



Technical Assistance Report

Project Number: 40138
December 2006

Kingdom of Thailand: Infrastructure Investment Advisory Assistance (Phase II)

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 6 December 2006)

Currency Unit	–	baht (B)
B1.00	=	\$0.0281
\$1.00	=	B35.560

ABBREVIATIONS

ADB	–	Asian Development Bank
DB	–	design-build
DBOM	–	design-build-operate-maintain
EA	–	executing agency
IA	–	implementing agency
MRT	–	mass rapid transit
O&M	–	operation and maintenance
OTP	–	Office of Transport and Traffic Policy and Planning
PDMO	–	Public Debt Management Office
PPP	–	public-private partnership
TA	–	technical assistance

TECHNICAL ASSISTANCE CLASSIFICATION

Targeting Classification	–	General intervention
Sector	–	Transport and communications
Subsector	–	Railways
Themes	–	Sustainable economic growth, capacity development, private sector development
Subthemes	–	Fostering physical infrastructure development, institutional development, policy/institutional/legal/regulatory reforms

NOTE

In this report, "\$" refers to US dollars

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Country Director	J. P. Verbiest, Thailand Resident Mission, SERD
Team leader	J. Lynch, Principal Programs Economist, SERD
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I. INTRODUCTION

1. The Government of Thailand (the Government) has requested technical assistance (TA) from the Asian Development Bank (ADB) to support implementation of plans for expanding and integrating the rail mass rapid transit (MRT) system in central Bangkok. A TA grant in the amount of \$450,000 has been included in ADB's 2006 TA program for Thailand, and the draft country partnership strategy identifies infrastructure development as a core area of cooperation between the Government and ADB. The TA aims to build on the analytical framework and conceptual approaches outlined under a previous ADB TA, which addressed key institutional, financial, and regulatory issues associated with large-scale investments in rail MRT systems.¹ A fact-finding mission from 10 to 14 November 2006 consulted with the Government and other key stakeholders on the desired focus and expected results of the TA. This report reflects the findings of the mission and the understandings reached with the Government on the objectives, scope, outputs, cost, and implementation arrangements for the TA.² The TA design and monitoring framework is in Appendix 1.

II. ISSUES

2. Rising levels of car ownership, lack of investment in public transit, and the absence of a comprehensive traffic management system have all contributed to increased traffic congestion in central Bangkok. The resulting high logistics costs of conducting business in Bangkok curtail the city's productivity and competitiveness, and pose a serious constraint to future economic growth. Given that the greater metropolitan area accounts for more than 45% of Thailand's gross domestic product, reducing traffic congestion in Bangkok has become a national economic priority. The environmental and health implications of increased car traffic and the associated need to reduce fuel consumption and imports further point to the urgency of encouraging greater use of public transit.

3. Expanding the Bangkok rail MRT system is an integral component of the Government's efforts to promote sustainable urban transit. The existing rail MRT system consists of two separate lines that are operated by different private concessionaires. The 24 kilometer (km) elevated skytrain has been in operation since 1999 and the 20 km subway commenced operations in 2004. The Government's master plan for the rail MRT system includes both underground and elevated schemes totaling nearly 300 km at a cost exceeding \$14 billion. In addition to the massive investment requirements, the core challenges associated with expansion include: (i) developing a strategic plan for implementation that reflects a phased approach to investing in priority lines; (ii) integrating operations, fare levels, and ticketing systems of the skytrain with the subway, and with new lines; (iii) structuring concession agreements that attract private sector participation in operations; and (iv) creating the institutional framework to regulate different rail operators and additional modes of public transit.

4. To assist the Government in addressing many of these complex issues concerning expansion of the rail MRT system, ADB provided TA (phase I) to the Public Debt Management Office (PDMO) in the Ministry of Finance, and the Office of Transport and Traffic Policy and Planning (OTP) in the Ministry of Transport (footnote 1). The phase I TA (i) proposed different institutional frameworks for a more integrated approach to the regulation of transit systems in

¹ ADB. 2006. *Technical Assistance to the Kingdom of Thailand for Infrastructure Investment Advisory Assistance to the Public Debt Management Office in Thailand – Major Change in Scope, Increase in Technical Assistance Budget, and Extension of Completion Date*. Manila (TA 4676-THA, approved on 31 October, for \$281,000).

