

**STUDY FOR TUNNEL OPERATION AND RISK MANAGEMENT**

**RG-T3026**

**CERTIFICATION**

I hereby certify that this operation was approved for financing under the **Public Capacity Building Korea Fund for Economic Development (KPC)** through a communication dated December 18, 2017 and signed by Chang You (ORP/GCM). Also, I certify that resources from said fund are available for up to **US\$500,000** in order to finance the activities described and budgeted in this document. This certification reserves resource for the referenced project for a period of four (4) calendar months counted from the date of eligibility from the funding source. If the project is not approved by the IDB within that period, the reserve of resources will be cancelled, except in the case a new certification is granted. The commitment and disbursement of these resources shall be made only by the Bank in US dollars. The same currency shall be used to stipulate the remuneration and payments to consultants, except in the case of local consultants working in their own borrowing member country who shall have their remuneration defined and paid in the currency of such country. No resources of the Fund shall be made available to cover amounts greater than the amount certified herein above for the implementation of this operation. Amounts greater than the certified amount may arise from commitments on contracts denominated in a currency other than the Fund currency, resulting in currency exchange rate differences, represent a risk that will not be absorbed by the Fund.

Original signed	2/23/2018
_____ Sonia M. Rivera Chief Grants and Co-Financing Management Unit ORP/GCM	_____ Date

Approved:	Original signed	2/23/2018
	_____ Nestor H. Roa Division Chief Transport Division INE/TSP	_____ Date

## TECHNICAL COOPERATION DOCUMENT (TC)

### I. BASIC INFORMATION FOR TC

▪ Country/Region:	Regional
▪ TC Name:	Study for Tunnel Operation and Risk Management
▪ TC Number:	RG-T3026
▪ Team Leader/Members:	Juan Manuel Leaño (TSP/CAR), Team Leader; Changho Lee, Borja Castro Lancharro, Minkyung Kim and Alba Taveras Marte (INE/TSP); and Margie-Lys Jaime Ramirez and Liza Lutz (LEG/SGO)
▪ Taxonomy:	Research and dissemination
▪ Date of TC Abstract authorization:	December 1 <sup>st</sup> , 2017
▪ Beneficiary:	IDB borrowing member countries
▪ Executing Agency:	Inter-American Development Bank (IDB) through the Transport Division (INE/TSP)
▪ Donors providing funding:	Public Capacity Building Korea Fund (KPC) for Economic Development
▪ IDB Funding Requested:	US\$500,000
▪ Local counterpart funding:	N/A
▪ Disbursement period:	24 months
▪ Required start date:	March 1 <sup>st</sup> , 2018
▪ Types of consultants:	Individual and consulting firms
▪ Prepared by Unit:	INE/TSP
▪ Unit of Disbursement Responsibility:	Country Office of Argentina
▪ TC included in Country Strategy:	No
▪ TC included in CPD:	No
▪ Alignment to the Update to the Institutional Strategy 2010-2020:	Productivity and innovation; Economic integration

### II. OBJECTIVES AND JUSTIFICATION OF THE TC

- 2.1 **Justification.** Transportation is one of the essential pillars for economic development of every country in the region. LAC countries have numerous mountain chains. This orography constrains transport among countries in the region. As an example, just between Chile and Argentina there are 26 level crossings through the Andes. This slows down the transport and impedes permanent communication between countries. As a result, production rates for LAC countries decrease, which has a direct effect on poverty levels.
- 2.2 Currently, megaprojects are one of the main strategic areas in INE/TSP together with Intelligent Transport Systems (ITS), urban transport, road safety and logistics. Within the transportation sector, there are mainly two types of megaprojects: mega bridge projects and mega tunnel projects.
- 2.3 Mega tunnels have been an effective solution for this kind of context in which orography limit transport services and compromises the quality of infrastructure. These conditions have pushed LAC to develop a strong interest in the construction

of mega tunnels and some countries in the region such as Argentina and Chile have already decided to take this approach to solve infrastructure problems (e.g. Agua Negra Tunnel<sup>1</sup>). Consequently, this TC pursues to prepare and support coming megaprojects in the region similar to TCs such as “Support for the preparation and implementation of megaprojects in LAC countries” (ATN/OC-14898-RG)<sup>2</sup>, and “Agua Negra International Project” (3867/OC-RG,3868/OC-RG), both under execution.

