

REQUEST FOR EXPRESSIONS OF INTEREST CONSULTING SERVICES

Selection # as assigned by e-Tool: PR-T1243-P001
Selection Method: Simplified Competitive
Country: Paraguay
Sector: CSD
Funding – TC #: PR-T1243
Project #: ATN/AC-16705-PR
TC name: Strengthening Urban Resilience in Riverside Asuncion

Description of Services:

The objective of the present consultancy is to analyze the flooding risk through the evaluation of the hazard as well as the exposure and vulnerability (physical and socio-environmental) of both the inhabitants and the infrastructure, of the Ricardo Brugada and Tacumbu Neighborhoods, the San Miguel Sand Banks, the Historical Downtown District, and the Port of Asuncion in order to understand the potential economic, social and environmental costs of the no-action option under a new climate regime.

Link to TC document: [<https://www.iadb.org/en/project/PR-T1243>]

The Inter-American Development Bank (IDB) is executing the above-mentioned operation. For this operation, the IDB intends to contract consulting services described in this Request for Expressions of Interest. Expressions of interest must be delivered using the IDB Portal for Bank Executed Operations (<http://beo-procurement.iadb.org/home>) by: 07/16/2018, 5:00 P.M. (Washington D.C. Time).

The consulting services (“the Services”) comprise two different geographical areas that lie on the shores of the Paraguay River and are 7 km apart from one another. Both areas have distinct morphologies but very similar ecosystems and socio-economic population that live on the area. The analysis should provide inputs, suggestions and design guidelines that would reduce the vulnerability and manage disaster risks within the area, leading to design the proposed interventions under the Master Plan development. As one of the main products, this activity will elaborate hazard maps based on flood stages, vulnerability curves, and maps of losses and damages obtained from the quantitative risk assessment conducted for population, ecosystem and infrastructure in the intervention area for extreme climatic events due to percentage changes in rainfall, river stage and an increase in average temperature of 3 to 4°C. Though the main risks are flood related, the study should also consider and evaluate the application of a different methodology to quantify the vulnerability of the area due to climate change related droughts and heat waves and the effects this would have on human health (i.e. increase of vector borne diseases) and food security. The studies are expected to be finalized by the second quarter of 2019.

Eligible consulting firms will be selected in accordance with the procedures set out in the Inter-American Development Bank: [Policy for the Selection and Contracting of Consulting firms for Bank-executed Operational Work](#) - GN-2765-1. All eligible consulting firms, as defined in the Policy may express an interest. If the Consulting Firm is presented in a Consortium, it will designate one of them as a representative, and the latter will be responsible for the communications, the registration in the portal and for submitting the corresponding documents.

The IDB now invites eligible consulting firms to indicate their interest in providing the services described below in the [draft summary](#) of the intended Terms of Reference for the assignment. Interested consulting firms must provide information establishing that they are qualified to perform the Services (brochures, description of similar assignments, experience in similar conditions, availability of appropriate skills among staff, etc.). Eligible consulting firms may associate in a form of a Joint Venture or a sub-consultancy agreement to enhance their qualifications. Such association or Joint Venture shall appoint one of the firms as the representative. The Expression of Interest cannot be longer than fifteen (15) pages. Longer EOI's won't be considered.

Interested eligible consulting firms may obtain further information during office hours, 09:00 AM to 05:00 PM, (Washington D.C. Time) by sending an email to: Roberto Cambior (ROBERTOCAM@IADB.ORG) and Sandra López (sandral@iadb.org)

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Draft Summary of Terms of Reference

1. Objectives

- 1.1. The objective of the present consultancy is to analyze the flooding risk through the evaluation of the hazard as well as the exposure and vulnerability (physical and socio-environmental) of both the inhabitants and the infrastructure, of the Ricardo Brugada and Tacumbu Neighborhoods, the San Miguel Sand Banks, the Historical Downtown District, and the Port of Asuncion in order to understand the potential economic, social and environmental costs of the no-action option under a new climate regime.

2. Key Activities

- 2.1. Conduct **baseline** (current conditions, pre-interventions) **Probabilistic Flood Risk Assessments (PFRA)** for (a) **riverine flooding** of the Paraguay River on the five study areas (Ricardo Brugada and Tacumbu Neighborhood, the Sand Miguel Sand Banks, the Historical Downtown District, and the Port of Asuncion), and (b) **urban flooding due to excess rainfall** for the five study areas. Furthermore, for each of these two PFRA, two runs of a risk model should be conducted, **without considering climate change**, and **with climate change**. These PFRA should properly model and integrate probabilistically the four components which make up a risk assessment: hazard module, exposure module, vulnerability module, and risk module.

