



Cuba

Independent regional climate change assessment

Key opportunities for climate ambition and implementation



- » Investment in climate-resilient infrastructure, such as housing, roads and new drainage systems, offers the opportunity to reduce the vulnerability of communities, protect the country's economic assets, strengthen its resilience and promote sustainable development.
- » Cuba's geographic location and favorable climatic conditions provide an excellent opportunity for the development of renewable energies, particularly solar and wind.
- » It is essential to develop integrated financial strategies, based on financing needs to meet national mitigation and adaptation objectives and capacity building for the formulation of bankable projects.

Although Cuba has made progress in developing renewable energies, such as solar and wind, significant barriers remain. In many areas, Cuba's energy infrastructure is obsolete and inefficient. Cuba still relies heavily on fossil fuels for its energy supply, particularly oil. Investing in sustainable development technologies will help reduce dependence on fossil fuels and contribute to society by improving health, creating jobs and promoting the country's technological innovation.



Climate Justice

Climate policy instruments

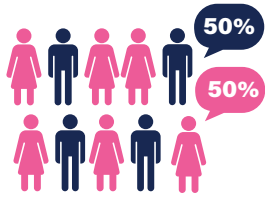
In compliance with the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement, the countries parties have developed regulatory instruments, institutional and budgetary arrangements to address the effects of climate change at the national level. The following is a list of some of the instruments that frame climate action at the domestic level:

NDC	1st NDC Updated (2020, 2016)
Target 2030 y 2050	Target to 2030: From 2014-2030 for each of the measures, total cumulative reduction by 2030 would reach 910 MtCO _{2e} . Target to 2050: Cuba has not reported its 2050 target yet.
BUR	1st BUR, 2020
LTS	Cuba has not yet presented its Long-Term Low Carbon Strategy
NC	3rd NC (2020, 2025, 2001)
PNA	Cuba has not submitted its National Adaptation Plan
Laws relevant to climate change	<ul style="list-style-type: none"> - Law No. 75 of Civil Defense and Decree-Law No. 170 of the Civil Defense Measures System (Disaster Management as a Response to Frequent Extreme Events). - Decree Law No. 337 on terrestrial waters - Decree-Law No. 147 on Reorganization of the Organs of the Central State Administration (creation of the Ministry of Science, Technology and Environment responsible for Climate Change policy).



Cuba

Context



Population of **11.3 million** inhabitants (2021)
Source: World Bank, 2022



No official information on the number of people belonging to or descending from **Indigenous peoples**.



Emissions per capita
4 tCO₂e/cápita.
Source: BUR, 2020



SOCIOECONOMIC



Cuba

76.9%



Inhabitants in urban areas 2023
Source: World Bank, 2022



Regional average

81.2%

0.76%

Index of **human development** 2021
Source: UNDP, 2022



0.75%

9,478 USD\$



GDP per capita in 2021
Source: World Bank, 2022

8,340 USD\$

72%

Poverty 2020
Source: Cepal, 2022



32%

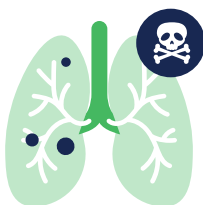
NO DATA



Gini Index income inequality in 2020
Source: Cepal, 2022

0.46

HABITAT AND ENVIRONMENT



Deaths attributed to **air pollution**
23 per 100,000 inhabitants
Source: IHME, 2019



Surface of **native forests** **29.5%** of total surface area of Cuba.
(**32,000 km²** in 2021)
Source: World Bank, 2022



Cuba

Adaptation and Vulnerability

With the signing of the Paris Agreement, the parties committed to increase capacity to adapt to the adverse effects of climate change and build climate resilience, as well as to promote low-GHG development.



CONTEXT

Cuba faces several challenges that include environmental, economic and social aspects, such as exposure to hurricanes, storms and prolonged droughts, which can exacerbate public health problems, such as vector-borne diseases (dengue, zika), and affect air and water quality.



KEY OPPORTUNITIES

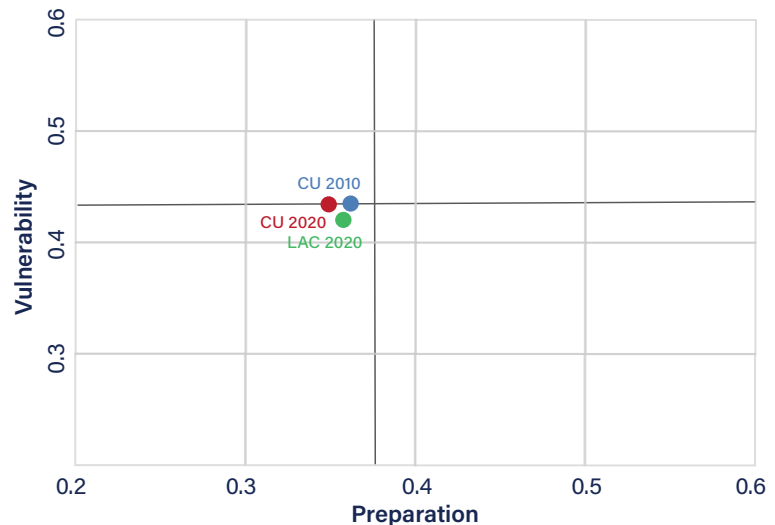
Given the vulnerability of coastal zones, it is advisable to apply environmentally compatible engineering concepts that reduce the susceptibility of historical-cultural sites. This approach ensures the development of protected urbanism that is highly resilient to the combined impacts of sea-level rise and extreme weather events.

3.1 Vulnerability and preparedness

According to the methodology developed by the University of Notre Dame (ND-GAIN Country Index ¹) to establish the degree of vulnerability of countries in relation to their degree of preparedness, Cuba shows average levels in both aspects, with no major advances in its level of preparedness from 2010 to the present (Figure 1).