- 2.4 **Objective.** The main objective of this TC is to support Latin American and Caribbean (LAC) countries with technical knowledge on operation and risk management for tunnel projects. In addition, this study will provide the considerations that all technical staff and policymakers should review before the final set of the technical design and financial structure of the projects. As a result, the TC will improve: (i) logistics network efficiency; (ii) transport of goods and people; (iii) connectivity between countries; and (iv) access to markets through making the tunnels safer and cost efficient in the life cycle cost of the project.
- 2.5 In megaprojects, there are criteria including cost, future traffic volume, public benefit, etc. that define a successful project. There have been several studies performed and currently being performed to improve cost overrun control techniques, forecast traffic volume more accurately, calculate the benefit without missing, etc. However, additionally, there are other operational and risk management factors that must be considered during the pre-construction and construction stages of the project. These factors require actual experience not only on routine operation procedures but also on disaster management, which is sometimes not prepared in depth.
- 2.6 In this regard, one of the main objectives of this TC is to give recommendations on mega tunnel projects, such as Agua Negra Tunnel, regarding operation and risk management based on case studies of mega tunnels in Europe and Asia, and a benchmark study of mega tunnels in Korea.
- 2.7 **Strategic alignment.** This TC is designed to advance progress in transportation networks, enhancing connectivity and ultimately the competitiveness of the region’s goods and passenger traffic. In terms of Bank’s strategy, this TC is consistent with the Update to the Institutional Strategy 2010-2020<sup>3</sup> (AB-3008) and it is strategically aligned with the following development challenges: (i) productivity and innovation by improving methodologies and planning on services in infrastructure fostering productivity and economy; and (ii) economic integration, by helping define best practices on tunnel construction, operation and management to improve connectivity between countries.
- 2.8 This TC is aligned with the IDB Infrastructure Strategy “Sustainable Infrastructure for Competitiveness and Inclusive Growth”<sup>4</sup> (GN-2710-5), as it will focus on planning, building, and maintaining infrastructure for the delivery of quality services. Finally, the TC is aligned with the Transportation Sector Framework<sup>5</sup> (GN-2740-7) through the following: logistics, competitiveness and integration since it makes an impact on economic growth fostering productivity and regional integration.

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<sup>1</sup> Official project description is available in the following link: <http://goo.gl/76C3Zc>.

<sup>2</sup> Project information is available on <https://goo.gl/f66Orh>.

<sup>3</sup> Item 3.7.a of Update to the Institutional Strategy 2010-2020 (page 8).

<sup>4</sup> Item 5.12 of IDB Infrastructure Strategy (page 25).

<sup>5</sup> Item 2.24 of Transport Sector Framework Document (page 8).

- 2.9 Furthermore, this TC is aligned with the Public Capacity Building Korea Fund for Economic Development (KPC) by providing tools and guidelines for strengthening of the public capacity for economic development. Particularly through this TC, KPC will help governments to improve the sustainability of mega tunnel operation and risk management.
- 2.10 The TC will contribute to the indicators of the Corporate Results Framework (CRF) through the indicator “government agencies benefited by projects that strengthen technological and managerial tools to improve public service delivery”. Given the context, it will also contribute to the number of professionals from public and private sectors trained or assisted in economic integration.

### **III. DESCRIPTION OF ACTIVITIES/COMPONENTS AND BUDGET**

- 3.1 **Component 1. Case study from Europe on Operation and Risk Management (US\$180,000).** This component will finance case studies and recommendations on operation and risk management from Europe’s experiences, the case studies will analyze the experience on mega tunnel operations of at least three European countries such as Laerdal (24 km, in Norway), St. Gotthard (16 km, in Switzerland) and Arlberg (13 km, in Austria). These projects have been exemplified because of their similar characteristics to Agua Negra project and because they are some of the most representative projects in the world. The main goal of this component is to get information and experiences from each case and recommendations for future tunnel projects in LAC. This component includes three subcomponents: (i) general information including technical features of the tunnel and procurement information that can be used as a reference for future tunnel projects in LAC; (ii) facilities for risk management such as escape gates provisions, ventilation systems, fire suppression systems and organizational structure for operation and maintenance including staff, facilities and budget allocation; and (iii) roles and responsibilities of each agency (operation agency, police, fire fighter, hospital) in case of emergency situations.
- 3.2 **Component 2. Case study from Asia on Operation and Risk Management and Benchmark study of mega tunnels in Korea (US\$270,000).**
- 3.2.1 **Case study from Asia on Operation and Risk Management (US\$180,000).** This component will finance case studies and recommendations on operations and risk management from experiences in Asia. The case studies will analyze the experience on mega tunnel operations of at least three Asian countries such as Inje (10 km, in Korea), Zhongnanshan (18 km, in China), Kanetsu (11 km, in Japan). The main goal of this component is to get information and experiences from each case and recommendations for future tunnel projects in LAC. This component includes three subcomponents: (i) general information including technical features of the tunnel and procurement information that can be used as a reference for future tunnel projects in LAC; (ii) facilities for risk management such as escape gates provisions, ventilation systems, fire suppression systems and organizational structure for operation and maintenance including staff, facilities and budget; and (iii) roles and responsibilities of each agency (operation agency, police, fire fighter, hospital) in case of emergency situations.

