# Barbados

# Climate Change and Urban Development Studies

# Bridgetown (Barbados), San José (Costa Rica), and Santiago de los Caballeros (Dominican Republic)

# TERMS OF REFERENCE

1. Background
   1. Cities play a key role in the economy of Latin America and the Caribbean (LAC) through the generation of expertise, diffusion of innovation, concentration of specialized labor, and provision of educational, cultural, and recreational services. At the same time, 66% of the 180 million poor in LAC that live in poverty live in cities. City dwellers have increasing and often unsatisfied demands for urban and social services, decent housing conditions, employment and opportunities to generate income.
   2. Intermediate cities in LAC present particularly complex and interrelated challenges, especially in relation with their fast growth rates that frequently surpass some of the region’s large cities, which have been growing more slowly since the 1980s (Cristini et al. 2008). Overcoming the challenges intermediate cities requires a comprehensive approach that enables them to develop sustainably and simultaneously improve their citizens’ quality of life.
   3. As a response to this situation and in light of the continuing urbanization process in the Region, the Bank launched the Emerging and Sustainable Cities Initiative (ESCI). The purpose of this Initiative is to contribute to the improvement of the quality of life in LAC’s cities in terms of environmental, urban, and fiscal sustainability. Through the ESCI, the Bank combines the expertise of its different sector departments in the formulation of comprehensive action plans designed to facilitate sustainable city planning. It leverages its capacities as the leading source of development financing for the region and applies its long experience in supporting the countries of LAC.
   4. One of the challenges prioritized in many cities in the region is managing urban growth and territorial expansion. Formal and informal growth often leads to negative environmental, social, and economic impacts. Municipal policy makers in intermediate cities usually lack adequate data and analysis to inform the design of policies that help promote growth in a sustainable way. In many cases, the implications for the municipal budget in terms of financing infrastructure development and operation costs have not been clarified in newly urbanized areas. Additionally, the environmental impacts of city growth are often not fully considered. Areas for conservation and aquifer recharge need to be protected or established and vulnerability to natural disaster and the effects of climate change reduced. Anticipatory planning can also help reduce greenhouse gas emissions (GHG) as a major factor affecting climate change.
   5. The studies described in these Terms of Reference aim to facilitate understanding and awareness of these dynamics and specifically address the following issues:
2. A. Mitigation of greenhouse gas emissions
   1. From a global perspective, urban areas in LAC are not major GHG emitters. Given the rapid growth of cities, however, preserving this low-carbon footprint could prove difficult without careful planning. Mitigating emissions and thus helping to protect future generations from dangerous climate change is challenging in LAC as the present generation still lacks adequate access to food, housing, basic utilities, and social services. A culture of resource conservation, efficiency, and respect for the environment needs to be established while continuing to enhance the quality of life of the Region’s citizens.
   2. The Bank will provide its partner cities with a GHG inventory as a basis for analyzing its carbon footprint. It will also help developing a GHG roadmap, helping cities identify concrete options for reducing local emissions. Local governments can use these planning tools to develop a long-term vision and bring together different stakeholders to help decrease their community’s carbon footprint.
3. B. Disaster risk and climate change vulnerability reduction
   1. The impacts of climate change on cities are becoming clearer. The expected increase in the number and intensity of extreme climate events together with the lack of resilience and socio-economic fragility of urban centers in LAC aggravate the risk of flooding, landslides, droughts, and other natural hazards. The livelihoods of coastal communities, for instance, are highly vulnerable to sea level rise. Half of the Region’s urbanized areas with a population of over 5 million people are located in low-lying coastal areas. According to Dasgupta et al. (2007), the damage caused by sea level rise in LAC would cost between 0.5% and 1.3% of the regional GDP.
   2. An expected increase in the number and intensity of extreme hydrometeorological events—such as hurricanes, intensive precipitation, and droughts—is expected to have severe impacts on cities and their inhabitants. These hazards are projected to augment economic and human losses, reduce water availability and production capacity, aggravate erosion, threaten coastal areas, and generate significant negative social impacts.
   3. LAC is also highly exposed to geophysical hazards. The economic losses from earthquakes in Haiti (USD 7.8 billion) and Chile (USD 30 billion) in 2010 came close to surpassing all economic losses in the region caused by natural disasters in the previous decade, a total of USD 34 billion between 2000 and 2009. (EM-DAT, Bureau of Labor Statistics, and IDB Staff calculations).
   4. The lack of adequate urban and rural planning further exacerbates the risk of disastrous events. The livelihoods of the poor are often located in areas with high exposure to natural hazards (i.e. river banks, wetlands, and areas with steep slopes). Disaster risk management in the Region’s mid-sized cities is often insufficient. According to ECLAC/IDB (2009), the cumulative costs of not reducing the impacts of extreme events in LAC in the decades to come could be as high as 250 billion USD by 2100.
   5. For these reasons, the Bank seeks to provide each ESCI city with data and tools to assess key hydrometeorological and geophysical hazards as well as their vulnerability and options for risk reduction.
