Climate action guidelines 2022–2030

City of Belmopan, Belize

Indhira De Jesús

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This document was prepared by Indhira de Jesús, consultant with the Sustainable Development and Human Settlements Division of the Economic Commission for Latin America and the Caribbean (ECLAC), under the supervision of Diego Aulestia, Chief of the Human Settlements Unit, and the coordination of Estefani Rondón Toro, Research Assistant, both of the same Division. It was prepared as part of the activities of the United Nations Development Account project 1819AJ, "Coordination, coherence and effectiveness for implementing the environmental dimension of the 2030 Agenda in Latin America and the Caribbean".

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Presentation

Climate change is a global phenomenon that greatly impacts urban life. In Belize, national reports indicate that climate change is already having significant impacts on the territory, population, and key economic sectors. Long droughts, floods, increased coastal erosion, and changing precipitation patterns are the main impacts registered to date, and in the future, these effects are expected to increase.

The City of Belmopan is a city that was designed as a response to natural disasters, to ensure the country would have a functioning capital despite the storms, even before climate change was an issue in our collective minds. Now, Belmopan is facing the challenges of rapid urban growth, combined with those of climate change.

The Climate Action Guidelines, formulated by the City Council, with support from the United Nations Economic Commission for Latin America and the Caribbean (UN-ECLAC), Making Cities Resilient 2030 (MCR2030), of the United Nations Office for Disaster Risk Reduction (UNDRR), and Capital Cities of the Americas facing Climate Change (CC35), will provide a roadmap for addressing climate change. This is our first Climate Action Guidelines document, and we find that there is little data and information disaggregated at the local level.

Our guidelines emphasize no-regret actions and actions that have potential co-benefits. Belmopan must find innovative ways to leverage our strengths to promote clean and sustainable economic growth, while increasing the resilience of our communities.

Miss Sheran "Sharon" Palacio
Mayor of Belmopan

Abstract

The City of Belmopan is an early example of climate adaptation. It was built away from the coast during the second half of the twentieth century to ensure government functions could continue even after severe storms. In the past 20 years, the city has experienced fast population growth, driven mostly by immigration, as well as straining services and infrastructure. Called the "garden city", Belmopan has ample green spaces and an overall negative carbon footprint. Climate change presents Belmopan with challenges related to drinking water availability, population growth in flood-prone areas, and food security. The Climate Action Guidelines respond to the need for addressing those challenges while contributing to Belize's overall ambition of continued greenhouse gas (GHG) emission avoidance and increased removal targets, as expressed in the country´s Nationally Determined Contribution (NDC).

These guidelines for the City of Belmopan are the result of a participatory planning process conducted from August to December of 2021. The Belmopan City Council has prioritized climate change objectives. The guidelines propose to reduce Belmopan´s emissions mainly by increasing green areas and arborization, promoting non-vehicular transportation, and improving solid waste management. To adapt to the inevitable impacts of climate change, the city will improve its stormwater management system, prioritizing nature-based solutions; Belmopan will also conduct detailed risk assessments and enforce zoning regulations to reduce population vulnerability. The city will also promote urban orchards. To implement the guidelines, the city needs to improve capacities at City Hall, revise regulations, and create a citizen awareness and engagement program.

Introduction

The Climate Action Guidelines document for Belmopan intends to be a strategic direction document that provides a roadmap to the main activities the city must implement in the following years to address the climate crisis and consolidate itself as a carbon-neutral city that is resilient to the effects of climate change. This document is the result of a participatory planning process, led by the City Council, which describes the city's current carbon footprint and analyses vulnerabilities, to propose climate actions and objectives. During the formulation of the Climate Action Guidelines, city stakeholders identified the main impacts of climate change they face in their city, the current challenges that increase vulnerability and risks, and the opportunities that exist to promote sustainable development objectives while increasing carbon capture and adapting to climate change.

This document starts with a description of the City of Belmopan, focusing on aspects that determine emissions or capture capacity, as well as those elements that determine vulnerability and risk. The document continues with a discussion on climate governance, greenhouse gas (GHG) emissions and climate-related risks.

This information forms the basis for the proposed action guidelines. The guidelines present mitigation, adaptation, and cross-cutting activities that must be implemented by the City Council, in collaboration with other governmental institutions, the private sector, and citizens.

The action guidelines must be a living document, periodically updated by future administrations, reflecting the progress in its implementation and the emergence of new alternatives and technologies that can contribute to climate action.

I. The city of Belmopan

The city of Belmopan was founded in 1970 as a response to the climate vulnerability of the previous capital, Belize City (Belmopan City Council, n.d.). In 1961, Hurricane Hattie produced winds and tidal waves that destroyed a large portion of the houses and other infrastructure in the then capital of British Honduras, as the colony was called at the time.[1] This event is reported as the tipping point that prompted the colonial government to plan a new city in a more secure area.

The site was chosen far enough inland to avoid flooding and other impacts of tropical storms, and near the geographic center of the country. A committee selected the site in 1962 and, in 1964 Premiere George Cadle Price led a delegation to London to seek funds to finance the new capital, and three years later (1967) work began to build the new city.

In 1970, government offices were moved to the new capital; housing construction went on through the 1970s. In 1981, when Belize gained its independence from the British Crown, Belmopan became the capital. "Belmopan was to be the new modern face of the country, the symbol of a young nation" (Cunin & Hoffmann, 2009).

Belmopan is Belize's administrative center, housing all government headquarters and highest offices, including the office of the Prime Minister. The city is also the location of many embassies and international organizations, the national university (UB), the National Police Academy, the Western Regional Hospital, the National Emergency Management Organization (NEMO), and the Caribbean Community Climate Change Center (CCCCC), among other organizations.

Until the year 2000, Belmopan was built and managed by a parastatal entity called the Reconstruction and Development Corporation (RECONDEV). In 1999, a referendum decided that the city should be self-governed. In 2000, Belmopan was recognized as a city and the first City Council was elected.

Therefore, it could be said that Belmopan is itself an example of climate adaptation, which makes it unique among Latin American capitals. City planners in the 1960s created a city well prepared to handle climate hazards. But the city has grown exponentially in the past decades, and infrastructure has struggled to keep up with growth. Climate change presents new challenges that the City Council recognizes as urgent for achieving sustainable development goals and for ensuring a resilient future for its citizens.

[1] In 1973, British Honduras became a self-governing colony and was renamed Belize.

