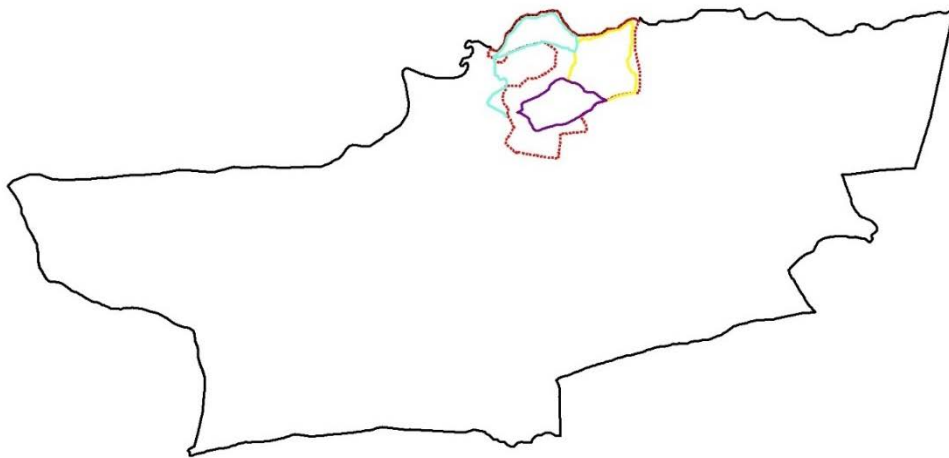




# MUNICIPAL LAND USE PLANNING FOR TERRENAS



2016 – 2028



**USAID**  
DEL PUEBLO DE LOS ESTADOS  
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## **I. Summary**

The Municipal Land Use Plan for Las Terrenas (MLUP-Terrenas) is the basic instrument used to guide land use and occupation in in the municipality over a twelve-year period, in keeping with the potential and boundaries of the land.

The formulation of this proposal includes a series of studies and analysis, which includes the analysis of the Municipality of Las Terrenas context, characterization of the environmental, spatial and socio-economic components of the land and analysis of climate vulnerability as an essential step to identify present and future factors threatening the municipality vis-à-vis climate change.

A vision towards land use planning was defined with the participation of the key stakeholders who impact the land, together with a series of objectives that guided the construction of the proposals contained in this document.

The proposals have been classified on a zoning map, where preferential land uses are established for the municipal territory, together with a set of policies that form part of the municipal ordinance binding for all stakeholders of the territory. These proposals are associated to a series of plans, programs and projects defined to guide the proper implementation of the land uses identified.

## 2. Introduction

The Municipal Land Use Plan (MLUP) is the local planning instrument used to plan and regulate land use and its activities, as a result of a collective vision that seeks to satisfy the basic needs of the population, reduce weaknesses identified and guide development leveraging land as a catalyst.

The Municipal Land Use Plan of Las Terrenas (MLUP-Terrenas) is part of the first generation of plans developed in the Dominican Republic following the guidelines of the Municipal Land Use Planning Methodological Guide published by MEPyD/DGODT in 2016, which has taken into consideration the climate change adaptation approach, in compliance with the constitutional mandate.

The MLUP-Terrenas summarizes the principal findings based on the diagnosis of the situation of the municipality, the future image of the territory and the proposals that will contribute to plan land use and its accompanying activities, which are to materialize further in a municipal land use ordinance.

### a. Legal Framework

Art. 193 of the Constitution of the Dominican Republic provides as follows: “Principles of Land Use Planning. The Dominican Republic is a unitary state whose land use plan seeks to foster its integral and balanced development and that of its inhabitants, in a manner compatible with its needs and the preservation of its natural resources, national identity and cultural values. Land use planning will be carried out in keeping with the principles of unity, identity, political, administrative, social and economic rationale.”

In turn, Article 19, letter d, of Law 176-07, on Municipalities and the National District, provides “Land use planning, urban planning, land management, urbanistic enforcement and discipline” as the sole competence of city/municipal councils.

Currently under discussion by the Congress of the Dominican Republic there is a bill on Land Use Planning that envisages three levels planning: national, regional and municipal.

The proposals contained in the MLUP – Terrenas were developed taking into account the normative aspects of the current land use in the country, taking as reference Chart I of the Municipal Land Use Planning Methodological Guide, which we transcribe as follows:

Chart I: Regulatory Land Use Framework<sup>1</sup>

<b>Scope and Scale</b>	<b>Legal Framework Identified</b>
Constitutional Vision	– Constitution of the Dominican Republic Art. 194
Strategic Vision	– 2030 Law on National Development Strategy, Law 1-12
National Regulation	<ul style="list-style-type: none"> <li>– General Law on the Environment and Natural Resources and its regulations, Law 64-00</li> <li>– Law on Risk Management, Law 147-02</li> <li>– Law that creates the Secretariat of State for Economy, Planning and Development (SEEPyD, per its acronym in Spanish) Law 496-06</li> <li>– Law on Planning and Public Investment, Law 498-06</li> <li>– Decree that establishes the Organizational Operating Regulation of the Secretariat of State for Economy, Planning and Development, Decree 231-07</li> <li>– Decree that establishes the National Policy for Climate Change, Decree 278-13</li> <li>– Law that creates the <i>José Joaquín Hungría Morell</i> National Geographic Institute, Law 208-14</li> </ul>
Municipal Normative	<ul style="list-style-type: none"> <li>– Law on Urbanization, Public Beautification and Constructions, Law 675-44</li> <li>– Law on Urban Planning, Law 6232-63</li> <li>– Law on the National District and Municipalities, Law 176-07</li> </ul>

Among the provisions contained in Law 64-00 on the Environment and Natural Resources, articles considered include Article 31 (on land organization), 109 to 111 (on human settlements), 129 (on protection of water sources) and 147 (on areas of the maritime-land public domain). Ley 202-04 (on protected areas) and Decree 571-09 providing for a 300-meter buffer or sustainable use area around all conservation units deemed as general categories by the International Union for Conservation of Nature, ranging from I to IV.

#### **b. Policy Formulation Process**

The MLUP-Terrenas is the result of two years of endeavors of the technical team integrated by key city/municipal staff under the leadership of the Mayor, together with the technicians of the Dominican Federation of Municipalities (FEDOMU, per its acronym in Spanish) and a

<sup>1</sup> DGODT/MEPyD: *Guía Metodológica para la Formulación del Plan Municipal de Ordenamiento Territorial*. (Municipal Land Use Planning Methodological Guide) (pp. 15-16. 2016)

group of professionals who provided the City Council technical assistance under the USAID/ICMA Planning for Climate Adaptation Program.

On June 29, 2015, an Empowerment Workshop was held at the Las Terrenas City Council. This formally initiated the works contained in the agreements signed by the Mayor with the Embassy of the United States of America and the International City/County Management Association (ICMA).

An interinstitutional and intersectoral Working Group was set up, following completion of a mapping of the key stakeholders in the process, thus contributing to the participatory technical formulation approach. Both the technical team and the working group held sessions for each stage of the policy-formulation process. From identifying and characterizing the municipal context, to its climate assessing its climate vulnerability and the land diagnosis up to the analysis of the critical factors for the municipal development, each aspect of the plan has been formulated relying on the active participation of all municipal stakeholders.

The process was also accompanied by technicians from the city of Miami Beach, Florida, who advised on topics dealing with land planning, drainage infrastructure and flood management, beach restoration, dynamic coast management and green infrastructure. Specialists from ICF International and ICMA also took part in overall matters dealing with climate vulnerability.

Together with the technical processes, the formulation of the MLUP plan included a citizen-participation and consultation process which involved representatives of over 90 municipal organizations, including public and private organizations, civil society organizations, neighbor associations and grassroots organizations. Aldermen and alderwomen and other authorities of the municipality and the province have also been actively involved.

This overall process resulted in ten (10) studies, matrixes and reports which form the basis of the final Municipal Land Use Plan for Las Terrenas (MLUP -Terrenas).

### 3. Diagnostics

#### a. Integrated Diagnosis

The contextual analysis of the Las Terrenas Municipality provided the relationship and the impact of the environmental, social, economic, spatial and cultural dynamics in the territory under analysis, and identified the aspects that influence and/or condition the development of the municipality.

The immediate context of Las Terrenas is limited to the territory located on the Samaná Peninsula which is shared by the municipalities of *Sánchez* and *Samaná*; and -in this area- is surrounded by a coastal-marine system that has been a major resource in the development of this territory, guiding the tourism activities in most of the settlements located on this territory. The exchange and relationships between the municipalities of this province are based on the inter-municipal connection. College education is absent in the municipality and requires inter-provincial displacement. The same is true of certain types of opportunities and some institutional services located outside the peninsula. This context has a water network with an important wealth of underground water and a mountain range (sierra) which has an impact on the relief, and therefore, on the soil type and the activities carried on such.

The remaining context is located outside the Peninsula and connects through the Nagua-Samaná Highway, revealing vulnerability in accessing this area of the country. The whole context identified is soil predominantly suitable for agriculture (64.28%), followed by a natural surface that represents 34.80%. Further to the connection with the indirect context identified, there is an important relationship with the Metropolitan area of Santo Domingo.

Together with the contextual analysis, the characterization of environmental, spatial and socio-economic components was also conducted, thus enabling an assessment of the land use and occupation of this territory based on seven (7) study categories described as follows:

- a. **Soil Potential:** is the relationship between land suitability, its use and resource availability.
- b. **Environmental Sustainability:** is the relationship between the availability of natural resources and the adequate use of the same.
- c. **Social Vulnerability:** is the relationship between the life conditions of the inhabitants and opportunities in the territory.
- d. **Land Vulnerability:** is the relationship between the inhabitable conditions of the population, its level of risk and adaptation capacity.
- e. **Land Concentration:** is the relationship between the location of the population and the activities of the productive sector.



