term of not less than ten (10) years as from the beginning of the contribution regime.

Within the framework of the New Gas Market Program, the **Brazilian** Ministry of Mines and Energy (MME) published rules on the proposal to expand, under an authorization regime, the natural gas transportation systems of Nova Transportadora do Southeast (NTS) and Transportadora Brasileira Gasoduto Bolivia-Brasil SA (TBG). The measure will allow transporters to initiate processes to expand their respective pipeline systems in order to meet the new demands for transportation services in the regions where they operate. In this context, amendments to Law No. 11,909 of 2009 were approved to create the Gas Pipeline Expansion Fund for Transportation and Production Flow (Brasduto), with resources from the Pre-Salt Social Fund, created by Law No. 12,351 of 2010. The amendments are aimed at achieving the expansion of the gas pipeline network with a percentage of the oil commercialization that belongs to the Union in the pre-salt exploration contracts under the sharing regime. It is expected that, with the increase in oil and natural gas production in the fields auctioned under the production sharing regime, there will be a significant increase in resources from the sale of the Union's oil surplus and that this will not affect health and education expenses covered by the resources of the Pre-Salt Social Fund.

The Executive Decree that amends the Regulation of Oil Products Price Regulation, published in 2005, entered into force in **Ecuador**. The amendments authorize private companies to freely import industrial gas, gasoline, natural gas, diesel, jet fuel, avgas, absorbents and other derivatives for nine economic sectors, including industrial, commercial, shipping and aviation. The new regulation does not imply modifications to the sale of fuels for the automotive sector or for domestic gas, which will continue to be the responsibility of Petroecuador.

In order to promote the generation of electricity based on natural gas, **Nicaragua** passed the Special Law for the Development of the Sandino Central Port Project, which consists of the design, development, engineering, financing, construction, ownership, possession, operation, maintenance and administration of a natural gas-based energy solution, including storage, LNG and natural gas transportation, regasification and electricity generation. Within the framework of this special law, the development of the Project for the generation of electric energy based on natural gas is declared of public utility and social interest. The law gives the project tax incentives among other prerogatives.

4. RENEWABLE SOURCES

Incentives

Brasil instituted the Social Biofuel Seal (which replaces the Social Fuel Seal) and established provisions on the reduction coefficients of the Contribution to the Social Integration Program and to the Program for the Formation of Civil Servant Assets and the Social Contribution for the Financing of Social Security, incident to the production and commercialization of biodiesel, and on the terms and conditions for the use of differentiated tariffs. For such purposes, the Biofuel Social Seal will be granted to the biodiesel producer that promotes the productive inclusion of family farmers who are included in the National Program for Strengthening Family Farming - Pronaf and who supply them with raw materials; and accredits fiscal regularity with the Single System for Registration of Suppliers - Sicaf. With the Biofuel Social Seal, the producer will have the right to benefit from specific public policies aimed at promoting the production of renewable fuels with social inclusion and regional development; and will be able to use it for the purpose of commercially promoting its production. In this scenario, the National Energy Policy Council (CNPE) published resolutions on biofuels aimed at improving the electricity sector. To this end, the guidelines are established for the new biodiesel commercialization model throughout the country, replacing the public auctions, which are currently promoted by the National Agency of Petroleum, Natural Gas and Biofuels (ANP) and operated by Petrobras. On the other hand, a Working Group was established to analyze and issue an opinion on the inclusion of biofuels for use in the diesel cycle in the National Energy Policy. The Maritime Fields Revitalization and Production Incentive Program (Promar) is also established. On the other hand, amendments to Law No. 13,203 of 2015 were approved, establishing new conditions for the renegotiation of the hydrological risk of electric power generation. According to the amendments, the holders of hydroelectric power plants participating in the Energy Reallocation Mechanism (MRE) will be compensated for the effects caused by hydroelectric projects with bidding and implementation priority indicated by the National Energy Policy Council (CNPE), derived from: restrictions in the flow of energy due to delays in the entry into operation or entry into operation in an unsatisfactory technical condition of the electricity transmission facilities intended for the flow; and from the difference between the physical guarantee granted in the motorization phase and the effective aggregation values of each motorized generating unit to the SIN, according to technical criteria applied by the granting authority to the other hydroelectric power plants. The compensation will consider the updating of the capital spent, both by the National Broad Consumer Price Index (IPCA) and by the expected discount rate. The text allows the extension of the concession term for hydroelectric power plants that had economic losses due to lack of rainfall and delays in the operation of large generators. With the extension of the planned contracts, hydroelectric operators would be compensated for part of the hydrological risk costs. In this context, the generating company must desist from taking legal action against the government.

Valuing that in 2018 various amendments were introduced to the General Law of Electric Services aimed at encouraging the development of residential generators, and incorporating specific regulations that enable the generation of electricity for self-consumption and the injection of surpluses, the Regulation that determines the applicable provisions regarding distributed generation intended for self-consumption was approved in **Chile**. In particular, it regulates the procedure for the connection of generation equipment and the cost of additional works, adjustments and adjustments, the limits to the connection and injections of generation equipment that do not require additional works, the measurement and valuation of injections and the transfer of surpluses of non-conventional renewable energies, as well as other matters necessary for the adequate development of distributed generation for self-consumption.

Colombia approved, through legislation, the authorization to the national government to finance with contributions from the General Budget of the Nation and the General System of Royalties the participation of territorial entities in renewable alternative energy generation projects. This authorization is aimed at promoting territorial participation in distribution, commercialization and small-scale self-generation projects and distributed generation with Non-Conventional Renewable Energy Sources (NCREF) such as biomass, hydroelectric, wind, geothermal, solar and ocean energy, among others. The law prioritizes the execution of projects in the rural sector and the hiring of local labor.

Nicaragua approved legislative reforms aimed at promoting the generation of electricity from renewable sources, expanding coverage and reducing consumer tariffs. The amendments imply a voluntary renegotiation process of the energy purchase and sale contracts signed with the generators, in order to access an extension of the Income Tax (IR) exemption term, as long as they decide to negotiate a decrease in the energy purchase price. Geothermal generators may apply for a 2-year extension, while generators from other sources may obtain up to 5 years. In order to be eligible for this negotiation process and possible extension of the benefit, generators must have negotiated and signed a new contract by October 31, 2020. Within the framework of the reform, a provision referring to the price band to be paid per kWh in the commercialization outside the contracts with the Distributor is permanently modified. Previously, the band included a minimum and a maximum price, and as of the reform, only the maximum limit remains at 6.5 cents per kWh.

5. ENERGY AND ENVIRONMENT

Pollution, emissions and climate change

Argentina published the so-called “Yolanda Law” aimed at guaranteeing public officials comprehensive training in environmental issues, with a sustainable development perspective and with special emphasis on climate change. For such purposes, mandatory training on environmental issues is established for all public officials of any level or hierarchy in the executive, legislative and judicial branches of the Nation. The enforcement authority shall ensure the participation of scientific institutions specialized in the subject, as well as civil society and its organizations, in the process of drafting the general guidelines for training, which shall include at least information on climate change, protection of biodiversity and ecosystems, energy efficiency, renewable energies, circular economy, sustainable development, and environmental regulations in force. On the other hand, the regulation of the Law of minimum budgets for adaptation and mitigation to climate change was approved, contemplating the criteria of simplicity, applicability and iteration, guaranteeing the federal regime and the participatory processes of each jurisdiction. These regulations are in line with the provisions of the United Nations Framework Convention on Climate Change, the Kyoto Protocol and the Paris Agreement, and establish a climate protection system throughout the country. It also contemplates the mainstreaming of the gender perspective as a key aspect in the design and implementation process of public climate policies at the national and jurisdictional levels, and empowers young people as significant actors to make climate urgency and its consequences for current and future generations visible.

In **Brazil**, new mechanisms were created by decree for the issuance of green bonds to finance infrastructure projects that provide relevant environmental or social benefits. In addition, the National Energy Policy Council (CNPE) approved a Resolution to establish mandatory annual greenhouse gas emission reduction targets for the sale of fuels under the National Biofuels Policy (RenovaBio). The targets are defined in Credit Units of Decarbonization (CBIO) and consider the recent impacts of the COVID-19 pandemic on the fuel market in the short and medium term.

In **Chile**, the Energy Undersecretariat notified the Environment Undersecretariat of the initiation of the Strategic Environmental Assessment procedure applicable to the updating of Chile’s Energy Policy to the year 2050. The content of the Assessment is aimed at incorporating the objective of achieving carbon neutrality by 2050, among other environmental and sustainability considerations applicable to the process required to achieve the goal of consolidating sustainability in all its dimensions as a permanent focus of the energy sector.

Costa Rica approved an adjustment to the dates indicated in the Regulation for the Control of Pollutant Emissions Produced by Internal Combustion Engine Vehicles in force since 2016. Based on the reform the technical specifications of the determined compression ignition vehicle emission reduction systems will be applicable to diesel engine vehicles entering as of January 1, 2018 and not to those entering as of January 1, 2017 as previously foreseen. Likewise, the obligation to have an exhaust gas recirculation system, engine crankcase purge and injection pump with electronic controller, or other technologies that produce equivalent effects will apply to diesel engine vehicles entering the country as of January 1, 2018, and the requirement to also have a three-way catalytic converter and particulate filter, or other technologies that produce equivalent effects will apply to vehicles entering the country as of January 1, 2022. Additionally, the schedule of emission standards compliance rules is reformulated according to years of importation of new and used vehicles of the automobile and light-duty categories of up to 3,500 kilograms of gross weight, requiring compliance with the Euro 4, Tier 2 or higher standard for those that entered on or after January 1, 2018, and the Euro 6, Tier 3 or higher standard for those that enter on or after January 1, 2022. These measures allow a better performance of the competent entities, by having a new regulation adapted to the technical and legal elements necessary to ensure the due application and preservation of the provisions of the Organic Law of the Environment, as well as the provisions of the World Health Organization (WHO) with respect to the effects on public health and the preservation of the environment.

Mexico approved reforms to the General Law on Climate Change aimed primarily at adapting the text to the extinction of the trust fund called the Climate Change Fund created in 2012. To this effect, a new title is added for resources aimed at supporting the implementation of actions to address climate change, the sources of which coincide with those that were previously part of the fund's assets. The Ministry of the Environment and Natural Resources (Semarnat) will be responsible for the administration and operation of these resources. In accordance with the reform, the law expressly states that in the application of resources, priority will be given to actions related to Adaptation. In addition, the Ministry of Energy (SENER) published the update of the Transition Strategy to Promote the Use of Cleaner Technologies and Fuels, in terms of the Energy Transition Law. The main objective of this instrument is to promote the reduction of polluting emissions from the electricity industry and to reduce the country's dependence on fossil fuels as a primary energy source, based on economic viability criteria. The new strategy sets the following clean energy generation targets for 2024: 35.1% of total electricity generation; in 2033, 39.9%; and in 2050, 50% of total electricity generation. On the other hand, in order to establish the necessary metrological requirements and measurement methodologies to be used in Power Plants that require obtaining the values of the variables to be used in the determination of the ELC (fuel-free energy), the Mexican Official Standard NOM-017-CRE-2019 was issued, which contains the methods of measurement of variables for the calculation of the percentage of free energy of fuel and procedure for conformity assessment. The referred standard is applicable to Power Plants that require to obtain the values of the variables for the determination of the ELC in terms of the Efficiency and ELC Provisions when using any of the following generation processes: Power Plants with efficient cogeneration processes, Clean Power Plants that use fossil fuels, Low Emission Technologies and thermal power plants with geological capture and storage processes or carbon dioxide bio sequestration, Power Plants with hydrogen utilization and hydroelectric power plants. Excluded from its application are Power Plants that have a Cogeneration permit and are accredited as efficient cogeneration in terms of the Public Electricity Service Law, as long as their Legacy Interconnection Contract remains in force.

In order to optimize and expedite the environmental remediation procedure, **Peru** amended the Regulations of the Law that creates the Contingency Fund for Environmental Remediation, approved by Supreme Decree to finance environmental remediation actions for sites impacted as a result of hydrocarbon activities that involve risks to health and the environment and require priority and exceptional attention from the State. The reform reformulates the functions of the Board of Directors, the Fund for the Promotion of Natural Protected Areas of Peru (PROFONANPE) and the Environmental Evaluation and Oversight Agency (OEFA); it also establishes other administrative provisions related to the obligations of the companies responsible for the impacts.

6. ENERGY EFFICIENCY

Argentina established new exceptions, for certain specific uses, to the ban on the importation and commercialization of halogen lamps established for the entire national territory as of December 31, 2019. In making this decision, it was considered that halogen lamps designed for industrial or commercial use are not directly replaceable by other energy-saving lamps and/or LED technology due, among other factors, to technical issues such as the wavelengths of light they emit and their heat output; Since these lamps have specific uses and are produced in low volumes, their total restriction implies the reengineering of entire value chains, resulting in the automatic obsolescence of a wide range of imported and domestic products in the domestic market, without the possibility of being repaired or replaced.

Within the framework of the Regulation that establishes the procedure for the preparation of the technical specifications of energy consumption labels, and with the purpose of favoring the acquisition of electrical energy consuming equipment with higher efficiency and lower consumption, the Ministry of Energy approved the definitive technical specifications of the energy efficiency label for electric ovens in **Chile** by resolution of the Ministry of Energy. Likewise, by virtue of the provisions of the energy efficiency regulations in force, the Ministry of Energy Resolution established the minimum energy efficiency standard for products used in indoor lighting and its implementation schedule, setting in its first imperative as "Limits and application schedule," in the case of minimum efficiency at 40 lm/W, as of May 1, 2021. Therefore, as of May 1, 2021, lamps with an efficiency of less than 40 lm/W will no longer be marketed.

In compliance with the provisions established to that effect in the Energy Transition Law, the new catalog of equipment and appliances for which manufacturers, importers, distributors and marketers must include information on their energy consumption was published in **Mexico**'s Official Gazette; as well as the formats for the delivery of the information, replacing its predecessor in force since 2017. In addition, the official standard that establishes the energy efficiency requirements to be met by refrigeration condensing and evaporating units, as well as the test methods to verify compliance, labeling and the procedure to assess product conformity, was published.

7. INTERNATIONAL AGREEMENTS, INTEGRATION AND INTERCONNECTIONS

The Law by which the **Argentine** Congress approved the 1997 Protocol which, through the addition of Annex VI "Regulations for the Prevention of Air Pollution from Ships", amends the 1973 International Convention for the Prevention of Pollution from Ships (MARPOL Convention), as amended by the 1978 Protocol, was published in the Argentine Official Gazette. This Annex, in force since 2005, sets limits on emissions of sulfur oxides and nitrogen oxides from ships' exhausts and prohibits deliberate emissions of ozone-depleting substances. In turn, it establishes stricter emission standards for these substances and particulate matter for designated emission control areas. In addition, the Annex contains the fuel oil quality standards and information to be included in the fuel delivery note. Finally, the Annex also establishes mandatory technical and operational energy efficiency measures aimed at reducing greenhouse gas emissions from ships. Specifically, the Annex provides for rules relating to emissions of volatile organic compounds and incineration on board ships. The MARPOL Convention is the main international convention on the prevention of pollution of the marine environment from ships and aims to prevent and reduce pollution from ships, whether from accidents or in the course of their normal operations. The Convention currently includes six technical annexes, including the one that determines the rules relating to the prevention of oil pollution. On the other hand, the National Congress approved the Headquarters Agreement between the Argentine Republic and the Intergovernmental Committee of the Paraguay-Parana Waterway (CIH). This act will allow the Executive Secretariat of the CIH to operate independently in Buenos Aires, giving the CIH a greater degree of institutionalism and the technical capacity of an intergovernmental body with the relevant immunities and privileges, thus giving impetus to river transport through this 3,400 km long waterway, considered the most important for the region's logistical integration. The Executive Secretariat plays a fundamental role in executing the mandate granted by the five countries meeting at the CIH, providing technical assistance and requesting cooperation from other international organizations, among other actions. The Executive Secretariat is currently working to establish regional statistical information mechanisms and develop proposals to promote the use of alternative fuels.

The Agreement on Cooperation in the Peaceful Uses of Nuclear Energy and its annexes signed with the Republic of Korea (South Korea) was promulgated in **Chile** in November 2002. Under the terms of the treaty, the parties undertake to encourage and promote cooperation in the peaceful uses of nuclear energy, on a basis of equality and mutual benefit, and in accordance with their respective laws and regulations on the subject. Areas of cooperation include: basic and applied research and development of peaceful uses of nuclear energy; research, development, design, construction, operation and maintenance of nuclear power plants, research reactors or small and medium-sized reactors; fabrication and supply of nuclear fuel elements used in nuclear power plants, research reactors or small and medium-sized reactors; nuclear fuel cycle, including radioactive waste management; and nuclear safety, among others.

The Decree promulgating the Agreement on Environmental Cooperation signed between the Governments of the United Mexican States, the United States of America and Canada was published in Mexico in November 2018. The objectives of the agreement are to: modernize and improve the effectiveness of environmental cooperation between the Parties; use environmental cooperation as a means to promote mutually supportive trade and environmental policies, including support for the implementation of the environmental goals and objectives set forth in the T-MEC; strengthen cooperation between the Parties to conserve, protect and enhance the environment, as well as address environmental challenges and priorities; promote cooperation and public participation in the development of environmental laws, regulations, procedures, policies and practices; and strengthen cooperation related to the enforcement and implementation of environmental laws and regulations.

The Decree approving the Framework Agreement on the establishment of the International Solar Alliance (ISA) concluded in New Delhi, India, on May 27, 2016, was published in **Nicaragua**, with the objective of pursuing joint efforts to reduce the cost of finance and the cost of technology, mobilize more than 1 billion dollars in investments needed by 2030 for the massive deployment of solar energy, and pave the way for future technologies tailored to the needs.

In order to propose measures and actions to mitigate the impacts of the COVID-19 pandemic in the energy sector and prevent the effects of the pandemic from jeopardizing its sustainability, the Council of Energy Ministers of the Central American Integration System SICA **(Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama and the Dominican Republic)**, approved the “SICA Energy Sectoral Plan to face the COVID-19 crisis” in an Extraordinary Meeting held on May 8, 2020. The aforementioned instrument, prepared and published with the collaboration and support of ECLAC after a process of discussion and consultation with the main institutions of the energy sector of the countries, as well as with inputs from the regional institutions of the Central American electricity market and with the permanent support of the General Secretariat of SICA, constitutes the proposal of the Central American energy sector and will be part of the “Regional Contingency Plan aimed at complementing national efforts for the prevention, containment and treatment of COVID-19 and other rapidly spreading diseases.” The document consists of five chapters describing the main actions taken by the countries in the energy sector during the pandemic crisis; analyzing the possible economic impacts of the pandemic, both at the SICA level in general and in each country; reviewing the effects of the pandemic containment measures on electricity and hydrocarbon demands; and finally, describing short and medium term actions to counteract the effects of COVID-19.

Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama, as States Parties to the Protocol to the General Treaty on Central American Economic Integration (Protocol of Guatemala), as amended by the Amendment of February 27, 2002, within the framework of the regional harmonization process of technical regulations, resolved to modify by total substitution the following technical regulations approved by the Council of Ministers of Economic Integration (COMIECO): Central American Technical Regulations for Oil Products. Superior gasoline. Specifications, Central American Technical Regulation Oil Products. Regular Gasoline Specifications, and Central American Biofuels Technical Regulations. Biodiesel (B100) and its Blends with Diesel Fuel Oil. Specifications.

Energy prospective for Latin America and the Caribbean

Prospects for the evolution of the energy sector in Latin America and the Caribbean with a view of the RELAC 2030 and NET ZERO emissions 2050 initiatives

1. INTRODUCTION

According to IPCC forecasts, in order to achieve the objective of maintaining global warming in the range between 1.5 and 2.0 C, with respect to pre-industrial conditions, it would be necessary to reach a level of zero net[1] anthropogenic CO_2 emissions worldwide between 2050 and 2070, a global socioeconomic development scenario called NET ZERO 2050.

As a result of the 2015 Conference of the Parties to the UNFCCC (COP21) and the Paris Agreement, most countries committed to directing their socioeconomic and energy development policies towards meeting specific GHG emission reduction targets by 2030, which was reflected in their respective NDCs, however, recent analyses predict that these goals would be insufficient to reach mid-century with zero net CO_2 emissions and therefore, the NDCs should be rethought, with much more ambitious goals and more aggressive and immediately applicable strategies to meet them.

On this subject, the International Energy Agency has published a report entitled: "Net Zero by 2050. A Roadmap for the Global Energy Sector," which presents a series of milestones, goals and key strategies that should be implemented in the global energy sector to achieve net zero CO_2 emissions by 2050, with many of the strategies having to be initiated in the short term. Although the scenario set out in the aforementioned document presents coherent premises and goals, some of them would be very difficult to implement or meet for countries with emerging economies such as those in LAC, especially in those countries that base a large part of their economic income on the exploitation and export of fossil energy sources, or on imports of this type of sources to supply growing domestic demand. For example, the following milestones are literally mentioned for the year 2021:

- "No new unabated coal plants approved for development"
- "No new oil and gas fields approved for development; no new coal mines or mine extensions"

On the other hand, an article published by the IDB and DDPLAC entitled: "Getting to Net-Zero Emissions: Lessons from Latin America and the Caribbean", emphasizes four main strategies through which the LAC region could achieve the goals of the NET ZERO 2050 global initiative, literally stated as follows:

1. "Produce zero carbon electricity (e.g. massive rollout of renewable energy combined with grid flexibility)."
2. "Undertake massive electrification (e.g. using electric vehicles, motors, heat pumps and boilers and cooking stoves), and where not possible, switch to other carbon-free fuels (e.g. hydrogen or sustainably- produce d biofuels)."
3. "Increase the share of public transportation (e.g. bus or train) and non-motorized transportation (e.g. walking and cycling) in total mobility and reduce demand for transport."
4. "Preserve and regenerate natural carbon sinks (e.g. by reducing deforestation, and promoting reforestation) and the restoration of other carbon-rich ecosystems."

Although all the recommendations made by international organizations are valid to guide countries towards meeting the global goal of slowing or neutralizing global warming and all LAC countries are in some way

1. Net zero emissions or null net emissions means that the amount of CO_2 generated by anthropogenic activities is equal to the amount of this gas that carbon sinks are capable of absorbing or sequestering.

committed to this initiative, each country has the sovereign power to formulate its energy development plans and policies in the manner that will most benefit its economy in the immediate future, especially in view of the need for a rapid recovery after the devastating effects of the COVID-19 pandemic.

Additionally, there are already national initiatives in LAC countries for the accelerated decarbonization of their economies in the medium and long term, with a view to a NET ZERO 2050 scenario, such as the massive penetration of renewable energy sources in their electricity generation matrices, greater electrification of their industry and means of transportation, greater use of modern biomass in their final consumption sectors, etc. One of these initiatives is RELAC (Renewables in Latin America and the Caribbean), whose goal is to achieve a 70% share of renewable energy in LAC by 2030. This initiative, originally proposed by Colombia, co-led by Chile and Costa Rica, to which other countries in the region have been adhering, has the support of international organizations such as OLADE, the IDB and IRENA and is considered a relevant milestone for a long-term orientation towards a net zero emissions scenario that is also very feasible to achieve, taking into account the region's high share of renewable energy in terms of electricity generation capacity (close to 60% by 2019).

In this context, this chapter presents a comparative analysis of two energy development scenarios for the LAC region for the period 2020-2050, with 2019 as the base year: a "business as usual" (BAU) reference scenario; and the other, following an evolutionary path with a medium-term vision (2030) of the RELAC initiative and a long-term vision (2050) of the NET ZERO 2050 initiative, with the respective particularities and characteristics of the socioeconomic and energy reality of the Latin American and Caribbean countries.

For the aforementioned analysis, the LAC region has been divided into four subregions and two countries:

- Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama).
- Andean Zone (Bolivia, Colombia, Ecuador, Peru and Venezuela).
- Southern Cone (Argentina, Chile, Paraguay y Uruguay).
- The Caribbean (Barbados, Cuba, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Suriname and Trinidad and Tobago).
- Brazil.
- Mexico.

Brazil and Mexico, given their great relative weight in the LAC region, are analyzed individually; however, to facilitate the writing of this chapter, these countries will also be referred to as subregions.

The Energy Matrix Simulation and Analysis Model (SAME), developed by OLADE, was used as a computer tool for the prospective exercise.

BAU Scenario

The BAU scenario constitutes the baseline of the prospective study and represents a projected evolution of the energy sector of the region and its different sub-regions, based on the latest energy development plans, programs and policies published by the OLADE Member Countries, taking into account, the estimated effects of the COVID-19 pandemic on the economy and energy consumption as of 2020, updating for the present exercise, the GDP - energy consumption correlations used for the Energy Outlook 2020, based on the forecasts of nominal GDP variation to the year 2022, presented in the article: "Global Economic Prospects: Latin America and the Caribbean" published by the World Bank in January 2021.

Table No. 1 Annual percentage change in nominal GDP at 2010 market prices

	2018	2019	2020	2021	2022
Argentina	-2.6	-2.1	-10.6	4.9	1.9
Belize	2.1	-2	-20.3	6.9	2.2
Bolivia	4.2	2.2	-6.7	3.9	3.5
Brazil	1.8	1.4	-4.5	3	2.5
Chile	3.9	1.1	-6.3	4.2	3.1
Colombia	2.5	3.3	-7.5	4.9	4.3
Costa rica	2.7	2.1	-4.8	2.6	3.7
Dominican Republic	7	5	-6.7	4.8	4.5
Ecuador	1.3	0.1	-9.5	3.5	1.3
El Salvador	2.4	2.4	-7.2	4.6	3.1
Grenada	4.1	2	-12	3	5
Guatemala	3.2	3.8	-3.5	3.6	3.8
Guyana	4.4	5.4	23.2	7.8	3.6
Haiti	1.7	-1.7	-3.8	1.4	1.5
Honduras	3.7	2.7	-9.7	3.8	3.9
Jamaica	1.9	0.9	-9	4	2
Mexico	2.2	-0.1	-9	3.7	2.6
Nicaragua	-4	-3.9	-6	-0.9	1.2
Panama	3.7	3	-8.1	5.1	3.5
Paraguay	3.2	-0.4	-1.1	3.3	4
Peru	4	2.2	-12	7.6	4.5
Suriname	2.6	0.3	-13.1	-1.9	-1.5
Uruguay	1.6	0.2	-4.3	3.4	3.2

Source: World Bank, January 2000

For the OLADE Member Countries not included in the table above, the prospects made in the Energy Outlook 2020 were kept.

Given that the projection horizon of this prospective exercise is 2050 and that the reference energy expansion plans generally have shorter horizons, the years for which information was not available were complemented with trend extensions, both in terms of energy demand and supply.

PRO NET-0 Scenario

The second scenario, which has been called PRO NET-0, is an offshoot of the BAU scenario from 2022 onwards, whose premise is the evolution of the energy sector in LAC countries towards a significant reduction in annual CO_2 emissions up to 2050, compared to the BAU scenario. Although a NET ZERO 2050 scenario, as proposed by the IPCC, assumes total neutralization of anthropogenic emissions by 2050, i.e., that the CO_2 emitted is equal to the CO_2 absorbed by carbon sinks, it would be very ambitious to try to estimate the current and future absorption capacity of these sinks for each of the countries in the region, and it would involve a field of study that would go beyond the energy sector. Furthermore, some of the milestones proposed by the IEA, so that the global energy sector can contribute effectively to meeting the NET ZERO 2050 scenario objective, would not be applicable at the regional level, given the energy and socioeconomic particularities of LAC. For this reason, the following two conditions have been established as the main premises of the PRO NET-0 scenario for this prospective exercise:

1. Meet the goals set in the RELAC Initiative for the year 2030 (minimum participation of 70% of renewable energies in the regional electricity generation matrix, both in terms of capacity and energy produced) and;

2. Stabilize or decrease CO_2 emissions from the LAC energy sector from 2030 onwards, despite the growth in energy demand.

To achieve these conditions, the following strategies are simulated for the PRO NET-0 scenario:

1. Increased electrification of energy end uses, including transportation.
2. Increased participation of modern biomass or liquid biofuels in the final consumption sectors.
3. Improved energy efficiency in end uses.
4. Increased use of solar thermal energy in final consumption.
5. More accelerated penetration of renewable energies in the electricity generation matrix.

2. ENERGY PROSPECTIVE FOR BRAZIL

2.1 General considerations

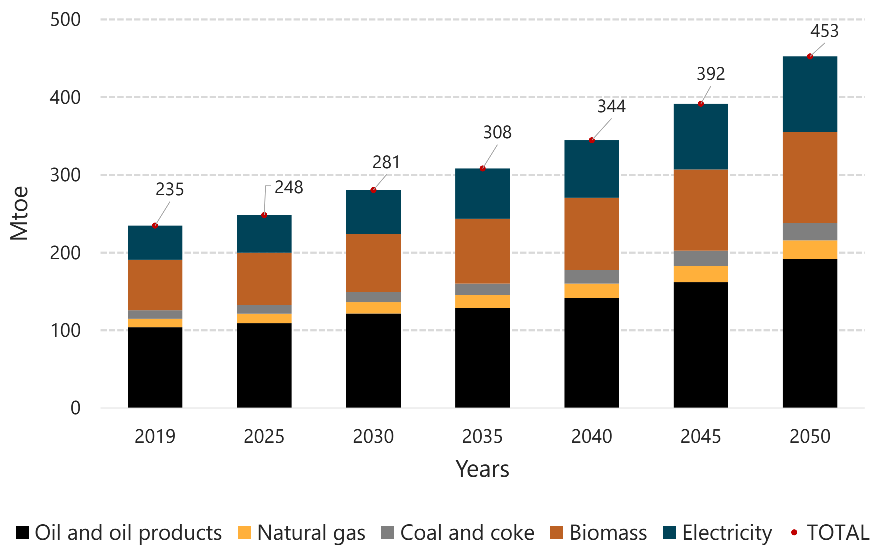
In the case of Brazil, the sources of reference information for the projections were the Ten-Year Energy Plan (PDE 2030) and the National Energy Plan 2050 (PNE 2050), both published by the country's Ministry of Mines and Energy. However, given that the base year for the PDE is 2020 and for the PNE 2050 is 2015, greater relevance was given to the projections presented in the PDE 2030, extending these projections to the year 2050, considering some of the assumptions made in the PNE 2050.

2.2 Projected final energy consumption

2.2.1 BAU Scenario

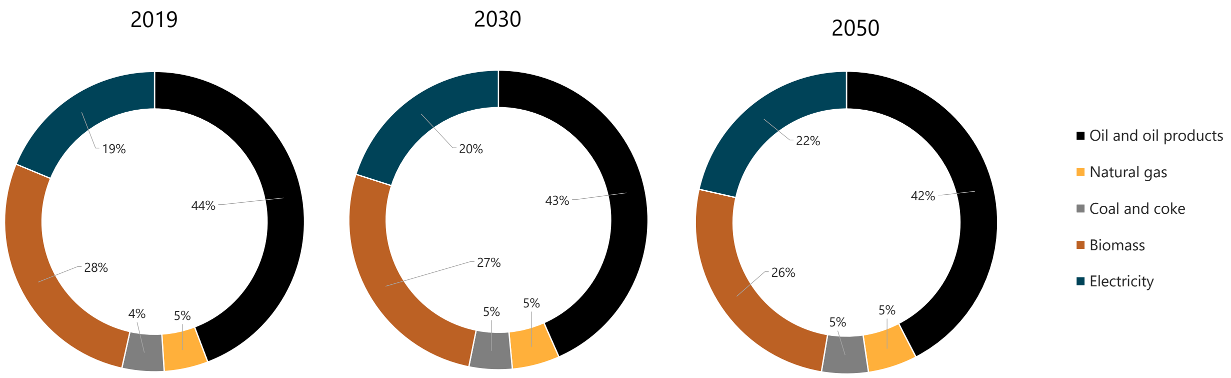
Final energy consumption in Brazil, according to the BAU scenario, evolves in a very uniform manner, with a small variation in the percentage structure of the matrix, increasing the share of electricity, to the detriment of the share of oil products and biomass. This is mainly due to the increased electrification of the transportation and industrial sectors (**Figures 1 and 2**).

Figure No. 1 Projected final energy consumption, Brazil, BAU scenario



Source: Own elaboration

Figure No. 2 Evolution of the final energy consumption matrix, Brazil, BAU scenario

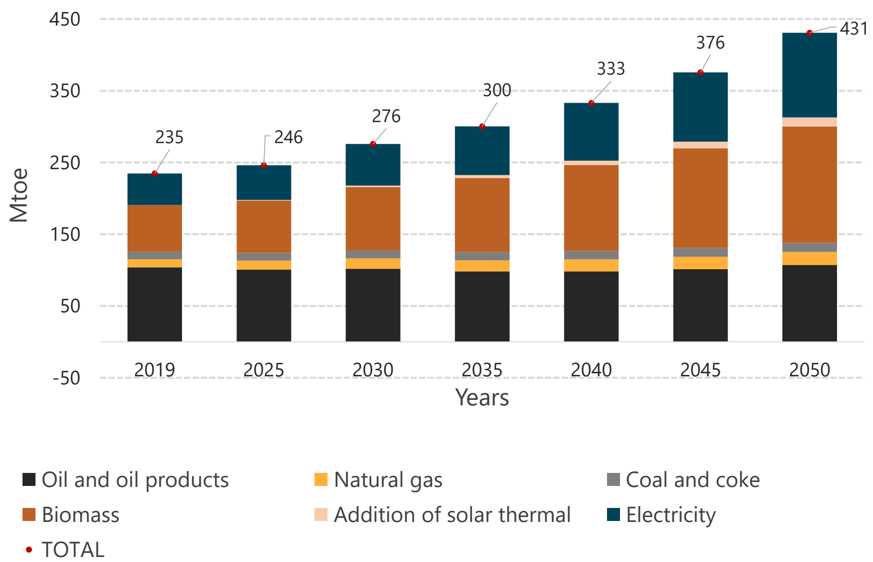


Source: Own elaboration

2.2. PRO NET-0 Scenario

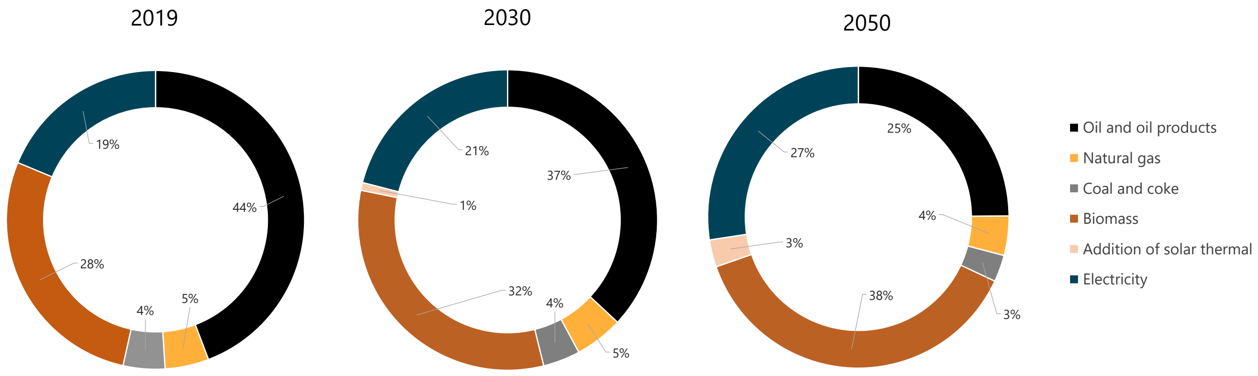
The PRO NET-0 scenario assumes a much more accelerated substitution of final consumption of fossil fuels, both by electricity and biofuels, in the transportation, industrial and commercial sectors; and at the same time a significant increase in the use of solar thermal energy in the residential and commercial sectors, allowing for electricity and fuel savings in water heating. It should also be noted that, thanks to the increase in energy efficiency in electrified end uses, an annual decrease in total consumption of 5 Mtoe by 2030 and 22 Mtoe by 2050 is achieved, compared to the values projected in the BAU scenario (**Figures 3 and 4**).

Figure No. 3 Projected final energy consumption, Brazil, PRO NET-0 scenario



Source: Own elaboration

Figure No. 4 Evolution of the final energy consumption matrix, Brazil, PRO NET-0 scenario



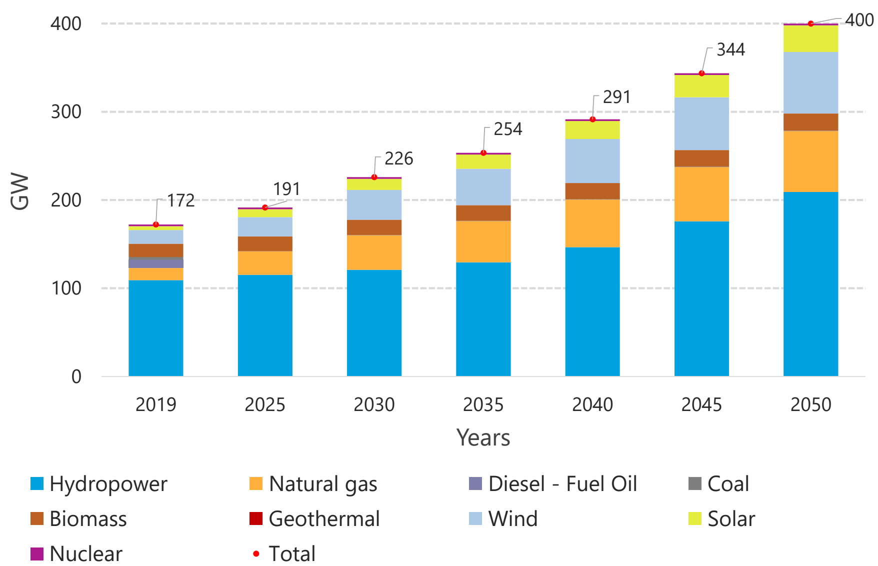
Source: Own elaboration

2.3 Projected installed capacity for electricity generation

2.3.1 BAU Scenario

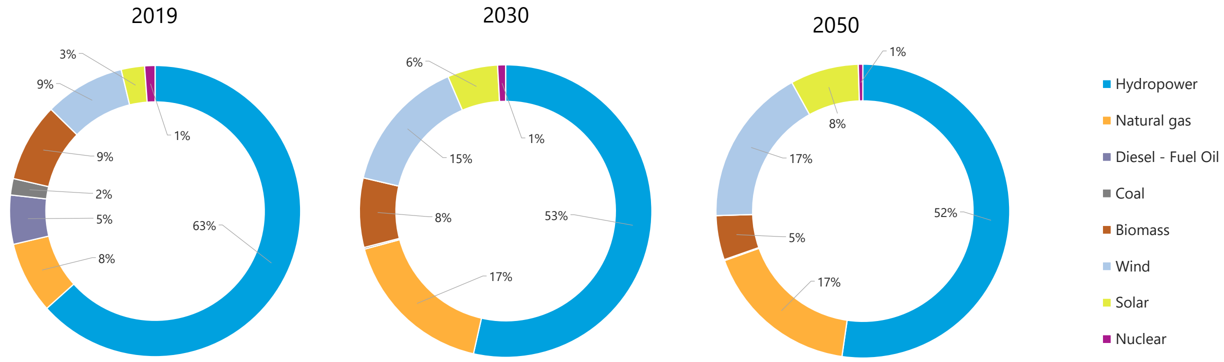
The BAU scenario for Brazil is characterized by a predominant installation of natural gas and wind power generation capacity until 2030, surpassing the installation of new hydroelectric and solar photovoltaic plants. As a result, there was a decrease of about 2 percentage points in the renewability of the installed capacity of the generation park for that year. However, by 2050, the installation of new hydro, wind and solar power plants accelerates, although also of natural gas-fired plants, so the capacity renewability index improves compared to 2030, but is still lower than that recorded in 2019 (**Figures 5, 6, 7 and 8**).

Figure No. 5 Projected installed capacity for electricity generation, Brazil, BAU scenario



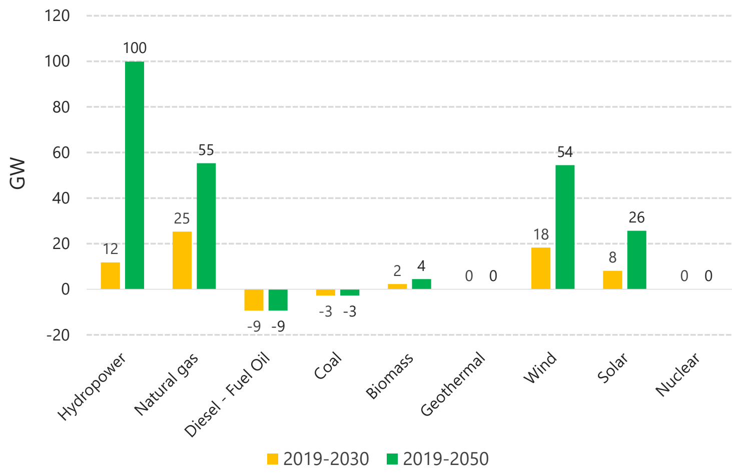
Source: Own elaboration

Figure No. 6 Structure of installed capacity for electricity generation, Brazil, BAU scenario



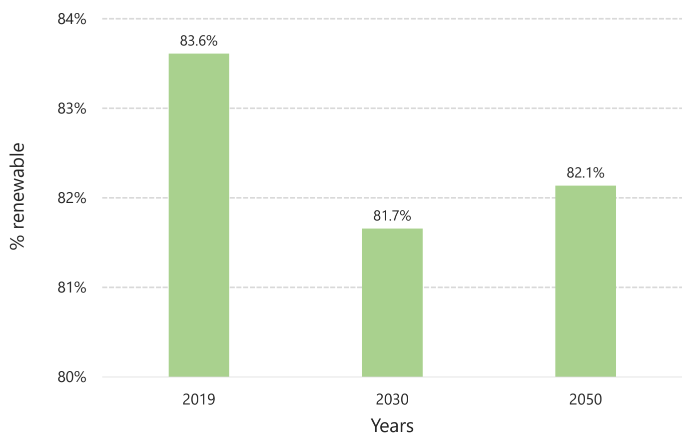
Source: Own elaboration

Figure No. 7 Incremental installed capacity for electricity generation, Brazil, BAU scenario



Source: Own elaboration

Figure No. 8 Renewable % of installed capacity for electricity generation, Brazil, BAU scenario

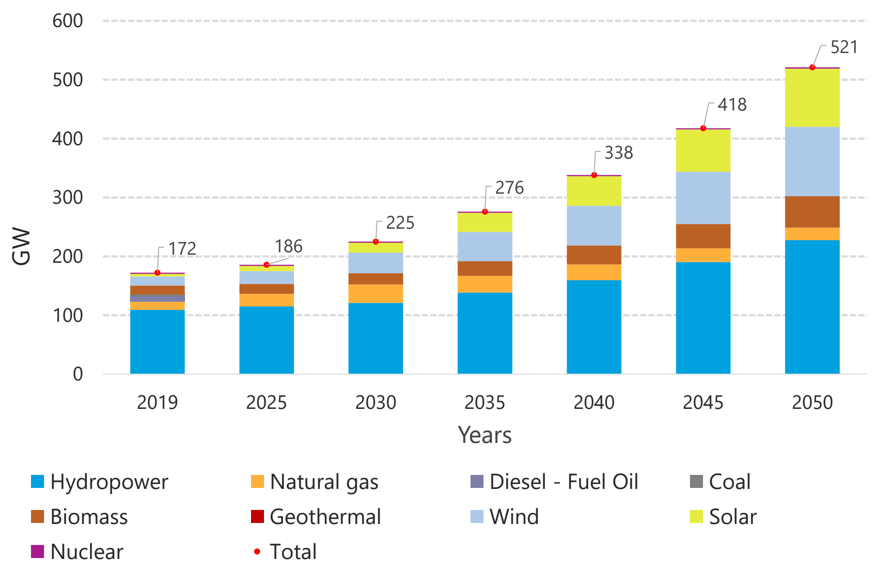


Source: Own elaboration

2.3.2 PRO NET-0 Scenario

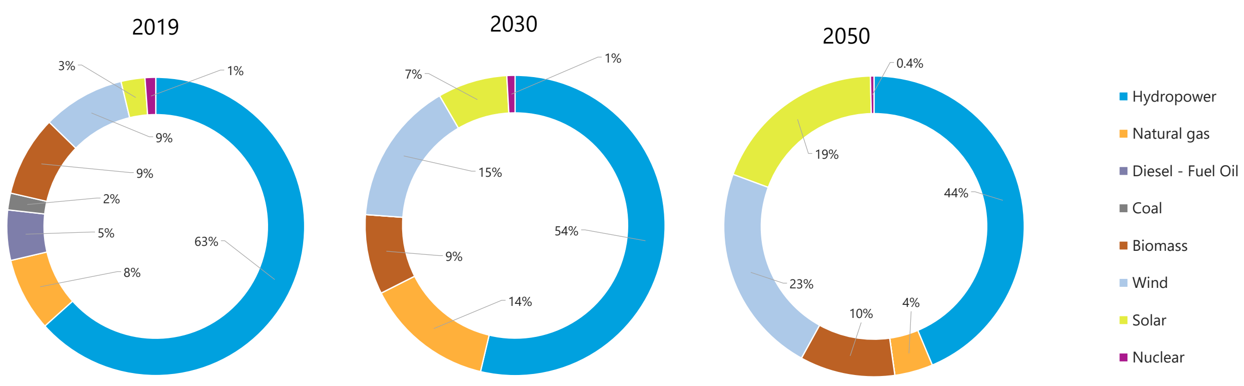
The PRO NET-0 scenario assumes that the installation of new electricity generation capacity from non-conventional renewable energies (wind, solar and biomass) will accelerate, mainly after 2030, taking on very significant proportions, even comparable to new hydroelectric capacity, relegating the installation of natural gas plants to a distant second plane. Under these conditions, the renewability index of Brazil's electricity generation installed capacity matrix will reach 95% by 2050. It should also be noted that, due to the higher penetration of electricity in the final consumption sectors, the generation capacity requirement in the PRO NET-0 scenario is 121 GW higher than that projected in the BAU scenario for the study horizon (**Figures 9, 10, 11 and 12**).