A. Geographic context

Belmopan is centrally located in inland Belize, in the Belize River valley, and is part of the Cayo District. It is situated about 83 kilometers (52 miles) west of Belize City, which remains the economic and commercial capital of the country. Its central location and easy access from the country's main cities and towns was an important consideration while siting the new city. Map 1 shows the location of Belmopan.

Map 1
Location of Belize in Central America and Belmopan in Belize

Source: Wikimedia Commons (n.d.).

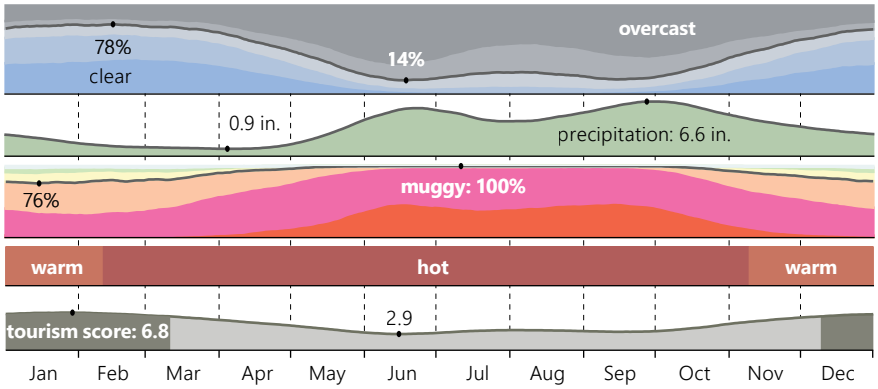
The Belmopan area sits on land ranging between 14 meters (45 feet) elevation above sea level, near the Belize River, and about 80 meters (270 feet) elevation, towards the Karst Hills in the south. The central area of Belmopan is at an altitude of about 45 meters (150 feet). The lowest part of town is where the Hummingbird and George Price highways meet near Guanacaste Park. The main water bodies surrounding Belmopan Municipality are the Belize River running west to east, the Roaring Creek running north to south, Mount Pleasant Creek, and the Ten Cents Creek (Belmopan City Council, 2014).

The Guanacaste National Park, the Blue Hole, and the buffer areas of both Mount Pleasant and Roaring Creek are the most important ecological areas surrounding Belmopan but are not located within the city limits. There are also Mayan archeological sites close to the city, but far enough that the city is not part of the tourism circuits. Most archeological tourism in the area is centered around the town of San Ignacio, Belize´s second largest city by population, about 34 kilometers (21 miles) to the south-east of Belmopan.

B. Climate

According to data from the National Meteorological Service of Belize, Belmopan has a lengthy wet season that runs from May through January, and a short dry season covering the remaining two months (National Meteorological Service of Belize, n.d.). As is typical with a tropical monsoon climate, Belmopan sees some precipitation during its dry season. March and April are Belmopan's driest months, with roughly 45 mm of rainfall observed on average. Over the course of the year, the temperature typically varies from 19°C to 34°C, with average monthly temperatures ranging from 23°C to 28°C. The chart below shows typical weather conditions for Belmopan, by month (Weather Spark, n.d.).

Figure 1
Climate in Belmopan



Source: Weather Spark (n.d.).

C. Socio-economic context

1. Population

Current census data for Belize is from 2010. A new census is planned for 2022. Between 2000 and 2010, Belmopan experienced tremendous population growth of over 17% per year, much greater than the 3% average annual urban population growth for the intercensal period in the rest of the country. At the 2010 population census count, the population was 13,900 people, making Belmopan the third most-populated municipality in Belize. The average household size was 4.0 people per household in 2010 (Statistical Institute of Belize, 2022).

The Statistical Institute of Belize estimates the population of Belmopan at 23,038 for 2018 (Statistical Institute of Belize, 2019). According to the Belmopan City Council, this growth can be explained by the extension of the Belmopan City limits to include adjacent rural communities such as Las Flores, Salvapan, and San Martin, plus a somewhat steady influx of new migrants from other areas of Belize and from other Central American and Caribbean countries, as well as from China.

2. Demographics

Through the 1980s and 1990s, the city received migrants escaping the armed conflicts in several Central American countries. This immigration continued and, by the 2010 census, the ethnic composition in the city had shifted to a "mestizos" (Hispanic) majority, according to the Municipal Profile published in 2012 with the census results. Mestizos comprised 50% of the population in 2010, an increase from 30% in 2000. In 2000, the largest ethnic group were Creoles (43%). According to the 2010 census results, about 12% of Belmopan's population were Mayas, the largest Maya community of any municipality in the country at that time. English, Spanish and Creole are the main spoken languages, English being the official language. The Age-Dependency ratio in 2010 was 67 dependents per 100 adults (UNICEF, n.d.).

3. Employment

Due to the sample design of the annual Belize Labor Force survey, no employment data is estimated separately for Belmopan. Employment data is released at the Cayo urban level, which includes Belmopan, San Ignacio-Santa Elena, and Benque Viejo combined. For 2018, unemployment rate was estimated at 13.6% for the Cayo District (7.2 for males, and 22.4 for females) (Statistical Institute of Belize, 2019).

4. Education

There are 4 pre-schools, 9 primary schools, and 7 high schools in Belmopan (Belmopan Online, n.d.). In 2010, the enrolment rate in primary school was 102%, indicating that some students from outside city limits attend school in Belmopan. The youth literacy rate was 92% in 2010, with similar levels of literacy between male and female youths (UNICEF, n.d.).

The University of Belize's main campus is also located in the City of Belmopan. Established in 2000 by the merger of two institutions, the University of Belize is a national, autonomous, and multi-location institution with over 5,000 students in total, of which close to 3,000 attend the Belmopan campus (University of Belize, 2020).

There are two other universities in the city. Galen University, with programs in social science and humanities, business, environmental science, and law; and the American Northwest University, focused exclusively on medical programs.

5. Health

Located in the city is the Belmopan Western Regional Hospital, which services the city and surrounding communities with specialist medical care. There are more than ten clinics and private practices in the city, including dental practices.

In 2021, the Pan American Health Organization (PAHO) finished retrofitting and updating the Palm View Center in Belmopan as a 'Smart Health Care' Facility. According to a press release from the organization, a 'smart' facility is a facility that can deliver care effectively and efficiently during disasters, generate operational savings, and reduce disaster losses (PAHO, 2021). "More than 67% of hospitals in the Caribbean and Latin America are considered located in high-risk disaster areas," said Dr. Noreen Jack, PAHO/WHO Representative in Belize. "As one of the countries in the region that are prone to natural hazards and disasters, it is crucial for the health facilities in Belize to be able to deliver care and protect its staff and patients during emergencies."

