

**TC Document**  
**HYDRO-CLIMATE SERVICES FOR ADAPTATION TO CLIMATE CHANGE**  
**RG-X1163**

**I. Basic Information for TC**

- Country/Region: Regional (Beneficiary countries: Argentina, Bolivia, Brazil, Paraguay and Uruguay).
- TC Name: HYDRO-CLIMATE SERVICES FOR ADAPTATION TO CLIMATE CHANGE
- TC Number: RG-X1163
- Associated Loan/Guarantee Name: n/a
- Associated Loan/Guarantee Number: n/a
- Team Leader: Fernando Miralles-Wilhelm (INE/WSA); Team Members: Irene Cartin (INE/WSA); Carlos DePaco (ORP/ORP); Guillermo Eschoyez (LEG/SGO); Alfred Grunwaldt (INE/ECC); and Raúl Muñoz (INE/WSA)
- Date of TC Abstract authorization: September 18, 2012
- Donors providing funding: Skoll Global Threats Fund (through a Project-Specific Grant)
- Beneficiary (countries or entities which are the recipient of the technical assistance): REGIONAL
- Executing Agency and contact name: Bank Executed
- IDB Funding Requested: US\$300,000
- Local counterpart funding, if any: n/a
- Execution period: 24 Months
- Disbursement period (which includes execution period): 27 Months
- Required start date: November 2012
- 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: N/A; TC included in CPD: N/A
- GCI-9 Sector Priority: Climate Change and Environmental Sustainability

**II. Description of the Associated Loan/Guarantee**

N/A

**III. Objectives and Justification of the TC**

In the context of climate change, extreme events such as floods and droughts (the costliest natural disasters) are expected to alter in frequency and severity in the Latin America and Caribbean region. Shorter-scale climate variability patterns are also likely to shift, placing pressure on many activities such as food production and water supply systems that sustain large populations, as well as potentially damaging water and sanitation related infrastructures and sensitive ecosystems. There have been shown marked climate signals on multiple time scales, from seasonal to multi-decadal (e.g., Boulanger et al. 2005; Barreiro et al. 2010). Inter-annual climate variability has considerable impact on agriculture (crop yields and profits) and water resources (likelihood of droughts and floods, stream flow of the river and its tributaries that supply freshwater to growing populations and allow transportation of agricultural exports). Decadal climate variability could not render further viable systems that have been developed in response to increased rainfall in the last few decades if climate reverts to a drier epoch. In conclusion, basin areas are vulnerable to a range of extreme hydro climate events, from widespread floods that displace urban and rural populations and disrupt productive activities and livelihoods, to almost unprecedented droughts that decrease crop production, and also all phenomena that occurs at a wide range of time scales, making climate adaptation a complex but required process.

For instance, a 2008 drought decreased soybean and wheat production by about 30% and 50% respectively at a regional level in South America; and the recent 2011 drought in Argentina caused

losses in the agriculture sector that translated into losses of about 3% of the national GDP for that year. In these as well as many other cases in the region, adequate climate information (i.e., forecasts, model simulations, communication protocols) existed and were available with several months of lead time. However, it has become clear that availability of such climate information by itself is not enough to prevent or reduce significant losses due to hydro climatological events (e.g., Stainforth et al., 2007; Harrison et al. 2008; Miralles-Wilhelm, 2011).

To meet this challenge, translation of scientific knowledge decision-making and operations is essential to enhance the capacity of different socioeconomic sectors, governments and other decision-making entities to respond to climate variability and change impacts. Over the next few decades, climate information must support adaptation decisions, provide straightforward estimates of uncertainty, and meet the decision needs of targeted sectors. The ability to monitor and predict variations in climate has improved substantially thanks to enhancements in climate science, observations and models. However, the use of climate information in decision-making continues to lag the availability of new knowledge; and more importantly, the existing communication barrier between climate information producers and its users. Adaptation to climate variability and change, therefore, requires building institutional and human capacity and overcoming technological, economic, cultural, and institutional barriers. In order to address these problems, the concept of climate services has emerged, defined as the timely production and delivery of useful climate data, information and knowledge, i.e., the “services”, to stakeholders, decision-makers, and other potential “users” of such services. The concept itself was proposed by the World Meteorological Organization (WMO), adopted at the Third World Climate Conference in 2009, and embraced by the UNFCCC through the Global Framework for Climate Services, released at the COP16 meeting in late 2010.

