

TC ABSTRACT

I. BASIC PROJECT DATA

▪ Country/Region	Regional
▪ TC name:	Investigation of the effects of intermittent water supply on drinking water quality and infrastructure
▪ <i>TC number:</i>	RG-T2441
▪ Team leader and team members:	Alejandra Perroni (INE/WSA) team leader; team members: Gustavo Martínez (WSA/CPN), Jorge Ducci, (WSA/CCH); Fernando Miralles, (INE/WSA); Coral Fernandez Illescas (INE/WSA), Roxana Martínez Chavez (INE/WSA); Bernardita Saez (LEG/SGO), René Herrera (VPC/FMP).
▪ Operational Support, Client Support, or Research & Dissemination.	Research & Dissemination
▪ Solicitud de Referencia: (IDB docs #)	38591987
▪ Date of TC abstract:	February 12, 2014
▪ Beneficiary	Regional
▪ Executing Agency and contact name	Executed by the Bank
▪ IDB funding requesting:	US\$ 100,000
▪ Local counterpart funding:	N/A
▪ Disbursement period:	March 2014-July 2016
▪ Required start date:	March 2014
▪ Type of consultant	Academic institution
▪ Prepared by:	INE/WSA
▪ Unit of disbursement responsibility:	INE/WSA
▪ Included in country strategy (si/no):	No
▪ GCI-9 sector priority :	Infrastructure for Competitiveness and Social Welfare

II. OBJECTIVES AND JUSTIFICATION

- 2.1 The objective of this TC is to evaluate the effects of different drinking water supply situations (ranging from continuous to different varieties of intermittent supply) on drinking water quality, infrastructure integrity, and leakage.
- 2.2 As per statistics prepared by PAHO and WHO, approximately 60% of households with connections to piped water supply in Latin America and the Caribbean had intermittent water supply (IWS) in 2001. Intermittency occurs when a water utility is unable to maintain positive pressure in the entire water distribution system (WDS) at one time, due to insufficient water resources, inadequate infrastructure, excessive consumption and water losses, or a combination of those factors.¹ IWS, water quality, infrastructure condition and leakage are inter-related. Poor infrastructure leads to increased leakage, which can result in IWS. IWS may further damage infrastructure, worsening the situation. Both IWS and poor infrastructure condition can threaten water quality through intrusion or regrowth of microorganisms.
- 2.3 Despite these elevated risks, only a small portion of research on water quality in distribution systems has focused on intermittent systems and the relationships between all the related factors. The proposed TC will lead to a better understanding of these relationships through a combination of analytical and field research works. Field data will be collected from the WDS in Arraiján, a rapidly growing suburban area of approximately 220,000 inhabitants outside of Panama City, Panama. A significant portion of households in the area receive intermittent water service, and IDAAN (Panama's

¹ Coelho et al., 2003; Lee and Schwab, 2005; Vairavamoorthy et al., 2008; Yepes et al., 2001

national water and sanitation utility) is making a series of investments (partially financed by the IDB, PN-L1042 program) over the next two years to improve the system's performance. Sub-sectors of the distribution system that represent a variety of supply situations will be selected as study zones. The TC will focus mainly on backflow and intrusion.

- 2.4 As a knowledge product, it is expected that the conclusions of this work will be used to better inform future programs funding rehabilitation of water networks in Latin America and the Caribbean. This study is aligned with the Bank's GCI-9 sector priority: "Infrastructure for Competitiveness and Social Welfare".