The vertical axis shows the vulnerability score, and the horizontal axis shows the readiness score for the country. The dark blue dot represents the initial year 2010, the red dot the final year 2020 and the green dot indicates the regional average for the year 2020.

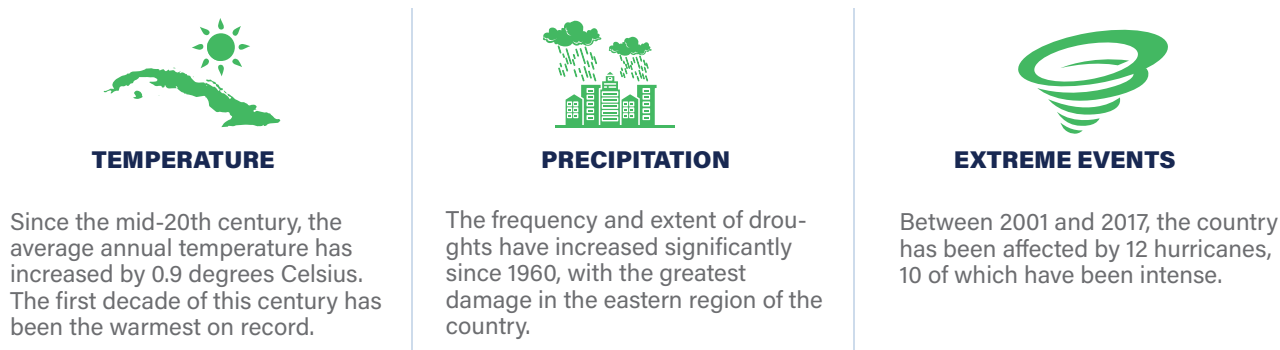
Figure 1. Comparative resilience 2010-2020.



Source: Prepared by the authors based on ND-GAIN, 2023.

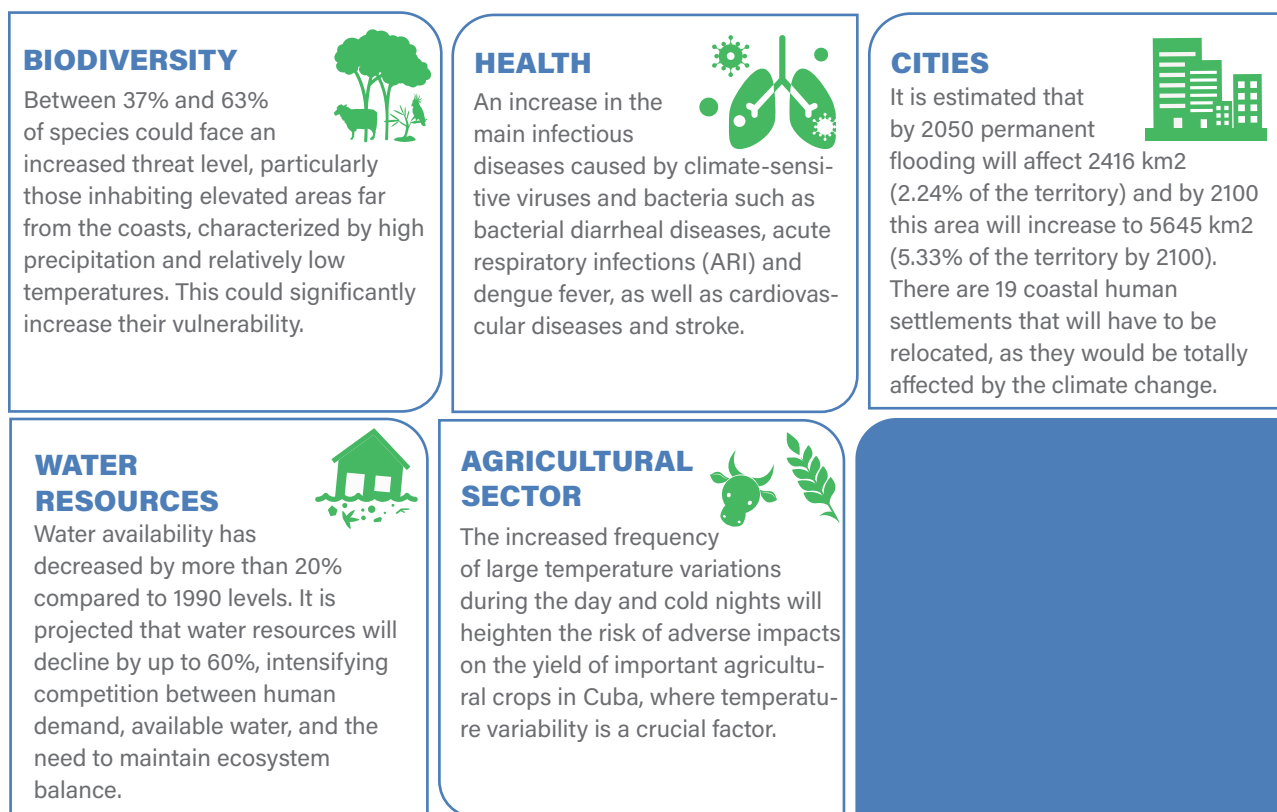
¹ The ND-GAIN country index summarizes a country's vulnerability to climate change and other global challenges combined with its readiness to improve resilience. It aims to help governments, businesses and communities better prioritize investments for a more efficient response to the immediate global challenges ahead. In this methodology, vulnerability measures a country's exposure, sensitivity and adaptive capacity to the negative effects of climate change, considering six life-supporting sectors: food, water, health, ecosystem services, human habitat and infrastructure. On the other hand, preparedness measures a country's capacity to leverage investments and convert them into adaptation actions, considering three components: economic preparedness, governance preparedness and social preparedness. <https://gain.nd.edu/our-work/country-index/>

Figure 2. Examples of changes observed in Cuba



Sources: NDC, 2020; TCN, 2020; NDC, 2022.