- f. **Land Connectivity:** is the relationship of the human settlements, the level of mobility and the distribution structure in the territory.
- g. **Land Suitability:** is the relationship of the human settlements and the level of service accessibility.

The following is the outcome of the survey and analysis conducted for each of the study categories mentioned. This survey was developed using environmental, social, economic and spatial characterization inputs.

### **Land Potential**

The *Las Terrenas* municipality currently records use of predominantly natural soil with a total surface of 82.53 km<sup>2</sup> (73.77%). The predominant type of soil is Class VII with a surface of 76.75 km<sup>2</sup> (68.60%). This type of soil is located in the Samaná mountain range that runs through the entire municipal territory on an east-westerly course with elevations of over 400 masl and its highest peak on *Loma Las Cañitas* (546 masl), occupying the entire unurbanized land of the municipality.

The urban area is located in the flattest land located in the proximities of the North coast, with a surface of 5.71 km<sup>2</sup> (5.10% of the municipal territory), close to a group of wetlands under the pressure of the expansion of a built surface that occupies territories located outside the established urban perimeter.

The mayor current land occupation takes place in the central area of the urban area and throughout the coastal-marine front, where a small portion of the total municipal surface concentrates the main activity of the territory. This situation sensibly impacts the natural resources of this area, and also leads to underuse the potential of the remaining territory, thus deteriorating the natural resources.

### **Environmental Sustainability**

93% of the municipality is located on the North Coast Basin of the *Samaná* Peninsula, which is impacted by the geomorphology of the municipality, where water accumulates at the edge of the mountainous system, rivers are short and flow into the Atlantic Ocean running through a surface of wetlands. These rivers are mostly seasonal, grow rapidly with rainfalls and return with equal speed to their normal flows; some even becoming dry during a drought.

Runoff occupation in the urban area has an impact on the deterioration of these aquifers, increasing the levels of pollution that flows into the sea. Likewise, wetlands

are occupied with no regulations for the conservation and preservation of this natural system.

The municipality has important bio diversity, coastal-marine and land resources of special value in the tourism sector and play a key role among its development objectives.

The coast of the municipality extends 26.72 km long, which includes 18.11 km. of sandy beach with a low level of environmental sustainability due to the historical pressure of occupation and sand extraction that affect the coastline configuration, and the deterioration of its natural ecosystems. The high rocky coast is 5.93 km long and the coast of mangroves extends 1.78 km.

The wooded area consists of two forest types: a very humid sub-tropical forest, found in the high-altitude sierra (64.53 km<sup>2</sup>) and a humid sub-tropical forest from the coast to the altitude of 400 masl (43.80 km<sup>2</sup>). Data surveyed reveals that the natural/forest surface shifted from 86.90 km<sup>2</sup> (2000) to 82.53 km<sup>2</sup> (2015) for a reduction of 4.37 km<sup>2</sup>. Analysis of this survey showed a soil gain of 2.14 km<sup>2</sup>, a loss of 9.02 km<sup>2</sup> and a 83.65 km<sup>2</sup> surface which retained its same suitability (2000-2015 period).

The only protected area in municipal territory is the direct environment surrounds the Atlantic Tourist Boulevard designated as a protected landscape pursuant to decree 654-11, with a total surface of 103.82 km<sup>2</sup>.

### **Social Vulnerability**

The number of inhabitants in the municipality has increased significantly over the last decades, due to the growing number of immigrants, second-property owners and the proliferation of activities directly or indirectly associated with the tourism sector. Despite the advantages this destination offers, 13,625 persons are recorded in poverty. (MEPyD 2014), which represents 72.7% of the population. The percentage in the urban area is 90.67%, while in the sections the percentage represents 46.96%. Thus, the urban poverty density is 1,753.41 poor/km<sup>2</sup> (national average of 79.8 poor/km<sup>2</sup>), which reveals high social vulnerability in the urban area.

The number of poor households in the urban area is 1,926 (337.30 poor households/km<sup>2</sup>), while there is a total of 251 poor households in the section (2.35 poor households/km<sup>2</sup>); which shows that hardships and vulnerabilities are concentrated in the urban area of the municipality.

Conditional Cash Transfer Programs indicate that 0.13% of the National Budget I (RD\$ 9,520,500.00) is earmarked for the *Comer es Primero* Program (Eating is First, PCP, per its acronym in Spanish) that targets 964 households (PROSOLI 2016); and in second place, the largest budget of this type of cash transfers to the municipality is assigned the BONOOGAS program that benefits 1,113 households (18.14%) amounting to RD\$ 3,057,480.00 (ADESS 2016).

### **Land Vulnerability**

Most of the population of the Municipality of Las Terrenas is in the urban area of the municipality and most of the housing units are in this space, occupied by a surface of 5.71 km<sup>2</sup>, for a ratio of 1,074.43 housing units/km<sup>2</sup> (6,135 housing units).

The areas of greatest municipal vulnerability are close to the marine coastline because of rising sea levels on account of a great many buildings and economic activities being located on this surface, and because of extreme meteorological events with storm surges that have an impact on it and cause seawater intrusion and coastal flooding with the ensuing erosion and loss of beach sand. Another high vulnerability land is on the sierra area next to the Atlantic Boulevard starting at 50 masl owing to possible landslides.

The location of Las Terrenas, along the course of its main aquifer source, exposes the population to possible flooding because this and other runoffs have been occupied, preventing water from taking its normal course. The main neighborhoods impacted by floods, due to a major volume of rainfalls and the proximity to the Las Terrenas river course are *Caño Seco, El Cacao, Come Pan, Pueblecito, Hospital* and *Centro del Pueblo*. Yet another significant factor is the lack of sewage system in the urban area of de Las Terrenas which contributes to the accumulation of a great volume of water in its streets.

The lack of physical boundaries to preserve public spaces in the Municipality of Las Terrenas has left a gap leading to their informal occupation; a silent occupation that demands the strengthening of the oversight mechanism of the City Council and government entities present in the territory, so as to insure the use of such public spaces by everyone, while protecting public places in areas of high vulnerability.

The response capability of the firefighting department is limited to a single station and the civil defense is limited to two stations, both of which have neither the staff nor the necessary equipment to address catastrophic events.

### **Land Concentration**

The population of the municipality is dispersed throughout the territory, both inside and outside the urban perimeter. There is, however, an important population concentrated in the municipal urban area, where 59.08% of the population (11,124 inhabitants) lives, for a density of 1,947.64 inhabitants/km<sup>2</sup>, while 40.92% lives outside this perimeter, for a population of 7,705 inhabitants and a density of 168.30 inhabitants/km<sup>2</sup>.

The largest concentration of the municipality is in the neighborhoods in the center of the urban perimeter: *Centro del Pueblo, El Cacao, La Ceiba* and *Hospital*. Outside the urban perimeter, the largest concentration of the population is in *Hoyo del Cacao, El Portillo* and *El Naranjito*. Distances within the urban perimeter are short and the existing traffic flow, on Calle Duarte and Calle El Carmen, has a bearing on the concentration of municipal activities.

The marine coastline is the space, par excellence, where tourism activities are concentrated, including hotels, houses, restaurants, street vendors and all type of kiosks associated with the sector's economy.

### **Land Connectivity**

The Municipality is connected to its overall immediate environment by a system of roads that offers inter-municipal displacement alternatives, which provides high inter-urban land connectivity. After opening the Atlantic Tourist Boulevard, this has been the most used road to gain access to Las Terrenas, even above the traffic flow on the Sánchez – Las Terrenas Highway.

The structure of the land in the urban area of Las Terrenas shows low urban connectivity between the different city neighborhoods, narrow streets that end in an incomplete layout, and some roads that do not connect major areas in this urban structure. The process of informal expansion of the city, outside the perimeter of the urban area has given rise to new communities which are yet to be connected to the remaining urban plan, thus making it impossible to consolidate an urban settlement integrated to the rest of the city.

The main streets running North to South (*Nuestra Señora del Carmen* and *calle Duarte*) are not planned in terms of traffic lanes, parking areas, public spaces and green areas. In the context of this situation, signage is lacking, which does not contribute to guide passers-by from the place they are to where they might be headed. Currently, there is a single, inter-urban transportation system, leaving internal public transportation in the hands of moto-conchos\*.

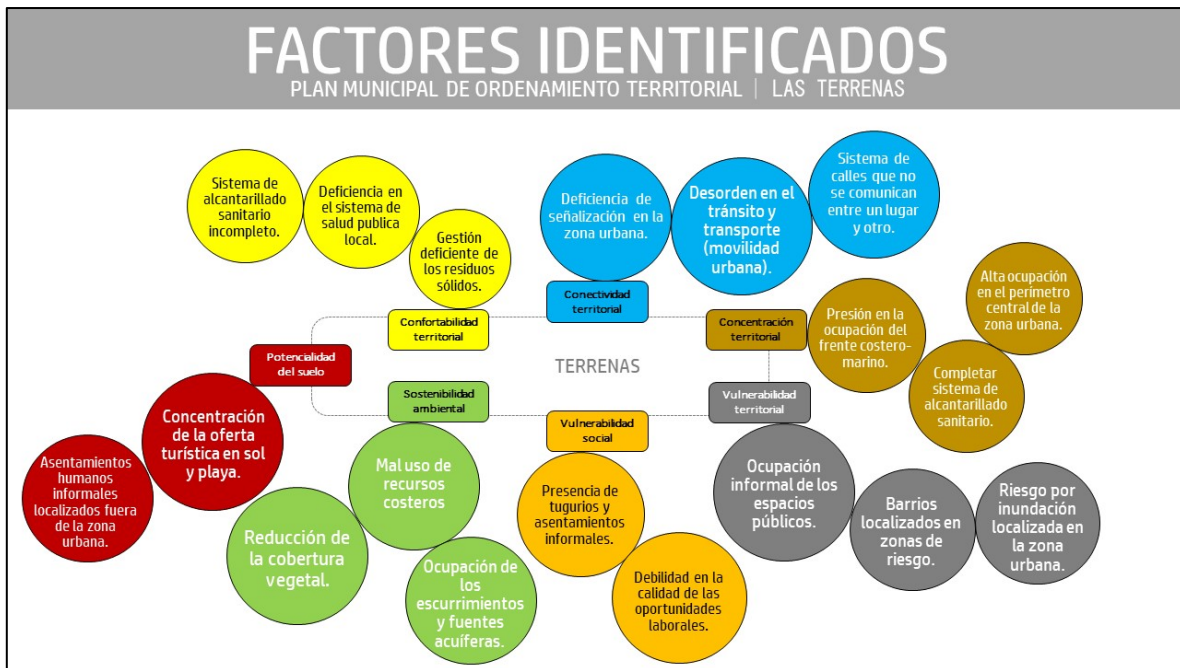
\*Translator's note: Moto-conchos is transportation by motorcycle.