III. DESCRIPTION OF ACTIVITIES

- 3.1 The project comprises two phases. Phase I includes one year of water quality, pressure transient and leakage measurements in four study zones representing different supply conditions existing in Arraiján, and the analysis of collected data. Phase II would include a second year of measurements in the same study zones once intermittency of water supply in those zones has been reduced as a consequence of infrastructure improvements made by IDAAN. Phase II would include analysis of IDAAN's pipe break records, a life-cycle assessment of how different supply conditions affect IDAAN's energy consumption and other operating and investment costs.
- 3.2 This TC supports activities in the scope of Phase I. Funding of Phase II activities will be considered once results of Phase I are duly analyzed. Activities included in Phase I are:
- a. **Activity 1: Selection of study zones and installation of sampling access points.** In consultation with IDAAN staff, portions of the Arraiján distribution system showing different supply conditions will be selected to study the main issues characterizing IWS and its effects. Access points for monitoring water quality, pressure transients, and leakage rates will be installed.
 - b. **Activity 2: Collection and analysis of data on water quality, pressure transients and leakage rates under different supply conditions.** Parameters defining water quality, the nature and frequency of pressure transients, and leakage rates will be measured for the water supply conditions prevailing in each of the zones defined in activity 1. Resulting data will be analyzed, together with existing information on other comparable cases (to be agreed between the Bank and the Consultant) in order to identify and characterize relationships between main involved factors.
 - c. **Activity 3: Analysis, publication, and dissemination of results.** Results of the research will be disseminated to enable their application by IDAAN, IADB and the water and sanitation sector at large. A complete report (in Spanish and English) of the results will be prepared by the Consultant for approval by IDAAN and IADB, and presented at a workshop for interested IDAAN staff and other stakeholders in Panama's water and sanitation sector and other IDB clients that IDAAN and the Bank wish to involve. Results will also be published in peer-reviewed academic and/or professional journals and might be presented at academic and/or professional conferences.

IV. EXPECTED RESULTS AND DELIVERABLES

- 4.1 Expected outputs are: (i) written reports and workshop presenting findings to IDAAN, IADB and other water and sanitation actors IDAAN wishes to involve and (ii) 1 peer-reviewed academic or professional publication and 2 presentations at academic and professional conferences.
- 4.2 Expected results are improved understanding of the effects of different intermittent supply conditions on water quality, pressure transients and leakage, in order to improve preparation of loan programs for the region.

V. BUDGET

- 5.1 Budget requested to support Phase I activities is estimated as USD 100,000, including salaries, benefits, travels, equipment, supplies and expenses. Additional funding is required to support Phase II activities. Local Counterpart funding: not applicable (N/A)

Activity	Budget (USD)
Activity 1	53,196
Activity 2	36,972
Activity 3	9,832
Total	100,000

VI. EXECUTING AGENCY, CONSULTANT AND EXECUTION STRUCTURE

- 6.1 The TC will be executed by INE/WSA. The TC contemplates the single source selection of Blum Center for Developing Economies and Department of Civil and Environmental Engineering, UC Berkeley. Because of the nature of this project, the project team, under the coordination of the Team Leader, finds that the Blum Center at UCB is the entity that is most suited to provide technical assistance to the project given its comprehensive and experience in the matter.
- 6.2 The Blum Center will provide faculty, graduate and undergraduate technical expertise. Statistical methods similar to those used by UC Berkeley researchers in previous IWS research in India (Kumpel and Nelson, 2013; 2014) will be used for this study. Furthermore, there is a Memorandum of Understanding between the Bank and Blum Center for collaboration in these types of efforts.
- 6.3 Therefore, given the competencies and expertise of UCB's Blum Center, and their technical knowledge, the project team suggests contracting that entity for the amount of US\$100,000 to provide technical support in implementation of the project, in single-source selection process as per policy GN-2350-9, 3.10 (d). ([SS Justification](#)).
- 6.4 In order to ensure a smooth and effective development of the study, IDAAN has committed to provide the consultant: (i) permission to conduct water quality monitoring in various points in the network, support to access those points and operational information; (ii) permission to use the results of the study to write articles in academic journals and make presentations at academic and professional conferences.

VII. MAJOR ENVISAGED RISKS OF THE TC

- 7.1 The two main risks for this project are: i) that IDAAN will not be able to ensure availability of technical capacity to support the consultant works, in particular the provision of information on service in selected supply zones, and access and connection to monitoring points in the WDS; and ii) that the planned infrastructure improvements will not take place soon enough for the improved supply conditions to be observed during the timeline of the research.
- 7.2 To reduce the risk that the utility is unable to provide the necessary resources, this proposal will be reviewed by IDAAN management at the regional (Arraiján) and national level. If some contents of the proposal do not appear feasible to IDAAN, the scope of services will be adjusted accordingly.

VIII. ENVIRONMENTAL AND SOCIAL CLASSIFICATION

- 8.1 Given the nature of the activities to be financed, and in accordance with the guidelines of the Bank's Environment and Safeguards Compliance Policy (OP-703), the proposed technical cooperation is classified as "C" ([See Filters](#)).