Figure 3. Projected impacts.



Sources: TCN, 2020; NDC, 2022.

3.2 Adaptation policies and measures

Although the Cuban government has not presented its National Adaptation Plan, it is possible to identify the status of implementation of its adaptation programs based on two alternative documents. First, in 2017, the State Plan for Confronting Climate Change of the Cuban Republic was presented (PEECCRC).




The program, called Tarea Vida, stipulates 5 strategic actions (SA) and 11 tasks focused on solving the main problems related to vulnerability, adaptation and mitigation of climate change. The implementation process of the tasks depends on the sectoral and territorial plans.



Second, in 2020, the government presented its third National Communication (NC) to the United Nations Framework Convention on Climate Change. This document describes Cuba's achievements and progress in implementing its mitigation and adaptation policies with respect to the previous NC presented in 2015.

Based on both documents, it is possible to trace the policies and projects that the Cuban government considers priorities for reducing its vulnerability and increase their degree of adaptation

to climate change. The following table details the implementation actions included in the Third NC that is directly related to the Strategic Actions and Tasks of the Life Task Plan that reflect the adaptation priorities of the Cuban government. Given that a system for monitoring and recording progress in implementation has not been implemented, it is only possible to identify concrete progress in some areas.

Table 1. Sectors with prioritized measures for adaptation.

Sectors	Measure	Degree of implementation (identified priorities / initiatives / flagship projects)
 <p>Human settlements and land use (AE focused on the 15 areas identified as most vulnerable)</p>	<p>SA 1: Prohibit construction in potentially threatened coastal settlements.</p>	<p>New housing developments are prohibited, with a greater emphasis placed on urban growth within existing cities that already have infrastructure.</p>
	<p>SA 1: Reduce population density in low-lying coastal areas.</p>	<p>Implementation of building and entry regulations for coastal zones, as well as prohibition of licenses for new vacation homes. Implementation of educational programs to reduce urbanization violations that contribute to population growth in low-lying coastal areas.</p>
	<p>SA 2: Develop new infrastructure adapted to coastal flooding.</p>	<p>Implementation of building and entry regulations for coastal zones, as well as prohibition of licenses for new vacation homes. Implementation of educational programs to reduce urbanization violations that contribute to population growth in low-lying coastal areas.</p>
	<p>SA 5: Plan urban reorganization processes.</p>	<p>Studies on areas designated for relocation of the population, especially after devastating hurricanes.</p>
 <p>Water resources/ Water and sanitation</p>	<p>Task 4: Ensure the availability and efficient use of water, based on the application of technologies and the satisfaction of local demands.</p>	<p>Significant hydraulic development has been achieved and is expanding, ensuring a sustainable water supply. This includes the construction of 242 dams, 700 micro-dams, 790 km of main canals, and 914 km of protection works (including 88 km against marine intrusion and the rest against flooding). 1.7 million people have experienced improvements in drinking water service since 2013 with an increase of 2.7% to basic sanitation services (equivalent to 364,600 inhabitants).</p> <p>Rehabilitation work on 2,379 km of pipelines and aqueduct networks, and recovery of 120 million cubic meters of water.</p>
 <p>Coastal zones marines resources</p>	<p>Task 3: To conserve and fully restore the numerous beaches.</p>	<p>Dumping of sand for the purpose of regenerating the beaches used for tourist purposes in Varadero, Cayo Coco, Cayo Guillermo and the Villa Clara tourist area.</p>
	<p>Task 6: Rehabilitate the most affected coral reefs and mangroves.</p>	<p>Through a perspective that prioritizes nature-based solutions, there is experimentation on the creation of coral farms in Pinar del Río and coral species nurseries have been created in the provinces of Artemisa and Mayabeque.</p>

	<p>Agriculture</p>	<p>SA 3: Adapt agricultural activities to changes in land use caused by sea level rise and drought.</p>	<p>1.Potato: Elimination of potato cultivation in provinces with unfavorable climatic conditions. High yield potential varieties have been used, and to adapt to each territory.</p> <p>2.Rice: Development of 12 rice varieties with tolerance to salinity, low water and fertilizer inputs, low temperatures and resistance to the <i>Steneotarsonemus spinki</i> mite. Work has been done on resistance to biotic and abiotic stresses and to eliminate the use of insecticides in the country.</p> <p>3.Tobacco: A new design of tobacco houses in the Pinar del Río plains is more resistant to the effects of climate change.</p> <p>Research projects to study tobacco varieties resistant to abiotic stress, caused by water scarcity, humidity, salinity and pests.</p> <p>4.Swine: In the swine sector, adaptation measures related to swine habitat have been implemented.</p>
	<p>Forests</p>	<p>Direct reforestation towards maximum soil protection.</p>	<p>1.Identification of endemic tree species and program for the conservation of these genetic resources.</p> <p>2.Areas that will be affected by sea level rise have been identified.</p> <p>3.Identification and classification of municipalities vulnerable to climate change.</p> <p>4.The importance of reactivating the national inventory of forest pests has been emphasized and the need for action has been argued to the Health System of the Ministry of Agriculture.</p>

Source: Prepared by the authors based on the State Plan to Confront Climate Change of the Cuban Republic and the Third National Communication of Cuba



Cuba

Mitigation

With the signing of the Paris Agreement, parties committed to keep the global average temperature increase well below 2°C above of pre-industrial levels and to continue efforts to limit it to 1.5°C.



CONTEXT

The country has seen an increase in gas and crude oil consumption due to the exploitation of oil fields, the commissioning of combined cycle plants for electricity generation, and the use of gas in the residential sector.



KEY OPPORTUNITIES

The following are identified as priority lines of action: the consolidation of the local model for the management of natural resources to address climate change and the formulation of long-term strategies for a "lower carbon development".