**Land Suitability**

Municipal public services in the municipality of Las Terrenas are managed by several entities. This requires the coordination, by City Council, of the different service providers with a view to improving the tourism supply identified in the survey conducted. The point of departure shows 20.84% of households have water inside the housing unit, 7.29% of households with electrical energy inside the housing unit, 72.43% with toilet inside the housing unit, 65.79% of households rely on garbage collection, all of which reveals important weaknesses in the provision of public services. Scarce sewage coverage -it is not even connected to an operating treatment plant, reveals a deficient sewage system. This exposes a major health deficit in the municipality, since it does not have the basic habitability aspects that provide for a better quality of life of the municipal residents. In terms of the provision of public health services, only two Primary Health Care Units (PHCUs) are operating, which reveals a ratio of 9,415 inhabitants cared for by each PHCU.

This situation calls for improving the management of the services provided by the Las Terrenas City Council, improving the coordination of the supply of infrastructure built in the municipality with government entities, articulating the provision of education and health services towards consolidating the formal human settlements, enhancing the creation of a new public space typology and strengthening the provision of civil care and protection.

Chart I. Critical MLUP Factors Identified-Terrenas



Source: ICMA-2017

**CRITICAL FACTORS.** This description of the results allows to identify a series of factors that need to be considered to guide municipal development, by improving the land occupation model and guaranteeing levels of minimum habitability for the resident population in the municipality of Las Terrenas. Critical factors are identified as follows:

1. Land Potential
  - a. Concentration of the sun and beach tourism offer
  - b. Informal human settlements outside the urban area
2. Environmental Sustainability
  - a. Inadequate use of coastal resources (Felling of mangroves, sand extraction and indiscriminate fishing)
  - b. Reduction of the vegetative cover
  - c. Occupation of runoffs and aquifers
3. Social Vulnerability
  - a. Presence of slums and informal settlements
  - b. Weak quality of labor opportunities
4. Land Vulnerability
  - a. Informal occupation of public spaces
  - b. Flood risk located in the urban area
  - c. Existence of neighborhoods in risk areas as a result of illegal occupation.
5. Land Concentration
  - a. Pressure due to the occupation of the coastal-marine front
  - b. Complete the sanitary sewer system
  - c. High occupation in the central perimeter of the urban area
6. Land Connectivity
  - a. Poor signage in the urban area
  - b. System of streets not connecting one place with another
  - c. Traffic and transportation disorder (urban mobility)
7. Land Suitability
  - a. Deficient final disposal of solid waste
  - b. Deficient local public health system
  - c. Incomplete sanitary sewer system

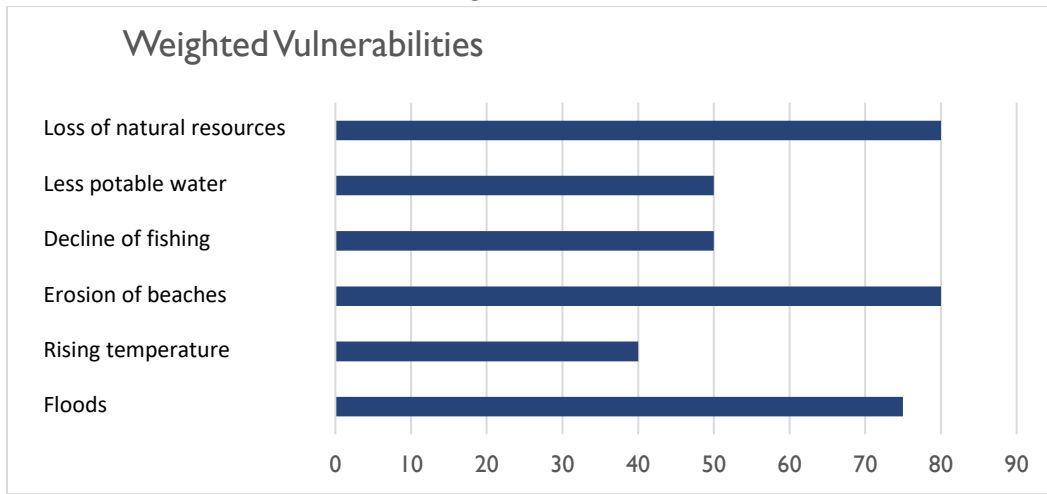
**Structural Factors:**

- Lack of inter-institutional coordination (city council – central government)
- Weakness of the structure and capabilities of City Council to manage the territory
- Lack of municipal standards regarding land use and occupation.

Citizen consultation enabled weighing the perception of the key sectors that interact in the municipality of Las Terrenas, in terms of prioritizing major vulnerabilities and critical factors dealing with municipal land occupation and use. This weighing of the vulnerabilities and their

impacts in the development of the municipality carried by grassroot organizations revealed the following results:

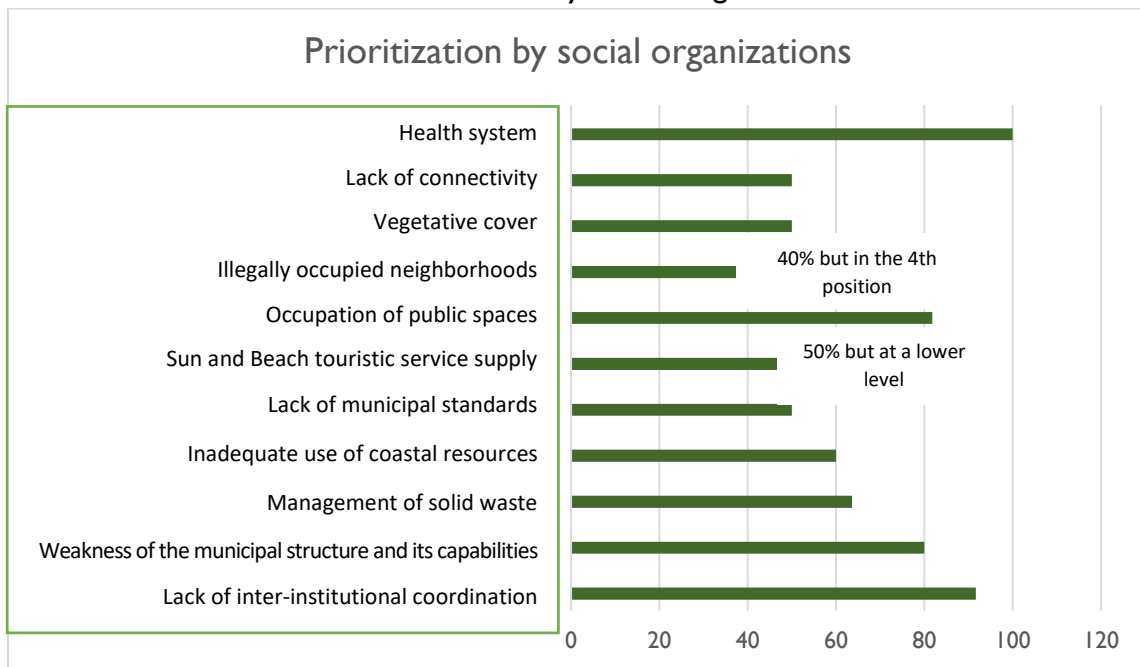
Chart 2. MLUP Weighted Vulnerabilities-Terrenas



Source: ICMA-2017

The critical factors prioritized by the social organizations include a deficient health system, lack of interinstitutional coordination and illegal occupation of public spaces. The following lists the critical factors identified and their percentages.