² The TA first appeared in *ADB Business Opportunities* on 10 November 2006.

the Bangkok metropolitan area, (ii) identified key fare setting and revenue sharing implications of integrating the two existing MRT rail lines under a single ticketing system, (iii) examined the benefits of a gross-cost concession approach for contracting responsibilities for operation and maintenance (O&M) of rail MRT lines to the private sector, and (iv) developed an interactive financial model to assess the impact of different fare structures and ridership levels on the operating revenues for different proposed line extensions.

5. The Government's strategic approach for expanding the rail MRT system has subsequently been refined from the original master plan of June 2005. The revised plans incorporate a number of the findings and recommendations of the phase I TA, including the following: (i) the prioritization and phasing of investments should be based on the financial viability of proposed lines, (ii) greater consideration should be given to gross-cost rather than net-cost concessions for O&M, and (iii) a single automated ticketing system should be pursued to facilitate network integration and increase ridership. As a result, the Government has reduced the number of new lines to five, down from 10 in the original master plan. The construction of three lines totaling 118 km and costing approximately \$4.5 billion will be open for bidding in early 2007. Adoption of a single automated ticketing system to integrate existing skytrain and subway operations, as well as new lines and possibly other transit modes (e.g., buses and ferries), will be pursued. Concession contracts will be applied to encourage private O&M of the new lines, and possibly investment in the rolling stock and signaling systems.

III. THE TECHNICAL ASSISTANCE

A. Impact and Outcome

6. The TA is designed to provide analytical and advisory support to PDMO and OTP in applying specific techniques and procedures to structure private concessions for the O&M of new rail lines, and to integrate the rail MRT network through the introduction of a single ticketing system. These activities contribute to the longer-term objectives of improved integration, operational efficiency, financial viability, and patronage of an expanded rail MRT system in Bangkok. The TA outcomes are twofold: (i) specifications and procedures for tendering and structuring O&M concessions on individual rail lines to the private sector; and (ii) an action plan for the tendering, financing, implementation, and O&M of an integrated ticketing system for the rail MRT system.

B. Methodology and Key Activities

7. The TA will consist of four components, each of which encompasses analytical and advisory activities linked to specific outputs that contribute to the achievement of the desired outcomes. As indicated above, the TA outcomes are aligned toward attaining the Government's longer-term objectives of infrastructure investments in the rail MRT sector.

8. **Preparing Concession Contracts for Private Sector O&M of New Rail MRT Lines.** Drawing on the analysis of different concession models under the phase I TA, this component will support the Government's plans to award O&M concessions for the new rail MRT lines to the private sector. For selected lines earmarked for construction, the TA will develop a financial model that indicates the relationship between projected ridership levels based on alternative fares, ticket product types, and fare implementation methods (e.g., distance, zonal, etc.). The analyses will also take into consideration the integration of individual lines into the existing and planned rail MRT network. This model will simulate gross operating revenues under different

fare and ridership scenarios. These calculations will be combined with operating cost estimates (along with potential capital and start-up costs to be assumed by the operator) to define an appropriate service fee and payment structure for an operating concession contract.

9. To evaluate the applicability of net-cost or gross-cost concession arrangements for O&M, the financial analysis will be combined with different assumptions of whether the public sector or the private operator would invest in the rolling stock and other equipment. The TA will develop a strategic approach for structuring and restructuring concession contracts that accounts for expansion of the rail MRT system, achieves value for money for the Government, and maximizes the net social benefits of an integrated transit network. Specifications for net-cost and gross-cost concession contracts will be prepared that define the terms and conditions for O&M, including performance-based criteria, maintenance responsibilities, and causes for contract termination. The TA will map out a tendering strategy that complies with the procedural requirements of the Act on Private Participation in State Undertakings, 1992. To facilitate the bidding process, the TA will prepare model tender documents with the technical specifications for proposals, the criteria for their evaluation, and an indicative schedule for the tendering process. The schedule will indicate the time frame required to comply with the 1992 Act to ensure that an O&M concessionaire is selected prior to the completion of civil works.