3.2.2 **Benchmark study of mega tunnels in Korea (US\$90,000).** This component will finance a benchmark study of mega tunnels in Korea to identify key aspects of tunnel operation and risk management. Additionally, during the benchmark study, the participants will learn about the project management of mega tunnels through the experience of Korea. The participants will be public officers from Argentina and Chile and/or team members of this TC and/or team member of the related loan project, whose work are related with Agua Negra tunnel project.

3.3 **Component 3. Administration and Dissemination (US\$50,000).** This component will finance administrative work and knowledge dissemination of two components: component 1 and 2. This work will consist of: (i) workshops in Chile and Argentina to develop and share future needs for long tunnel projects; and (ii) the dissemination of the technical study output in english and spanish that will be shared with the beneficiaries and other interested agents including transportation agencies in Chile and Argentina such as DV (*Dirección de Vialidad*), DNV (*Dirección Nacional de Viabilidad*), and EBITAN (*Entidad Binacional de Túnel de Agua Negra*), which will be the beneficiaries of these workshops. These two countries were selected because currently they are developing the only mega tunnel in LAC.

3.4 The total cost of this TC will be US\$500,000, of which US\$500,000 will be financed by the KPC. The following table shows the budget itemized by component.

**Table 1. Indicative Budget (US\$)**

Activity	Unit	Amount	Total
<b>Component 1 – Case study from Europe on Operation and Risk Management</b>			
<ul style="list-style-type: none"> <li>Case study on mega tunnels including Operation and Risk Management</li> <li>Recommendation for mega tunnels based on the case study</li> </ul>	1	180,000	180,000
<b>Component 2 – Case study from Asia on Operation and Risk Management and Benchmark study of mega tunnels in Korea</b>			
<ul style="list-style-type: none"> <li>Case study on mega tunnels including Operation and Risk Management</li> <li>Recommendation for mega tunnels based on the case study</li> </ul>	1	180,000	180,000
<ul style="list-style-type: none"> <li>Benchmark study in Korea</li> <li>Participants will be government officials of Argentina and Chile (around 10 people)</li> </ul>	1	90,000	90,000
<b>Component 3 – Administration and Dissemination</b>			
<ul style="list-style-type: none"> <li>Workshops in Chile and Argentina</li> <li>Translation and publishing of case studies</li> </ul>	1	50,000	50,000
<b>TOTAL</b>			<b>500,000</b>

#### IV. EXECUTING AGENCY AND EXECUTION STRUCTURE

4.1 The IDB will be executing this TC since it leads the design and implementation of the Agua Negra tunnel project, while working closely with both governments to move forward the project preparation phase, and it is the only institution with the knowledge and competency to manage it. Furthermore, both governments have requested the IDB to execute it, as it is shown on Annex I.

- 4.2 The activities to be executed under this operation have been included in the Procurement Plan (Annex IV) and will be executed in accordance with the Bank's established procurement methods, namely: (a) hiring of individual consultants, as established in AM-650 standards; (b) contracting of consulting firms for services of an intellectual nature according to GN-2765-1 and its associated operational guides (OP-1155-4); and (c) contracting of logistics services and purchase of goods in accordance with the policy GN-2303-20.
- 4.3 The period of execution of this TC will be 24 months. The TC will be executed in parallel to the loan Agua Negra Pass International Tunnel Structuring Program (3867/OC-RG,3868/OC-RG), which is currently under execution.

## **V. MAJOR ISSUES**

- 5.1 The risks identified for this TC are minor and do not represent an important deterrent for the development of this project. The risk associated with this TC would be the unwillingness to share information from any of the agencies in charge of the tunnels, so to get the best-case studies and recommendations, the request for information from specific tunnels should not be mandated in the Terms of Reference (TORs).
- 5.2 In case the agencies identified in this profile do not want to collaborate with this work, there are ten other mega tunnel projects identified that can be considered for this TC.

