WATER AVAILABILITY AND INTEGRATED WATER RESOURCES MANAGEMENT IN NORTHERN HAITI

HA-T1179

CERTIFICATION

I hereby certify that this operation was approved for financing under AquaFund (AQF) through a communication dated on February 21, 2013 sent by Gerhard Lair, (ORP/GCM.) Also, I certify that resources from the AquaFund (AQF) are available for up to US$1,000,000 in order to finance the activities described and budgeted in this document. This certification reserves resources for the referenced project for a period of four (4) calendar months counted from the date of eligibility. If the project is not approved by the IDB within that period, the reserve of resources will be cancelled, except in the case a new certification is granted. The commitment and disbursement of these resources shall be made only by the Bank in US dollars. The same currency shall be used to stipulate the remuneration and payments to consultants, except in the case of local consultants working in their own borrowing member country who shall have their remuneration defined and paid in the currency of such country. No resources of the Fund shall be made available to cover amounts greater than the amount certified herein above for the implementation of this operation. Amounts greater than the certified amount may arise from commitments on contracts denominated in a currency other than the Fund currency, resulting in currency exchange rate differences, for which the Fund is not at risk.

Sonia M. Rivera
Chief a.i.
Grants and Co-Financing Management Unit
ORP/GCM

03/18/2013
Date

APPROVAL

Approved:

Alexandre Meira Rosa
Sector Manager
Infrastructure and Environment Sector
INE/INE

03/19/2013
Date

TC DOCUMENT

Water Availability, Quality and Integrated Water Resources Management in Northern Haiti

HA-T1179

I. Basic Information for TC

- Country/Region: HAITI
- TC Name: Water Availability and Integrated Water Resources Management in Northern Haiti
- TC Number: HA-T1179
- Associated Loan/Guarantee Name: Productive Infrastructure Program
- Associated Loan/Guarantee Number: HA-L1081
- Team Leader: Fernando Miralles-Wilhelm (INE/WSA); Team Members: Taos Aliouat (LEG/SGO); Gerard Alleng (INE/CCS); Stefanie Brackmann (VPS/ESG); Irene Cartin (INE/WSA); Corinne Cathala (INE/WSA); Carlos De Paco (ORP/ORP); Jennifer Doherty-Bigara (INE/CCS); Crystal Fenwick (VPS/ESG); Agustín Filippo (CDH/CDH); Martin Kerres (INE/CCS); Michele Lemay (INE/RND); and Raúl Muñoz (INE/WSA).
- Date of TC Abstract authorization: January 20, 2013
- Donors providing funding: IDB-AQF (Aquafund)
- Beneficiary (countries or entities which are the recipient of the technical assistance): HAITI
- Executing Agency and contact name: Bank Executed
- IDB Funding Requested: US$1,000,000
- Local counterpart funding, if any: n/a
- Execution period: 27 Months
- Disbursement period (which includes execution period): 30 Months
- Required start date: April 2013
- Types of consultants (firm or individual consultants): Firm and individual consultants
- Prepared by Unit: INE/WSA
- Unit of Disbursement Responsibility : INE/WSA
- TC Included in Country Strategy: Yes; TC included in CPD: Yes
- GCI-9 Sector Priority: Climate Change and Environmental Sustainability

II. Description of the Associated Loan/Guarantee

2.1 The IDB has financed the Caracol Industrial Park (PIC) through two grants of US$55,000,000 and US$50,000,000 in 2011 and 2012, respectively, currently being developed as part of a longer term program for northern Haiti; a third operation (HA-L1081) is currently under preparation. This 250-ha development includes factory sheds, a water treatment plant capable of processing 2,500 m^3/d, an 18 MW diesel generated power plant, a wastewater treatment plant, a solid waste facility and other associated infrastructure (e.g., dormitories, canteens, training center, offices, clinic, storage facilities).

III. Objectives and Justification

3.1 A key information gap that has been identified as development of the PIC has progressed is a reliable quantitative assessment of water availability and quality for the industrial park. This assessment needs to consider the water availability and quality of contributing surface watersheds, groundwater sources and their surrounding ecosystems, and to recognize the needs and demands of all water users as well as possible impacts of climate change.