4. C. Sustainable urban growth
   1. Sustainable urban growth requires adequate planning. The current urban footprint and its potential future growth are important factors that affect a city’s ability to become sustainable and improve the quality of life of its citizens. The analysis of different growth scenarios (low density sprawl, medium to high density mixed-use communities) allows cities to estimate the future infrastructure costs and GHG emissions associated each option. The Bank will provide such assessments through this consultancy in order to support planners and policy-makers in adapting territorial development plans accordingly. This exercise will contribute to low-cost and low-carbon growth while protecting key green infrastructure (like conservation areas and aquifer recharge areas) and avoiding the occupation of highly vulnerable areas.
5. Objective
   1. The overall development goal of this consultancy is to promote sustainable development in the cities of San José (Costa Rica), Bridgetown (Barbados), and Santiago de los Caballeros (Dominican Republic). The products outlined in these Terms of Reference will contribute to this goal by providing analytical inputs necessary for the application of the ESCI methodology and by developing important planning tools for city officials.
   2. The studies that form part of this consultancy seek to achieve specifically the following:
      1. The **climate change mitigation assessment** will provide the analysis and tools necessary to assess and reduce a city’s carbon footprint.
      2. The **disaster risk and climate change vulnerability assessment** will allow getting a better understanding of the risks a city face from natural disasters in a changing climate and facilitate adequate planning.
      3. The **urban growth study** will assess the urban footprint of a city and its dynamics under past, current, and expected future trends to inform and facilitate successful infrastructure and environmental planning at the city and regional level.
6. Activities
7. A. Consulting Engagement 1: Develop a climate change mitigation assessment for each city.
   1. Develop at least one GHG inventory.
   2. The consulting firm must create an inventory to reflect the current level of emissions (preferably for 2013). If data availability permits, an additional inventory for an earlier year (preferably 2011 or even earlier) is to be developed. Inventories shall follow national standards and take into account the most recent methodological approaches under the Global Protocol for Community-scale Greenhouse Gas Emissions (GPC) developed by ICLEI. The emission sources to be covered shall be those included in GPC’s BASIC+ methodology[[1]](#footnote-1) unless the consulting firm can demonstrate to the Bank that certain sectors are not relevant in the city. The inventory shall disaggregate emissions in a way that it becomes evident which emissions result from the operations of the local government.[[2]](#footnote-2)
   3. Develop a GHG roadmap through the following activities:
   4. **Develop** **two** **GHG emission scenarios** for key economic sectors including water, transport, solid waste, energy (supply as well as residential, industrial, and commercial consumption), agriculture, and land use, land-use change, and forestry. The analysis shall provide an understanding of challenges and opportunities facing these sectors. Projections should generally be made for 2030 and 2050 (each for a current trends and a smart growth scenario as described under Consulting Engagement 3 which also needs to take the mitigation options described in the next paragraph into account) or in accordance to the time horizons of local development plans if applicable.
   5. **Determine mitigation targets and identify, assess, and prioritize mitigation options** for relevant sectors. 15 mitigation options shall be proposed. 3 to 5 of these shall help the city government to reduce emissions from its own operations as an organization to lead by example. For each option, an analysis of the following aspects shall be conducted:
      1. Costs: The analysis shall calculate key financial variables as the upfront project costs, payback periods, internal rates of return, and the cost per tonne CO2e reduced
      2. Benefits The assessment of GHG emission savings must draw on the calculation methods from the GPC methodology. If additional methodologies are needed, those from the national emissions inventory that the country reports to the UNFCCC, the Clean Development Mechanism (CDM), or Intergovernmental Panel on Climate Change (IPCC) shall be used. Co-benefits (social, health, environmental, etc.) must be identified and quantified based on calculations or experience from comparable projects.
      3. Financial feasibility
      4. Feasibility of measuring, reporting, and verifying GHG emission reductions (MRV)
   6. The prioritization of the mitigation options shall take the results from this analysis as well as the city’s development priorities into account. Guidance shall be given to city officials on how to implement the prioritized mitigation options by providing international examples of successful application. Examples for potential mitigation options include commercial building efficiency improvements, introduction of emission standards, introduction of Park-and-Ride facilities, tree planting, capture and use of landfill biogas, and improvement of waste collection systems.
   7. **Develop a mitigation assessment manual** to support the local capacity to understand and update the products generated under this Consulting Engagement. The manual shall provide detailed instructions on how to update all elements of the climate change mitigation assessment an especially facilitate the use of the corresponding Excel calculation sheets.
8. B. Consulting Engagement 2: Develop a disaster risk and climate change vulnerability assessment for each city.
   1. The activites to be completed under this Consulting Engagement shall adhere to the following phases (Figure 1)