This activity is comprised of the following specific activities:

2.1.1. **Hazard module:** the hazard module should be based on a combination of a hydrologic and hydraulic model, which evaluates the changes in urban flash floods and river stage (hydrologic model) and the displacement of flood waves through the intervention area (hydraulic model).

Two hazard models should be developed, each with two variations, (4 total) as follows:

- a) Riverine flooding of the Paraguay river on the 5 study areas:
 - i. Without considering climate change and assuming current hydrological condition remain the same.
 - ii. Considering climate change based on regional climatic models that describe changes in the hydrological cycle.
- b) Urban flash floods
 - i. Without considering climate change and assuming current hydrological condition remain the same.
 - ii. Considering climate change (modelling the hazard conditions factoring in climate change).

2.1.2. **Exposure module:**

- a) Assemble an updated geodatabase of all the physical assets (infrastructure and buildings) and social assets (population) that are part of the intervention areas, characterizing them through their physical conditions, their use sectors, and their economic value. The calculation of the economic value should consider the costs associated with relocation, loss of income, and health costs.
- b) An analysis of this database should be made, analyzing environmental and social exposure, and the effects of not only flood related risk, but also the hazards caused by droughts and heatwaves (as part of this activity the consultancy should first establish, jointly with the IDB and the GoP, the conceptual framework and analytical definition of exposure and vulnerability to these hazards to be used). This should be reflected through a quantitative mapping assessment of the current exposure of the area using indicators of stock of humans, natural and fabricated capital; an appropriate scale (i.e. from 0 to 100) where less exposed areas, population and infrastructure can be identified over others. An adaptive capacity/vulnerability index should be developed and mapped as well, and it should consider the targets of vulnerability as people, environmental resources, economic activities and infrastructure. In the creation of these maps, a high resolution digital surface model should be used that considers the topography of the study area and the bathymetry of the streams (based on aerial photogrammetry or Light Detection and Ranging (LiDAR) detector). As part of the mapping, the current “stocks” should be monetized in order to understand the economic exposure to climate change impacts. The consultancy should leave installed capacity in the form of a template, protocol or guideline as well as a workshop with the GoP in order to adapt the maps once new information is known or as replicating the methodology in other regions of the country.

2.1.3. **Vulnerability module:** assemble a set of vulnerability curves (for physical affection of assets and for human affection) for the exposure database. The set of vulnerability curves developed for the *Climate Change Risk and Vulnerability Study for the Metropolitan Area of Asuncion*, under the IDB Emerging and Sustainable Cities Program (ESCI)¹, shall be used as a base. These curves shall be reviewed and modified or updated (or new curves should be created) if it is found necessary, to properly reflect current vulnerability conditions of the exposure in the 5 study areas.

2.1.4. **Risk module:** conduct two probabilistic flood risk assessments, each with two variations, (four total, one for each hazard model) as follows:

- a) Riverine flooding risk of the Paraguay river on the intervention areas

¹ http://www.urbandashboard.org/iadb/index_studies.html?lang=ES#?city=ASU&page=1

- i. Use the exposure and vulnerability modules together with the riverine-flood-hazard-**without-climate-change** module to run risk.
 - ii. Use the exposure and vulnerability modules together with the riverine-flood-hazard-**with-climate-change** module to run risk.
- b) Urban flash floods
- i. Use the exposure and vulnerability modules together with the urban-flood-hazard-**without-climate-change** module to run risk.
 - ii. Use the exposure and vulnerability modules together with the urban-flood-hazard-**with-climate-change** module to run risk.

Each of the variations should consider at least the following flood return periods: 2, 5, 10, 20, 50, 100, 1000 years, or as necessary.

The PFRA shall integrate the hazard, exposure and vulnerability modules performing the appropriate mathematical integration among them. The results for each of these four runs shall be expressed through the Annual Average Loss (AAL) and the Loss Exceedance curve (LEC), and these should be compared, analyzing the differences in risk from riverine and urban flooding, and the impact climate change has on risk levels. Risk maps should also be developed, showing the AAL or Probable Maximum Losses (PML) for different return periods

2.1.5. **Disaster risk indicators:** for monitoring purposes, propose disaster risk indicators based on the risk measures obtained in activity 2.1.4 and the Sendai Reference Framework², and quantify their baseline values.