6. Intangible cultural assets

The mix of cultures can be considered an asset for the city of Belmopan. Creole, Mestizo, Maya, Garifuna, East Indian, Chinese and Mennonites are all ethnic and cultural groups established in the city. Each of these cultural groups communicate in their own language but collectively communicate in the dominant Creole language, with English as the official language taught in all public schools. Food, music, crafts, and other cultural expressions from all groups can be found throughout the city. Several times in the year, and especially during Belize's independence celebrations, the City of Belmopan hosts cultural events with participating groups providing a taste of their culture's food, music, and dances.

D. Urban services and infrastructure

1. Electricity

The City of Belmopan is connected to Belize's national grid. Belize Electricity Limited (BEL) is the primary entity responsible for purchasing, transmitting, and distributing electricity throughout the country. BEL operates a transmission line backbone running generally from the north to the south of Belize, being interconnected with the Mexican national electricity grid in the north. Approximately 92.8% of the population in Belize has access to a reliable electricity supply (Statistical Institute of Belize, 2019). The annual average unit cost of power sold in 2019 was BZD 31.9 cents per kilowatt-hour (kWh). The City of Belmopan also has an emergency power generator dating back to the time the city was built. This generator is kept as a backup system in case of electricity failure (Energy Unit, 2021).

There are no local refineries in Belize, all refined petroleum products are imported into the country via a sole importer, PUMA Energy Limited. Imported refined products include Gasoline (Premium and Regular), Diesel, Kerosene, Fuel Oil (Light and Heavy Fuel Oil), and Aviation Fuels (Jet Fuel Kerosene and Aviation Gasoline).

Under the National Sustainable Energy Strategy (2012-2033), which was included in the Ministry of Energy, Science & Technology and Public Utilities Strategic Plan 2012-2017, the goal of generating over 50% of electricity from renewable energy by 2033 was met between 2013 and 2018, peaking at 55.9% in 2017. However, severe droughts from 2017 to 2019 caused the percentage of electricity from renewables to drop to 21% in 2019. This dramatic decline was a result of consistent and severe drought conditions which created a shortage in energy supply from hydroelectric and biomass generation.

2. Drinking water, wastewater, and stormwater drainage

The city of Belmopan draws water from the Roaring Creek, a tributary of the Belize river. Water and sewerage services are provided by the Belize Water Services (BWS), a parastatal company established in 2001. The government of Belize is the majority share owner.

The water intake is located near the Guanacaste National Park. Water is piped to the treatment plant and treated in a rapid filtration facility. There is a water storage tank located at the treatment plant. From the plant, water is pumped to a reservoir located near the city center. Good quality water is reliably provided to most of the city by this system.

Image 1
Drinking water storage tank

Source: Photo by Indhira De Jesús.

Parts of the unplanned urban expansion areas, like Salvapan, Mayapan and Riviera, are not serviced by BWS. In those areas, some households use groundwater from private wells, collect rainwater, and even get water from creeks for non-potable uses. Some households buy drinking water from neighbors. During the dry season, the City Council uses a water truck to deliver water to these areas.

There is a sewage system that covers the original city footprint and has been expanded to some of the newer neighborhoods. These systems take the wastewater to a treatment plant prior to disposal in the Belize River. Other areas of the city have septic tanks, which are the responsibility of the City Council. The municipality has septic cleaning services, and there are private companies that also provide those cleaning services. As with the drinking water connections, growth has occurred unplanned in the city´s periphery without sewage systems or properly constructed septic systems. Effluents from households and businesses in these areas could be polluting local waterways and groundwater.

Image 2
Squatters in the Salvapan neighborhood lack piped water and sanitation services

Source: Photo by Indhira De Jesús.

The original city and some subdivisions have a system of ditches and culverts to manage stormwater, which is very well maintained by the City Council. Other areas of the city do not have stormwater drainage infrastructure, which increases flood risk.

Image 3
Stormwater drainage system plays a critical role in flood prevention

Source: Photo by Indhira De Jesús.

3. Transportation and mobility

Belmopan receives many daily commuters who come to the city for work, school, to go to the Regional Hospital, or for government business, as well as for shopping and going to the farmer´s market, which occurs twice a week. Most of these commuters reach Belmopan by bus as it is a very economical way to travel. Hourly bus services connect Belmopan with the main urban and rural areas in Belize, including Santa Elena and San Ignacio Town, Benque Viejo, Belize City, Orange Walk Town, Corozal Town, Dangriga, Hopkins, Placencia Village, Siene Bight Village, Independence Village, and Punta Gorda Town. However, improvement is needed in terms of frequency of services to accommodate the large traffic of commuters. The current bus terminal has very limited expansion possibilities and thus a new site has been under consideration for a long time.

The city of Belmopan is connected to Belize City by the Western Highway, which stretches for 81 miles from Belize City to the Guatemalan border in the west. It was renamed the George Price Highway in 2012, but the new name does not yet appear in many maps. To the west, Belmopan is connected to the coastal city of Dangriga through the Hummingbird Highway. Belmopan also has a municipal airstrip which is serviced by Maya Island Air and Tropic Air.

Belmopan´s city center is very walkable due to the original design of the city. Newer areas are accessible, but require the use of private cars, small buses, taxis, and motorcycles. Bicycle paths and walking paths have been delineated in several roads. Small bus services run approximately every 30 minutes and do not cover all neighborhoods.

4. Solid waste management

The City Council operates a solid waste collection service. Solid waste is taken to a municipal dump located some 10 kilometers from the city center. Informal waste pickers take recyclables from the dump. Waste frequently catches on fire and smoke from the dump often affects the city in the early evening hours. To improve solid waste disposal, the government of Belize has built a transfer station next to the municipal dump. Once the station enters operation, solid waste from Belmopan will be taken to a regional landfill located some 30 kms from the city. Currently, the city does not have any formal program for solid waste reduction, waste classification, or recovery.

Image 4
Belmopan´s new transfer station

Source: Photo by Indhira De Jesús.

5. Green infrastructure

Belmopan has been called the "Garden City". The original part of the city was designed and built around large green areas, and with connecting walkways that allow pedestrians to get around safely and easily. Compared to the original part of Belmopan, the newer residential subdivisions have not provided adequate public open spaces, sidewalks, and pedestrian walkways. Sometimes residents cross through private yards in some of these new areas to reach a main road or street more directly.

