

Technical Cooperation Document

I. Basic Information for TC

▪ Country/Region:	COLOMBIA
▪ TC Name:	Using Information and Communication Technologies to Reduce Exposure to Air Pollution in Colombia
▪ TC Number:	CO-T1560
▪ Team Leader/Members:	Blackman, Allen (CSD/CSD) Team Leader; Hoffmann, Bridget Lynn (RES/RES) Alternate Team Leader; Cardona Rivadeneira, Jaime Eduardo (SCL/SPH); Colonna Urdaneta, Maurizio (CSD/CCS); Crausaz Sarzosa, Ernesto Patricio (VPC/FMP); Gomez, Juan Carlos (CSD/CCS); Hillman, Eugenio F. (VPC/FMP); Martinez, Ynty Koyllor (SRE/PFA); Negret Garrido, Cesar Andres (LEG/SGO); Salazar Echavarria, Carlos Alberto (CSD/RND); Sandoval Pedroza, Jose Manuel (CSD/CCS); Sarkozy, Louis (CSD/CSD); Vogt-Schilb, Adrien (CSD/CCS)
▪ Taxonomy:	Client Support
▪ Operation Supported by the TC:	N/A
▪ Date of TC Abstract authorization:	06 Jan 2020.
▪ Beneficiary:	Ministry of Health, Ministry of the Environment, and Pan American Health Organization, Bogota Office
▪ Executing Agency and contact name:	Inter-American Development Bank
▪ Donors providing funding:	OC Strategic Development Program for Sustainability(SUS)
▪ IDB Funding Requested:	US\$240,000.00
▪ Local counterpart funding, if any:	US\$0
▪ Disbursement period:	24 months (24 months of execution)
▪ Required start date:	March 2020
▪ Types of consultants:	Firms and individuals
▪ Prepared by Unit:	CSD-Climate Change and Sustainable Development Sector
▪ Unit of Disbursement Responsibility:	CSD-Climate Change and Sustainable Development Sector
▪ TC included in Country Strategy:	No
▪ TC included in CPD:	No
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Environmental sustainability

II. Objectives and Justification of the TC

- 2.1 This Technical Cooperation (TC) has two broad goals. Goal 1 is to measure the effects on Bogota residents' behavior and environmental attitudes of Information and Communications Technologies (ICTs) that provide detailed real-time information on air quality (AQ). Examples of such ICTs include smart phone applications, SMS text messaging systems, and personal portable AQ monitors. Goal 2 is to use what is learned about these effects to inform the design of scalable, pilot ICT AQ alert systems in Bogota and possibly other Colombian cities.
- 2.2 Considerable scientific evidence demonstrates that air pollution causes illness and death (U.S. EPA 2009; Chay and Greenstone 2003; Ebenstein et al. 2017). Numerous studies document this link in Bogota. For example, Blanco-Becerra et al. (2013) find that daily average particulate matter smaller than ten microns (PM10) is positively correlated both with mortality due to all causes and mortality from respiratory causes. Lozano (2004) finds that the number of hospital visits for acute respiratory illness is

positively correlated with PM10 and nitrogen dioxide, and that these correlations are strongest among the elderly.