II. VULNERABILITY ANALYSIS

IV. VULNERAB. REDUCTION PROPOSALS

III. PRIORITIZATION OF VULNERABILITY CHALLENGES

I. PREPARATORY STAGE

Participatory prioritization of main challenges

Stakeholder analysis (identification of key actors, capacities, and opportunities)

Participatory hazard selection

Analysis of causes of vulnerability

Identification and prioritization of strategies to reduce vulnerability

Probabilistic and susceptibility analysis

Engagement / dissemination strategy

*Figure 1: Elements of Consulting Engagement 2*

* 1. Phase 1: Preparatory Stage
  2. This phase includes three activities:
     1. Participatory hazard selection: For each city, three priority hazards affecting it must be assessed under this Consulting Engagement, at least one of these being a slow-onset hazard. Especially (but not only) the following hazards shall be considered:
     2. Rapid-onset hazards:

1. Coastal flooding, storm surge, and different levels of sea level rise;
2. Inland flooding;
3. Hurricanes and tropical storm-strength winds;
4. Seismic activity and its effects (ground shaking, liquefaction, tsunamis, etc.);
5. Volcanic activity;
6. Landslides;
7. Wildfires;
   * 1. Slow-onset hazards:
8. Heat waves and Cold waves;
9. Glacier retreat and its effects;
10. Coastal erosion (also taking into account sea-level rise)
11. Coral losses;
12. Groundwater salinization
13. Drought.
14. (Further) Effects of changes in minimum or maximum temperatures, precipitation, insolation, and in seasonal climatic patterns (e.g. food and water shortages).
    1. The hazard selection needs to be based on criteria to be agreed with national and local governments (and their implementing agencies responsible for urban planning and disaster risk reduction) and in consultation with Bank staff.
    2. Hazards shall be selected using a multi-criteria analysis for comparing and prioritizing them. Criteria should include, at a minimum, hazard frequency and recurrence, the area/population potentially affected, potential impact in key sectors (energy, transport, water, and economic activities, among others), and the pertinence of in-depth analysis for the hazard (e.g. based on local priorities, availability of necessary data, and existence of similar studies).[[3]](#footnote-3) The final selection must be approved by the IDB.
       1. Stakeholder analysis. Identify public and private key actors on the local, state, and national level which need to be involved in the preparation of the study and in the application of its results. Institutional capacities and opportunities regarding risk reduction shall be assessed and current relevant initiatives identified (e.g. in the areas of urban planning, definition of land use regulations, development planning and institutional budgets).[[4]](#footnote-4)
       2. Engagement and dissemination strategy. An engagement strategy considering different levels of participation shall be designed, including a list of potential focal points representing each stakeholder and of the activities to be undertaken to ensure an effective validation and dissemination of the study results. The strategy shall involve relevant public and private stakeholders from the national and sub-national level.
    3. Phase 2: Vulnerability Analysis
    4. Analysis of Causes of Vulnerability. This analysis shall identify infrastructure-related, institutional, social, and economic causes of vulnerability associated with the prioritized hazards. The analysis shall make use of site visits and stakeholder consultations in the form of interviews and focus group discussions.[[5]](#footnote-5)
    5. Probabilistic and Susceptibility Analysis. The consulting firm will undertake the following activities for the selected hazards, taking into account the technical details provided in Annex I of these Terms of Reference:
    6. **Identify and summarize available information**, including historical disaster data, risk information (hazard, exposure, and vulnerability), and regional climate change model outputs and studies.
       1. For inland flooding, coastal flooding, seismic activity and its effects, and hurricane-strength winds (if selected), develop a probabilistic disaster risk analysis applying the methodology and tools from CAPRA (<http://ecapra.org>) or a similar platform (e.g. Hazus), with the following general steps:
       2. Hazard analysis: Analyze past, current, and future hazard trends (under consideration of climate change if applicable to the hazard). The analytical data and modelling shall be complemented with field work (e.g. identification of historical inundation levels). The interplay of hazards has to be taken into account (multi-hazard; e.g. hurricanes in coastal areas can imply multiple risks like storm surge, strong winds, and inland flooding that interact with each other).
       3. Exposure value calculation: Develop an inventory of critical infrastructure and residential and commercial areas that may be affected by those hazards. The data should include but not be limited to the best information available on health infrastructure, potable water supply, sanitation, drainage, electricity supply, solid waste collection, housing, and roads. In the case of residential areas, the firm will define in dialogue with relevant government authorities the construction area, value of assets, and exact location of construction. If cadastral information is not available at the residential level, the firm shall generate exposure maps at least at neighborhood level.
       4. Description and identification of vulnerability functions: Define, with the appropriate technical justification and in dialogue with government authorities, the physical vulnerability function of each type of construction and infrastructure for the considered hazards. Existing vulnerability functions developed and/or deemed adequate by the IDB (e.g. CAPRA) may be applied.
       5. Risk estimation: Based on the information of hazards, exposure values and vulnerability functions, develop a quantitative probabilistic risk analysis in terms of physical and human losses. This calculation includes the probable maximum loss and expected annual loss from the prioritized hazards.