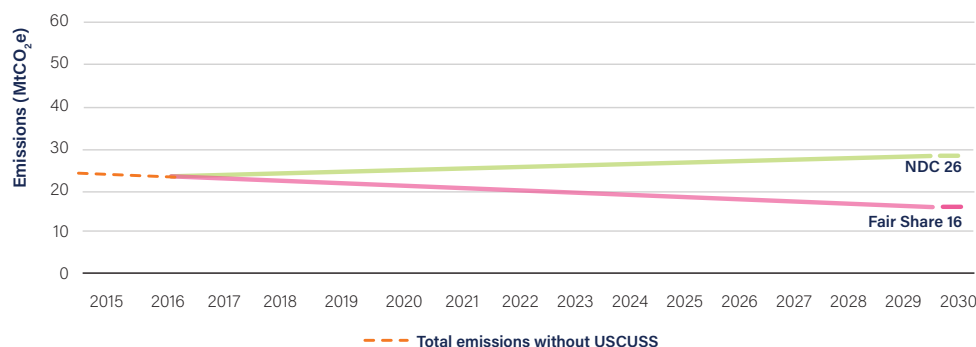
4.1 Country contribution to emissions

Cuba's latest total annual emissions reported by the country were 50.2 MtCO₂e in 2020, and 23.1 MtCO₂e if land use emissions (LULUCF) are not considered (BUR, 2020).

In the latest update of its NDC, Cuba commits not to exceed 26 MtCO₂e per year by 2030, representing a 48% reduction in emissions compared to 2016 (see figure 4).

Whereas, considering the fair contribution for Cuba (Fair Share²), according to the Stockholm Environment Institute Calculator (SEI, 2023), the country should reduce its emissions to 16 MtCO₂e by 2030 (without considering LULUCF). This implies a reduction of almost 31% compared to emissions in 2016 (see Figure 4).

Figure 4. Cuba's NDC target and fair share without USCUS.

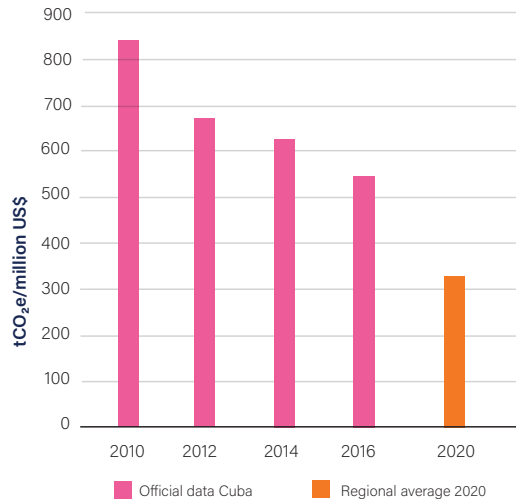


Source: Own elaboration based on BUR, 2020; NDC, 2021; SEI, 2023.

The emissions intensity of the Cuban economy has shown a decrease of more than 50% over 2010-2020 reaching 326 tCO₂ e/million USD\$ in 2020 (own calculation based on EDGAR, 2022; FAO, 2022; World Bank, 2022), lower than the regional average of the same year 640 tCO₂ e/

million USD\$ (EDGAR, 2022; IPCC, 2022; World Bank, 2022). If the official data for Cuba is considered, the emissions intensity of the economy decreased by 35% between 2010 and 2016 (BUR, 2020).

Figure 5. Carbon intensity of the economy (tCO₂ e / million USD\$).



Source: Own elaboration based on official country data: BUR, 2020.

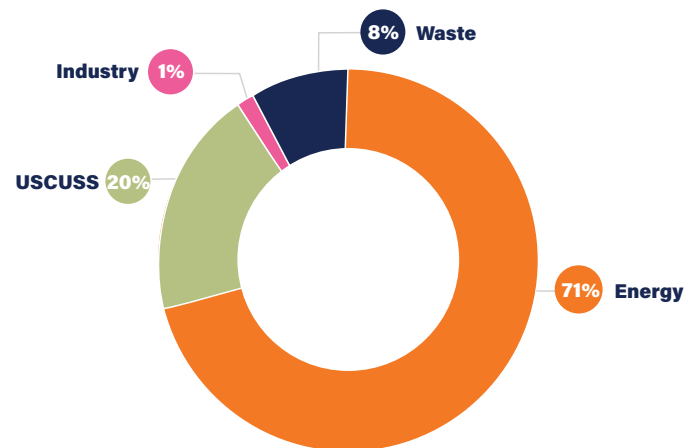
4.2 Emissions by sector

71% of the country's emissions comes from the energy sector, while another 20% come from the Agriculture, Forestry and other land use sector (BUR, 2020).

Energy

Cuba's fossil fuel reserves (natural gas, oil, and coal) account for a negligible percentage of the total reserves in Latin America and the Caribbean (OLADE, 2022; BP, 2022; Our World in Data, 2022).

Figure 6. Total emissions by sector 2020.



Source: Own elaboration based on BUR, 2020.

2 The Fair Share represents the fraction of emissions that each country should emit at most (in this case by 2030) in order not to exceed the 1.5°C average global temperature increase. Various methodologies exist for calculating the Fair Share, and the one used here, developed by SEI, is chosen for its comprehensive coverage of all Latin American and Caribbean countries. Considerations used for the calculation (SEI): Historical responsibility: since 1850, Mitigation pathway: 1.5°C standard (excl LULUCF), Capacity: \$0 development threshold, 50% Responsibility - 50% Capacity.

