IDB Inter-American Development Bank

TERMS OF REFERENCE

Nexus Case studies in Korea and identification of potential Nexus project for LAC countries

Regional
RG-T3427
Case study of Nexus in Korea and utilization for LAC countries

1. Background and Justification

1.1. Established in 1959, the Inter-American Development Bank ("IDB" or "Bank") is the main source of financing for economic, social and institutional development in Latin America and the Caribbean. It provides loans, grants, guarantees, policy advice and technical assistance to the public and private sectors of its borrowing countries.

1.2. 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 withdrawals, making it the largest user of water.

1.3. 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. 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.

1.4. According to the IDB's Institution Strategy 2010-2020, 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. This TC and related consulting works will contribute to providing 'Inclusive infrastructure and infrastructure services (3B, 3.5e)' of the LAC region through 'Multi-sectorality (4A.2)' approach.

1.5. 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.

2. Objectives

2.1. The ultimate objective of this consulting work is to contribute to an efficient planning and integrated management of water, energy, food resources in LAC countries to ensure water and food security, sustainable agriculture, and energy production.

2.2. The selected consulting firm will identify at least one potential Nexus project for each beneficiary country, Colombia and Uruguay, based on Nexus cases and experiences of the Korean government. Nexus scenario analysis will be applied to the potential projects to briefly explore and justify the benefits of the Nexus approach.

3. Scope of Services

3.1. This consulting services will cover research and investigation into the regulations, policies, business environment, and case studies on Water-Energy-Food Nexus limited to the LAC region and Korea.

4. Key Activities

4.1. Identify and review successful Nexus cases of Korea:

- Review the laws, regulations, and policies that the Korean government has developed to promote integrated management of water, energy, and food resources. The consultancy will closely work with ministries and their related entities of the Korean government such as Ministry of Land, Transport and Maritime Affairs, Ministry of Trade, Industry and Energy, and Ministry of Environment
- Identify Water-Energy-Food Nexus cases of Korea and classify them into different categories. The classification criteria will be determined by each topic or a social issue to be addressed
- Review the Nexus cases and select best practices for each category considering background, scope, scale, cost-benefit effectiveness, efficiency, financing plan,

applicability to other countries, and overall impact of the project

4.2. Identify Nexus cases and demands for LAC countries

- Conduct general research on the water, energy, and agriculture industries and review existing Nexus projects of the LAC region. Classify the Nexus projects into the previously defined category in the first activity
- Review the legal and institutional framework of the LAC governments which have expressed an interest in Nexus projects, if they have a ministry or institution which leads the Nexus agenda, or if one of them is in charge of integrated resource management of the country, and how the discussions and collaborations have been made among them
- Aligned with the development strategy of beneficiary countries as well as the IDB and its water and sanitation division. Conduct survey directly or indirectly with the LAC government officials to identify their demands on Nexus with specific areas in priority
- Identify and screen potential Nexus projects of each country and seek ways to share knowledge and experiences on Nexus between Korea and the LAC region

4.3. Select potential pilot projects and apply Nexus scenario analysis:

- Carry out additional surveys, questionnaires, and interviews to prioritize Nexus projects of each country. Potential pilot projects will be selected to proceed with Nexus scenario analysis and pre-feasibility study
- Analyze the current water, energy, and food balances of the selected regions by figuring out the supply and demand of each resource. The amount of water supply, energy generation, and food production will be compared with its current consumption
- Analyze future water, energy, and food balances of the same regions by applying Water-Energy-Food Nexus scenarios. Existing resource development plans will also be considered to estimate future resource balances
- Compare the resource balances and Nexus scenarios before and after applying the pilot project. Justify the necessity of the pilot project focused on the most vulnerable area

5. Expected Outcome and Deliverables

5.1. A consultancy work plan should be submitted before the initiation of this project. The work plan will describe detailed activities to accomplish the objectives and schedule of the project. Proper allocation of human, financial, and material resources will be presented through the work plan.

5.2. A report on the Water-Energy-Food Nexus of Korea and the LAC region should be submitted, which includes every key activity in 4.1, 4.2, and 4.3. The first part of the report will cover the policies and efforts of the Korean government to promote integrated resource management as its Water-Energy-Food Nexus best practices. The second part of the report will mainly deal with identifying potential Nexus projects based on the environment and demand of each beneficiary country. The last part will include the result

of Nexus scenario analysis for potential projects of Colombia and Uruguay.

6. Project Schedule and Milestones

Milestone #	Milestones	Due date
1	Submit a consultancy work plan	Sep 1, 2019
2	Submit the report on Water-Energy-Food Nexus of Korea and the LAC region	Mar 1, 2020
3	Submit the result of Nexus scenario analysis	Sep 1, 2020

7. Reporting Requirements

7.1. The consulting firm should follow the above-mentioned project scope, activities, schedule and milestones in a timely manner. Every deliverable including plans, reports, and proposals should be written in English.

