ADB

Technical Assistance Report

Project Number: 48082-001
Policy and Advisory Technical Assistance (PATA)
July 2016

Mongolia: Intelligent Transport Systems Development for Mongolia

(Financed by the Republic of Korea e-Asia and Knowledge Partnership Fund)

Asian Development Bank

CURRENCY EQUIVALENTS
(as of 24 June 2016)

Currency unit	–	togrog (MNT)
MNT1.00	=	$0.000516
$1.00	=	MNT1,937.00

ABBREVIATIONS

ADB	–	Asian Development Bank
ICT	–	information and communication technology
ITS	–	intelligent transport system
MRT	–	Ministry of Roads and Transportation
TA	–	technical assistance

NOTE
In this report, "$" refers to US dollars.

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POLICY AND ADVISORY TECHNICAL ASSISTANCE AT A GLANCE

1. Basic Data — **Project Number:** 48082-001

Project Name	Intelligent Transport Systems Development for Mongolia
Country	Mongolia
Department /Division	EARD/EATC
Executing Agency	Ministry of Road and Transportation

2. Sector	**Subsector(s)**	**Financing ($ million)**
✓ Transport	Urban roads and traffic management	0.50
	Total	**0.50**

3. Strategic Agenda	**Subcomponents**
Inclusive economic growth (IEG)	Pillar 1: Economic opportunities, including jobs, created and expanded
Regional integration (RCI)	Pillar 1: Cross-border infrastructure

Climate Change Information	
Climate Change impact on the Project	Low

4. Drivers of Change	**Components**
Governance and capacity development (GCD)	Institutional development
Knowledge solutions (KNS)	Knowledge sharing activities
Partnerships (PAR)	Implementation Private Sector
Private sector development (PSD)	Public sector goods and services essential for private sector development

Gender Equity and Mainstreaming	
No gender elements (NGE)	✓

5. Poverty Targeting	
Project directly targets poverty	No

Location Impact
Not Applicable

6. TA Category: B

7. Safeguard Categorization Not Applicable

8. Financing

Modality and Sources	**Amount ($ million)**
ADB	**0.00**
None	0.00
Cofinancing	**0.50**
Republic of Korea e-Asia and Knowledge Partnership Fund	0.50
Counterpart	**0.00**
None	0.00
Total	**0.50**

9. Effective Development Cooperation

Use of country procurement systems	No
Use of country public financial management systems	No

I. INTRODUCTION

1. The policy and advisory technical assistance (TA)[1] has been developed at the request of the Ministry of Roads and Transportation (MRT) of the Government of Mongolia. Through this TA, the Asian Development Bank (ADB) will support the MRT in preparing a national intelligent transport system (ITS)[2] policy and a strategic deployment plan. In September 2015, ADB and the MRT reached an understanding on the objectives, scope, implementation arrangements, cost, and terms of reference of the TA. The design and monitoring framework is in Appendix 1.[3]

II. ISSUES

2. Mongolia faces many challenges in making the country's economic and social development process more efficient, inclusive, and integrated. While all sectors are affected, the country's large size, low density in rural areas, and densely populated capital city (Ulaanbaatar) make the development challenges more acute in the transport sector. These include (i) reducing transport and logistics costs for trade to foster regional integration; (ii) enhancing transport efficiency and safety; (iii) promoting urban efficiency through improved urban transport management and services; (iv) developing cost-effective solutions to enhance rural accessibility; and (v) improving institutional and financial management, and human capacity to ensure asset sustainability.

3. An ITS is an information and communication technology (ICT) area where opportunities for improving the performance of urban and rural transport have not yet been properly explored in Mongolia. Because of the country's vast size, sparse settlement patterns in rural areas, and rapid rural–urban migration to Ulaanbaatar, transport infrastructure investments need to be carefully chosen to ensure they are economically viable and maximize the efficiency and safety of existing transport infrastructure. When planned and deployed in an integrated way, an ITS also offers a great opportunity for using existing transport infrastructure more efficiently, mitigating the limitations of the constrained transport infrastructure, and optimizing future infrastructure investment.