3.2 For instance, the PIC site's primary source of surface water, the Trou du Nord watershed, feeds into Caracol Bay, a potentially sensitive ecological resource. Challenges include a lack of data on the ecological conditions and characteristics of Caracol Bay, the absence of data to assess critical

environmental flows to the bay, and extremely limited hydrometeorological and water quality data for the region, specifically for the Trou du Nord watershed. The potential for adversely impacting the surface hydrology was sufficient for a recent study (ENVIRON 2011) to recommend against the use of surface water to meet the anticipated demands of the PIC. Furthermore, although preliminary estimates suggest there is ample groundwater available within the underlying Massacre Transboundary Aquifer (MTA) to meet the PIC's water demands, the aquifer is believed to be unconfined and overlain by highly porous, alluvial sands, rendering the aquifer vulnerable to contamination.

3.3 Furthermore, climate change has the potential to further strain the availability and quality of water resources in the area. Global climate models indicate increasing temperatures for Haiti, while a rising sea level and an increased intensity and frequency of hurricanes are likely in the future. It is crucial to include existing climate projections and their impacts in the water management plans in order to provide a basis for successful adaptation.

3.4 Based on this background, the primary objective of this TC is to quantitatively assess current and future water availability and quality and water demand by all stakeholders as key inputs to integrated water resources management (IWRM) in northern Haiti at three connected scales:

- *within the industrial park*: improve the ability to analyze existing (baseline) conditions and potential impacts associated with the PIC development currently and over time, while promoting improved water resources management practices in PIC itself;
- *within the watershed*: support the development of an integrated water resources management (IWRM) plan for the Trou du Nord Watershed/MTA area in Northern Haiti;
- *within the country*: serve as a pilot project for a future program designed to assess water availability at the watershed level throughout the country, by scaling up the IWRM approach to the regional and national levels.

3.5 This project is aligned with the lending targets of: (i) "small and vulnerable countries"; (ii) poverty reduction and equity enhancement"; and (iii) “climate change, sustainable energy and environmental sustainability” of the report of the ninth general increase in the resources (GCI9) of the Bank. The project is also aligned to the water sector portion of the Country Strategy, Document GN-2646. In addition, it will be coordinated with the Bank’s Emerging and Sustainable Cities Initiative (ESCI), given that this area surrounding the PIC and Trou du Nord Watershed/MTA in northern Haiti is currently the focus of this initiative in the country.

IV. Description of activities/components and budget

4.1 The proposed TC project will finance consultancies for the following activities, outputs and results:

4.2 **Activity 1. Institutional and governance analysis of in-country water resources management.**
Overlapping responsibilities, weak public institutions and low cost recovery are typical challenges in the water and sanitation sectors of many developing countries, and Haiti is not an exception. According to the country's 2009 national water framework law, municipalities are responsible for water supply, but due to a lack of capacity, water supply is largely managed by NGOs, private operators and water user associations; the sector depends largely on external financing. USAID´s report (2009) regarding Watershed Management in Haiti[1] concluded that there are enormous institutional and policy gaps and barriers for the integrated watershed management, both at national and local level.

[1] Watershed Management in Haiti; Recommended Revisions to National Policy. USAID. 2009.

4.3 At national scale, the major salient feature of watershed management has been the confusion between the respective roles of the ministries of agriculture and environment. The result is a dysfunctional leverage of responsibility and resources between the two ministries, leading to situations where the Ministry of the Environment has most of the responsibility but very few resources, while the Ministry of Agriculture has much less responsibility in watershed management but higher capacity in term of resources and means. At the practical level, this means that the Ministry of the Environment has almost no human and material resources for the enforcement for watershed management, and the local and rural authorities do not pay any attention to the regulations or laws.