8. Acceptance Criteria

8.1. The team leader of the Technical Cooperation (TC) team will decide whether the deliverables are acceptable or not. Internal meetings will be held within the TC team to decide and to figure out if the deliverables meet requirements of this consultancy. If the deliverables do not comply with the requirements, the consulting firm will be obliged to revise and supplement the deliverables.

9. Other Requirements

9.1. The consulting firm should demonstrate the capacity to form a team with the following characteristics:

- Expertise in the policies, laws, and regulations of integrated resource management
- Expertise in Water-Energy-Food Nexus scenario analysis
- Extensive experiences providing high-level advice to national governments
- Work or research experiences in Latin America and the Caribbean region
- Work experiences with multilateral development organizations
- Resources to communicate and access documents in English, Spanish, and Korean

10. Supervision and Reporting

10.1. After the consulting firm submits the work plan, the IDB and consulting firm will have meetings at least once a month on a regular basis. Every TC team member can give comments on the deliverables to secure the quality of deliverables.

11. Schedule of Payments

Deliverable	%
After submission of milestone one	30 %
After submission of milestone two	30 %
After submission of all milestones	40 %
Total	100 %

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TERMS OF REFERENCE

Pilot pre-feasibility studies on Nexus projects

Regional
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Case study of Nexus in Korea and utilization for LAC countries

1. Background and Justification

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1.2. 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 withdrawals, making it the largest user of water.

1.3. 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. 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.

1.4. According to the IDB's Institution Strategy 2010-2020, 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. This TC and related consulting works will contribute to providing 'Inclusive infrastructure and infrastructure services (3B, 3.5e)' of the LAC region through 'Multi-sectorality (4A.2)' approach.

1.5. 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.

2. Objectives

2.1. The ultimate objective of this consultancy is to contribute to an efficient planning and integrated management of water, energy, food resources in LAC countries to ensure water and food security, sustainable agriculture, and energy production.

2.2. The selected consultancy will conduct a pilot pre-feasibility study of a Water-Energy-Food Nexus project to provide a justification for proceeding to a final feasibility study. All possible project alternatives and any aspects of the project that may require in-depth investigation will be examined.

3. Scope of Services

3.1. The scope of consulting services will include the pre-feasibility assessment of a potential Nexus project. However, only a general description for a pre-feasibility study will be provided in this Terms of Reference since the specific type and nature of the pilot project is not determined. Detailed objectives, scope, and activities will be given once the beneficiary country and the pilot project are selected by Component 1.

4. Key Activities

4.1. Select pilot projects and prepare an initial plan.

- Review potential pilot projects and screen them into one. Each beneficiary country will select one pilot project to proceed with pre-feasibility study. The beneficiary country's development strategy and Nexus scenario analysis result by the previous component will mainly be considered as a project selection criteria.
- Improve the logic and viability of the pilot project by developing initial plans for financing, implementation, operation, and maintenance. Specific plan and procedure will be determined once the type of pilot projects is determined.

4.2. Pre-feasibility studies for the pilot projects.

(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.

5. Expected Outcome and Deliverables

5.1. A consultancy work plan should be submitted before the initiation of this project. The work plan will describe detailed activities to accomplish the objectives and schedule of the project. Proper allocation of human, financial, and material resources will be presented through the work plan.

5.2. A pre-feasibility study report on Nexus should be submitted which includes a project overview, economic analysis, technical-physical analysis, policy analysis, and comprehensive evaluation as it is described in key activities 4.1 and 4.2.

6. Project Schedule and Milestones

Milestone #	Milestones	Due date
1	Submit a consultancy work plan	Sep 1, 2020
2	Complete activity 4.1 and 4.2	Mar 1, 2020
3	Submit pre-feasibility study report	Jun 1, 2021

7. Reporting Requirements

7.1. The consulting firm should follow the above-mentioned project scope, activities, schedule and milestones in a timely manner. Every deliverable including plans, reports, and proposals should be written in English.

8. Acceptance Criteria

8.1. The team leader of the Technical Cooperation (TC) team will decide whether the deliverables are acceptable or not. Internal meetings will be held within the TC team to decide and to figure out if the deliverables meet the requirements of this consultancy. If the deliverables do not comply with the requirements, the consulting firm will be obliged to revise and supplement the deliverables.

9. Other Requirements

9.1. The consulting firm should demonstrate the capacity to form a team with the following characteristics:

- Expertise in technical, economic, and political analysis to carry out a pre-feasibility study
- Extensive experience providing high-level advice to national governments
- Work or research experiences in Latin America and the Caribbean region
- Work experiences with multilateral development organizations
- Ability to hire personnel with fluency in English, Spanish

10. Supervision and Reporting

10.1. After the consulting firm submits the work plan, the IDB and consulting firm will have meetings at least once a month on a regular basis. Every TC team member can give comments on the deliverables to secure the quality of deliverables.

11. Schedule of Payments

Deliverable	%
After submission of milestone one	30 %
After submission of milestone two	30 %
After submission of all milestones	40 %
Total	100 %