Figure No. 9 Projected installed capacity for electricity generation, Brazil, PRO NET-0 scenario



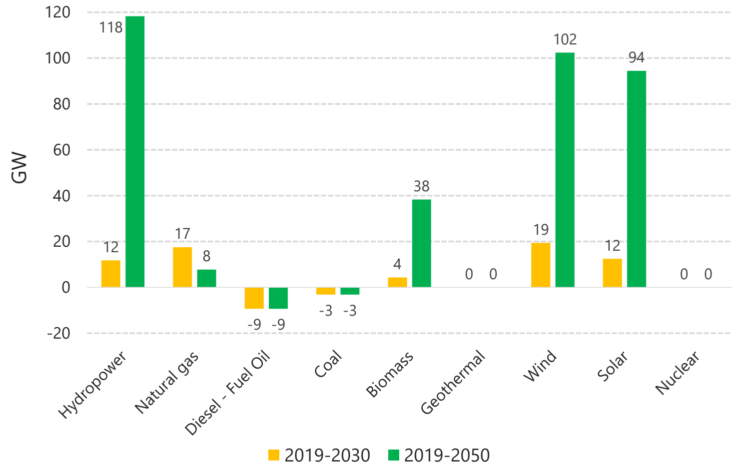
Source: Own elaboration

Figure No. 10 Structure of the installed capacity for electricity generation, Brazil, PRO NET-0 scenario



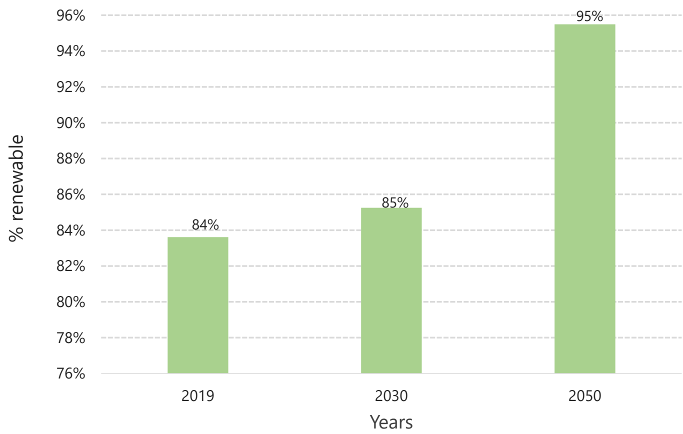
Source: Own elaboration

Figure No. 11 Incremental installed capacity for electricity generation, Brazil, PRO NET-0 scenario



Source: Own elaborationn

Figure No. 12. Renewable % of installed capacity for electricity generation, Brazil, PRO NET-0 scenario



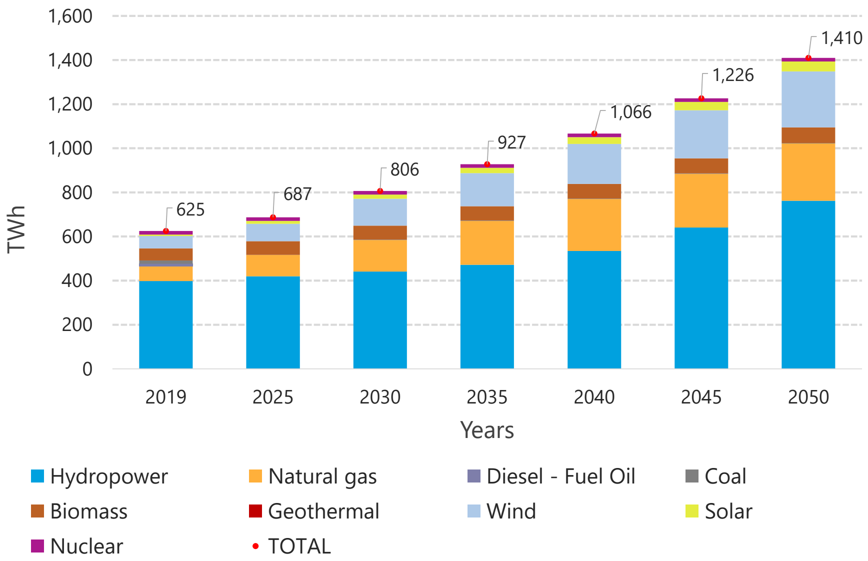
Source: Own elaboration

2.4 Projected electricity generation

2.4.1 BAU Scenario

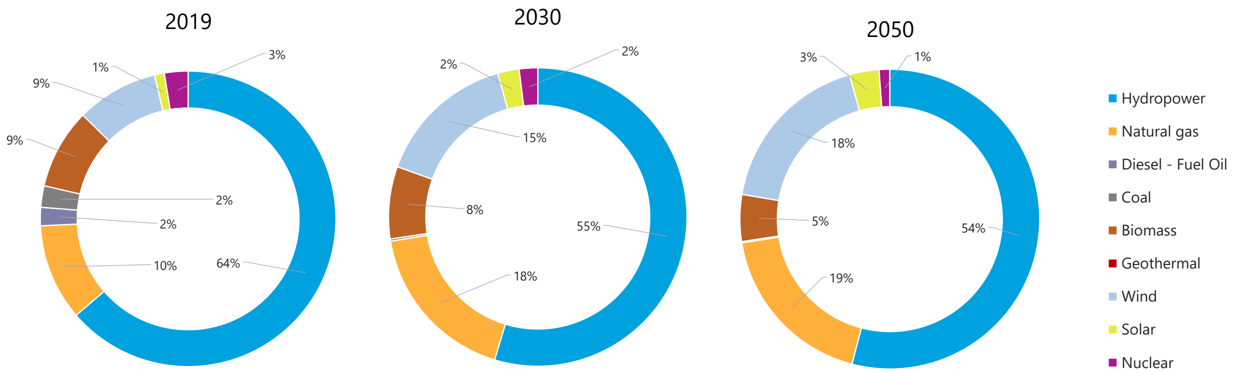
In terms of electricity production, and coherently with the projection of installed capacity, under the BAU scenario, natural gas and wind energy are the sources that gain the greatest share in Brazil's electricity generation matrix, to the detriment of hydroelectricity, biomass, coal and oil products, with a decrease in the percentage share of renewable energies in this matrix, with respect to the base year (**Figures 13, 14 and 15**).

Figure No. 13 Projected electricity generation, Brazil, BAU scenario



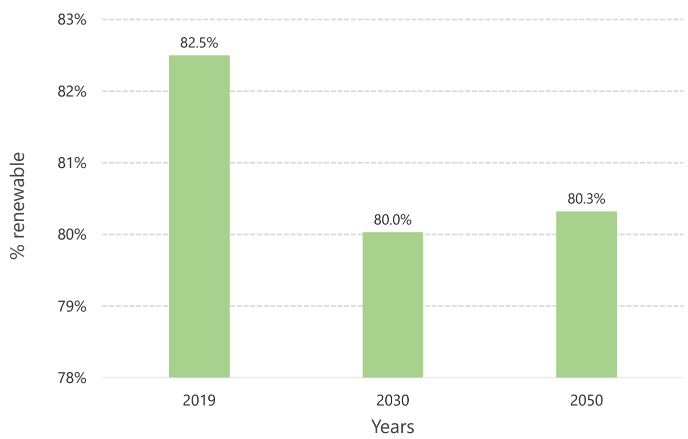
Source: Own elaboration

Figure No. 14 Structure of electricity generation, Brazil, BAU scenario



Source: Own elaboration

Figure No. 15 Renewable % of electricity generation, Brazil, BAU scenario

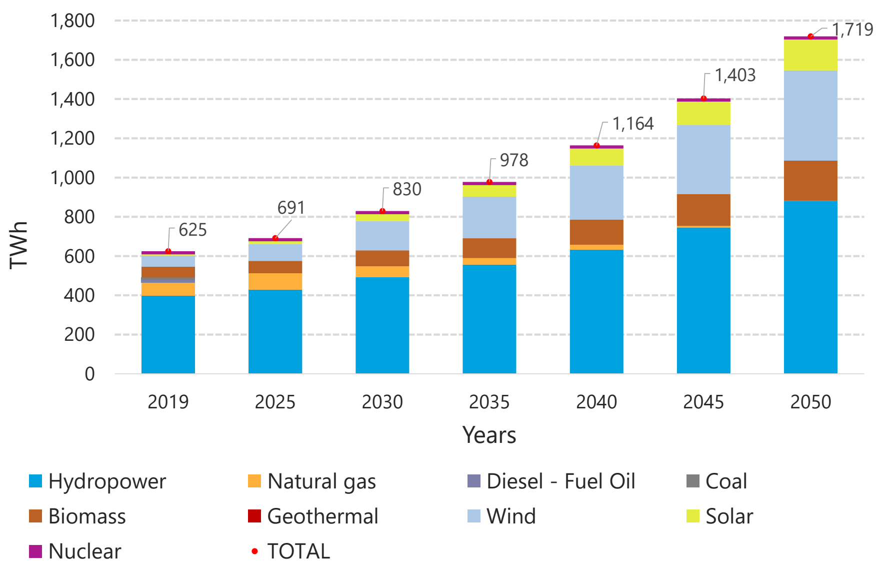


Source: Own elaboration

2.4.2 PRO NET-0 Scenario

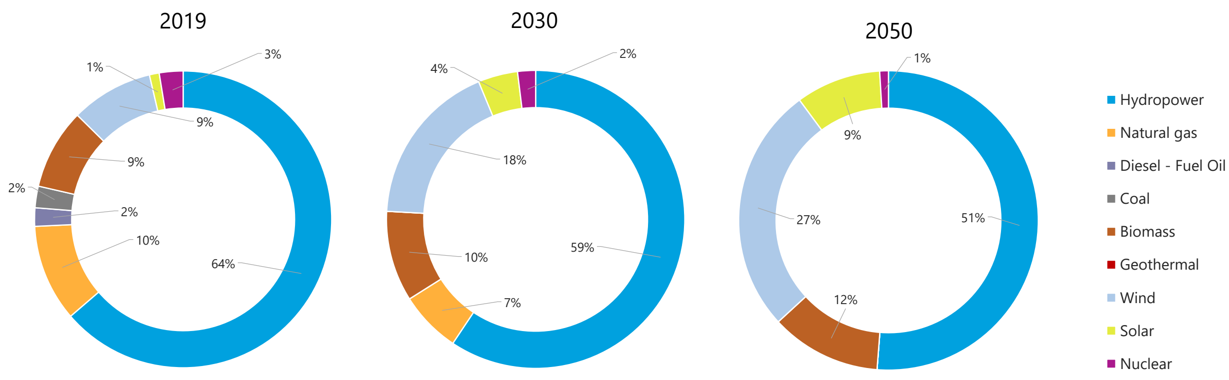
In accordance with the projection of Brazil's installed capacity in the PRO NET-0 scenario, the generation of electricity with non-conventional renewable energy sources (wind, solar and biomass), acquire very relevant shares in the generation matrix of this country and, together with hydropower, will completely displace the use of fossil fuels by 2050, leaving only nuclear energy as a non-renewable source. Thus, the renewability index of electricity generation reaches 99% in Brazil by the end of the projection period. Due to the increase in electricity demand in the final consumption sectors, an additional 309 TWh of generation is required in the PRO NET-0 scenario for that year, compared to the value projected in the BAU scenario (**Figures 16, 17 and 18**).

Figure No. 16 Projected electricity generation, Brazil, PRO NET-0 scenario



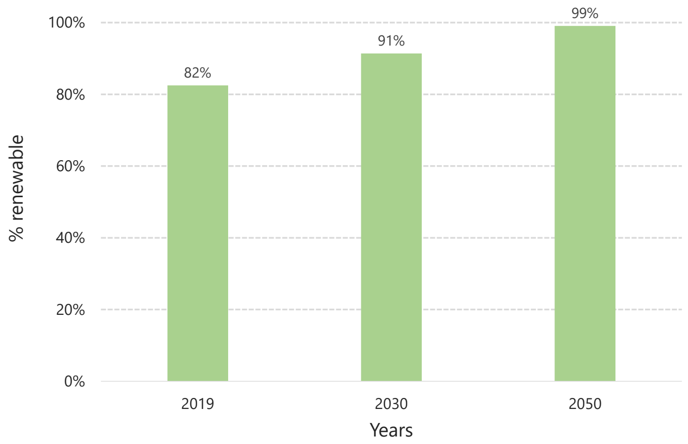
Source: Own elaboration

Figure No. 17 Structure of electricity generation, Brazil, PRO NET-0 scenario



Source: Own elaboration

Figure No. 18 Renewable % of electricity generation, Brazil, PRO NET-0 scenario



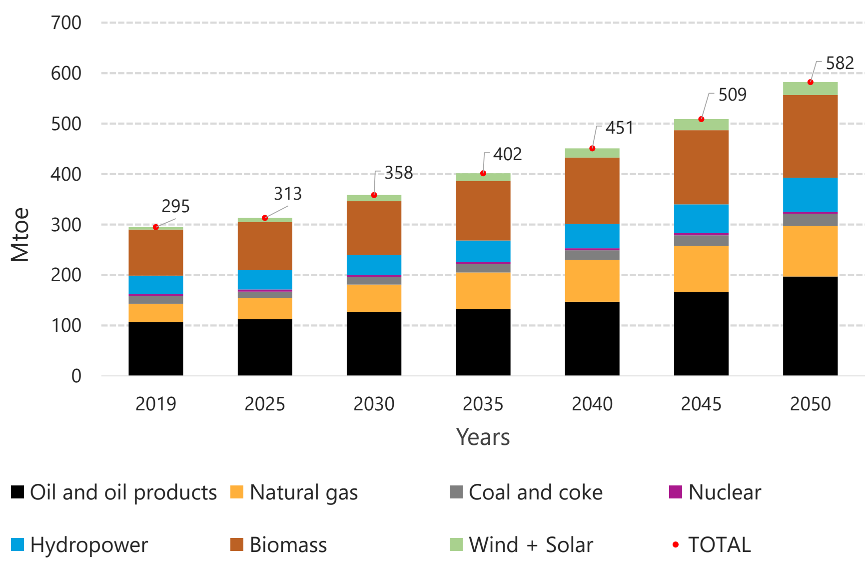
Source: Own elaboration

2.5 Projected total energy supply

2.5.1 BAU Scenario

In Brazil's total energy supply matrix, under the BAU scenario assumptions, natural gas gains percentage share during the projection period, displacing oil and its products. As for renewable energies, hydropower maintained its percentage share and while biomass lost a little space, wind and solar energy gained ground, doubling their percentage share with respect to the base year. In general terms, the renewability index of Brazil's total energy supply matrix, under this scenario, decreases with respect to the base year (**Figures 19, 20 and 21**).

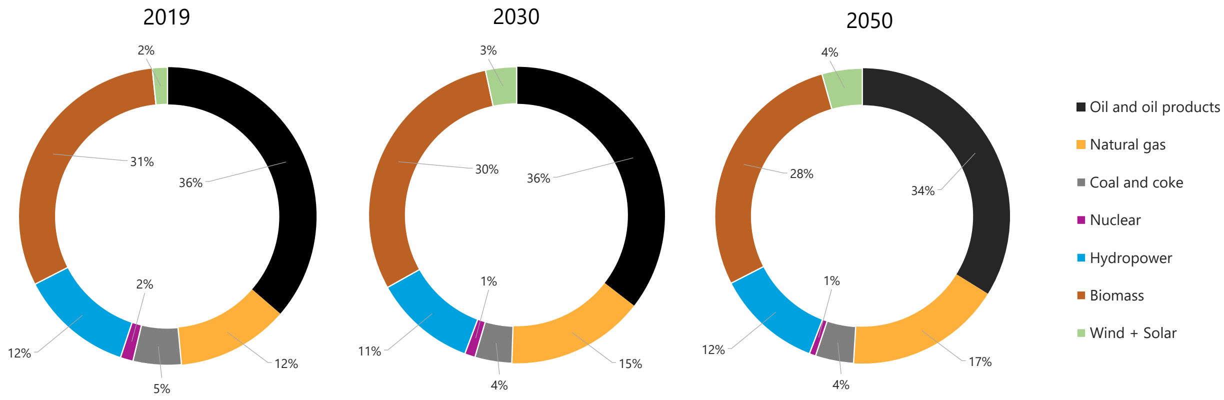
Figure No. 19 Projected total energy supply, Brazil, BAU scenario



Source: Own elaboration

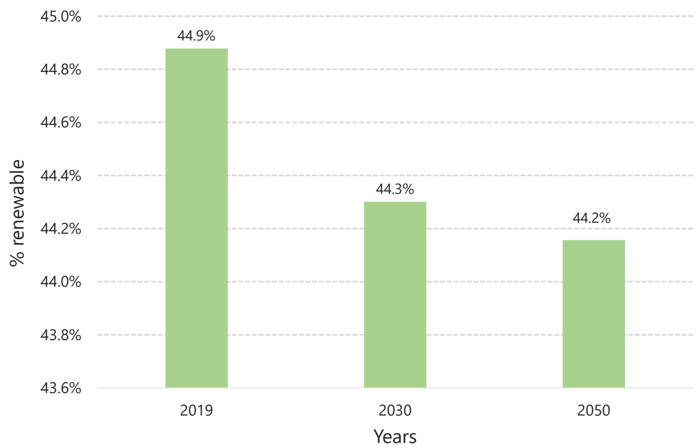
ENERGY PROSPECTIVE LAC

Figure No. 20 Structure of the total energy supply, Brazil, BAU scenario



Source: Own elaboration

Figure No. 21. Renewable % of total energy supply, Brazil, BAU scenario

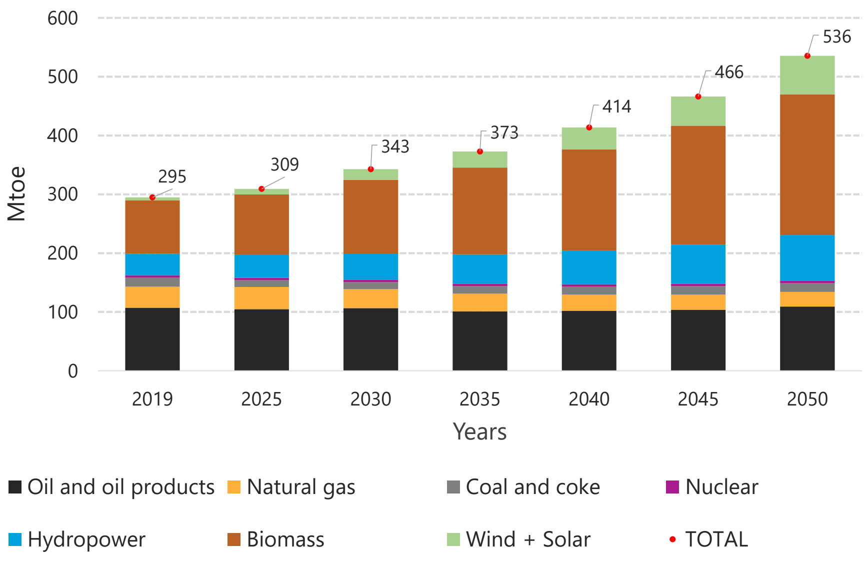


Source: Own elaboration

2.5.2 PRO NET-0 Scenario

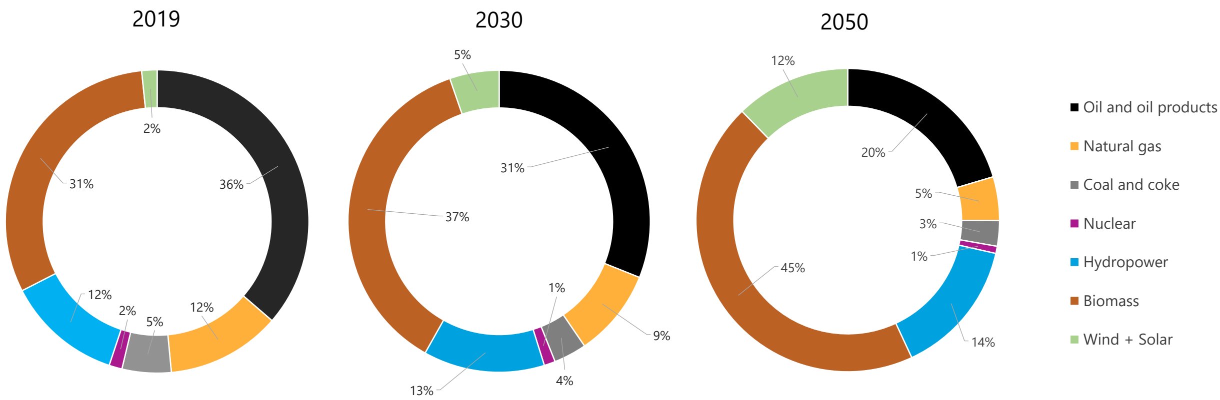
Thanks to the increased penetration of electricity and biofuels in the final consumption sectors and the total decarbonization of Brazil's electricity generation matrix by 2050, under the assumptions of the PRO NET-0 scenario, Brazil would reach a renewability index of 71% by the end of the projection period, significantly improving this indicator with respect to the base year and much more with respect to the value projected in the BAU scenario. It is also important to highlight a net saving of 46 Mtoe of energy supplied by 2050 with respect to the corresponding value in the BAU scenario (**Figures 22, 23 and 24**).

Figure No. 22 Projected total energy supply, Brazil, PRO NET-0 scenario



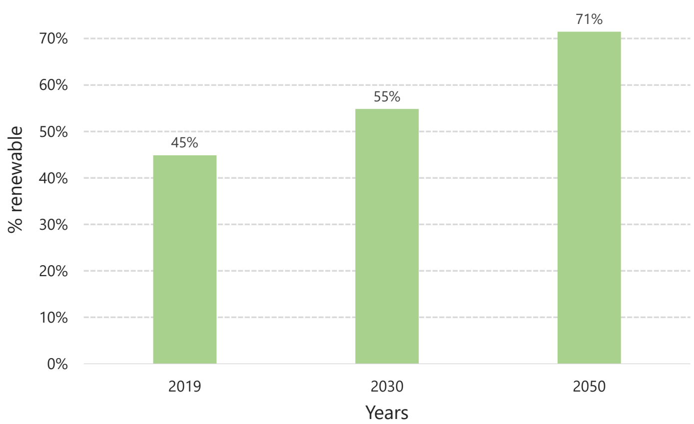
Source: Own elaboration

Figure No. 23 Structure of the total energy supply, Brazil, PRO NET-0 scenario0



Source: Own elaboration

Figure No. 24 Renewable % of total energy supply, Brazil, PRO NET-0 scenario



Source: Own elaboration

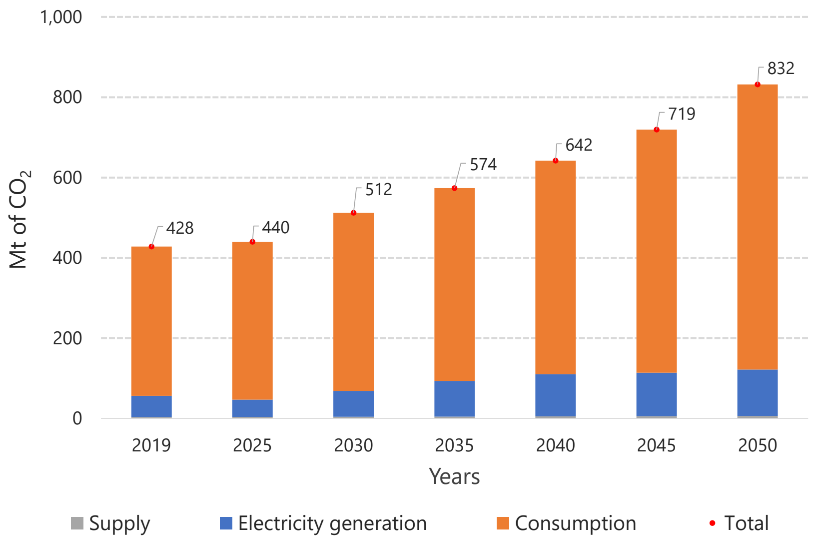
ENERGY PROSPECTIVE LAC

2.6 Projected CO_2 emissions

2.6.1 BAU Scenario

As shown in **Figure 25**, under the BAU scenario assumptions, CO_2 emissions from the Brazilian energy sector would increase both in 2030 and 2050 with respect to the base year, almost doubling over the projection horizon.

Figure No. 25 Projected CO_2 emissions, Brazil, BAU scenario

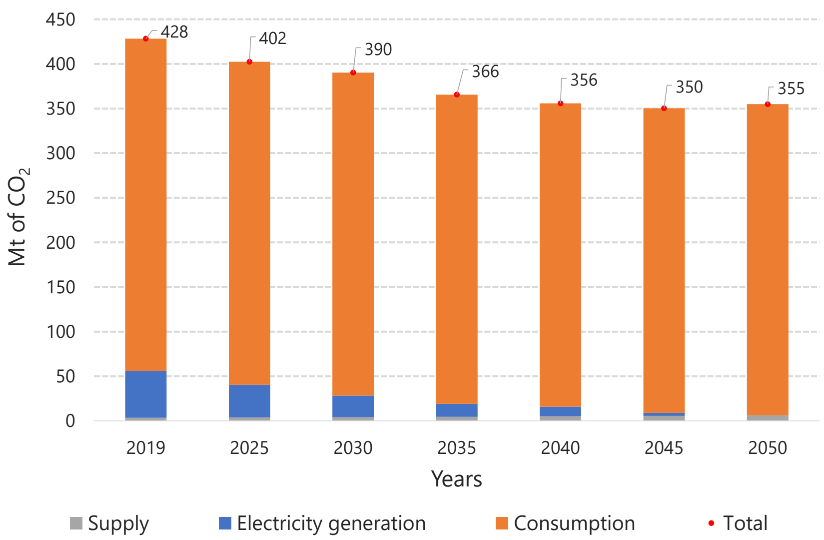


Source: Own elaboration

2.6.2 PRO NET-0 Scenario

Contrary to the BAU scenario, Brazil's annual CO_2 emissions in the PRO NET-0 scenario show a continuous decrease during the projection period, resulting in the year 2050 to be 17% lower than those recorded in the base year and 57% lower than those projected in the BAU scenario for the same year (**Figure 26**).

Figure No. 26 Projected CO_2 emissions, Brazil, PRO NET-0 scenario



Source: Own elaboration

3. ENERGY PROSPECTIVE FOR MEXICO

3.1 General considerations

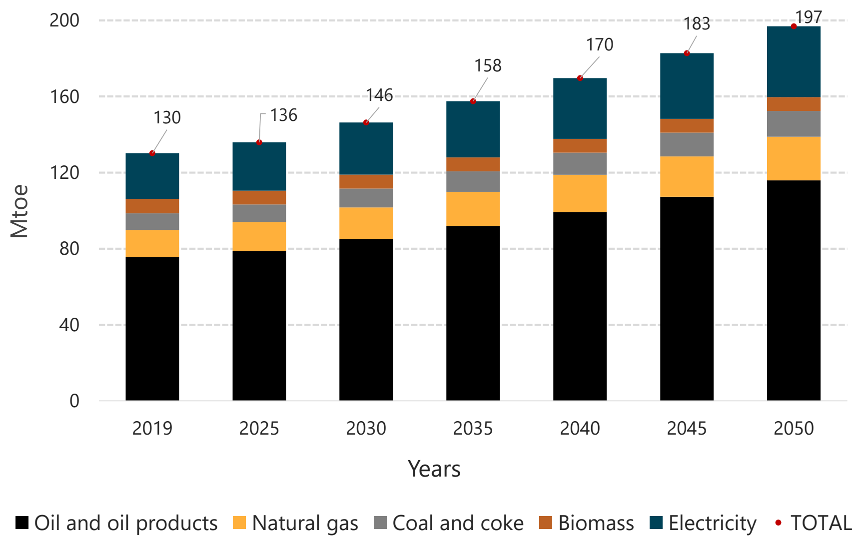
The sources of reference information for the case of Mexico were the series of energy prospective prepared and published by SENER, for the period 2018-2032, for crude oil and its products, natural gas, LPG, renewable energies and electricity, in combination with the 2019 National Energy Balance of that country and the estimates of final energy consumption with COVID-19 effect, prepared based on the projections of nominal GDP published by the World Bank.

3.2 Projected final energy consumption

3.2.1 BAU Scenario

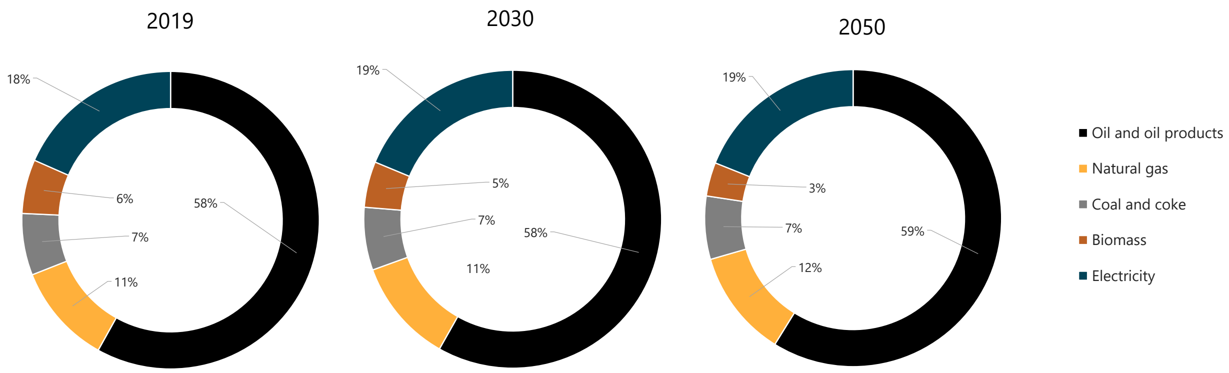
Final consumption in Mexico, under the BAU scenario assumptions, increases at an average annual rate of 1.3% during the projection period, without significant changes in the percentage structure, maintaining the predominance of oil products in the consumption matrix (**Figures 27 and 28**).

Figure No. 27 Projected final energy consumption, Mexico, BAU scenario



Source: Own elaboration

Figure No. 28 Evolution of the final energy consumption matrix, Mexico, BAU scenario



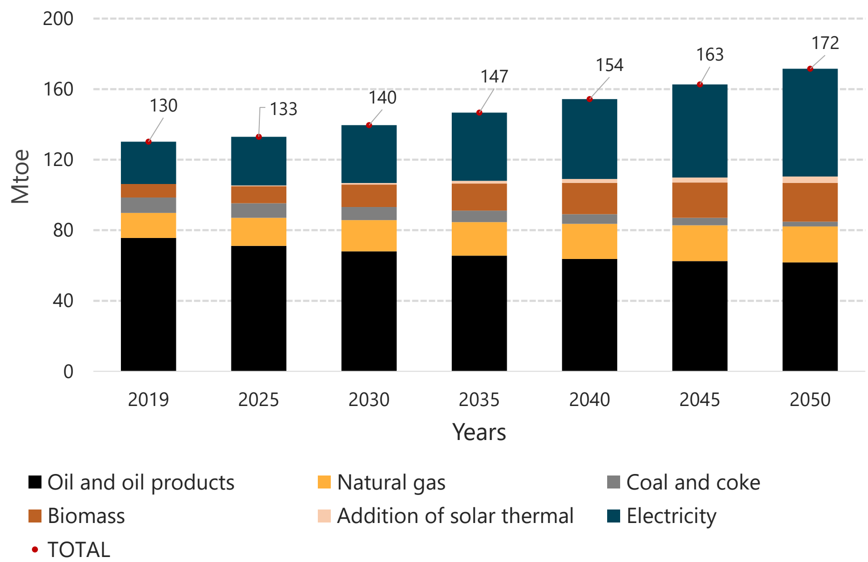
Source: Own elaboration

ENERGY PROSPECTIVE LAC

3.2.2 PRO NET-0 Scenario

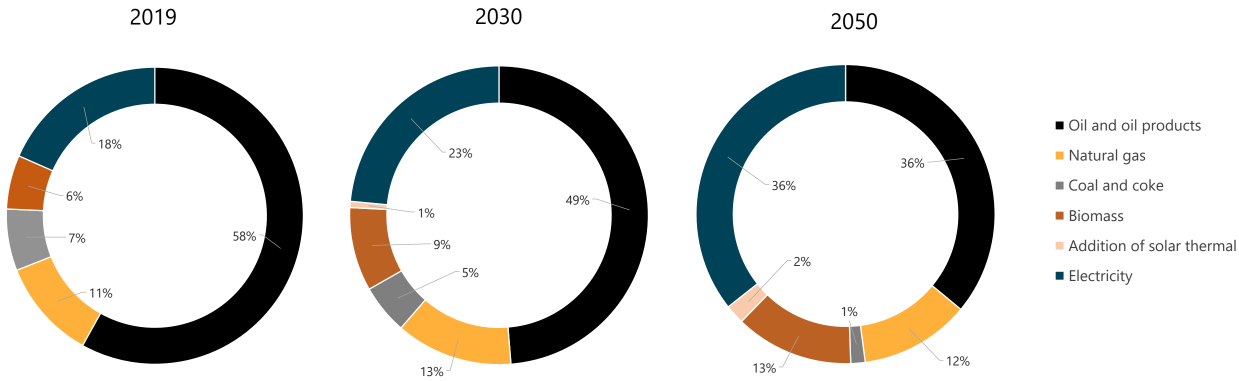
Under the assumptions of the PRO NET-0 scenario, electricity and biofuels (biomass) gain ground over oil products, due to their greater penetration in the final consumption sectors, especially transportation and industry. The share of natural gas remains almost unchanged and there has been an increase in the use of solar thermal energy as a measure of fuel and electricity savings. Thanks to the increase in energy efficiency in the different end uses, savings of 6 Mtoe per year in 2030 and 25 Mtoe per year in 2050 are achieved, compared to the consumption projected in the BAU scenario for these same years (**Figures 29 and 30**).

Figure No. 29 Projected final energy consumption, Mexico, PRO NET-0 scenario



Source: Own elaboration

Figure No. 30 Evolution of the final energy consumption matrix, Mexico, PRO NET-0 scenario



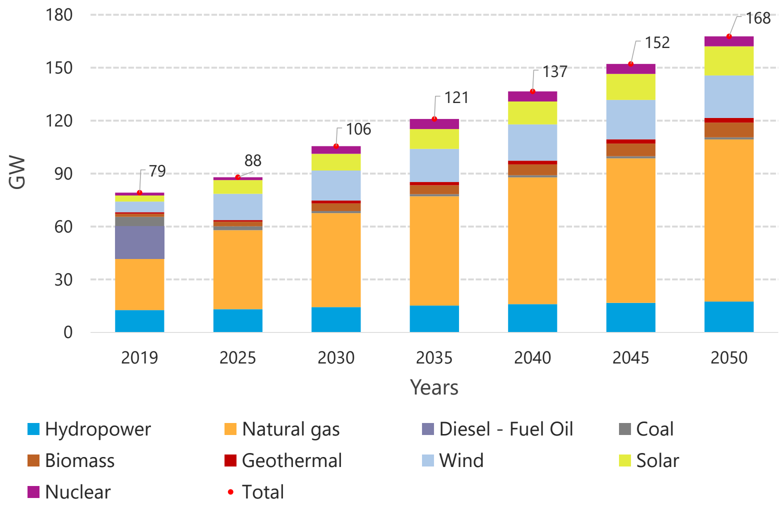
Source: Own elaboration

3.3 Projected installed capacity for electricity generation

3.3.1 BAU Scenario

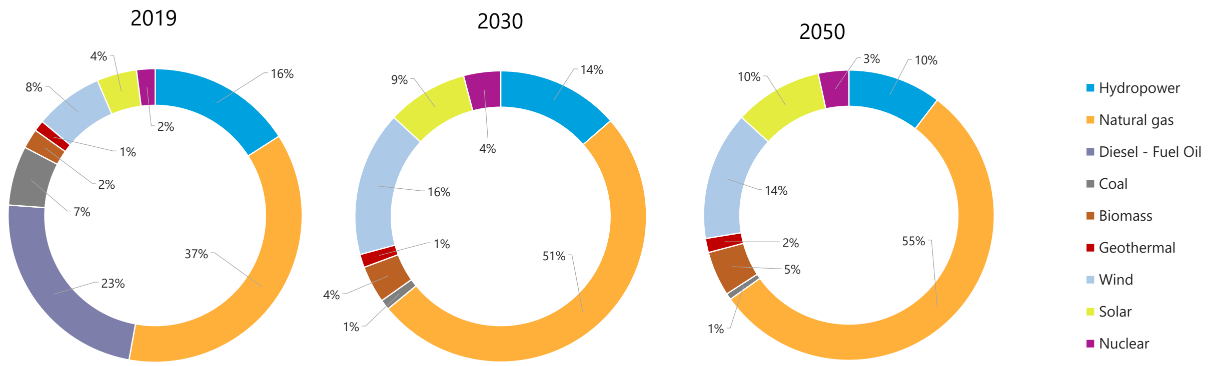
The new electricity generation capacity installed in Mexico, under the BAU scenario assumptions, is mainly natural gas-fired plants; however, the renewable capacity incorporated into the generation park during the projection period is also significant, which means that the renewability of this park will increase with respect to the base year (**Figures 31, 32, 33 and 34**).

Figure No. 31 Projected installed capacity for electricity generation, Mexico, BAU scenario



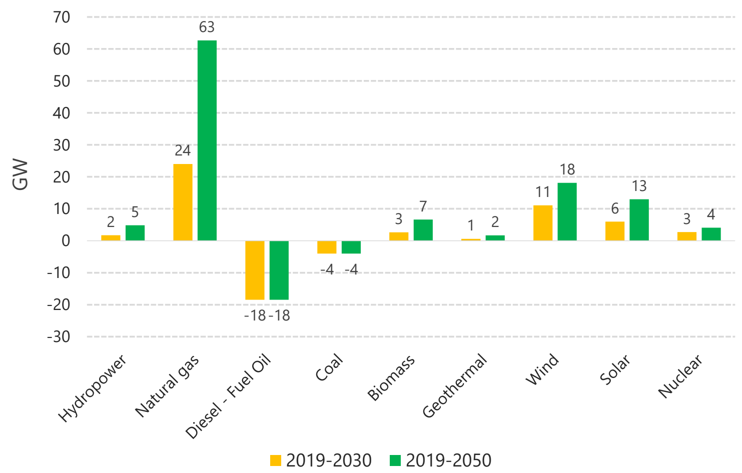
Source: Own elaboration

Figure No. 32 Structure of installed capacity for electricity generation, Mexico, BAU scenario



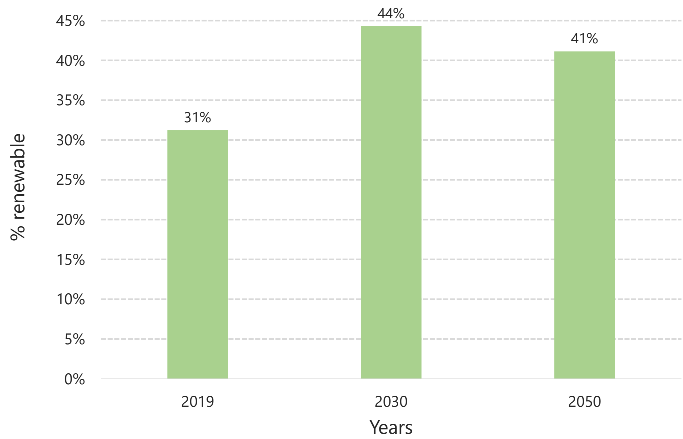
Source: Own elaboration

Figure No. 33 Incremental installed capacity for electricity generation, Mexico, BAU scenario



Source: Own elaboration

Figure No. 34 Renewable % of installed capacity for electricity generation, Mexico, BAU scenario

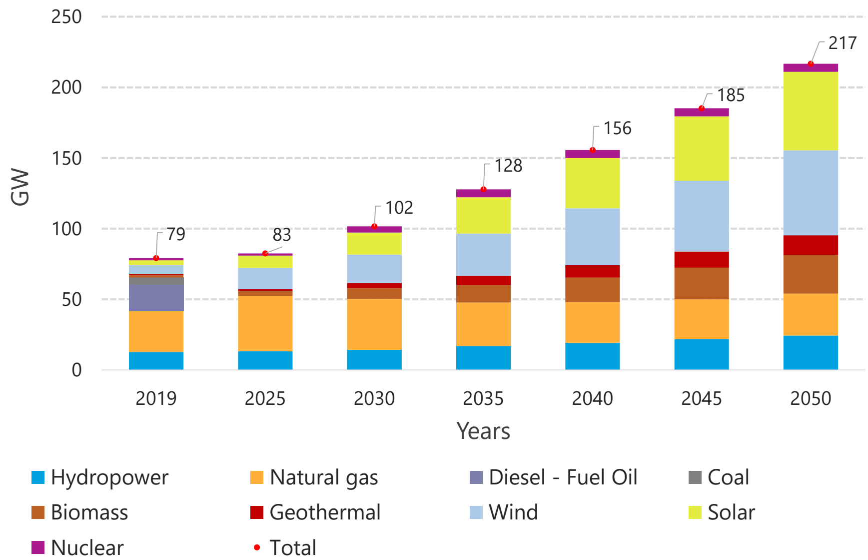


Source: Own elaboration

3.3.2 PRO NET-0 Scenario

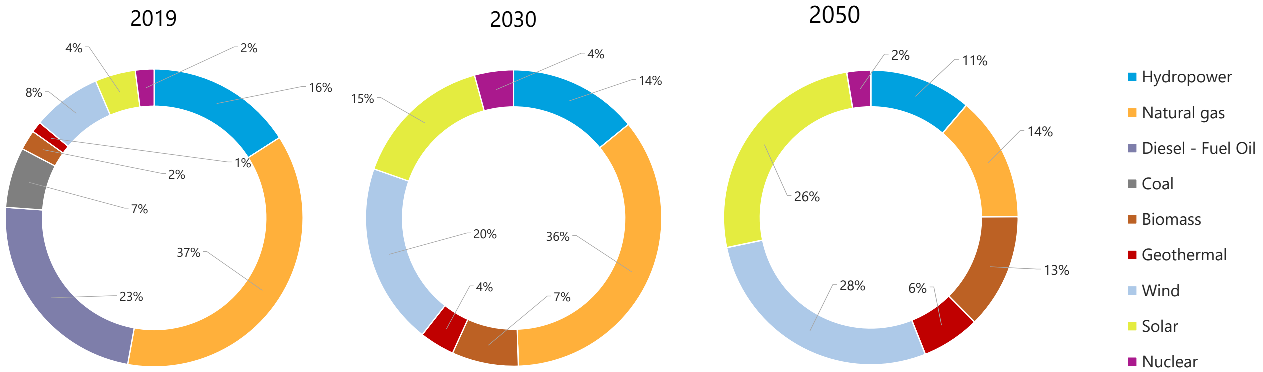
Considering Mexico's significant renewable energy potential in sources such as wind, solar, biomass and geothermal energy, for the PRO NET-0 scenario, a prominent increase in the use of these sources for electricity generation was considered during the projection period, leaving aside the trend increase in the use of natural gas. As a result, the renewability of installed capacity for electricity generation in Mexico would reach up to 84% in the study horizon and, due to the increase in electricity demand, an additional 49 GW would be required with respect to the value projected for that year in the BAU scenario (**Figures 35, 36, 37 and 38**).