## **VI. EXCEPTIONS TO BANK POLICY**

- 6.1 No exceptions to Bank policies were identified.

## **VII. ENVIRONMENTAL AND SOCIAL STRATEGY**

- 7.1 Negative environmental and social impacts are not expected from the implementation of this TC given its classification as Research and Dissemination. In compliance with the Environment and Safeguards Policy (OP-703), it is proposed for this TC to be categorized as "C". See [Safeguard Policy Filters](#) and [Safeguard Screening Form](#).

## **ANNEXES:**

- Annex I. [Request letters from the ministries](#)
- Annex II. [Results Matrix](#)
- Annex III. [Terms of Reference \(TORs\)](#)
- Annex IV. [Procurement Plan](#)



República Argentina - Poder Ejecutivo Nacional  
2017 - Año de las Energías Renovables

### **Nota**

**Número:** NO-2017-27265106-APN-DNPOIC#MF

CIUDAD DE BUENOS AIRES  
Martes 7 de Noviembre de 2017

**Referencia:** Solicitud de Cooperación Técnica Estudio de Operación y Gestión de Riesgos de Túneles.

**A:** Jose Luis LUPO (Banco Interamericano de Desarrollo),

**Con Copia A:**

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#### **De mi mayor consideración:**

Tengo el agrado de dirigirme a usted en relación a la solicitud de la Cooperación Técnica No Reembolsable del Banco Interamericano de Desarrollo (BID) para el Estudio de Operación y Gestión de Riesgos de Túneles.

Al respecto, con fecha 2 de noviembre del corriente año la Subsecretaría de Evaluación Presupuestaria e Inversión Pública de Jefatura de Gabinete de Ministros remitió a esta Subsecretaría NO-2017-26631139-APN-SSEPIP#JGM (la cual se embebe a la presente), solicitando se efectúen las gestiones pertinentes a fin de tramitar dicha Cooperación Técnica.

El objetivo general de dicha cooperación, es la capacitación de funcionarios de alto nivel y profesionales del Ministerio de Transporte en áreas relacionadas con la gestión institucional, económica y constructiva de proyectos de túneles.

Indica la nota mencionada que la solicitud de fundamenta en la necesidad de adquirir apoyo y conocimientos técnicos para la identificación y gestión de los riesgos de ejecución en materia de túneles, especialmente durante la etapa operativa de los proyectos de túneles, lo cual está vinculado con el proyecto del Túnel de Agua Negra que se está gestionando actualmente.

Asimismo, se hace saber que la mencionada Cooperación Técnica no implicará la disposición de recursos, toda vez que los fondos serán gestionados y ejecutados directamente por el Banco Interamericano de Desarrollo.

Por todo lo expuesto, se solicita a usted tenga a bien efectuar las gestiones necesarias a los efectos de la obtención de esta Cooperación Técnica no reembolsable.

Sin otro particular saluda atte.

Agustin Mai  
Director Nacional  
Dirección Nacional de Proyectos con Organismos Internacionales de  
Crédito  
Ministerio de Finanzas





QQ-300-c-17 / 09-11-2017

Santiago, 16 NOV. 2017

Señora  
Caroyn Robert  
Representante en Chile  
Banco Interamericano de Desarrollo (BID)  
Presente

Ref.: Solicita Cooperación Técnica No Reembolsable (CTNR) BID.  
Ant.: Carta de fecha 07.11.2017, del Sr. Subsecretario de Obras Públicas (MOP).

De mi consideración:

Mediante Carta del Antecedente, el Sr. Subsecretario de Obras Públicas ha solicitado a esta Dirección de Presupuestos, manifestar a esa Representación, su interés en recibir una Cooperación Técnica No Reembolsable (CTNR) hasta por un monto de USD 200.000, para apoyar la capacitación, en la República de Corea, de personal de ese Ministerio, en materias relacionadas con la construcción, operación y gestión de riesgo de túneles.

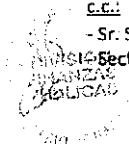
Sobre el particular, y conforme con lo establecido en el "Protocolo para la Tramitación de Cooperaciones Técnicas No Reembolsables", suscrito entre el BID y esta Dirección, cumpla con comunicar a usted que, este Gobierno no tiene inconveniente en que se realice la operación de CTNR antes señalada, por lo que agradeceré a usted acogerla favorablemente.