4. ITSs are advanced applications that aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and smarter use of transport networks. Recent advances in telecommunications, internet services, and sensing technologies offer the possibility of innovations, which include connected vehicles, traffic data collection, and traffic information provision through smartphones. An ITS offers considerable potential for enabling the efficient use of transport infrastructure, both to complement capital investments and as an alternative to additional capital-intensive infrastructure deployment, and as a tool for enhancing road safety and transport operations capacity.

5. Ulaanbaatar city deployed an urban ITS in 2010 with a traffic signal control system and traffic control center, vehicle detectors, closed-circuit television, and variable message signs. However, the system has not been properly upgraded to match the growing travel demand and the operational efficiency is very low as a result of improper maintenance and coordination with

[1] The TA is included in ADB. 2015. *Country Operations Business Plan: Mongolia, 2015.* Manila.

[2] An ITS uses information and communication technology to provide services supporting users, operators, and maintainers of multiple modes of transportation—resulting in safer, more efficient, and higher utility transport networks.

[3] The TA first appeared in the business opportunities section of ADB's website on 19 February 2016.

the traffic police. Regional roads in Mongolia are not covered by an ITS, except to monitor the location of regional buses in operation. Toll gates and the weighing system are being operated offline, regional roads have no emergency communication system, and the logistics sector is still operating without an ITS. The city deployed an e-ticketing system, bus management system, and bus information system in 2015 through a public–private partnership, but the system is not yet complete and integration between the traffic control center and the bus management center has not been achieved.

6. **Need for an integrated intelligent transport system policy.** National and local governments implement ITS on a project-by-project basis, rather than by following a coherent overarching ITS policy (with a national ITS architecture, ITS strategic plan, and open standards interoperability plan that would promote institutional and systems integration). The ITS in Mongolia lags in terms of technology; it is fragmented as it does not have a national ITS policy, ITS architecture and standards plan, and strategic investment plan (including a technology and project road map and implementation plan); and it is inefficient as it lacks associated institutional cooperation.

7. **Information and communication technology and intelligent transport system development in Mongolia.** The government's ICT initiatives focus on overcoming the development constraints of high logistics costs. It has launched various initiatives to use ICT to support the creation of a knowledge society and has made significant progress through the E-Mongolia National Program, the E-Government Master Plan, the Smart Government Project, and the Budget Transparency Law, 2014.[4] These programs are designed to deliver services in an efficient and transparent manner, and support business process reforms across the government. They have created high demand for improved ICT infrastructure and e-solutions. Developing ICT in the transport sector can leverage these efforts and increase the sector's overall efficiency and effectiveness.

8. A well-integrated ITS is vital for the Mongolian transport environment, where the road network is sparsely located in rural areas and road capacity is very limited in the urban area. Mongolia's transport sector can be safer, more efficient, and more sustainable by applying ICT to all modes of passenger and freight transport—adding ITS applications and equipment to the existing telecommunication infrastructure. The integration of existing transport services can also create new services, jobs, and growth in the transport and ICT sectors. To be effective, the near-, medium-, and long-term rollout of ITS needs to be coherent and coordinated across the country's transport and allied entities.

III. THE POLICY AND ADVISORY TECHNICAL ASSISTANCE

A. Impact and Outcome

9. The impact of the TA will be enhanced transport operation and management in Mongolia. The TA is aligned with the ICT National Strategy 2013.[5] The outcome of the TA will be the presentation of a national ITS policy and deployment plan to the Government of Mongolia. The TA will provide an opportunity for the government to integrate ITS deployment activities across

[4] Government of Mongolia, Information and Communications Technology Authority. 2005. *E-Mongolia National Program for 2005–2015*. Ulaanbaatar; Government of Mongolia. 2005. *E-government Master Plan*. Ulaanbaatar; Smart Government. Smart Government Project. http://smart.gov.mn/en/about/1; and Government of Mongolia, State Great Khural. 2014. *Law of Mongolia on Glass Accounts.* Ulaanbaatar (Budget Transparency Law).

[5] Government of Mongolia, Information Technology, Post and Telecommunications Authority. 2013. *ICT National Strategy 2013*. Ulaanbaatar.

modes and institutions, leading to an efficient and effective ITS deployment plan suitable for the Mongolian transport sector.