In 2014, the Municipal Development Plan identified areas to be protected from future development, which included the east bank of the Roaring Creek (the west bank belongs to the Roaring Creek village), including the Riviera Area, where people go for recreation and swimming; the entire Mount Pleasant Creek system dividing Maya Mopan and San Martin from the University of Belize; the Cohune Walk catchment reserve, which is reputed to be the habitat of some protected species; and the Fridge Creek from Dame Minita Gordon Boulevard to the Roaring Creek, which is a natural drain and a flood prone area. Currently, some of these areas are occupied by squatters and some have been developed.

Image 5
Large green spaces are key features of the original city plan

Source: Photo by Indhira De Jesús.

6. Land use

The city of Belmopan covers an area of about 33 square kilometers. The city has a zoning plan that has been updated several times, but enforcement of zoning codes and regulations, particularly in peri-urban areas, is a challenge. The city's population grew significantly in the first decade of this century. Immigration from rural areas and from other central American countries has generated squatter and unplanned neighborhoods in what were originally rural areas surrounding the city.

According to the Municipal Development Plan of 2014, growth has been taking place since 2006 primarily towards the east of the original Belmopan, particularly along a north-south strip including the neighborhoods of Maya Mopan, San Martin and Salvapan. The city also grew to the south along the Hummingbird Highway, particularly the area known as Lomas de Las Flores or simply Las Flores. The area to the west of the Hummingbird Highway has also grown, but not as fast. This area is primarily made up of privately-owned parcels of agricultural land. Land-use planning and land-use decision governance in Belmopan is complex, as RECONDEV continues to own large areas and can make decisions on their development.

Belmopan has no downtown in the usual sense. Commercial uses are primarily concentrated in the central part of the city (inside or next to the Ring Road), around the bus terminal, and the market. Most government buildings are also located in the central part of town. Big box commercial and light industrial uses can be found within the triangle formed by Forest Drive, the Hummingbird Highway, and Constitution Drive. The remaining parts of town are primarily residential. The city has been promoting industrial development to the north and west of the original city. Between 30% and 40% of Belmopan's total area remains vacant.

Most housing is single family. The architectural style of the older part of the city (from the 70´s and 80´s) has given way to more modern construction styles. The cost of housing in Belmopan has increased significantly in the last decade, according to information provided by the City Council. Low- and medium-income households typically access land and housing through subsidized government programs, which are scarce, or they must settle in neighboring areas outside the municipal boundary where land is cheaper. Lack of affordability and limited housing typologies in Belmopan are also preventing the city's ability to cater to younger households coming out of university.

In 2017, a team from UN-Habitat worked with the Belmopan City Council to develop a master plan using a "blue-green network planning approach" (Mayr et al., 2017) . This plan proposes to use the

natural systems in the region to structure the plan and guide the city's future development. The city has potential for further integration of green infrastructure into the built environment and the surrounding natural systems. Among other recommendations, the planners suggested connecting the isolated patches of green spaces using green corridors. They also stressed the importance of ensuring connectivity of waterways, the need to improve riparian vegetation, and to develop stormwater retention basins. The master plan proposes features to address the urban heat island effect which is exacerbated by climate change. It features blue networks such as water bodies to transport cool air into the city. Increasing green networks, such as tree corridors, would provide cool microclimates from shading and the evaporation of water through plant leaves.

II. Developing a Climate Action Guideline

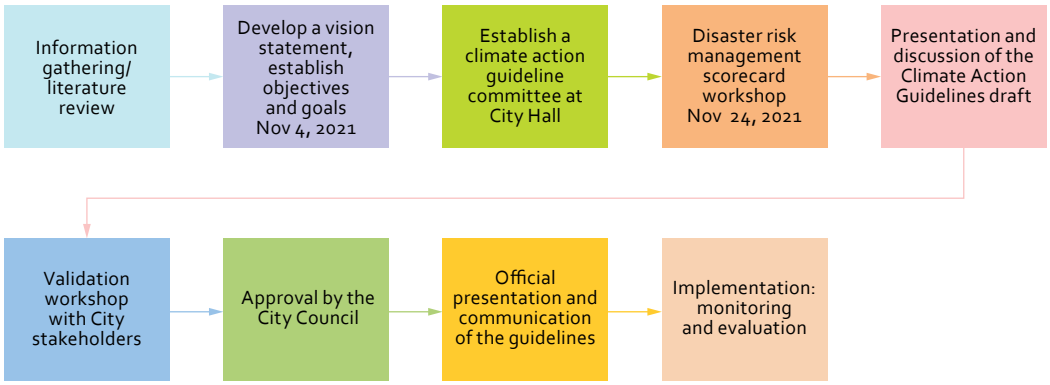
The Belmopan City Council identified climate change as a priority and requested support from international organizations to develop a guidelines document that could serve as a roadmap for both mitigation and adaptation activities. The City Council recognizes that climate change has been a subject mostly managed at the national level. This has resulted in limited local capacities and little awareness of the public regarding local climate action.

The City Council has conducted a participatory process, engaging local and national level officials, civil society organizations, and other stakeholders.

As shown below, diagram 1 illustrates the overall process, while image 6 shows the inception workshop conducted on November 4th, 2021.

The development of the Climate Action Guidelines was coordinated by the Department of Economic Development and Innovation, with participation from all other departments at City Hall.

Diagram 1
Climate Action Guidelines process for Belmopan



Source: Own elaboration as a result of the City of Belmopan Climate Action Guidelines Inception Workshop, 2021.

Image 6
Climate Action Guidelines inception workshop at City Hall

Source: Photo by Indhira De Jesús.