- 2.3 Significant evidence also demonstrates that providing people with timely accurate information about AQ can reduce the adverse health effects of severe air pollution episodes, particularly vulnerable individuals such as children, senior citizens, and those with chronic respiratory conditions. For example, Neidell (2009) studied AQ alerts issued when ozone is predicted to exceed a specified threshold in Los Angeles, CA. The alerts, which are disseminated via public media such as television and radio, advise vulnerable people to remain indoors and avoid rigorous outdoor activities. The study shows that in response, daily attendance falls 6-13% at outdoor zoos and other destinations. Moreover, daily attendance for children and the elderly falls by a greater amount. Janke (2014) studied the effect of air pollution alerts in England on children's hospitalizations due to respiratory conditions. She finds that alerts cause an 8% decrease in hospitalizations due to asthma among children.
- 2.4 These studies suggest that disseminating data from Bogota's AQ monitoring networks could help reduce air pollution's adverse health impacts in the short-term by enabling residents to engage in avoidance behavior on days when pollution is particularly severe. That might entail, for example, wearing face masks, using air purifiers and postponing outdoor activities, in particular, strenuous exercise.
- 2.5 In addition, providing Bogota's residents with AQ information may help to reduce health impacts in the long-term by changing attitudes about the environment, which in turn can generate support for policies and programs to improve AQ. Hence, providing AQ information can have both short- and long-term benefits.
- 2.6 Currently, however, few Bogota residents regularly access information generated by the city's AQ monitoring network either on the internet or via public media such as radio, newspapers, or television. A logical policy solution is to use ICTs like smart-phone applications and SMS text message systems to provide this information.
- 2.7 This planned study of the use of ICTs to address air pollution problems in Bogota is the result of discussions and meetings among the Bank, the Pan American Health Organization Bogota office, and client country agencies—specifically, the Ministry of Health, the Ministry of Environment, the Secretary of the Environment for Bogota, and the Secretary of Health for Bogota—about the use of ICT systems to disseminate AQ information in Bogota. These discussions and meetings began in the summer of 2019 and continued through the fall of 2019.
- 2.8 This TC will support two rigorous evaluations of the effect of such ICTs on the behavior and environmental attitudes of residents of the Bogota metropolitan area. The first study (Study A) will focus on a smartphone application because this ICT has the potential to reach a large segment of Bogota's residents. Smartphone penetration in Bogota is high: according to the 2018 the "*Encuesta Nacional de Calidad de Vida*", 77% of all residents over the age of five use one. Moreover, smartphone penetration will likely continue to grow rapidly in Bogota. Finally, smartphones enable users to engage with AQ data in an interactive manner and to tailor these data to their own needs. These attributes that may make these data more salient and actionable. The first study will focus on AIRE BOGOTA an app launched by the Secretary of the Environment for Bogota in late 2019. It provides real-time accurate information on a variety of AQ measures. The Secretary of the Environment for Bogota has welcomed the proposed evaluation of AIRE BOGOTA's impacts.

- 2.9 The second study (Study B) will focus on a complementary ICT such as an SMS text messaging system that not necessarily require a smartphone. The purpose is to test the effects of an ICT that will reach a large segment of the subpopulation of Bogota residents who are particularly vulnerable to the effects of air pollution. This subpopulation mainly consists of residents who are elderly and who reside in relatively low socioeconomic status neighborhoods in the Southwest part of the city, where air pollution is chronically severe. Scoping workshops in Bogota in September 2019 indicated for this subpopulation, smartphone penetration is still relatively low. Moreover, many members of this group who do have smartphones do not have unlimited data plans that make it cost effective to use smartphones to access digital air quality information.
- 2.10 Both the Colombian Ministry of Health and the Colombian Ministry of the Environment are interested in using the results from these studies to decide whether and how to scale the smartphone application and complementary ICT systems to other jurisdictions in Colombia.
- 2.11 The project aligns with (1) the Update to the IDBG Institutional Strategy 2010-2020: Partnering with Latin America and the Caribbean to Improve Lives (AB3008), which incorporates environmental sustainability as one of the LAC region's three crosscutting challenges, and in particular with: (a) the development challenge of social exclusion and inequality (because air pollution has disproportionate impacts on the poor who often work outdoors and in close proximity to hazards and lack access to air conditioning), (b) the objectives of providing inclusive infrastructure services like ICT systems, leveraging south-south and triangular cooperation, and strengthening institutional capacity and the rule of law, and (c) the guiding principles of multi-sectoriality, leveraging partnerships, and innovation and knowledge; (2) the Environment and Biodiversity Sector Framework Document (GN-2827-5), and in particular with 'development challenges' of gaps in environmental governance and water, soil and air pollution, and 'line of actions' that call for improving environmental governance, reducing exposure to that pollution and raising awareness of health-related impacts; (3) the IDBG Colombia Country Strategy (2019-2022), and in particular with the strategic area and strategic objectives of: (a) increasing economic productivity by increasing the quality and stock of infrastructure; (b) increasing public management effectiveness by increasing equitable access to quality basic services; (c) promoting the digital economy by reducing the digital gap in the economy; and (d) combating climate change by preserving natural capital; and finally (4) the Ordinary Capital Strategic Development Program for Sustainability, and in particular with the objectives of supporting municipal governments to prepare for the challenges related to rapid urban growth in a sustainable manner, and expanding the knowledge base on climate mitigation, adaptation and sustainable energy.

III. Description of Activities/Components and Budget

- 3.1 **Component 1. Randomized implementation of interventions and data collection (US\$190,000).** This component will enable the project team to achieve Goal 1. It will entail two Randomized Controlled Trial (RCT) studies —Study A and Study B described above.

Study A: The effect of AIRE BOGOTA on the environmental attitudes and avoidance behavior of university students in Bogota.