Figure No. 35. Projected installed capacity for electricity generation, Mexico, PRO NET-0 scenario



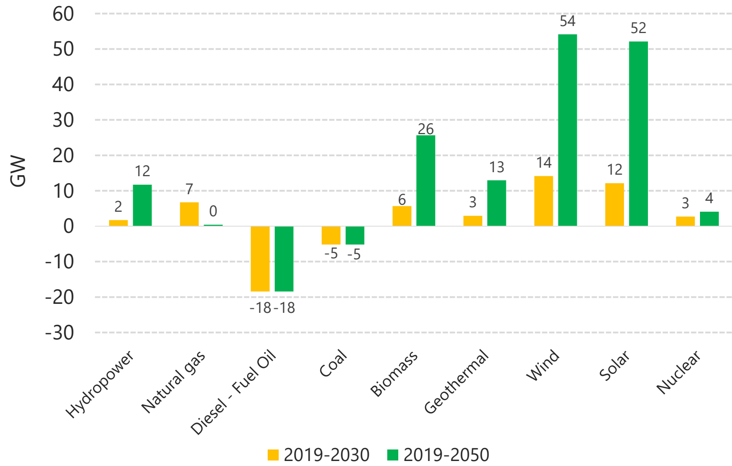
Source: Own elaboration

Figure No. 36 Structure of installed capacity for electricity generation, Mexico, PRO NET-0 scenario



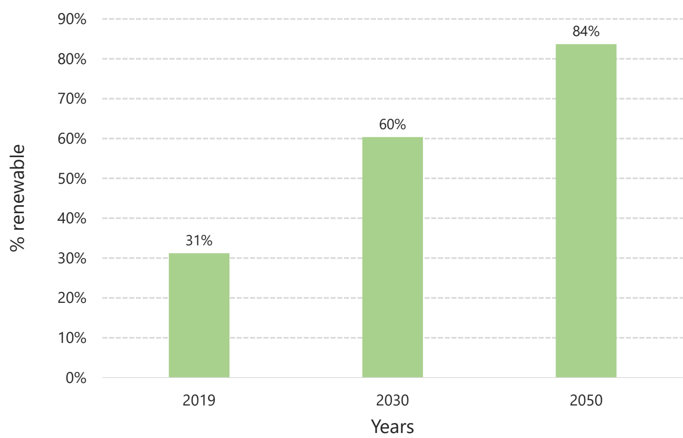
Source: Own elaboration

Figure No. 37 Incremental installed capacity for electricity generation, Mexico, PRO NET-0 scenario



Source: Own elaboration

Figure No. 38 Renewable % of installed capacity for electricity generation, Mexico, PRO NET-0 scenario



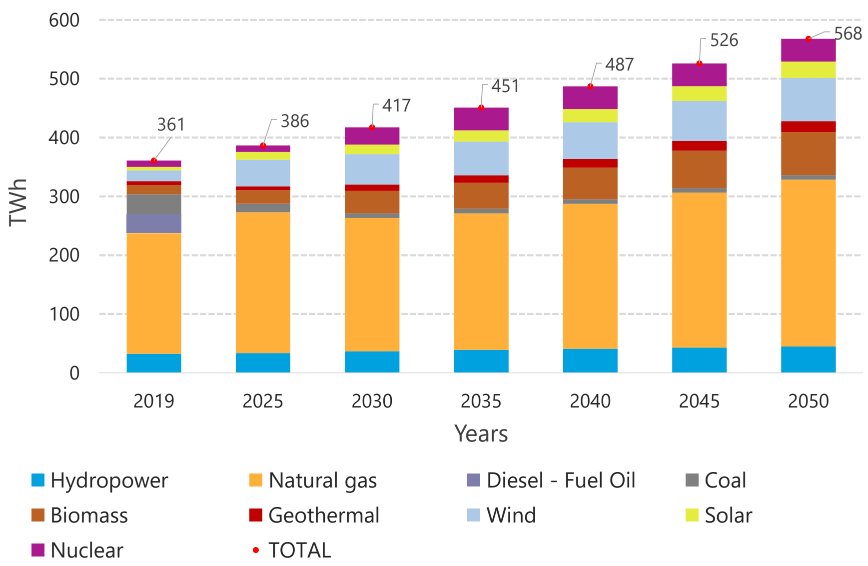
Source: Own elaboration

3.4 Projected electricity generation

3.4.1 BAU Scenario

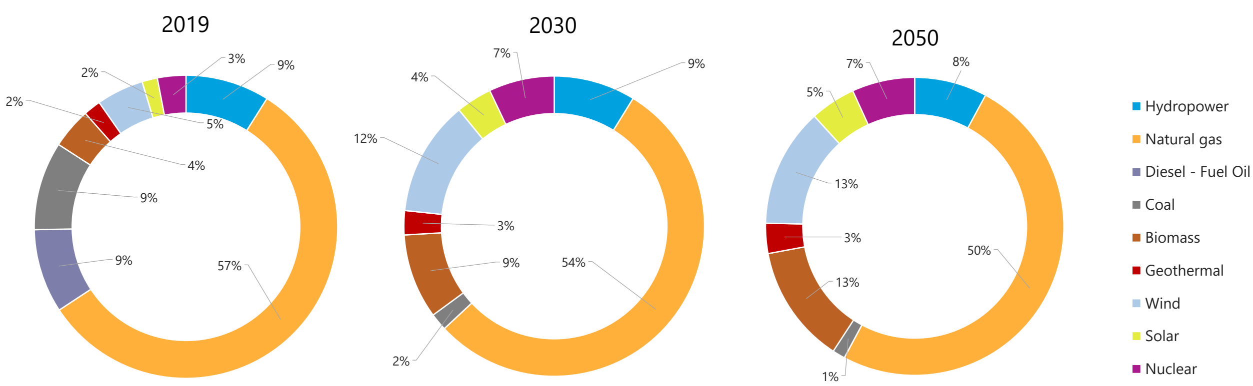
According to the electricity generation capacity projected for the BAU scenario, the energy generation matrix in Mexico maintains the predominance of natural gas, although with a notable increase in the share of renewable energy sources, which increases from 22% in the base year to 37% in 2030 and 42% in 2050. There is also an increase in thermonuclear generation, while the use of oil products disappears and the use of coal is reduced to a minimum (**Figures 39, 40 and 41**).

Figure No. 39 Projected electricity generation, Mexico, BAU scenario



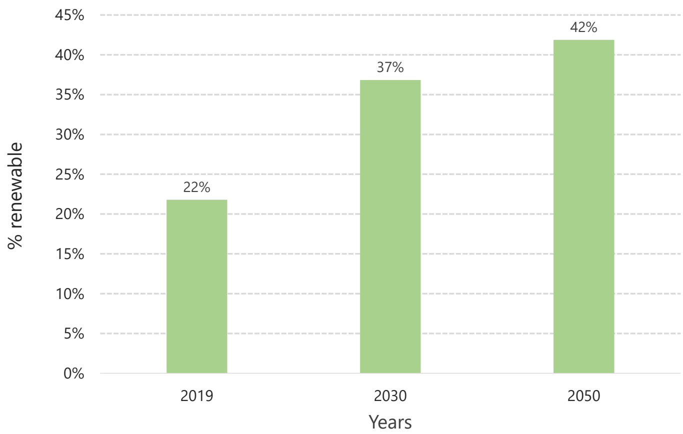
Source: Own elaboration

Figure No. 40 Structure of electricity generation, Mexico, BAU scenario



Source: Own elaboration

Figure No. 41 Renewable % of electricity generation, Mexico, BAU scenario

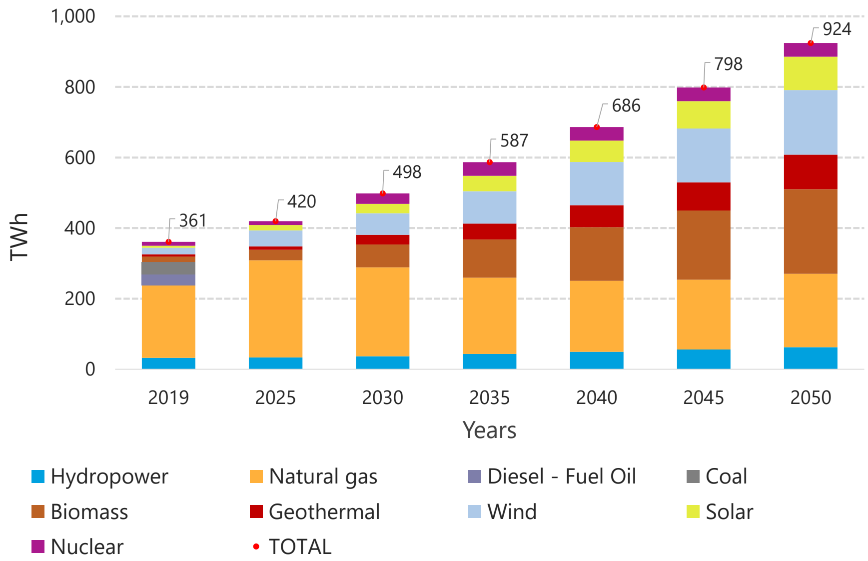


Source: Own elaboration

3.4.2 PRO NET-0 Scenario

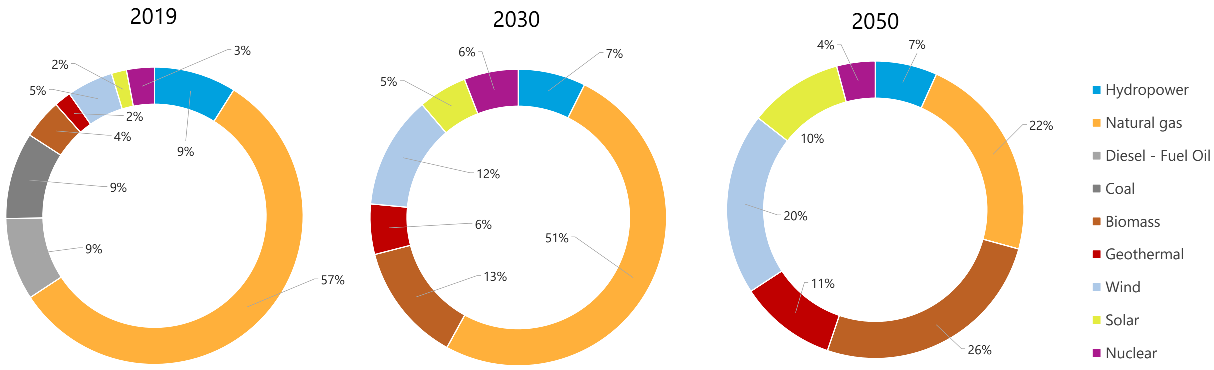
In the PRO NET-0 scenario, electricity generation with renewable energies is intensified, especially with biomass, wind, solar and geothermal energy, even reducing the use of natural gas plants, thanks to which the renewability index of the generation matrix reaches 73% by 2050. It should also be noted that, due to the higher penetration of electricity in the final consumption sectors, energy generation in the PRO NET-0 scenario for 2050 is 63% higher than that projected in the BAU scenario for the same year (**Figures 42, 43 and 44**).

Figure No. 42 Projected electricity generation, Mexico, PRO NET-0 scenario



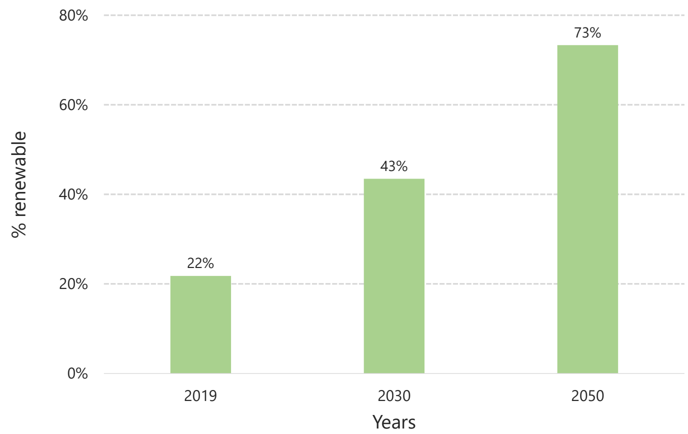
Source: Own elaboration

Figure No. 43 Structure of electricity generation, Mexico, PRO NET-0 scenario



Source: Own elaboration

Figure No. 44 Renewable % of electricity generation, Mexico, PRO NET-0 scenario



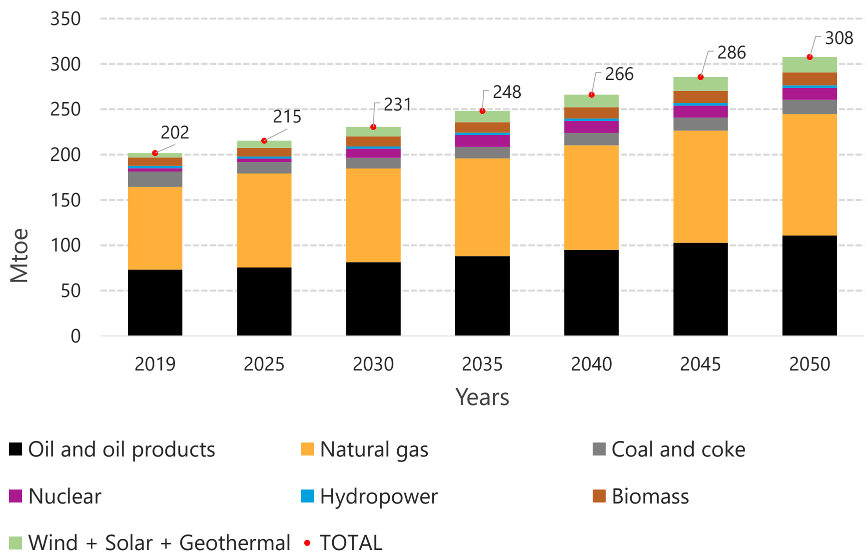
Source: Own elaboration

3.5 Projected total energy supply

3.5.1 BAU Scenario

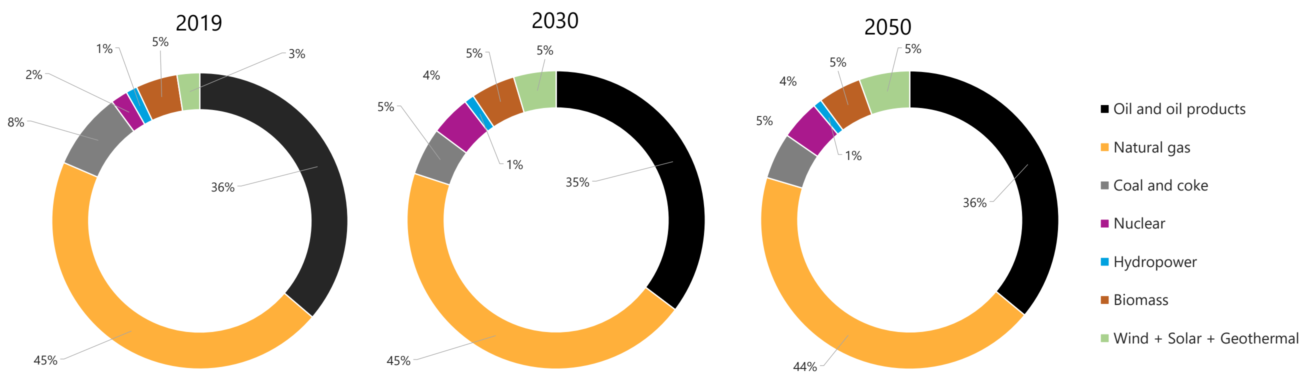
According to the BAU scenario, the total energy supply in Mexico will continue to be mostly hydrocarbons, mainly natural gas, until 2050, although there is a small increase in the share of renewable energies of 3 percentage points with respect to the base year (**Figures 45, 46 and 47**).

Figure No. 45 Projected total energy supply, Mexico, BAU scenario



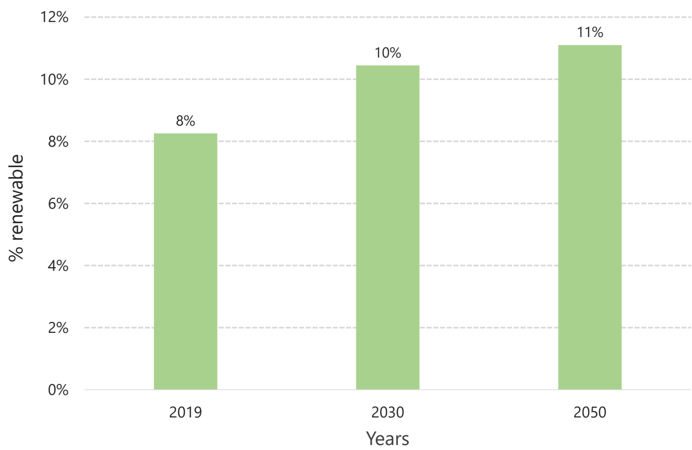
Source: Own elaboration

Figure No. 46 Structure of the total energy supply, Mexico, BAU scenario



Source: Own elaboration

Figure No. 47 Renewable % of total energy supply, Mexico, BAU scenario

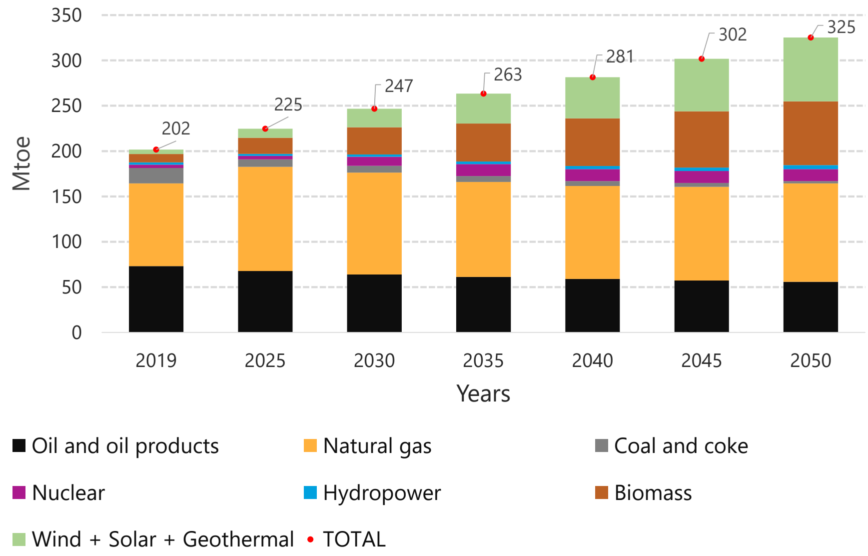


Source: Own elaboration

3.5.2 PRO NET-0 Scenario

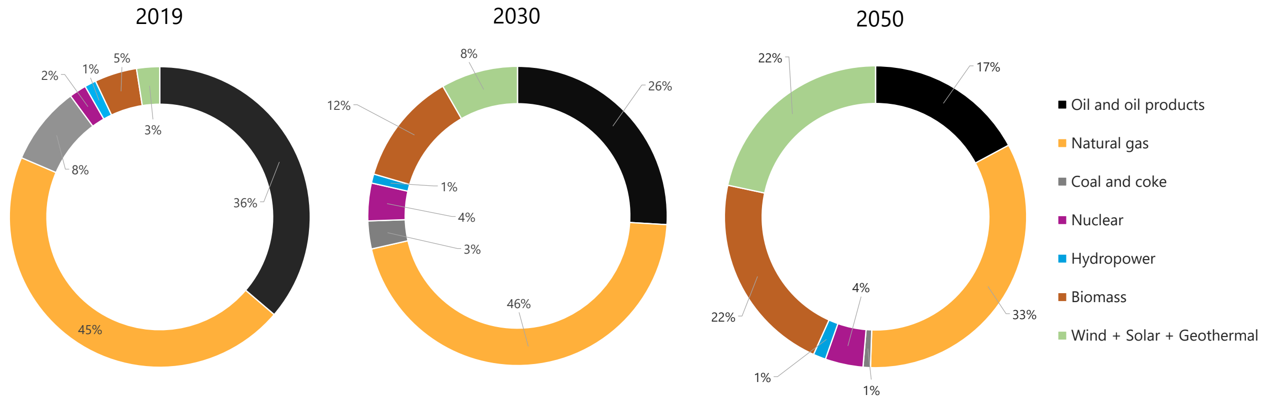
Under the assumptions of the PRO NET-0 scenario, renewable energies manage to gain significant ground over hydrocarbons, relegating them to a share of only 50% compared to the 81% they represented in the base year. The renewability index of the total supply matrix improves from 8% in the base year to 21% in 2030 and 45% in 2050, thanks to the contribution of biomass, wind, solar and geothermal energy. Due to the higher electricity demand and the lower efficiency in the use of biomass in electricity generation, with respect to natural gas, the total annual energy supply in the PRO NET-0 scenario shows an increase of 6% by 2050, with respect to the value projected for that year in the BAU scenario (**Figures 48, 49 and 50**).

Figure No. 48 Projected total energy supply, Mexico, PRO NET-0 scenario



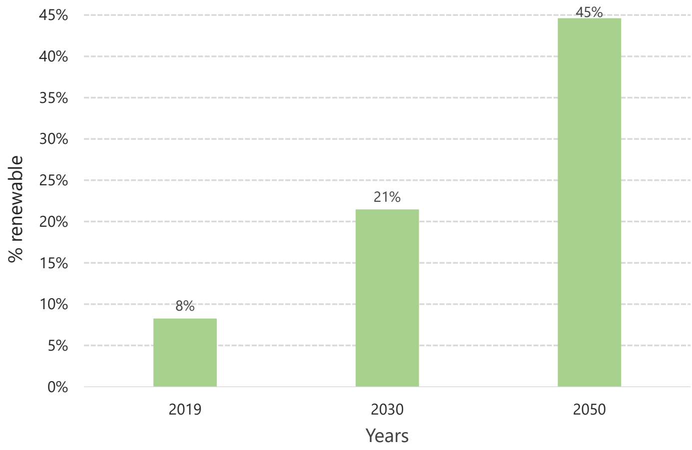
Source: Own elaboration

Figure No. 49 Structure of the total energy supply, Mexico, PRO NET-0 scenario



Source: Own elaboration

Figure No. 50 Renewable % of total energy supply, Mexico, PRO NET-0 scenario



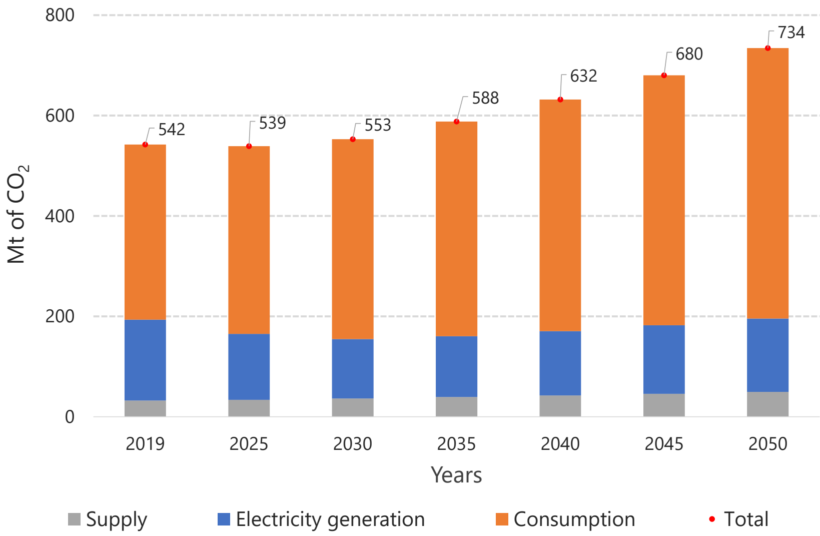
Source: Own elaboration

3.6 Projected CO_2 emissions

3.6.1 BAU Scenario

Under the BAU scenario assumptions, annual CO_2 emissions from the Mexican energy sector would grow by 2% by 2030 and by 35% by 2050, compared to the base year (**Figure 51**).

Figure No. 51 Projected CO_2 emissions, Mexico, BAU scenario

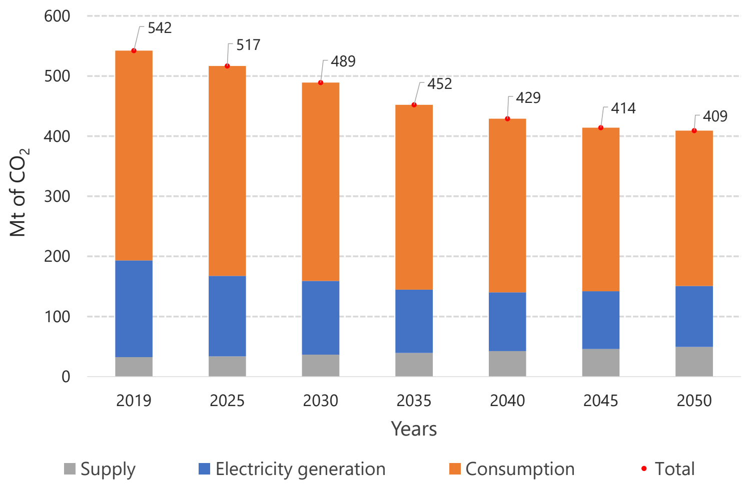


Source: Own elaboration

3.6.2 PRO NET-0 Scenario

In the case of the PRO NET-0 scenario, there would be a continuous decrease in annual CO_2 emissions from the Mexican energy sector, falling 25% by 2050 with respect to the base year and 44% with respect to the value projected in the BAU scenario by the end of the projection period (**Figure 52**).

Figure No. 52. Projected CO_2 emissions, Mexico, PRO NET-0 scenario



Source: Own elaboration

4. *ENERGY PROSPECTIVE FOR CENTRAL AMERICA*

4.1 General considerations

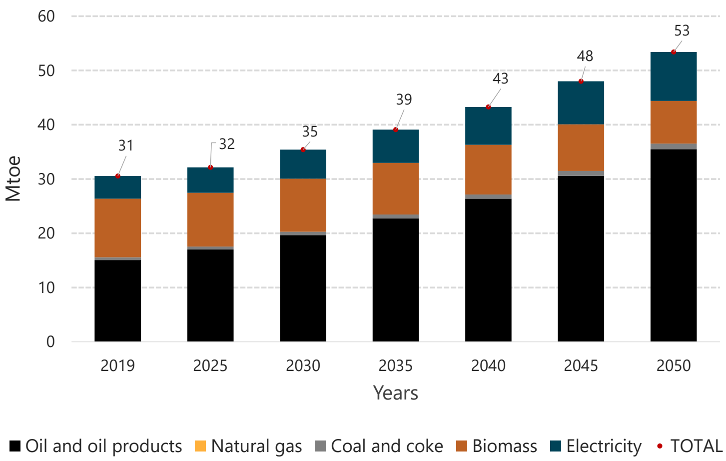
The energy prospective for the Central American sub-region is based on the "Regional Indicative Plan for the Expansion of Electricity Generation 2018-2035", published by the Central American Electrification Council (CEAC by its acronym in Spanish), on the National Energy Balances of the Central American countries for the year 2019 and on the estimates of final energy consumption with COVID-19 effect, prepared in correlation with the projections of nominal GDP published by the World Bank.

4.2 Projected final energy consumption

4.2.1 BAU Scenario

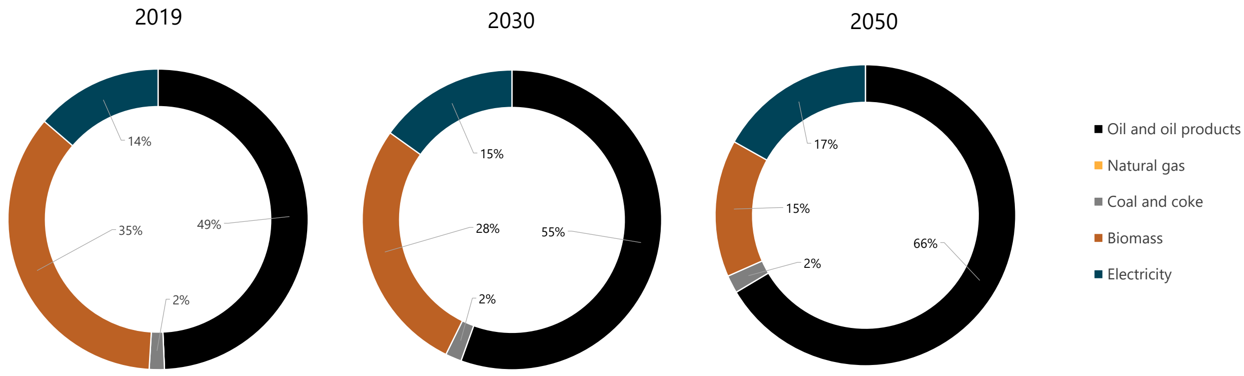
In the context of the BAU scenario, the projection of final energy consumption for the Central American subregion is characterized by a reduction in biomass consumption and an increase in the consumption of oil products, mainly due to the substitution of firewood for LPG for cooking in the residential sector, although there is also greater use of electricity in the final consumption sectors (**Figures 53 and 54**).

Figure No. 53 Projected final energy consumption, Central America, BAU scenario



Source: Own elaboration

Figure No. 54 Evolution of the final energy consumption matrix, Central America, BAU scenario

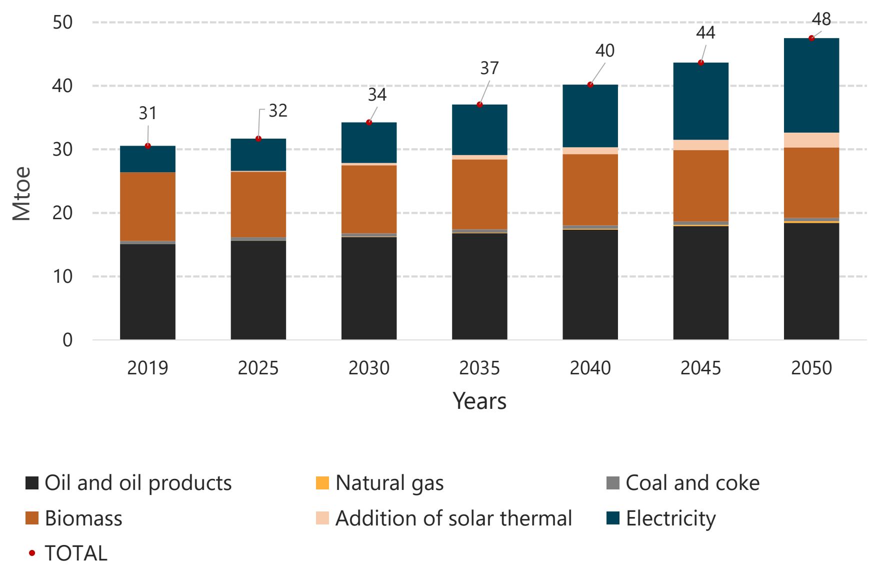


Source: Own elaboration

4.2.2 PRO NET-0 Scenario

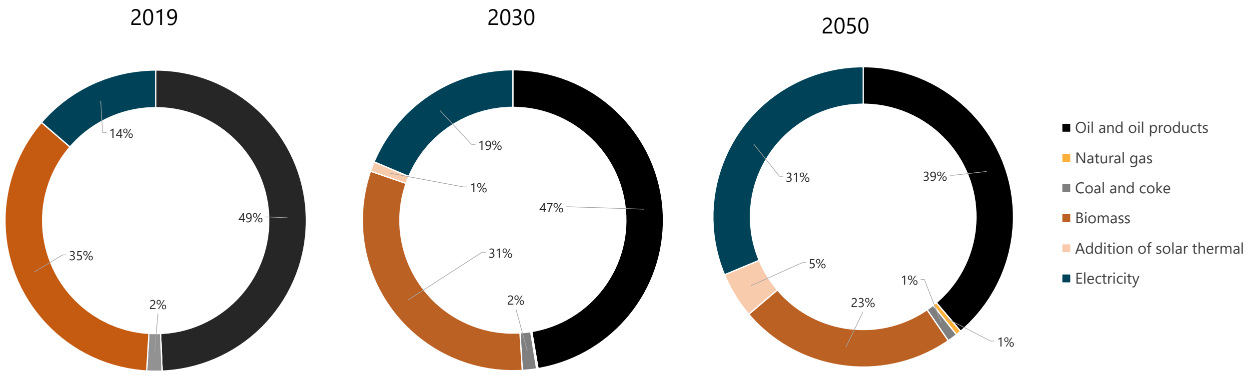
Under the premises of the PRO NET-0 scenario, the penetration of electricity in the final consumption sectors is much more evident, especially in transportation, industry and the residential sector, and although biomass continues to lose share during the projection period, oil products also do so, even though in absolute terms they show a small growth in the order of 0.6% average annual growth. Also noteworthy is the increase in the use of solar thermal energy in the residential and commercial sectors and the total savings in annual energy consumption with respect to the BAU scenario, which by 2030 means 1 Mtoe and by 2050, 5 Mtoe (**Figures 55 and 56**).

Figure No. 55 Projected final energy consumption, Central America, PRO NET-0 scenario



Source: Own elaboration

Figure No. 56 Evolution of the final energy consumption matrix, Central America, PRO NET-0 scenario



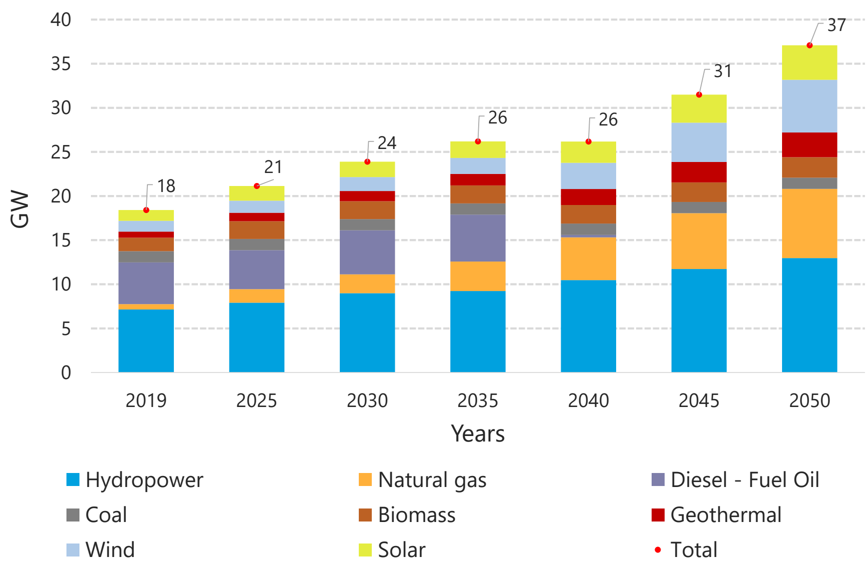
Source: Own elaboration

4.3 Projected installed capacity for electricity generation

4.3.1 BAU Scenario

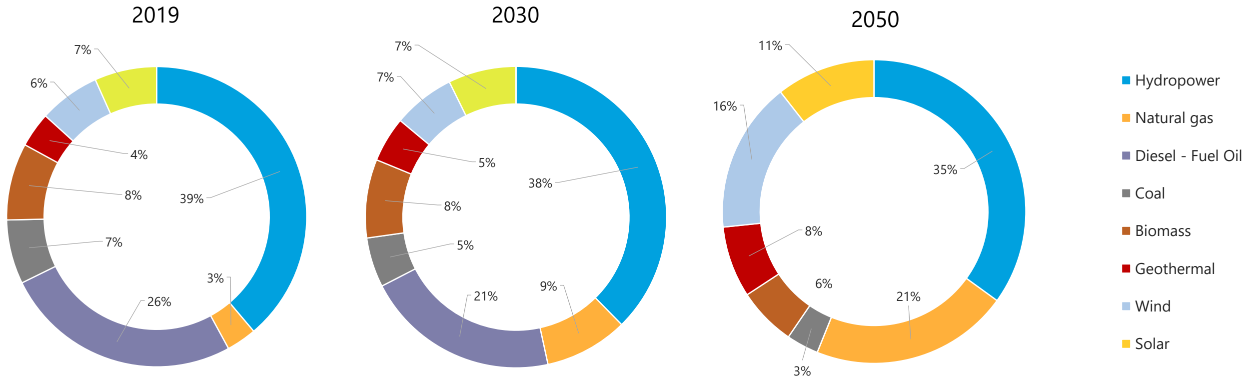
In the installation of new electricity generation capacity for the Central American subregion, under the BAU scenario assumptions, natural gas, hydroelectric and wind power plants predominate, although increases in solar photovoltaic and geothermal capacity are also important. Although the use of power plants using oil products (diesel-fuel oil) decreases, this type of power plant cannot be completely eliminated until 2040, and the use of coal will persist until the end of the projection period; however, the renewability index of electricity generation capacity in this scenario improves, reaching 75% in the projection horizon (**Figures 57, 58, 59 and 60**).

Figure No. 57 Projected installed capacity for electricity generation, Central America, BAU scenario



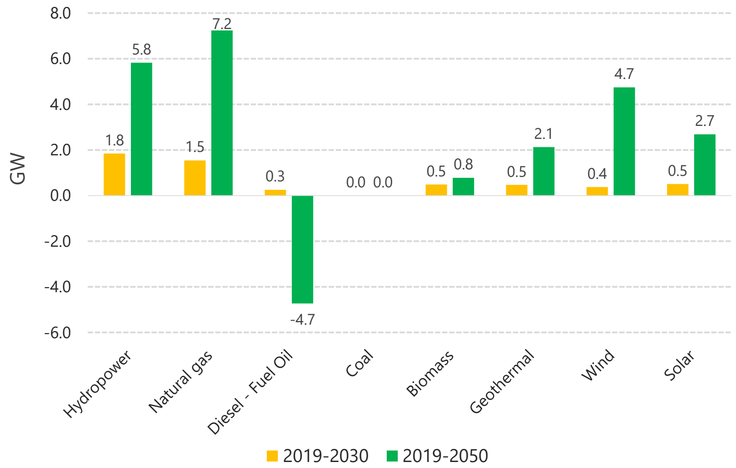
Source: Own elaboration

Figure No. 58 Structure of installed capacity for electricity generation, Central America, BAU scenario



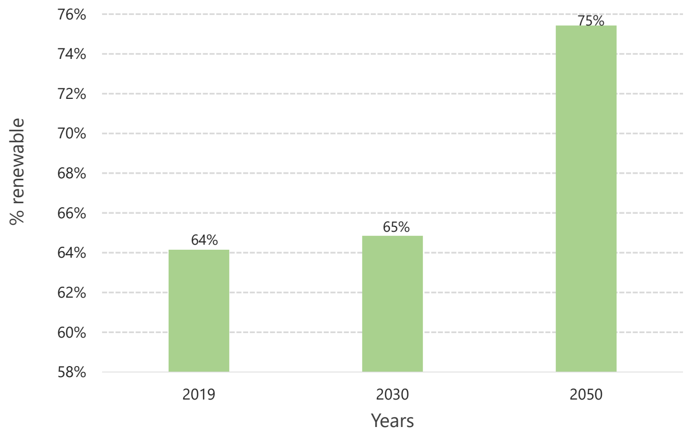
Source: Own elaboration

Figure No. 59 Incremental installed capacity for electricity generation, Central America, BAU scenario



Source: Own elaboration

Figure No. 60 Renewable % of installed capacity for electricity generation, Central America, BAU scenario

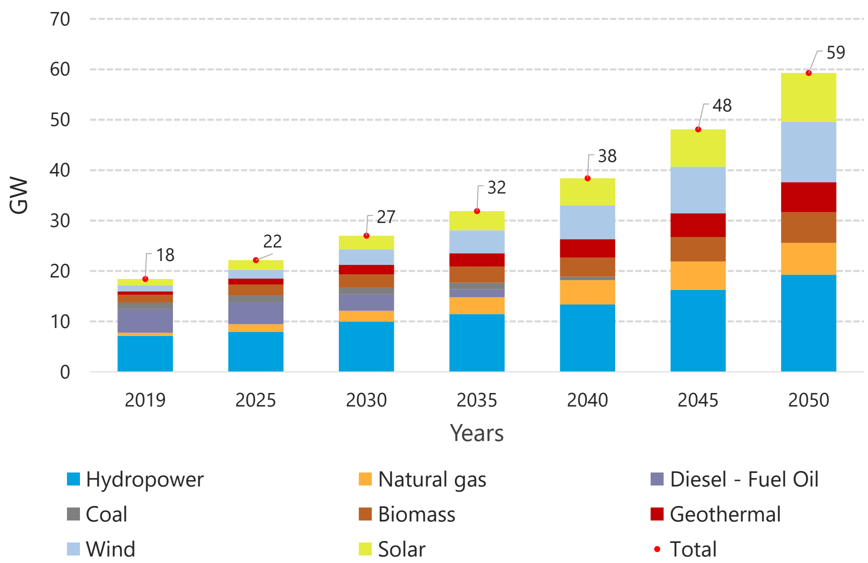


Source: Own elaboration

4.3.2 PRO NET-0 Scenario

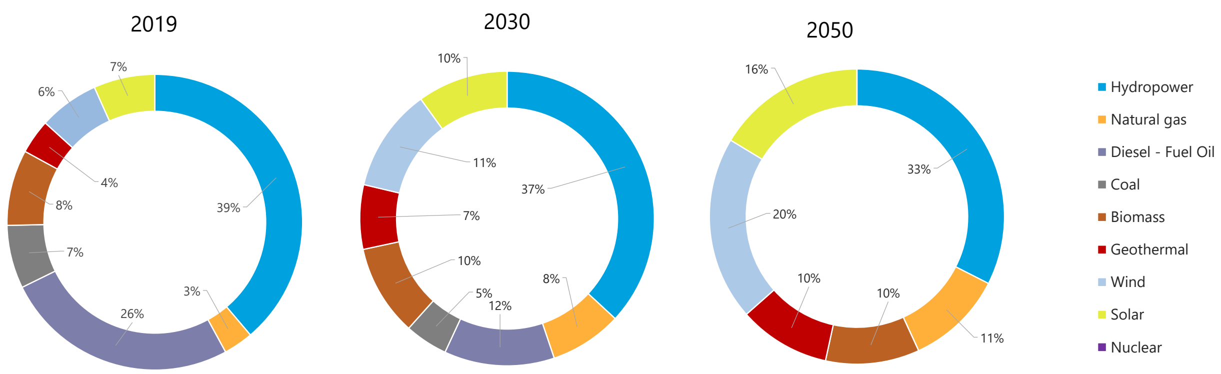
Under the conditions of the PRO NET-0 scenario, the installation of new power plants that take advantage of renewable energy sources, such as hydro, wind, solar, geothermal and biomass, becomes more relevant than the installation of natural gas power plants, and from the year 2045, the use of oil (diesel-fuel oil) and coal-fired power plants will be completely omitted. It should also be noted that, due to the increase in electricity demand in the final consumption sectors, the capacity required in 2050 is 22 GW higher than the value projected in the BAU scenario for the same year, and that the renewable component of the generation park reaches 89% in the projection horizon (**Figures 61, 62, 63 and 64**).