Chart 3. MLUP Prioritization by Social Organizations -Terrenas

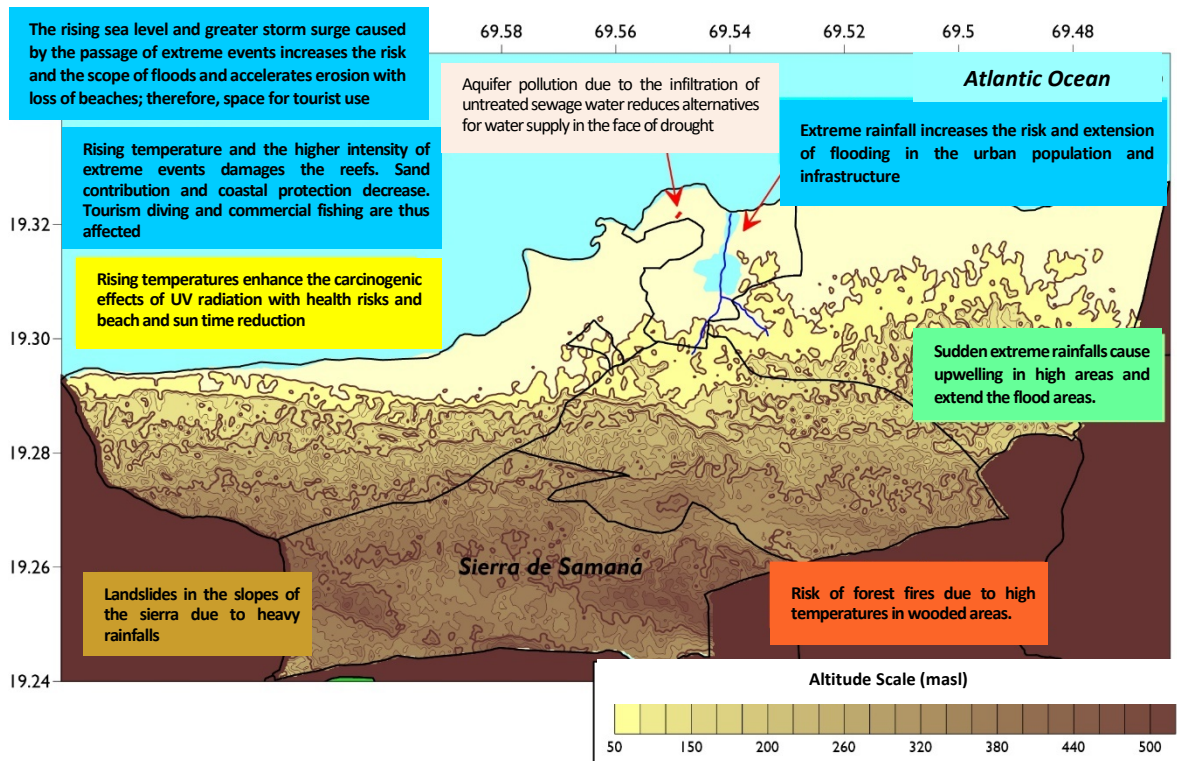


Source: ICMA-2017

## b. Analysis of Climate Vulnerability

In the context of the Las Terrenas Municipal Land Use Plan, the Assessment of Climate Vulnerability was an essential step in identifying present and future vulnerabilities that threaten municipal development vis-à-vis climate change, based on which adaptation measures were elaborated, set out in a plan and incorporated in the decision-making process through land use planning instruments. The climate vulnerability assessment reveals that the population and urban infrastructure of all sectors and key municipal services are vulnerable to various climate threats and stressors that can cause a variety of impacts depending on their vulnerabilities, that is, their degree of exposure and sensitivity, and the level of development of adaptive capacity. We refer to rising temperature and heat waves, to a greater intensity of extreme meteorological events with intense rainfall and floods, changes in rainfall patterns (with a scenario of reduction and drought or extreme off-season rainfall) and rising sea level with greater storm surge and coastal flooding.

Figure 1. Summary of climate threats and their present and future impacts on the geomorphological context in the Municipality of Las Terrenas. Light Blue indicates the flooded strip in the urban area, and dark blue lines are the Las Terrenas and Caño Seco rivers, and a red dot shows the actual polluted waters infiltration site. All climate impacts are aggravated by the non-climate impacts described in the text.



Source: Adaptation Measures Plan for the Municipality of Las Terrenas in the framework of land development and use plans /ICMA/USAID/ICF 2017.



Regarding rising temperatures, the urban area of the municipality is located in an environment with an annual mean temperature of around 26°C. The population and urban infrastructure, and all municipal key sectors and services, especially tourism and natural resources it relies on, are vulnerable to rising temperatures. At the sector level, high temperatures particularly affect public health owing to increased stress due to heat and greater disease propagation. Other sectors especially affected are solid waste, as elevated temperatures accelerate the physical-chemical processes associated to the transformation and decomposition of organic matter; and the electric system due to overheating in energy transmissions and distribution lines. Given that these services are essential for tourism, they can also be affected by high temperatures that limit or reduce the time for open-air activities, and increase water needs and refrigeration. This situation can worsen towards the future, since projections for high and low emission scenarios, respectively, are that the annual average temperature will rise by 2030 in 0.7°C and 0.8°C and between 1.13°C to 1.56°C by 2050. Removal of the vegetative cover by the tourism industry may leave the territory deprived of enough acclimatization and shade spaces.

As for flooding, we must consider the natural conditions of the land favoring them and the transformations of an unplanned urbanization that promotes them. The city extends into a valley, between the coastal edge and the Sierra de Samamá, a situation that favors runoff towards the urban area. This, together with its location on the lower basin of the Las Terrenas River, in addition to the presence of numerous lagoons and swamps, are natural conditions for floods.

The urban population and infrastructure, and all key municipal activities, sectors and services, especially in the urban center, are vulnerable to intense rainfall that trigger floods caused by the surge of the *Las Terrenas* and *Caño Seco* rivers due to the accumulation of water in low-lying flood-prone areas (flood areas) or where -as a result of uncontrolled urbanization- the topography and drainage have been altered favoring stagnant conditions. This situation may worsen because of the upwelling of waters in the high areas of the municipality that further strengthen and expand flooded areas such as during the extreme rainfall events in the last quarter of 2016. Except for *El Almendro*, the remaining nine urban neighborhoods are, to a greater or lesser extent, vulnerable to floods, but the most critical are the *Center of the City* with the most important commercial area, or *El Hospital*, where the major health infrastructure is found. Global warming is foreseen to intensify the severity and precipitation rates that will increase flooding. Vulnerability to floods is enhanced by non-climate impacts such as unplanned constructions that change the course of runoffs or render the soil impermeable, thus doing away with infiltration; dispersion of solid waste that obstruct drainage, elimination of vegetation for construction purposes that drastically reduces

natural drainage spaces or informal human settlements in low areas or in fluvial flood plains themselves.

Within the scenario of drought, we must consider that the municipal water service is from the *Cosón* River and it is distributed to the population through the aqueduct. Water being an essential factor for development, the population and urban infrastructure, and that of all sectors and services, are vulnerable to reduced rainfall and drought, which can reduce the amount and quality of consumption water. The driest periods for Las Terrenas have been reported in 2000–2001 and 2010 and aridness and the annual deficit in humidity are expected to increase by 2030 due to a rise in temperature, potential evapotranspiration and reduced rainfall, although Las Terrenas is still considered to be humid in the future. Projections, however, for annual average rainfall indicate reductions by year 2030 (-1.2% to -2.3%) and up to mid-2050 (-3.7% to -10.9%), which points to the need for taking measures to protect surface and underground water resources.

Vulnerability increases due to non-climate impacts arising from the inadequate management of water sources: river pollution, swamp filling or infiltration of the phreatic mantle of untreated residual waters as a result of the improper operation of the municipal treatment plant. The scenario of changes in precipitations also includes sudden extreme rain such as in the last quarter of 2016, causing surges of water in the high areas of the municipality that created new provisional water currents and extended the flooded areas.

In the light of rising sea levels, we must consider the municipality has 26.72 km of coastline to the Atlantic Ocean. The urban population and infrastructure, and all of the key activities, sectors and services (residential, commercial and tourist) on or close to the coastal area, mainly on the Punta Balatá coast up to the East municipal border (some 20.7 km), are vulnerable to extreme meteorological events with their sea swells that cause sea penetration and coastal floods with erosion and loss of beach sand. Floods and their negative consequences on the population and coastal infrastructure may be greater in the future under the climatic scenarios that indicate more extreme meteorological events with storm waves of greater scope due to rising sea level.

Projections of rising sea level between 0.20 to 0.58 m by 2050 will cause the sea to cover part of the coast (depending on the slopes) causing larger waves during storm surges, with a greater penetration scope, thus increasing the risks of coastal floods. Vulnerability worsens due to non-climatic impacts such as the buildings close to the coastline (60-m strip), mangroves felling, illegal sand extraction and selective elimination of the coastal vegetative cover (herbaceous and arboreal).

Something that must be considered very especially in Las Terrenas is the vulnerabilities of tourism-sustaining natural resources. Tourism in Las Terrenas is essentially “sun and beach” tourism, the basic activities of which take place on the beach (recreation and sunbathing) and in the sea (bathing). This offer is further enhanced and complemented by a set of exploration, navigation, sports fishing and diving recreational activities. All of these activities are sustained on natural resources. On the coastal edge there are 1.9 km of mangroves, 5.8 km of rocky coast, 18.5 km of sandy beaches, several lagoons and swamps; and the marine area has extensive coral reefs with a great diversity of species that are fishing resources.

