

TC Document

I. Basic Information for TC

▪ Country/Region:	REGIONAL (Colombia, Uruguay)
▪ TC Name:	Case study of Nexus in South Korea and utilization for LAC countries
▪ TC Number:	RG-T3427
▪ Team Leader/Members:	Munoz Castillo, Raul (INE/WSA) Team Leader; Basani, Marcello (INE/WSA) Alternate Team Leader; Esquivel Gallegos, Maricarmen (CSD/CCS); Gil, Byungwoo (INE/WSA); Grunwaldt, Alfred Hans (CSD/CCS); Guerrero Rivera, Marilyn Ivette (INE/WSA); Lee, Seulkie (INE/WSA); Navarrete Jimenez, Manuel Jose (WSA/CCO); Negret Garrido, Cesar Andres (LEG/SGO); Orellana Arevalo, Edgar R. (INE/WSA); Rezzano Tizze, Nicolas Guillermo (INE/WSA); Valdes Conroy, Hector (CSD/RND)
▪ Taxonomy:	Client Support
▪ Operation Supported by the TC:	
▪ Date of TC Abstract authorization:	15 Mar 2019
▪ Beneficiary:	Colombia, Uruguay
▪ Executing Agency and contact name:	Inter-American Development Bank by INE/WSA
▪ Donors providing funding:	Korea Poverty Reduction Fund(KPR)
▪ IDB Funding Requested:	US\$550,000.00
▪ Local counterpart funding, if any:	N/A
▪ Disbursement period (which includes Execution period):	Execution: 24 months Disbursement: 30 months
▪ Required start date:	1st Aug 2019
▪ Types of consultants:	Consulting firms and individual consultants (Non-consultancy services will also be required to fully execute all the components of this TC)
▪ Prepared by Unit:	INE/WSA-Water & Sanitation
▪ Unit of Disbursement Responsibility:	INE-Infrastructure and Energy Sector
▪ TC included in Country Strategy (y/n):	Yes (Integrated water resources management) ¹
▪ TC included in CPD (y/n):	No
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Key Challenges: Low Productivity and innovation (2B.2) IDB's Vision: Inclusive Infrastructure and Infra-services (3B, 3.5e) IDB's Strategic Relevance: Multi-sectorality (4A.2)

II. Objectives and Justification

- 2.1 The objective of this TC is to contribute to an efficient planning and integrated management of water, energy, and food resources in the Latin America and the Caribbean (LAC) countries to ensure water and food security, sustainable agriculture,

¹ [IDB, Country Strategies, Colombia \(2019-2022\) p25, Uruguay \(2016-2020\) p22](#)

and energy production, by applying the Nexus cases of Korea (such as multipurpose dams and floating photovoltaic power plants).

- 2.2 Water, energy, and food are indispensable resources. Being inextricably linked to each other through the Water-Energy-Food Nexus, they always require a suitably integrated approach to ensure resource security. This strong interaction between water, energy, and food is expected to be even more significant in the future due to global climate change, population growth, and rapid urbanization. This is especially relevant, considering that, according to the FAO, agriculture alone nowadays accounts for 70 percent of total global freshwater withdrawals², making it the largest user of water.
- 2.3 Although these resources are closely related to each other, the public and private sectors usually manage them separately. However, as population growth and industrialization drastically increase the use of resources, the lack of integrated management has begun to cause severe inefficiencies and conflicts in resource management across all industries. In LAC, the unevenly distributed water resources and the high dependency on hydropower and/or agriculture industry further highlight the importance of integrated resource management applying the Nexus concept. For example, more than 60 percent of the urban population in Colombia lives near the Magdalena and Cauca river basins while the basins contain only 13 percent of the national water availability.³ Sparsely populated Amazon region, on the other hand, has much of the country's surface water. In the case of the electricity sector, almost 70 percent of the electricity demand for both Colombia and Uruguay is covered by hydropower sources.⁴
- 2.4 According to the Institution Strategy 2010-2020⁵, the IDB has identified 'low productivity and innovation (2B.2)' as one of the pervasive challenges of the region which limits endogenous economic growth in a sustainable way. Nexus approach, as an innovative way of efficient resource management, has great potential to boost the efficiency of resource utilization and to improve low productivity. 'Multi-sectorality (4A.2)' is the area where the IDB holds comparative advantages and strategically tries to strengthen catalytic capabilities. Since the objective of Nexus itself is pursuing a multi-sectoral approach, this TC will contribute to providing 'Inclusive infrastructure and infrastructure services (3B, 3.5e)'. The IDB has been internally supporting it through various programs. The Energy Division (INE/ENE), the Environment, Rural Development and Disaster Risk Management Division (CSD/RND), as well as the Water and Sanitation Division (INE/WSA) actively generate knowledge on interdisciplinary interaction promoting integrated planning. The INE/WSA is developing analytical tools and case studies to support the decision-making process of public policies and water infrastructure planning.⁶