10. **Assessing the Functional, Technological, and Operational Requirements of an Integrated Ticketing System.** The desired functional capabilities of integrated transit ticketing systems have a direct bearing on their technical and operational characteristics. The ticketing platform under consideration for Bangkok is an automated fare collection system that integrates multiple rail MRT operators, and potentially additional transit modes (e.g., bus and ferry), through a single payment media. Given recent advances in smart card technology, there is also interest in expanding ticket capabilities to include e-commerce applications. The TA will conduct a detailed assessment of the functional requirements of an integrated ticketing system for Bangkok that takes into account key factors such as fare policies, revenue sharing arrangements, plans to encompass new operators and different transit modes, the need to improve physical connections between rail stations (as well as bus depots and ferry landings), and potential e-commerce linkages.

11. A well-defined fare policy is a necessary precondition for the adoption of an integrated ticketing system. To enable the Government to make informed decisions, advice will be provided on how alternative fare policies could impact existing and future rail MRT operators, the operators of other transit modes, and the Government's budget. Efficient, transparent, and secure ticketing operations require an automated clearinghouse system for credit and debit processing, reconciling revenues among transit operators (as well as participating financial institutions and retail establishments), processing settlements, and generating financial reports. The TA will outline specifications for an open architecture platform to allow the system to accommodate additional operators, transit modes, and new applications over time. It will also detail further operational aspects of an integrated ticketing system such as card production and distribution, customer services, and equipment maintenance.

12. **Evaluating Procurement Options for an Integrated Ticketing System.** The Government has expressed an interest in implementing a new integrated ticketing system as a public-private partnership (PPP). The TA will analyze the merits of such an approach compared with traditional procurement, taking into account (i) the need to secure the participation of all rail MRT operators (with eventual expansion to operators of other transit modes); (ii) the desired functional characteristics of the system (including potential e-commerce applications); (iii) the potential institutional responsibilities for O&M (as well as the associated risk management

requirements); (iv) experiences and lessons from other integrated urban MRT systems; and (v) the option that maximizes the Government's value for money based on life-cycle costing. Given the potential for the system to include e-commerce applications, the TA will also explore the prospect for equity financing from private sources and how this could influence the approach to procurement.

13. The assessment of procurement options will take into account the two interrelated elements of integrated ticketing systems: (i) the ticketing equipment, centralized computer systems, and associated infrastructure; and (ii) services to operate and maintain the system. Because of the cost, complexity, and risk of managing these new, state-of-the-art systems, transit authorities are increasingly outsourcing their system support and operational requirements. Given these considerations, the TA will evaluate the advantages and disadvantages of a design-build-operate-maintain (DBOM) approach to procurement as compared with a design-build (DB) option. Analysis of the DB option will also assess different possible institutional arrangements for system O&M, including account management, cash collection, customer relations, marketing support, technical help, etc. The TA will recommend an institutional design and structure for the management of an integrated ticketing contract.

14. **Preparing an Action Plan for Tendering and Implementing an Integrated Ticketing System.** Based on the analysis of system requirements and institutional arrangements for O&M, the TA will prepare the technical components of tender documents for an integrated ticketing system that encompasses existing and future rail MRT operators. In an effort to ensure system compatibility with current and planned rail MRT lines, the TA will also coordinate with existing operators to define its technical specifications. This analysis will explicitly consider the interface of integrated ticketing with existing and future concession arrangements (i.e., net-cost and gross-cost) and fare sharing provisions. Considering the desirability of outsourcing the responsibilities (and risks) for system O&M, the tender documents will reflect the most appropriate approach to procurement (i.e., DBOM, DB, or some variation thereof). In outlining bidding procedures and proposal evaluation criteria, the TA will draw on best practices and lessons from other cities, and prepare indicative estimates of the capital and O&M costs of a new system.

15. To assist the Government in determining the necessary procedural steps, institutional responsibilities, legal requirements, and requisite time frame for moving forward, the TA will prepare a comprehensive action plan for the tendering process and eventual implementation of an integrated ticketing system. The action plan will also outline proactive measures for the Government to define a fare policy that ensures the full participation of rail MRT operators, encompasses and integrates other transit modes and operators, and minimizes the need for budgetary support. Input will be solicited from the Bank of Thailand to determine the licensing, financial, reporting, and security requirements that would apply to the fare collection and clearinghouse system operator. The action plan will also be underpinned by recommendations for a phased approach to integrated ticketing, starting with the rail MRT system, progressing to other transit modes, and possibly including e-commerce applications.