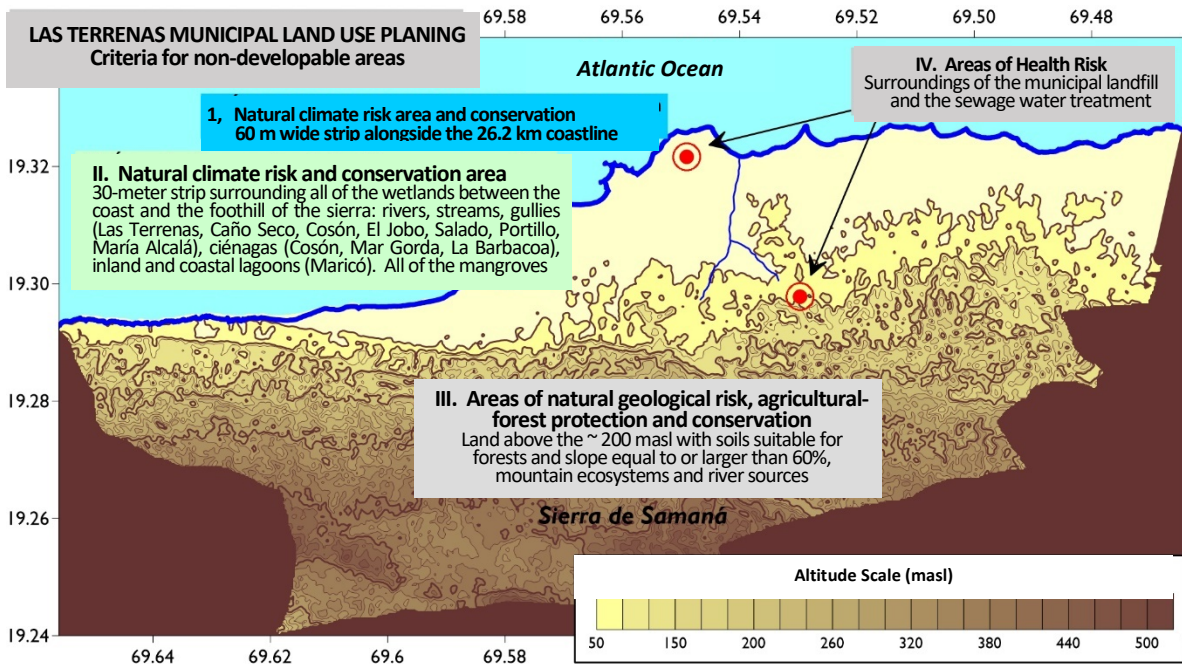
The beaches and coral reefs are highly vulnerable to climate change. In the beaches, rising sea level will leave parts of the coast submerged, while extreme meteorological events of greater intensity, with larger storm surges, will accelerate erosive processes with loss of beach sands. Coral reefs have a narrow thermal tolerance and are very vulnerable to temperature increases that cause colonies to suffer the phenomenon known as coral bleaching that can lead to annihilation of the reef. On the other hand, extreme meteorological events can cause physical damages to the reef especially at shallow depth. Impacts to the beach will lead to loss of carrying capacity for tourism recreation. Impacts to reefs will affect underwater landscape to the detriment of tourism diving and to the services this ecosystem renders: beach sand contribution and protection against waves. Furthermore, reef species, which are fishing resources of commercial value, will be affected.

The mangroves, lagoons and swamps can be affected by water reduction or the physical impact of extreme events, and their conservation is crucial given the role they play as flood buffers. These resources have already been degraded due to a combination of climate and non-climate impacts, such as pollution by waste waters, sand extraction, mangrove felling, wetland landfilling or overfishing. Growing demands for service infrastructures (new hotels and other facilities) with the expansion of the tourism sector, will worsen the vulnerability of natural resources in the future if the projects are not implemented sustainably. The ecosystem services are essential to develop tourism-oriented services, and to strengthen the adaptive land capability. Resilience to climate change in the Las Terrenas municipality shall, of need, require practicing an ecosystem-based adaptation.

These vulnerabilities associated to the exposure and sensitivity of the various assets require developing an adaptive capability to help counter them. In terms of enhancing adaptive capability, an essential challenge is to strengthen the existing institutional capability to reduce vulnerability and adapt to climate change.

Lack of coordination between institutions and sectors is presently a serious problem that does not help climate impacts that promote vulnerability. On the other hand, achieving coordination and collaboration between sectors and local institutions and City Council is essential to address and solve the negative synergies created between the climate impacts and those derived from inadequate land management in environmental terms and its basic services.

Figure 4. Criteria for Non-Developable Areas on the Geomorphological Context of the Las Terrenas Municipality



Source: Las Terrenas Municipality Plan for adaptation measures in the framework of the land use and development plans /ICMA/USAID/ICF 2017.

#### 4. Prospective Land Planning<sup>2</sup>

Starting with the diagnosis conducted, two **land scenarios** indicate what to expect in the municipality of Las Terrenas in the event the current trend (trend scenario) continues, and what would happen in the event we had the municipality everyone dreams of (ideal scenario). Following the consultation process carried out by the Inter-Institutional Working Group, the following scenarios were identified.

##### **Trend Scenario:**

The urban area of the municipality continues its expansion throughout the municipal territory occupying land with natural and agricultural suitability outside the perimeter of its urban area. This promotes informality, increases the built surface and weakens the supply of effective public services. Highlighted among the services that have a greater negative impact on the population is the lack of an effective solid waste collection and final disposal system, deteriorating the health of its inhabitants and affecting urban economy. As for the blue network of the municipality, the main aquifer sources are still being occupied by informal human settlements that deteriorate the natural urban system, raising the level of risk to the population that lives in these human settlements. On the other hand, deterioration of Las Terrenas marine coastal front continues to have a negative impact on productive activities carried out and depend on this territory.

##### **Ideal Scenario:**

Standards establishing the official limits of the urban area and its neighborhoods are approved, thus consolidating an exclusive area to locate the human settlements which allows to improve public service management and extend their coverage. All aquifer sources are integrated to a protection system, limiting vulnerable and risk areas. Limits are established for the entire marine coastal front of Las Terrenas, complying with the legal provision to free the 60 meters from the high tide line. Governance of Las Terrenas is strengthened through the coordination fostered by Las Terrenas City Council with the central government and the productive sector; defining sustainable land use policies for Las Terrenas and prompting shared land management.

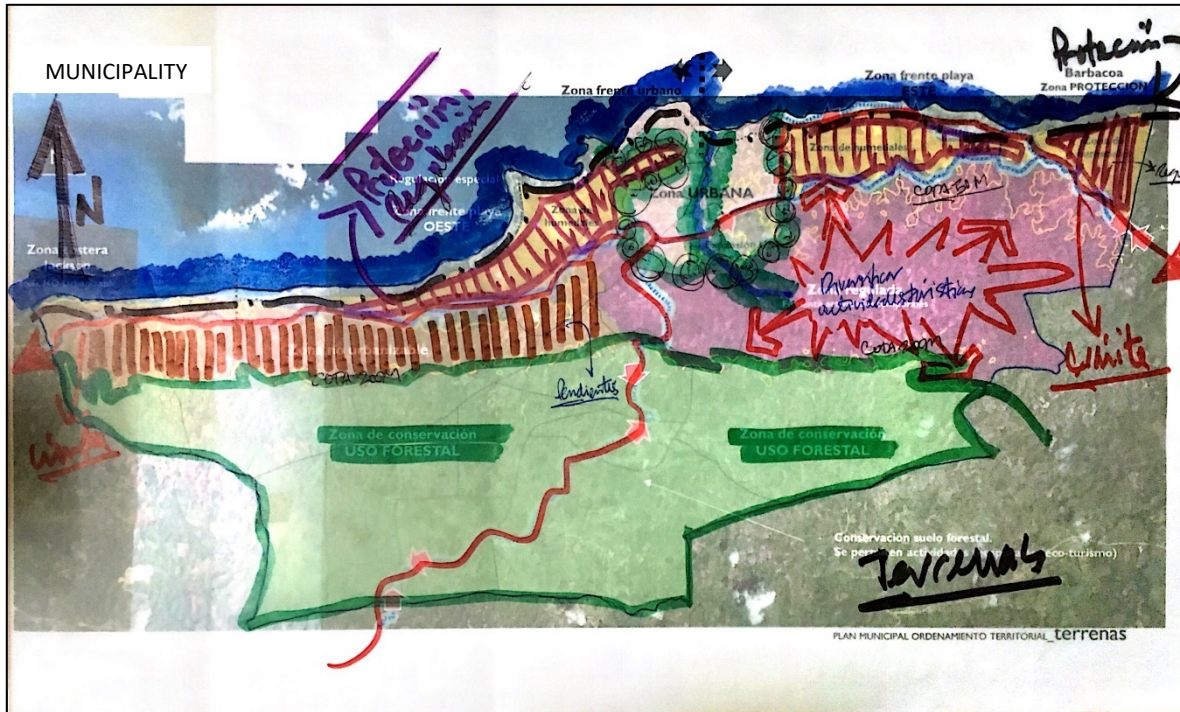
Translating the **ideal scenario** into a set of ideas that consolidate the dreams and yearnings of key stakeholders allows to construct a vision that also guides the objectives that need to be implemented in the municipal land to achieve the longings of the population and the key

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<sup>2</sup> Prospective Land Planning: A social transformation process that systematizes collective intelligence, constructs the vision of land use to guide decisions, mobilize joint actions and address challenges. (Mideplan, 2005).

stakeholders interacting there. In doing this, land planning and development instruments were surveyed and analyzed as a stepping stone to defining this vision. The following is a map that summarizes the ideal scenario agreed to:

Map I. MLUP Ideal Scenario -Terrenas



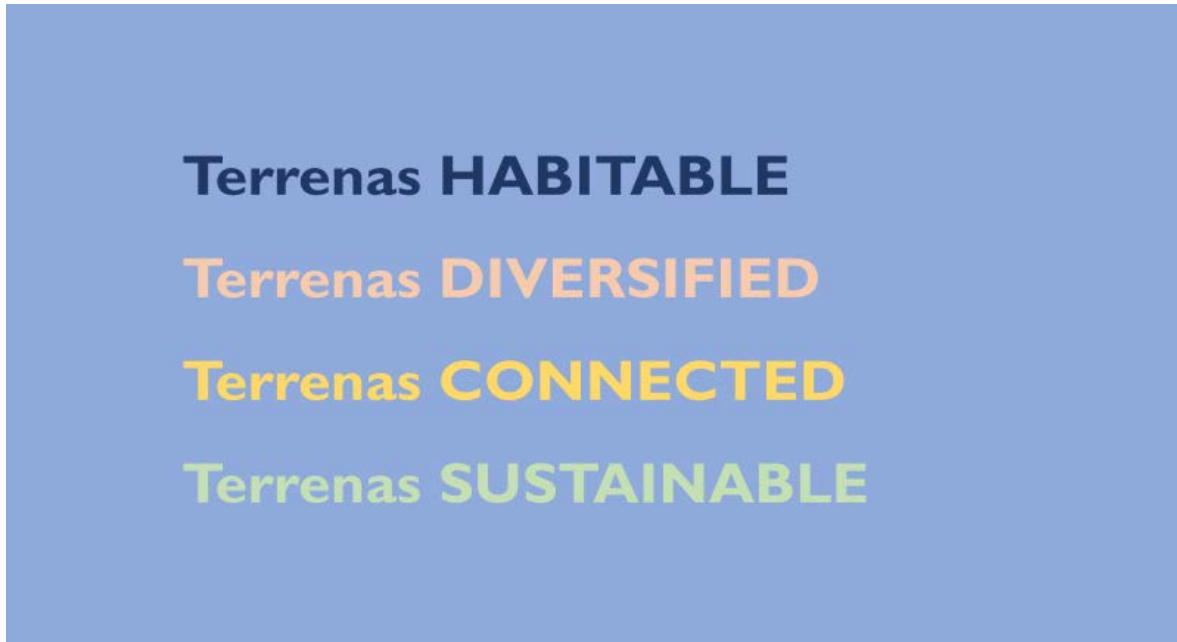
Source: Prepared by the Inter-Institutional Group