Figure 7. Cuba's fossil fuel reserves and its share of total LAC reserves

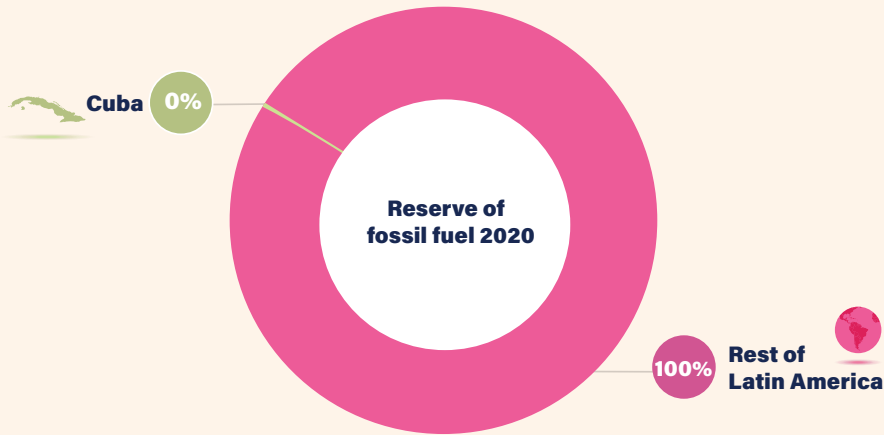
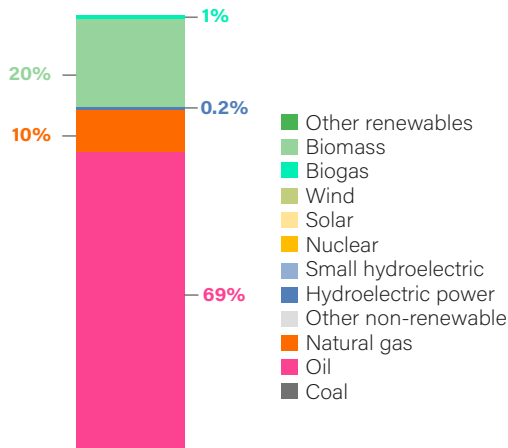


Figura 8. Primary energy matrix 2010-2021

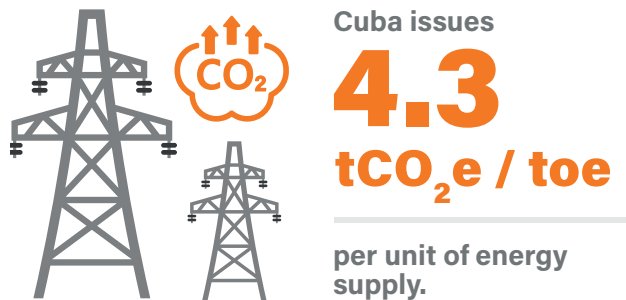


The primary energy matrix has historically been dependent on oil (69% in 2021), adding natural gas, the share of fossil fuels in the primary matrix reaches almost 80%, higher than the regional average of 66% for the same year. Renewable energies have reached a share of 21% in 2021, mainly driven by biomass (BEN, 2021). A drop of almost 50% in primary energy levels can be observed in the period 2010-2021.

Source: Own elaboration based on BEN, 2021. This matrix shows the primary energy resources; in this sense, it should be considered that if the country imports secondary fuels, these will be reflected in the emissions of the sector, but not in this primary energy matrix.

Figure 9. Carbon intensity of Cuba.

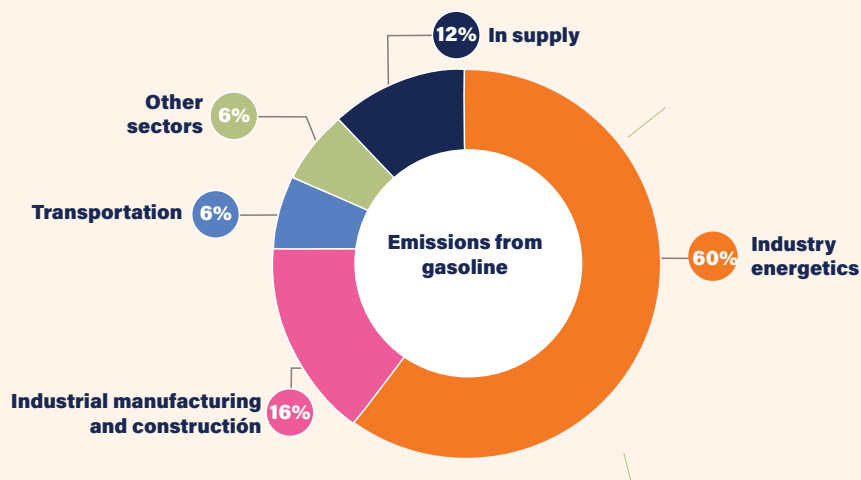
The carbon intensity of the primary matrix reached 4.3 tCO₂e/toe in 2021, higher than the regional average of 2.25 tCO₂/toe in the same year (based on OLADE, 2022; EDGAR, 2022). This highlights the permanently high dependence on oil in the matrix.



Source: OLADE, 2022; EDGAR, 2022.

Emissions from the energy sector have remained almost constant, with the energy industry being the subsector that contributes the most to the emissions of this sector with a 58% share in 2021, followed by the manufacturing and construction industry subsector with 25%. % (EDGAR, 2022).

Figura 10. Energy sector emissions by subsector 2018.



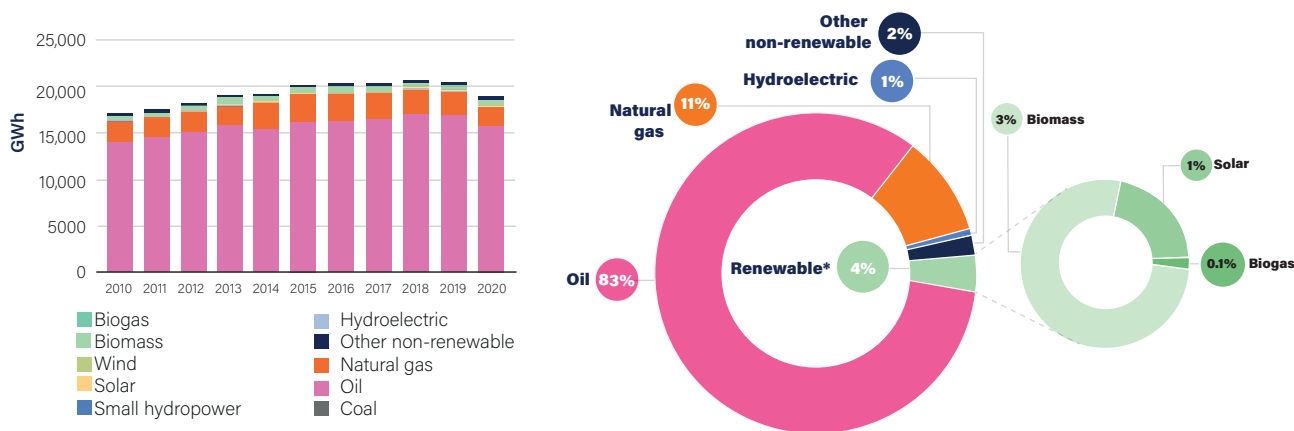
Source: Own elaboration based on BUR 2020