III. Climate governance

Most climate governance for Belize is enacted at the national level. Belize's Nationally Determined Contributions (NDC), revised in 2020, has the most updated compilation of the policies, strategies, and laws related to climate governance for the country. These are:

- The Climate–Resilient Investment plan 2013, that provides a framework to build climate resilience, reduce disaster risk and build economic and social resilience (Government of Belize, 2013).
- Mainstreaming of climate change in the Growth and Sustainable Development Strategy, that is a medium term plan to achieve economic development and poverty reduction (Government of Belize, 2016).
- Mainstreaming of climate change in the Belize long-term development plan (Horizon 2030). One of the four main pillars of Horizon 2030 is environmental stewardship that stresses the integration of environmental sustainability into development planning and sustainable energy.
- The National Climate Change Policy, Strategy, and Action Plan (NCCPSAP 2015-2020), which serves as the policy to transition to a low-carbon economy and increase the resilience to climate change. This document led the way to the development of the Nationally Determined Contributions (NDCs) in 2020.
- Development of the Nationally Determined Contributions (2020).
- The National Energy Policy Framework, that sets guidance on how to pursue energy efficiency, sustainability, and resilience in the next 30 years (Tillett et al., 2011).
- A Roadmap for the elaboration of a low carbon development strategy that focuses on building technical capacity, strengthening institutions, and engaging stakeholders for low carbon development that complements the two national level strategies in the medium and long terms.
- The National Solid Waste Management Policy (NSWMP), that provides a policy framework for all municipal, industrial, and hazardous waste in Belize and includes recycling, reusing, and recovering waste. This policy is aligned with a National Solid Waste Management Strategy and Implementation (Betts, 2015).

- Development of national climate adaptation plans for two priority sectors: agriculture and water sectors (BEST, 2009; Caribbean Community Climate Change Centre, 2015).

The National Climate Change Office was established in 2014, under the Ministry of Sustainable Development, Climate Change, and Disaster Risk Management. It is the secretariat for climate change, responsible for the implementation of national climate change policy, and the coordination of the country's response. The National Climate Change Office acts as the operational arm of the Belize National Climate Change Committee by mobilizing climate change related actions across the country.

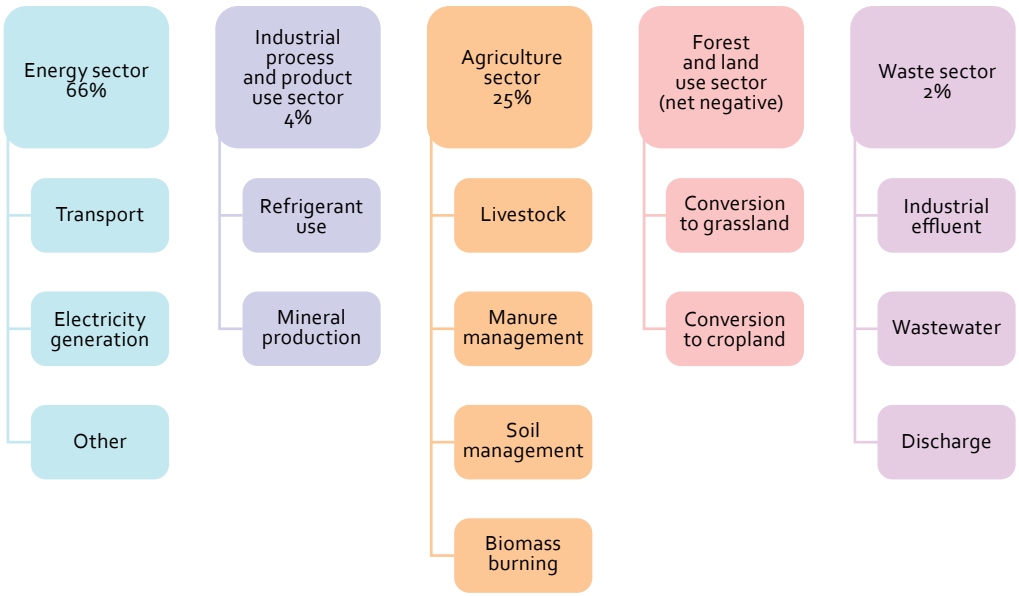
The City Council is directly responsible for urban zoning and construction permitting, stormwater management, maintenance of roads and drainage infrastructure, maintenance of parks and public spaces, public markets, regulating motor vehicles and urban mobility, septic tanks maintenance and disposal of septage, solid waste collection and disposal, and coordination of local emergency management response. Many key aspects of city resilience fall outside local governance: water and sanitation, energy, transportation, solid waste management policy and regulation, environmental protection, and regulation of land use change are functions of the national government (directly or through parastatal entities).

For the implementation of the city of Belmopan Climate Action Guidelines, the City Council will create a local climate change committee to serve as a focal point and coordinating entity for implementing climate actions at the city level. The city recognizes the need to coordinate closely with the national government, and to leverage national policy for local results.

IV. GHG inventory

Greenhouse gas emissions data for the city of Belmopan is not available. The entire country of Belize is a net climate sink (Ministry of Forestry, 2020).Therefore, it is not a significant emitter of greenhouse gasses (GHG). Nevertheless, conversion of forestland to grassland and agriculture is emitting carbon into the atmosphere and contributing to global warming. The primary GHG emitters for the country are the energy, agriculture, waste, and industrial processes and product use (IPPU) sectors (Government of Belize, 2021). The contribution of GHG emissions by sector in Belize, according to the Biennial Update Report (BUR), is summarized in diagram 2 below.

Diagram 2
Main sources of GHG emission and percent contributions by sector



Source: Prepared for presentation at the City of Belmopan Climate Action Guidelines Inception Workshop 2021, with data from Ministry of Forestry (2020).

It is important to recognize that, since some of Belize's electricity is imported from Mexico, the emissions are assigned to the latter country. If Belize decides to generate electricity through fossil fuels, then its GHG emissions would increase significantly. The recommendation is that Belize transitions to cleaner electricity sources.

At the city level, the City Council identifies emissions coming mainly from the transportation and waste sectors (municipal dump). Belmopan is also promoting industrial development within city limits, which could result in higher emissions in the future if not properly regulated. There is some use of solar power, but it is not yet mainstream and there are few incentives.

National level measures to close municipal dumps might improve emissions coming from that sector. There are also opportunities for the city to reduce waste generation by creating waste valorization programs.

Belize's Updated Nationally Determined Contributions (NDCs) sets the following targets:

- Avoid a cumulative emissions total of 5,647 $KtCO_2e$ between 2021 and 2030 (peaking at 1,080 $KtCO_2e$ in avoided emissions in 2030)
- Increase GHG removals in 63% from the AFOLU sector and an increase of renewable energy projects for electricity.

V. Climate related risks

The city of Belmopan is a direct response to climate risk. Over the last 150 years, about 57 hurricanes and tropical storms have impacted the country. Strong storms have historically flooded areas in the city, sometimes with a combination of stormwater and wastewater from septic tanks or flooded pumping stations. Storms have also damaged critical infrastructure, such as power grids, and people's homes.