2.2. Conduct a working table with the IDB and the GoP to propose risk reduction/mitigation/intervention measures and conduct **Probabilistic Flood Risk Assessments (PFRA)** for (a) **riverine flooding** of the Paraguay River and (b) **urban flooding due to excess rainfall** for the five study areas, and **without and with climate change**. These PFRA should properly model the three components - hazard, exposure or vulnerability - as they would be after the interventions are made, and the fourth component – risk – should be properly calculated.

This activity is comprised of the following specific activities:

2.2.1. **Propose risk reduction measures:** Provide structural (physical constructions or engineering techniques or technology) and/or non-structural (policies, laws, training or education) designs guidelines and strategies to reduce and manage the flood risk of the area and increase its adaptive capacity. The measures should be categorized according to the following:

- a) Prospective risk reduction measures: measures focused on avoiding the development of new or increased disaster risks.
- b) Corrective risk reduction measures: measures focused on correcting already present disaster risks.
- c) Response measures: provision of emergency services and public assistance during and immediately after a disaster occurs.
- d) Recommendations for planning the construction sequence aiming at avoiding exacerbation of flooding risks during execution of the works within the intervention area (i.e. avoid the generation of enclosed inhabited areas during dredging and landfilling activities).

² <https://www.preventionweb.net/drr-framework/sendai-framework-monitor/indicators>

The response measures should include a descriptive budget for the development of an early warning system (EWS) for flood risk management within the area of intervention that can complement ongoing efforts by the central government and the IDB. These design guidelines should answer to:

- a) Description of type of measurements, analysis and computational models needed as well as the costs associated with their implementation.
- b) Identifying who should be in charge of collecting the measurements, analyzing and running the model data and alerting the appropriate authorities.
- c) Describe the appropriate actions that need to be taken by either a municipal or central government institution regarding prevention actions and include a list of civil society and private sector actors that could help in the development of an EWS.

2.2.2. **Hazard module:** modify the four hazard models to include the proposed structural measures that intervene the hazard conditions, if any.

2.2.3. **Exposure module:** modify the exposure database to include the proposed structural measures that involve changing the exposure (moving assets or population) or vulnerability conditions of the exposure (changing structural characteristics), if any.

2.2.4. **Vulnerability module:** modify the vulnerability functions to include the proposed structural measures that involve changing the vulnerability conditions of the exposure (changing structural characteristics such as elevating houses, using more resistant materials, etc.), if any.

2.2.5. **Risk module:** rerun the PFRA with the modified hazard, exposure or vulnerability modules, as follows:

- a) Riverine flooding risk of the Paraguay river on the 5 study areas
 - i. Use the modified exposure and vulnerability modules (if any) together with the modified riverine-flood-hazard-**without-climate-change** module (if it applies) to run risk.
 - ii. Use the modified exposure and vulnerability modules (if any) together with the modified riverine-flood-hazard-**with-climate-change** module (if it applies) to run risk.
- b) Urban flooding risk due to excess rainfall
 - i. Use the modified exposure and vulnerability modules (if any) together with the modified urban-flood-hazard-**without-climate-change** module (if it applies) to run risk.
 - ii. Use the modified exposure and vulnerability modules (if any) together with the modified urban-flood-hazard-**with-climate-change** module (if it applies) to run risk.

The PFRA shall integrate the hazard, exposure and vulnerability modules performing the appropriate mathematical integration among them. The results for each of these four runs shall be expressed through the Annual Average Loss (AAL) and the Loss Exceedance Curve (LEC), and these should be compared among themselves, but more importantly, compared to the results from activity 2.1, analyzing the avoided losses between the no-action scenario and the proposed GCF program interventions considered. Risk maps should also be developed, showing the AAL or PML for different return periods, and these should be compared to the maps obtained in activity 2.2 and the broader maps developed for the whole *Metropolitan Area of Asuncion under the IDB Emerging and Sustainable Cities Program (ESCI)*³. Specify the gains from reducing flood risk and strengthening resilience and adaptive capacity of the proposed interventions, considering the relevant and applicable sub-criteria and assessment factors specified in the GCF investment framework. When applicable,

³ http://www.urbandashboard.org/iadb/index_studies.html?lang=ES#?city=ASU&page=1

indicate the degree to which the Program avoids lock-in of long-lived, climate-vulnerable infrastructure.

2.2.6. **Disaster risk indicators:** use the results from activity 2.2.5 to evaluate the values of the risk indicators defined in activity 2.1.5 for the post-interventions condition and compare.

3. Develop an analysis of the current risk reduction governance scheme for the intervention area with clear examples of how the central and municipal governments respond. Define specific responsibilities and actions for each party. The National Emergency Plan, the National Development Plan, and the Municipal Zoning Plan should be used as basis for a possible governance scheme.