Power generation

The share of renewable energies has declined slightly in the last decade from 5% in 2010 to 4% in 2020 (IRENA, 2022). There is no official data available for the country in terms of electricity generation.

Within the 4% of electricity generation from renewable sources achieved in 2020, 1% was from solar energy and another 3% from biomass, with a minor share of biogas (IRENA, 2022).

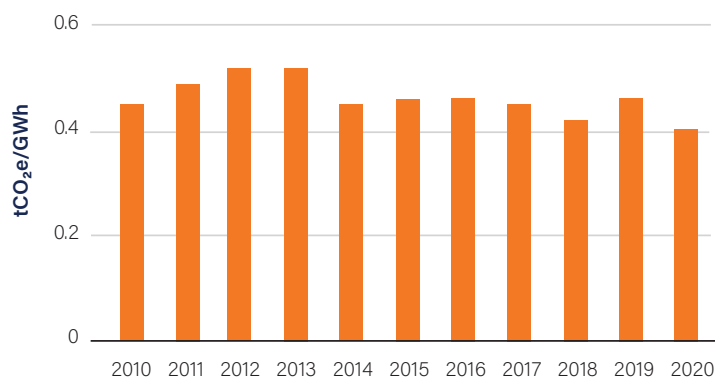
Figure 11. Electricity generation matrix from 2010 to 2020.



Source: Own elaboration based on IRENA, 2022.

Carbon intensity of electric power generation (ktCO₂e/GWh).

The emissions intensity of electricity generation has decreased by 25% from 2010-2020 (EDGAR, 2022; IRENA, 2022).

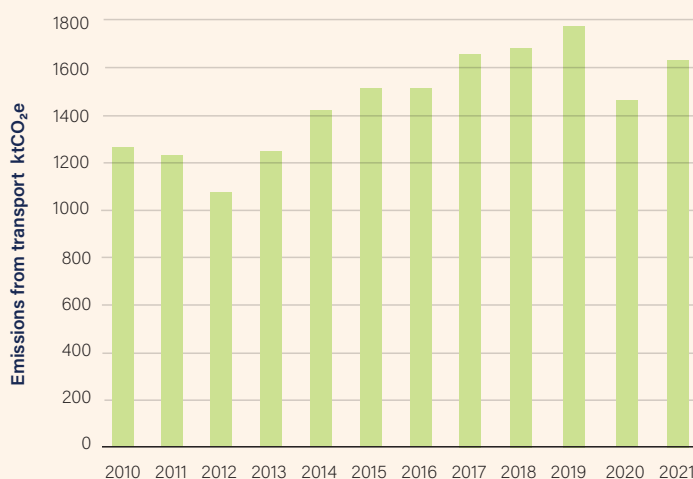


Source: Own elaboration based on EDGAR, 2022; IRENA, 2022.

Transportation

Emissions from the transportation sector increased 40% between 2010 and 2019, but showed a sharp drop in 2020 (EDGAR, 2022) due to restrictions imposed by the COVID19 pandemic.

Figure 13. Transportation Emissions 2010-2021.

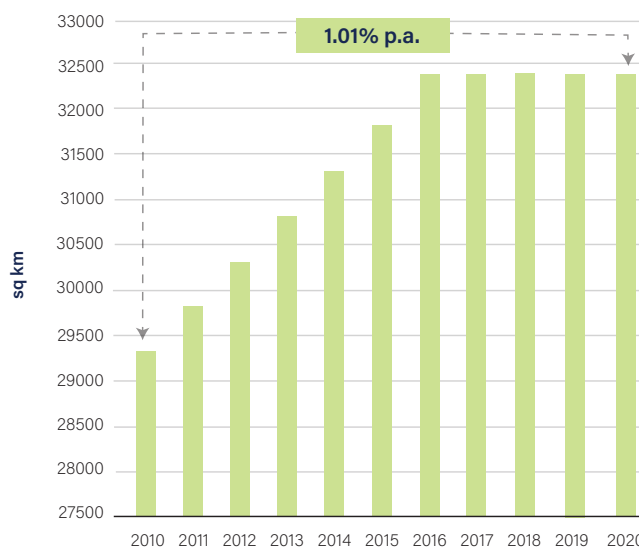


Source: Own elaboration based on EDGAR, 2022.

Agriculture, forestry and other land use (AFOLU)

Forest land in Cuba increased by an average annual rate of 1.01% between 2010 and 2016 equivalent to 28 thousand hectares per year. Since 2016, the extent of forest land has remained constant (World Bank, 2022).