Figure No. 61 Projected installed capacity for electricity generation, Central America, PRO NET-0 scenario



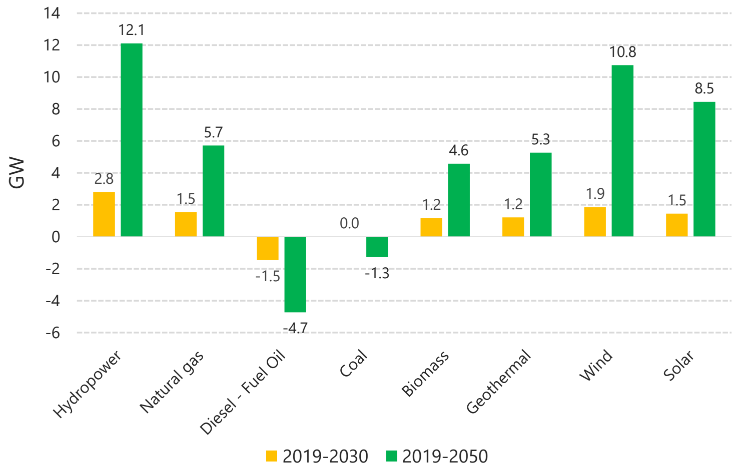
Source: Own elaboration

Figure No. 62 Structure of installed capacity for electricity generation, Central America, PRO NET-0 scenario



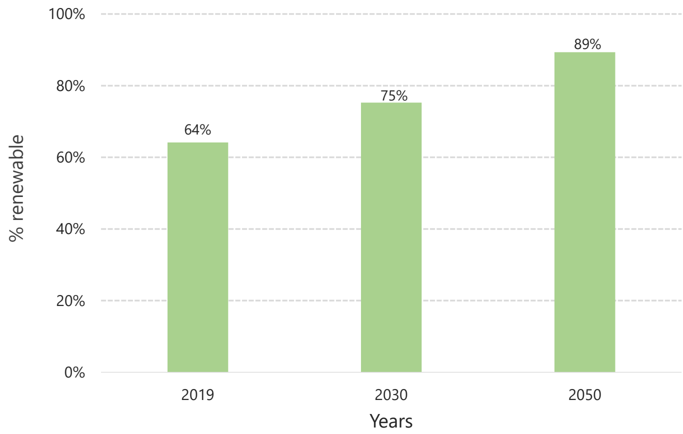
Source: Own elaboration

Figure No. 63 Incremental installed capacity for electricity generation, Central America, PRO NET-0 scenario



Source: Own elaboration

Figure No. 64 Renewable % of installed capacity for electricity generation, Central America, PRO NET-0 scenario



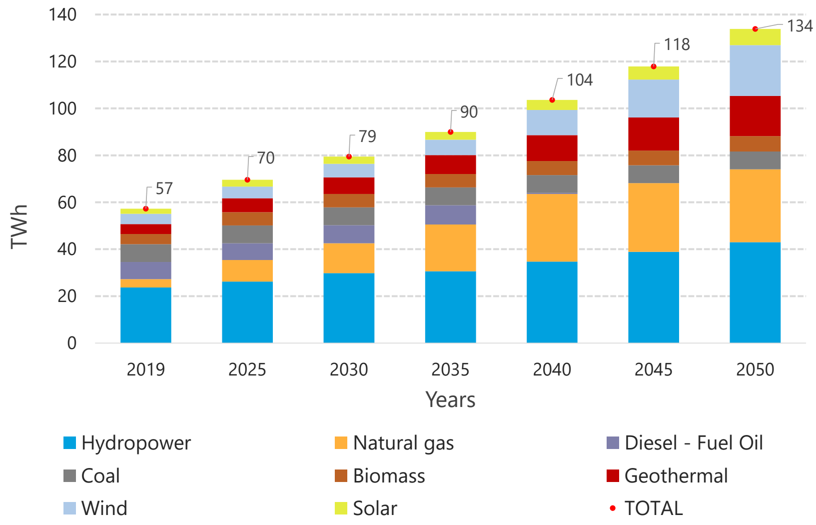
Source: Own elaboration

4.4 Projected electricity generation

4.4.1 BAU Scenario

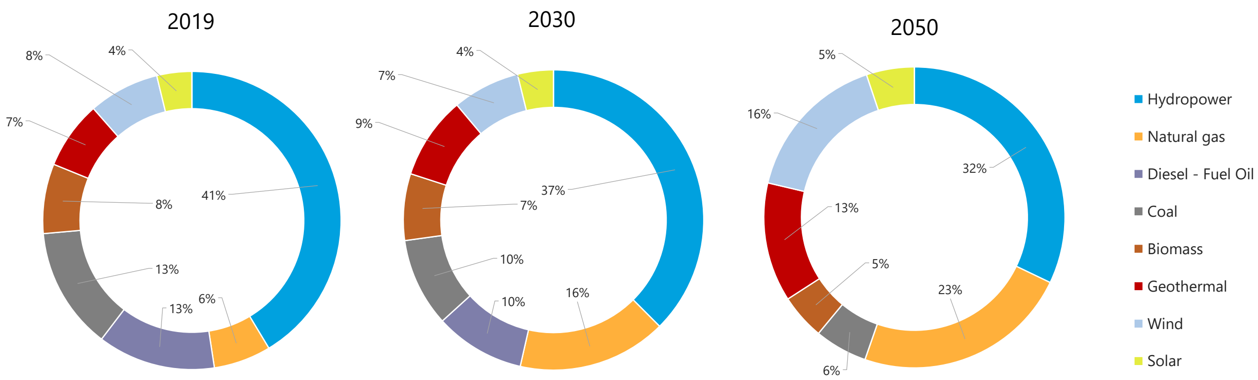
Consistent with the projection of Central America's installed electricity generation capacity for the BAU scenario, in the energy production matrix, natural gas and renewable energy sources are gaining ground over oil products and coal. Although by the year 2030, the renewability index of this matrix suffers a slight deterioration with respect to the base year due to the greater penetration of natural gas, in the following projection years this indicator recovers and improves, thanks to the acceleration in the introduction of renewable energies (**Figures 65, 66 and 67**).

Figure No. 65 Projected electricity generation, Central America, BAU scenario



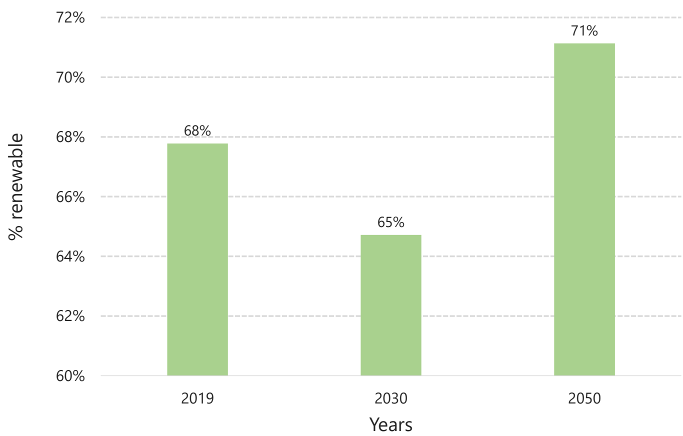
Source: Own elaboration

Figure No. 66 Structure of electricity generation, Central America, BAU scenario



Source: Own elaboration

Figure No. 67 Renewable % of electricity generation, Central America, BAU scenario

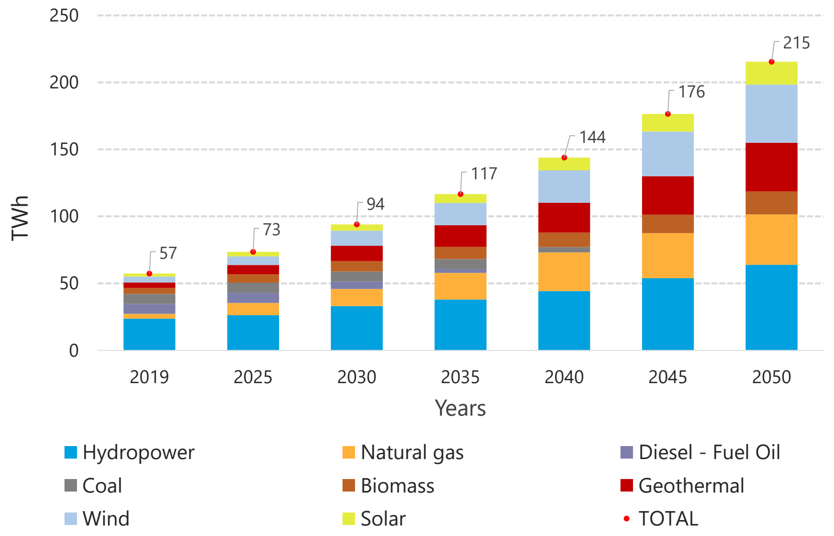


Source: Own elaboration

4.4.2 PRO NET-0 Scenario

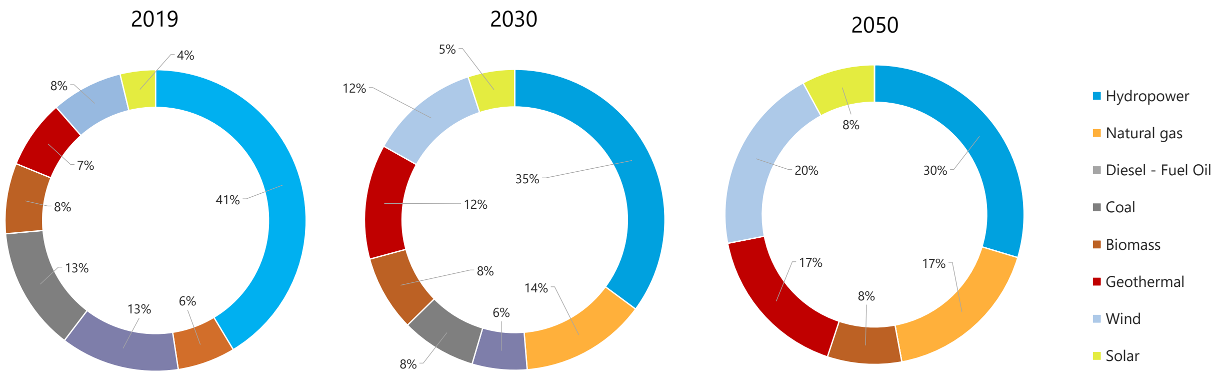
Given that under the assumptions of the PRO NET-0 scenario, the installation of renewable electricity generation capacity exceeds that of natural gas-fired plants, there is a continuous improvement in the renewability index of the electricity production matrix, from 68% in the base year to 72% in the year 2030 and 83% in the year 2050. Electricity generation in the latter year turns out to be 81 TWh higher than projected in the BAU scenario, due to the greater electrification of the final consumption sectors (**Figures 68, 69 and 70**).

Figure No. 68 Projected electricity generation, Central America, PRO NET-0 scenario



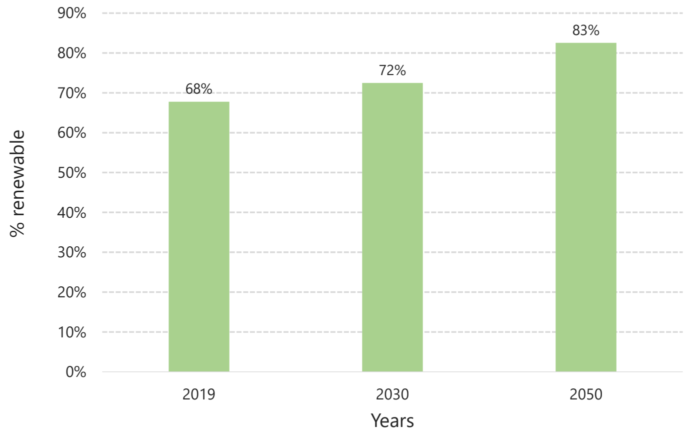
Source: Own elaboration

Figure No. 69. Structure of electricity generation, Central America, PRO NET-0 scenario



Source: Own elaboration

Figure No. 70 Renewable % of electricity generation, Central America, PRO NET-0 scenario



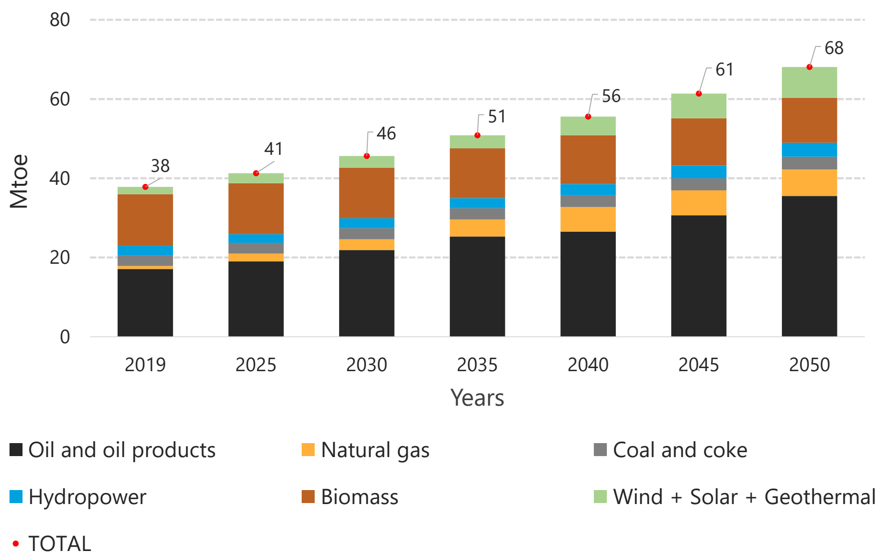
Source: Own elaboration

4.5 Projected total energy supply

4.5.1 BAU Scenario

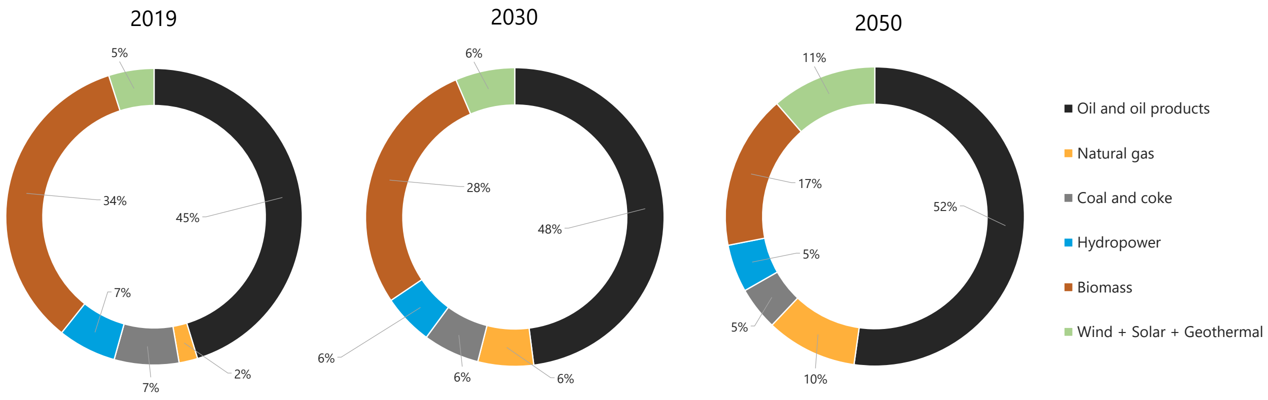
In Central America's total energy supply matrix, despite the improvement in the renewability of electricity generation, under the BAU scenario assumptions, the share of fossil fuel sources increases during the projection period, mainly due to the substitution of residential firewood consumption by LPG; however, it is possible to see a substantial increase in the supply of non-conventional renewable energy sources such as wind, solar and geothermal energy (**Figures 71, 72 and 73**).

Figure No. 71 Projected total energy supply, Central America, BAU scenario



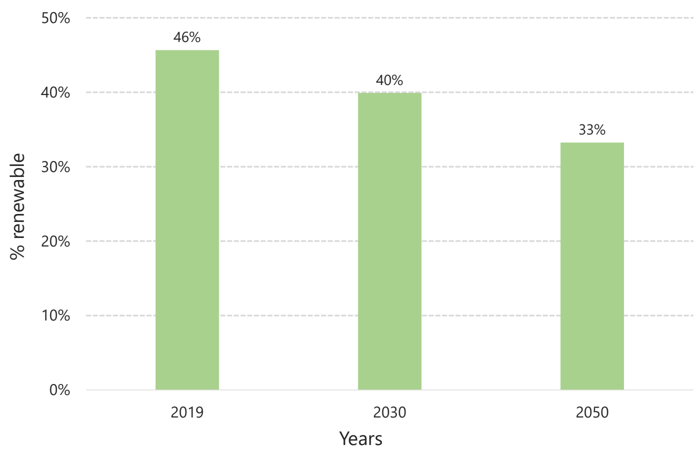
Source: Own elaboration

Figure No. 72 Structure of the total energy supply, Central America, BAU scenario



Source: Own elaboration

Figure No. 73 Renewable % of total energy supply, Central America, BAU scenario

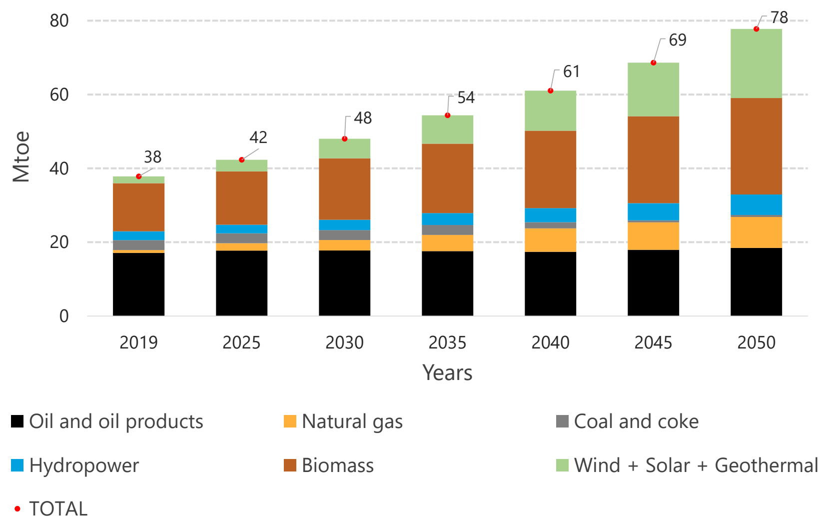


Source: Own elaboration

4.5.2 PRO NET-0 Scenario

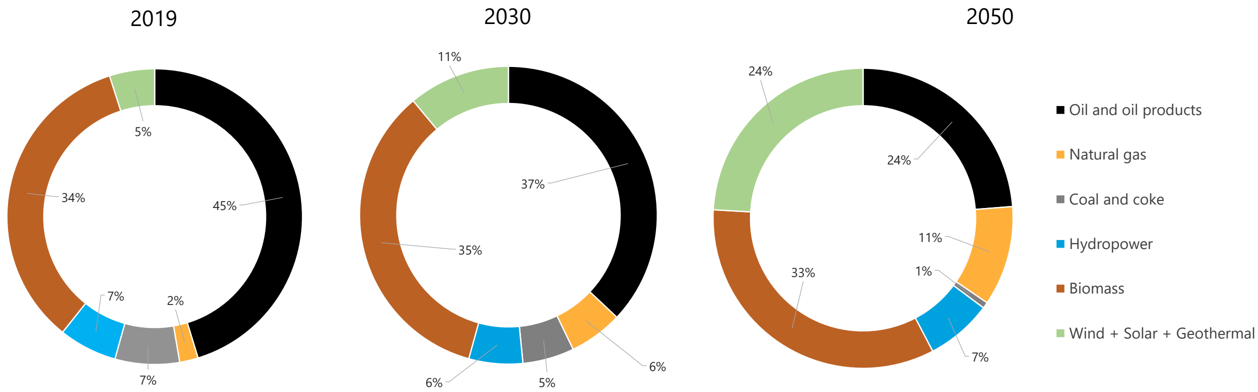
Following the increased use of electricity, solar thermal and biofuels in the end-use sectors and the increased penetration of renewables in the electricity generation matrix, the renewability of the total energy supply in the PRO NET-0 scenario experiences a sustained improvement over the projection period, rising from 46% in the base year to 52% in 2030 and 65% in 2050. Due to the higher electricity demand and the lower efficiency in the use of biomass in electricity generation, with respect to natural gas, the total annual energy supply in the PRO NET-0 scenario shows an increase of 15% by 2050, with respect to the value projected for that year in the BAU scenario (**Figures 74, 75 and 76**).

Figure No. 74 Projected total energy supply, Central America, PRO NET-0 scenario



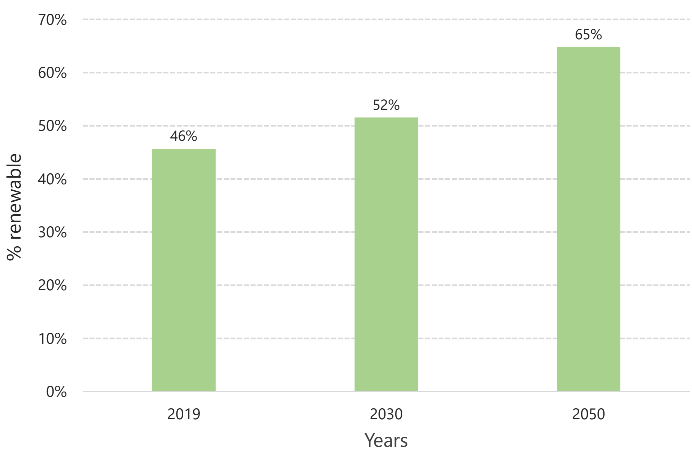
Source: Own elaboration

Figure No. 75 Structure of the total energy supply, Central America, PRO NET-0 scenario



Source: Own elaboration

Figure No. 76 Renewable % of total energy supply, Central America, PRO NET-0 scenario



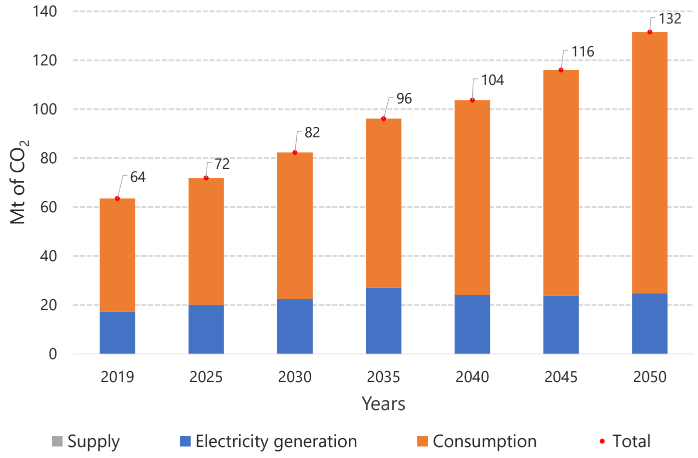
Source: Own elaboration

4.6. Projected CO_2 emissions

4.6.1 BAU Scenario

Under the BAU scenario assumptions, although the increase in annual CO_2 emissions from electricity generation is only 43%, when comparing the year 2050 with the base year, in the case of emissions produced by final consumption and energy itself, this increase is 131%, i.e. more than double, due to the substitution of firewood for LPG in the residential sector (**Figure 77**).

Figure No. 77 Projected CO_2 emissions, Central America, BAU scenario

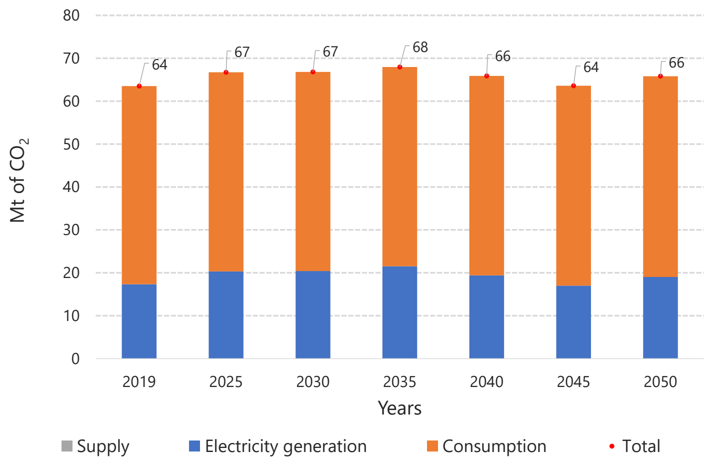


Source: Own elaboration

4.6.2 PRO NET-0 Scenario

En el escenario PRO NET-0, pese a que de igual manera el consumo de leña residencial es sustituido por otras fuentes, la mayor electrificación de los usos finales de la energía, la mayor penetración de biocombustibles y energía solar térmica en dichos usos y el incremento más acelerado de la instalación de capacidad de generación eléctrica renovable, permiten que la emisiones totales de CO_2 del sector energético de América Central, lleguen a estabilizarse a partir del período entre el 2030 y 2035, resultando de todas manera en valores muy inferiores a los proyectados en el escenario BAU (**figura 78**).

Figure No. 78 Projected CO_2 emissions, Central America, PRO NET-0 scenario



Source: Own elaboration

5. ENERGY PROSPECTIVE FOR THE ANDEAN ZONE

5.1 General considerations

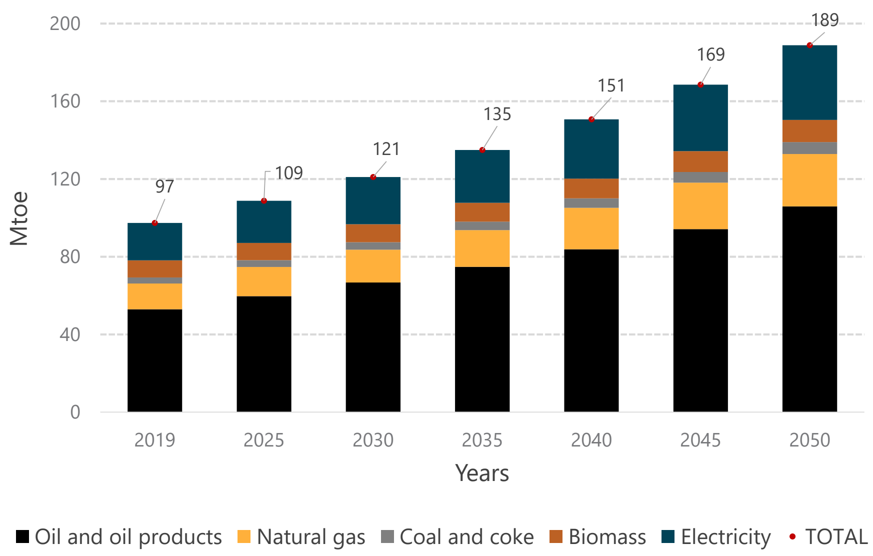
In the construction of the energy scenarios for the Andean Zone, some publications related to the expansion of the energy sector in the countries of the sub-region were used as a reference, such as: “The Reference Expansion Plan for Transmission and Generation 2020-2034”, prepared by UPME of Colombia, the “Final Proposal for Updating the Transmission Plan 2021-2030”, prepared by COES of Peru, the “Electricity Master Plan 2018-2027”, prepared by MERNNR of Ecuador. Additionally, the National Energy Balances of the Andean Zone countries for the year 2019 and the estimates of final energy consumption with COVID-19 effect, elaborated in correlation with the projections of nominal GDP published by the World Bank, were used.

5.2 Projected final energy consumption

5.2.1 BAU Scenario

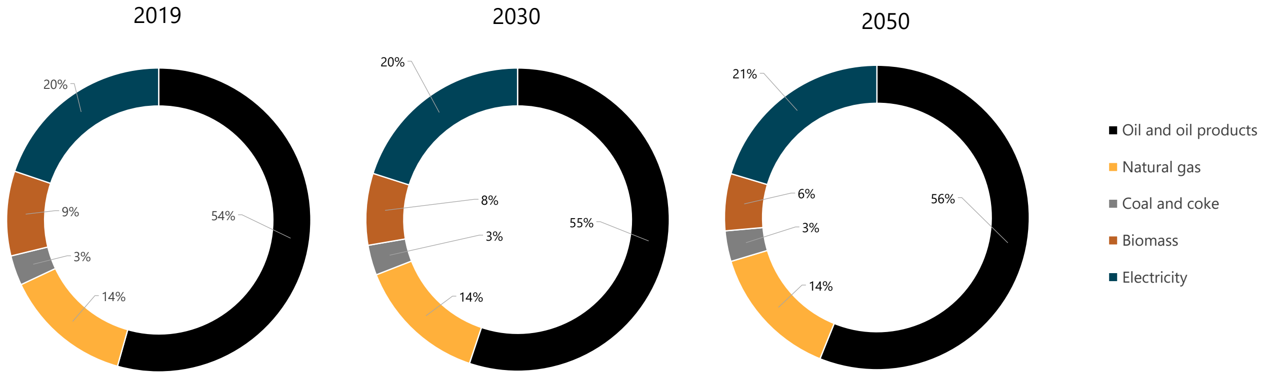
Under the BAU scenario assumptions, the share of oil products in the final consumption matrix increases during the projection period, although there is already a greater electrification of this matrix and a reduction in the use of biomass, mainly residential firewood. Other sources such as natural gas and coal maintain their percentage share. Total energy consumption in this scenario presents an average annual growth rate of 2.2% during the projection period (**Figures 79 and 80**).

Figure No. 79 Projected final energy consumption, Andean Zone, BAU scenario



Source: Own elaboration

Figure No. 80 Evolution of the final energy consumption matrix, Andean Zone, BAU scenario

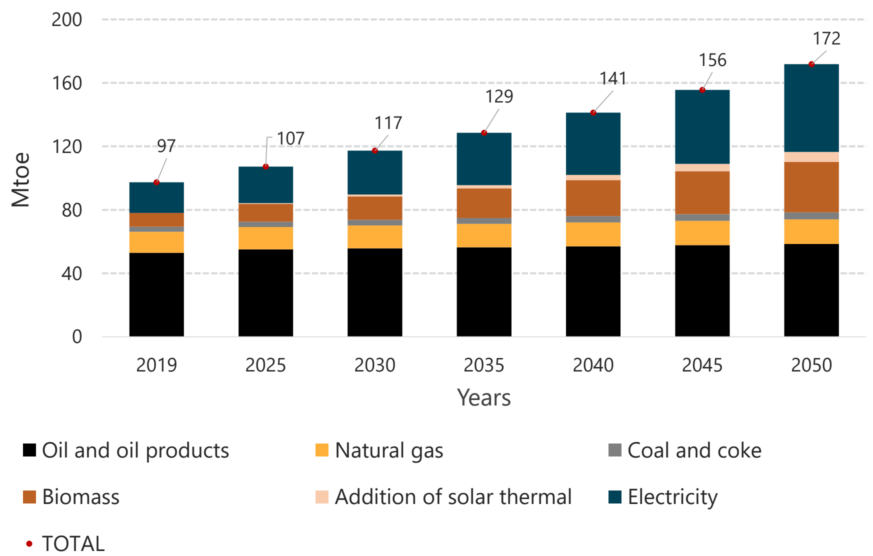


Source: Own elaboration

5.2.2 PRO NET-0 Scenario

The greater electrification of the final consumption sectors, mainly transportation, industry and the residential and commercial sectors, as well as the greater penetration of biofuels (ethanol and biodiesel) and the greater use of solar thermal energy in these sectors, in the context of the PRO NET-0 scenario, will make it possible to significantly reduce the share of fossil fuels in the final consumption matrix of the Andean Zone and, at the same time, generate savings in annual energy consumption with respect to that projected in the BAU scenario, which for the year 2050, reaches 17 Mtoe (**Figures 81, 82 and 83**).

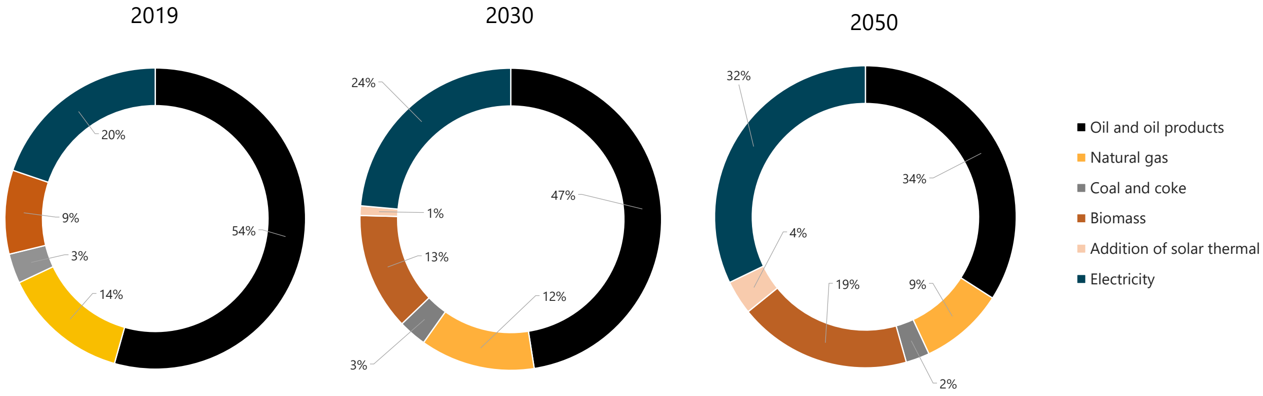
Figure No. 81 Projected final energy consumption, Andean Zone, PRO NET-0 scenario



Source: Own elaboration

ENERGY PROSPECTIVE LAC

Figure No. 82 Evolution of the final energy consumption matrix, Andean Zone, PRO NET-0 scenario



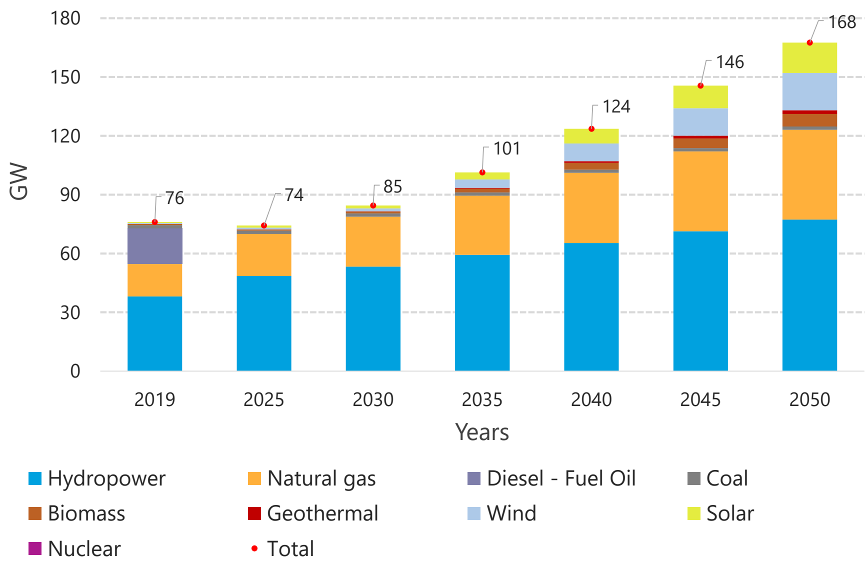
Source: Own elaboration

5.3 Projected installed capacity for electricity generation

5.3.1 BAU Scenario

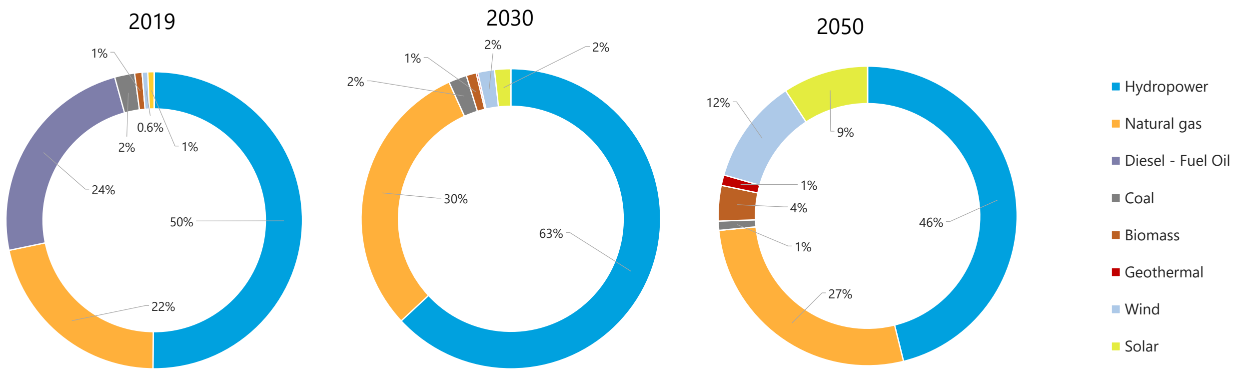
In the Andean Zone, in the BAU scenario, the installation of additional electricity generation capacity with hydroelectric and natural gas plants predominates during the projection period, with the installation of wind and photovoltaic plants also being important in the long term, and also including biomass and geothermal plants to a lesser extent. Under these conditions, the renewability of the Andean generation park improves from 52% in the base year to 68% in 2030 and 72% in 2050 (**Figures 83, 84, 85 and 86**).

Figure No. 83. Projected installed capacity for electricity generation, Andean Zone, BAU scenario



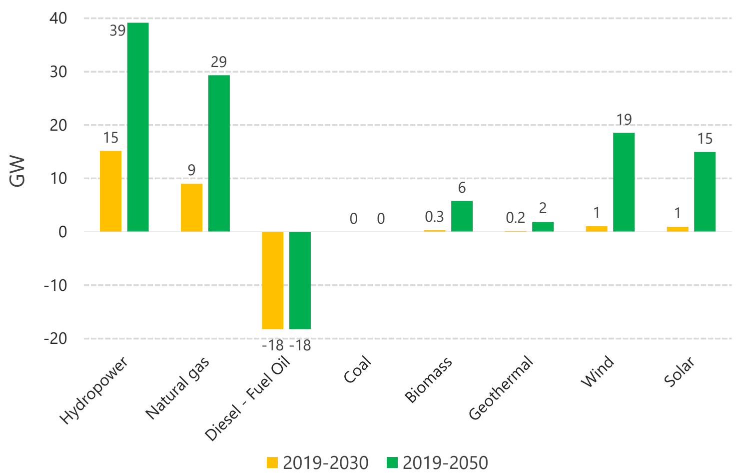
Source: Own elaboration

Figure No. 84 Structure of installed capacity for electricity generation, Andean Zone, BAU scenario



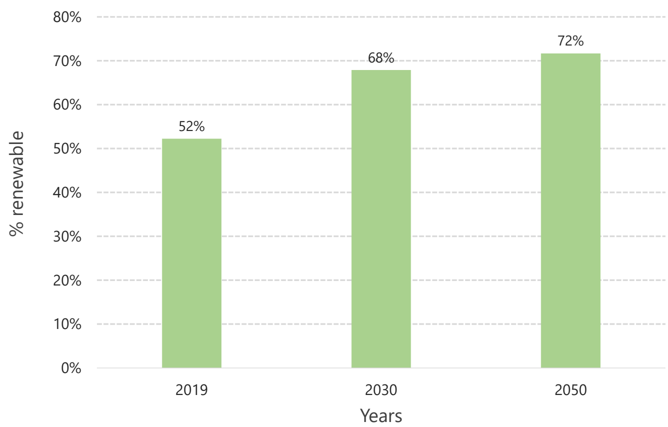
Source: Own elaboration

Figure No. 85 Incremental installed capacity for electricity generation, Andean Zone, BAU scenario



Source: Own elaboration

Figure No. 86 Renewable % of installed capacity for electricity generation Andean Zone, BAU scenario



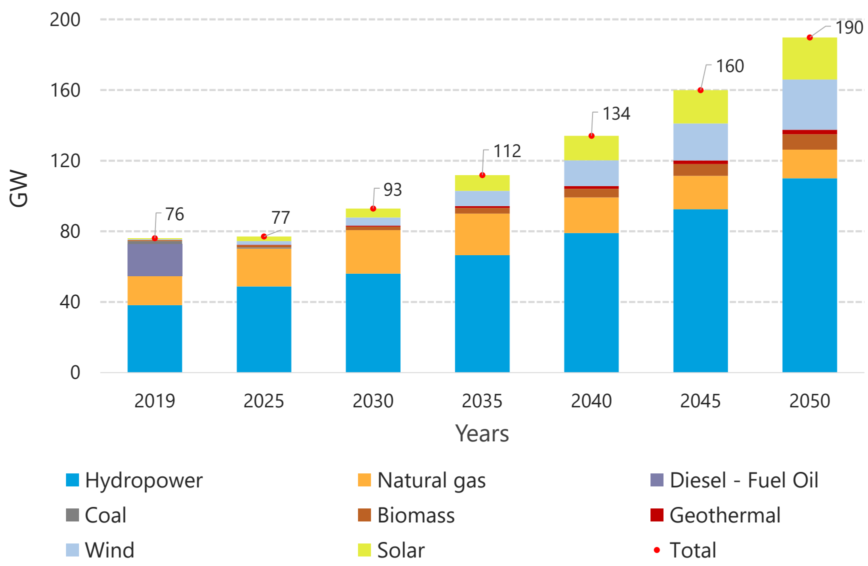
Source: Own elaboration

ENERGY PROSPECTIVE LAC

5.3.2. PRO NET-0 Scenario

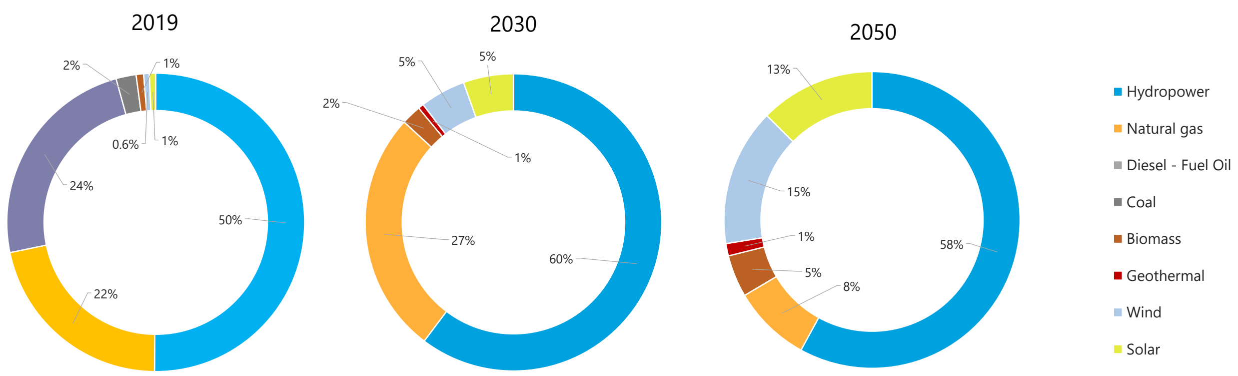
Under the premises of the PRO NET-0 scenario, in the Andean Zone, greater priority is given to the installation of electricity generation capacity with renewable energy sources, mainly hydropower, although the installation of wind, photovoltaic, biomass and geothermal power plants is also relevant. With respect to natural gas plants, although there is an additional 8 GW installation until 2030, by 2050, these new plants will be taken out of operation, leaving only the capacity that existed until the base year. Furthermore, thermoelectric power plants that use oil products and coal are completely phased out. In this way, the renewability of the Andean power generation park will reach 73% in 2030 and 91% in 2050. It should be noted that the increase in installed capacity required, due to higher electricity consumption, at the end of the projection period is 22 GW, compared to the value projected in the BAU scenario (**Figures 87, 88, 89 and 90**).