- 3.2 Target population. The study focuses on university students in Bogota because they are likely to own and regularly use smartphones, engage in outdoor activities that expose them to air pollution, and have flexible schedules that might allow them to avoid exposure to air pollution. The study sample will include up to 1,200 students split between up to 200 students in the pilot sample and up to 1,000 students in the main sample. The actual number of students in the sample will depend on our ability to recruit in the required time frame. We will divide the students participating in the pilot and main study roughly equally split between treatment and control groups.
- 3.3 Treatment and control groups. As part of the baseline survey, a randomly selected subsample of students (the treatment group) will be encouraged to download and install the AIRE BOGOTA application on their smartphones. These students will also receive emails encouraging and incentivizing them to engage with the app. The control group will not receive the information session or encouragement to download and use the application.
- 3.4 Baseline and endline surveys. We will administer baseline (pre-treatment) and end-line (post-treatment) surveys to both the treatment and control groups to collect the following types of information: demographics and proxies for income and wealth; labor market and home production; health and physical activity; AQ knowledge and information; avoidance behavior; environmental behavior, preferences, and policy demand; and implicit environmental attitudes measured by an implicit association test.
- 3.5 Timing. The baseline survey will be administered at the start of Bogota's 2020 severe air pollution season in 2020. Endline surveys in lab sessions (similar to those used in the baseline survey) will be administered in April-June of 2020.

Study B: The effect of a complementary ICT system on the environmental attitudes and avoidance behavior of residents of Bogota with cardiopulmonary conditions.
- 3.6 Target population. This study focuses on individuals with chronic health conditions that are exacerbated by poor air quality ('patients' for short) living in the southwest part of Bogota. Focusing on this target population will enable us to test the effect of AQ alerts on individuals who are most exposed to poor air quality and vulnerable to its adverse effects. The study will include up to 200 individuals in the pilot sample and up to 1,000 individuals in the main sample. Again, the actual number of individuals in the sample will depend on our ability to recruit in the required time frame. We will divide the individuals participating in the pilot and main study roughly equally split between treatment and control groups.
- 3.7 Treatment and control groups. As part of the baseline survey, a randomly selected subsample of individuals (the treatment group) will be encouraged to sign up for the provision of AQ information via an ICT along with very brief health recommendations.
- 3.8 Baseline and endline surveys. We administer baseline (pre-treatment) and end-line (post-treatment) surveys to both the treatment and control groups to collect the following types of information: demographics and proxies for income and wealth; labor market and home production; health and physical activity; AQ knowledge and information; avoidance behavior; environmental behavior, preferences, and policy demand; and implicit environmental attitudes measured by an implicit association test.
- 3.9 Timing. The baseline and endline surveys for Study B will be administered roughly a year after the surveys for Study A. The baseline survey will be administered in January and/or February of 2021 and the endline survey in April-June of 2021.

- 3.10 **Component 2. Data management and analysis, writing papers and policy briefs (US\$30,000).** This component also will enable the project team to achieve Goal 1. It will entail compiling, cleaning and analyzing the data gathered in the baseline and endline surveys. The principal aim will be to measure the effect of each ICT (for Study A, the AIRE BOGOTA application, and for Study B, the complementary informational system) on study participants' environmental attitudes and avoidance behavior. To that end, we will use standard regression analysis. This component will also support writing technical notes and policy briefs reporting our results. The technical notes and policy briefs will be submitted to Bank paper series and will be targeted to academic audiences. The policy briefs will be submitted to Bank paper series and will be targeted to policymakers. These and any other intellectual property products will be the property of the Bank.
- 3.11 **Component 3. Dissemination of results (US\$20,000).** This component will enable the team to meet Goal 2. It will finance the dissemination of results from the interventions. Activities include: (i) meetings with government agencies to present the results of the interventions, to discuss any potential improvements recommended before adoption of similar policies, and to summarize lessons learned that will be important for scale up; and (ii) workshops to present the results of the analysis to government agencies, academics, and other interested stakeholders.
- 3.12 The project team will include local consultant who specialize in the implementation of RCTs. The local consultants key activities will include: helping to design and pilot baseline and endline survey instruments, helping to design and pilot information treatments, helping to obtain internal review board (IRB) certifications, recruiting a sample of participants, administering baseline and endline survey, administering informational treatments, helping to clean and compile survey data, and helping to facilitate interactions with local stakeholders.
- 3.13 The project's success in meeting the goals listed in ¶2.1 will be evaluated by tracking a series of indicators listed in the projects results matrix.
- 3.14 The project requires a 24-month execution period because each of the randomized controlled trials (RCTs) that the project will support will require 12 months to conduct and must be conducted sequentially. For each study, the baseline survey and informational intervention must be conducted during the severe air pollution season, which lasts from January through April. Subsequently, the project team will compile and analyze the data, write up results, and finally disseminate the results —activities that together will consume at least six months. Moreover, several months are required design, obtain Internal Review Board approval for, and plan each study before launching it in the first months of the severe air pollution season. Only the first study is ready to be launched during the 2020 severe air pollution season in Bogota. The second study will be launched during the 2021 severe air pollution season.
- 3.15 The team leaders will directly monitor the submission of deliverables and track that these products are delivered according to the planned project timeline.
- 3.16 The total amount of funding needed to achieve the expected outputs is US\$240,000, financed with resources from the Ordinary Capital Strategic Development Program for Sustainability (SUS).