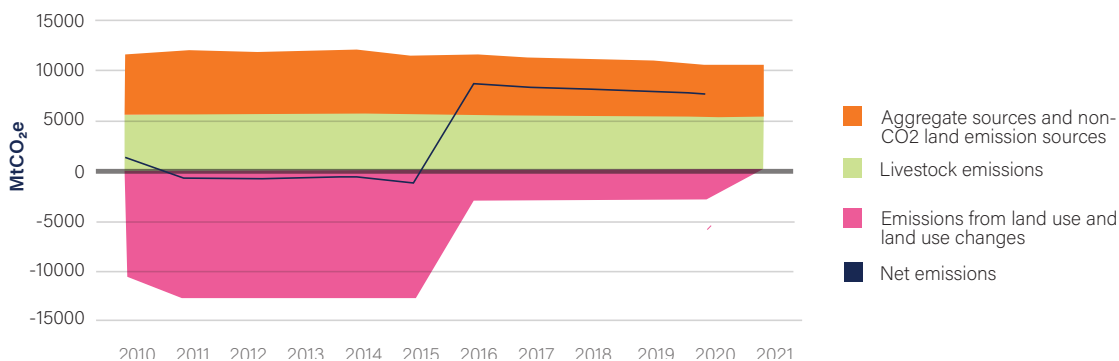
Figure 14. Area of native forests in Cuba and average annual loss rates.



Source: Own elaboration based on World Bank, 2022.

The historical series of emissions from the Agriculture, Forestry and other land use sector (Figure 14), reflects the recovery of forest land between the years 2010 and 2016, presenting net removals in this category, to then present positive emissions after 2016 when the recovery of forest land stopped and remained constant (EDGAR, 2022; FAO, 2022).

Figure 15. AFOLU emissions by subsector.



Source: Own elaboration based on EDGAR, 2022; FAO, 2022.

4.3 Mitigation policies and measures


The main mitigation document presented by the Cuban government is its Nationally Determined Contribution (NDC). It outlines the main areas in which the government will focus its efforts to meet its mitigation commitments, primarily in the energy sector. Although the Life Task Plan establishes priority in adaptation, Task 8 establishes the need to:

"Implement and control climate change adaptation and mitigation measures derived from sectoral policies in programs, plans and projects related to food security, renewable energy, energy efficiency, territorial and urban planning, fisheries, agriculture, health, tourism, construction, transportation, industry and integrated forest management."

This perspective allows us to broaden the scope of mitigation efforts and measures beyond the energy sector and towards a cross-cutting perspective.

Despite efforts to implement mitigation programs, there is no system for identifying, recording and monitoring actions in this area. However, the Biennial Update Report (BUR) and the second National Communication, both presented by the Cuban government in 2020, make efforts to track the implementation of measures. The following table presents the achievements of the measures and, in the case of the commitments presented in the first NDC, the degree of implementation of mitigation policies.

Table 2. Mitigation measures for the energy and transportation sector established in the NDC 2020.

Sector	Measure	Degree of implementation (identified priorities / initiatives / flagship projects)
 Energy (generation)	Reducing fuel consumption by increasing renewable energy sources to 1389MW of power connected to the national grid by 2030.	Currently in the design phase with partial implementation: There have been significant advances in solar PV technology, increasing installed capacity from 14 MW in 2014 to 135 MW in 2018, and electricity generation from 16.8 GWh to 146.5 GWh over the same period. The incorporation of wind and hydroelectric generation is planned to begin in 2020 and continue beyond 2020.

3 OnCuba. "Primera bioeléctrica cubana 'lista' para pruebas de sincronización con central azucarero" OnCubaNews, 11 Dec. 2022, oncubanews.com/cuba/primera-bioelectrica-cubana-lista-para-pruebas-de-sincronizacion-con-central-azucarero/. Accessed July 15, 2023.






 Energy (generation)	Reduction of fuel consumption through the installation of 612 MW of power connected to the national grid by 2030 based on bioelectricity.	Currently in the design phase with partial implementation: Substitution of energy blocks from sugar mills for sugar plants bioelectric power plants with high energy efficiency in 2020 entered the implementation stage. In May 2023, the first bioelectric power plant at the Ciro Redondo sugar mill came online.
	Reduction of fuel consumption through the installation of forest biomass gasification plants.	Implementation: Five small plants have been installed to expand the energy supply of local communities.
 Energy (residential consumption)	Efficiency and savings energy by means of installation of heaters and pumps solar, LED lamps and replacement of kitchens electrical.	Currently in the design phase with partial implementation: Funding barriers for the procurement of raw materials, by 2020: -5,055m2 of solar heaters (with a target of 1 million by 2030) -598,694 LED lamps (with a target of 15,250,000 by 2030) -287,751 induction stoves (with a target of 2 million by 2030) -1,148 solar pump systems (with a target of 5,000 by 2030)
 Transportation	Reduction of fossil fuel consumption in automotive transportation.	Currently in the design phase with partial implementation: As of 2020, several projects are in the planning phase. In administrative transportation, the replacement of 1,320 vehicles has led to a reduction in the number of vehicles in use. 1,893,594 liters of fuel consumption. The introduction of 40 hybrid buses has reduced fuel consumption and a 51.5% reduction in pollutant gas emissions.
	Fossil fuel production through the use of anhydrous alcohol-gasoline mixtures.	It has not yet been implemented due to the lack of raw material, but positive results have been obtained at the research level.
	Reduction of fossil fuel consumption through the use of biodiesel.	With international funding, the use of biodiesel as a fuel is under investigation. Although satisfactory results have been obtained at the laboratory level, field tests are currently underway.
	Increased use of railroads for freight transportation.	Higher volumes have been achieved in transports and general cargo in 2018, indicating an increase in rail usage.
	Increase in the use of railroads for passenger transportation.	Passenger transportation has increased in the first half of 2019, restoring itineraries on national trains and reinforcing interprovincial and local rail service.