B. Methodology and Key Activities

10. The TA will adopt an ITS user service[6] approach to identify priority ITS services based on different users' needs and priorities. Potential ITS users include road users, transport system operators and maintainers, and government agencies in the transport sector. Identified user services and service bundles (needs) will determine the ITS services (ITS architecture and standards) needed to satisfy the user needs, and how those services will be customized (into customized service packages) based on actual institutional and environmental requirements. The ITS architecture will specify the customized ITS service packages, which will then identify (i) stakeholder elements and their inputs from other stakeholder elements, and (ii) outputs to other stakeholder elements that implement one or more ITS user services. Each stakeholder element includes a set of functional requirements that specifies its operations. The ITS architecture also specifies the roles and responsibilities of each ITS stakeholder based on its ITS elements and the ITS services in which its ITS elements participate. The deployment plan includes high-level technology choices to implement the near-term customized service packages (based on trade-off studies where appropriate); and considers stakeholder scope and performance requirements, the sequence of projects, and near-term project investment cost estimates.

11. The TA will have three outputs, as described below.

(i) **Output 1: National Intelligent Transport System Policy and Deployment Plan for Mongolia.** The TA will prepare the national ITS policy (needs, architecture, and standards) and a strategic deployment plan (para. 10) for Mongolia. The policy and deployment plan will incorporates state-of-the-art ITS concepts and infrastructure over 2017–2037, with technology choices over 2017–2022. The output will select the ITS user services and user service bundles needed to improve the efficiency and safety of the transport sector from 2017 to 2027 for the ITS deployment plan (project road map). Existing ITS infrastructure and services will be incorporated in the policy and the deployment plan. This output also includes the project summary information describing associated customized service packages for the project, project stakeholder element functional requirements, open standards used in the project, project assumptions about scope and performance, and project cost estimates.

(ii) **Output 2: Intelligent transport system capacity development.** Capacity development will be provided to ITS-related government agency staff to support their participation in the development of output 1. The capacity development activities will include training, workshops, and a study tour of successful investments in countries with an advanced ITS.

(iii) **Output 3: Knowledge product.** A case study—ITS Policy and Deployment Strategy in Sparsely Populated Countries: The Case of Mongolia—will be published and disseminated.

[6] A user service is a specific need (of travelers, system operators, or system maintainers) that can be solved by one or more alternative ITS services. A logical grouping of user services is called a service bundle, which provides a convenient way to address the range of user needs. Eight service bundles are commonly used in an ITS: travel and traffic management, public transportation management, electronic payment, commercial vehicle operations, emergency management, advanced vehicle safety systems, information management, and maintenance and construction operations.

12. A possible risk is the lack of coordination between the different government ministries and agencies during TA implementation. This can be mitigated by (i) forming a steering committee composed of representatives from different ministries, agencies, and telecommunications service providers involved in ITSs; (ii) ensuring continuous policy dialogue with the executing agency; and (iii) selecting highly qualified international consultants with experience in developing national ITS policies and deployment plans. The steering committee will validate the project at key draft milestones. The consulting team will analyze and track the steering committee's feedback at each draft milestone to produce a final milestone that meets all steering committee member ministry and/or agency needs.

C. Cost and Financing

13. The TA is estimated to cost $550,000, of which $500,000 will be financed on a grant basis by the Republic of Korea e-Asia and Knowledge Partnership Fund and administered by ADB. The government will provide counterpart support in the form of staff time, access to administrative data, assistance to field trips, use of office space and facilities, logistic support, and other in-kind contributions. The cost estimates and financing plan are in Appendix 2.

D. Implementation Arrangements

14. The MRT will be the executing agency and the ministry's Strategic Policy and Planning Department will be the implementing agency. A steering committee will be established to consolidate the needs from different sectors, including (i) the Information Technology, Post and Telecommunications Authority, which is in charge of Mongolia's ICT sector under the Prime Minister's Office; (ii) the Ulaanbaatar Urban Transport Control Center; and (iii) the National Traffic Control Center.