4.4 The activity will encompass not only the legal water and sanitation policy, regulation and provision framework, including cooperation on groundwater management of the MTA aquifer shared with the Dominican Republic, but also the actual performance and capability of the diverse actors. It will review the organizational structure and functions of existing institutions, identification of governance gaps, and recommendations towards implementation in the Trou du Nord-MTA watershed as a model for IWRM in the country. Existing studies and lessons learned from similar activities by Haitian and international institutions (e.g. donors) will be included.

4.5 As a result, the activity will yield suitable solutions to the local reality of the Trou du Nord-MTA watershed while at the same time considering potential for replication in other parts of Haiti.

4.6 Initiation and dissemination results meetings/workshops to engage the stakeholders identified as critical will be carried out to enhance their involvement in the project. These stakeholders will be more policy driven than technical staff.

4.7 **Activity 2. Data gap analysis and compilation of available modeling data in the PIC and its contributing watershed.**

4.8 This activity comprises the review of current hydro-climate data, availability of information related to water quantity, and quality, demand in the Trou du Nord-MTA system, and assessment of data needs for detailed hydrologic modeling purposes.

4.9 The hydrologic and water quality modeling proposed as a tool to identify specific water resources management measures in Northern Haiti will include the study of several hydrological, climatological and water resources phenomena such as tropical cyclones, storm surge, extreme rainfall, flooding, heat and/or cold-waves, drought, temperature, precipitation, salinity intrusion, and sea level rise. Analyzing vulnerability, or the degree to which cities may be harmed, will require integration of different types of information about exposure, susceptibility (sensitivity) and adaptive capacity.

4.10 This information will consist of the following databases (as existing):

- Water Infrastructure and Investments: mapping of water, sanitation and other utilities, public health facilities, industrial systems (e.g., PIC), as well as natural infrastructure (e.g., wetland delineation, freshwater and coastal ecosystems).
- Climatology: gridded objective analysis of daily rainfall, surface temperature and other quality-controlled data for mapping extreme events (e.g., droughts, floods, and heat waves), standardized precipitation index based on the long-term climate and satellite-based precipitation data.
- Hydrology: map watersheds, stream flow, runoff, infiltration, evapotranspiration, land cover, surface water and groundwater elevation.

- Socioeconomic: gridded maps of settlements and population estimates; map livelihood patterns (rural/urban); income and consumption patterns; food grain prices and trends; variations in prices during extreme climate events.
- Agriculture: Quantify and map sown area under crop, crop vigor and variations using long-term vegetation indices; crop moisture index, change in cropping patterns, irrigation area, yield and productivity.

4.11 This data compilation and analysis effort will be reported and communicated as the modeling data baseline for the project.

4.12 Based on the information collected, this activity will highlight priority areas of future monitoring, water quality hotspots and pollution reduction potentials that will empower local authorities and other stakeholders in their commitment to tackle water resources management.

4.13 The data gap analysis and review results will be disseminated through a capacity building workshop that will summarize the findings of the project up to this activity. This workshop will contribute to solidify the integration of stakeholders and institutions that carry out water resources management activities through building capacity that is specific to this project.

4.14 **Activity 3. Development of hydrologic models.**

4.15 This activity will focus on the development, testing and implementation of hydrologic (including water quality) modeling tools, devised with the specific purpose of their use in quantitatively-based water resources management activities.

4.16 This activity pursues a dual purpose. On one hand, there is an immediate and concrete need to assess water resources in the PIC as an integral part of the Bank's commitment to the country. On the other hand, it is clearly understood that water resources availability and quality in the PIC are part of the larger, partly cross-border issue of overall water resources management in the Trou du Nord - MTA system, so proceeding with a narrow focus on the PIC and its near surroundings would be insufficient to assess the medium-to-long term sustainability of water resources and other natural and built infrastructure in the area.

4.17 In addition to this dual purpose, this project presents a unique and timely opportunity to develop an analysis template to tackle water resources management issues in other basins and aquifers across the country. The integration of institutional governance (Activity 1) data analysis (Activity 2) and hydrologic modeling (this activity) allows the formulation of a template that can be later applied to other parts of the country. Because of this, and due to the fact that extending the modeling effort to the rest of the country can be achieved here through economies of scale, it is proposed that the modeling tools developed through this activity are extended spatially to cover the entire country of Haiti.