       6. Develop maps that illustrate the results of the probabilistic disaster risk analysis.
       7. For all other hazards: Conduct a susceptibility and impact analysis. This analysis needs to take into account climate change if climate change is expected to affect the hazard, and shall follow these steps:
       8. Develop susceptibility maps that illustrate to which degree the different city areas are currently or expected to be affected by the hazards covered under this task, taking into account the different factors that influence these hazards. For details on the bivariate landslide methodology to be used, refer to Annex I.
       9. Develop maps of the expected socio-economic impacts of the hazards covered under this task on the different city areas. A traffic light system shall illustrate the degree of the impact with red for critical impacts, yellow for moderate impacts, and green for low impacts. Different socio-economic impacts can be summarized in adequate categories depending on the share of the population and critical infrastructure affected and the degree of the expected impact.
       10. **Climate Change** projections: It is expected that for slow-onset hazards two climate change projections, preferably for 2030 and 2050, and for each projection three climate change scenarios (optimistic, moderate, pessimistic) will be applied to the analyses. The time horizons of local development planning and the availability of climate change studies shall be taken into account if different from the projection periods and scenarios specified here). For rapid-onset hazards, other methodologies should be applied (for example, modelling of non-probabilistic scenarios), considering (if available) national guidelines.
       11. **Calibration of risk and susceptibility maps and risk calculations**: The consultancy firm shall carry out and include in the report a calibration of the risk and susceptibility maps and risk calculations using information on historical losses in order to estimate the accuracy of the results.
       12. **Application of the results to the urban growth scenarios**: The risk and susceptibility assessments shall also be conducted for the urban growth scenarios of Consulting Engagement 3 in order to determine how these will influence future vulnerability.
    7. Phase 3: Prioritization of vulnerability challenges
    8. A multi-criteria analysis in terms of magnitude, urgency, and probability of occurrence shall be used for prioritizing the vulnerability challenges. The risk and susceptibility identified in Phase 2 shall guide this analysis in a participatory process.[[6]](#footnote-6)
    9. Phase 4: Identification and prioritization of solutions to risk challenges
    10. A set of proposals for dealing with the risk challenges previously identified shall be prepared, encompassing both engineering and socio-economic measures. From these proposals, five shall be prioritized and assessed in greater detail including a preliminary cost-benefit analysis to facilitate corresponding local planning. In order to account for uncertainty of climate and growth scenarios, these measures should have the following characteristics: (i) no/low regret, (ii) flexibility, (iii) safety margins, and (iv) appropriate timing making use of windows of opportunity.[[7]](#footnote-7) These proposals should be validated and prioritized through a participatory process involving the major stakeholders. The goal of the assessment is to provide an adequate overview of possible risk reduction activities to direct specific pre-feasibility studies.[[8]](#footnote-8)
15. C. Consulting Engagement 3: Develop an urban growth study for each city.
    1. Analyze the current and historic urban footprint as follows:
    2. Use multi-temporal satellite imagery and remote sensing technology to analyze past and current urban footprints and identify built-up area changes since 1984. This analysis must be done using high-resolution image data (1.5m or the best available) in intervals of approximately ten years.
    3. Classify land-covers using a highly accurate object-oriented supervised classification methodology, mapping the 23 classes of land-cover within the study area for each dataset as defined in Annex III.
    4. Urban areas shall have three separate built density (or intensity) categories based on their imperviousness: high density, medium density, and low density (20-50%; 50% to 80%; and 80% to 100%). Categories such as agriculture and pasture land will be separated with a dependable rule set that can be replicated in all data sets.
    5. Collect sample points or training data remotely to conduct classification through imagery and site surveys. Experts from the consulting team shall collect a local ground sample to calibrate training data that will be used to produce supervised classification. If existing ground samples or land cover data are available, the classification process must be able to incorporate those data in the sampling process.
    6. Check final land cover classification for any quality assurance and quality control (QA/QC) issues. Land cover classes shall address any logical/illogical issue. For example, a speckle of urban categories in the middle of a lake or river will be an illogical classification.
    7. Develop a comprehensive geo-database with the GIS data produced and all relevant geo-referenced information available in the city. Include specific data on key green and gray infrastructure, produced through satellite imagery classifications, open street map databases, or other relevant sources. Gray infrastructure consists of human-built components which involve shared resources or networks. It comprises roads, water lines, water treatment plants, sewers, electric distribution systems, and various public facilities (schools, hospitals, etc.). Green infrastructure consists of specific components of the natural environment which produce identifiable ecological services. Examples are woodlands, wetlands, river corridors, parks, and other green spaces. These interconnected components generally provide a number of multi-functional uses, including provision of drinking water, soil slope stability, flood protection, various forms of biodiversity, and public recreation.
