TC ABSTRACT

Development of Case Studies of the Water-Energy-Food Nexus in Latin America and the Caribbean

I. Basic project data

▪ Country/Region:	REGIONAL
▪ TC Name:	Development of Case Studies of the Water-Energy-Food Nexus in Latin America and the Caribbean
▪ TC number:	RG-T2660
▪ Team Leader/Team members:	Fernando Bretas (INE/WSA); Team Members: Raúl Muñoz, Silvia Ortiz, Miguel Campo Llopis, Pedro Coli and Yolanda Galaz (INE/WSA); Mónica Lugo (LEG/SGO); Maricarmen Esquivel (INE/CCS), Ramón Espinasa (INE/ENE) and Sebastián Miller (RES).
▪ Taxonomy	Knowledge generation and dissemination
▪ Date of TC Abstract:	May, 2015
▪ Reference to Request:	N/A
▪ Beneficiary:	Regional
▪ Executing Agency and contact name:	IDB (INE/WSA)
▪ IDB Funding Requested:	US$1,000,000
▪ Local counterpart funding, if any:	None
▪ Disbursement period:	24 months
▪ Required start date:	July 2015
▪ Types of consultants:	Firm and individual consultants
▪ Prepared by Unit:	INE/WSA
▪ Unit of Disbursement Responsibility:	INE/WSA
▪ TC included in Country Strategy: ▪ TC included in CPD:	N/A N/A
▪ GCI-9 Sector Priority:	Climate Change and Environmental Sustainability

II. Objective and Justification

2.1 The main objective of this TC is to contribute to sustainable management and development of the water, energy and food production sectors by increasing analytical capabilities and documented case studies on integrated resource planning in Bank investments, identifying and evaluating trade-offs and synergies between water resources management, energy generation and food production, when planned in an integrated fashion. This overarching objective can be achieved by supporting client countries develop and use innovative approaches and evidence-based operational tools to assess the economic and social tradeoffs of constraints in water, energy and food and their corresponding and intertwined security.

2.2 The interdependency between water, energy and food is growing in importance as demand for water, energy and food (WEF) securities increases. Several regions of the world are already experiencing WEF security challenges, which adversely affect sustainable economic growth. Specifically in the LAC region, population and income per capita continue to grow, which in turn increases demand for water, energy and food, especially in fast-growing countries. At the same time, scarcity in water, energy or food is caused not only by physical factors, but there are also political and economic issues at play that effect the allocation, availability, and use of these resources.

2.3 Almost all primary energy production and electricity generation processes require significant amounts of water, and the treatment and transport of water require energy (mainly in the form of electricity); food production requires both water and energy resources. For instance, even though water use for energy generation is non-consumptive, temperature changes in return flows have impacts on aquatic ecosystems, and conflicts with other uses of water (such as food production) may arise in water scarce regions and basins due to different demand regimes. Climate change will further exacerbate problems like this, as local climate dictates spatial and temporal variations of water availability, and lead to intensified flooding and drought events. This is likely to increase competition for water across sectors, such as agriculture, the biggest consumer of water worldwide, but also energy generation, potable water supply, as well as the environment.

2.4 As a consequence, there is a pressing need for integrated planning of WEF resource development and use, to avoid unwanted and unsustainable scenarios in the coming years. Although the WEF nexus is now fairly evident, these three sectors have historically been regulated and managed separately; and despite growing concern over these trends, decision makers often remain ill-informed about their drivers and ill-equipped to deal with possible outcomes.

III. Description of Activities and outputs

3.1 The project will support the development of methodologies and outputs consisting of the following activities. These activities are further detailed in the TC Document for this operation:

3.2 **Activity 1:** Preparation of the Background Information: this activity will include a literature review, assessment of data availability and needs to implement the WEF nexus methodology, travel to the countries for data collection and interviews, data analysis, and the identification of pilot case studies for implementation (Activity 3).