4.18 In view of this, three nested models will be developed: the first will be a detailed (spatially distributed) hydrologic model at the scale of the PIC which will serve to quantify current and future water availability and quality for the industrial park; and the second will be a basin-level (spatially lumped) model for the Trou du Nord-MTA system. The first model will be nested within the second. Each model will address the following specific technical components: (i) surface and groundwater availability (water balance); (ii) water use; (iii) impacts under different climate and development (localized climate projections, land use, water allocation) scenarios; (iv) flood risk analysis, in particular, for the PIC; (v) discrete water quality; and (vi) the potential for salinity intrusion. The second model will be developed

so that it is nested within a third hydrologic model that covers and is able to simulate all the watersheds of Haiti. This third model should be parameterized so that it becomes a modeling template for future extensions of hydrologic assessment activities in the country.

4.19 The hydrologic model development results will be disseminated through a capacity building workshop that will summarize the findings of the project up to this activity. This workshop will contribute to solidify the integration of stakeholders and institutions that carry out water resources management activities through building capacity that is specific to this project.

4.20 **Activity 4. IWRM Plan for the Trou du Nord - MTA System.**

This activity entails the development of an IWRM plan and specifications for its implementation in the Trou du Nord-MTA system. Based on the findings of Activity 1, this will include a watershed committee/strengthening of the water user's association (WUA), preparation of an IWRM plan and support for implementing the plan. It is expected that the development and implementation plan under this task can serve as a pilot for future implementation within other watershed systems in the country.

4.21 The specific sub-activities to be carried out are proposed as follows: (i) engagement of IWRM stakeholders (identified under Activity 1) and assessment of Trou du Nord-MTA system's hydroclimatic vulnerability (Activity 2); (ii) use of this forum and the results of "base" scenario model simulations (Activity 3) for the identification and prioritization of water resources issues and definition of a set of actionable solutions, including those actions prioritized and previously conceptualized and designed; and (iii) formulation of the IWRM plan and a strategic financial plan for major initiatives.

4.22 The prioritized issues, along with their solutions, will be structured into the action plan with clear goals (short/medium/long term). Also, conceptualization at the prefeasibility level of the IWRM plan implementation and the identification of estimated resources to execute this plan, as well as an estimate of investment amounts and schedules at a level of detail that is sufficient for preliminary loan preparation at the IDB, will be performed.

4.23 The IWRM plan and specifications for implementation results will be disseminated through a capacity building workshop that will summarize the findings of the project up to this activity. This workshop will contribute to solidify the integration of stakeholders and institutions that carry out water resources management activities through building capacity that is specific to this project.

Indicative Results Matrix

Project Activity	Outputs	Results
General		TC General Outcome: Number of times institutions/entities within Haiti make use of the modeling and IWRM Plan tools developed through this TC.
Activity 1: Institutional and governance analysis	Output 1A: Analysis of the institutional and governance information completed. Output 1B: Analysis of the capacity of local institutions for IWRM completed. Output 1C: Dissemination and engagement meeting	Outcome 1: Number of times the analysis completed has been used as input in the development of Activity 4: IWRM for the Trou du Nord-MTA watershed, as well as other IWRM efforts in Haiti.
Activity 2: Data gap analysis and	Output 2A: Data input for	Outcome 2: Hydrologic model data input