C. Cost and Financing

16. The total cost of the TA is estimated at \$645,000 equivalent, of which \$450,000 will be financed on a grant basis by ADB's TA funding program. The Government will finance the remaining \$195,000 equivalent by providing counterpart staff and other support facilities. The cost estimates and financing plan are in Appendix 2.

D. Implementation Arrangements

17. The Ministry of Finance will be the Executing Agency (EA) for the TA, with PDMO and OTP serving as implementing agencies (IAs). PDMO's principal area of responsibility will include financial policy issues whereas OTP will oversee matters pertaining to transport planning and operations. Similar to the implementation arrangements under the phase I TA, a working group jointly chaired by the deputy directors general of PDMO and OTP will provide comments, suggestions, and guidance at different stages of TA implementation. Tripartite reviews will involve the working group, consultants, and ADB. Inception, interim, draft final, and final reports will be submitted to ADB, PDMO and OTP directors general, and heads of other relevant offices and agencies for guidance and necessary action. PDMO and OTP will each appoint a project director to assist with daily implementation of the TA, as well as counterpart staff and other support services required by the consultants.

18. The TA will require a total of 12 person-months of international consultant inputs over a period of 9 months, starting in February 2007 and finishing in October 2007. Consulting services will be provided by a team of five individual international consultants: (i) an urban transport planner/team leader (3.0 person-months), (ii) a transport economist/policy specialist (2.5 person-months), (iii) a financial specialist on PPPs (2.5 person-months), (iv) a legal expert on concession agreements (2.0 person-months), and (v) a transit ticketing specialist (2.0 person-months). Because of the highly specialized skills and experience required of each consultant, the number of qualified experts is limited. To ensure that experts are of high caliber and meet the Government's expectations, consultants will be recruited on an individual basis rather than through a firm. The consultants will be engaged by ADB in accordance with its *Guidelines on the Use of Consultants* (2006, as amended from time to time). Outline terms of reference for the consultants are in Appendix 3.

19. The consultants will prepare an inception report within 2 weeks of mobilization, which will include a detailed work plan and schedule of deliverables agreed upon with ADB and the IAs. Interim reports will be submitted within the deadlines specified in the work plan. The draft final report will incorporate feedback from the EA, IAs, other relevant offices and agencies, and ADB. The team leader is responsible for submitting all required reports on behalf of the team. To facilitate the dissemination of TA findings and to solicit input from other stakeholders, including ADB's development partners, a series of forums will be conducted at selected intervals over the implementation period. Two workshops, one on operating concessions and another on integrated ticketing systems, will be conducted for the purpose of drawing on international experience and expertise. To further facilitate dissemination of the TA findings and recommendations, the final report will be provided in both hard copy and electronic format. An indicative outline for the final report is in Appendix 4.

IV. THE PRESIDENT'S DECISION

20. The President, acting under the authority delegated by the Board, has approved the provision of technical assistance not exceeding the equivalent of \$450,000 on a grant basis to the Government of Thailand for Infrastructure Investment Advisory Assistance (Phase II), and hereby reports this action to the Board.