    8. Generate a geospatial metadata library for all land cover classification data following the ISO geospatial metadata standards.
    9. Develop urban growth scenarios as follows:
    10. Analyze census data and population projections to calculate current, past, and future population for the study area and for each administrative subdivision.
    11. Review all available information on planned gray or green infrastructure that may have an impact on future land use.
    12. Review existing urban development plans and identify areas where various kinds of development are currently allowed and determine the respective densities.
    13. Develop a set of constraining factors to future development, such as environmental masks that identify areas where various forms of development are impractical or not advisable and should be protected by urban growth policies. For example, general constraints should include environmental elements (such as aquifer recharge areas and forest reserves), areas that are highly vulnerable to natural disasters (such as flood plains and steep slopes, as resulting from the analysis from Consulting Engagement 2), areas where industrial uses or agriculture uses are specifically zoned, and cultural heritage and archeological areas.
    14. Perform an analysis of recent historic land cover change and its associations with various potential non-spatial explanatory factors, such as aggregate population and employment growth. Project future land use demands (in hectares) for the projection horizon (e.g. demand for total urban residential land should be related to jobs, population growth rates, and built density).
    15. Analyze the spatial factors that can potentially explain the spatial patterns exhibited in recent historic change (attractiveness factors) which are expected to remain important across future scenarios (e.g. distance or travel time to various amenities).
    16. Develop a future-oriented “attractiveness” or “suitability” model that estimates the relative likelihood of each legally and practically buildable unit to be developed. Using the information gathered, determine land attractiveness for various uses across all potential development areas applying a 2050 projection of land cover, taking into account land use conflicts, vulnerable areas, economic changes, and existing planning rules and regulations. The objective of this calculation is to estimate the distribution of future populations over time, resolving land use conflicts using adjustable rules.
    17. Develop three different urban growth scenarios for each 2030 and 2050: “current trends” scenario, “smart growth” (ideal) scenario, and “compound” scenario. The “current trends” scenario extrapolates current regional and urban growth trends based on existing policies and trends. “Smart growth” refers to an ideal growth pattern characterized by medium to high density, mixed-use development that seeks to improve quality of life and resource efficiency while at the same time reducing disaster risk, climate change vulnerability, and the city’s negative impact on the environment (ecological footprint), without taking into account financial or technological constraints. The compound scenario reflects an intermediate growth pattern that differs from the current trends scenario by proposing strategic policies and interventions improving sustainability. Nevertheless, it is expected to be more feasible than the ideal of the smart growth scenario by taking financial, technological, and other constraints into account.
    18. Estimate the urban footprint extension and population density for each scenario in 2030 and 2050.
    19. Analyze the investment costs for providing basic infrastructure (such as potable water supply, sanitation, drainage, electricity supply, urban mass transit, solid waste collection, roads, and works required to reduce natural disaster risk) to accommodate growth in the three different scenarios. Local costs for infrastructure should be considered.
    20. Analyze the impacts of each scenario on GHG emission levels.
    21. Develop a planning summary for policy makers expressing major findings of the analysis performed and detailed policy recommendations that can be used for planning and decision-making.
16. D. For all three consulting Engagements:
    1. Each consulting engagement will serve both as an important input for the implementation of the ESCI methodology (see Methodological Guide at <http://www.iadb.org/cities>) and as a planning instrument for each city. In order to maximize synergies between the different engagements, the consulting firm is expected to link data, methodologies, and outputs wherever useful. For example, the GHG emission scenarios shall account for the growth patterns projected in the growth scenarios, while the smart growth scenario on the other hand needs to consider both climate change mitigation and disaster risk reduction in the context of climate change.
    2. In order to facilitate the implementation of the recommendations from the three Consulting Engagements, the consulting firm shall develop, in consultation with local and national stakeholders, a road map for each city. The road map must summarize the next steps to be taken, specifying responsibilities, timing, partners, and other relevant details.
    3. The three Consulting Engagements feed into the ESCI methodology particularly through the Climate Change Filter as outlined in the Methodological Guide (pp. 37ff). This filter determines the potential to reduce GHG emissions in each topic and its vulnerability to climate change.[[9]](#footnote-9) As part of this consultancy, the consulting firm shall facilitate this process by translating the results from its studies into the scoring system of the Climate Change Filter, following an approach currently being developed by the IDB. This will allow the IDB and local stakeholders to prioritize the different themes based on climate change mitigation and adaptation considerations.