15. The TA will be implemented over 12 months from 15 August 2016 to 14 July 2017, and will require 14 person-months for four international consultants and 26 person-months for five national consultants. The team of international and national specialists will include (i) a transport and/or ITS specialist, (ii) an ITS infrastructure specialist, (iii) an ITS technology and/or equipment specialist, and (iv) an ITS architecture and standards specialist. ADB will engage international and national firms or individuals through a firm in accordance with its Guidelines on the Use of Consultants (2013, as amended from time to time). All procurement under the TA will be carried out in accordance with ADB's Procurement Guidelines (2015, as amended from time to time). All disbursements under the TA will be carried out in accordance with ADB's *Technical Assistance Disbursement Handbook* (2010, as amended from time to time). The consulting team will administer training sessions and seminars. An international firm and a national firm will be hired using the quality- and cost-based selection method with a 90:10 quality–cost ratio. To improve economy, efficiency, and value for money, all consulting services under the TA will be engaged on output-based (lump-sum) contracts.

IV. THE PRESIDENT'S DECISION

16. The President, acting under the authority delegated by the Board, has approved ADB administering technical assistance not exceeding the equivalent of $500,000 to the Government of Mongolia to be financed on a grant basis by the Republic of Korea e-Asia and Knowledge Partnership Fund for the Intelligent Transport Systems Development for Mongolia project, and hereby reports this action to the Board.

DESIGN AND MONITORING FRAMEWORK

Impact the TA is Aligned with

Transport operation and management in Mongolia through ITS (ICT National Strategy 2013)[a] enhanced

Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting	Risks
Outcome National ITS policy and deployment plan presented to the Government of Mongolia adopted	By 2018 National ITS policy and deployment plan is adopted as a national government policy (2016 baseline: Not applicable)	MRT annual report	Implementation of the deployment plan may be delayed by the government's financial constraint
Outputs 1. National ITS policy and deployment plan for Mongolia prepared	1. National ITS policy and deployment plan, and a 10-year investment plan finalized by 2017 (2016 baseline: Not applicable)	1–2. Periodic consultant progress reports and MRT annual report	Consultation process prolonged because of lack of coordination between the ministries and agencies
2. ITS capacity improved	2. 100% of ITS-related MRT staff awarded accreditation certificates from training by the end of March 2017 (2016 baseline: Not applicable)		
3. Knowledge product on national ITS policy and deployment plan prepared	3. ITS Development Strategy for Sparsely Populated Countries: The Case of Mongolia paper finalized for publication by the end of July 2017 (2016 baseline: Not applicable)	3. Periodic consultant progress reports and deliverables	

Key Activities with Milestones

1. National intelligent transport system policy and deployment plan for Mongolia prepared (August 2016–July 2017)

1.1 Recruit ITS consulting team and mobilize the team after notice to proceed (August 2016)
1.2 Host TA inception meeting and conduct consultation with executing and implementing agencies (September 2016)
1.3 Review deployed, ongoing, and planned ITS development in Mongolia (September–October 2016)
1.4 Review state-of-the-art ITS technology and identify items relevant to Mongolia (September–October 2016)
1.5 Prepare long-term ITS policy and consult with the executing and/or implementing agency for confirmation of the plan (October 2016–January 2017) [GCD]
1.6 Identify ITS user service items and content for a 10-year ITS deployment plan (November 2016–January 2017)
1.7 Prepare ITS architecture and open standards suitable for Mongolia from good practices in countries with an advanced ITS (November 2016–January 2017)
1.8 Prepare an implementation plan for existing and planned transport infrastructure, with indicative cost (January–March 2017)
1.9 Host workshop to discuss 10-year ITS deployment plan (May 2017)
1.10 Confirm proposed 10-year ITS deployment plan (June 2017) [GCD]

2. Intelligent transport system capacity development (October 2016–April 2017)

2.1 Conduct training on the introduction to ITS, ITS infrastructure, ITS architecture, and standard and state-of-the-art ITS policy (October 2016) [GCD]
2.2 Conduct study tour to ADB member countries with an advanced ITS operation (October 2016) [GCD]
2.3 Conduct training on ITS user services, service packages, and operations (April 2017) [GCD]

3. Knowledge product (November 2016–July 2017)

3.1 Draft case study (ITS Development Strategy for Sparsely Populated Counties: The Case of Mongolia) prepared

and reviewed (May 2017) [KNS] 3.2 Final case study is printed and disseminated to developing member countries (July 2017) [KNS]
Inputs Republic of Korea e-Asia and Knowledge Partnership Fund: $500,000 (grant) Note: The government will provide counterpart support in the form of staff time, access to administrative data, assistance to field trip/s, use of office space and facilities, logistic support, and other in-kind contributions.
Assumptions for Partner Financing Not applicable.