² [FAO, 2011, AQUASTAT - Water withdrawal by sector](#)

³ [OECE, 2014, OECD Environmental Performance Reviews: Colombia](#)

⁴ [World Energy Council, 2016, Energy Resources in Latin America & the Caribbean](#)

⁵ [IDB, 2015, Update to the Institutional Strategy 2010-2020](#)

⁶ [IDB, 2015, \(RG-T2660\) Development of Case Studies of the Water-Energy-Food Nexus in Latin America](#)

- 2.5 As part of the national strategy for promoting the new industry, technological innovation, and efficient use of resources, Korea has been actively conducting projects and researches on Nexus. For example, the Korean government has built multipurpose dams since the 1960s for efficient use of water resources with limited financial resources. For the same reason, Korea recently put much effort into the Integrated Water Management System (IWRM) applying ICT technology and Floating Solar Photovoltaic (FPV) power plants. The Ministry of Trade, Industry and Energy (MOTIE) has developed knowledge in integrated energy management and energy efficiency by establishing the world's largest smart grid demonstration complex. The Ministry for Food, Agriculture, Forestry and Fisheries (MIFAFF) is actively promoting energy and water saving technologies in the production of agricultural products and bioenergy production technologies having the Nexus concept in mind. These experiences can be considered as good examples for LAC countries in similar situations. Moreover, according to a recent study of the IDB,⁷ increased water demands for crop, biomass, irrigation, and electricity generation have been identified as potential risks of regional conflicts under the Paris Agreement framework.
- 2.6 As a result, this TC will identify potential Nexus projects in the LAC region bearing in mind the high importance and interest in integrated resource management. Two pre-feasibility studies will be conducted in Colombia and Uruguay which have expressed a strong interest in Nexus and even suggested a potential project to be applied Nexus approach. These projects will provide LAC countries with a new direction for sustainable infrastructure projects through multi-sectoral integrated resource management.

III. Description of activities/components and budget

- 3.1 **Component 1: Nexus case studies in Korea and identification of potential Nexus projects for LAC countries (US\$200,000).** This component will finance a series of activities to identify potential Nexus projects in beneficiary countries, where experiences from Korea can be applied. The first activity will identify successful Nexus cases in Korea, reviewing project background, scope, cost-benefit effectiveness, and efficiency through the integration of Water-Energy-Food. The second activity will identify demands for Nexus project in the LAC region by mapping water, energy, and food needs in different countries as a part of a preliminary identification of pilot projects. Surveys will be conducted within beneficiary countries to confirm their interest and environment for the application of potential Nexus projects (which correspond to the potential Nexus projects identified through the first activity). At the end of this activity, a workshop will be held for LAC countries which showed and confirmed interest in Nexus. The workshop will include lectures and site-visits on the Nexus cases related to major areas of interest of Korea and the participant countries. Each beneficiary country will submit ideas to develop a new Nexus project, in accordance with the country development strategy and in coordination with the IDB water and