    4. The study area for all three Consulting Engagements is in principle the metropolitan area plus the area that is expected to be relevant for the urban growth scenario. The boundaries shall be derived under consideration of the city’s physical, social, economic, ecological, infrastructure, and institutional subsystems as well as its political boundaries. It is not sufficient to only consider political boundaries. The exact boundaries shall be developed by the consulting firm early in the process and in dialogue with local stakeholders and the Bank. All maps must be developed at a scale of 1:10,000 (1:25,000 is sufficient if deemed adequate by the Bank).
    5. In carrying out the aforementioned activities, the consulting firm will be responsible for all data collection and analysis. In addition to travelling to the city to gather information, it is highly recommended that the consulting firm employs local consultants to support data collection and the follow-up with local officials. The consulting firm shall not rely solely on the municipality as source of information but identify and use additional/alternative information sources to reach the desired results. These shall especially include the results of relevant studies conducted or commissioned by international, regional, national, and local organizations (IPCC, multi- and bilateral development agencies, academic institutions, etc.). After the first field visit, the consulting firm is expected to provide IDB with a summary of what data is available and the implications for the three assignments.
    6. In order to support the Bank in improving its activities related to this assignment, the consulting firm will implement a four-day workshop at IBD headquarters in Washington DC for IDB specialists after submission of the final draft products. The workshop will serve to discuss the methodologies used in each Consulting Engagement and the lessons learned from their application. Special emphasis shall be given to the incorporation of climate change into Consulting Engagement 2.
    7. Throughout the assignment, the consulting firm is expected to maintain a close dialogue with national and local officials and the Bank (both ESCI coordination team and IDB country office). It is expected that key staff for each assignment will travel to each city at least three times in order to guarantee an adequate presence in the field for data collection, stakeholder consultations, results presentations, and capacity building activities. The minimum of three visits must cover the following aspects for each assignment:
    8. Introduction of the consulting firm and its work program to all relevant stakeholders and first data collection on the ground.
    9. Presentation of preliminary results in each city and participatory validation with all relevant stakeholders, ensuring that the products will meet their needs and expectations. This must be accomplished before submitting the advanced drafts for the three assignments to the Bank.
    10. Presentation of final results and recommendations to all relevant stakeholders in targeted meetings, taking into account the different approaches needed to reach officials, technical staff, academia, citizens, etc. The final presentations will be held after the Bank’s approval of the final reports and the road map.
17. Products
    1. All products must be presented to the Bank in an editable, electronic format. Reports and manuals shall be compatible with MS Word, inventories and comparable products with MS Excel, and the GIS database with ESRI ArcGIS. All spatial data should include metadata. A file summarizing the metadata of the layers (e.g. Excel file) should be submitted. All spatial layers shall additionally be submitted in Google Maps format (.kml). All data collected and used shall be submitted to the IDB, including a detailed listing of all input data used in each step of the Consulting Engagements with full references. Further specifications may apply. Reports, maps, and manuals shall also be submitted in print with five copies per city.
    2. All products specified below must be provided for San José and Santiago de los Caballeros in Spanish, and for Bridgetown in English.
18. A. Consulting Engagement 1: Develop a climate change mitigation assessment
    1. The consulting firm must produce the following products:
       1. **Climate Change Mitigation Assessment Report** covering the GHG inventory and the GHG roadmap
       2. **Spreadsheets with calculations** for the GHG inventory and the GHG roadmap
       3. **Mitigation Assessment Manual**
19. B. Consulting Engagement 2: Develop a disaster risk and climate change vulnerability assessment
    * + 1. **Disaster Risk and Climate Change Vulnerability Report**: to document the methodologies used, their application, and the results for all activities undertaken in the four phases as described above.
        2. **Hazard, Exposure, Probabilistic Disaster Risk, Susceptibility, and Socio-economic Impact Maps** at appropriate scale (1:10,000, though 1:25,000 is sufficient if deemed adequate by the Bank), including the corresponding GIS data archive.
        3. **GIS Database** including metadata with a description of the data and its format.
        4. **Risk Calculation Data** (e.g. **.**ame format for CAPRA)
20. C. Consulting Engagement 3: Develop a study of urban growth
    1. The consulting firm must produce the following products:
       1. **GIS Database:** A geodatabase containing all the GIS data produced, including the land-cover classification, as well as the density maps key green and gray infrastructure and natural disaster-prone areas, in .shp format. All maps produced shall be submitted in .mxd format.
       2. **Urban Growth Report** covering:
          1. Current and Historic Urban Footprint: A historic analysis of the urban change since 1984 that presents the composition of the urban footprint in terms of land cover classes, and the identification of the areas of change since 1984, including a study of the historic densities associated with each urban footprint, and a study of the current densities for the city with documentation and imagery and photographic samples of each density category.
          2. Development of Urban Growth Scenarios: A simulation and its analysis for three different urban growth scenarios for 2030 and 2050: “current trends”, “smart growth” and “compound” scenario., including: (i) a cost analysis of infrastructure for the three growth scenarios analyzed; (ii) analysis in terms of the impacts of each scenario (costs and GHG emission level implications); and (iii) a planning summary for policy makers expressing major findings of the analysis performed and policy recommendations.
       3. **Urban metrics data set** including:
          1. Annual growth rate of the urban footprint (average for last decade)
          2. Urban population density (residents/km2)
          3. Percentage of vacant lands within the urban footprint.
          4. Green area per 100,000 residents (hectares/100,000 residents)
          5. Percentage of housing located in informal settlements
          6. Percentage of households at risk due to inadequate construction or placement in areas of non-mitigable risk.
          7. Percentage of critical infrastructure at risk due to inadequate construction or placement in areas of non-mitigable risk.
       4. **Cross-cutting products**:
          1. **Work Plan:** All steps for completing the Consulting Engagements, the corresponding timelines, the composition o the task teams (with detailed CVs), and the methodologies to be used must be laid out in a work plan to be submitted as the first deliverable under these Terms of Reference. The Bank will approve the work plan or request changes within 5 business days.
          2. **Digital Terrain Model (DTM):** In order to meet the quality requirements for the products outlined above, it will be necessary to base the corresponding analysis on a DTM. This DTM must meet the technical requirements specified in Annex II. If a DTM for the entire study area or parts of it is already available and its extent and quality approved by the Bank as being adequate for the purpose of this assignment, no DTM needs to be developed by the consulting firm.
          3. Minimum of three visits to each city by the key staff members of each assignment with corresponding reports.
          4. **Capacity Building Activities with corresponding repor**ts: To support the capacity of local and national officials to understand, make use of, and in the case of Consulting Engagement 1 replicate the activities this assignment, capacity building activities must accompany the work of the consulting firm in each city. For each Consulting Engagement, a small group of technical personal (3-5 persons) must be trained for at least 70 hours by the consulting firm throughout the contract duration to achieve these goals. To facilitate local learning, this training must accompany the activities continuously and shall not only be provided in workshops but (also) through regular mentoring that may take place remotely.
          5. Executive Summary Report of the results from all three Consulting Engagements.
          6. Road Map for using the results from the three studies
          7. Power Point Presentation summarizing the activities undertaken as well as the results.
          8. Climate Change Filter Report with a description of the methodology used for topic prioritization, details on the relevance of each topic in the context of climate change, and the resulting list of scores per topic.
          9. Final workshop with IDB specialists in Washington DC with corresponding report.
21. Timeframe
    1. The activities under these terms of reference should be completed within **five months** from the starting date of the contract. The IDB may consider extensions of deadlines under extraordinary circumstances.
22. Proposal
    1. Please note that proposals must not exceed 100 pages (excluding CVs). Submissions can be made in either English or Spanish.
    2. Methodological details for all activities under this assignment must be covered in the proposal. Special consideration must be given to the following aspects: In its proposal, the consulting firm must define a preliminary study area for each city. Furthermore, it shall provide a preliminary list of hazards to be assessed as part of Consulting Engagement 2. A detailed technical justification for the hazard selection based on a rapid risk analysis that takes into account historical losses shall be included. The consulting firm shall describe in the proposal how they intend to link the probabilistic disaster risk analysis and the susceptibility and impact analysis with the impacts of climate change. The proposal shall elaborate on how the consulting firm will proceed if data from regional climate change models does not exist or has not been validated. For Consulting Engagement 3, the consulting firm shall specify and justify in its proposal the number of land cover classes that will be interpreted from satellite imagery. The modeling tools that it will use to estimate ‘current’ and ‘smart’ urban growth must be described and the choice justified. Also the type of infrastructure selected for the cost analysis must be specified and justified in the proposal. If data gaps are expected for any of the three Consulting Engagements, these should be addressed in the proposal together with suggestions for how the challenges resulting from these will be solved.
    3. The reference budget for this consultancy is $250,000 per city. Prices shall be stated in USD. The consulting firm shall provide its prices for both cases outlined - that is, with and without developing a DTM. The consulting firm shall state its financial proposals according to the following table:

|  |  |  |
| --- | --- | --- |
| **Cities** | **Price** | |
| **Including DTM development** | **excluding DTM development** |
| 1. San José |  |  |
| 1. Bridgetown |  |  |
| 1. Santiago de los Caballeros |  |  |
| 1. All three cities |  |  |

* 1. Even though Consulting Engagements will not be contracted individually, the pricing per city shall be disaggregated by Consulting Engagement for informational purposes. For the DTM, also the price per km2 shall be provided to allow cost comparisons despite potential changes in the study area.

1. Delivery and Payment Schedule
   1. The delivery of the products and the corresponding payments will be scheduled as follows:

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Timing** | **Payment** |
| Agreement on the work plan | within 2 weeks from the starting date of the contract | 20% |
| Submission of the initial drafts | within 2 months from the starting date of the contract | 20% |
| Submission of the final drafts | within 4 months from the starting date of the contract | 20% |
| Submission of the final products | within 5 months from the starting date of the contract | 40% |

* 1. All payments are subject to the Bank’s approval of the corresponding products.

1. Coordination and Supervision
   1. The supervision of the consulting firm’s work and deliverables will be done in coordination with Mr. Ellis Juan, General Coordinator of the Emerging and Sustainable Cities Initiative; Horacio Terraza, Coordinator for Infrastructure and Environment; Huascar Eguino, Coordinator for Institutions for Development; and David Maleki, Climate Change Analyst.

1. Global Protocol for Community-scale Greenhouse Gas Emissions. Version 0.9 and Pilot Version 1.0, as well as newer versions if available. [↑](#footnote-ref-1)
2. For stationary units, for example, the inventory could distinguish between residential buildings, commercial buildings, municipal buildings, and industrial facilities. For further guidance see: ICLEI 2009: International Local Government GHG Emissions Analysis Protocol (IEAP). Version 1.0. [↑](#footnote-ref-2)
3. Refer to the UK Climate Change Risk Assessment Methodology (HR Wallingford) for further information (p. 7‑9)

   <http://randd.defra.gov.uk/Document.aspx?Document=10065_CCRA_Method_Report_FINAL_R2.pdf> . [↑](#footnote-ref-3)
4. As a reference, the methodology for stakeholder analysis “Climate changing, changing communities” developed by ICLEI can be used (see Annex I.6 of these ToR and p.2-3 of the following document):

   <http://www.lis.edu.es/uploads/7a9bad44_bf1f_4580_98ca_6a0885cc03c6.pdf> . [↑](#footnote-ref-4)
5. The methodology proposed by UNDP/BCPR (Proyecto Regional Capitales Andinas) and the DPAE (Municipality of Bogota) can be used as a reference. See Annex I.7 of these ToR and p. 24-28 of the following document:

   <http://bvpad.indeci.gob.pe/doc/pdf/esp/doc1269/doc1269-contenido.pdf> . [↑](#footnote-ref-5)
6. The UK Climate Change Risk Assessment methodology can be used as a reference. See p. 13-14 and 28-31 of the following document: [http://randd.defra.gov.uk](http://randd.defra.gov.uk/Document.aspx?Document=10065_CCRA_Method_Report_FINAL_R2.pdf) [↑](#footnote-ref-6)
7. For further details, see chapter three in “Urban Adaptation to Climate Change in Europe” (EEA 2012). [http://www.eea.europa.eu/](http://www.eea.europa.eu/publications/urban-adaptation-to-climate-change) [↑](#footnote-ref-7)
8. The following two methodologies can be used as references: 1. the prioritization method used by the IDB Climate Change Adaptation project in Santa Ana, El Salvador (forthcoming); 2. the methodology used by the UNDP/BCPR Andean Capital Cities Project for identifying disaster risk reduction proposals (p. 28-31of the following document: <http://bvpad.indeci.gob.pe/doc/pdf/esp/doc1269/doc1269-contenido.pdf>) [↑](#footnote-ref-8)
9. A complete list of the 24 ESCI topics (e.g. water, sanitation and drainage, solid waste management) can be found in Annex 2 of the Methodological Guide. [↑](#footnote-ref-9)