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
<p>Impact Improved integration, operational efficiency, financial viability, and patronage of an expanded rail MRT system in Bangkok</p>	<p>O&M responsibilities for individual lines are awarded to private operators through viable concessions</p> <p>Greater physical and operational integration through a functioning single ticketing system</p> <p>Increased ridership levels on existing and new rail MRT lines</p>	<p>Official statistics and reports from relevant transit authorities and regulatory agencies</p> <p>Annual reports and data from operators of individual rail lines and the integrated ticketing system</p> <p>TA consultants' reports and ADB review missions</p>	<p>Assumptions</p> <ul style="list-style-type: none"> Investment program to expand the rail MRT system moves forward Political will and commitment to pursue reforms and recommendations under the TA <p>Risks</p> <ul style="list-style-type: none"> Resistance to reforms and implementation measures from vested interests Insufficient institutional capacity to structure and tender viable concessions
<p>Outcomes</p> <p>1. Specifications and procedures for tendering and structuring O&M concessions on individual rail lines to the private sector</p> <p>2. An action plan for the tendering, financing, implementation, and O&M of an integrated ticketing system for the rail MRT system</p>	<p>Indicative schedule, model contract documents, and technical specifications for tendering O&M concessions</p> <p>Analyses of the functional requirements, institutional arrangements, and legal requirements for implementing an integrated ticketing system</p>	<p>TA working group meetings</p> <p>TA consultants' reports and ADB review missions</p>	<p>Assumptions</p> <ul style="list-style-type: none"> Fare policies and revenue sharing arrangements translate into financially viable concessions Existing operators participate in an integrated ticketing system <p>Risks</p> <ul style="list-style-type: none"> Lack of clarity and predictability on fare levels and revenue sharing arrangements Resistance to transfer O&M for integrated ticketing system to third party
<p>Outputs</p> <p>1. Financial model for defining terms of operating concession for select rail lines</p> <p>2. Concession contract specifications and tendering procedures</p> <p>3. Analysis of functional, technological and operating requirements of an integrated</p>	<p>TA implementation adheres to schedule</p> <p>Recommendations reflect sound principles and procedures that can be realistically achieved</p> <p>Recommendations are clear, specific, and practical</p>	<p>Consultations with all relevant agencies and stakeholders on recommendations</p> <p>Feedback received from the working group</p> <p>TA consultants' reports and ADB review missions</p>	<p>Assumptions</p> <ul style="list-style-type: none"> Consensus among relevant agencies on TA recommendations Commitment of the Government to implement reforms and recommended measures Availability of data and counterpart staff to undertake analyses <p>Risks</p> <ul style="list-style-type: none"> Lack of cooperation in

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
ticketing system 4. Assessment of procurement options for an integrated ticketing system 5. Action plan for tendering and implementing an integrated ticketing system	The Government, ADB, and other relevant stakeholders are satisfied with the scope, quality, and substance of the TA outputs		sharing data and information <ul style="list-style-type: none"> • Inadequate guidance provided by the Government and ADB at various stages of TA implementation • Consultants do not possess the requisite skills and experience to undertake the TA
Activities with Milestones 1. Preparing Concession Contracts for Private Sector O&M of New Rail MRT Lines 1.1 Collect data on alternative fares, ticket product types, and fare implementation methods for selected lines earmarked for construction. 1.2 Estimate appropriate fare elasticity factors to simulate changes in ridership levels on individual lines, taking into account their integration into the MRT network. 1.3 Simulate gross operating revenues under different fare and ridership levels. 1.4 Develop operating cost estimates and calculations for potential operator investments in rolling stock and other equipment. 1.5 Combine the results of 1.3 with 1.4 to define an appropriate service fee and payment structure for an operating concession contract. 1.6 Based on the results of 1.5, evaluate the applicability of net-cost or gross-cost concession contracts for O&M of the selected lines. 1.7 Develop a strategic approach for structuring and restructuring concession contracts that accounts for the expansion of the rail MRT system, achieves value for money for the Government, and maximizes the net social benefits of an integrated transit network. 1.8 Prepare model net-cost and gross-cost concessions for rail line O&M that include performance specifications. 1.9 Map out a tendering strategy that complies with the procedural requirements of the Act on Private Participation in State Undertakings, 1992. 1.10 Prepare tender document specifications, criteria for bid evaluations, and an indicative schedule that complies with the 1992 Act. 2. Assessing the Functional, Technological, and Operational Requirements of an Integrated Ticketing System 2.1. Conduct a detailed assessment of the functional requirements of an integrated ticketing system for Bangkok. 2.2. Take into account fare policies, revenue sharing arrangements, plans to encompass new operators and different transit modes, the need to improve physical connections between rail stations (as well as bus depots and ferry landings), and potential e-commerce linkages. 2.3. Examine how alternative fare policies could impact existing and future rail MRT operators, the operators of other transit modes, and the Government's budget.			Inputs <ul style="list-style-type: none"> • ADB: staff support for monitoring TA implementation; grant financing of \$450,000 to cover 12 person-months of international consultant inputs and other TA expenses • Government: provision of information and data, access to relevant agencies, coordination support, counterpart staff, and office space equivalent to \$195,000. • Others: strategic input is also expected from key public and private stakeholders, and development partners in Thailand