Figure No. 87 Projected installed capacity for electricity generation, Andean Zone, PRO NET-0 scenario



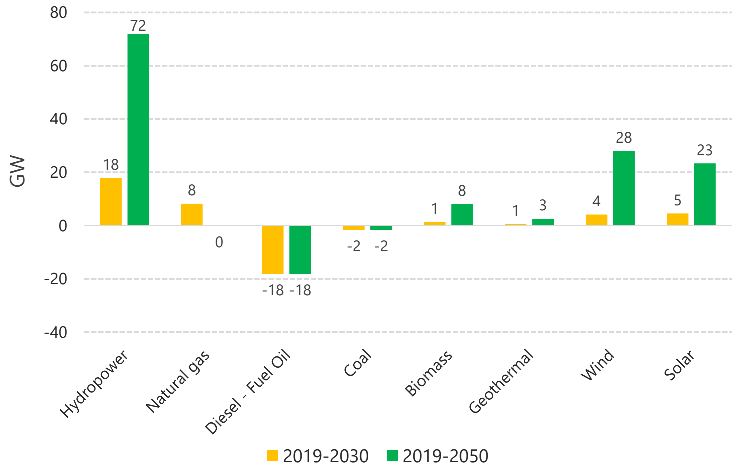
Source: Own elaboration

Figure No. 88 Structure of installed capacity for electricity generation, Andean Zone, PRO NET-0 scenario



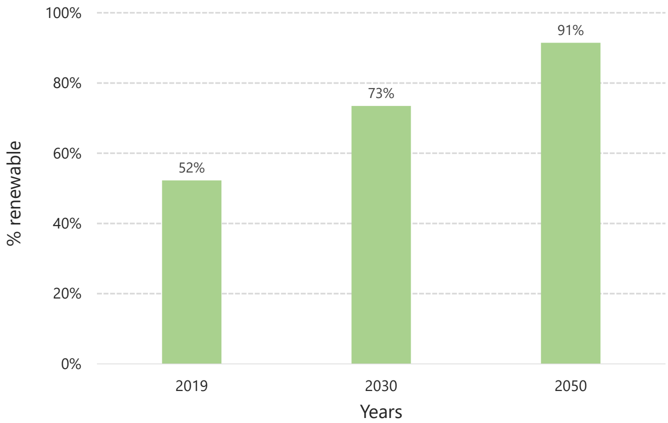
Source: Own elaboration

Figure No. 89 Incremental installed capacity for electricity generation, Andean Zone, PRO NET-0 scenario



Source: Own elaboration

Figure No. 90 Renewable % of installed capacity for electricity generation, Andean Zone, PRO NET-0 scenario



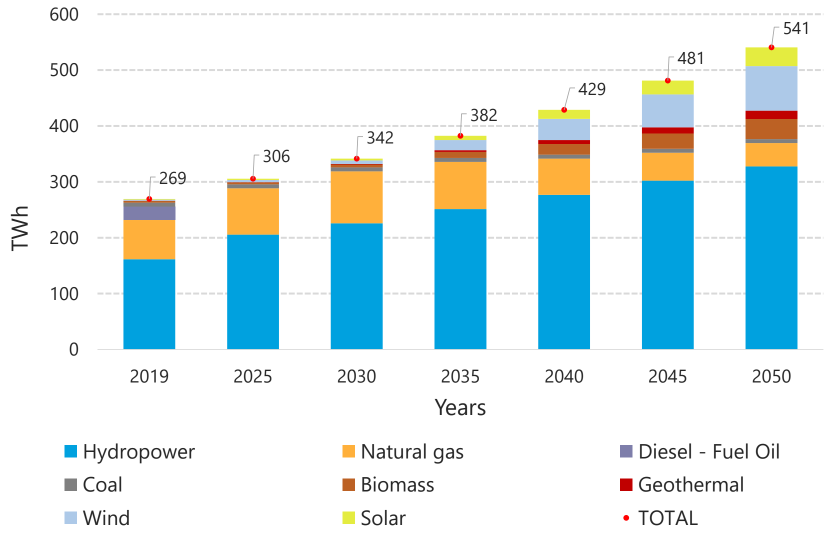
Source: Own elaboration

5.4 Projected electricity generation

5.4.1 BAU Scenario

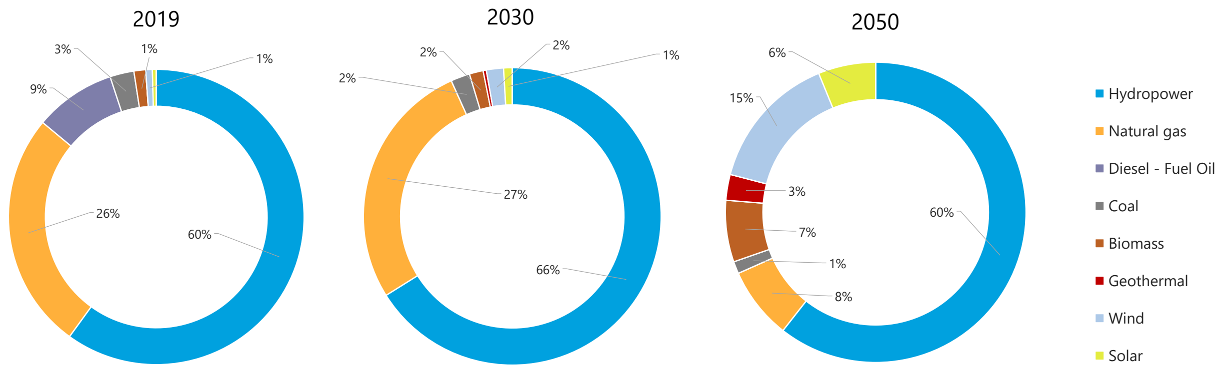
According to the projection of installed capacity for the Andean Zone in the BAU scenario, the electricity generation matrix, up to 2030, shows a predominance of hydroelectric and natural gas sources, together occupying 93% of said matrix and leaving only 7% for other sources, distributed among coal, wind energy, biomass and solar energy. However, by the year 2050, generation with non-conventional renewable energy sources (wind, solar, biomass and geothermal) will become more relevant, taking away ground from natural gas and hydropower in the matrix, so that even in this scenario, the renewability index will experience evident improvements during the projection period (**Figures 91, 92 and 93**).

Figure No. 91 Projected electricity generation, Andean Zone, BAU scenario



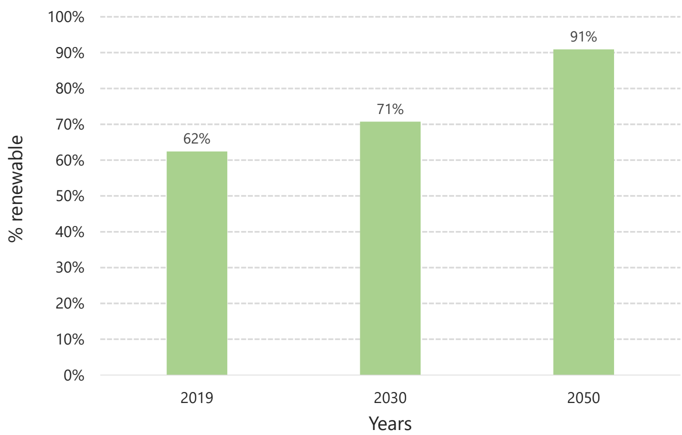
Source: Own elaboration

Figure No. 92 Structure of electricity generation, Andean Zone, BAU scenario



Source: Own elaboration

Figure No. 93 Renewable % of electricity generation, Andean Zone, BAU scenario

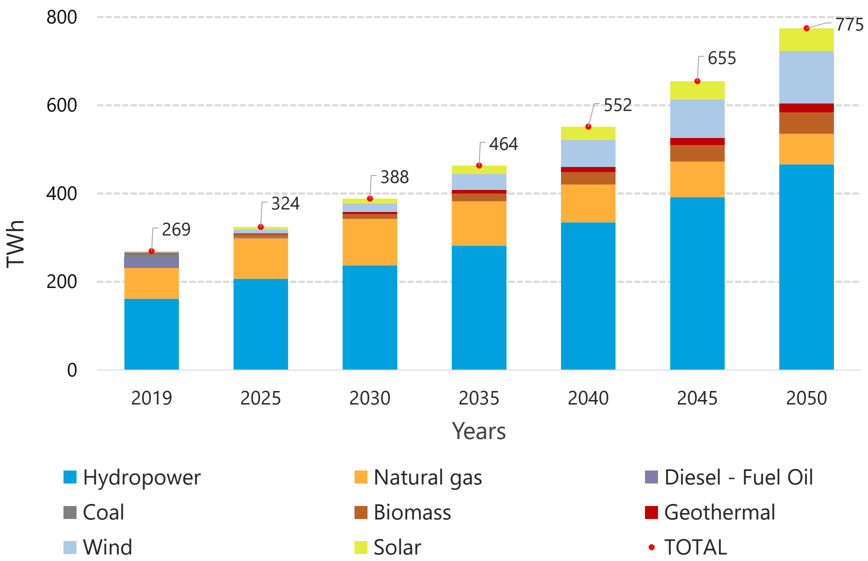


Source: Own elaboration

5.4.2 PRO NET-0 Scenario

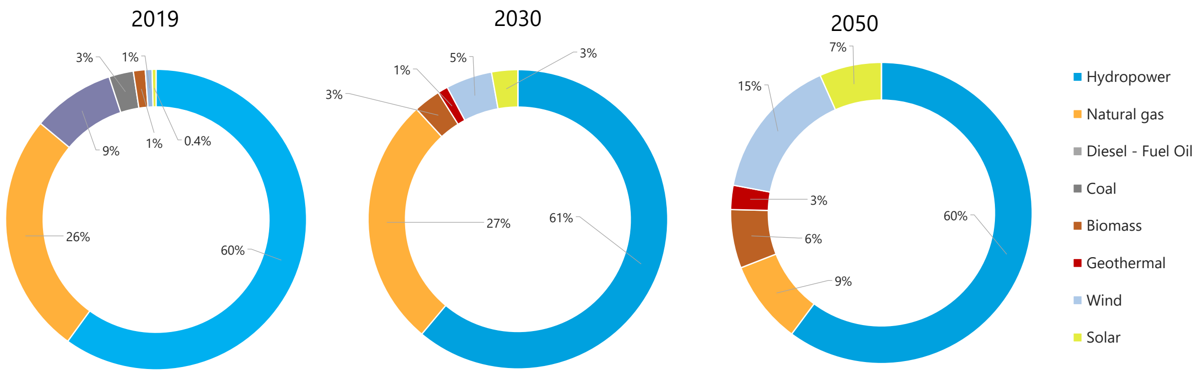
With the assumptions of the PRO NET-0 scenario, the electricity generation matrix of the Andean Zone improves its renewability for the year 2030 by 3 percentage points; however, for 2050, it maintains the value of this indicator projected in the BAU scenario, due to a slight increase in the participation of natural gas. The additional annual electricity generation requirement, due to the increase in electricity demand in the final consumption sectors, reaches 234 TWh by 2050, with respect to the value projected in the BAU scenario (**Figures 94, 95 and 96**).

Figure No. 94 Projected electricity generation, Andean Zone, PRO NET-0 scenario



Source: Own elaboration

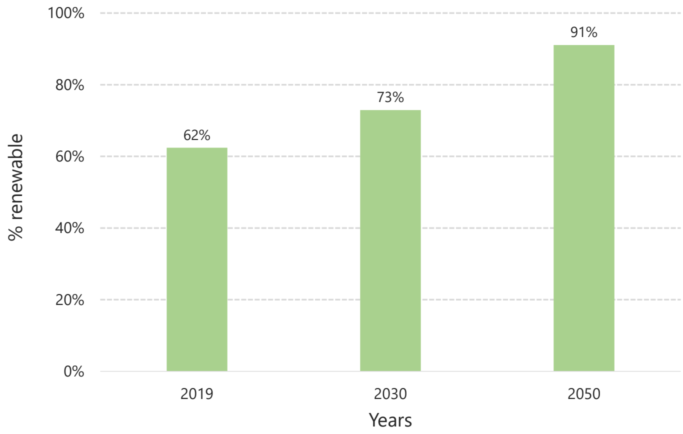
Figure No. 95 Structure of electricity generation, Andean Zone, PRO NET-0 scenario



Source: Own elaboration

ENERGY PROSPECTIVE LAC

Figure No. 96 Renewable % of electricity generation, Andean Zone, PRO NET-0 scenario



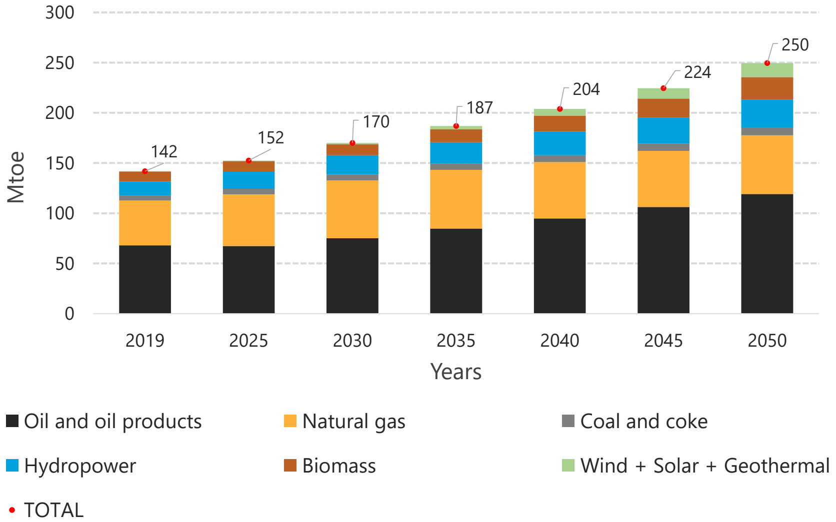
Source: Own elaboration

5.5 Projected total energy supply

5.5.1 BAU Scenario

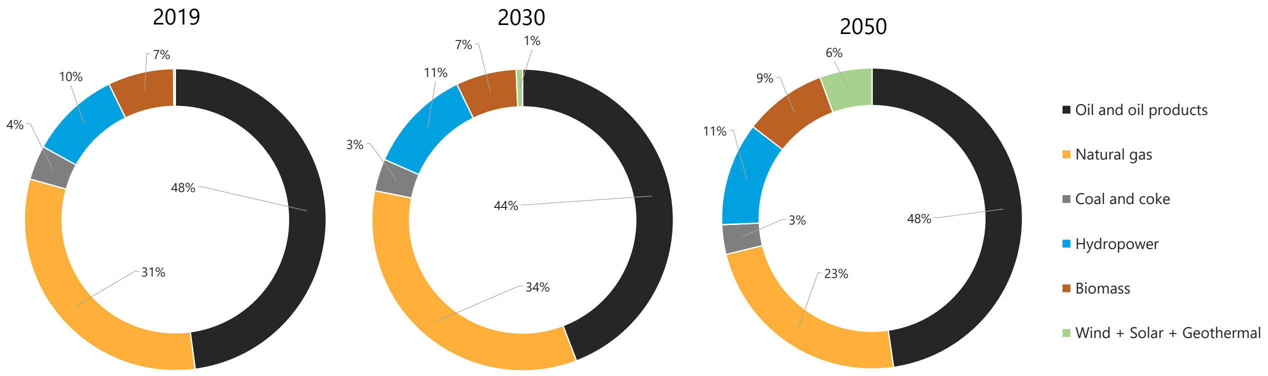
In the BAU scenario projections, the share of fossil fuels in the total energy supply matrix of the Andean Region remains predominant throughout the projection period; however, mainly due to the increase in the share of renewable sources in electricity generation, the renewability index of the total energy supply shows a continuous improvement during the projection period, going from 17% in the base year to 18% in 2030 and 26% in 2050 (**Figures 97, 98 and 99**).

Figure No. 97 Projected total energy supply, Andean Zone, BAU scenario



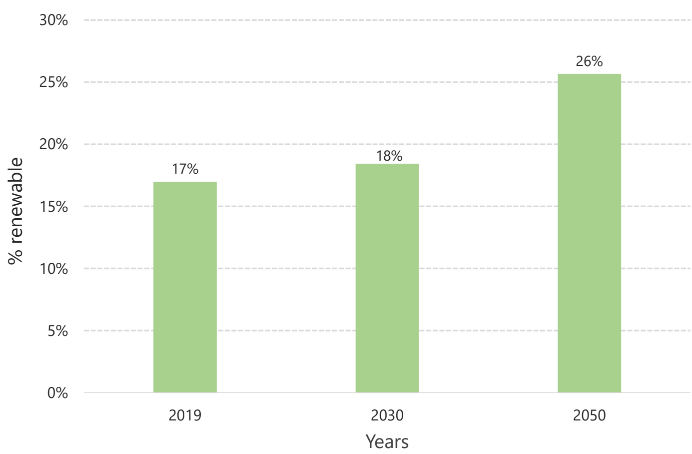
Source: Own elaboration

Figure No. 98 Structure of the total energy supply, Andean Zone, BAU scenario



Source: Own elaboration

Figure No. 99 Renewable % of total energy supply, Andean Zone, BAU scenario

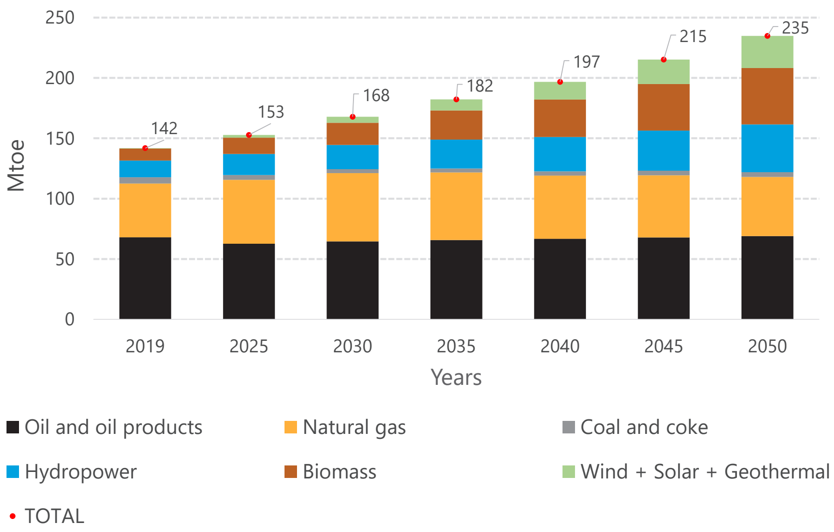


Source: Own elaboration

5.5.2 PRO NET-0 Scenario

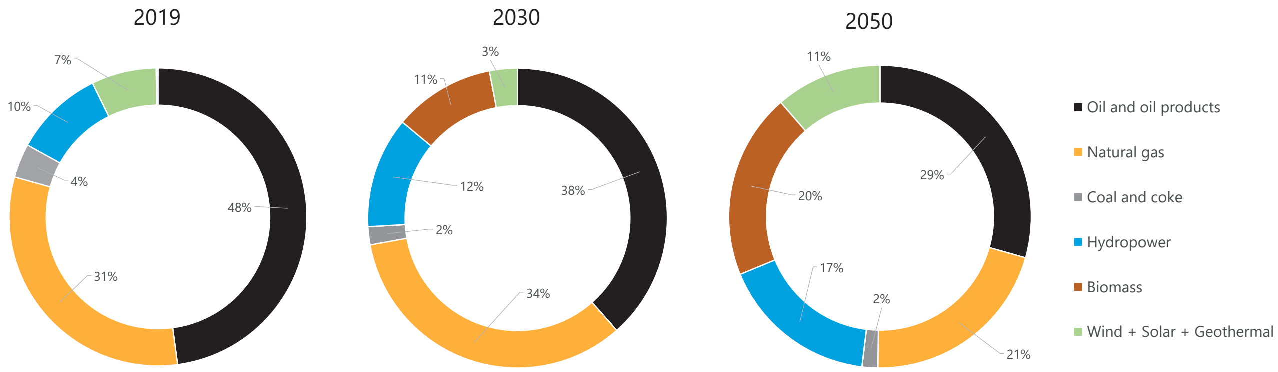
With the assumptions of the PRO NET-0 scenario, related to the increased electrification of the final consumption sectors, the increased penetration of biofuels in these sectors, the increase in the final use of solar thermal energy and the improvement in the renewability of the electricity generation matrix, the renewable component of the total energy supply matrix reaches 2050 with a percentage share of almost 50%, which means a significant reduction in the supply of fossil fuels. Furthermore, the improvement in energy efficiency allows savings in the annual energy supply, which by 2050, reaches 15 Mtoe, with respect to the value projected in the BAU scenario (**Figures 100, 101 and 102**).

Figure No. 100 Projected total energy supply, Andean Zone, PRO NET-0 scenario



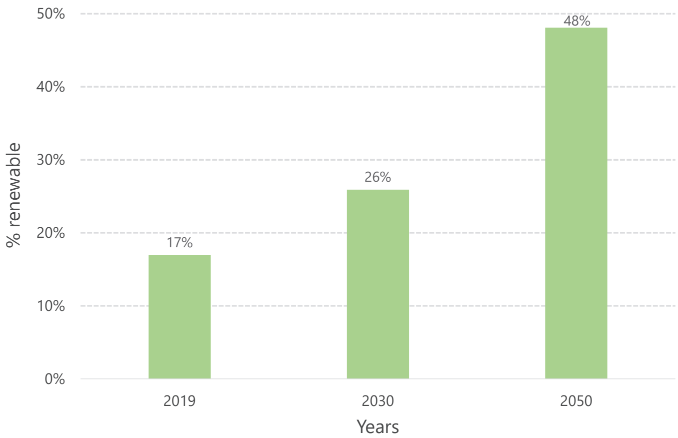
Source: Own elaboration

Figure No. 101 Structure of the total energy supply, Andean Zone, PRO NET-0 scenario



Source: Own elaboration

Figure No. 102 Renewable % of total energy supply, Andean Zone, PRO NET-0 scenario



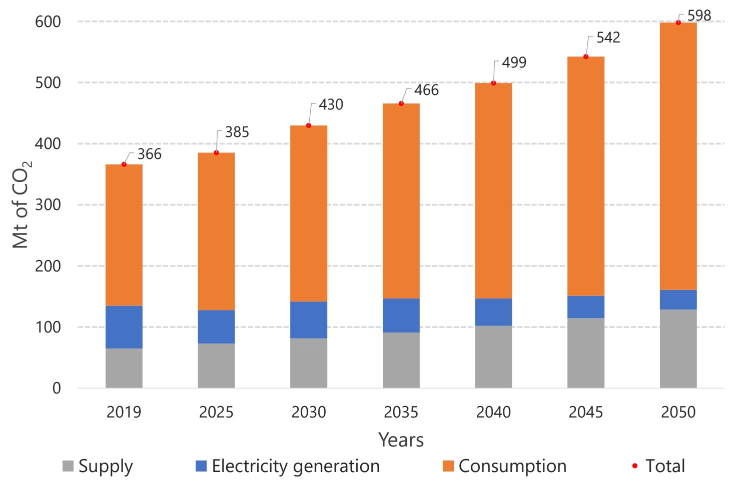
Source: Own elaboration

5.6 Projected CO_2 emissions

5.6.1 BAU Scenario

Under the BAU scenario, although annual CO_2 emissions from electricity generation decrease by about 54% in 2050 compared to the base year, emissions from energy consumption increase by about 90%, which means that the total annual emissions of the energy sector will also suffer a net increase in that period of about 63% (**Figure 103**).

Figure No. 103 Projected CO_2 emissions, Andean Zone, BAU scenario

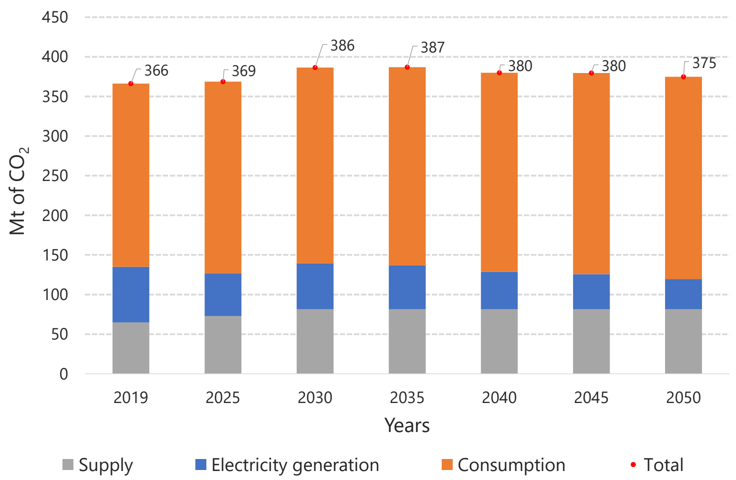


Source: Own elaboration

5.6.2 PRO NET-0 Scenario

With the measures simulated in the PRO NET-0 scenario, both in the final consumption sectors and in the electricity generation sector, a turning point in the growth of annual CO_2 emissions is achieved in the year 2035, after which these emissions begin to decrease until 2050, with only a 2.4% increase compared to the base year. It should be noted that for a subregion that includes countries that are major producers of fossil resources such as oil, natural gas and coal, such a condition in the evolution of emissions can be considered a major achievement (**Figure 104**).

Figure No. 104 Projected CO_2 emissions, Andean Zone, PRO NET-0 scenario



Source: Own elaboration

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6. ENERGY PROSPECTIVE FOR THE SOUTHERN CONE

6.1 General considerationss

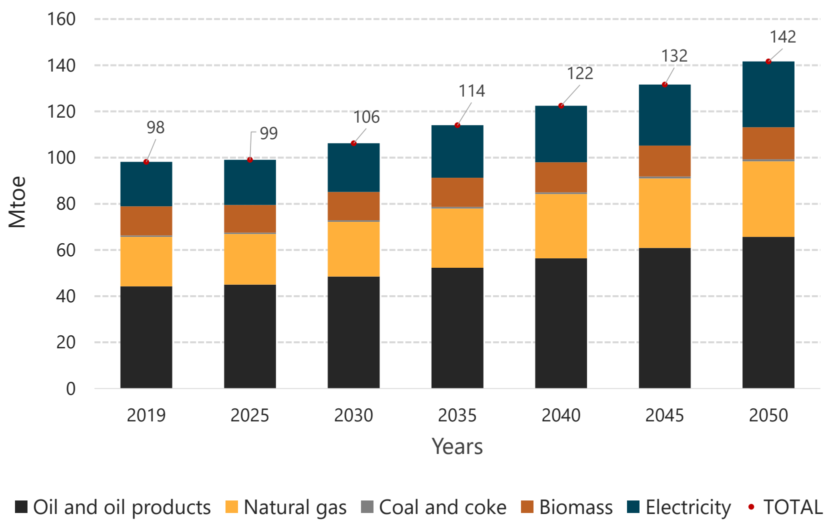
For the Southern Cone prospective exercise, information on energy development plans and policies published by the countries that make up this sub-region was considered, such as Chile's "Carbon Neutrality Plan 2050," Argentina's "Energy Scenarios 2030," Paraguay's "2050 Energy Prospective," Uruguay's "Electricity Demand Prospective 2018," as well as energy balances for 2019 and final consumption projections with the effect of COVID-19, correlated with the World Bank's nominal GDP variation estimates.

6.2 Projected final energy consumption

6.2.1 BAU Scenario

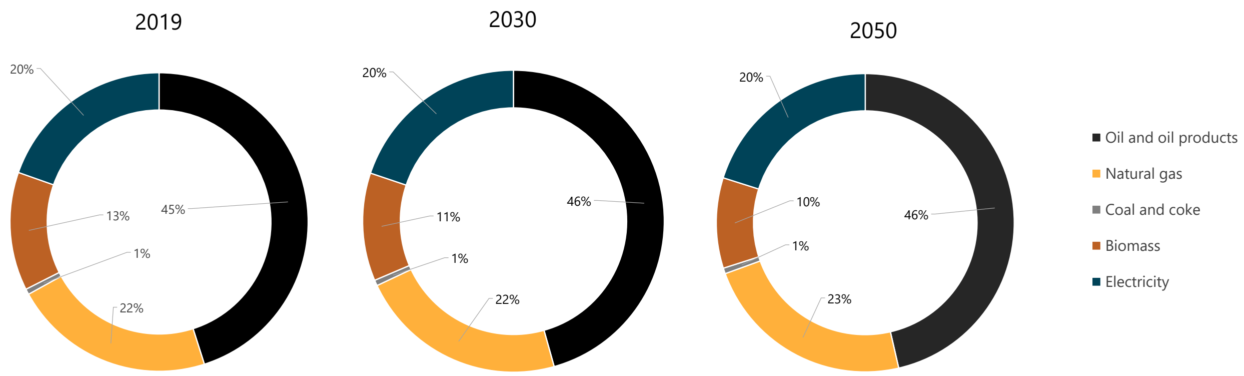
For the BAU scenario, total final energy consumption in the Southern Cone subregion increases at an average annual rate of 1.2% during the projection period and its percentage structure by source does not undergo significant variations during that period, except for a small decrease in the share of biomass (**Figures 105 and 106**).

Figure No. 105 Projected final energy consumption, Southern Cone, BAU scenario



Source: Own elaboration

Figure No. 106 Evolution of the final energy consumption matrix, Southern Cone, BAU scenario



Source: Own elaboration

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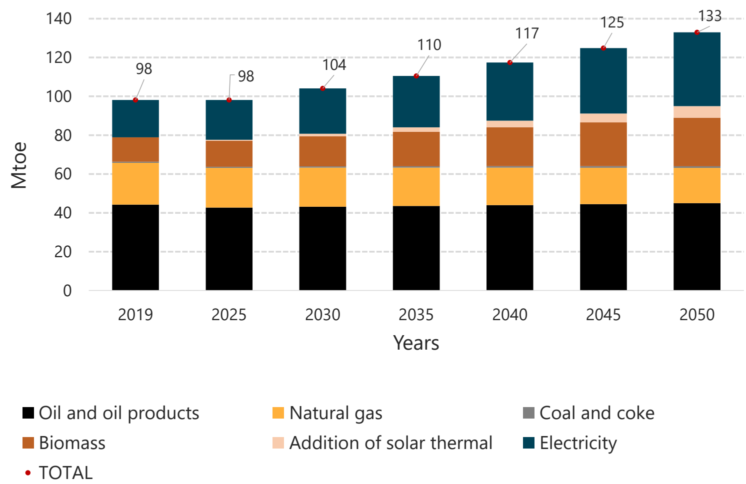
6.2.2 PRO NET-0 Scenario

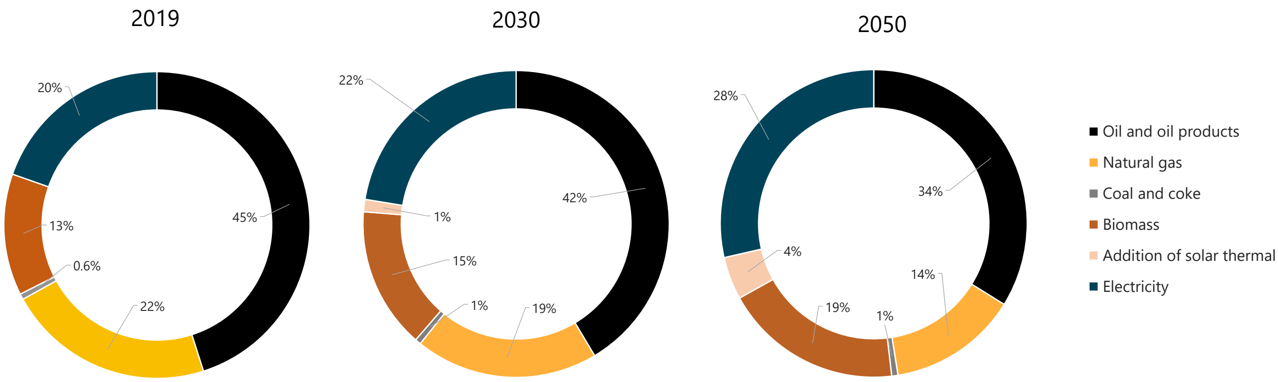
In the PRO NET-0 scenario, under the assumptions of greater electrification of energy end uses and greater penetration of biofuels and solar thermal energy in the final consumption sectors, a decrease in the share of fossil fuels is achieved, from 67% in the base year to 48% in the projection horizon. Thanks to the increase in energy efficiency in final consumption, a total annual saving of 9 Mtoe of energy consumed is achieved by 2050, with respect to the value projected in the BAU scenario (**Figures 107 and 108**).

Figure No. 107 Projected final energy consumption, Southern Cone, PRO NET-0 scenario



Source: Own elaboration

Figure No. 108 Evolution of the final energy consumption matrix, Southern Cone, PRO NET-0 scenario



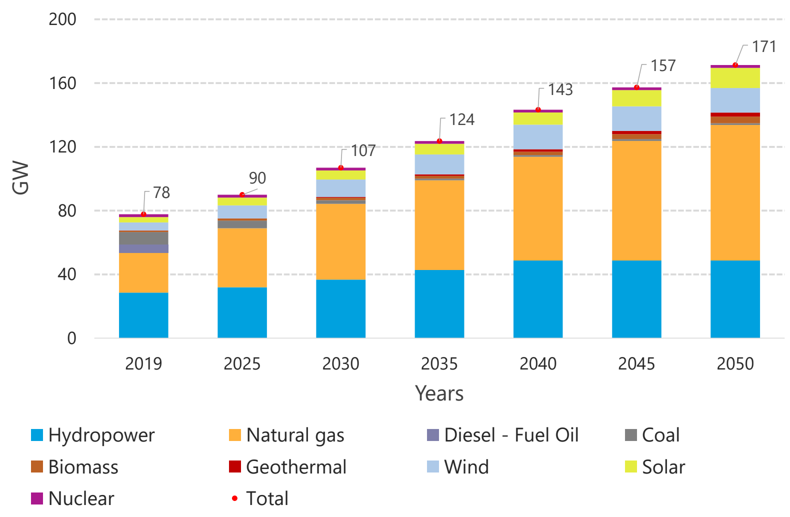
Source: Own elaboration

6.3 Projected installed capacity for electricity generation

6.3.1 BAU Scenario

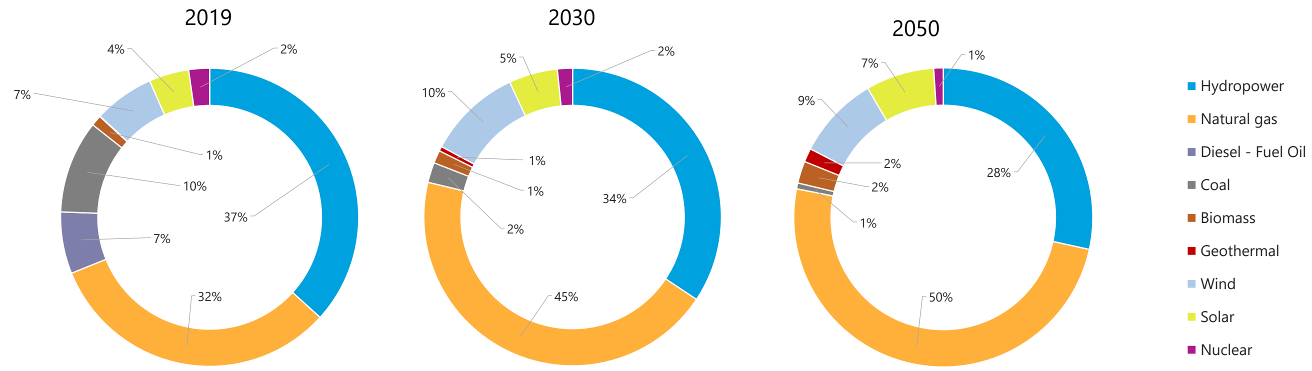
In the Southern Cone sub-region, under the BAU scenario assumptions, the expansion of installed electricity generation capacity during the projection period will be primarily with natural gas plants, although an increase in hydro, wind, solar, biomass and geothermal plants is also foreseen. Under these conditions, although the renewable component of the Southern Cone's generation park gains some percentage share by 2030, due to the greater addition of natural gas plants, by 2050, this renewable component will again reduce its share to the levels it had in the base year (**Figures 109, 110, 111 and 112**).

Figure No. 109 Projected installed capacity for electricity generation, Southern Cone, BAU scenario



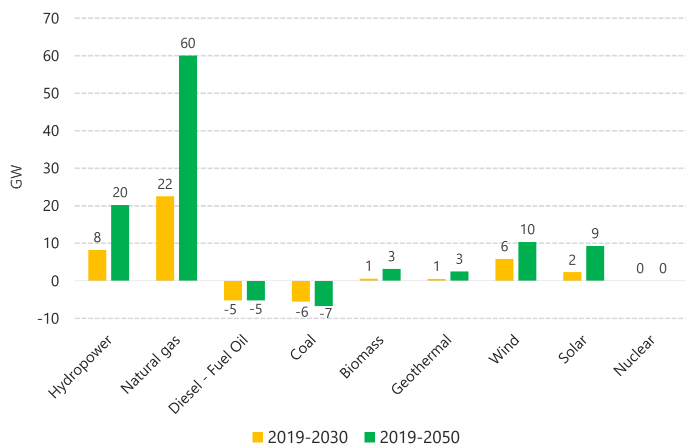
Source: Own elaboration

Figure No. 110 Structure of installed capacity for electricity generation, Southern Cone, BAU scenario



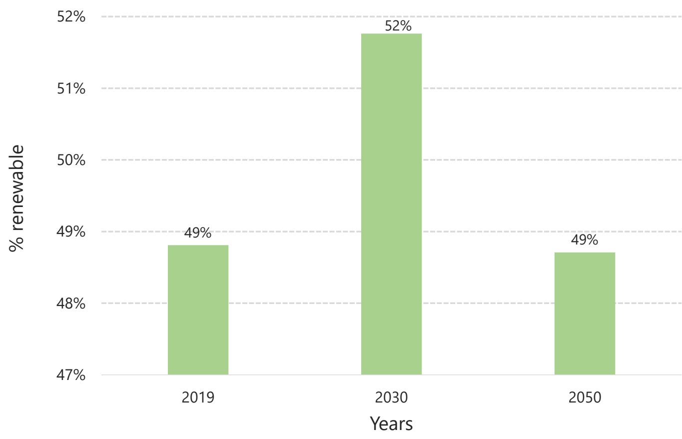
Source: Own elaboration

Figure No. 111 Incremental installed capacity for electricity generation, Southern Cone, BAU scenario



Source: Own elaboration

Figure No. 112 Renewable % of installed capacity for electricity generation, Southern Cone, BAU scenario

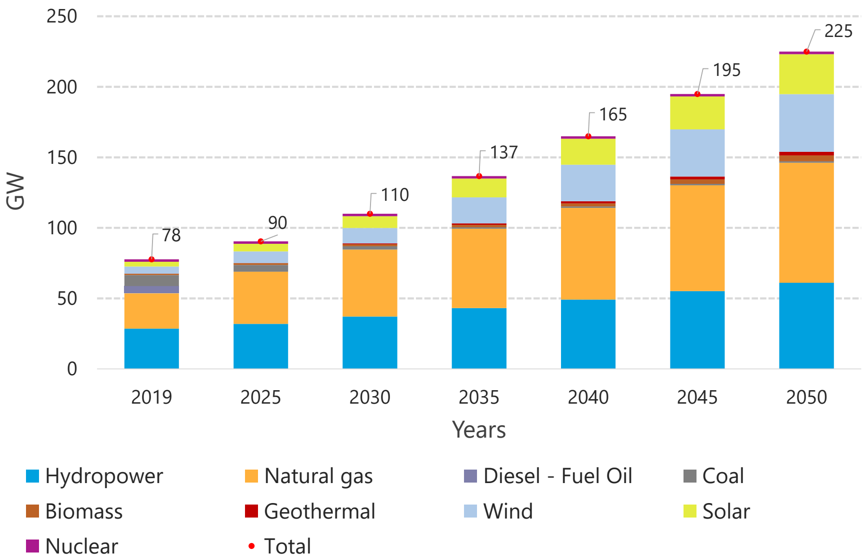


Source: Own elaboration

6.3.2 PRO NET-0 Scenario

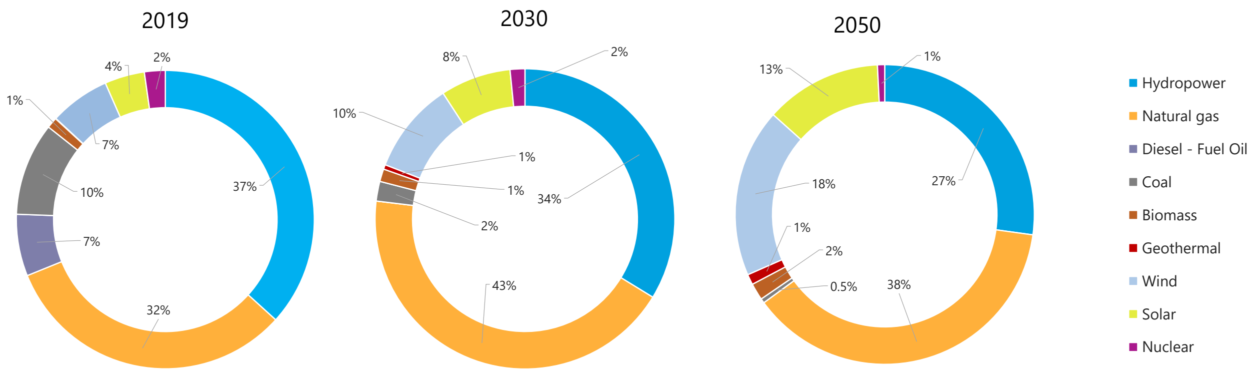
For the PRO NET-0 scenario, although the installation of new natural gas generation capacity continues to be the most important, there is an increase in the installation of renewable energy capacity, which in order of magnitude corresponds to hydro, wind, solar, geothermal and biomass. Under these conditions, the renewability of the Southern Cone's generation park will experience a continuous improvement, from 49% in the base year to 53% in 2030 and 61% in 2050. It is also worth mentioning that, due to the increase in electricity demand in the final consumption sectors, an additional 54 GW of installed capacity will be required by 2050, with respect to the value projected in the BAU scenario for the same year (**Figures 113, 114, 115 and 116**).