The ideal scenario chart shows four (4) major strips for the zoning of municipal land. The first strip aspires to consolidate a limit for the entire marine coastal front to define areas not suited for development and regulate the type of occupation and the manner of construction that needs to be carried out. Land protection where wetlands are located identifies a second major strip throughout the municipality. The third strip limits development in areas with larger slopes, and also regulates occupation aimed at diversifying activities outside the urban area. All land above the 200 level is consolidated as the fourth strip intended to preserve natural land.

The vision agreed to by consensus indicates: **“Terrenas consolidates a diversified tourism on the entire municipal territory, preserving the entire marine coastal edge and arranging population concentration in a connected urban zone, resilient to climate and an infrastructure of efficient services.”**

The prospective outlook of the Las Terrenas Municipality, considering the economic, social, spatial and environmental dynamics, allows to lay down the new course that the stakeholders of this land aspire to improve the livelihood of its inhabitants: prompting an economy that can sustain itself despite climate changes. Towards this purpose, the following proposition is offered: Las Terrenas inhabitable, diversified, connected and sustainable.

Figure 3. Summary of the vision of the Municipality of Las Terrenas



The vision agreed to identifies a series of objectives that contribute to improving the livelihood of the inhabitants.

Objective 1 (O1). To protect all aquifer sources in the Municipality of Las Terrenas.

Objective 2 (O2). To establish a municipal management system for the collection and final disposal of solid waste.

Objective 3 (O3). To approve instruments to limit, promote and restrict the use and occupation of urban area land.

Objective 4 (O4). To guarantee the conservation and sustainable use of the entire coastal marine front of Las Terrenas.

Objective 5 (O5). To improve coordination between the Las Terrenas city council and the central government for the supply of effective public services.

Objective 6 (O6). To diversify and complement the sun and beach offer by including ecotourism and mountain tourism.



## 5. Proposals

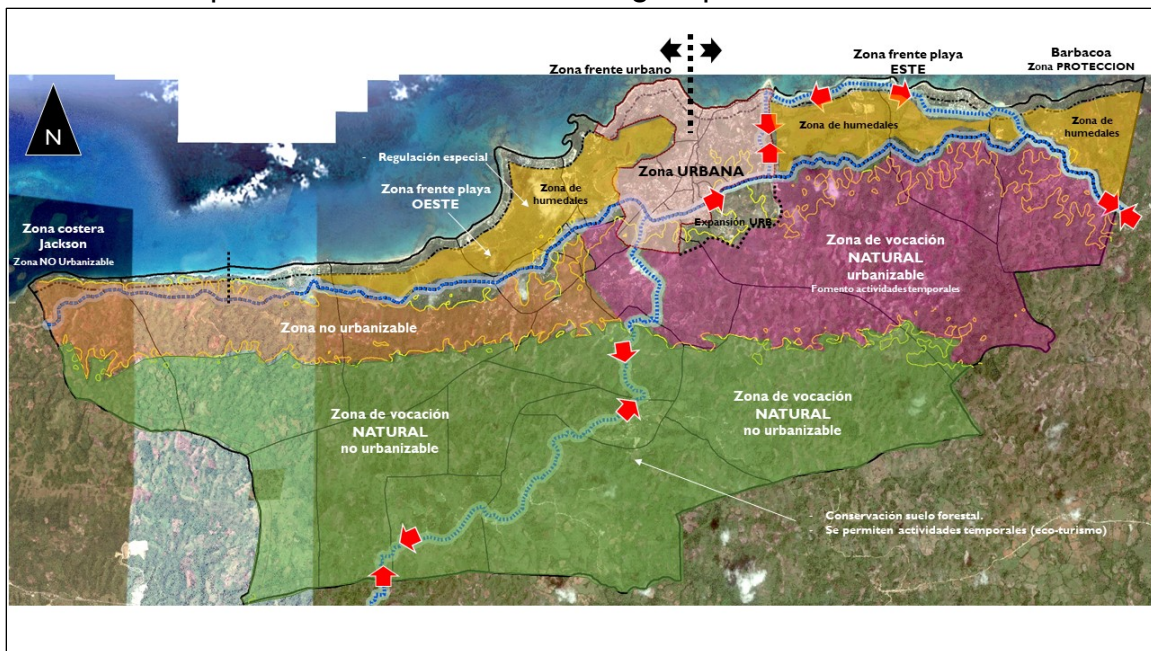
The prospective outlook contributes to the definition of limits and initiatives in the search for definitive solutions to the critical factors identified in the seven categories<sup>3</sup>. These proposals are grouped in a preferential use zoning map (ZUP), a set of policies and a portfolio of plans, programs and projects.

### a. Preferential Land Use Zoning (ZUP)

Taking into account the four strips<sup>4</sup> identified for the Las Terrenas Municipality, Preferential Land Use Zone is established for the entire municipality and city management zoning (urban area). The municipal scale identifies, four (4) areas oriented to preferential uses, as follows:

1. Coastal edge area
2. Urban area
3. Wetlands area
4. Natural area

Map 2. Preferential Land Use Zoning Proposal MLUP -Terrenas



Source: ICMA-2017

The regulation surface boundary of the coastal edge is 200.0 meters from the established coastline. This surface belongs to strip I which is divided in two well defined areas: a first boundary from the coastline to the first 60.0 meters established as non-developable area, strengthening the provisions of Law 305-68, regulating

<sup>3</sup>Land potential, environmental sustainability, Social vulnerability, land vulnerability, land concentration, land connectivity and land suitability.

<sup>4</sup> Strip 1 (coastal marine front), strip 2 (wetlands area), strip 3 (Natural development area), strip 4 (natural area – non-developable).

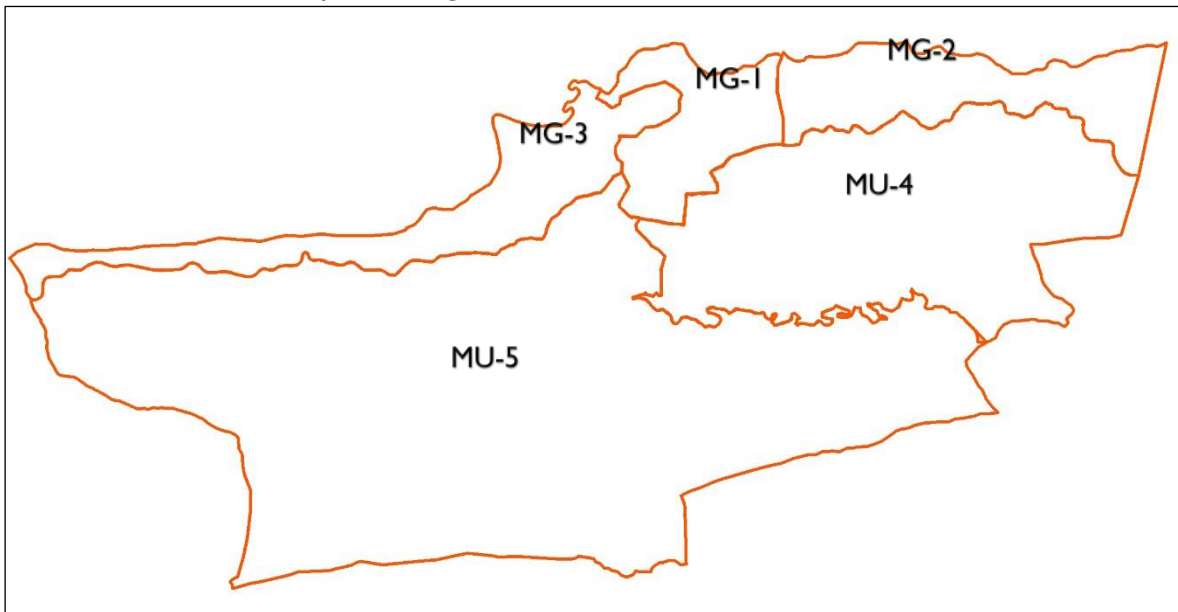


temporary activities and allowing uses that do not affect the degradation or erosion of beach areas. The second boundary is from the 60.0 meters identified up to 200.0 meters for a second, 140.0-meter regulation strip aimed at protecting mangroves (coastal and/or basin). The non-developable area is established between the beach limit and the dunes. It is necessary to keep 100% of the existing sand surface in this strip. An assessment of the existing vegetation is requested, a minimum percentage of permeable area is set, and lighting is regulated to protect the species identified in the area.

The first strip located in the urban area of Las Terrenas pavement calls for improvement of the pavement to make it resistant and permeable, building of gray-green infrastructure is allowed, coastal forest and mangrove reforestation is promoted, and new authorizations must respond to the scheme identified by the municipal land use plan.

