OUTPUT: RURAL ROAD ASSET MANAGEMENT

A. Introduction

1. **The Project**. The Royal Government of Cambodia (the Government) has requested for a loan from Asian Development Bank (ADB) for the Rural Roads Improvement Project II (RRIP II), which will implement the improvement of 39 roads of about 729 kilometers (km) located in nine provinces, including the improving climate resilience access by paving 50 km of roads and 11 jetties in the five Mekong River islands in Kampong Cham Province. The projects provinces are: Battambang, Banteay Meanchey Kampong Chhnang, Kampong Thom, Pursat, and Siem Reap and, all located in the Tonle Sap region and Kampong Cham, Kampong Speu, and Takeo located to the north east, south, and southwest of Phnom Penh, respectively. The civil works comprise the improvement of existing earth or gravel surfaced roads to a double bituminous surface treatment (DBST) and green planting along the project roads. There will be no widening of the existing roads to avoid resettlement impact. Improvements to road drainage and road structures will also be undertaken where necessary.

2. There are five key outputs in this project: (i) rural road improvements; (ii) rural road asset management; (iii) rural road safety and community awareness program; (iv) project management support; and (v) connectivity improvements for Mekong River Islands. This supplementary appendix focuses on the rural road safety and community awareness program output.

3. **Road Network of Cambodia and Related Issues.** Cambodia's road network of approximately 50,900 km includes: (i) national roads (primary national highways) with a total length of about 4,800 km; (ii) provincial roads (secondary national highways) with a total length of about 6,600 km; and (iii) about 39,500 km of rural roads. Management of national and provincial roads is the responsibility of the Ministry of Public Works and Transport (MPWT), whereas management of rural roads is the responsibility of Ministry of Rural Development (MRD).

4. In recent years, the Government and its development partners have invested strongly to improve the road network at the national and provincial levels of the road network, much of which is now at a bitumen-surfaced standard. However, as the rural economy is becoming increasingly dependent on the improved national road network, the rural road network continues to deteriorate due to rapidly growing traffic, combined with lack of maintenance financing, poor road maintenance standards, inadequate institutional capacity in road maintenance and management, lack of private contractor capacity, and shortcomings in design and construction methods. As a consequence of relatively rapid economic development and activity, overloading of cargo vehicles has become the major cause of road damage in Cambodia in the past 5 years. This is also a serious issue on rural roads due to overloaded trucks that haul agricultural products and those that carry quarry materials for construction.

5. **Initiatives to date**. ADB and other development partners have initiated several interventions to remedy the aforementioned issues. As almost no rural road is all weather, the Rural Roads Improvement Project[1] initiated a large scale road improvement in 2010 paving 505 km of priority rural roads in seven provinces (Battambang, Kampong Cham, Kampong Chhnang, Kampong Speu, Kampong Thom, Pursat, and Siem Reap) to DBST standard.

[1] ADB. 2010. *Report and Recommendation of the President (RRP) to the Board of Directors: Proposed Loan to the Kingdom of Cambodia for Rural Roads Improvement Project*. Manila (Loan 2670-CAM).

6. Preservation of the road investments through effective road asset management is of the utmost importance to MRD and, although some capability has been developed for the management of gravel surfaced roads and those of a lower standard, there is the demand for significantly higher standards and capability in all levels of asset management. Therefore, Loan 2670[2] has taken initiatives to introduce the need for effective management of bitumen surfaced roads. This proposed project will further implement a 729-km scale improvement of MRD's road assets from a laterite surface to DBST in the nine project provinces.

7. An essential part of the effective road asset management is the effective control of axle overloading in arresting deterioration and preserving the road assets. While ADB is currently supporting axle load control programs for the national and provincial road networks, Loan 2670 initiated axle load control on rural roads as a pilot. The proposed project aims to extend the ongoing pilot overloading control program to rural roads to all project provinces.

8. The capability and experience of local contracting firms is limited in Cambodia, which in turn limits their business opportunities and capability in providing quality services for the Government. This situation can be changed through a system of registration and effective training of registered firms to develop their eligibility for work. It is seen that support at the most local levels including commune and road maintenance committee levels will produce local opportunities for long-term employment in the roads sector.

9. The Government is engaged in deconcentration and decentralization programs which devolve responsibilities towards local levels and provide additive opportunities at a local and provincial level. Support for this program both enhances rural development and opportunities, and it is expected that this project will support these aims.

B. Objective of the Output

10. Given this background, the objective of this output is to improve the capability of MRD in managing its road assets and prioritizing investments in a manner that it suitable for attracting funding through national or development partner resources. Initiatives to reduce the force account, and attract private sector contractors to perform MRD's recurrent road maintenance activities, is another key objective under this output. Continuous training of MRD staff and other road engineering professionals, in association with the Board of Engineers of Cambodia (BEC) and the Cambodian contractor industry, is a key activity under the services.