Asimismo, me permito hacer presente que su ejecución no podrá significar, para las entidades públicas involucradas, gastos adicionales a los que se contemplan en sus respectivos presupuestos, conforme con las Leyes de Presupuestos del Sector Público, para los años que dure la ejecución de la misma.

Sin otro particular, le saluda atentamente,

  
SERGIO GRANADOS AGUILAR  
Director de Presupuestos

c.c.:  
- Sr. Subsecretario de Obras Públicas.  
Sector Obras Públicas y Transporte, DIPRES.



**Results Matrix**

**Outcomes**

<b>Outcome:</b> <a href="#">1 Special commitment on Agua Negra tunnel</a>							
Indicators	Flags*	Unit of Measure	Baseline	Baseline Year	Means of verification	EOP	
1.1 Improvement of Agua Negra tunnel.		# components	0,00	2018	Number of component adopted/upgraded in Agua Negra tunnel	P	5,00
						P(a)	
						A	
<b>Outcome:</b> <a href="#">2 Knowledge generation on Mega tunnel in LAC</a>							
Indicators	Flags*	Unit of Measure	Baseline	Baseline Year	Means of verification	EOP	
2.1 Knowledge generation on tunnel in LAC.		# downloads	0,00	2018	Number of download of the report from IDB web site	P	100,00
						P(a)	
						A	

CRF Indicator

**Outputs: Annual Physical and Financial Progress**

1 1. Case study on Operation & Risk Management from experiences of Europe						Physical Progress					Financial Progress					Theme	Fund	Flags	
Outputs	Output Description	Unit of Measure	Baseline	Baseline Year	Means of verification	2018	2019	2020	EOP	2018	2019	2020	EOP						
1.1 Recommendations from adaptation study implemented	Case study from Europe & recommendation on Agua Negra tunnel	Studies (#)	0	2017	Case study and recommendation report from the best case of Europe	P	0	3	0	3	P	126000	54000		180000	Sustainable Infrastructure	KPC		
						P(a)					0	P(a)							0
						A						A							
2 2. Case study on Operation & Risk Management from experiences of Asia, Benchmark study in Korea						Physical Progress					Financial Progress					Theme	Fund	Flags	
Outputs	Output Description	Unit of Measure	Baseline	Baseline Year	Means of verification	2018	2019	2020	EOP	2018	2019	2020	EOP						
2.1 Recommendations from adaptation study implemented	Case study from Asia & recommendation on Agua Negra tunnel	Studies (#)	0	2017	Case study and recommendation report from the best case of Asia	P	0	3	0	3	P	126000	54000		180000	Sustainable Infrastructure	KPC		
						P(a)					0	P(a)							0
						A						A							
2.2 Institutional strengthening programs delivered	Institutional strengthening programs delivered	Programs (#)	0	2017	Country report from each participating country. Mission report	P	1	0	0	1	P	90000	0	0	90000	Institutional Development	KPC		
						P(a)					0	P(a)							0
						A						A							
3 3. Administration & Dissemination						Physical Progress					Financial Progress					Theme	Fund	Flags	
Outputs	Output Description	Unit of Measure	Baseline	Baseline Year	Means of verification	2018	2019	2020	EOP	2018	2019	2020	EOP						
3.1 Training workshops delivered	Training workshops delivered in Chile and Argentina	Workshops (#)	0	2017	Workshop and mission report.	P	0	1	1	2	P	0	25000	25000	50000	Institutional Development	KPC		
						P(a)					0	P(a)							0
						A						A							

**Other Cost**

**Total Cost**

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CRF Indicator

Standard Output Indicator

	2018	2019	2020	Total Cost
P	\$342.000,00	\$133.000,00	\$25.000,00	\$500.000,00
P(a)				
A				