Figure No. 113 Projected installed capacity for electricity generation, Southern Cone, PRO NET-0 scenario



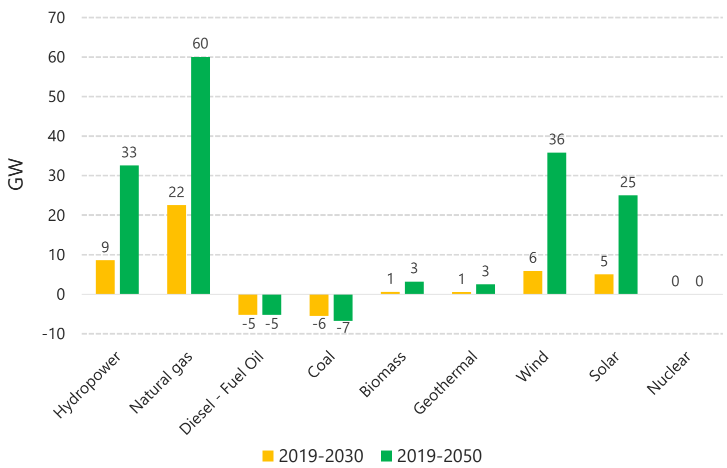
Source: Own elaboration

Figure No. 114 Structure of installed capacity for electricity generation, Southern Cone, PRO NET-0 scenario



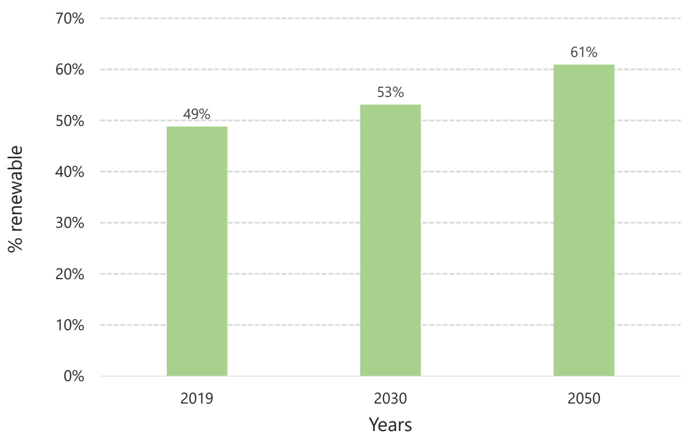
Source: Own elaboration

Figure No. 115 Incremental installed capacity for electricity generation, Southern Cone, PRO NET-0 scenario



Source: Own elaboration

Figure No. 116 Renewable % of installed capacity for electricity generation, Southern Cone, PRO NET-0 scenario



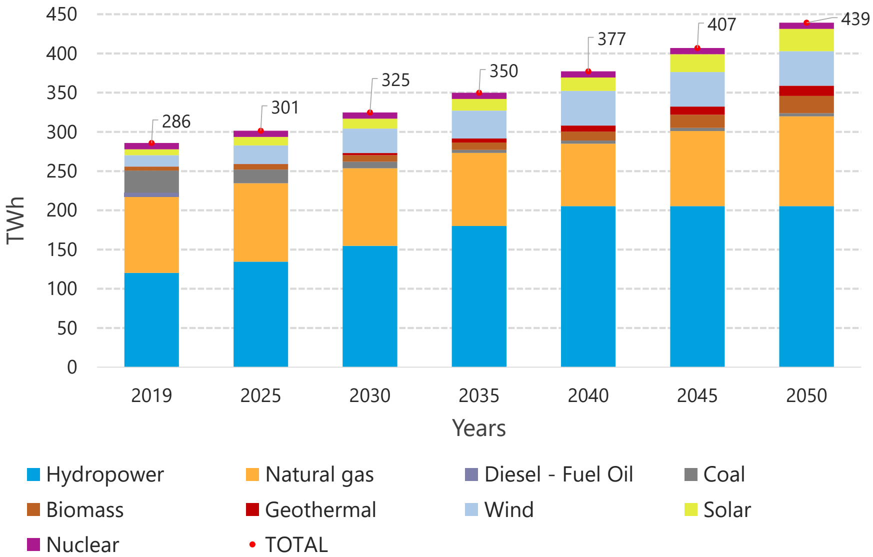
Source: Own elaboration

6.4 Projected electricity generation

6.4.1 BAU Scenario

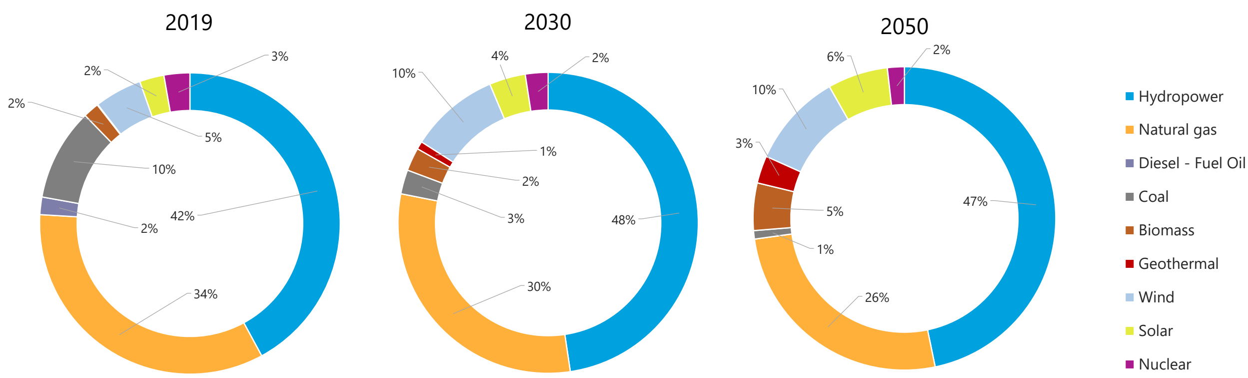
As for the Southern Cone's electricity generation matrix, for the BAU scenario, despite the increase in installed capacity with natural gas, due to the priority given to renewable energy sources in the dispatch, the renewability of this matrix increases during the projection period, from 52% in the base year to 64% in 2030 and 71% in 2050 (**Figures 117, 118 and 119**).

Figure No. 117 Projected electricity generation, Southern Cone, BAU scenario



Source: Own elaborationn

Figure No. 118 Structure of electricity generation, Southern Cone, BAU scenario



Source: Own elaboration

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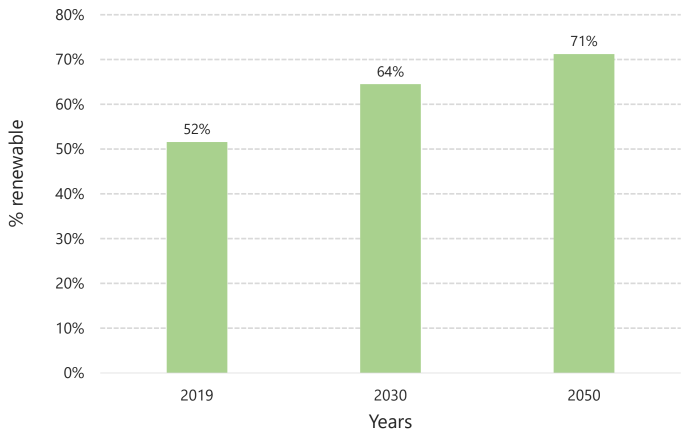
Figure No. 119 Renewable % of electricity generation, Southern Cone, BAU scenario

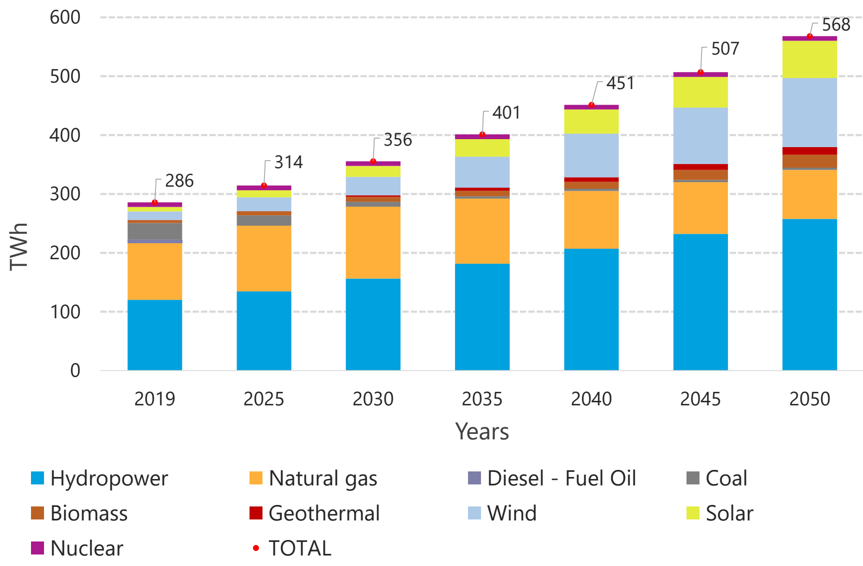


Source: Own elaboration

6.4.2 PRO NET-0 Scenario

With the most accelerated expansion of generation capacity with renewable sources, simulated in the PRO NET-0 scenario, it is possible to reach the year 2050 with a renewability rate of 83% of the electricity production matrix and an additional energy generated of 129 TWh, with respect to the value projected in the BAU scenario for that year, due to the increase in electricity demand in the final consumption sectors (**Figures 120, 121 and 122**).

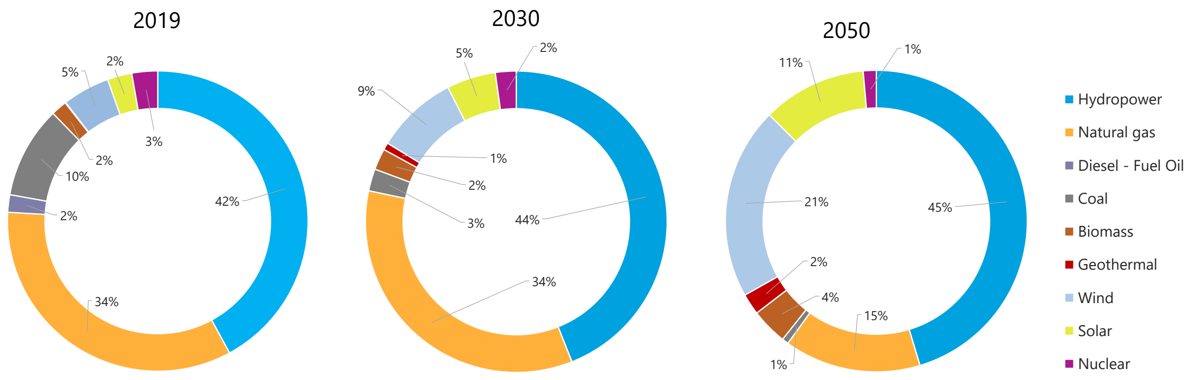
Figure No. 120 Projected electricity generation, Southern Cone, PRO NET-0 scenario



Source: Own elaboration

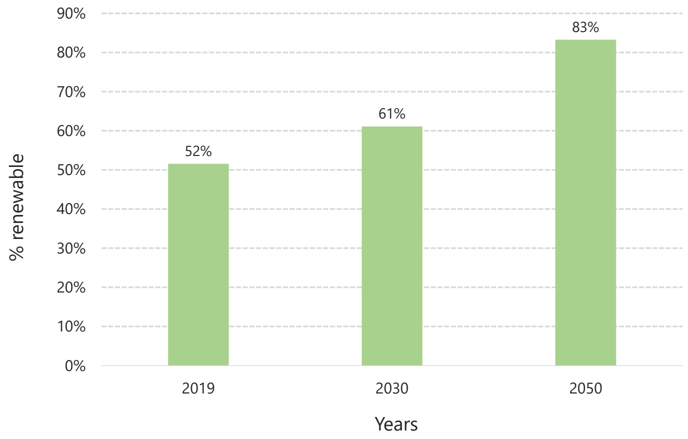
ENERGY PROSPECTIVE LAC

Figure No. 121 Structure of electricity generation, Southern Cone, PRO NET-0 scenario



Source: Own elaboration

Figure No. 122 Renewable % of electricity generation, Southern Cone, PRO NET-0 scenario



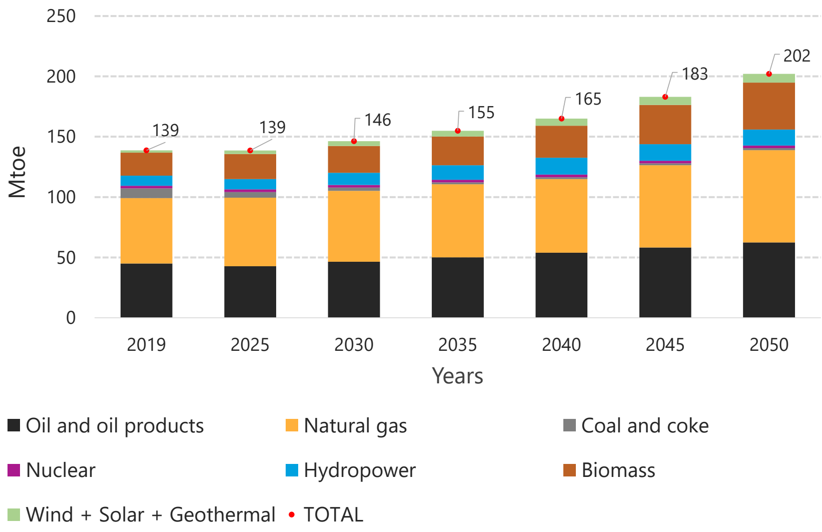
Source: Own elaboration

6.5 Projected total energy supply

6.5.1 BAU Scenario

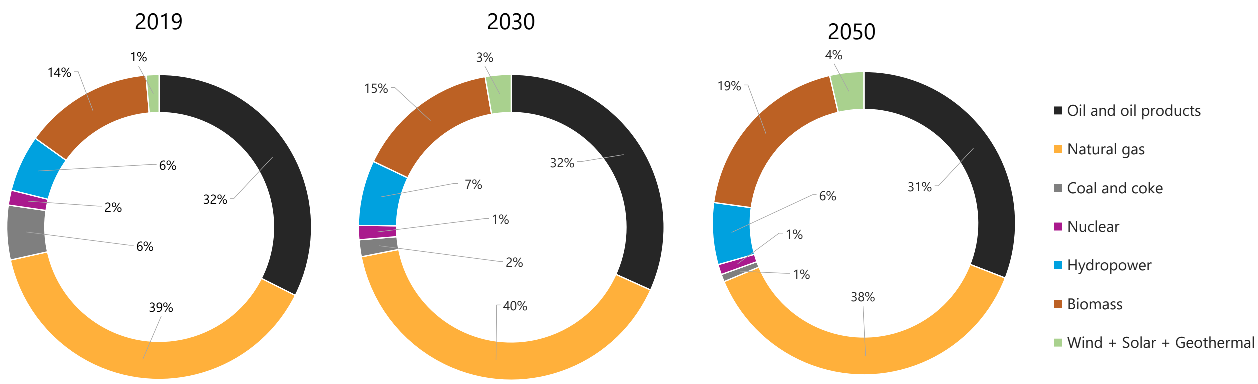
The evolution of the total energy supply matrix of the Southern Cone in the BAU scenario is mainly characterized by an increase in the participation of biomass and other renewable energy sources such as wind, solar and geothermal energy, which together will account for about 30% of the total energy supply by 2050. However, despite this increase in the renewability of the matrix, hydrocarbons still predominate throughout the projection period (**Figures 123, 124 and 125**).

Figure No. 123 Projected total energy supply, Southern Cone, BAU scenario



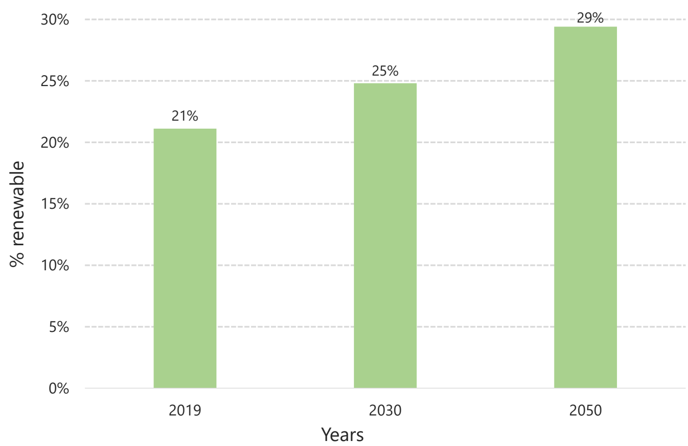
Source: Own elaboration

Figure No. 124 Structure of the total energy supply, Southern Cone, BAU scenario



Source: Own elaboration

Figure No. 125 Renewable % of total energy supply, Southern Cone, BAU scenario

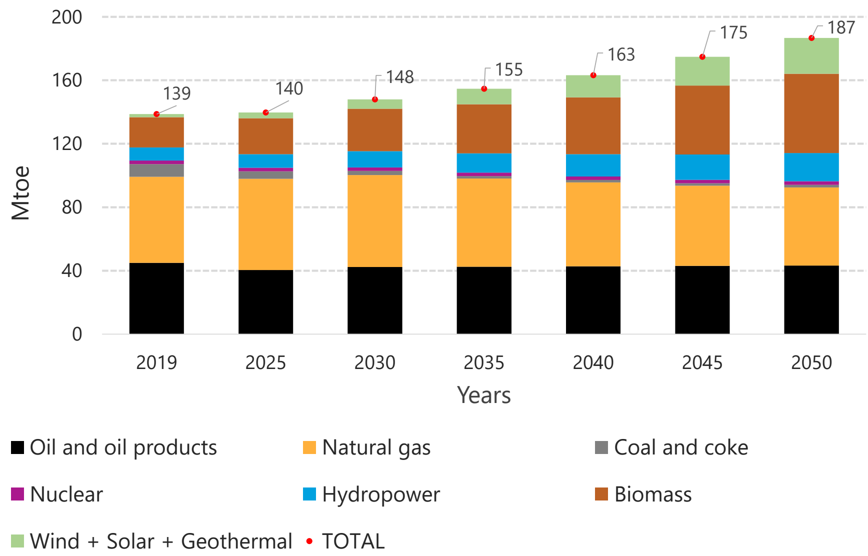


Source: Own elaboration

6.5.2 PRO NET-0 Scenario

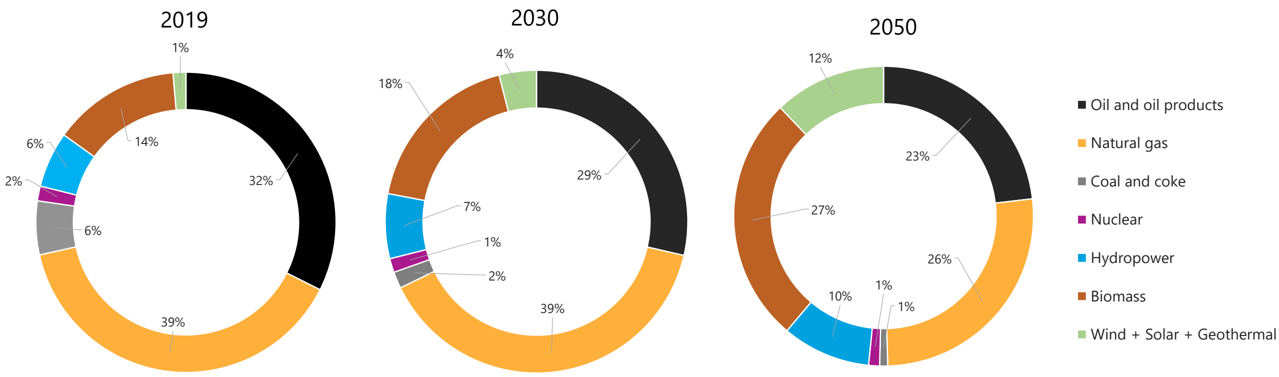
Under the assumptions of the PRO NET-0 scenario, the renewability of the total energy supply matrix reaches almost 50% in the projection horizon, thanks to the accelerated increase in the final consumption of biofuels, electricity and solar thermal energy; and the greater penetration of renewable energy sources in electricity generation, such as hydro, wind, solar, biomass and geothermal. It is also important to note that, due to the increase in energy efficiency, there is a saving of 15 Mtoe in the annual energy supply in the year 2050, with respect to the value projected in the BAU scenario for that year (**Figures 126, 127 and 128**).

Figure No. 126 Projected total energy supply, Southern Cone, PRO NET-0 scenario



Source: Own elaboration

Figure No. 127 Structure of the total energy supply, Southern Cone, PRO NET-0 scenario



Source: Own elaboration

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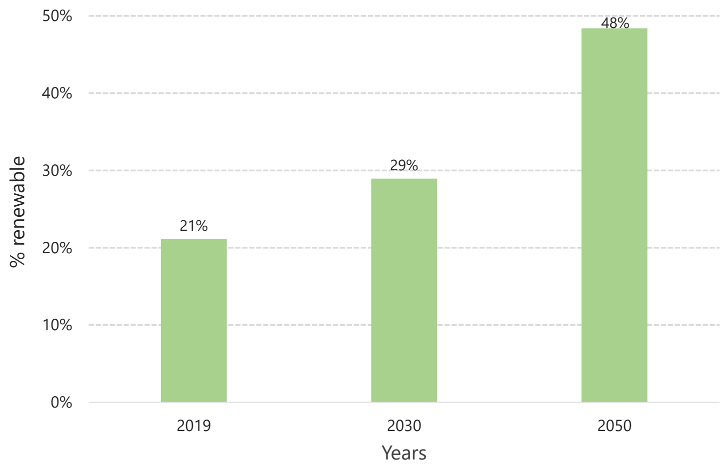
Figure No. 128 Renewable % of total energy supply, Southern Cone, PRO NET-0 scenario



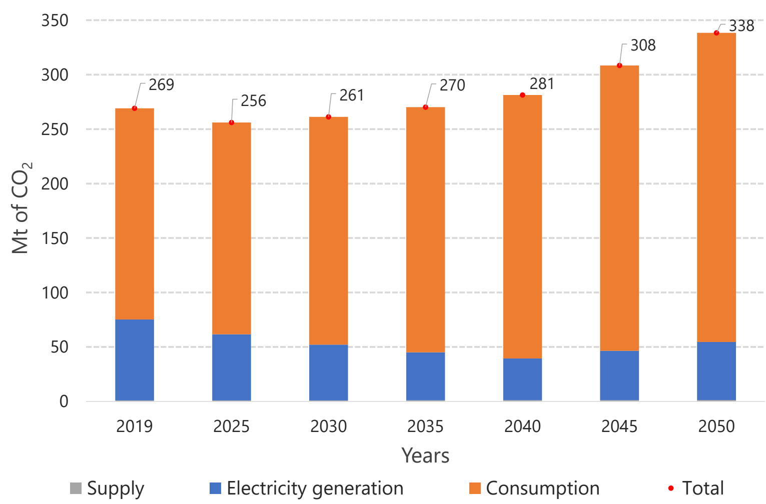
Source: Own elaboration

6.6 Projected CO_2 emissions

6.6.1 BAU Scenario

Although the total annual CO_2 emissions of the Southern Cone energy sector in the BAU scenario show a slight decrease until 2030, they then begin to increase until 2050 with a value 26% higher than the base year. This is due to the increase in the consumption of fossil fuels in the final consumption sectors, mainly natural gas (**Figure 129**).

Figure No. 129 Projected CO_2 emissions, Southern Cone, BAU scenario

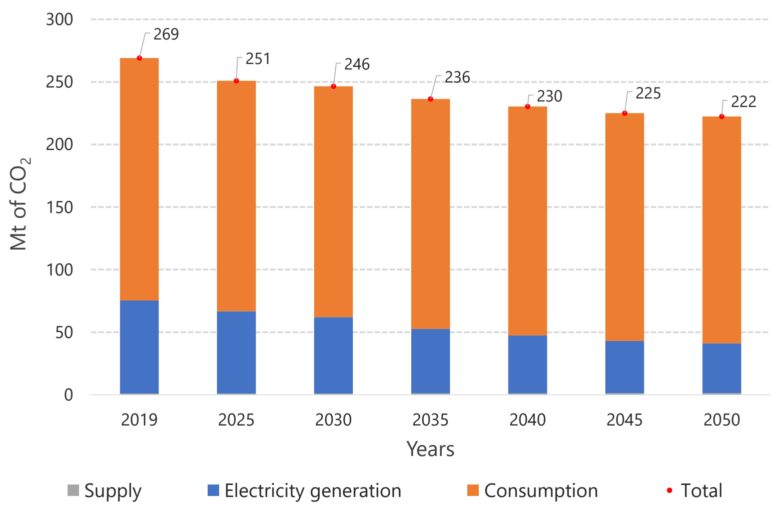


Source: Own elaboration

6.6.2 PRO NET-0 Scenario

Under the assumptions of the PRO NET-0 scenario, CO_2 emissions from the Southern Cone energy sector show a continuous decrease throughout the projection period, reaching 2050 with an annual value 17% lower than in the base year and 34% lower than the value projected in the BAU scenario (**Figure 130**).

Figure No. 130 Projected CO_2 emissions, Southern Cone, PRO NET-0 scenario



Source: Own elaboration

7. ENERGY PROSPECTIVE FOR THE CARIBBEAN

7.1 General considerations

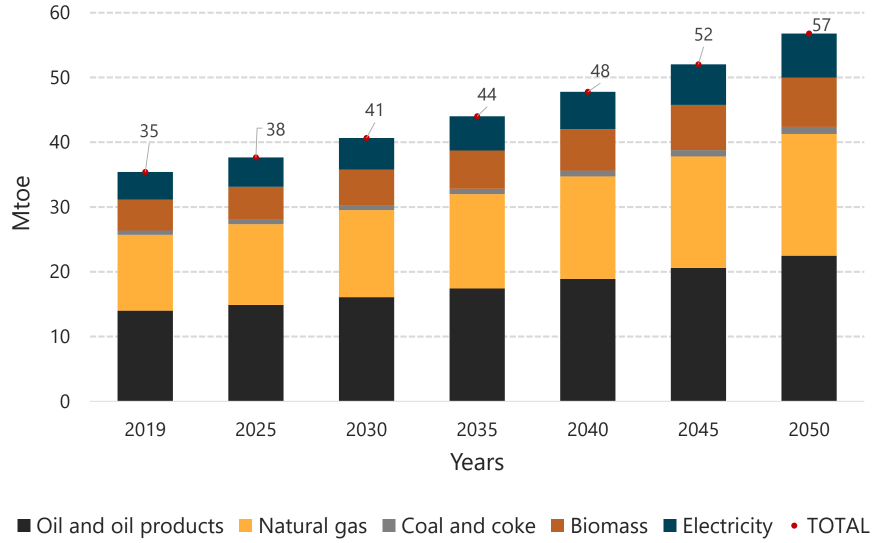
Among the information used as reference for the projections of the energy sector in the Caribbean subregion, it is worth mentioning the report of the study "Investment Planning for Electricity Generation in the Dominican Republic 2040," carried out by OLADE in the framework of the MEM's "Energy Transition of the Dominican Republic" project, the documents: "IDB-TN-851 Energy Dossier (Grenada)" and "EPM_GD_National Energy Forecast 2015-2035_25 (Grenada)"; the report: "GY Generation Expansion Study - Final Report and Annexes (Guyana)"; the report: "Achieving-Sustainable-Energy-in-Barbados-Energy-Dossier);" Caricom's "RE Development MSTEM (Jamaica)" report; the "A-Unique-Approach-for-Sustainable-Energy (T&T)" reports; as well as 2019 energy balances and COVID-19-effect final consumption projections correlated with World Bank nominal GDP change estimates.

7.2 Projected final energy consumption

7.2.1 BAU Scenario

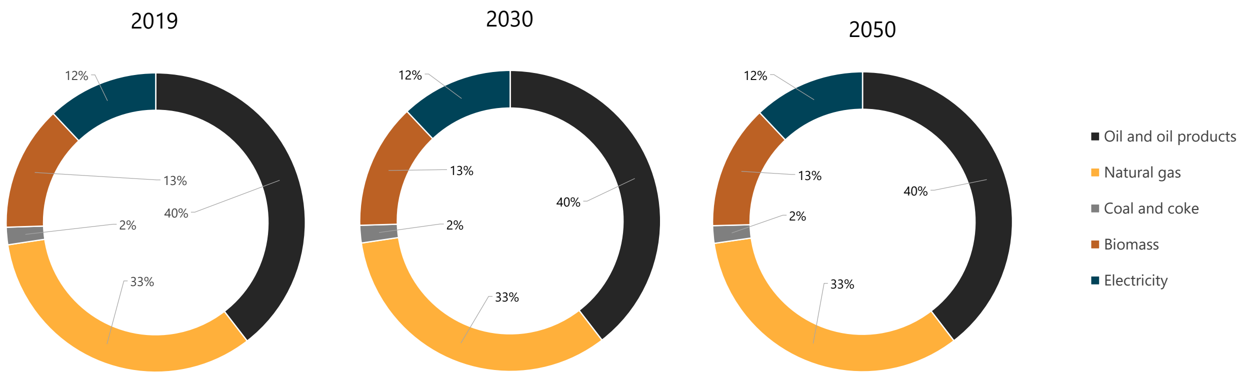
Final energy consumption in the Caribbean subregion, under the BAU scenario, would grow at an average annual rate of 1.6% during the projection period, without undergoing structural changes in its matrix by source, where hydrocarbons (oil, oil products and natural gas) maintain their predominant share with 73% of total consumption (**Figures 131 and 132**).

Figure No. 131 Projected final energy consumption, Caribbean, BAU scenario



Source: Own elaboration

Figure No. 132 Evolution of the final energy consumption matrix, Caribbean, BAU scenario

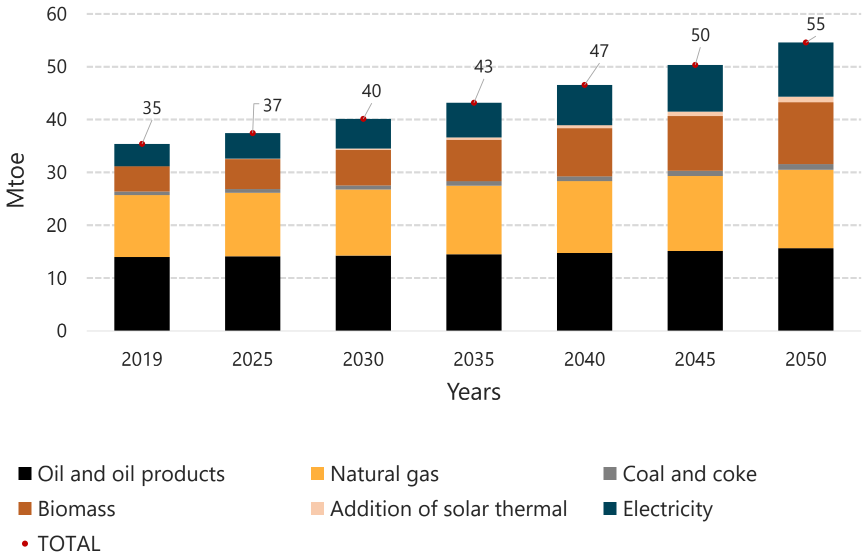


Source: Own elaboration

7.2.2 PRO NET-0 Scenario

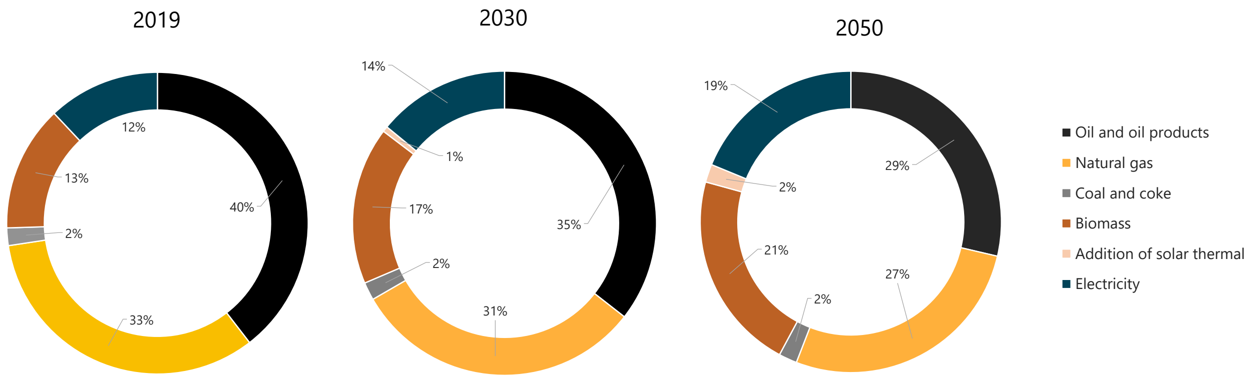
Under the assumptions of greater electrification of the final consumption sectors, greater use of biofuels and solar thermal energy, simulated in the PRO NET-0 scenario, the Caribbean's final consumption matrix would reduce its hydrocarbon component to a 66% share in 2030 and 56% in 2050, also allowing, thanks to increased energy efficiency, a saving in annual energy consumption of 2 Mtoe by the end of the projection period (**Figures 133 and 134**).

Figure No. 133 Projected final energy consumption, Caribbean, PRO NET-0 scenario



Source: Own elaboration

Figure No. 134 Evolution of the final energy consumption matrix, Caribbean, PRO NET-0 scenario



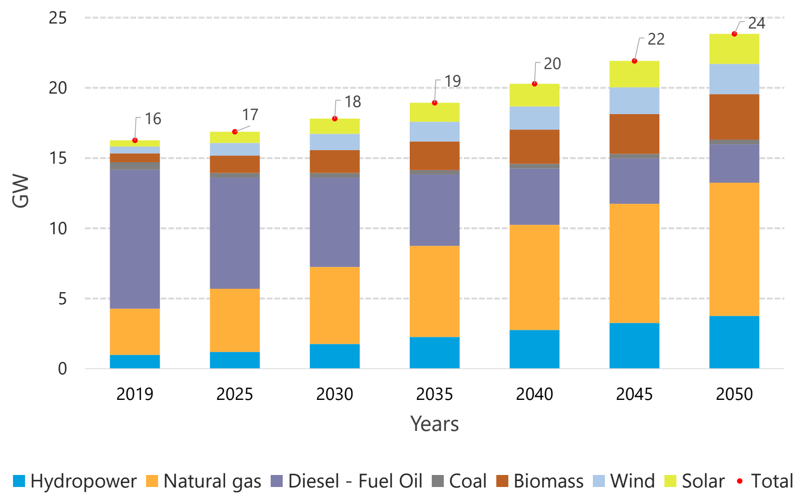
Source: Own elaboration

7.3 Projected installed capacity for electricity generation

7.3.1 BAU Scenario

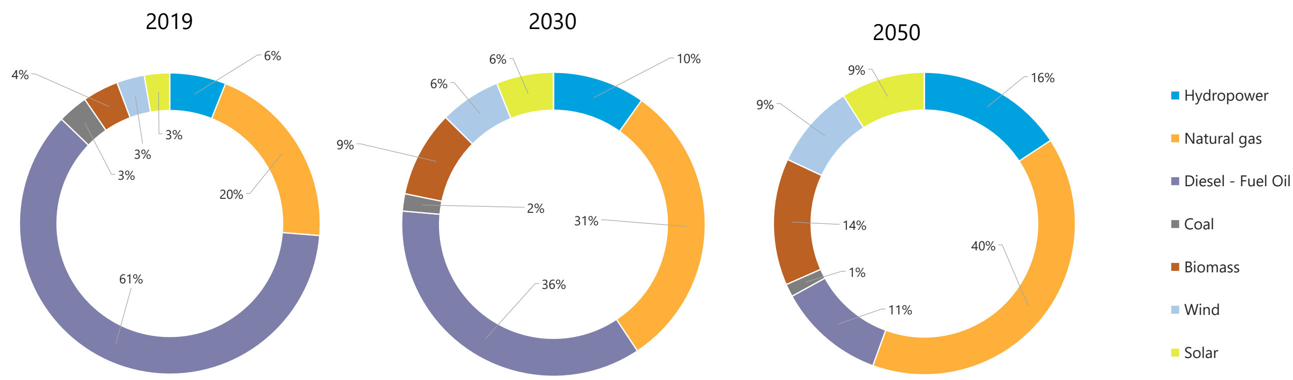
In the BAU reference scenario, most of the new capacity installed during the projection period corresponds to natural gas plants, followed in importance by biomass, hydro, wind and solar plants. It should be noted that the installation of new hydroelectric power plants would take place mainly in continental countries such as Guyana and Suriname. Under these conditions, the renewability of the Caribbean generation park would increase from 16% in the base year to 32% in 2030 and 47% in 2050 (**Figures 135, 136, 137 and 138**).

Figure No. 135 Projected installed capacity for electricity generation, Caribbean, BAU scenario



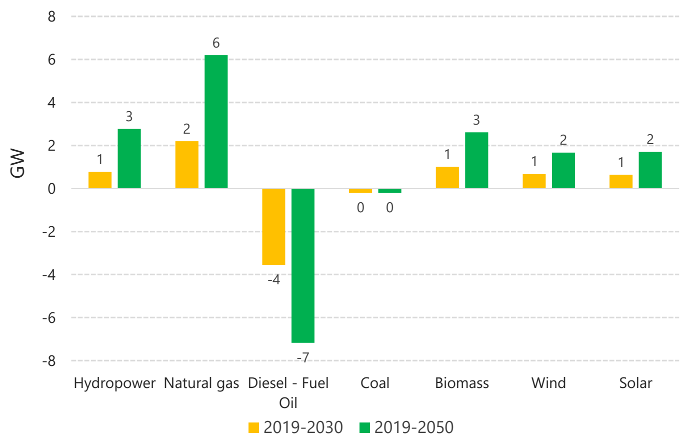
Source: Own elaboration

Figure No. 136 Structure of installed capacity for electricity generation, Caribbean, BAU scenario



Source: Own elaboration

Figure No. 137 Incremental installed capacity for electricity generation, Caribbean, BAU scenario



Source: Own elaboration

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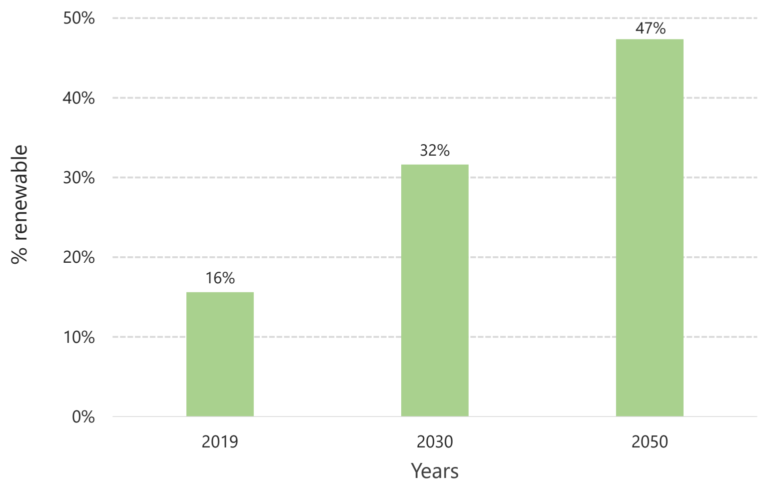
Figure No. 138 Renewable % of installed capacity for electricity generation, Caribbean, BAU scenario

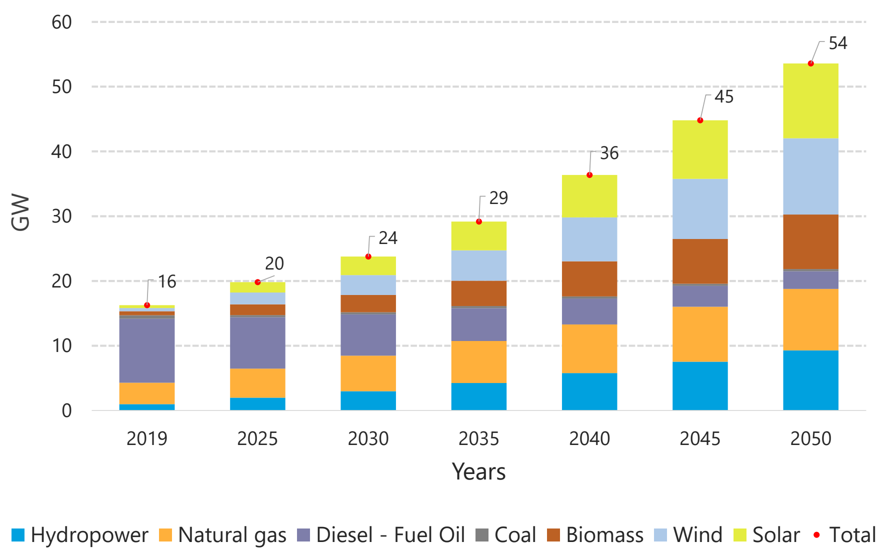


Source: Own elaboration

7.3.2 PRO NET-0 Scenario

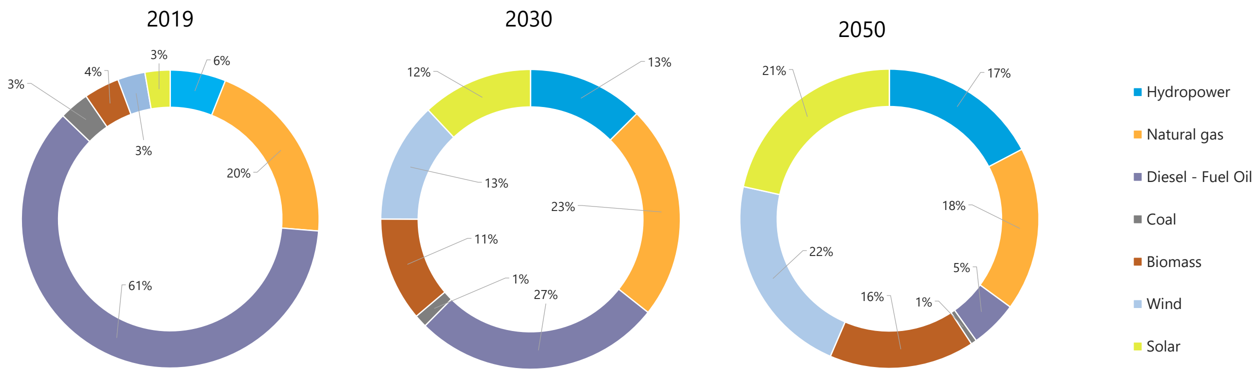
Although the increase in the renewability of the Caribbean generation pool is already considerable from the point of view of the BAU scenario, under the assumption of a greater penetration of renewable energy capacity, even exceeding the expansion of natural gas plants, as simulated for the PRO NET-0 scenario, the renewability of this generation pool would reach 49% in 2030 and 77% in 2050. It should be noted that, due to the increase in electricity demand in the end-use sectors, by 2050, more than double the total installed capacity projected for that year in the BAU scenario will be required (**Figures 139, 140, 141 and 142**).

Figure No. 139 Projected installed capacity for electricity generation, Caribbean, PRO NET-0 scenario



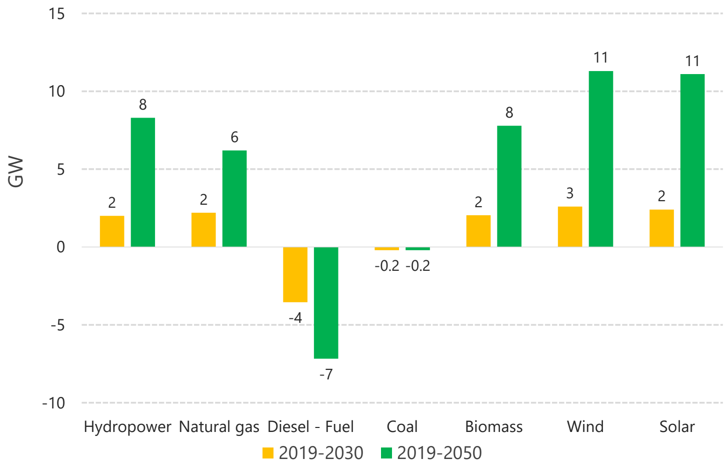
Source: Own elaboration

Figure No. 140 Structure of installed capacity for electricity generation, Caribbean, PRO NET-0 scenario



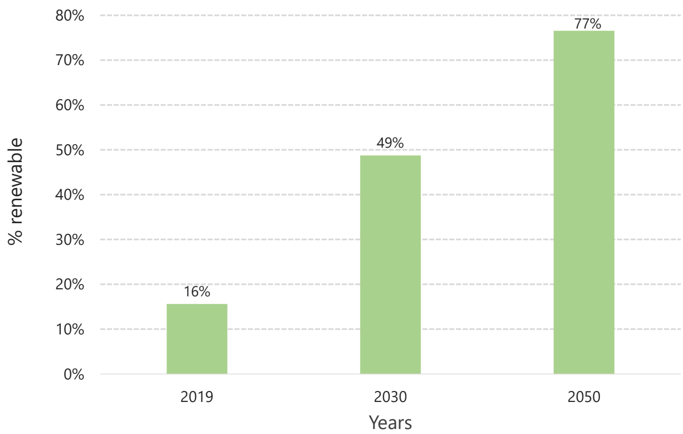
Source: Own elaboration

Figure No. 141 Incremental installed capacity for electricity generation, Caribbean, PRO NET-0 scenario



Source: Own elaboration

Figure No. 142 Renewable % of installed capacity for electricity generation, Caribbean, PRO NET-0 scenario



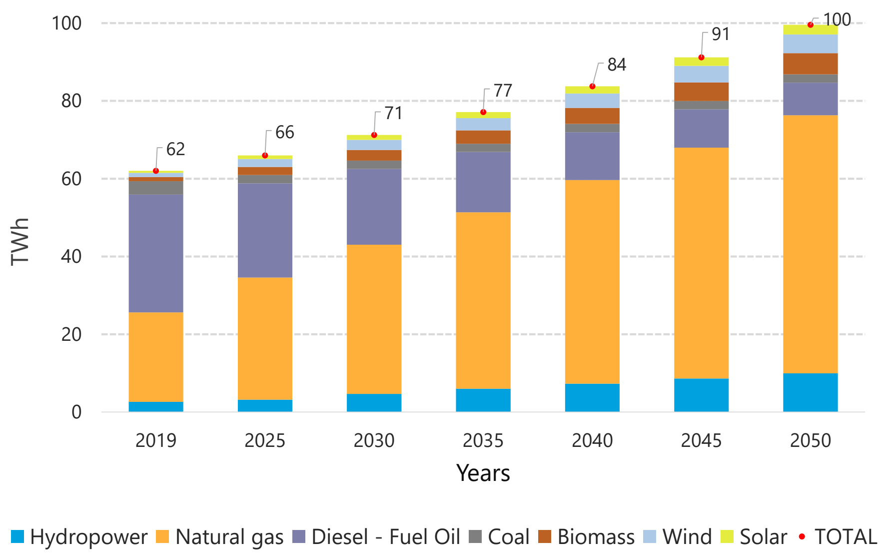
Source: Own elaboration

7.4 Projected electricity generation

7.4.1 BAU Scenario

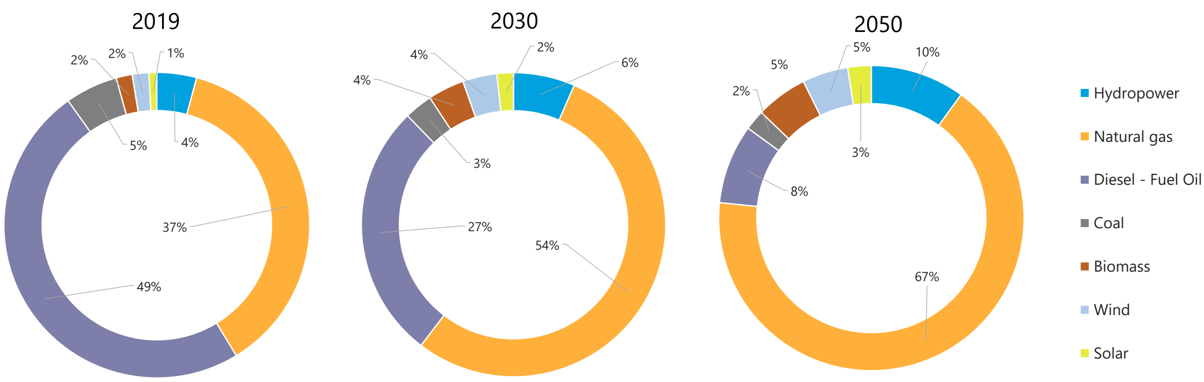
In the BAU scenario, there is an appreciable increase in electricity generation with natural gas in the Caribbean subregion, displacing the use of oil products throughout the projection period, and also a significant increase in the presence of renewable energies in the electricity production matrix, allowing for an improvement in the renewability of this matrix, from 8% in the base year to 16% in 2030 and 23% in 2050 (**Figures 143, 144 and 145**).