Belize's NDCs indicates that temperatures are projected to rise from 2°C and 4°C by 2100, depending on the emissions scenario. It also predicts a 7-8% decrease in the length of the rainy season, a 6-8% increase in the length of the dry season and a 20% increase in the intensity of rainfall in very short periods. Other problems stemming from this variability in precipitation is increased erosion, contamination of coastal areas, sea level rise, and flooding. Although Belmopan's strategic inland location guards its population from some of the most direct coastal climate change impacts, there are some climate risks that its inhabitants will face, especially as its population continues to rise in the periphery that lacks adequate urban planning and basic services.

In general, the climate vulnerability of Belize has been assessed at the national level in its NDCs and 1st and 2nd National Communications for the United Nations Framework Convention on Climate Change (UNFCCC). Some key vulnerabilities that apply to Belmopan are:

Electricity. A recent World Bank report (Jayawardena et al., 2016) revealed that the electricity distribution system of Belmopan is still primarily operated at 11 kV networks, so damage to its network from a hurricane or other natural hazards could lead to widespread and prolonged outages. For example, Hurricane Richard in 2010 led to blackouts in Belmopan of up to 6 hours from problems related to system restoration outages and the distribution and transmission lines because of fallen trees, poles, and wires, as a consequence of the high wind speeds (Jayawardena et al., 2016). A similar situation occurred during Hurricane Dean that struck Belize in 2007. Therefore, a recommendation to improve electricity access when faced with hurricanes and strong storms is the installation of a back-up control and dispatch center at Belmopan.

Agriculture. In the agriculture sector, climate change is expected to reduce agricultural production by 10-20%. That could lead to loss of income and livelihoods to agriculture-dependent communities. It could also affect food security.

Water. Lower precipitation in general, with higher intensity of storms, are predicted for Belize. Severe drought has affected the country in recent years, reducing hydroelectric power generation and affecting sugar cane production.

Waste. The Belmopan municipal dump is located some 10km from the city center. Solid waste that reaches the dump is burned on a regular basis, however, data on the frequency that waste is transferred to the station and its burning periods were not available. Some potential vulnerabilities associated with the dump are increase in GHG emissions from burning waste, waste by-product seeping into the Belmopan waterways, and foul smell in areas close to the dump.

A. Stakeholder vulnerability mapping

Belmopan City Council identifies flooding as the main climate related threat to the city. Unplanned growth, squatters in low areas, deforestation of riverine vegetation, subdivisions that have encroached into flood-prone areas, are some of the reasons identified. There is no formal study of current flood risks for Belmopan.

From interviews with key stakeholders and the review of national level studies, Belmopan seems vulnerable to the impacts of more severe storms, changes in rainfall patterns, drought, increased heat and, indirectly, to sea level rise.

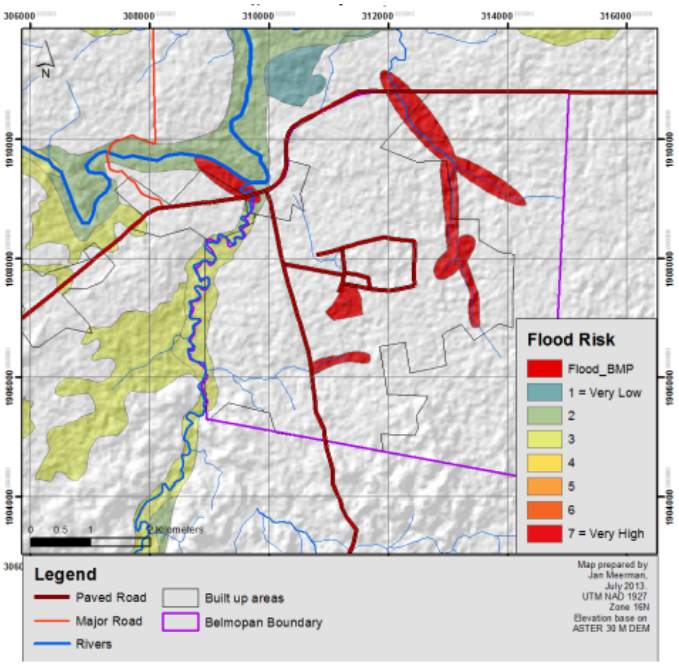
- More severe storms are predicted for the Caribbean region (IPCC, 2013). Belmopan is a city with aging infrastructure and significant population growth. Those factors combined can result in more disaster conditions that must be planned for. More severe storms can cause disruptions in the supply chain of goods and services to the city, extensive flooding, disruption of economic activities, and interruption on electric and or drinking water services. In 2014, Belmopan´s Municipal Development Plan identified areas of flood risk (see map 2). Interviews with stakeholders for the preparation of the climate action guidelines indicate that those areas continue to be at risk.
- Changes in rainfall pattern and drought. These changes can result in road and backyard flooding, water scarcity, and agricultural losses. Although a large portion of the city has adequate drainage systems, many areas do not. The reduction of green spaces and increase of impermeable areas with development also increases the city´s vulnerability to flooding. Belize suffered from a severe and sustained drought between 2017-2019, that resulted in increased electricity prices and shortages due to the reduced availability of hydroelectricity and biomass energy (mainly from bagasse). The sugar cane industry, which constitutes the second largest export for Belize, suffered great losses due to a drought in 2019 and excess rain in 2020 (CLAC & FAIRTRADE, n.d.). Although there is no data specific to the city, it is evident that there is great potential for impact, including indirect impact from climate migrants from rural areas of Belize and other central American countries.
- Increased heat. According to national estimates, temperatures in Belize have increased on average. The city does not yet report heat related issues, but urban growth has resulted in a reduction of green and open spaces.
- Indirect impact of sea level rise through climate migration from Belize´s coastal areas.

A challenge for disaster risk management in Belmopan is the coordination with the different institutions involved. Participation in the workshop for application of the UNDRR scorecard[2] was low, as were responses to the survey. The city has a local emergency management committee that is part of the National Emergency Management Organization´s system. The focus is on emergency preparedness and

[2] Making Cities Resilient 2030, UNDRR initiative (On-Line: https://mcr2030.undrr.org). Workshop for the Scorecard application (On-line web news: https://www.cepal.org/es/notas/oportunidades-recuperacion-post-pandemia-mas-sostenible-carbono-alc-plan-accion-climatica-la).

response, not on disaster risk management, as defined by the Sendai framework. The system includes the identification of an emergency operations control center (the Firefighters building), identification and maintenance of shelters, and emergency response planning.