## **TERMS OF REFERENCE**

### **STUDY FOR TUNNEL OPERATION & RISK MANAGEMENT (RG-T3026)**

#### **I. BACKGROUND**

- 1.1 Transportation is one of the essential pillars for economic development of every country in the region. Currently, megaprojects are one of the main strategic areas in the Transport Division (TSP) together with Intelligent Transport Systems (ITS), urban transport, road safety and logistics. Within the transportation sector, there are mainly two types of megaprojects: mega bridge projects and mega tunnel projects.
- 1.2 Latin-American (LA) countries have numerous mountain chains. This orography constrains transport among countries in the region. As an example, just between Chile and Argentina there are 26 level crossings through the Andes. This slows down the transport and impedes permanent communication between countries. As a result, production rates for LA countries decrease, which has a direct effect on poverty levels.
- 1.3 Mega tunnels have been an effective solution for this kind of context in which orography limit transport services and compromises the quality of infrastructure. These conditions have pushed Latin America to develop a strong interest in mega tunnels to be built in the coming years: some countries in the region have already started to define this approach to solve infrastructure problems (e.g. Agua Negra Tunnel). Consequently, this TC pursues to prepare and support coming Megaprojects in the region such as “Agua Negra International Project” (RG-L1074).
- 1.4 There are many essential factors in Megaprojects including cost overrun, future traffic volume, public benefit, etc. There have been many studies performed and currently performing to control the cost overrun, forecast traffic volume more accurately, calculate the benefit without missing, etc. However, additionally, there are some other operational and risk management factors that we must consider during the post preparation and construction stage. These factors need actual experience not only on routine operation but also on disaster management, which is sometimes not prepared in depth.

#### **II. OBJECTIVES**

- 2.1 The main objective of this project is to support LAC countries with operational and technical knowledge on Tunnel Operation & Risk Management during operational stage of Tunnel projects. In addition, this study will include the information that all technical staff and policy makers should consider before the final setting of the technical design and financial structure of the projects.

### III. SCOPE AND ACTIVITIES

- 3.1 This project will perform case studies and recommendations on Operation and Risk Management from experiences of **Europe**. The case studies will analyze the experience on mega tunnel operations of **at least three European countries** such as **Laerdal (24km, in Norway), St. Gotthard (16km, in Switzerland) and Arlberg (13km, in Austria)**. The main goal of this project is to get information and experiences from each case and recommendations on future tunnel projects in LAC. This project includes four components: (i) General information including technical feature of the tunnel and procurement information that will be referred to future tunnel projects in LAC; (ii) Facilities for risk management such as escape gate, ventilation, fire extinguish systems and organizational structure for operation and maintenance including staff, facilities and budget; (iii) Roles and responsibilities of each agency among operation agency, police, fire fighter, hospital in case of emergency; and (iv) Recommendation on Risk Management for Agua Negra Tunnel.
- 3.2 The details are as follows:
- (i) General information of the tunnel and procurement information as below, but not limited to;
    - a. Summary of Tunnel: length, construction cost, construction period, construction method, cross section of tunnel, composition of lanes, features including vertical and horizontal slope, pavement method, clearance, traffic volume forecast and real, and other information needs for operation & risk management
    - b. Procurement: Procurement procedure and duration, Evaluation method, Special conditions on Cost overrun and Construction delay
  - (ii) Technical feature of facilities for routine operation & risk management, and organizational structure for operation and maintenance as below, but not limited to;
    - a. Facilities for routine operation & risk Management
      - Facility lists: workers path, escape gate(path), ventilation, fire extinguish, communication, imagery sensing, snow melting system before & after tunnel, traffic control facility, traffic control room, and other information needs for operation & risk management
      - Features: installation space, capacity or specification, size, and other information needs for operation & risk management
    - b. Organizational structure for operation & maintenance
      - Organizational structure chart, number of staffs, role of each staff,
      - Facility list for Operation and Maintenance such as vehicles
      - Annual budget for Operation and Maintenance
    - c. Performance criteria of operation & maintenance
      - Performance criteria of routine maintenance including pavement, light, ventilation, signs, etc.
      - Tunnel availability during the year except emergency.

- (iii) Roles and responsibilities of agencies in case of emergency
    - Roles and responsibilities of each agency in case of emergency among operation agency, police, fire fighter, hospital, etc.
    - Emergency procedures in cases such of traffic accident and/or fire accidents, etc.
  - (iv) Recommendation on below components for Agua Negra Tunnel.
    - On Facilities for Risk Management
    - On Organizational structure for Operation & Maintenance
    - On Role & Responsibility of each agency in case of Emergency
- 3.3 Before the case study of 3 European countries' mega tunnel, the consulting firm should report tunnel lists, at least 10 mega tunnels in Europe, through literature review. Then finalize the 3 mega tunnels from different countries.
- 3.4 The consulting firm will make a presentation on the final report at IDB headquarters in USA and EBITAN in Chile and Argentina.
- 3.5 To undertake the activities described above, the consulting firm will interact with the project team at the Bank, and with government officials who may be engaged in this project.

#### **IV. DURATION**

- 4.1 The whole duration of this project will be 12 months.