Indicative Budget (US\$)

Component	IDB Funding	Total
Component 1. Randomized implementation & data collection	190,000	190,000
Component 2. Data management and analysis	30,000	30,000
Component 3. Dissemination of results	20,000	20,000
Total	240,000	240,000

IV. Executing agency and execution structure

- 4.1 The Inter-American Development Bank, through its Climate Change and Sustainable Development (CSD) Sector will execute the operation, which is classified as Client Support. Execution has the support of the Ministry of Health, the Ministry of the Environment, and the Pan-American Health Organization, through its Bogota office. These institutions will assume responsibilities for implementing aspects of the project under the Bank oversight. The Bank will work with national and local public or private institutions to create other alliances that help deliver these components.
- 4.2 The principal reason for this execution structure is that the project requires highly specialized expertise that the Bank project team has and that, to our knowledge, is limited in the project's beneficiary and partner institutions in Colombia. Specifically, the project requires expertise in the design and implementation of RCT aimed at assessing the effects on avoidance behavior, environmental attitudes, and policy demand of using ICT to provide real-time air quality information. The IADB has expertise and experience conducting exactly these types of studies. A second reason is that the project will involve a variety of stakeholders at various levels of government that will need to be coordinated. A final reason for this execution structure has to do with dissemination. Many cities in LAC have poor air quality and extensive air quality monitoring systems. Therefore, the policy implications from the proposed studies will be informative for other countries. IDB execution of the project will facilitate communication and dissemination of the results of our studies across countries. The focal point and sector specialist for this TC in the Colombia Country office will be Carlos Salazar.
- 4.3 The project will rely on single source procurement because the tasks the consulting firms will undertake represent a natural continuation of previous work carried out by these firms and because only these firms have the experience of exceptional worth for this assignment, giving them a clear advantage over competition. The TC will support two consultancies. One consulting firm, Innovations for Poverty Action, will help to obtain institutional review board approval for the study, design and administer the surveys, and compile, validate and clean the survey data. The second consulting firm, the Colegio Mayor De Nuestra Señora Del Rosario, will help to select a sample of students to participate in the studies, provide an experimental economics computer lab facility in which to administer surveys, and help administer those surveys.
- 4.4 As the executing agency, the IDB will follow its procurement policies and guidelines related to hiring processes: (i) individual consultants will be hired in accordance with the guidelines set out in policy AM-650; (ii) consulting firms of an intellectual nature only will be hired in accordance with the "Policy for the Selection and Contracting of Consulting Firms for Bank-executed Operational Work" (GN-2765-1) and its related Operational Guidelines (OP-1155-4); and (iii) logistics and other related services in accordance with the "IDB Corporate Procurement Policy" (GN-2303-28).

V. Major issues

- 5.1 The main risks to the project concern potential changes in local Bogota city agencies (*Secretaría de Salud de Bogota and Secretaría de Ambiente de Bogota*) following the October 2019 elections. These risks have been minimized by establishing good relations and communications with points of contact in these agencies who will continue in their positions in the new administration; working towards memoranda of understanding with each agency; and working towards letters of support and memoranda of understanding with federal ministries of health and education.

VI. Exceptions to Bank policy

- 6.1 This TC does not involve any exceptions to Bank policy.

VII. Environmental and Social Strategy

- 7.1 Per the Environment and Safeguard Compliance Policy of the Bank (OP-703), the operation has been classified as Category “C”, therefore no environmental assessment studies are required for this category. (See the [Safeguard Screening Form](#) and the [Safeguard Policy Filter](#)).

Required Annexes

[Request from the Client_48182.pdf](#)

[Results Matrix_26153.pdf](#)

[Terms of Reference_39878.pdf](#)

[Procurement Plan_67151.pdf](#)

- [Procurement Plan](#)