As proposed by the WMO<sup>1</sup>, *Climate Services* go beyond the generation and provision of a wide range of information on past, present and future climate and its impacts on natural and human systems, and the application of that information for decision-making at all levels of society. They are provided by a variety of national and international, public and private, and research and operational organizations and are used to deliver social, economic and environmental benefits in climate-sensitive sectors of the economy. Some climate services are provided as public goods to the community at large, while others are provided and consumed under commercial or other financial arrangements between individuals, firms, organizations or governments.

Climate services need to inform decision-makers about what is happening with the current climate, and why and how the climate could change in the future. They are closely linked with traditional weather services and are increasingly focused on the challenges of adaptation to climate variability and change. Climate information is built on observations, assimilation of data from observations into models, and using the models for attribution and prediction. The information is assessed and assembled into products that are disseminated to users, and the users in turn can provide feedback on their needs for improvement of the products. The climate information and products (i.e., the “services”) include an extensive array of general and user-specific information, prediction, warning and advisories that may range from general public information to customized products.

As understanding of the climate system grows and society becomes more aware of the potential opportunities arising from this knowledge, communities increasingly expect that these services should be:

- Available/accessible: at time and space scales that meet the needs of users.
- Dependable: delivered regularly and on time.
- Usable: presented in user-specific formats so that the client can fully understand the service.
- Credible: for the user to confidently apply to decision-making.

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<sup>1</sup> [http://www.wmo.int/pages/gfcs/documents/GFCS\\_Position\\_Paper\\_DRAFT\\_REV\\_1\\_en\\_1.pdf](http://www.wmo.int/pages/gfcs/documents/GFCS_Position_Paper_DRAFT_REV_1_en_1.pdf).

- Authoritative: entitled to be accepted by stakeholders in the given decision contexts.
- Responsive and flexible: to the evolving needs of users

Based on this concept, the objective of this TC is to support development of specific hydro-climate services for a pilot basin in a collaborative approach with users, contributing to bridge the identified gaps through climate services tailored to the water resources sector (hydro) to address specific needs for mainstreaming (climate) adaptation into planning and decision-making in order to: i) increase the resilience of hydro climate-sensitive sectors such as water resources management and agricultural production; and ii) facilitate sustainable societal adaptation to changing climate, mainly by improving the adaptation capacity to hydro-climate extreme events.

The specific objectives of this TC that will guide the development of the activities described below will be the following: i) to identify potential users of hydro-climate services; ii) to define specific needs for hydro-climate services for the identified users; and iii) to establish the added value of the hydro-climate services to be proposed.

Because of the recent series of severe drought events that have taken place in southeastern South America (2008-2011) and because socioeconomic losses due to unpreparedness (or lack of adaptation) have been well documented, we have chosen to focus on the development of climate services for adaptation to drought in the La Plata River Basin.

The La Plata River Basin is a trans-boundary system along five different countries, which specific climate vulnerabilities and with different and specific climate threats depending on the sub-basin to take into consideration. Governments, institutions and decision makers from each different country and from the different sub-basins are aware of this and have been developing different initiatives for the promotion of hydro-climate information and services in order to allow mainstreaming climate change and climate variability into planning and decision-making. Some of them are individual initiatives at country or sub-basin level, and others have been joint projects between national agencies from different countries.

In what is perhaps the most salient example of this, the governments of Argentina, Bolivia, Brazil, Paraguay and Uruguay have agreed to prepare a program of strategic actions designed to strengthen and implement their shared vision for the economic, social and environmentally sustainable development of the basin through the Framework Program for the Sustainable Management Water Resources of the La Plata Basin, which has been coordinated and implemented by the *Comité Intergubernamental Coordinador de los Países de la Cuenca del Plata* (CICPLATA) with GEF funding through UNEP and OAS. There are different initiatives being considered under the Framework Program such as a Decision-Making Support System, a basin-wide water balance, and a series of hydro-climate scenarios, including the identification and definition of plans for adaptation to climate change and climate variability for the water resources management. The outcomes of this TC will be useful and valuable inputs for some of these initiatives, especially for the design of a Decision-Making Support System and for evaluating vulnerabilities in order to designing specific adaptation measures. This will also complement other efforts and coordinate with other institutions involved in issues of water and climate in the countries that comprise the basin such as INTA and SMN (Argentina), MMAA (Bolivia), INM and IBGE (Brazil), DMH (Paraguay) and DINAGUA (Uruguay).