ADB = Asian Development Bank, GCD = good governance and capacity development, ICT = information and communication technology, ITS = intelligent transport system, KNS = knowledge solutions, MRT = Ministry of Roads and Transportation, TA = technical assistance.

[a] Government of Mongolia, Information Technology, Post and Telecommunications Authority. 2013. *ICT National Strategy 2013.* Ulaanbaatar.

Source: Asian Development Bank.

COST ESTIMATES AND FINANCING PLAN

($'000)

Item	Amount
Republic of Korea e-Asia and Knowledge Partnership Fund[a]	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	286.0
ii. National consultants	104.0
b. International and local travel	28.0
c. Reports and communications[b]	20.0
2. Equipment[c]	10.0
3. Workshops and training[d]	
a. Workshop (Ulaanbaatar)	5.0
b. Study Tour (TBD)	20.0
c. Training program (Ulaanbaatar)	5.0
4. Contingencies	22.0
Total	**500.0**

TBD = to be determined.

Note: The technical assistance (TA) is estimated to cost $550,000, of which contributions from the Republic of Korea e-Asia and Knowledge Partnership Fund are presented in the table above. The Ministry of Roads and Transportation will provide counterpart support in the form of counterpart staff; suitably furnished office space with utilities and telecommunication access; information materials, data, and other documents as needed; and other in-kind contributions. The value of government contribution is estimated to account for 9% of the total TA cost.

[a] Administered by the Asian Development Bank.

[b] Includes the cost of written translation of documents and interpretation.

[c] Equipment will be turned over to the executing agency upon completion of TA activities. The equipment includes laptops, desktop computers, and printer.

[d] Includes venue rental, interpretation, translation and other logistics, and administration costs for two training sessions and two seminars. The consulting team will administer the item.

Source: Asian Development Bank estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

A. Objective and Scope

1. The technical assistance (TA) will assist the Government of Mongolia in (i) developing a national intelligent transport system (ITS) policy and deployment plan, (ii) enhancing the ITS capacity of Ministry of Roads and Transportation staff, and (iii) producing a knowledge product.

B. Consulting Team

2. The TA requires 14 person-months of international and 26 person-months of national consultant inputs. A team of international and national experts will be hired using the quality- and cost-based selection method with a 90:10 quality–cost ratio. To reduce the administrative burden and improve economy, efficiency, and value for money, all consulting services under the TA will be engaged on output-based (lump-sum) contracts.

3. The consulting services positions and person-months are in the table.

Consulting Services Requirement

Position	Person-Months Required	
	International	National
Team leader, transport and/or ITS specialist	5	6
ITS infrastructure specialist	3	5
ITS technology and/or equipment specialist	3	4
ITS architecture and standards specialist	3	5
Project coordinator	0	6
Total	**14**	**26**

ITS = intelligent transport system.
Source: Asian Development Bank.

1. **International Consultants** (14 person-months)

4. **Transport and/or intelligent transport system specialist** (team leader, 5 person-months). The TA consulting team will be led by an international transport and/or ITS specialist. The team leader should have a bachelor's degree or higher in a subject related to transport and/or ITS. The international team leader should have a minimum of 15 years of experience in ITS development, including a minimum of 5 years of experience in developing countries. The specialist should be highly proficient in English. The specialist will:

(i) coordinate the TA activities and communication among the consulting team, executing agency, and the Asian Development Bank (ADB);
(ii) review the current ITS development policy and initiatives to generate a long-term ITS policy and a 10-year ITS deployment plan;
(iii) consolidate activities and outputs from other team members, lead and organize workshops and the study tour, conduct training, and prepare deliverables;
(iv) review the current status of the Ulaanbaatar Traffic Control Center and National Traffic Control center, and identify directions for improvement;
(v) review the current operational practice of the Ulaanbaatar Traffic Control Center and National Traffic Control center, and produce recommendations for operational improvement;
(vi) identify ITS services needed for the Mongolian transport sector and specify the service items with their associated justification;
(vii) generate estimated investment costs for implementing the 10-year plan;

(viii) prepare ITS training and workshop materials and coordinate training and workshop activities; and
(ix) plan a study tour to one or more countries with an advanced ITS and coordinate the study tour logistics.