Map 2
Flood prone areas in Belmopan



Source: Belmopan City Council, (2014).

The following elements have been identified by the City Council as factors that increase climate vulnerability:

- Rapid city growth.
- Outdated land use plan/zoning plan or regulations.
- Limited enforcing capacity.
- Lack of awareness on climate/environmental issues.
- Informal settlements.
- Poverty.
- Lack of data/information for decision-making regarding climate.
- Limited resources.
- Economic slowdown due to COVID may divert resources from needed infrastructure.

Belize is endowed with healthy ecosystems that provide benefits to its residents. Nature-based solutions can be promoted for both climate mitigation and adaptation.

VI. Belmopan City Council´s strategic vision

The current City Council of Belmopan was elected in March 2021 for a period of 3 years. The Council members drafted a strategic plan which presents vision and mission statements, focuses on values, and provides guidance for departmental planning.

Vision

The Belmopan City Council is responsive, adaptable, innovative, leading a safe, green, economically vibrant, healthy, and futuristic Capital City with an innovative plan, offering opportunities for all residents to enjoy the services and improved standard of living for business and education in a strong family-oriented environment.

Mission

The Belmopan City Council will play a leading and visionary role, providing infrastructure development and maintenance services, promoting an environment conducive to growth, and enhancing the quality of life of its residents. The Council is committed to being transparent, accountable, efficient, professional, and courteous while stimulating participation and cooperation within the community.

The plan identifies climate change funding as an opportunity to improve storm drains & flood mitigation infrastructure. Belmopan City Council's strategic plan identifies Disaster Management and Mitigation as a priority area, defined as "the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response, and recovery in order to lessen the impact of disasters. Belmopan is used as a major safe zone during disasters such as hurricanes and flooding" (Palacio, 2021).

VII. Climate actions

The climate action guidelines for the city of Belmopan are influenced by the country's Nationally Determined Contributions (Government of Belize, 2021), and other national-level commitments that directly affect the city. Additionally, stakeholder interviews communicated actions that the city would like to pursue to increase the resilience of its residents.

The city of Belmopan´s ***vision*** for its climate action guidelines is of a ***safe, equitable, and innovative city, that is better prepared and more resilient to the impacts of climate change, developing sustainably, and with low emissions.***

The following objectives were identified:

- To contribute to the national GHG emission avoidance and increased removal targets.
- To reduce climate risk in the city of Belmopan.
- To promote awareness of climate issues among the people of Belmopan.
- To improve capacities at City Hall.
- To increase availability of climate data for decision making at the local level.

A. Mitigation actions

Table 1 details the mitigation actions for the City of Belmopan.

Table 1
Mitigation actions

Activity	Description	Timeline	Responsibility	Possible source(s) of financing
M1. Conduct GHG emission inventory for the city and develop monitoring plan.	A local inventory estimates GHG emissions and removals that can be directly attributed to the city. It provides a baseline and allows the city to develop specific policies and programs to reduce emissions. The monitoring system allows quantification of future reductions and policy evaluation.	6 months.	Belize Climate Change Office/ City Hall.	NDC Partnership. Government of Belize. Bilateral cooperation.
M2. Belmopan is my Garden City (City Arborization Plan).	Promote tree planting in public and private land. The plan will engage private sector, schools, community organizations, and citizens in increasing arborization of public and private land within city limits. Trees will be native species, well adapted to climate conditions in the area. This program will also contribute to reducing the impact of extreme heat events in the city as average global temperatures increase.	3 months for designing the plan. Years for implementation of pilot program in selected areas. Roll out city-wide by 2024.	City Hall.	Belmopan private sector. Companies with carbon neutrality or sustainability programs. National forestry programs can provide technical assistance and plants.
M3. Reduce burning of waste.	Closing of the municipal dump with the operation of the transfer station. Improvement of waste collection to eliminate household and field burning.	1 year.	Belize Solid Waste Management Authority (Belize SWAMA)/ City Hall.	Government of Belize. Improved revenue from waste collection services.
M4. Making greens by being green program (Promoting waste valorization and circular economy).	Reduce emissions from solid waste by reducing organic waste going to landfill. Promote green entrepreneurship based on separation and collection of biodegradable organic waste (as much as 60% of municipal waste in Belize is food waste), to produce compost as an agricultural and landscaping supply. The city can enter into partnerships with local entrepreneurs by guaranteeing purchases of compost for city parks and tree nurseries. Promote recycling of other types of waste with local market value.	6 months for program design. 3 years implementation of pilot program with international cooperation support. Long term monitoring and evaluation.	City Hall.	Bilateral cooperation (US, UK, Canada, EU).
M5. Reduce emissions from wastewater and septage management.	Study feasibility of changing current treatment processes to reduce GHG emissions.	5 months for study.	Belize Water Service.	CReW+ project[a] Government of Belize. Bilateral cooperation.

Table 1 (concluded)

Activity	Description	Timeline	Responsibility	Possible source(s) of financing
M6. Belmopan is safe to walk and bike (promoting sustainable transportation).	Develop pedestrian and bicycle routes beyond the city´s center, that are secure, well illuminated, and safe to use. Educate drivers and pedestrian in the safe use of public ways. Develop city ordinances that create incentives for people to walk or bike, and to ensure the city remains walkable as it grows.	6 months for planning and establishment of routes. On-going monitoring and evaluation.	City Hall.	City Hall.
M7. Reduce vehicle emissions.	Develop city ordinances to promote cleaner public transportation, carpooling, and increased use of vehicles with lower emissions.	1 year program design.	City Hall/Climate Change Office.	Climate funds.

Source: Own elaboration.
[a] CReW+ is a partnership project funded by the Global Environment Facility (GEF) that is being co-implemented by the United Nations Environment Programme (UNEP) and the Inter-American Development Bank (IDB) in 18 countries of the Wider Caribbean Region (WCR), including Belize.

At the national level, Belize Electricity Limited (BEL) is working on an electricity expansion plan to analyze the potential of improving Belize's generation, evaluating renewable energy sources, and considering the operating margin emission factor for Belize's national electricity grid. This plan will also provide guidance on how to reduce the dependency on electricity generated in Mexico. The city of Belmopan can reach out to BEL and seek ways to collaborate in creating incentives for solar or other types of renewable energy generation within city limits.

B. Adaptation actions

Table 2 details the adaptation actions for the City of Belmopan.