Pursuant to the proposals, the **Management Unit (MU)** is established at the municipal level, as the basic space limited for planning, implementation and follow up of policies, plans, programs and projects identified in the MLUP-Terrenas, in addition to promoting compliance with the vision established and insuring basic habitability. These management units have been divided attending to existing physical boundaries that establish the division with clarity, homogeneous physical elements and similar development characteristics.

Map 3. Management Units-MU MLUP-Terrenas.



Source: ICMA-2017

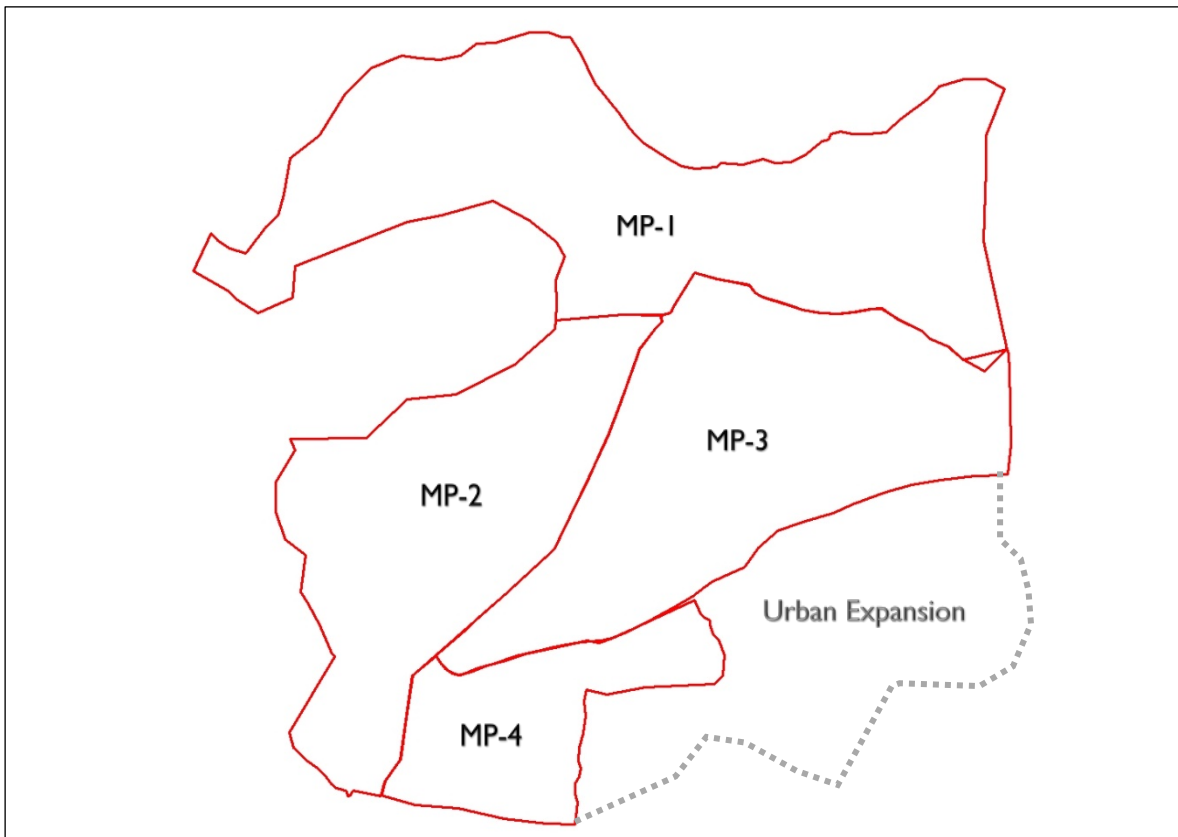
Pursuant to the general criteria identified, five (5) management units are established, as follows:

MU-1 is circumscribed to the municipal urban area, while the land scope of MU-2 and MU-3 is from the coastline up to the Atlantic Boulevard; and MU-4 is to the east of the municipal urban area between the Atlantic Boulevard and the 200.0 M elevation, up to the south boundary of the municipality.

The Directorate of the Management Unit will be in charge of the Secretariat General of the city council thus enabling it to coordinate all of its technical bodies with responsibility for designing, elaborating, regulating, and managing the use of land and buildings throughout the territory.

Within the urban area, management perimeters (MP) are established and defined as urban cells integrated by neighborhood groups and/or lots with similar spatial characteristics to manage and tailor public services. The following is the scheme of the MP identified in MU-1:

Map 4. Map of Management Perimeters-MP identified in MU -I (change)



Fuente: ICMA-2017

MP-1 is limited to the north by the coastal-marine front, to the east by the urban perimeter next to *Calle El Carmen*, to the south by *Calle Salome Ureña* and to the west by the urban perimeter boundary. MP-2 is limited to the north by **calle XXXX**, to the east by *Calle Duarte* and to the southwest by the urban perimeter boundary. MP-3 is limited to the north by *calle Salome Ureña*, to the east by the urban



The mobility system for the Las Terrenas urban area establishes a new road nomenclature with a set of elements that make up the overall traffic and transportation system for the municipality, linking the use and occupation to the space of the mobility system. This is being developed to improve displacement conditions of pedestrian and motorized traffic, adding value to the possibility of walking through the city, while using less polluting mobility systems and planning roads that optimize the displacements of the different vehicle types.

The road network for the municipality of Las Terrenas is divided according to their carrying capacity, and as such are classified as:

- a. **Main road** with two or more two-way lanes
- b. **Primary road** with one, two-way lane
- c. **Secondary road** with two or more one-way lanes
- d. **Tertiary road** for pedestrian traffic and bike road

The roads allowing motorized traffic are main, primary, and secondary; while tertiary roads are solely for pedestrian traffic. Both for primary and secondary roads there are bike roads and sidewalks 1.50-meters wide. The following is a matrix with the name of the streets depending on the carrying capacity.

<b>Main</b>
Atlantic Boulevard / Las Terrenas – Sánchez road
<b>Primary</b>
Calle El Carmen / Calle Duarte / Calle Nuestra Señora del Carmen
<b>Secondary</b>
Avenida 27 de Febrero / Calle Francisco Alberto Caamaño Deñó / Avenida Juan Pablo Duarte / Calle 30 de Marzo / Avenida Italia / Calle Las Playas / Pedro Francisco Bono / Margareth / Los Corrales / Avenida Marico / Calle del Hospital / Calle Gregorio Luperón / Calle Fabio Abreu / 16 de Agosto / Pepín / Calle Salome Urena / 30 de Marzo / Calle Emilio Prudhomme / Benelux
<b>Tertiary</b>
Libertad /

This division, in turn, is classified according to urban attributes; circuits, promenades or panoramic views. The circuits are two-way vehicular traffic roads, with collective transport axes that group various human settlements. Promenades are roads designed predominantly for pedestrian walks, located near high activity development areas.



Panoramic roads have been designed for landscape enjoyment and recreation in keeping with the National System for Protected Areas. The main characteristics are:

- Ban on landscape obstruction
- Development of bike lanes
- Continuity of green surface
- Vehicle load regulation
- Prohibition of parking on both sides of the road

To this end, the road located across the marine coast is designated as panoramic view, to enable it to function as the boundary between the non-developable area and the marine coast surface.

Map 6. MLUP-Terrenas Road System Proposal



Source: ICMA-2017

To contribute to reducing traffic congestion in the central roads of the municipality of Las Terrenas, traffic circulating from the Atlantic Boulevard along the coastal road (Av. 27 de Febrero and calle Caamaño Deñó Francisco) is deferred through *Calle Nuestra Señora del Carmen*, towards *Calle el Carmen*. This street is located on the east boundary of the urban perimeter, connecting the motorized traffic entering the municipality with facilities located on the marine coastal front. Another access is established on the coast connecting with the north circuit located to the west of the urban perimeter.

Motorized circuits are also established to connect the various neighborhoods. These are integrated by roads of lesser capacity for displacement of pedestrians,

bicycles or lower-speed motorized traffic. The circuits designed are: North circuit, East circuit, and Central circuit.

Mapa 7. MLUP-Terrenas Coastal-Marine Front Road Network Proposal



Fuente: ICMA-2017

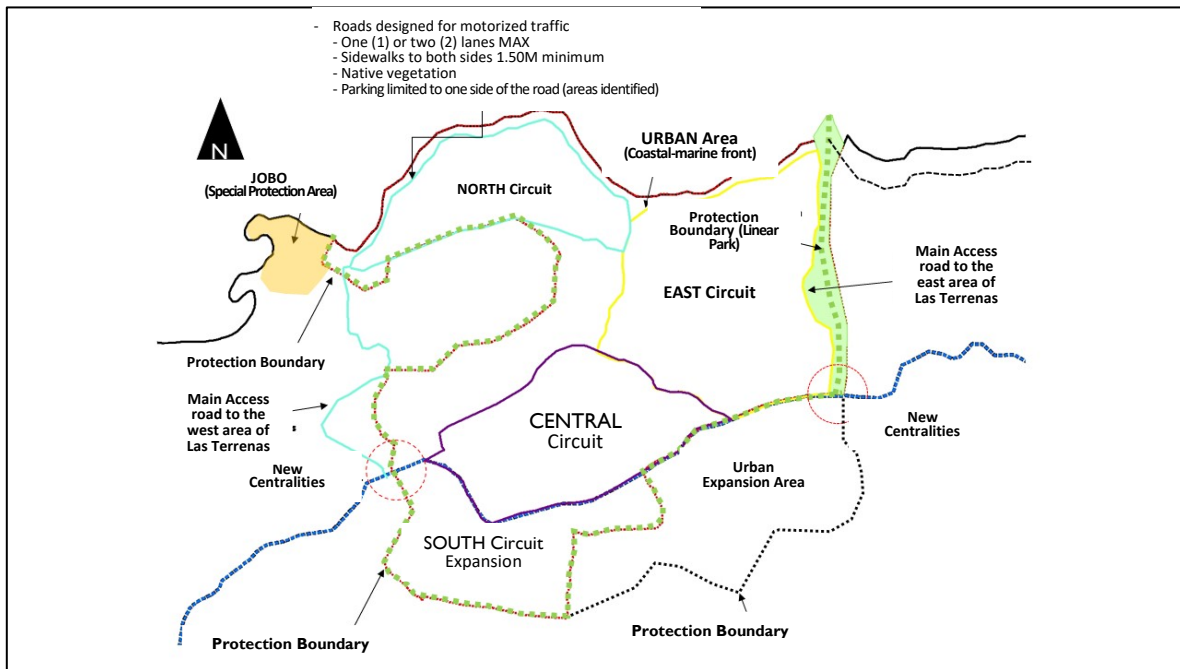
Insert – Linear Park Map (East protection boundary)