#### **V. DELIVERABLES AND PAYMENTS**

- 5.1 The deliverables expected from the consultancy are summarized below:

Deliverable	Description
Working plan and methodological approach	3.1 & 3.2
Final report	3.1
Presentation at IDB Headquarters and EBITAN	3.4

- 5.2 The Consultant will be remunerated according to the following schedule of product deliveries.
- 30% at the delivery of a working plan and methodological approach
  - 40% at the delivery of the draft report
  - 30% at the approval of the final report
- 5.3 The report should be English and Spanish.

#### **VI. COORDINATION**

- 6.1 This consultancy will be coordinated and supervised by the team leader, Leano, Juan Manuel (INE/TSP), of the operation RG-T3026.

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- 1.4 There are many essential factors in Megaprojects including cost overrun, future traffic volume, public benefit, etc. There have been many studies performed and currently performing to control the cost overrun, forecast traffic volume more accurately, calculate the benefit without missing, etc. However, additionally, there are some other operational and risk management factors that we must consider during the post preparation and construction stage. These factors need actual experience not only on routine operation but also on disaster management, which is sometimes not prepared in depth.

#### **II. OBJECTIVE**

- 2.1 The main objective of this project is to support LAC countries with operational and technical knowledge on Tunnel Operation & Risk Management during operational stage of Tunnel projects. In addition, this study will include the information that all technical staff and policy makers should consider before the final setting of the technical design and financial structure of the projects.

### III. SCOPE AND ACTIVITIES

3.1 This project will perform case studies and recommendations on Operation and Risk Management from experiences of **Asia**. The case studies will analyze the experience on mega tunnel operations of **at least three Asian countries** such as **Inje (10km, in Korea), Zhongnanshan (18km, in China), Kanetsu (11km, in Japan)**. The main goal of this project is to get information and experiences from each case and recommendations on future tunnel projects in LAC. This project includes four components: (i) general information including technical feature of the tunnel and procurement information that will be referred to future tunnel projects in LAC; (ii) facilities for risk management such as escape gate, ventilation, fire extinguish systems and organizational structure for operation and maintenance including staff, facilities and budget; (iii) roles and responsibilities of each agency among operation agency, police, fire fighter, hospital in case of emergency; and (iv) recommendation on Risk Management for Agua Negra Tunnel. The details are as follows:

- (v) General information of the tunnel and procurement information as below, but not limited to;
  - a. Summary of Tunnel: length, construction cost, construction period, construction method, cross section of tunnel, composition of lanes, features including vertical and horizontal slope, pavement method, clearance, traffic volume forecast and real, and other information needs for operation & risk management
  - b. Procurement: Procurement procedure and duration, Evaluation method, Special conditions on Cost overrun and Construction delay
- (vi) Technical feature of facilities for routine operation & risk management, and organizational structure for operation and maintenance as below, but not limited to;
  - a. Facilities for routine operation & risk Management
    - Facility lists: workers path, escape gate(path), ventilation, fire extinguish, communication, imagery sensing, snow melting system before & after tunnel, traffic control facility, traffic control room, and other information needs for operation & risk management
    - Features: installation space, capacity or specification, size, and other information needs for operation & risk management
  - b. Organizational structure for operation & maintenance
    - Organizational structure chart, number of staffs, role of each staff,
    - Facility list for Operation and Maintenance such as vehicles
    - Annual budget for Operation and Maintenance
  - c. Performance criteria of operation & maintenance
    - Performance criteria of routine maintenance including pavement, light, ventilation, signs, etc.
    - Tunnel availability during the year except emergency.
- (vii) Roles and responsibilities of agencies in case of emergency
  - Roles and responsibilities of each agency in case of emergency among operation agency, police, fire fighter, hospital, etc.

- Emergency procedures in cases such of traffic accident and/or fire accidents, etc.
- (viii) Recommendation on below components for Agua Negra Tunnel.
- On Facilities for Risk Management
  - On Organizational structure for Operation & Maintenance
  - On Role & Responsibility of each agency in case of Emergency
- 3.2 Before the case study of 3 European countries' mega tunnel, the consulting firm should report tunnel lists, at least 10 mega tunnels in Europe, through literature review. Then finalize the 3 mega tunnels from different countries.
- 3.3 The consulting firm will make a presentation on the final report at IDB headquarters in USA and EBITAN in Chile and Argentina.
- 3.4 To undertake the activities described above, the consulting firm will interact with the project team at the Bank, and with government officials who may be engaged in this project.

#### **IV. DURATION**

- 4.2 The whole duration of this project will be 12 months.