<p>2.4. Outline specifications for an open architecture platform to allow the ticketing system to accommodate additional operators, transit modes, and new applications over time.</p> <p>2.5. Detail further operational aspects of an integrated ticketing system such as card production and distribution, customer services, and equipment maintenance.</p> <p>3. Evaluating Procurement Options for an Integrated Ticketing System</p> <p>3.1. Analyze the merits of a public-private partnership for procurement of an integrated ticketing system compared with alternative approaches.</p> <p>3.2. Take into account the need to secure the participation of all rail MRT operators (with eventual expansion to operators of other transit modes); the desired functional characteristics of the system (including potential e-commerce applications); potential institutional responsibilities for operational and maintenance requirements (as well as the associated risk management requirements); experiences and lessons from other integrated urban MRT systems; and the option that maximizes the Government's value for money based on life-cycle costing.</p> <p>3.3. Explore the prospect for equity financing from private sources and how this could influence the approach to procurement.</p> <p>3.4. Evaluate the advantages and disadvantages of a DBOM approach to procurement compared with a DB option.</p> <p>3.5. Assess different possible institutional arrangements for system O&M that take into account ongoing service requirements such as account management, cash collection, customer relations, marketing support, technical help, etc.</p> <p>3.6. Recommend an institutional design and structure for the management of an integrated ticketing contract.</p> <p>4. Preparing an Action Plan for Tendering and Implementing an Integrated Ticketing System</p> <p>4.1. Prepare the technical components of tender documents for an integrated ticketing system that encompasses existing and future rail MRT operators.</p> <p>4.2. Coordinate with existing operators to define the system's technical specifications and consider the interface of integrated ticketing with existing and future concession arrangements (i.e., net-cost and gross-cost) and fare sharing provisions.</p> <p>4.3. Prepare tender documents that reflect the most appropriate approach to procurement (i.e., DBOM, DB, or some variation thereof).</p> <p>4.4. Draw on best practices and lessons from other cities to outline bidding procedures and proposal evaluation criteria.</p> <p>4.5. Prepare indicative estimates of the capital and O&M costs of a new system.</p> <p>4.6. Develop a comprehensive action plan for the tendering process and eventual implementation of an integrated ticketing system which includes proactive measures for the Government to define a fare policy that ensures the full participation of rail MRT operators, encompasses and integrates other transit modes and operators, and minimizes the need for budgetary support.</p> <p>4.7. Solicit input from the Bank of Thailand to determine the licensing, financial, reporting, and security requirements that would apply to the fare collection and clearinghouse system operator.</p>	
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4.8 Incorporate recommendations for a phased approach to integrated ticketing, starting with the rail MRT system, progressing to other transit modes, and possibly including e-commerce applications.	
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ADB = Asian Development Bank, DB = design-build, DBOM = design-build-operate-maintain, MRT = mass rapid transit, O&M = operation and maintenance, TA = technical assistance.

COST ESTIMATES AND FINANCING PLAN
(\$'000)

Item	Total Cost
A. Asian Development Bank (ADB) Financing^a	
1. Consultants	
a. Remuneration and Per Diem	
i. International Consultants	294.75
b. International and Local Travel	40.00
c. Reports and Communications	8.00
2. Conferences	53.00
3. Miscellaneous Administration and Support Costs	9.25
4. Representative for Contract Negotiations	0.00
5. Contingencies	45.00
Subtotal (A)	450.00
B. Government Financing	
1. Office Accommodation and Transport	36.00
2. Remuneration and Per Diem of Counterpart Staff	125.00
3. Others	34.00
Subtotal (B)	195.00
Total	645.00

^a Financed by ADB's technical assistance funding program.
Source: ADB estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

A. Scope

1. The technical assistance (TA) will require a total of 12 person-months of input from five individual international consultants. The scope of consulting services corresponds with the four principal components of the TA: (i) preparing concession contracts for private sector operation and maintenance (O&M) of the new rail mass rapid transit (MRT) lines; (ii) assessing the functional, technological, and operational requirements of an integrated ticketing system; (iii) evaluating procurement options for an integrated ticketing system; and (iv) preparing an action plan for tendering and implementing an integrated ticketing system. The TA deliverables are outlined under para. 19 of the main text of this report.

B. Individual Consultants

2. Required qualifications and outline terms of reference for each of the individual international consultants are presented below.