Since CICPLATA has a relatively well established governance structure and is already coordinating these initiatives related to climate services in the La Plata River Basin, it is well deemed to serve the role of beneficiary for this TC in representation of the beneficiary countries (Argentina, Bolivia, Brazil, Paraguay and Uruguay).

This project is aligned with the lending target of “climate change, sustainable energy and environmental sustainability” of the GC-I9 Bank’s policy document.

#### IV. **Description of activities/components and budget**

The proposed TC project entails the following activities, outputs and results:

**Activity 1. Gap/barrier analysis and validation of existing hydro-climate data and drought information in the La Plata River Basin.** This activity consists of the review of current hydro-climate data, availability of information related to droughts in La Plata River Basin, and an assessment of the technical capacity (local “state of the art”) of the user communities and institutions responsible for the development and delivery of hydro-climate services and products. The analysis to be carried out aims to identify specific gaps (what is lacking in climate service offerings) and barriers (limitations for use of existing climate information) for the development and implementation of climate services that could range from insufficient and inadequate climate science information and tools, to social, cultural, political, economic, and other gaps. Based on the findings of this assessment, specific and tailored hydro-climatic services for the Basin will be designed. It is worth noting that this gap/barrier assessment will be user-centric, i.e., focused on identifying specific demands for hydro-climate products (existing and needed). This demand-driven analysis will be centered mainly in users from the water supply and the irrigation sectors in the La Plata River Basin.

This activity requires consolidation and integration, analysis and assessment of different types of information available locally and within research groups worldwide that have carried out investigations in the Basin. This information will consist of the following databases (as existing):

- **Socioeconomic:** Gridded maps of population estimates; map livelihood patterns (rural/urban); income and consumption patterns; food grain prices and trends over the long-term; variations in prices during extreme climate events, and particularly droughts.
- **Meteorology:** Gridded analysis of daily rainfall, surface temperature and other quality-controlled data for mapping extreme events (droughts and heat waves particularly) identifying vulnerable areas, drought severity indexes, standardized precipitation index (SPI) based on the long-term climate and satellite-based precipitation data; quantifying sea surface temperature (SST) and other circulation anomalies associated with El Niño/La Niña extreme events.
- **Hydrology:** Map watersheds, stream flow, runoff, infiltration, evapotranspiration, surface water and groundwater elevation. Long-term soil moisture distribution for assessing long-term droughts.
- **Agriculture:** Quantify and map sown area, crop vigor and variations using long-term vegetation indexes; crop moisture index, change in cropping patterns, irrigation area, yield and productivity to climate and changing hydrology over decadal time-scales.
- **Infrastructure and Investments:** mapping of water and energy utilities, public health facilities, industrial systems, as well as natural infrastructure (e.g., wetland delineation).

This activity will include the assessment of the technical capacity of local institutions and research centers in charge of production and management of hydro-climate information and databases, as well as those responsible for weather and climate forecasting and predictions (mainly national and sub-national meteorological institutes, universities and research institutions, as well as users such as basin councils (farmers’ associations (e.g., AACREA and INTA in Argentina), and water and sanitation operators (AySA in Argentina, ANA in Brazil, and DINAGUA in Uruguay). The interaction with stakeholders involved will be coordinated by CICPLATA, and there will be a first mission to the La Plata Basin for meeting with all the institutions identified with the main objective of getting involved all of them in the process and for discussing the objectives and scope of the services to be developed.

**Activity 2. Development and implementation of Basin-wide Hydro-climatic Services for monitoring and Adaptation to Drought.** Based on the assessment carried out by Activity 1, this activity consists of the development and implementation of hydro-climatic services for adaptation to drought conditions, in close collaboration with key local stakeholders in the Basin.