collection of model required information	hydrologic modeling collected. Output 2B: Data required for hydrologic modeling analyzed. Output 2C: Data gaps are identified. Output 2D: Capacity Building Workshop delivered.	templates elaborated.
Activity 3: Development of hydrologic models	Output 3A: Local scale (PIC) hydrologic model developed. Output 3B: Local scale (PIC) hydrologic model calibrated. Output 3C: Watershed scale (Trou du Nord - MTA) hydrologic model developed. Output 3D: Watershed scale (Trou du Nord - MTA) hydrologic model calibrated. Output 3E: National scale (all basins in Haiti) hydrologic model developed. Output 3F: National scale (all basins in Haiti) hydrologic model parameterized. Output 3D: Model Training and Capacity Building Workshop delivered.	Outcome 3A: Number of times local scale model is used for PIC planning, management and decision-making actions. Outcome 3B: Number of times watershed scale model is used for planning, management and decision-making actions in the Trou du Nord-MTA system. Outcome 3C: Number of basins in Haiti with a calibrated hydrologic model for IWRM planning and management activities.
Activity 4: IWRM for the Trou du Nord - MTA watershed	Output 4A: IWRM Plan for the Trou du Nord - MTA watershed completed. Output 4B: IWRM knowledge transfer and capacity building workshops delivered.	Outcome 4A: Number of times the IWRM Plan is used for planning, management and decision-making actions in the watershed. Outcome 4B: number of times the IWRM Plan is used as a model to develop IWRM plans for other watersheds in Haiti.

Indicative Budget (Detailed Budget: IDBDOCS # 37435901)

Activity	Total Funding (AQF)
Institutional and governance analysis	250,000
Data gap analysis and collection of model-required information	100,000
Development of hydrologic models	400,000
IWRM for the Trou du Nord - MTA watershed	250,000
TOTAL	**US$1,000,000**

V. Executing agency and execution structure

5.1 The Beneficiary is the Government of Haiti. The Executing Agency (EA) is the Inter-American Development Bank through Water and Sanitation Division (INE/WSA) for all components within this TC, at the request of the GoH.

5.2 This is an Operational Support TC focused on gaining an improved understanding of water availability and quality within geographical areas in which the Bank has ongoing significant financial and intellectual investments. Because of the wide range of technical and sectorial aspects covered by the scope of this TC (e.g., water supply and sanitation, agricultural and industrial water use, ecological considerations, economic impacts and others), it provides the opportunity for several Bank divisions and departments to engage in a multi-sector effort that will yield important knowledge regarding the state of water resources in Haiti. The execution of this TC will provide a learning, knowledge transfer and data gathering opportunity for Bank staff involved in issues of water resources, vulnerability and adaptation to climate change, which is a key area of work that the Bank has engaged increasingly. Therefore, at the request of the beneficiary (per letter received from the Ministry of Economy and Finance, IDBDOCS No. 37616838), this TC will be executed by the Bank.

5.3 On a wider scale, the Bank will be able to use the knowledge generated though this TC to the benefit of the borrowing member countries, specifically the beneficiary countries in the Caribbean Basin.

5.4 The Bank will contract all consulting services according to the Bank's project procurement policies and procedures, contained in Bank Document GN-2350-9.

VI. Major issues

6.1 The primary risk for implementation of this TC project is the lack of commitment over time of the institutions and stakeholders involved in implementing the hydrologic modeling tools and the IWRM approach and plan delivered through this TC. To mitigate this risk, preliminary consultations with climatological, hydrological, agricultural institutions and international organizations working in the Trou du Nord watershed have been initiated. An additional risk stems from the pioneering nature of this TC; there isn't much operational experience in Haiti with the kinds of hydrologic modeling products that the TC will yield. We have, therefore, included a significant level of capacity building efforts in all of the four project tasks described above. Also, a significant focus will be placed on integrating local stakeholders and institutions identified under Activity 1 through capacity building efforts in place throughout this project. This will contribute to build the local empowerment that will be necessary to carry out similar IWRM exercises in other watershed systems throughout the country, and provide sustainability to this initial IWRM effort.

VII. Exceptions to Bank policy –

N/A

VIII. Environmental and Social Strategy

8.1 Following ESG's project classification process (Safeguard Policy Filter and Safeguard Screening Form) requirements, it has been determined that this project falls under Category C. No environmental assessment studies or consultations are required for Category "C" operations (IDBdocs 37438995).

Annexes:

Terms of Reference: IDBDOCS 37435921

Procurement Plan: IDBDOCS 37435908