#### **V. DELIVERABLES AND PAYMENTS**

- 5.4 The deliverables expected from the consultancy are summarized below:

Deliverable	Description
Working plan and methodological approach	3.1 & 3.2
Final report	3.1
Presentation at IDB Headquarters and EBITAN	3.3

- 5.5 The Consultant will be remunerated according to the following schedule of product deliveries.
- 30% at the delivery of a working plan and methodological approach
  - 40% at the delivery of the draft report
  - 30% at the approval of the final report
- 5.6 The report should be English and Spanish.

#### **VI. COORDINATION**

- 6.1 This consultancy will be coordinated and supervised by the team leader, Leano, Juan Manuel (INE/TSP), of the operation RG-T3026.



PROCUREMENT PLAN FOR BANK EXECUTED OPERATIONS														
Country: Regional						Executing Agency: IDB				UR: INE/TSP				
Project number: RG-T3026						Title of Project: Study for Tunnel Operation & Risk Management								
Period covered by the Plan: [24 months]						Total Project Amount: \$ 500.000								
Component	Procurement Type (1) (2)	Service type (1) (2)	Description	Estimated contract cost (US\$)	Selection Method (2)	Type of Contract	Source of Financing and Percentage				Estimated date of the procurement notice	Estimated contract start date	Estimated contract length	Comments
							IDB/MIF		Other External Donor					
							Amount	%	Amount	%				
Component 1	A. Consulting services	Consulting Firm (GN-2765)	<b>Case study on Operation &amp; Risk Management from experiences of Europe</b>	\$ 180.000	SCS	Lump Sum	\$ 180.000	100%	\$ -	0%	1-Apr-18			
			<ul style="list-style-type: none"> <li>Case study on Mega tunnels including Operation &amp; Risk management</li> <li>Recommendation for Mega tunnels based on the case study</li> </ul>											
Component 2	A. Consulting services	Consulting Firm (GN-2765)	<b>Case study on Operation &amp; Risk Management from experiences of Asia and Benchmark study in Korea</b>											
			<ul style="list-style-type: none"> <li>Case study on Mega tunnels including Operation &amp; Risk management</li> <li>Recommendation for Mega tunnels based on the case study</li> </ul>	\$ 180.000	SCS	Lump Sum	\$ 180.000	100%		0%	1-Apr-18			
			<ul style="list-style-type: none"> <li>Benchmark study of Mega Tunnels in Korea</li> </ul>	\$ 90.000	SCS	Lump Sum	\$ 90.000	100%		0%	1-Apr-18			
Component 3	C. Non consulting services		<b>Administration &amp; Dissemination</b>	\$ 50.000			\$ 50.000	100%		0%				
			<ul style="list-style-type: none"> <li>Workshops in Chile and Argentina.</li> </ul>							0%	1-May-19			
			<ul style="list-style-type: none"> <li>Translation and publishing of component 1 &amp; 2</li> </ul>							0%	1-Mar-20			
<b>Prepared by:</b>		<b>Changho Lee</b>	<b>TOTALS</b>	<b>\$ 500.000</b>			<b>\$ 500.000</b>	<b>100%</b>	<b>\$ -</b>	<b>0%</b>				

(1) Grouping together of similar procurement is recommended, such as publications, travel, etc. If there are a number of similar individual contracts to be executed at different times, they can be grouped together under a single heading with an explanation in the comments column indicating the average individual amount and the period during which the contract would be executed. For example: an export promotion project that includes travel to participate in fairs would have an item called "airfare for fairs", an estimated total value of US\$5,000, and an explanation in the Comments column: "This is for approximately four different airfares to participate in fairs in the region in years X and X1".

(2) (i) **Individual consultants:** ICQ: Individual Consultant Selection Based on Qualifications; SSS: Single Source Selection. Selection process to be done in accordance with AM-650.

(2) (ii) Consulting firms: Per GN-2765-1, Consulting Firm selection methods for Bank-executed Operations are: Single Source Selection (SSS); Simplified Competitive Selection (<=250K) (SCS); Fully Competitive (>250K) (FCS); and Framework Agreement Task Order (TO). All Consulting Firm selection processes under this policy must use the electronic module in Convergence.

(2) (iii) Goods: Per GN-2765-1, par. A.2.2.c: "The procurement of goods and related services, except when such goods and related services are necessary to achieve the objectives of the Bank-executed Operational Work and are included in the consulting services contract and represent less than ten percent (10%) of the consulting services contract value."