One of the costliest climate-related risks in the Basin is the occurrence of drought; for instance, most agricultural production is rainfed (irrigation is not very common). For this reason, there is great interest locally in diagnostic services that can quantify the severity, duration, spatial extent and impact of dry events. Diagnostic climate information characterizes conditions experienced in the recent past (from the last few days to months). This information is very helpful in informing decisions (e.g., should a farmer plant if it has not rained in weeks and the soil is dry), and also in interpreting forecasts about seasonal climate conditions (e.g., if a drought is already being experienced, a forecast of a dry summer raises awareness on the imminence of potential extremes).

Although there is a suite of candidate indices, the Lincoln Declaration on Drought Indices [Hayes et al. 2011] recommended use of the Standardized Precipitation Index<sup>2</sup> (SPI). The SPI has several advantages. First, its computation only requires rainfall data, unlike other indices that are much more data-demanding. Second, values of the SPI can be compared over space and time, thus allowing to monitor drought over large areas (e.g., the entire maize and/or soybean-producing region of South America). Third, this quantity is already being calculated for grain-producing regions over North America and is monitored by farmers worldwide. Because of the recent series of severe drought events that have taken place in southeastern South America (2008-2011) and because socioeconomic losses due to unpreparedness (or lack of adaptation) have been well documented, this project will focus on the development of climate services for adaptation to drought in the La Plata River Basin.

Pilot computation of the SPI has been implemented already in Argentina and Brazil, and this has raised interest in this diagnostic index in neighboring countries of the Basin (Bolivia, Uruguay and Paraguay). This task would entail a more detailed implementation of the SPI throughout the Basin, and a coordinated approach to define common protocols and tools to compute and visualize the SPI. For instance, the Argentine implementation is based on proprietary software, and it would be convenient to migrate it into a web-based open source environment, such as the recently launched HC-LAC (Hydrology and Climate for the LAC region), developed by the IDB. Given the proliferation of automated weather stations owned by individual farmers or commodity trading groups, the software could be transferred at no cost so the index could be available for many locations, perhaps providing the basis for an index insurance mechanism in which insurance payments are triggered by objectively defined values of a climate index closely related to yields.

**Activity 3. Outreach for Dissemination and Capacity Building Workshops.** This activity consists of the translation of the findings of the Activities 1 and 2 into practice-based guidance for the provision and use of hydro-climate services for adaptation for key users in the Basin. This activity aims to promote a better institutional framework and technical capabilities in order to diminish the barrier usually existing between climate information producers and its users. This closing activity will enable the creation of a common framework within the La Plata Basin for supporting climate services production and sharing among the basin stakeholders (users and providers of climate services). This activity will support to reduction of the communication gap that exists between the producers of climate information and users (e.g., farmers); this gap has been identified in the La Plata River Basin as a key reason for the inability of users to assimilate climate information and adapt accordingly.

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<sup>2</sup> The Standard Precipitation Index (SPI) is a relatively new drought index based only on precipitation. It is an index based on the probability of precipitation for any time scale. (<http://lwfi.ncdc.noaa.gov/oa/climate/research/prelim/drought/spi.html>).

The SPI climate service will be complemented with appropriate manuals and online web content describing the indices and their computation, examples, and their strengths and limitations. A dissemination plan will be developed so that short tutorial videos will be produced to be distributed over many channels, including YouTube and cable TV channels focused on farming (e.g., Canal Rural). Partnerships will be sought with farmers' associations in the Basin so that the tutorials would be presented by regional technical experts, who already have credibility and trust among farmers, and thus are good vehicles for transfer of information about technological innovations.

The SPI could be routinely distributed via websites of governmental meteorological agencies or non-profit farmers' associations, and accessed through PCs or cell phones as mobile applications, adding the interactive capability for users to report local conditions, e.g., commenting on impacts of ongoing conditions on the evolution of local crops.

The results of the studies carried out and the referred best-practices and techniques will be disseminated through two capacity building workshops to take place in two locations within La Plata basin (hosted by two different key institutions for managing climate and/or hydrology information in the basin). No-objection statements from the hosting countries will be obtained prior to these workshops.