⁷ [IDB, 2018, Energy-Water-Land Nexus in Latin America and the Caribbean](#)

sanitation division. After the workshop, two potential projects will be selected in total to proceed with pilot pre-feasibility studies (see Component 2). One pilot project can be selected for each beneficiary country (Colombia and Uruguay) which have already shown their interest in Nexus by submitting an official project request letter. If beneficiary countries have a particular area of interest or a potential Nexus project in their mind, it will have more priority over other projects. Workshop participants from other countries are also able to suggest Nexus pilot projects. However, those projects will not be financed by this TC but will be considered with other financing options. The third activity will evaluate the expected outcomes of the selected potential projects from a Nexus perspective. Nexus scenario analysis will be applied to potential projects to briefly explore and compare the benefits of the comprehensive management of Water-Energy-Food resources.

3.2 Component 2: Pilot pre-feasibility studies on Nexus projects (US\$300,000). This component includes activities for formulating two potential Nexus pilot projects and conducting pre-feasibility studies. Firstly, the ideas suggested by the previous component will be filtered out by comparative analysis of project alternatives. This activity will also detail and refine the selected pilot projects by consolidating project logic and viability. Each project proposal will include initial plans for financing, implementation, operation, and maintenance. Secondly, pilot pre-feasibility studies will be carried out. Since the topic and location of pilot projects are not determined yet, a specific procedure for pre-feasibility studies will also be determined once the pilot projects are selected through the previous activity. However, the pre-feasibility studies will follow general guidelines for infrastructure projects which include the following activities:

- (i) Project overview and basic data analysis:** This activity stipulates and collects project basic data such as background and purpose of a project, selection process, implementation agency, contents of a project, project location, total estimated costs, project effects and results. Also, it analyzes natural, living, social, and economic environments of a project identifying similar cases.
- (ii) Economic analysis:** Economic analysis is comprised of elements that can be quantified by analytical frameworks. This activity includes demand-benefit-cost estimations and analysis, economic feasibility evaluation, and financial feasibility analysis. While an economic feasibility analysis measures the costs and benefits of a public project from the perspective of an entire nation or society, financial feasibility focuses on actual monetary costs and cash flows from the perspective of individual parties responsible for a project. Ways to attract private investment and the potential of Public-Private Partnerships (PPPs) will be assessed in this activity.
- (iii) Technical-physical analysis:** Integrative modeling of Water-Energy-Food resources or Nexus analytical tool will be applied to assess water availability of the target region and its surrounding area as a base of alternative analysis for infrastructure planning and pre-design (i.e. hydrological modeling, water balances, energy demands, land use, food production, environmental data, etc.).

This analysis will facilitate finding synergies and constraints of the selected Nexus project as a sustainable infrastructure.

- (iv) **Policy analysis:** Policy analysis includes elements that are among social benefits or costs resulting from a project but cannot be quantified by the framework of cost-benefit analysis. Nevertheless, these elements are important enough to be considered to evaluate the feasibility of a project. This analysis will verify political consistency and willingness of a government by looking into its political directions and plans, willingness to pursue a project, level of project preparedness, and so on. Various risks in pursuing projects such as the possibility of financing and socio-environmental impacts will be examined in this category. Also, an alternative analysis will consider IDB's E&S safeguards policies and standards.
- (v) **Comprehensive evaluation:** The final step of a pre-feasibility study is putting the results of both economic and policy analysis together to make a final decision on whether to go ahead with the project. A multi-criteria analysis will be used in this step to bring out an optimal alternative and determine the feasibility of a project which satisfies multiple project objectives.