5. **Intelligent transport system infrastructure specialist** (3 person-months). The international specialist should have a bachelor's degree or higher in a subject related to information and communication technology (ICT) infrastructure and should have a minimum of 15 years of experience in ICT and/or ITS infrastructure development, including experience in developing countries. The specialist should be familiar with current ITS infrastructure trends and equipment and be highly proficient in English. The specialist will:

(i) review the existing ITS infrastructure (especially the communications network) and ICT infrastructure development plans of the government, and produce infrastructure improvement needs to accommodate ITS services recommended for Mongolia;
(ii) identify the telecommunication industry structure of Mongolia and recommend an infrastructure sharing scheme;
(iii) provide a tentative investment cost estimate for ITS infrastructure investments;
(iv) prepare the ITS infrastructure development training and workshop materials and provide training and workshop activities; and
(v) produce deliverables for ITS infrastructure.

6. **Intelligent transport system technology and/or equipment specialist** (3 person-months). The international specialist should have a bachelor's degree or higher in an ITS-related subject and should have a minimum of 15 years of experience in ITS technology and equipment. The specialist should be familiar with current ITS technology and equipment and be highly proficient in English. The specialist will:

(i) review the existing ITS technology and equipment in Mongolia and produce a recommendation for Mongolia on choosing ITS technology and equipment;
(ii) provide recent ITS technology and equipment development information to the team members and executing agency and/or implementing agency;
(iii) provide tentative investment cost estimates for the ITS technology and equipment investment for the long-term and 10-year ITS deployment plan;
(iv) prepare ITS technology and equipment training and workshop materials and provide training and workshop activities; and
(v) produce deliverables for technology and equipment.

7. **Intelligent transport system architecture and standards specialist** (3 person-months). The international specialist should have a bachelor's degree or higher in an ITS-related subject and should have a minimum of 15 years of experience in ITS architecture and standards. The specialist should be familiar with ITS architecture and standards and be highly proficient in English. The specialist will:

(i) review the existing ITS architecture and standards and identify the deficiencies in terms of integration and interoperability;
(ii) provide an improved ITS architecture and standards plan based on those adopted in countries with an advanced ITS, and recommend a suitable ITS architecture development strategy and standards plan for Mongolia;
(iii) recommend an ITS architecture and standards plan for the user needs based on customized ITS service packages recommended by other team members;

(iv) prepare the ITS architecture and standards training and workshop materials and provide training and workshop activities; and
(v) produce deliverables for the ITS architecture and standards plan.

2. **National Consultants** (26 person-months)

8. **Transport and/or intelligent transport system specialist** (deputy team leader, 6 person-months). The national team leader should have a minimum of 5 years of experience in ITS deployment in Mongolia. The specialist should be fluent in English. The specialist will:

(i) assist the team leader in coordinating the TA activities and communication among the consulting team, executing agency, and ADB;
(ii) assist the international team in reviewing the current ITS policy and initiatives to generate a long-term ITS policy and a 10-year ITS deployment plan;
(iii) consolidate activities and outputs from the national team members; coordinate training sessions, workshops, and study tour plans; conduct training; and prepare deliverables in the Mongolian language;
(iv) assist the international team in reviewing the current status of the Ulaanbaatar Traffic Control Center and the National Traffic Control center, and identify directions for improvement;
(v) assist the international team leader in reviewing the current operational practices of the Ulaanbaatar Traffic Control Center and the National Traffic Control center, and produce recommendations for operational improvements;
(vi) assist the international team in identifying ITS services needed for the Mongolian transport sector and specify the service items with justification;
(vii) assist the international team leader in generating tentative investment costs for implementing the 10-year plan; and
(viii) produce a Mongolian version of deliverables.