Figure No. 143 Projected electricity generation, Caribbean, BAU scenario



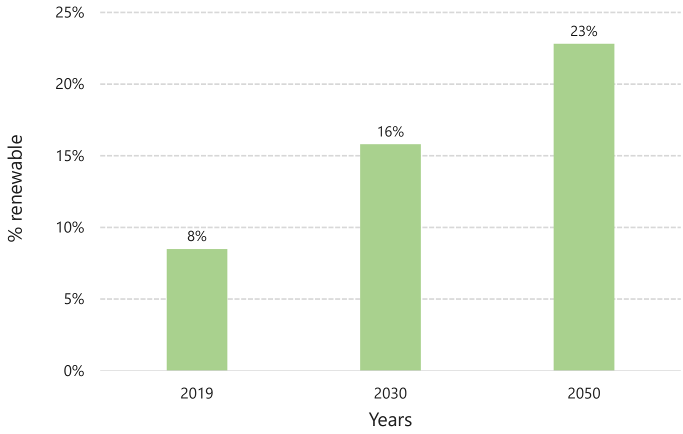
Source: Own elaboration

Figure No. 144 Structure of electricity generation, Caribbean, BAU scenario



Source: Own elaboration

Figure No. 145 Renewable % of electricity generation, Caribbean, BAU scenario

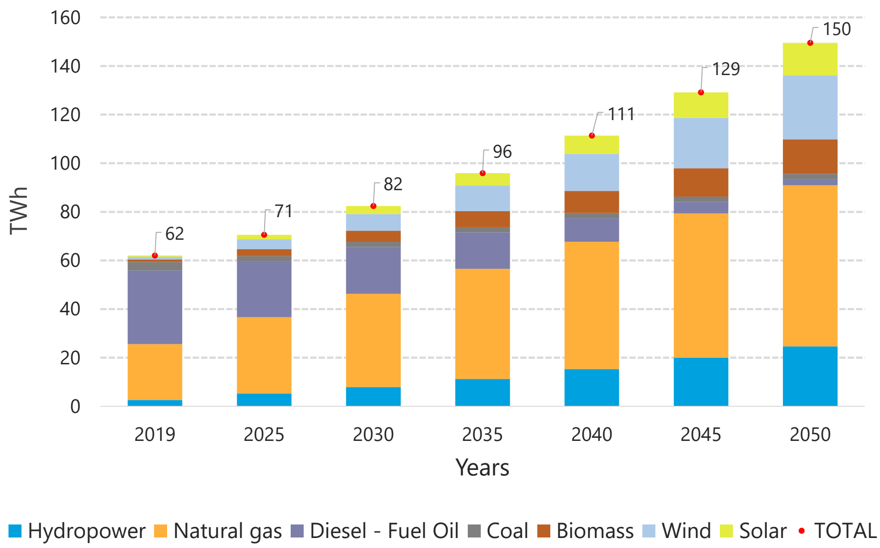


Source: Own elaboration

7.4.2 PRO NET-0 Scenario

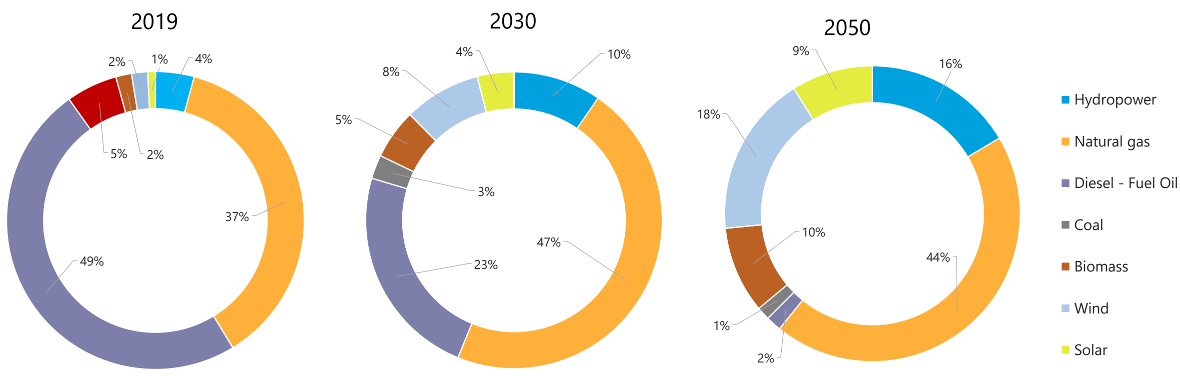
Under the premises of the PRO NET-0 scenario, the substitution of oil products with natural gas in the electricity generation matrix is maintained, but the penetration of renewable energy sources in this matrix is accelerated, which in order of importance are wind, hydro, solar and biomass, allowing a much more substantial improvement in renewability with respect to the BAU scenario, reaching values of 27% in 2030 and 53% in 2050. Due to the increase in electricity demand in the final consumption sectors, the total annual generation in 2050 increases by 50% compared to the value projected in the BAU scenario (**Figures 146, 147 and 148**).

Figure No. 146 Projected electricity generation, Caribbean, PRO NET-0 scenario



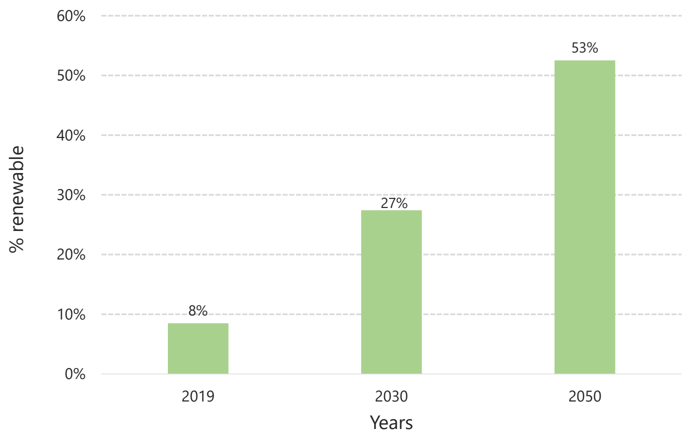
Source: Own elaboration

Figure No. 147 Structure of electricity generation, Caribbean, PRO NET-0 scenario



Source: Own elaboration

Figure No. 148 Renewable % of electricity generation, Caribbean, BAU scenario



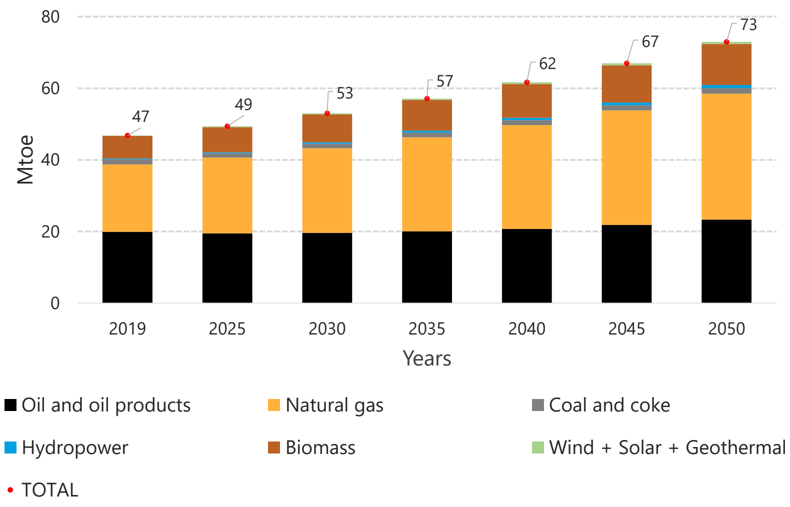
Source: Own elaboration

7.5 Projected total energy supply

7.5.1 BAU Scenario

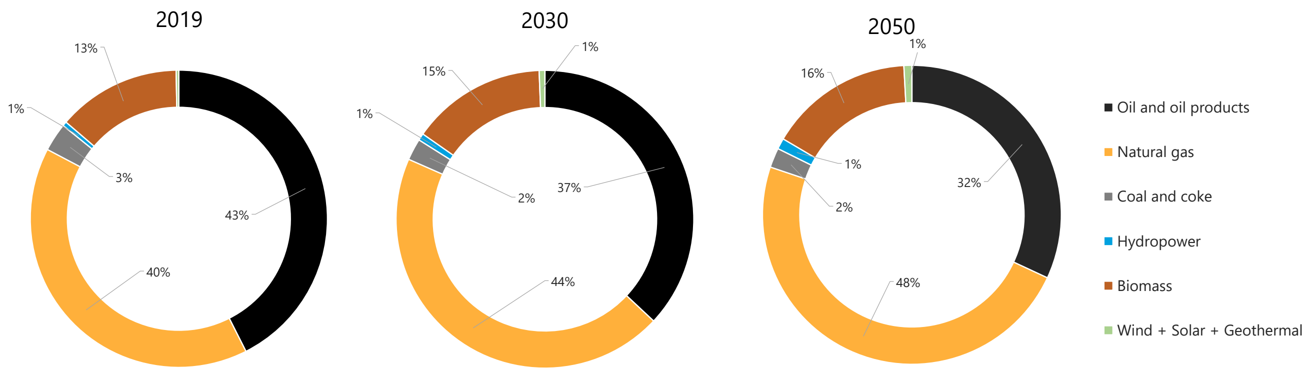
Under the BAU scenario, the total energy supply matrix of the Caribbean subregion will continue to be dominated by hydrocarbons during the projection period; however, natural gas will increase its share at the expense of the reduced use of oil and its products. On the other hand, the increase in the share of biomass in this matrix is also evident, allowing an increase in renewability from 14% in the base year to 16% in 2030 and 18% in 2050 (**Figures 149, 150 and 151**).

Figure No. 149 Projected total energy supply, Caribbean, BAU scenario



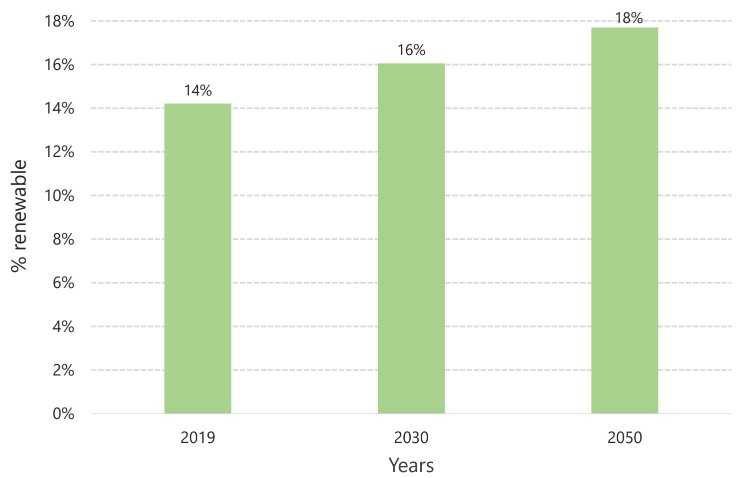
Source: Own elaboration

Figure No. 150 Structure of the total energy supply, Caribbean, BAU scenario



Source: Own elaboration

Figure No. 151 Renewable % of total energy supply, Caribbean, BAU scenario

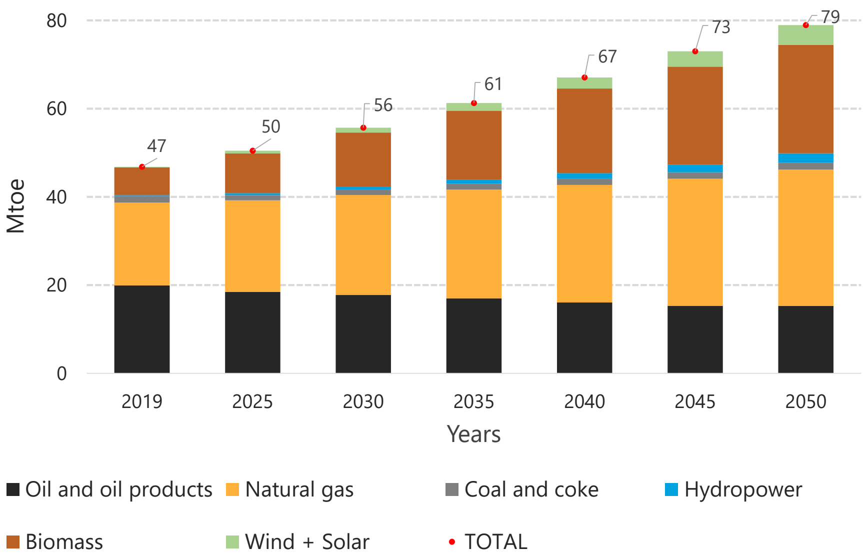


Source: Own elaboration

7.5.2 PRO NET-0 Scenario

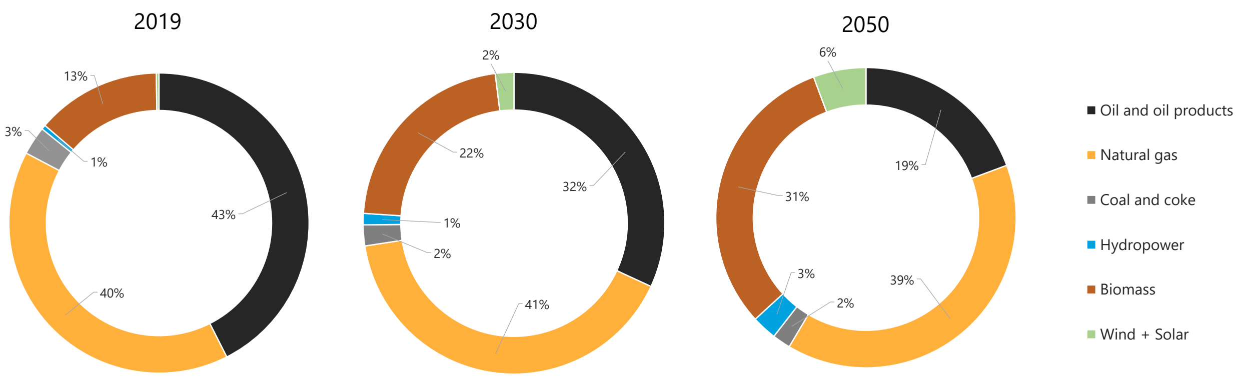
According to the assumptions of the PRO NET-0 scenario, of a more accelerated penetration of biofuels, electricity and solar thermal energy in the final consumption sectors; and of an increase in electricity generation from renewable sources, it can be observed that hydrocarbons suffer a significant reduction in their percentage share in the total energy supply matrix, giving way to an increase in biomass and direct energy such as wind and solar. In this scenario, the renewability of this matrix improves from the base year, reaching 25% in 2030 and 39% in 2050. Due to the increase in electricity demand and the lower efficiency of biomass use in electricity generation, with respect to natural gas and oil products, the total annual energy supply in the PRO NET-0 scenario increases by 8% by 2050, with respect to the value projected for that year in the BAU scenario (**Figures 152, 153 and 154**).

Figure No. 152 Projected total energy supply, Caribbean, PRO NET-0 scenario



Source: Own elaboration

Figure No. 153 Structure of the total energy supply, Caribbean, PRO NET-0 scenario



Source: Own elaboration

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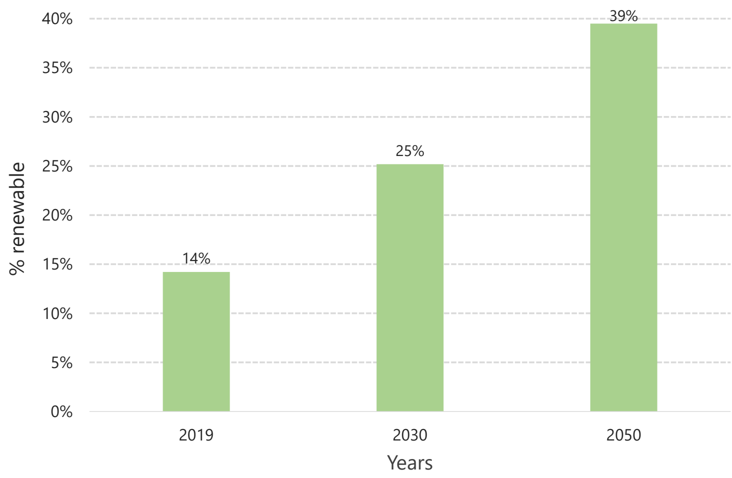
Figure No. 154 Renewable % of total energy supply, Caribbean, PRO NET-0 scenario



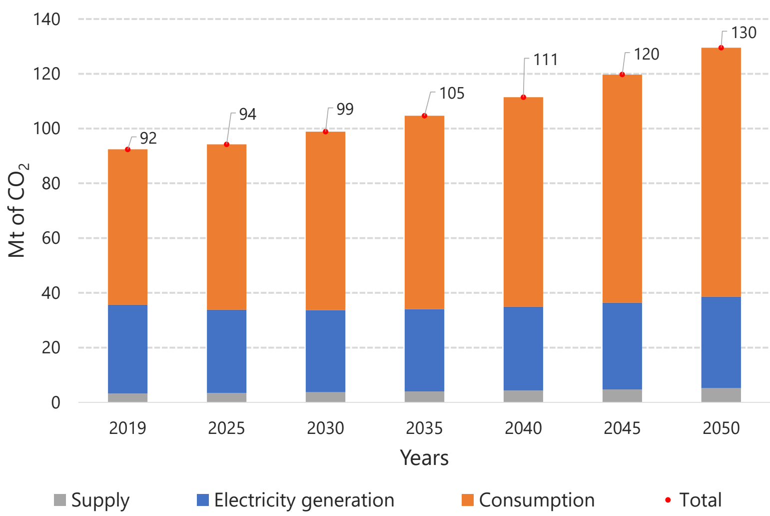
Source: Own elaboration

7.6 Projected CO_2 emissions

7.6.1 BAU Scenario

Total CO_2 emissions from the Caribbean energy sector, under the BAU scenario, increase during the projection period, reaching 2050 with a value 41% higher than in the base year. This increase is mainly due to the increase in emissions in the consumption sectors, as emissions from electricity generation remain relatively stable (**Figure 155**).

Figure No. 155 Projected CO_2 emissions, Caribbean, BAU scenario

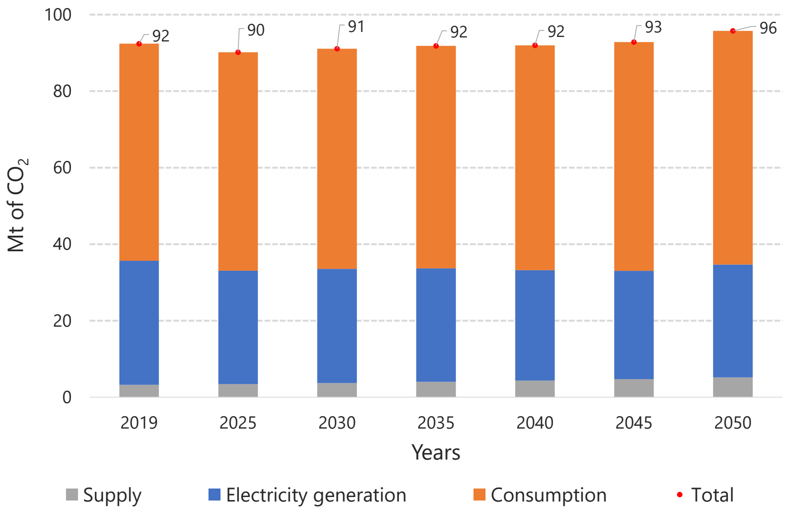


Source: Own elaboration

7.6.2 PRO NET-0 Scenario

Although total annual CO_2 emissions from the Caribbean energy sector, projected under the PRO NET-0 scenario assumptions, show a slight growth of 4% over the projection period, by 2050 these emissions are 26% lower than those projected for the same year in the BAU scenario. Considering that the Caribbean has historically been a subregion highly dependent on fossil fuels, this buffering of CO_2 emissions can be considered an important achievement (**Figure 156**).

Figure No. 156 Projected CO_2 emissions, Caribbean, PRO NET-0 scenario



Source: Own elaboration

8. *ENERGY PROSPECTIVE FOR LATIN AMERICA AND THE CARIBBEAN (LAC)*

8.1 General considerations

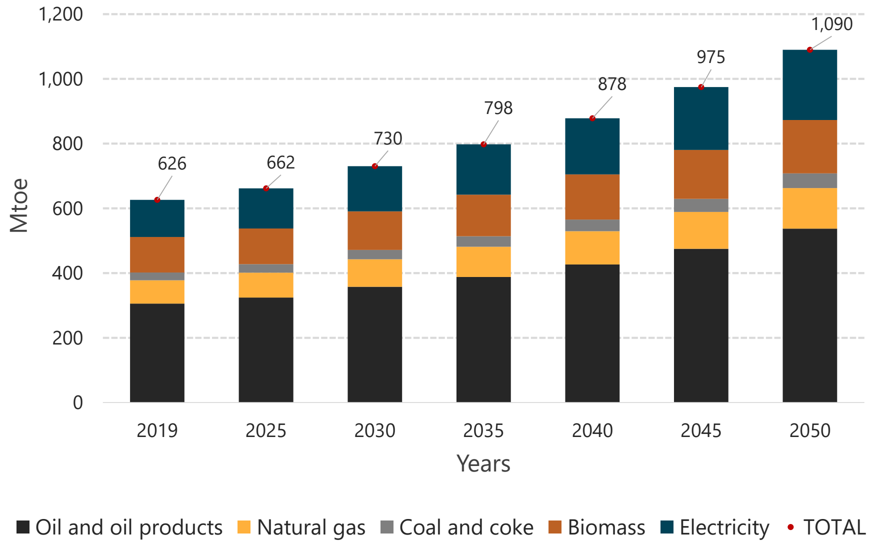
The energy scenarios for the LAC region (BAU and PRO NET-0) correspond to the aggregation of the projections prepared for the six subregions analyzed (including Brazil and Mexico).

8.2 Projected final energy consumption

8.2.1 BAU Scenario

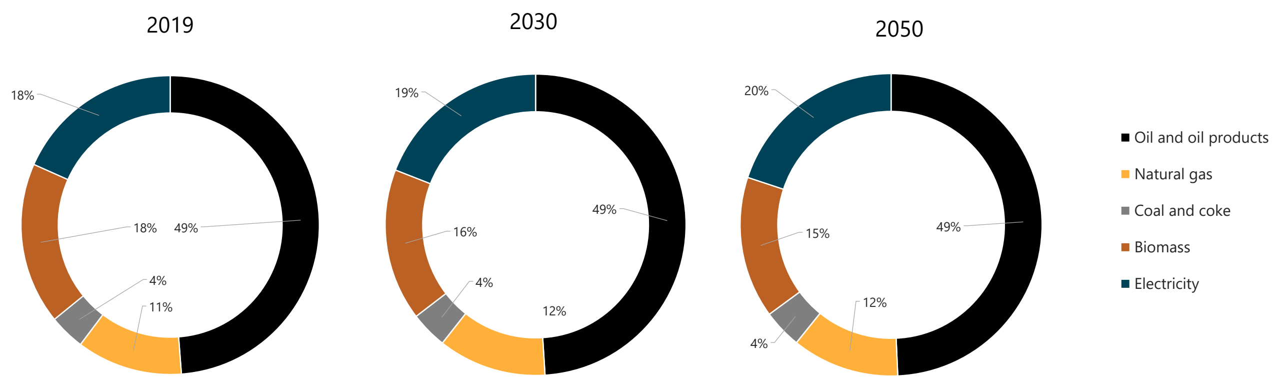
As a result of the projections made in the six subregions analyzed, under the BAU scenario assumptions, total final energy consumption in LAC would have an average annual growth of 1.8% during the projection period, with an almost structurally stable matrix, characterized by a small increase in the share of electricity, a small reduction in the consumption of biomass, specifically residential firewood, and a slight increase in the share of natural gas (**Figures 157, 158 and 159**).

Figure No. 157 Projected final energy consumption, LAC, BAU scenario



Source: Own elaboration

Figure No. 158 Evolution of the final energy consumption matrix, LAC, BAU scenario

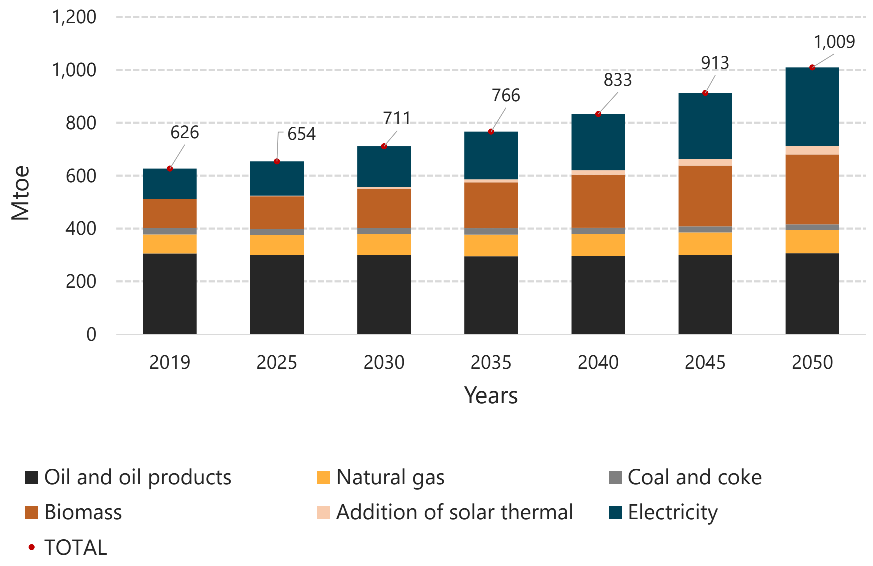


Source: Own elaboration

8.2.2 PRO NET-0 Scenario

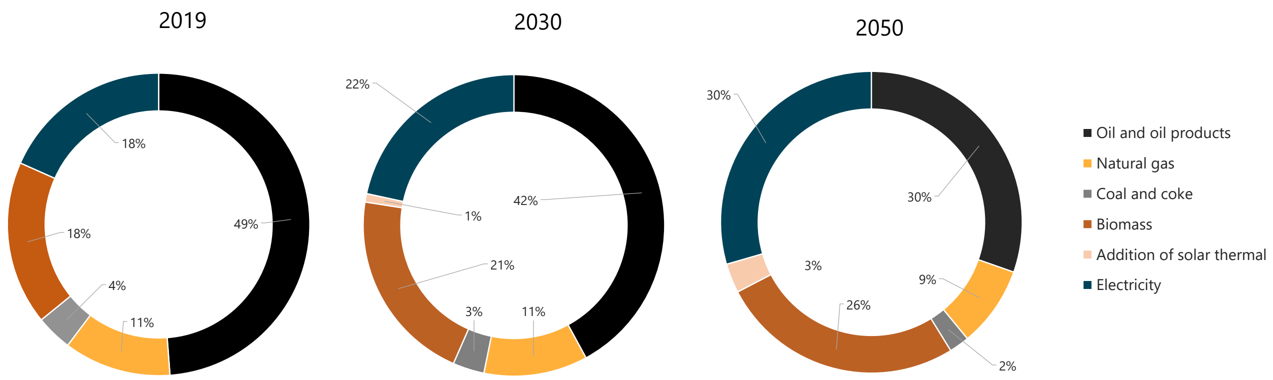
Under the assumptions of the PRO NET-0 scenario, the final consumption matrix of the LAC region will show a significant increase in the share of electricity, biomass (greater use of liquid biofuels) and solar thermal energy, displacing fossil fuels, which will reduce their share from 64% in the base year to 56% in 2030 and 41% in 2050 (**Figures 159 and 160**).

Figure No. 159 Projected final energy consumption, LAC, PRO NET-0 scenario



Source: Own elaboration

Figure No. 160. Evolution of the final energy consumption matrix, LAC, PRO NET-0 scenario



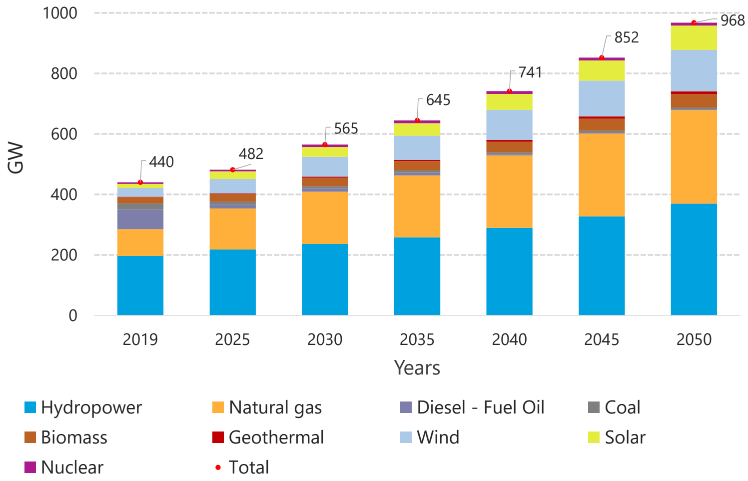
Source: Own elaboration

8.3 Projected installed capacity for electricity generationation

8.3.1 BAU Scenario

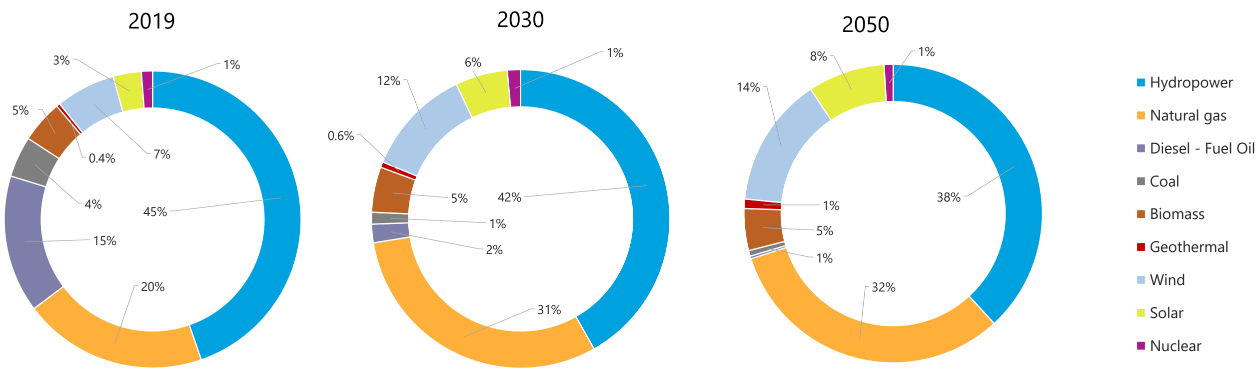
For the BAU scenario, it is observed that the predominance in the addition of installed electricity generation capacity during the projection period in LAC is held by natural gas plants, even surpassing hydroelectric plants, which are in second place, followed in order of magnitude by wind, solar, biomass and geothermal plants. Under these conditions, the renewable component of the Latin American and Caribbean generation park will increase from a 59% share in the base year to 65% in 2030 and 66% in 2050. It should be noted that, under the assumptions of this scenario, the 70% renewable installed capacity target of the RELAC initiative would not be reached, not even by 2050 (**Figures 161, 162, 163 and 164**).

Figure No. 161 Projected installed capacity for electricity generation, LAC, BAU scenario



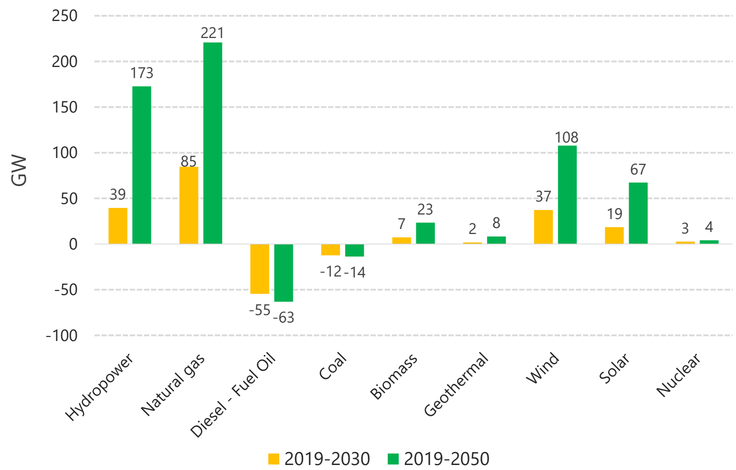
Source: Own elaboration

Figure No. 162 Structure of installed capacity for electricity generation, LAC, BAU scenario



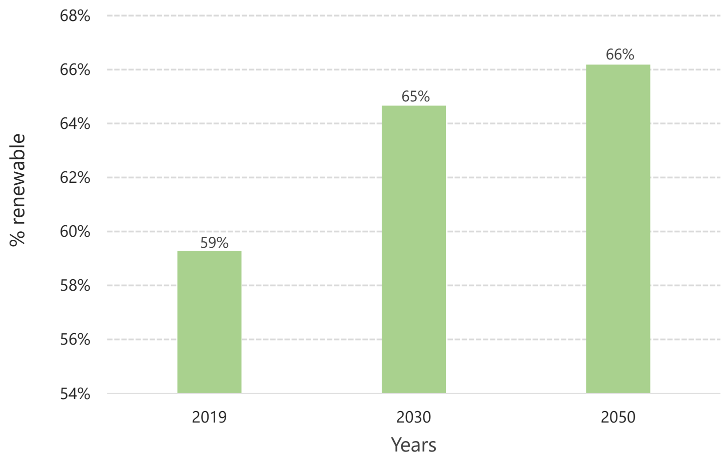
Source: Own elaboration

Figure No. 163 Incremental installed capacity for electricity generation, LAC, BAU scenario



Source: Own elaboration

Figure No. 164 Renewable % of installed capacity for electricity generation, LAC, BAU scenario

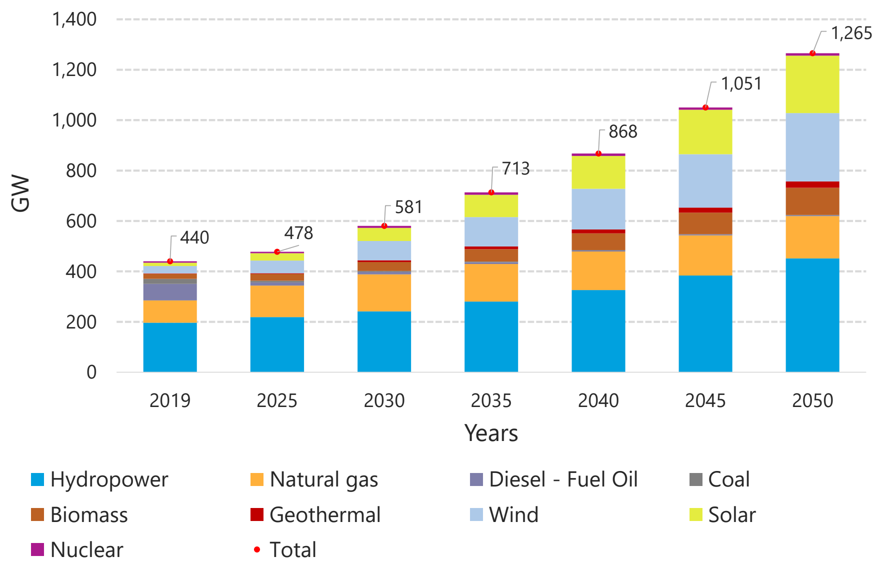


Source: Own elaboration

8.3.2 PRO NET-0 Scenario

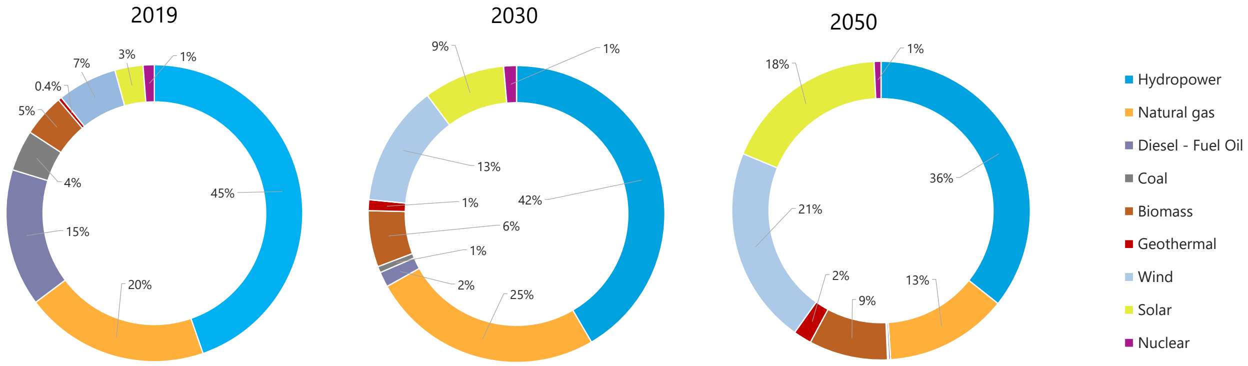
Considering the much more accelerated installation of electricity generation capacity with renewable energy sources, simulated in each of the subregions for the PRO NET-0 scenario, where the installation of new renewables far exceeds the installation of natural gas plants, the renewability of LAC's generation capacity would reach 71% by 2030 and 86% by 2050, which would now meet the target established in the RELAC initiative for the year 2030. Due to the higher electricity demand in the final consumption sectors, the installed capacity required in 2050 is 31% higher than that projected in the BAU scenario for the same year (**Figures 165, 166, 167 and 168**).

Figure No. 165 Projected installed capacity for electricity generation, LAC, PRO NET-0 scenario



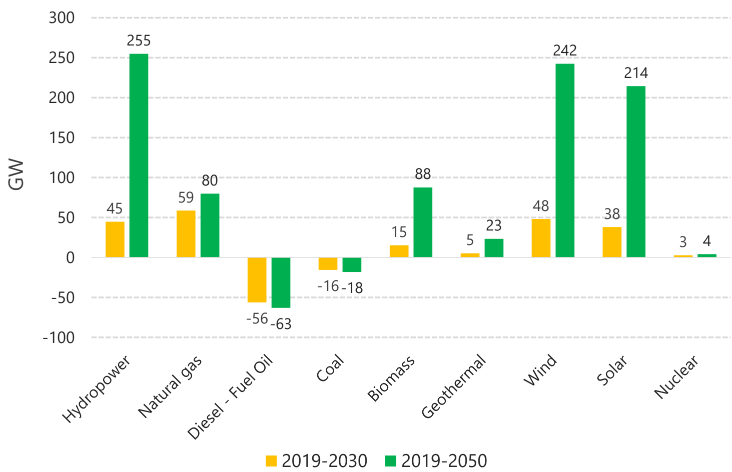
Source: Own elaboration

Figure No. 166 Structure of installed capacity for electricity generation, LAC, PRO NET-0 scenario



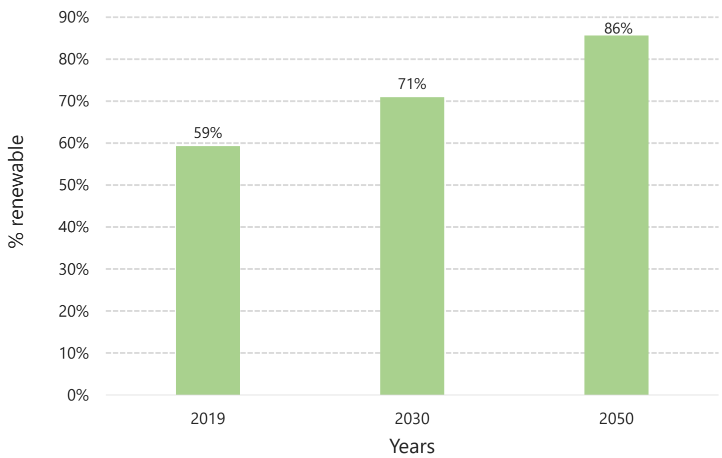
Source: Own elaboration

Figure No. 167 Incremental installed capacity for electricity generation, LAC, PRO NET-0 scenario



Source: Own elaboration

Figure No. 168 Renewable % of installed capacity for electricity generation, LAC, PRO NET-0 scenario



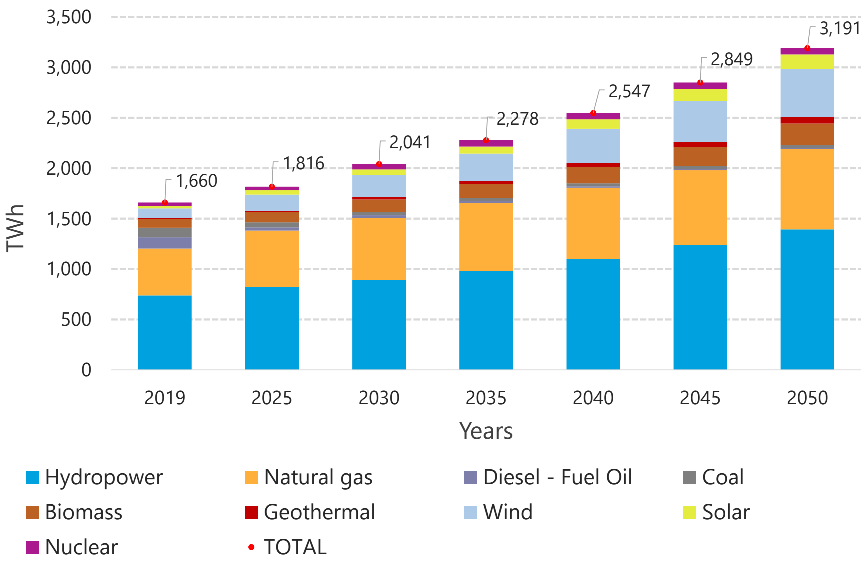
Source: Own elaboration

8.4 Projected electricity generation

8.4.1 BAU Scenario

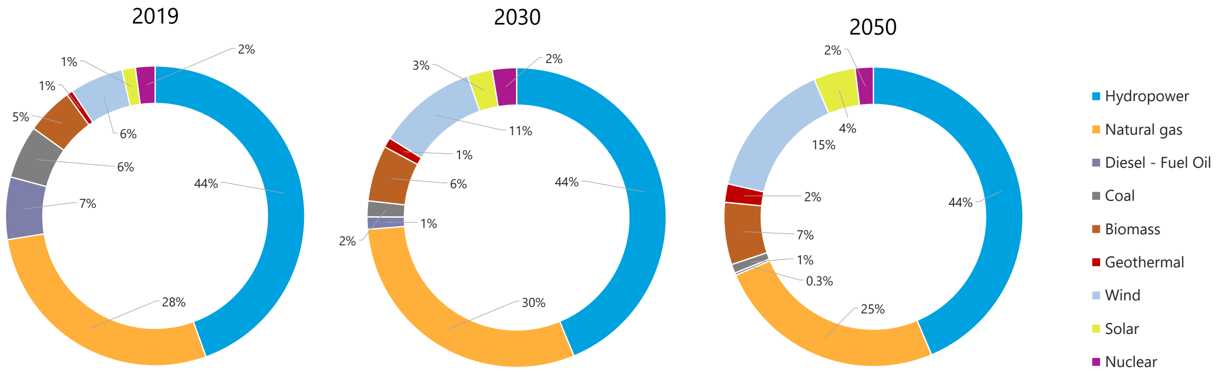
LAC's electricity generation matrix, in the BAU scenario, is characterized by a significant growth in the share of non-conventional renewable energy sources such as wind, solar, biomass and geothermal. While the share of hydroelectric plants remains stable, fossil fuels are losing ground, although there is still an important component of natural gas. Under these conditions, the renewability of this matrix increases from 57% in the base year to 64% in 2030 and 72% in 2050, which means that, as far as electricity generation is concerned, the RELAC initiative's goal of at least 70% renewable would only be reached by the end of the projection period (**Figures 169, 170 and 171**).