Table 2
Adaptation actions

Activity	Description	Timeline	Responsibility	Possible source(s) of financing
A.1 Revise and enforce building regulations to ensure new construction improves resilience.	Unplanned and unregulated urban growth has increased exposure and vulnerability in Belmopan. Proper regulation of new development and construction is critical to reduce risk and increase resilience.	3 months for revision of existing regulations. 6-month communication plan to ensure dissemination of new regulation. On-going enforcement.	City Hall/ RECONDEV.	City Hall. Insurance companies.
A2. Conduct a city-wide infrastructure risk assessment.	This assessment must include infrastructure that is owned and operated by the City Council, as well as other critical infrastructure owned by utilities or national government entities.	6 months to 1 year.	City Hall/ Government of Belize.	Government of Belize. Climate funds. Insurance industry.

Table 2 (concluded)

Activity	Description	Timeline	Responsibility	Possible source(s) of financing
A3. Develop a Climate Risk Management Plan.	Create a plan that ensures the city can implement the Sendai Framework for Disaster Risk Reduction (2015-2030) (MCR 2030, 2017).	6 months.	City Hall / Climate Change Office.	Government of Belize. Climate funds. Insurance industry.
A.4 Improve storm drainage infrastructure.	Construction of new infrastructure. Rehabilitation and maintenance of existing drainage.	3 years.	City Hall.	Multilateral finance institutions (i.e. World Bank, Caribbean Development Bank). Adaptation Fund.
A5. Protect and increase permeable areas.	Develop and enforce regulations to maintain and increase permeable areas to reduce flooding.	On-going.	City Hall.	City Hall.
A6 Develop and implement a watershed management plan for the Roaring Creek to ensure long term water availability for the city.	Since climate models indicate reduced precipitation and increase intensity of extreme events, management and conservation of the Roaring creek catchment area is needed to guarantee drinking water supply for Belmopan. The study should consider watershed governance and water finance, including payment for ecosystem services.	1 year for planning. 3 years of pilot implementation and evaluation. Long term implementation.	City Hall / BWS/ Ministry of Sustainable Development, Climate Change and Risk Management.	Bilateral cooperation. Adaptation Fund. Green Climate Fund.
A7. Urban orchards.	Promote food production within city limits to increase food security. Can be linked to compost production program and to arborization program.	2 years for pilot program and education.	City Hall /Ministry of Agriculture, Food Security and Enterprises.	City Hall. Government of Belize. Bilateral cooperation. Private sector.

Source: Own elaboration.

C. Cross-cutting activities

Table 3 details the cross-cutting activities to do due to the Climate Action Guidelines.

Table 3
Cross-cutting activities

Activity	Description	Timeline	Responsibility	Possible source(s) of financing
C.1 Citizen education.	Develop and implement a broad education program to sensitize the citizens and communities in Belmopan towards climate action. The goal is to increase citizens´ engagement and ownership of climate activities.	6 months to design education campaign. On going.	City Hall/Ministry of Education/ Ministry of Sustainable Development, Climate Change and Risk Management.	Government of Belize.

Table 3 (concluded)

Activity	Description	Timeline	Responsibility	Possible source(s) of financing
C2. Capacity development at the City level.	Train and equip city officials to be able to design, implement, monitor, and evaluate climate actions, and to mainstream climate into municipal policies and management. Can benefit from strategic alliances with the University of Belize and other academic institutions.	2 years.	Climate Change Office.	Green Climate Fund. Bilateral cooperation. Government of Belize.
C3. Climate information and knowledge management.	Improve data production at the city level; create capacities for data acquisition, analysis, and storage; develop information and knowledge products to inform decision makers and support citizens education.	4 years.	City Hall / Climate Change Office.	Green Climate Fund. Bilateral cooperation. Government of Belize.
C.4 Strategic partnerships.	Develop partnerships to improve City Council capacity to address climate change.	On going.	City Hall.	City Hall.
C.5 Land use planning to reduce emissions and increase resilience.	Revise Belmopan´s zoning regulations. Develop long term land-use plans that accommodate urban growth without negatively affecting emission and reducing risks.	1 year.	City Hall / RECONDEV/ Ministry of Natural Resources´ Land and Surveys Department/ Ministry/Ministry of Sustainable Development, Climate Change and Risk Management.	Green Climate Fund. Bilateral cooperation. Government of Belize.

Source: Own elaboration.

VIII. Conclusions and next steps

The city of Belmopan has prioritized climate action for two main reasons: their desire to contribute to Belize NDC´s goals, and their realization that adapting to climate change will be critical to the future wellbeing of its citizens. The formulation of the climate action guidelines has helped the city articulate the relationships between climate action and sustainable development actions. In order to implement the proposed guidelines, the city must establish strategic partnerships with national government institutions, non-governmental organization, private sector, and civil society organizations.

The climate action guidelines implementation, monitoring, and evaluation will be in the hands of the City Council and City Hall. For implementation, the city will need support to improve capacities, including personnel training, development of processes and procedures, updating zoning plans and regulations, as well as increased enforcement and monitoring capacities.

There is limited availability of city-specific information. Therefore, the guidelines document proposes additional assessments, especially in the development of a climate change vulnerability assessment and a rigorous technical study on GHG emissions, as these inputs have not been developed by the city and represent a valuable source of information for the design of climate actions. It is crucial to the success of this process, that once those assessments are completed, the guidelines are revised and updated to reflect the improved information. These Climate Action Guidelines must be a living document that is regularly evaluated and updated by the city.

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The city of Belmopan, built away from the coast during the second half of the twentieth century to ensure continuity of government functions even after severe storms, is an early example of climate adaptation. In the past 20 years, the city's fast population growth, driven mostly by immigration, has strained services and infrastructure. Belmopan —the "garden city"— has ample green spaces and an overall negative carbon footprint, but faces challenges posed by climate change. The *Climate action guidelines 2022-2030* respond to the need to address those challenges while contributing to Belize's overall ambition, expressed in its nationally determined contribution (NDC). The guidelines aim to reduce Belmopan´s emissions, mainly by expanding green areas and forestation, promoting non-vehicular transportation and improving waste management. Adaptation will involve improving the city's stormwater management system, prioritizing nature-based solutions, conducting risk assessments and enforcing zoning regulations to reduce population vulnerability. Implementing these guidelines will require the city to improve capacities at City Hall, revise regulations and create citizen awareness and engagement programmes.

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