1. Urban Transport Planner/Team Leader (international, 3 person-months)

3. The team leader will be a transport planner with extensive experience working in Thailand and detailed knowledge of the issues associated with the proposed expansion of the Bangkok rail MRT system. As team leader, the consultant will ensure the timely delivery of quality outputs for all tasks and activities under the TA; monitor implementation progress and fine-tune the TA as necessary, paying particular attention to proper sequencing of various TA elements; ensure that inputs are adequately distributed among the different TA components; liaise between the Government and ADB; plan and organize all TA presentations and workshops; and bring to the attention of the Government and ADB all matters that need to be addressed for facilitating TA implementation. In terms of technical input, the consultant will focus on how transit fare policies influence the structure of O&M concessions as well as the implementation of integrated ticketing systems. Specific tasks will include the following:

- (i) Describe the Government's policy framework for setting and adjusting fares on the rail MRT lines, and compare this approach with fare policies for other modes of transit.
- (ii) Elaborate the interrelationship and implications of the Government's transit fare policies on appropriate forms of concession agreements for the O&M of new rail lines.
- (iii) Present recommendations for improving the existing fare policy—based on plans to encompass new operators into the rail MRT network as well as different transit modes—for sharing revenues across different rail operators, and for minimizing the need for budgetary support.
- (iv) Consider the interface of an integrated ticketing system with existing and future concession arrangements (i.e., net-cost and gross-cost) and fare sharing provisions, given input from existing rail line operators.
- (v) Coordinate with the transit ticketing specialist to prepare a comprehensive action plan for the tendering process and eventual implementation of an integrated ticketing system that includes proactive measures for the Government to define a fare policy that ensures the full participation of rail MRT operators, encompasses

and integrates other transit modes and operators, and minimizes the need for budgetary support

2. Transport Economist/Policy Specialist (international, 2.5 person-months)

4. The transport economist/policy specialist will have experience in addressing transport policy issues in Thailand and knowledge of existing transit fare policies, rail MRT operating costs, financial modeling, and the details of net-cost and gross-cost concession agreements for O&M. The consultant will have the following responsibilities:

- (i) Evaluate the applicability of net-cost or gross cost concession contracts for O&M, drawing upon the financial model developed to simulate operating costs and revenues for select rail MRT lines, as well as potential investments in rolling stock and other equipment.
- (ii) Develop a strategic approach for structuring and restructuring concession contracts that accounts for the expansion of the rail MRT system, achieves value for money for the Government, and maximizes the net social benefits of an integrated transit network.
- (iii) Prepare draft net-cost and gross-cost O&M concession contracts that include performance specifications, maintenance responsibilities, and causes for contract termination.
- (iv) Map out a tendering strategy for O&M concessions that complies with the procedural requirements of the Act on Private Participation in State Undertakings, 1992.
- (v) Prepare tender document specifications to solicit bids for O&M concessions, define criteria for bid evaluations, and outline an indicative schedule that complies with the 1992 Act and ensures that an operator is selected prior to the completion of civil works.

3. Financial Specialist on PPPs (international, 2.5 person-months)

5. The financial specialist on public-private partnerships (PPPs) will have knowledge of the financing and financial performance of the current skytrain and subway systems within the Bangkok MRT network, understand the nature of the respective concession agreements, and possess financial modeling skills. The consultant will be responsible for the following:

- (i) Collect data on alternative fares, ticket product types, and fare implementation methods for select lines earmarked for construction.
- (ii) Estimate appropriate fare elasticity factors to simulate changes in ridership levels on individual lines, taking into account their integration into the MRT network, and simulate gross operating revenues under different fare and ridership levels.
- (iii) Develop operating cost estimates and calculations for potential operator investments in rolling stock and other equipment.
- (iv) Combine the operating cost and revenue estimates to define an appropriate service fee and payment structure for an operating concession contract.
- (v) Coordinate with the transit ticketing specialist to prepare indicative estimates of the capital and O&M costs of an integrated ticketing system.