3.3 **Activity 2:** Development of base analytical tool for WEF Nexus: this activity consists of the development of an integrative modeling tool of water, energy and food production/security issues, following the approach of existing global Integrated Assessment Models (IAMs), but tailored and localized to the Latin America and the Caribbean (LAC) region. An IAM will be developed for the LAC region building upon the Hydro-BID system developed by the IDB, integrating it with an existing IAM (e.g., GCAM: global change assessment model) with four major stock groups (water, energy, food and ecosystems), including modules for economic (trade-off, optimization, economic output) analysis, and environmental impact analysis. The economic analysis modules will include ecosystem services trade-offs assessment capabilities. It is worth noting that such a tool does not yet exist for the LAC region, and this product will be a primary contribution of this TC.

3.4 **Activity 3:** Case Study Applications: Water resources management data will be derived through the Bank's existing Hydro-BID system for water availability (water sources and quantities), water demand use and efficiency data available from INE/WSA clients through the region. We estimate that three case studies will be performed under this activity (e.g., *Corporación Autónoma Regional del Valle Cauca* (CVC) in Colombia, *Autoridad Nacional del Agua* (ANA) in Peru, and *Agencia Pernambucana de Aguas y Clima* (APAC) in Brazil). Particular focus will be placed on water allocations for energy generation, food production purposes and ecological flows for ecosystems preservation and maintenance. These case studies have been pre-selected as they involve clients that have expressed interest in engaging in water-energy-food nexus activities, particularly as they relate to adaptation to climate change, a key priority of the LAIF program with the IDB.

3.5 **Activity 4:** Seminar/workshop(s) to disseminate knowledge and generate policy dialogue. This activity will result in the drafting of IDB Technical Notes (3) documenting the case study applications, as well as an article for submission to a peer-reviewed journal.

In addition to these activities, coordination and supervision by Bank staff will be carried out.

IV. Indicative Budget

4.1 An indicative budget is presented below. These TC activities will be financed with the EU´s Latin American Investment Facility (LAIF), through the Spanish Agency for International Cooperation (AECID).

Indicative Budget

Activity	Total Funding (LAIF)
1. Preparation of the Background Information and Materials	50,000
2. Development of base analytical tool for WEF Nexus	150,000
3. Case Study Applications	600,000
4. Knowledge Dissemination, Working Paper, Journal Papers	200,000
TOTAL	**US$ 1,000,000**

V. Executing agency and Execution structure

5.1 This is a Bank-originated TC focused on integrating recently developed methods and tools in modeling, visualization and decision-making processes, which that are particularly applicable to water scarce areas as case study applications that may be replicated in other climate-sensitive parts of the LAC region. In addition, this detailed research and development effort will add value by offering the opportunity of mainstreaming climate change impacts in the design of water resources planning and Bank´ infrastructure operations in different sectors (Water Supply, Water Resources Management, Hydro-energy, Irrigation, Natural Hazards and Risk Management and Transport). Besides the water resources management and planning uses of Hydro-BID and GCAM, the knowledge and tools developed through this TC will be able to serve as support for the environmental evaluation and screening of Bank´s project loans at regional scale. 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 an increasing area of work for the Bank (and particularly the WSA division). Therefore, it is deemed critical that this TC is Bank-executed. The Bank will contract all consulting services (firms and individual) according to current corporate acquisitions policies and procedures.

VI. Project Risks and issues

6.1 The primary risk for implementation of this TC project is the lack of technical capacity of some of Bank´s clients and the gap of information for model parameterization in particular areas. To mitigate this risk, the TC includes providing technical support and guidance to model users and building capacity with our client country counterparts: *Corporación del Valle del Cauca* (CVC) in Colombia, *Autoridad Nacional del Agua* (ANA) in Perú and *Agencia Pernambucana de Agua y Clima* (APAC) in Brazil, as well as with a local universities to sustain this effort beyond the duration of this TC. An additional risk stems from the pioneering nature of this TC; there isn't much operational experience with the kinds of products that this TC will yield. We have therefore included peer review of all outputs of this TC by at least 2 anonymous reviewers (one within the Bank and one outside the Bank) to insure quality of the TC deliverables.

VII. Environmental and Social Classification

7.1 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.