#### Indicative Results Matrix

Project Activity	Outputs	Outcome
General		TC General Outcome: Number of <u>institutions/entities within the La Plata River Basin with new climate services (SPI) implemented.</u>
Activity 1: Gap/barrier analysis and validation of existing hydro-climate data and drought information	<u>Output 1A:</u> Analysis of the hydro-climate information completed. <u>Output 1B:</u> Analysis of the technical capacity of local institutions for climate services production completed.	<u>Outcome 1:</u> Number of times the analysis completed has been used as input in the <u>development of Activity 2: Development and implementation of Basin Hydro-climatic Services for Adaptation to Drought.</u>
Activity 2: Development and implementation of Basin-wide Hydro-climatic Services for Adaptation to Drought	<u>Output 2A:</u> Hydro-climate services applications for water resources management developed and implemented	<u>Outcome 2:</u> Basin Hydro-climate services for <u>adaptation to drought.</u>
Activity 3: Outreach for Dissemination and Capacity Building Workshops	<u>Output 3A:</u> Framework for sharing climate information developed <u>Output 3B:</u> Technical note with lessons learned and best-practices and techniques published <u>Output 3C:</u> Workshops delivered (2)	<u>Outcome 3A:</u> New climate service agreements and/or partnerships established. <u>Outcome 3B:</u> Number of times knowledge produced in the technical note has resulted in changes in CICPLATA practices. <u>Outcome 3C:</u> Number (or %) of participants that showed increased knowledge regarding climate services.

#### Indicative Budget (Detailed Budget: [IDBdocs37228937](#))

Activity	Total Funding (SGTF)
Gap analysis and validation of existing hydro-climate data and drought information	65,000
Development of Basin-wide Hydro-climatic Services for Adaptation to Drought	180,000
Outreach for Dissemination and Capacity Building Workshops	40,000
Administrative Fee	15,000(*)
<b>TOTAL</b>	<b>US\$300,000</b>

(\*) Resources of this project to be received from SGTF will be provided to the Bank through a Project Specific Grant (PSG). A PSG is administered by the Bank according to the "Report on COFABS, Ad-Hocs and CLFGS and a Proposal to Unify Them as Project Specific Grants (PSGS)" (Document SC-114). As contemplated in these procedures, the commitment from SGTF will be established through an Administrative Agreement. Under such agreement, the resources for this project will be administered by the Bank and the Bank will charge an administrative fee of 5% of the contribution, which is duly identified in the budget of this project.

**V. Executing agency and execution structure**

This is a Bank-originated TC focused on developing climate services as adaptation measures to climate change that can be used as a reference tool for similar interventions in other Bank member countries and regions. It is important that knowledge in the area of climate change adaptation and climate services development is cultivated in the Bank, and this TC offers a first clear opportunity to do so. The Bank will use the knowledge generated through this TC to the benefit of the borrowing member countries, specifically the beneficiary countries in the La Plata River Basin. 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 new area of work that the Bank (and particularly the WSA division) has engaged in recently. 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. Major issues**

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 hydro-climate services developed through this TC. To mitigate this risk, previous conversations with climatological, hydrological and agricultural institutions in the La Plata River Basin have been initiated and CICPLATA has been selected as Bank's counterpart for this TC given its previous work and experience in engaging key stakeholders in La Plata River Basin for the climate services promotion. In addition, and as starting point a first Bank's recognizance mission is proposed to be carried out jointly with the selected consultancy firm/research institution, with the objective of engaging local key stakeholders by discussing the objective of the studies and services to be developed

An additional risk stems from the pioneering nature of this TC; there isn't much operational experience with the kinds of products that climate services will yield. In order to mitigate this risk, this TC is proposed to be Bank-executed, and a dedicated team compounded by technical Bank's staff will be monitoring directly the TC execution and the quality control of the selection process for consultancy services to be hired as well as the implementation of the proposed technical solutions. Just top consultancy firms or high-level research institutions will be invited to present proposals. 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.

The Team Leader for this TC will be responsible for the preparation and delivery of project reports as specified in the Administrative Agreement for this PSG.

**VII. Exceptions to Bank policy –**

N/A

**VIII. Environmental and Social Strategy**

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 ([IDBdocs37114410](#)).

**Annexes:**

Terms of Reference: [IDBdocs37228925](#)

Procurement Plan: [IDBdocs37228916](#)

Appendix I – References: [IDBdocs37248134](#)

11/7/12

*Aprobado: Federico Basaños, Jefe INE/WS*