Insert – Use Scheme – Coastal edge boundary circulation

Insert – Urban area west boundary scheme – pedestrian path / bike road

Insert - Central Park Map – Urban aquifer source protection

Map 8. MLUP-Terrenas Road Network Proposal-Circuits



Source: ICMA 2017

Within the urban area, an aquifer source protection scheme is defined, with a 30.0-meter area on both sides of the aquifer sources as non-developable area (Law 64-00 Art.129), release of runoffs, sanctioning of discharges and reconversion of the land available for conversion into park.

### b. Land Use Policies

To the end of driving a land use policy in the municipality of Las Terrenas a **Municipal Ordinance** is proposed for approval, to enable regulation of the Las Terrenas Municipal Land Use Plan (MLUP-Terrenas) with indication of boundaries, incentives and restrictions for municipal land use and occupation. The main land use policies conceived in said ordinance are as follows:

1. **Four strips** are established for the municipal land zoning in terms of the land characteristics. The marine-coastal strip (F1), wetlands strip (F2), highway strip to the 200.0 m elevation (F3), strip above the 200.0 M elevation (F4).
2. The **urban area** of the municipality of Las Terrenas is consolidated in its current perimeter of 5.71 km<sup>2</sup>, establishing an urban expansion area towards the land located next to the Atlantic Boulevard to the southeast of the urban perimeter, under the 50.0 m elevation.
3. The entire territory that forms part of the National System of **Protected Areas** located within the municipality (area next to the Atlantic Boulevard) is deemed non-developable.
4. The entire land of the municipality of Las Terrenas located above the 200.0-meter elevation is established as the **conservation area for forest use**.
5. The **protection, conservation and maintenance policy for the overall blue system** of the Las Terrenas Municipality is established. It comprises the entire network of rivers, lagoons, streams, gullies and wetlands.

Likewise, an agreement between the city council of Las Terrenas and the legislative body<sup>5</sup> representing the municipality, called **Land Legislative Agenda**, is necessary to the end of coordinating presentation and/or follow up of useful bills for land development in Las Terrenas.

The initiatives of this agenda include:

- a. Presenting a bill to expand the urban area boundary, with the purpose of regulating it as urban expansion area through a municipal ordinance.
- b. Creating a fund for the improvement of basic public service infrastructure (water, sanitary sewage, storm drainage, final solid waste disposal) and identification of a series of tourism taxes, transferrable to the institutions tasked with managing such services.
- c. Supporting a strategy to position the supply of tourism services of Las Terrenas

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<sup>5</sup> Integrated by the Senator and Congressmen



**c. PPP (Plan, program and project) Matrix**

To the end of organizing the initiatives proposed, the following PPP matrix is presented with plans, programs and projects identified in terms of the objectives proposed.

<b>Objectives</b>	<b>PPP</b>	<b>Characteristics</b>
O1. To protect all aquifer sources in the municipality of Las Terrenas	Ecology Restoration Program	At riverheads and riverbanks and the coastal area, with emphasis on mangroves; through cleaning, sanitation, reforestation and follow up actions, under a green circuit integration approach.
	Environmental and climate education program	Training on land use, climate change, comprehensive disaster risk management and the role of ecosystems in adaptation
	“Blue-Green Network Plan” for the urban area	
O2. To establish a municipal self-management system for the collection and final disposal of solid waste	“Zero Garbage” Municipal Solid Waste Comprehensive Management Program	To address environmental issues and offer adaptation measures for the sector with ample institutional and community participation
	Project to locate and construct a sanitary fill	
O3. To approve instruments for urban area land boundaries, incentives as well as use and occupation restrictions	Urban area regulating plan	Instrument to regulate the urban municipality growth, where boundaries, elevations, developable surface, waterproofing index, etc. are defined; according to the urban polygons defined in the MLUP

Objectives	PPP	Characteristics
	Urban Mobility Plan	To plan population (pedestrians and motorized) displacements and improve road articulation outside the coastal area (with regards to the 60 m) and evaluate solutions for the future recovery of the current 6 km of roads on the sandy coast
	To establish the municipal ordinance	To define the urban area perimeter boundary, quantity/name of neighborhood units, developable and non-developable and high vulnerability areas
	Integration and activation of the land observatory	To survey the residential and tourist infrastructure already located in the coastal ZNU to assess short and medium-term measures for vulnerability reduction. To manage the inventory program and ecosystem cartography
	Program to strengthen capabilities for land use management and supervision	City council staff training, hardware acquisition, updating the municipality to new technology, hiring of key personnel to implement a land monitoring and management system and installing a land and environmental information system in the city council to collect and process pertinent data and information for the decision-making process in land, coastal and marine areas.
O4. To guarantee sustainable conservation and use of the entire Las Terrenas marine-coastal front	Sea turtle use and eco-tourism conservation project	O4. To guarantee the sustainable use of the entire Las Terrenas marine coastal front.
	Program to activate the coastal-marine front land observatory	(Activities: To survey existing residential and tourist infrastructure + topographic survey with LIDAR technology + cartographic inventory of ecosystems).

Objectives	PPP	Characteristics
		To obtain an exact topography of the coastal area to support rising sea level and storm surge impact modelling; as well as urban area impact to assess floods focusing on the natural drainage pattern
	To establish zoning regulation of the marine-coastal front (Municipal Ordinance)	
O5. To improve coordination between the Las Terrenas City Council and the central government to and effective public service supply	Project dealing with flood management in vulnerable areas and neighborhoods	Neighborhood design adapted to floods, with targeted pavement, gutters and ditches to direct water; tree planting and creation of drainage spaces (i.e. <i>El Hospital</i> or <i>Las Terrenas</i> urban area) with incorporation of modern technology (from biofiltration to permeable pavements) to give ad-hoc solutions
	Municipal Hospital relocation	To guarantee the location of the health service center in a less-vulnerable location with better access for the population
	Project to activate the Land Management Committee (City Council + MITUR [Ministry of Tourism] + MOPC [Ministry of Public Works])	
O6. To diversify and complement the supply of sun and beach activities with that of ecotourism and mountain tourism.	Program to identify ecological routes in the rural area.	Coffee route Apiculture

## 6. Implementation Recommendations

The creation of a **Land Use Commission** is recommended as an articulation space between the executive body and the standards-setting body of City Council. The main objective of this Commission is to identify the actions to establish a shared strategy between the executive body and the standards-setting body of City Council. One of the first tasks this Commission should take on is the formulation of a **municipal ordinance** binding all stakeholders, officializing municipal land use policy, establishing boundaries, defining incentives and restrictions.

Likewise, activating the **Land Management Unit** is recommended to apply, follow up and monitor the Municipal Land Use Plan (MLUP). This unit must arrange for the signing of interinstitutional agreements with the public and private sectors to guarantee application of the MLUP provisions. The data surveyed and recorded during the process need to be incorporate to a **spatial data base** containing all documented and non-documented information; thus allowing to visualize land improvements to the end of monitoring advances in policies, plans, programs and projects defined. This unit shall be ascribed to the Secretariat General for the purpose of articulating all existing units, departments and directorates to achieve compliance with the initiatives defined in the MLUP.

## 7. Base Document

1. USAID/ICMA/FEDOMU 2015. Base document for the evaluation of climate vulnerability of the Las Terrenas Municipality. International City/County Management Association, 34 pp.
2. USAID/ICMA/ICF/FEDOMU/AMLT 2016. Evaluation of the climate vulnerability of the Municipality of Las Terrenas for the Municipal Land Use Plan [Working Document], 43 pp.
3. USAID/ICMA/FEDOMU/AMLT 2017. Analysis of the context of the Municipality of Las Terrenas, 23pp
4. USAID/ICMA/FEDOMU/AMLT 2017. Las Terrenas Land Diagnostic Plan, 107pp
5. USAID/ICMA/FEDOMU/AMLT 2016. Integrated Diagnostic Matrix-Las Terrenas, 2pp.
6. USAID/ICMA/ICF 2017. Fact sheets to support climate adaptation and land use in Dominican municipalities: Fact Sheet 1. Solid Waste, 13pp; Fact Sheet 2. Historical Patrimony, 11pp; Fact Sheet 3. Electrical System, 8pp; Fact Sheet 4. Urban Mobility, 9pp; Fact Sheet 5. **Water Supinator**, 7pp.
7. USAID/ICMA/ICF 2017. Adaptation Measure Plan for the municipality of Las Terrenas under Development and Land Use Plans, 29pp.
8. USAID/ICMA/FEDOMU/AMLT 2017. Summary of Land Prospective. 10 pp
9. USAID/ICMA/FEDOMU/AMLT 2017. Policy, Plan, Program Matrix -Las Terrenas, 1pp
10. Map Compendium for the Municipal Land Use Plan
11. USAID/ICMA/AMLT 2017. Las Terrenas Indicator Baseline, 3pp.