Figure No. 169 Projected electricity generation, LAC, BAU scenario



Source: Own elaboration

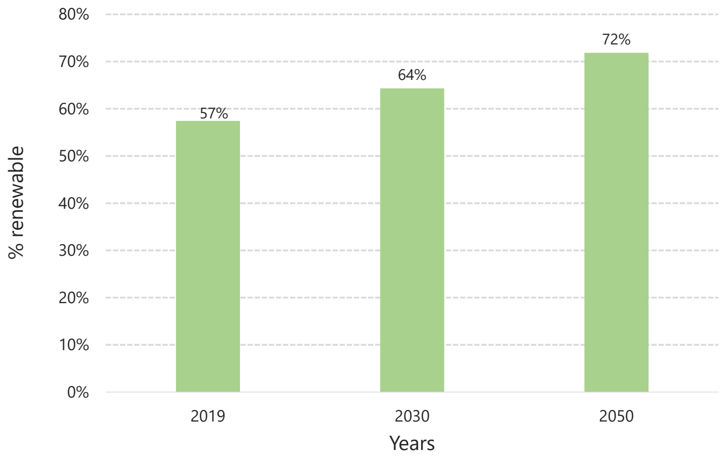
Figure No. 170 Structure of electricity generation, LAC, BAU scenario



Source: Own elaboration

ENERGY PROSPECTIVE LAC

Figure No. 171 Renewable % of electricity generation, LAC, BAU scenario

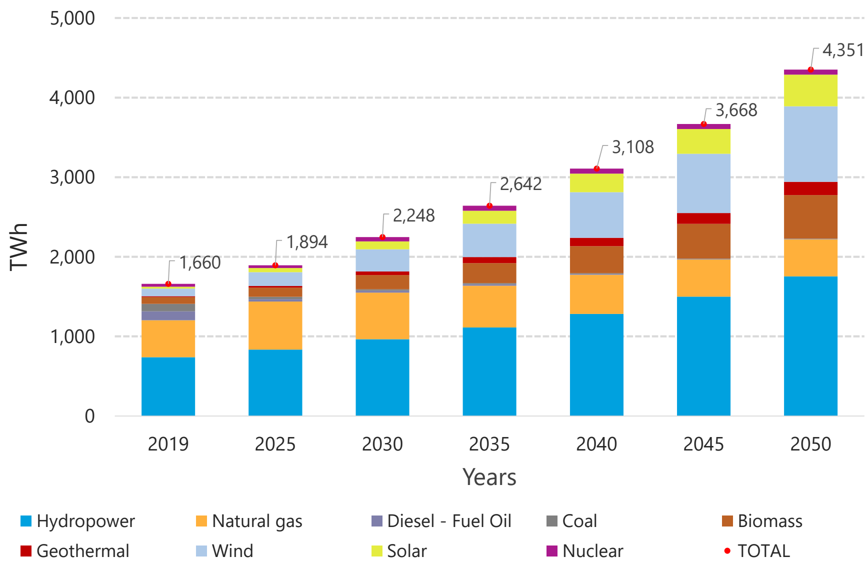


Source: Own elaboration

8.4.2 PRO NET-0 Scenario

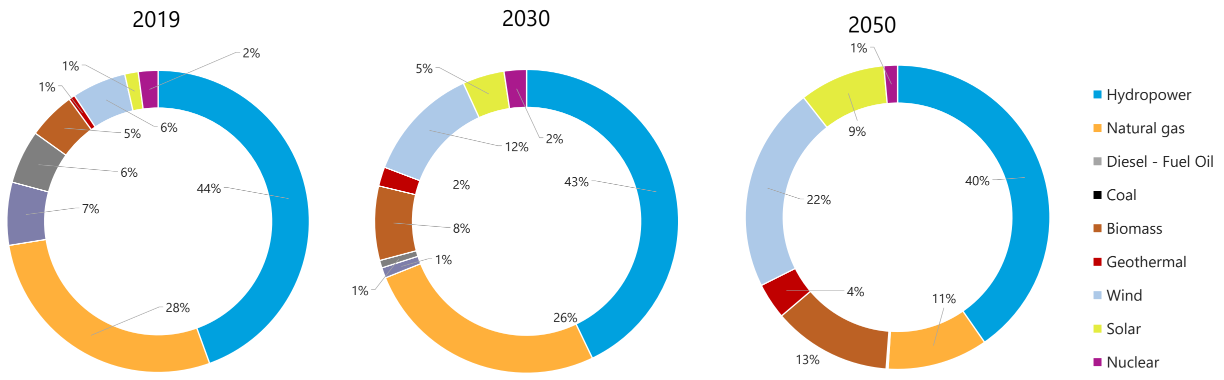
Under the premises of the PRO NET-0 scenario, the electricity generation matrix of the LAC region would increase its renewability index much faster than in the BAU scenario, reaching the 70% renewable target of the RELAC initiative by 2030 and advancing to 88% renewable by the end of the projection period, thanks to the more accelerated penetration of renewable sources such as hydro, wind, solar, biomass and geothermal energy. Due to the increase in electricity demand in the final consumption sectors, annual generation in 2050 would be 36% higher than the value projected in the BAU scenario for that year (**Figures 172, 173 and 174**).

Figure No. 172 Projected electricity generation, LAC, PRO NET-0 scenario



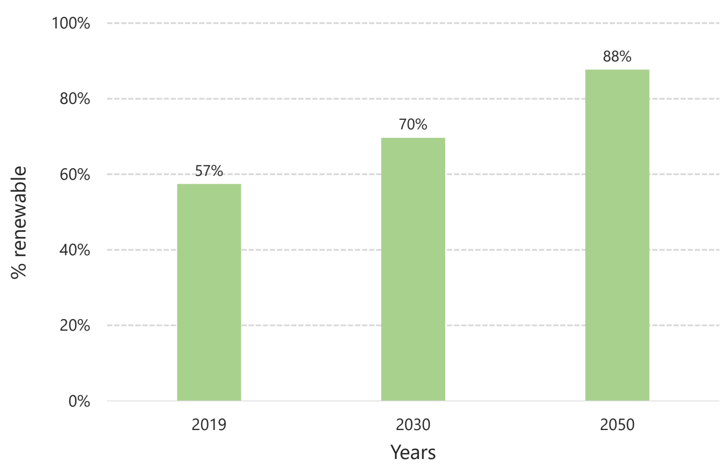
Source: Own elaborationn

Figure No. 173 Structure of electricity generation, LAC, PRO NET-0 scenario



Source: Own elaboration

Figure No. 174 Renewable % of electricity generation, LAC, PRO NET-0 scenario



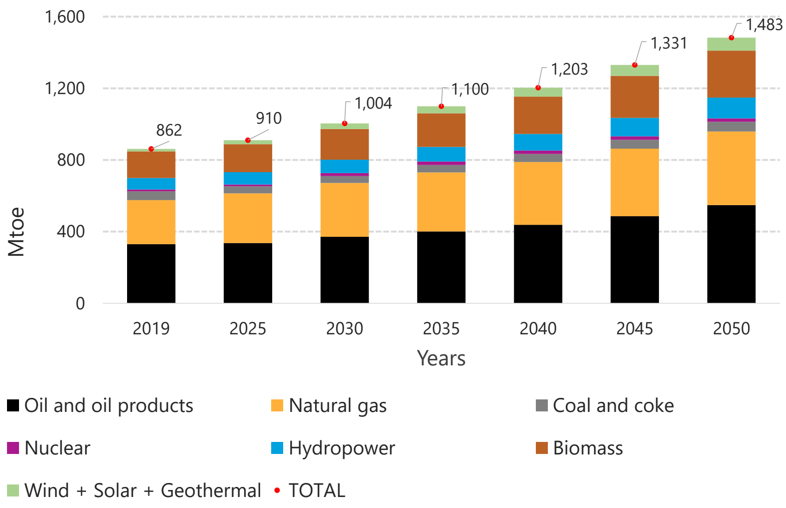
Source: Own elaboration

8.5 Projected total energy supply

8.5.1 BAU Scenario

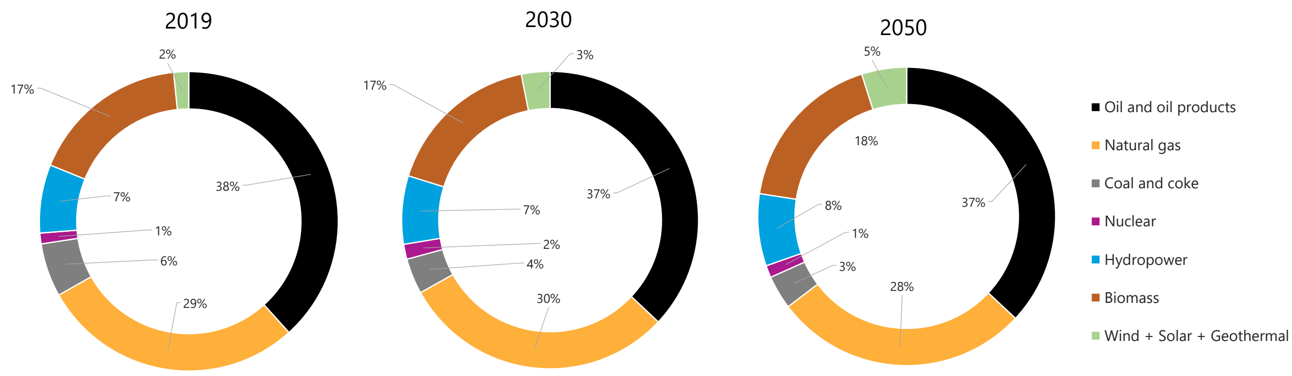
Under the BAU scenario assumptions, the total energy supply matrix of the LAC region experiences a moderate increase in the share of renewable energy, from 26% in the base year to 28% in 2030 and 30% in 2050, gaining some ground over fossil fuels, which, however, as a whole, maintain their predominance until the end of the projection period (**Figures 175, 176 and 177**).

Figure No. 175 Projected total energy supply, LAC, BAU scenario



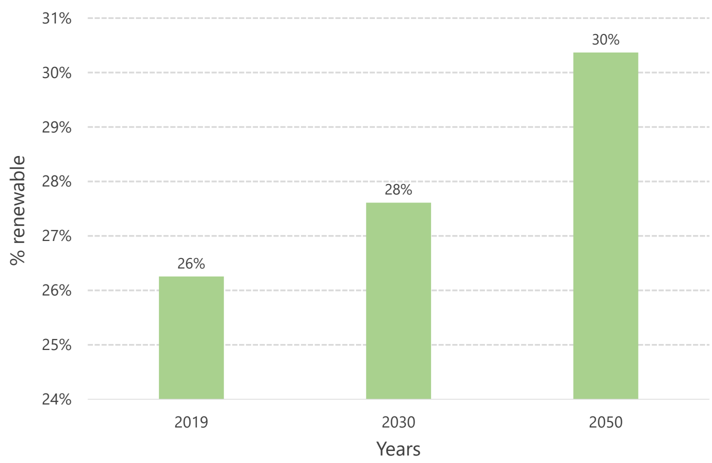
Source: Own elaboration

Figure No. 176 Structure of the total energy supply, LAC, BAU scenario



Source: Own elaboration

Figure No. 177 Renewable % of total energy supply, LAC, BAU scenario

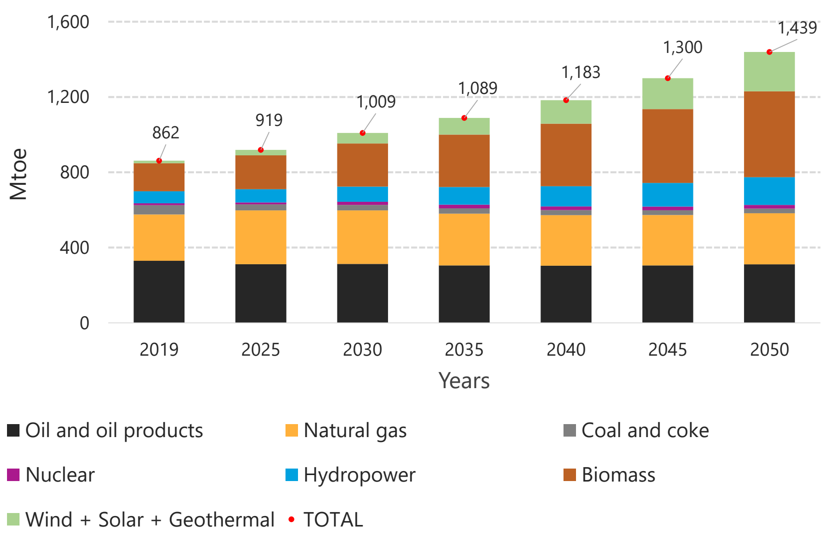


Source: Own elaboration

8.5.2 PRO NET-0 Scenario

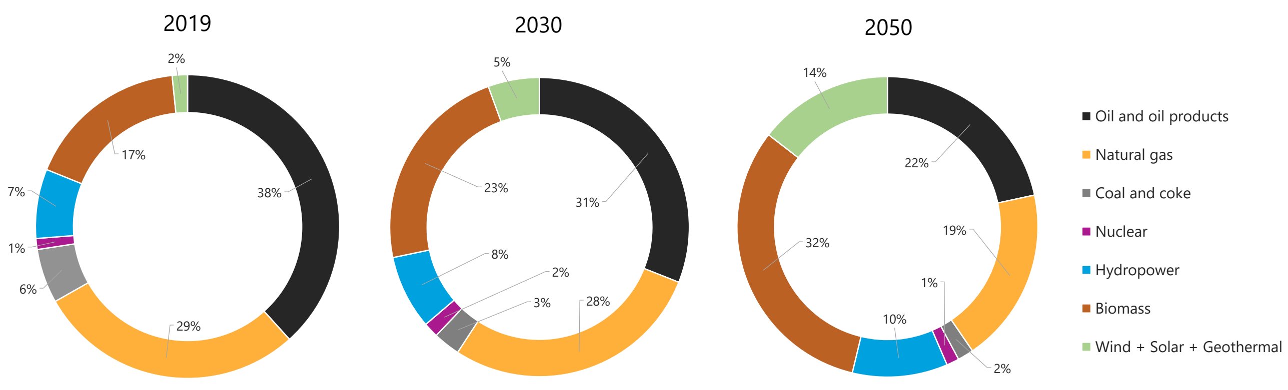
Under the PRO NET-0 scenario, the accelerated penetration of renewable energy sources, both in the final consumption matrix and in the electricity generation matrix, will allow the total energy supply matrix of the LAC region to reach a renewable component of more than 50% by the end of the projection period, which would be an extraordinary achievement, considering that LAC is already the region with the highest rate of renewability in the world's energy matrix. It is also important to note that thanks to the assumptions of the PRO NET-0 scenario, a net saving in annual energy supply of 3% is achieved at the regional level by the end of the projection period, with respect to the value projected in the BAU scenario, despite the fact that in some of the subregions the energy supply was increased (**Figures 178, 179 and 180**).

Figure No. 178 Projected total energy supply, LAC, PRO NET-0 scenario



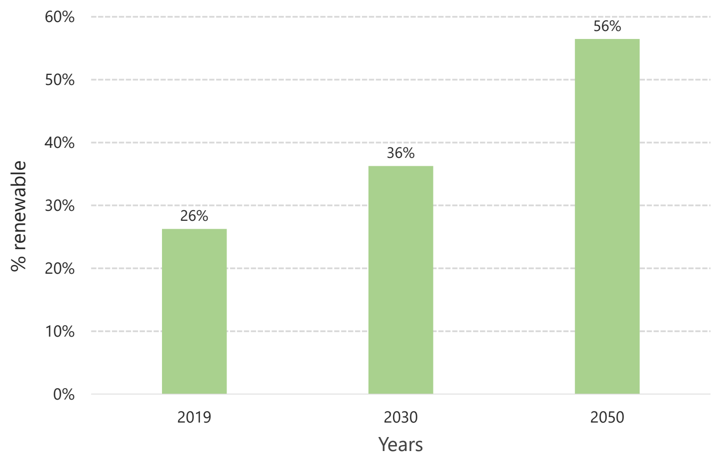
Source: Own elaboration

Figure No. 179 Structure of the total energy supply, LAC, PRO NET-0 scenario



Source: Own elaboration

Figure No. 180 Renewable % of total energy supply, LAC, PRO NET-0 scenario



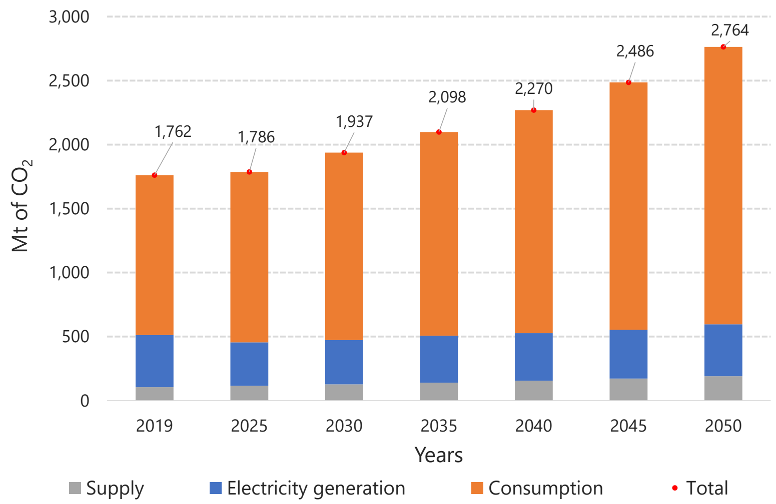
Source: Own elaboration

8.6 Projected CO_2 emissions

8.6.1 BAU Scenario

In the context of the BAU scenario, although the annual CO_2 emissions produced by the electricity sector in the LAC region show a slight decrease during the projection period, the consumption sectors are responsible for a net increase in the annual emissions of the regional energy sector, which increase by 57% with respect to the base year in the projection period (**Figure 181**).

Figure No. 181 Projected CO_2 emissions, LAC, BAU scenario

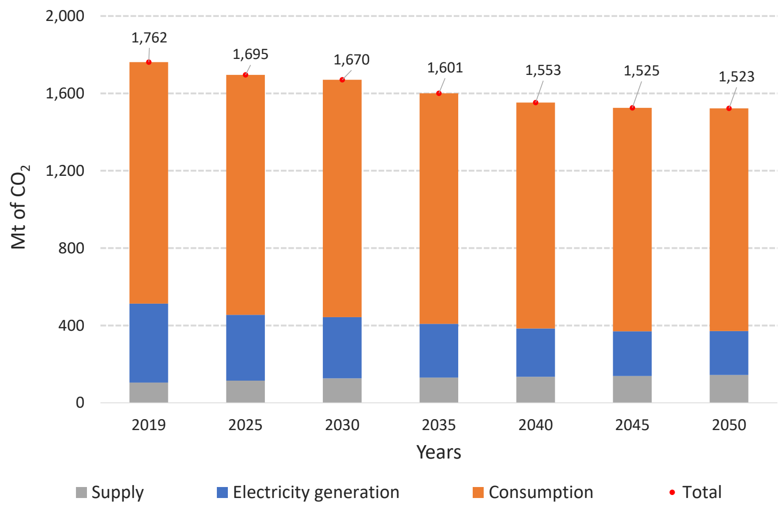


Source: Own elaboration

8.6.2 PRO NET-0 Scenario

Under the assumptions of the PRO NET-0 scenario, annual CO_2 emissions at the regional level decrease during the projection period, both in the electricity generation sector and in the consumption sectors, allowing 14% less CO_2 to be emitted into the atmosphere by 2050 than in the base year and 45% less than the emissions projected in the BAU scenario for that final projection year (**Figure 182**).

Figure No. 182 Projected CO_2 emissions, LAC, PRO NET-0 scenario



Source: Own elaboration

9. CONCLUSIONS

As mentioned in the introductory section, constructing a scenario of net zero CO_2 emissions by 2050, in the strict sense of the word, for the energy sector in the Latin American and Caribbean region would entail knowing the present and future absorption capacity of all carbon sinks for each country in the region, as well as the projected emissions from all other anthropogenic activities; which is completely beyond the scope and objective of this chapter. However, the prospective exercise carried out shows the magnitude and urgency with which the energy matrices of the subregions analyzed must evolve towards a massive use of renewable sources in order to ensure that in the medium and long term, CO_2 emissions in the sector stabilize or begin to decrease, despite the sustained growth in energy demand, typical of emerging economies.

The analysis shows that in order to reach the goal of 70% participation of renewable energies in LAC's electricity generation matrix, both in terms of installed capacity and energy production, as proposed in the RELAC initiative, an additional 151,000 MW of renewable sources should be installed within 10 years, which is equivalent to approximately 90% of Brazil's current capacity and almost double Mexico's installed capacity; and in addition, 72,000 MW of non-renewable thermal power plants should be taken out of operation; all this considering the increase in generation needed to cover a greater penetration of electricity in the final consumption sectors, mainly in transportation.

Additionally, in order to achieve a 14% reduction in annual CO_2 emissions from the region's energy sector with respect to base year levels (2019), over the 30-year projection period, it would be necessary to install 823,000 MW of renewable generation capacity, i.e. almost double the total installed capacity of LAC in 2019, and to phase out 81,000 MW of non-renewable thermal power plants. Even under these conditions, the electricity generation matrix would have a 12% non-renewable component in 2050.

It is also important to note that, in order to cover the demand for biofuels in the final consumption sectors, the supply of biomass in the PRO NET-0 scenario would represent around 80% of the current supply of hydrocarbons (base year) in the projection horizon, which means large extensions of agroenergy crops that could compete with primary forests and food crops.

As a final conclusion of this analysis, it should be mentioned that in order to reach the goal of net zero CO_2 emissions by mid-century, not only should efforts be directed towards reducing emissions from different anthropogenic activities, but at the same time, the capacity of both natural and artificial carbon sinks should be increased.

Annexes and bibliography

ABDAN	Brazilian Association of Nuclear Development Activities
ACHS	Chilean Security Association
AECID	Spanish International Cooperation Agency for Development
ALADI	Latin American Integration Association
ALIDES	Alliance for Sustainable Development
AME	Association of Ecuadorian Municipalities
ANCAP	National Fuel, Alcohol and Portland Administration
ANDE	National Electricity Administration
ANP	National Agency of Petroleum, Natural Gas and Biofuels
ANTEL	National Telecommunications Administration
API	American Petroleum Institute
ARC	Agency for the Regulation and Control of Energy and Non-Renewable Resources
ARCONEL	Electricity Regulation and Control Agency
ARESEP	Public Utilities Regulatory Authority
ATTT	Transit and Land Transportation Authority
ATU	Urban Transport Authority
BHP	Broken Hill Proprietary
BidSIM	Program for Improvement of Bid Rounds for the Exploration and Production of Oil and Natural Gas
BIEE	Energy Efficiency Indicator Base
BNEP	Barbados National Energy Policy
CAN	Andean Community of Nations
CARICOM	Caribbean Community
CBIO	Decarbonization Credit
CCC	Canadian Commercial Corporation
CCREEE	Caribbean Center for Renewable Energy and Energy Efficiency
CDE	Energy Development Account

CENACE	National Energy Control Center
CERT	Tax Reimbursement Certificate
CES	Secondary Education Council
CFE	Federal Electricity Commission
CFLI	Canada Fund for Local Initiatives
CIE	Interinstitutional Statistics Commission
CIH	Intergovernmental Committee for the Paraguay-Paraná Waterway
CIME	Interinstitutional Electric Mobility Commission
CIS	Commonwealth of Independent States
CLDH	Liquid Fuels Derived from Hydrocarbons
CNE	National Energy Commission
CNFL	National Company of Power and Light
CNG	Compressed Natural Gas
CNLV	Laguna Verde Nuclear Power Plant
CNPE	National Council for Energy Policy
CNSNS	National Commission for Nuclear Safety and Safeguards
COE	Emergency Operation Center
COMIECO	Council of Ministers of Economic Integration
CONACE	National Statistical Advisory Council
CPF	Registry of Natural Persons
CRE	Energy Regulatory Commission
CTF	Clean Technology Fund
CTMA	Center for Advanced Manufacturing Technology
CUJAE	Technological University of Havana José Antonio Echeverría
DFA	Development Finance Agency
DG	Distributed Generation
DISNORTE	Electricity Distribution Company of the North

DISSUR	Electricity Distribution Company of the South
DR	Dominican Republic
EC	Energy Conservation
EE	Energy Efficiency
EEC	Energy Efficiency Certificates
EECP	Energy Efficiency and Conservation Program
EEM	Energy Efficiency Measures
EEQ	Empresa Eléctrica Quito
EIB	European Investment Bank
EITI	Extractive Industries Transparency Initiative
ELC	Fuel free energy
ENAP	National Petroleum Company
ENATREL	National Electric Transmission Company
ENCC	National Climate Change Strategy
ENDE	National Electricity Company
ENEL	Nicaraguan Electricity Company
ENRE	National Electricity Regulatory Entity
ENTREL	National Electric Transmission Company
EOR	Enhanced Oil Recovery
EPE	Energy Research Company
ERPA	Emission Reduction Purchase Agreement
FAS	Social Advancement Fund
FAZNI	Financial Support Fund for the Energization of Non-Interconnected Zones
FCPF	Forest Carbon Partnership Facility
FERUM	Rural and Urban Marginal Urban Electrification Program
FISE	Energy Social Inclusion Fund
FNMC	National Climate Change Fund

FOME	Emergency Mitigation Fund
FONAFIFO	National Forestry Financing Fund
FUDAEE	Uruguayan Savings and Energy Efficiency Trust
GCCE	Coordinating Group for the Conservation of Electric Energy
GEA	Guyana Energy Agency
GHG	Greenhouse Gases
GIZ	German Development Cooperation
GSDS	Growth and Sustainable Development Strategy
GU	Generating Units
IAEA	International Atomic Energy Agency
ICE	Costa Rican Electricity Institute
IDB	Inter-American Development Bank
INB	Nuclear Industries of Brazil
INEC	National Institute of Statistic and Census
INEN	Ecuadorian Standardization Service
INPI	National Institute of Indigenous Peoples
IPCA	Amplifid National Consumer Price Index
IPCC	Intergovernmental Panel on Climate Change
IR	Income Tax
IREC	Catalonia Energy Research
IRENA	International Renewable Energy Agency
ISA	International Solar Alliance
ISC	Selective Consumption Tax
ITT	Ishpingo, Tambococha and Tiputini
JCF	Jamaica Constabulary Force
JICA	Japan International Cooperation Agency
LAC	Latin America and the Caribbean

LED	Light Emitting Diode
LIE	Electricity Industry Law
LNG	Liquid Natural Gas
LPC	La Plata Industrial Complex
LPG	Liquefied Petroleum Gas
LUC	Urgent Consideration Law
MEM	Ministry of Energy and Mines
MER	Regional Electricity Market
MERNNR	Ministry of Energy and Non-Renewable Natural Resources
MIEM	Ministry of Industry, Energy and Mining
MINAE	Ministry of Environment and Energy
MME	Electric Mobility Roundtable
MME	Ministry of Mines and Energy
MOPC	Ministry of Public Works and Communications
MOU	Memorandum of Understanding
MOVÉS	Efficient and sustainable urban mobility (Uruaguay Project)
MRE	Energy Reallocation Mechanism
NCES	Non-Conventional Energy Sources
NCRE	Non-Conventional Renewable Energy
NCRES	Non-Conventional Renewable Energy Sources
NDC	Nationally Determined Contribution
NEI	Nuclear Energy Institute of the United States
NGC	National Gas Company
NGV	Natural Gas Vehicle
NTS	New Transporter of the Southeast
OCCRE	Circulation and Residence Control Office
OC-SENI	Coordinating Organization of the Interconnected Electricity System

OEC	Conformity Assessment Bodies
OECD	Organization for Economic Cooperation and Development
OEFA	Environmental Assessment and Control Agency
OLADE	Latin American Energy Organization
OSINERGMIN	Energy and Mining Investment Supervisory Agency
OTP	Public Transport Operators
PALCEE	Program for Latin America and the Caribbean in Energy Efficiency
PCJ	Petroleum Corporation of Jamaica
PDAC	Prospectors and Developers Association of Canada
PDE	Ten-Year Energy Expansion Plan
PDET	Development Programs with a Territorial Approach
PEC	Stabilized Price to Regulated Customer
PEECES	Energy Efficiency Program Caribbean Sustainable Energy
PEMEX	Petróleos Mexicanos
PEN	National Energy Policy
PETROBRAS	Petróleo Brasileiro S.A.
PGAI	Institutional Environmental Management Plans
PHARES	Haitian Program for Access of Rural Communities to Solar Energy
PIST	Point of entry to the transportation system
PLANEE	National Energy Efficiency Plan
PNCB	National Biomass Certification Program
PNE	National Energy Plan
PNER	National Rural Electrification Plan
Pneser	National Program for Sustainable Electrification and Renewable Energy
PNP	Average Node Price
PNTE	National Electric Transportation Plan
PPP	Public-private partnerships

PROEZA	Poverty, Reforestation, Energy and Climate Change
PROFONANPE	Fund for the Promotion of Protected Natural Areas of Peru
Promar	Maritime Fields Production
Promarnat	Sectoral Program for the Environment and Natural Resources
Pronaf	National Program to Strengthen Family Farming
PSA	Payment for Environmental Services Program
PTB	Physical Technical Federal Institute (Translated from German)
RCE	Regulated Contracting Environment
REATE	Revitalization Program for onshore Oil and Natural Gas Exploration and Production
RECOPE	Costa Rican Oil Refinery
RenovaBio	National Biofuels Policy
RRA	Renewable Energy Readiness Assessment
RTCA	Central American Technical Regulation
SAC	Closed Stock Company
SADI	Argentine Interconnection System
SDDP	Stochastic Dual Dynamic Programming
SDGs	Sustainable Development Goals
SEIN	National Interconnected Electric System
Semarnat	Secretariat of Environment and Natural Resources
SEN	National Statistics System
SENER	Energy Secretariat
SENI	National Interconnected Electric System
SER	Rural Electric System
SHP	Small Hydropower Plant
SIC	Central South Electric System
SICA	Central American Integration System
Sicaf	Single Supplier Registration System

SIE	Energy Information System
sieLAC	Energy Information System of Latin America and the Caribbean
SIESUR	Southern Energy Integration System
SIGET	General Superintendence of Electricity and Telecommunications
SIN	National interconnected system
SINAC	National System of Conservation Areas
SINEA	Andean Electric Interconnection System
SING	Norte Grande Electric System
SITGAS	Integrated Gas Transportation System
SMR	Low and medium power modular reactors
SNE	National Energy Secretariat
SNEE	National Energy Efficiency System
SNRCC	National Climate Change Response System
SOSEM	Systematic of Operation in a Downstream Hydrological Emergency Situation
SOTE	Trans-Ecuadorian Pipeline System
SREP	Renewable Energies Expansion Program
STAT	Extra High Voltage Electric Power Transmission System
STDT	Electric Power Transmission System by Mainline Distribution
TBG	Transportadora Brasileira Gasoduto Bolivia-Brasil SA
TCM	Moín Container Terminals
TMI S.A.	TSK Melfosur International
TPM	Deadweight Tons
TRB	Gross Registered Tonnage
TUSD	Fee for Use of the Distribution System
TUST	Fee for the Use of the Transmission System
UAE-CREF	United Arab Emirates -Caribbean Renewable Energy Fund
UESTEE	Special Unit of the Electric Power Transportation System

UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UPME	Mining and Energy Planning Unit
URA	Caetité Uranium Concentration Unit
URSEA	Regulatory Unit for Energy and Water Services
USBEF	Brazil-United States Energy Forum
uSFV	Photovoltaic microgeneration systems
UTE	National Administration of Electric Power Plants and Transmissions
UTE	National Administration of Electric Power Plants and Transmissions
UTU	Council of Professional Technical Education / University of Labor of Uruguay
VAT	Value Added Tax
VMME	Viceministry of Mines and Energy
VRF	Variable Refrigerant Flow
WHO	World Health Organization
WTI	West Texas Intermediate
YPFB	Bolivian Fiscal Oil Fields

Ah	Amp-Hours
°C	Degrees Celsius
°F	Degrees Fahrenheit
bbl / day	American barrels per day
boe / day	Barrels of oil equivalent per day
BTU	British Thermal Unit
CO_2	Carbon dioxide
cSt	centistokes
GDP	Gross Domestic Product
Gm^3	Billions of cubic meters
GRT	Gross Registered Tonnage
GW	Gigawatt
GWh	Gigawatt hour
GWh / year	Gigawatt hour per year
ha	Hectare
inhab. / m^2	Inhabitants per square meter
kbbl / day	Thousands of barrels per day
kg CO_2 /day	Kilograms of carbon dioxide per day
km	Kilometer
km^2	Square kilometer
koe	Kilogram of oil equivalent
koe / USD	Kilogram of oil equivalent per US dollar
koe / USD 2011 PPP	Kilogram of oil equivalent per US dollars at constant prices 2011 (Purchasing Power Parity)
kt	Thousands of metric tons
ktoe	Thousands of tons of oil equivalent
kV	Kilovolt

kW	Kilowatt
kWh	Kilowatt hour
kWh / day	Kilowatt hour per day
kWh / month	Kilowatt hour per month
kWp	Kilowatt peak
m	Meter
m^2	Square meters
m^3	Cubic meters
Mbbl	Millions of American barrels
Mbbl / day	Millions of barrels per day
Mboe	Millions of barrels of oil equivalent
MBTU	Millions of British Thermal Units
Mcf	Million cubic feet
Mcfad	Million cubic feet average daily
Mcfd	Millions of cubic feet per day
Mm^3	Millions of cubic meters
Mm^3 / day	Millions of cubic meters per day
Mt	Millions of metric tons
$MtCO_2$	Millions of tons of carbon dioxide
$MtCO_2eq$	Millions of tons of carbon dioxide equivalent
Mtoe	Million tons of oil equivalent
MUSD	Millions of US dollars
MVA	Megavolt ampere
MW	Megawatt
MWe	Electric megawatt
MWh	Megawatt hour
MWh / year	Megawatt hour per year

MWp	Megawatt peak
ppm	Parts per Million
PPP	Purchasing Power Parity
QCM	Quintillion cubic meters
SHP	Small Hydropower Plant
t	Metric ton
t / inhab.	Tons per inhabitant
tCO_2	Tons of carbon dioxide
tCO_2 / toe	Tons of carbon dioxide per tons of oil equivalent
tCO_2 / year	Tons of carbon dioxide per year
tCO2eq	Tons of carbon dioxide equivalent
thousand inhab.	Millions of inhabitants
toe / inhab.	Tons of oil equivalent per inhabitant
ton / day	Tons per day
ton / hour	Tons per hour
TWh	Terawatt hour
USD	American Dollars
USD 2011 PPP	US dollars at constant prices 2011 (Purchasing Power Parity)
W	Watt

REFERENCE CONVERSION FACTORS USED BY OLADE's MEMBER COUNTRIES (YEAR 2020)

Original Units	kbbl	Mm³	kt	GWh	GWh	kg	kt	GWh	kbbl	kbbl	kbbl	kbbl	kbbl	kt	kt	kbbl
A: boe x 10³	Oil	Natural gas	Coal	Hydroenergy	Geothermal	Nuclear	Firewood	Electricity	LPG	Gasoline	Kerosene/Jet	Diesel oil	Fuel oil	Coke	Charcoal	Alcohol
Argentina	1.0196	6.2127	5.1881	0.6197		110.1888	1.4916	0.6197	0.7010	0.8934	0.9583	1.0015	1.0304	4.8998	5.0440	0.9096
Barbados	1.0015	5.9806	5.0439	0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8998	4.9718	
Belize	1.0015	5.9806	5.0439	0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8998	4.9718	
Bolivia	1.0015	5.9806	5.0439	0.6196			2.3417	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8998	4.9718	
Brazil	1.0208	6.1969	3.4659	0.6197		532.5556	2.2338	0.6197	0.6999	0.9022	0.8212	0.8473	0.9561	4.9719	4.6548	0.6424
Chile	1.0551	6.6721	5.0440	0.6197			2.4002	0.6197	0.7624	0.9366	1.0300	1.0300	1.0300	5.0000		
Colombia	1.0476	6.1359	4.9498	0.6196			2.9246	0.6196	0.6981	0.9175	0.8109	0.9760	0.9398	3.4593	4.6829	0.5826
Costa Rica	0.9940		5.2630	0.6200	0.6200		3.0999	0.6200	0.6992	0.8938	0.9438	0.9937	1.0660	4.9392	4.6861	
Cuba	1.0015	6.3604	5.7645	0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8998	4.9718	
Dominican Republic	1.0015	5.9806	5.0439	0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8999	4.9724	
Ecuador	1.0015	5.9806		0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304			
El Salvador				0.6196	0.6196		2.5316	0.6196	0.7009	0.8831	0.9488	0.9916	1.0717	4.8998	4.6837	
Grenada		5.9806	5.0439	0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8998	4.9718	
Guatemala	0.9935		5.0469	0.6200	0.6200		2.5955	0.6200	0.6705	0.8918	0.9459	0.9935	1.0691	4.9027		
Guyana	1.0015	5.9806	5.0439	0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8998	4.9718	
Haiti	1.0015	5.9806	5.0439	0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8998	4.9718	
Honduras			5.0439	0.6196			2.5940	0.6196	0.6701	0.8711	0.9583	1.0087	1.0462	4.9000	4.9718	
Jamaica	1.0015	5.9806	5.0439	0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8998	4.9718	
Mexico*	1.0555	7.3428	5.0520	0.6196	0.6196	566.0843	2.4948	0.6196	0.7152	0.9074	0.9906	1.0316	1.1155	5.1551		
Nicaragua	1.0059			0.6196	0.6197		2.3086	0.6197	0.6975	0.8906	0.9540	0.9857	1.0679	0.5009	2.7864	
Panama	1.0015	5.9805	5.2690	0.6196			2.6940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.9100	4.8926	
Paraguay			5.0359	0.6197			2.5940	0.6196	0.6899	0.8901	0.9450	0.9921	1.0701	5.5977	4.9718	0.5957
Peru	0.9973	6.9749	5.0439	0.6197			2.5940	0.6197	0.6845	0.8791	0.9584	0.9944	1.0593	4.6115	4.7016	
Suriname	1.0015	5.9806	5.0439	0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8998	4.9718	
Trinidad & Tobago	1.0015	5.9806	5.0439	0.6196			2.5940	0.6196	0.6701	0.8934	0.9583	1.0015	1.0304	4.8998	4.9718	
Uruguay**	0.9688	5.9807	5.0440	0.6197			1.9455	0.6728	0.6730	0.9055	0.9510	0.9706	1.0770	4.8998	5.4042	
Venezuela	1.0391	7.3453	5.4029	0.6072			2.5219	0.6072	0.7361	0.9990	1.0850	1.1408	1.2058	5.0621	5.6252	0.5804

(*) The natural gas data corresponds to the weighted production.
(**) The coke data corresponds to coal coke.

COAL IMPORTS

Argentina	10³ ton =	5.1881	10³ boe	
Brazil	10³ ton =	3.4573	10³ boe	
Peru	10³ ton =	5.2601	10³ boe	
	10⁶ m³	Refinery Gas =	7.9261	10³ boe
	10⁶ m³	Coke oven gas =	3.0263	10³ boe
Other	10⁶ m³	Blast furnace gas =	0.6485	10³ boe
	10⁶ m³	GasWorks Gas =	2.8820	10³ boe
	10⁶ m³	Biogas =	3.9630	10³ boe
	10⁶ m³	Bagasse =	1.3114	10³ boe

CONVERSION TABLE FOR ENERGY UNITS

	boe	toe	tce	Tcal	TJ	10³ BTU	MWh	kg LPG	m³ Nat. gas	cf Nat. gas
boe	1	0.13878	0.1982593	0.00139	0.00581	5,524.86	1.61394	131.0616	167.2073	5,917.1598
toe	7.205649	1	1.4285868	0.01	0.04184	39,810.22	11.62952	944.3839	1,204.8371	42,636.9763
tce	5.04390	0.6999925	1	0.007	0.029288	27,866.85	8.14057	661.0616	843.3769	29,845.5621
Tcal	720.56490	100	142.85868	1	4.184	3,981,022	1162.9520	94,438.388	120,483.714	4,263,697.6
TJ	172.21914	23.900574	34.144044	0.2390057	1	951,487	277.95214	22,571.316	28,796.2988	1,019,048.19
10³ BTU	0.00018	2.51E-05	3.59E-05	2.51E-07	1.05E-06	1	0.00029	0.02372	0.030265	1.07101
MWh	0.61960	0.08599	0.1228	0.00086	0.0036	3,423.2	1	81.20577	103.6016	3,666.2722
kg LPG	0.00763	0.00106	0.001513	1.06E-05	4.43E-05	42.154696	0.0123144	1	1.2758	45.1479
m³ Nat gas.	0.00598	0.00083	0.001186	8.30E-06	3.47E-05	33.041989	0.0096524	0.783827	1	35.3882
cf Nat gas.	0.00017	2.35E-05	3.35E-05	2.35E-07	9.81E-07	0.9337017	0.0002728	0.0221494	0.02825803	1

1bbl LPG = 0.6701 bep   1bbl LPG = 0.15898 m³ = 5.6143 cf   1m³ LPG = 552.4 kg   1 cf = 0.028317 m³

Summary description of the SAME Model

The SAME is a simulation model of technical coefficients, developed by OLADE, that allows the construction of different prospective scenarios of demand and supply energy for a given study horizon.

It is very versatile in the projection method being able to generate in a very agile tendential, evolutionary or rupture scenarios, allowing to simulate policies of diversification of the matrix of final consumption and energy supply, measures to reduce greenhouse gas emissions (GHG) and energy efficiency programs.

As a parameter of comparison between the developed scenarios, it provides various energy, economic and environmental indicators, such as the following:

a) Index of the renewability of energy supply.
b) Index of autarchy or energy sufficiency.
c) Average GHG emissions factor of the integral energy matrix.
d) Average GHG emissions factor of the electricity generation matrix.
e) Levelized cost of electricity.
f) Structure of energy consumption.
g) Structure of the total energy supply.
h) Structure of the electricity generation matrix.
i) Projected energy balances.
j) Forecast of GHG emissions.
k) Forecast of the installed capacity of electricity generation and other energy supply infrastructure.
l) Scope of proven reserves of fossil energy sources.
m) Level of exploitation of the potentials of renewable energy sources.
n) Projection of energy efficiency indexes by final use of energy.

Utility of the Model

Among other applications of the SAME Model, the following can be mentioned:

- ⇨ It is ideal for designing and fine-tuning sustainable energy development policies.
- ⇨ It allows to update studies of energy forecast before the change of premises or of exogenous and endogenous conjuncture.
- ⇨ Build exploratory scenarios of coherent futures in the energy sector.
- ⇨ Build scenarios type roadmap or anticipation.
- ⇨ Prepare national energy development plans, both integral and sectoral.

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