4. Legal Expert on Concession Agreements (international, 2 person-months)

6. The legal expert will be familiar with the application of Thai laws in structuring and enforcing concession agreements for projects involving PPPs. The consultant will also be knowledgeable of the Act on Private Participation in State Undertakings, 1992, and the procedures for its application. The legal expert will be responsible for the following:

- (i) Coordinate with the transport economist/policy specialist to prepare draft net-cost and gross-cost O&M concession contracts that include performance specifications, maintenance responsibilities, and causes for contract termination.
- (ii) Map out a tendering strategy for O&M concessions that complies with the procedural requirements of the Act on Private Participation in State Undertakings, 1992.
- (iii) Prepare tender document specifications to solicit bids for O&M concessions, define criteria for bid evaluations, and outline an indicative schedule that complies with the 1992 Act and ensures that an operator is selected prior to the completion of civil works.
- (iv) Solicit input from the Bank of Thailand to determine the licensing, financial, reporting, and security requirements that would apply to the fare collection and clearinghouse operator of an integrated ticketing system.

5. Transit Ticketing Specialist (international, 2 person-months)

7. The transit ticketing specialist will have experience in the design, tendering, contract negotiation, implementation, and management of integrated ticketing systems for large-scale urban MRT networks. The transit ticketing specialist will be responsible for the following:

- (i) Coordinate with all team members to conduct a detailed assessment of the functional requirements of an integrated ticketing system for Bangkok, taking into account fare policies, revenue sharing arrangements, plans to encompass new operators and different transit modes, the need to improve physical connections between rail stations (as well as bus depots and ferry landings), and potential e-commerce linkages.
- (ii) Outline specifications for an open architecture platform to allow the ticketing system to accommodate additional operators, transit modes, and new applications over time; detail further operational aspects of an integrated ticketing system such as card production and distribution, customer services, and equipment maintenance.
- (iii) Analyze the merits of a public-private partnership for procurement of an integrated ticketing system compared with alternative approaches, considering the need to secure the participation of all rail MRT operators (with eventual expansion to operators of other transit modes); the desired functional characteristics of the system (including potential e-commerce applications); the potential institutional responsibilities for O&M (as well as the associated risk management requirements); experiences and lessons from other integrated urban MRT systems; and the option that maximizes the Government's value for money based on life-cycle costing.

- (iv) Evaluate the advantages and disadvantages of a design-build-operate-maintain (DBOM) approach to procurement compared with a design-build (DB) option, and assess different possible institutional arrangements for system O&M.
- (v) Prepare the technical components of tender documents for an integrated ticketing system that encompass existing and future rail MRT operators and reflect the most appropriate approach to procurement (i.e., DBOM, DB, or some variation thereof); draw on best practices and lessons from other cities to outline bidding procedures and proposal evaluation criteria.
- (vi) Develop a comprehensive action plan for the tendering process and eventual implementation of an integrated ticketing system that incorporates recommendations for a phased approach, starting with the rail MRT system, progressing to other transit modes, and possibly including e-commerce applications.

OUTLINE OF THE FINAL REPORT

EXECUTIVE SUMMARY

- I. STRUCTURING VIABLE CONCESSIONS FOR RAIL LINE OPERATIONS
 - A. The Importance of a Transparent and Predictable Fare Policy
 - B. Operating Costs, Revenues, and Capital Investment Considerations
 - C. Model Net-Cost and Gross-Cost Concession Agreements
 - D. Tendering Procedures, Strategies, and Safeguards
- II. FUNCTIONAL REQUIREMENTS OF AN INTEGRATED TICKETING SYSTEM
 - A. Considerations Related to Fare Policies and Revenue Sharing Arrangements
 - B. Incorporating New Operators, Different Modes of Transit, and e-Commerce
 - C. Institutional and Regulatory Issues for Clearinghouse Operations
- III. PROCUREMENT OPTIONS FOR AN INTEGRATED TICKETING SYSTEM
 - A. Separating Equipment Requirements from Systems Operations
 - B. The Relationship Between Financing Sources and System Applications
 - C. Management and Oversight of Clearinghouse Operations
- IV. ACTION PLAN FOR IMPLEMENTING AN INTEGRATED TICKETING SYSTEM
 - A. Tender Specifications and Procedures for Procuring an Integrated Ticketing System
 - B. Compliance with Applicable Legal and Regulatory Requirements
 - C. Strategic Action Plan for Financing and Implementing an Integrated Ticketing System
- V. CONCLUSIONS AND RECOMMENDATIONS