- 3.3 **Component 3: Knowledge and experience dissemination (US\$50,000).** This component includes activities for dissemination of knowledge and experiences generated by the TC. Every cost associated with the preparation, publication, and translation of reports will be covered by this component. Such cost will also cover the publication of one final report of Component 1 and two pre-feasibility study reports of Component 2. Two workshops are expected to be held with the budget of this component, which are one dissemination workshop included in Component 1 and the final workshop before the termination of TC. Additional workshops can be held for the officials of LAC countries with an affordable budget.

Indicative Budget*

Activity	Unit	Amount (US\$)
Component 1. Case studies and identification of potential Nexus projects		
▪ Identify successful Nexus cases in Korea	9 months	150,000
▪ Survey on the Nexus demand in the LAC region		
▪ Evaluate expected outcomes applying Nexus scenario analysis	3 months	50,000
Component 2. Pilot pre-feasibility studies on Nexus projects		
▪ Conduct two pilot pre-feasibility studies	12 months	300,000
Component 3. Knowledge and experience dissemination		
▪ Workshops and knowledge dissemination activities	2 times	40,000
▪ Reports preparation, translation, and publication	3 reports	10,000
Total		550,000

*[See Detailed Budget](#)

IV. Executing agency and execution structure

- 4.1 One of the main goals of a Nexus approach is to promote sustainable and efficient resource use through integrated management of different areas which have been approached separately. Therefore, it is imperative that the executing agency has both experiences and knowledge in various areas including water, energy, and food. Moreover, as a regional TC whose objective is to promote regional knowledge sharing between the LAC and Korea, the executing agency should possess the ability to work closely with the governments of LAC countries and Korea. In this respect, the IDB not only has great expertise in every sector but also easily mobilizes human resources through country offices than any other agencies in the LAC region. As the IDB country directors and secondees from both donor and beneficiary countries are already aware of this TC, they will facilitate the TC execution by supporting the communication between the IDB and their countries. For these reasons, this TC will be executed and monitored by the IDB through INE/WSA division with the sector specialist Raul Muñoz Castillo (raulmu@iadb.org).
- 4.2 Supervision costs are estimated to be minor which are mostly traveling costs. So, they will not be budgeted separately but will be included in Component 3 as a part of workshop activities. The designated focal point for executing pilot projects will be Edgar Orellana (edgaro@iadb.org) and Marcello Basani (marcellob@iadb.org) for Colombia and Uruguay, respectively. All contracting and procurement activities in the Procurement Plan will be carried out in accordance with the Bank policies as follows: (a) AM-650 for Individual consultants; (b) GN-2765-1 and Guidelines OP-1155-4 for Consulting Firms for services of an intellectual nature and; (c) GN-2303-20 for logistics and other related services; (d) Operational Guidelines for Technical Cooperation Products (GN-2629-1).

V. Major issues

- 5.1 Although the risks identified for this TC are minor, there can be potential issues raised from the lack of interest or lack of understanding. In order to adopt the Nexus approach, it is inevitable to work closely with various government departments as well as various sectors such as water, energy, and food. Therefore, government officials and policymakers need to clearly understand not only the Nexus perspective but the interrelation and interaction with other sectors. Also, the roles and responsibility on the project need to be properly distributed within the different ministries. The lack of interest or understanding may hinder close cooperation among them. The operation will mitigate this risk by actively engaging government officials from the early stage of the TC.

VI. Exceptions to Bank policy

- 6.1 There are no exceptions to bank policy.

VII. Environmental and Social Strategy

- 7.1 Given the involvement of this TC in institutional strengthening and policy dialogue, negative environmental and social impacts are not foreseen. Consequently, this TC has been classified as C category ([see filters](#)). However, the pilot projects which are scheduled to be selected by this TC may have the potential to cause negative environmental or social impacts. It is necessary to monitor the foreseen impacts of the projects with a continuous interest.

Required Annexes:

[Request from the Client - RG-T3427](#)

[Results Matrix - RG-T3427](#)

[Terms of Reference - RG-T3427](#)

[Procurement Plan - RG-T3427](#)