9. **Intelligent transport system infrastructure specialist** (5 person-months). The national specialist should have a bachelor's degree or higher in an ITS-related subject and should have a minimum of 5 years of experience in ITS and/or information and communication technology (ICT) infrastructure development in Mongolia. The specialist should be fluent in English. The specialist will:

(i) assist the international specialist in reviewing the existing ITS infrastructure (especially the communication network) and the ICT infrastructure deployment plan of the government;
(ii) assist the international specialist in preparing tentative investment cost estimates for ITS infrastructure investments;
(iii) assist the international specialist in preparing the ITS infrastructure development training and workshop materials, and provide training and workshop activities; and
(iv) produce deliverables for the ITS infrastructure in the Mongolian language.

10. **Intelligent transport system technology and/or equipment specialist** (4 person-months). The national specialist should have a bachelor's degree or higher in an ITS- and/or ICT-related subject and should have a minimum of 5 years of experience in ITS and/or ICT systems in Mongolia. The specialist should be fluent in English. The specialist will:

(i) assist the international specialist in reviewing existing ITS technology and equipment in Mongolia, and produce a recommendation for Mongolia on choosing ITS technology and equipment;

(ii) assist the international specialist in providing recent ITS technology and equipment development information to the team members and executing agency and/or implementing agency;
(iii) assist the international specialist in preparing a tentative investment cost estimate for ITS technology and equipment investments for the long-term and 10-year ITS deployment plan;
(iv) assist the international specialist in preparing the ITS technology and equipment training and workshop materials, and provide training and workshop activities; and
(v) produce deliverables for technology and equipment in the Mongolian language.

11. **Intelligent transport system architecture and standards specialist** (5 person-months). The national specialist should have a bachelor's degree or higher in an ITS- and/or ICT-related subject and should have a minimum of 5 years of experience in ITS and/or ICT in Mongolia. The specialist should be fluent in English. The specialist will:

(i) assist the international specialist in reviewing the existing ITS architecture and standards used in different ITS projects in Mongolia;
(ii) assist the international specialist in presenting the different types of ITS architecture and standards and recommending a suitable ITS architecture development strategy and standards plan for Mongolia;
(iii) assist the international specialist in preparing recommendations for the ITS architecture and standards plan for selected ITS user services and associated customized service packages recommended by other team members;
(iv) coordinate the ITS architecture and standards plan training and workshop materials, and provide training and workshop activities; and
(v) produce deliverables for the ITS architecture and standards plan in the Mongolian language.

12. **Project coordinator** (6 person-months). The coordinator will have at least 10 years of experience in project coordination, including transport and/or ITS projects. The specialist will have a bachelor's degree or higher and be fluent in English. The tasks of the specialist include the following:

(i) liaise with the executing agency, implementing agency, consultants, contractors, and other stakeholders during project administration;
(ii) monitor the TA project and prepare relevant correspondence;
(iii) support ADB East Asia Department's Transport and Communications Division missions, and organize and participate in meetings with the executing agency, consultants, and stakeholders;
(iv) facilitate and contribute to the work of the international consultants as requested by the Transport and Communications Division supervisor;
(v) provide project-specific inputs as agreed with relevant project officers;
(vi) assist in the translation and interpretation between English and Mongolian during meetings and for reports;
(vii) manage the TA team office on a daily basis; and
(viii) contract and manage the TA team transportation in the project city.

C. Reporting and Knowledge Product Submission Requirements

13. The TA will engage the consulting team intermittently from August 2016 to July 2017 to produce the following deliverables:

(i) Reports
- (a) Inception report: 1 month after mobilization
- (b) Interim report: 4 months after mobilization
- (c) Draft final report: 9 months after mobilization
- (d) Final report: 11 months after mobilization

(ii) Training and workshop materials
- (a) Training materials: 3 months after mobilization
- (b) Workshop materials: 4 months after mobilization

(iii) Knowledge products
- (a) Draft knowledge product: 9 months after mobilization
- (b) Final knowledge product: 11 months after mobilization