Table 4. Sectors with mitigation measures for the Agriculture, Forestry and other land use sector

Sector	Measure	Degree of implementation (identified priorities / initiatives / flagship projects)
 Forests	Increased the area covered by artificial forests by 74,800 hectares, reaching a coverage of 31%.	Advanced implementation: From solely domestic financial sources, 74,835 hectares were reforested from 2010 to 2018, resulting in a removal of 1,618.9 kilotons of CO ₂ from the atmosphere. The largest forest estate in the country was transferred and its management objectives were modified to become a Managed Resource Protected Area. The plan is to reduce annual forest harvesting levels by more than 80%, for mitigation results at a lower net cost.
 Agriculture	Wastewater treatment and the use of biogas for heat and electricity production.	Formulation stage: In search of funding there is collaboration with FAO and the Central American Bank for Economic Integration to submit a proposal to the Green Climate Fund, with the objective of beginning project implementation.

Source: Own elaboration based on BUR, 2020 and Second CN, 2020.



Financing

Under the Paris Agreement, Parties committed that financial flows will be consistent with a scenario towards low GHG emissions and resilient climate development.

CONTEXT

The embargo policy generates economic limitations and restricts access to international financing and foreign investment, especially to Cuba's climatic agenda. This imposes significant limitations on climate action and the ability to achieve more ambitious goals, as international cooperation and technology transfer are essential for Cuba's access to financing, resources, and technology.

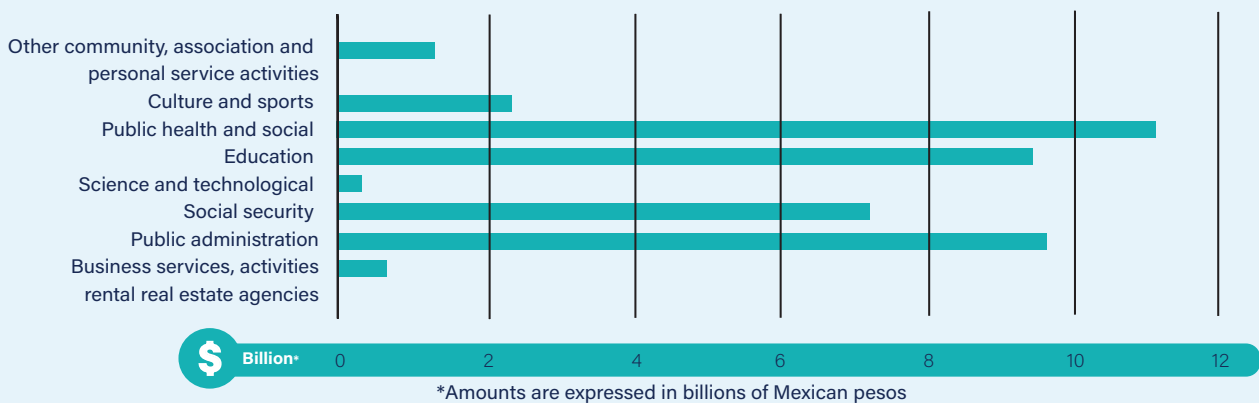
KEY OPPORTUNITIES

There are several opportunities that can be used to attract resources and develop sustainable projects. Cooperation with multilateral organizations such as the World Bank and the Inter-American Development Bank (IDB), as well as with partner countries, can provide financing and technical assistance for climate projects.

5.1 The role of the public sector

The distribution of the federal budget makes it possible to identify government priorities in the development planning of Latin American and Caribbean countries.

Figure 16. Budget allocation for strategic sectors in Cuba 2019.

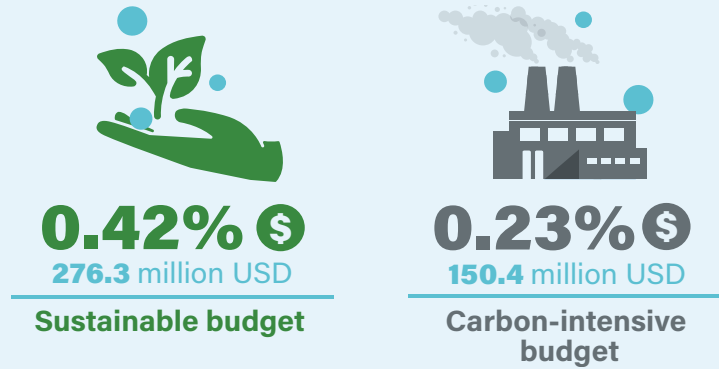


Source: Prepared by the authors with information from GFLAC, 2021.

In 2019, the budget for hydrocarbons accounted for 0.23% of the State Budget, which was 1.8 times lower than the initially budgeted amount.

The country's sustainable position includes designated spending for climate change, energy efficiency, renewable energy and natural disasters.

Figura 17. Comparison of sustainable budget versus carbon intensive budget.



Source: Prepared by the authors with information from GFLAC, 2021.

Cuba has not implemented any taxation tools to record carbon emissions yet (Our World in Data, 2022).

There is no information available on fossil fuel subsidies in Cuba.

5.2 Internacional cooperation

Cuba receives international cooperation for mitigation and adaptation projects from different international organizations. These resources include non-reimbursable support and loans

Table 6. List of projects and amounts approved for Cuba from different international cooperation agencies.

Agency / Institution	Scope of the project	Amount approved for the period 2016-2022 (Million US\$)			Approved projects period 2016-2022			
		Non refundable	Loan	Co-financing	Mitigation	Adaptation	Others	Preparation
Green Climate Fund (GCF)	Only Cuba	66.69	--	102.08	--	1	1	5
	Multiple countries	0.89	--	--	--	--	--	4
Global Environment Facility (GEF)	Only Cuba	8.08	--	53.04	--	--	5	--
	Multiple countries	1.57	--	1.64	--	--	2	--
UN Climate Technology Centre and Network (CTCN)	Only Cuba	0.09	--	--	1	--	--	--
	Multiple countries	0.05	--	--	--	--	1	--
Inter-American Development Bank (IDB)	Only Cuba	--	--	--	--	--	--	--
	Multiple countries	--	--	--	--	--	--	--

Source: Own elaboration based on CTCN, 2022; IDB, 2022; GEF, 2022; GCF, 2022.



Cuba

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Cuba

Country profile March 2024

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