C. Scope of the Output

11. The consultants to be recruited to implement this output will be responsible for enhancing the capacity for road asset management in Cambodia by developing an understanding of the current capability on road asset management, applying the road asset management model initiated in an ongoing intervention for MPWT,[3] with proper modification and lessons learned[4] to minimize the force account in road maintenance works for private contracting, and then providing robust solutions primarily through effective training programs to resolve them effectively. The consultants will also be responsible for feedback and further

[2] Footnote 1.
[3] ADB. 2009. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Kingdom of Cambodia for the Road Asset Management Project*. Manila (Loan 2406-CAM).
[4] Lessons Learned (accessible from the list of linked documents in Appendix 2 of the RRP).

developing road asset management system used by the MRD, through ongoing Loan 2670. Additional portable equipment for axle load control will be procured under the output and its use will be expanded in the project area. The equipment will be used for enforcement in accordance with the Axle Load Control Subdecree for Rural Roads. Practical training in road design, construction, and maintenance techniques is essential for effective training and, to this end, access to the civil works contractors' equipment will be provided for training purposes from time to time. Costs for access to equipment will be met under the civil works program.

12. The consulting services will be provided by a consulting firm, joint venture, or consortium of consulting firms, to be appointed by MRD in accordance with ADB's Guidelines on the Use Consultants (2013, as amended from time-to-time). The consultant's role and responsibilities will include the following:

(i) investigate the current situation of force account within MRD for recurrent maintenance works and propose a practical model similar to that developed under the Road Asset Management Project[5] for MPWT and pilot implement this model within this output.
(ii) analyze and evaluate the road asset management regimes used or developed by MRD.
(iii) review MRD's current capabilities for road inventory and asset management, and the methodologies and systems that are in use.
(iv) review MRD's system for annual and periodic budgeting, and enhance such systems to ensure rural national and development partners.
(v) devise and implement a pilot program for a classified traffic counting system for MRD's road assets using national standard systems of classification and quantification, including factors for vehicle loading based on data held by the MPWT, and include analysis in the prioritization of the network.
(vi) prepare and deliver effective formal and practical training programs which is consistent with the Project's Gender Action Plan (GAP) to enhance the capability of MRD and its Provincial Department of Rural Development (PDRD) in the design, construction, maintenance, and management of both earth and gravel surfaced roads, and having developed an understanding for the current capability for paved roads, prepare and provide effective training for the management of paved roads.
(vii) provide management training, as well as technical training, to the PDRDs.
(viii) support the BEC by preparing and delivering effective formal and practical training programs suitable for formal road engineering professional development to a national and international standard. Some of the training will be using the training network requirements captured and prioritized for effective investments in the network by training of the trainers approach to ensure sustainability.
(ix) support the BEC through the planning and undertaking of visits for senior BEC officials to a regional and international institute of substantial international reputation to assist in their development of a suitable model for a professional body (BEC) for Cambodia.
(x) based on an understanding of the capability of the existing national, provincial, and local contracting firms and entities, devise and assist in the development of a professional association to support the industry in Cambodia. Provide the same for the consulting firms. Devise suitable linkages from the professional

[5] Footnote 3.

associations to the BEC.

(xi) coordinate all aspects of the program with project stakeholders to inform and ensure the program is complementary in nature to the country-wide effort to achieve durable road infrastructure.

D. Implementation Arrangements

13. It is estimated that the consultant will provide a total of 128 person-months of inputs from an international and national experts on an intermittent basis over a period of 3 years.

14. MRD will provide an office with basic utilities. Office equipment and utilities for the consultant will be financed under the consulting services contract. Transport and accommodation will also be financed under the consulting services contract.

15. The Rural Road Asset Management output will be undertaken at MRD under the overall guidance of the Director General for Technical Affairs. The consultant will work with the detailed design and implementation supervision (DDIS) consultants. The DDIS consultants will provide coordination for the consultants of this output, and provide procurement support for the engagement of local consultants or other entities and procurement of equipment. One equipment package is envisaged to provide portable weighbridges and enforcement patrol vehicles among other items. Procurement will be in accordance with ADB's Procurement Guidelines (2013, as amended from time-to-time).

E. Consulting Services

16. The consultant will be a consulting firm, joint venture, or consortium of consulting firms, with extensive experience in road asset management, training, and axle load control with specialist staff with preferably more than 10 years' experience including preferably more than 5 years in the region. The consultant will be fully conversant with international road and pavement design, road construction and maintenance standards, and techniques and guidelines, and they will be fully conversant with the engineering links between pavement design, pavement drainage, road maintenance, disaster mitigation strategy, and traffic and axle load control for flexible road pavements. They will also be able to train and guide effectively at a multitude of levels, and communicate clearly and share knowledge with the stakeholders. The composition of consultants and person-month are shown below.

Table 1: Rural Road Asset Management Consultant Input Requirement

Consultant team		**Person-month**
International:	Team Leader/Senior Road Maintenance Engineer	16
	Pavement Engineer	2
	Axle Load Specialist	6
	Reorganization Specialist	4
	Subtotal	**28**
National:	Deputy Team Leader/Road Maintenance Engineer	36
	Pavement Engineer	4
	Axle Load Specialist	16
	Institutional Analysis Specialist	4
	Legal expert	4
	Database manager	24
	Geographic Information System specialist	12
	Subtotal	**100**
	Total	**128**

17. The selected consulting firm or individual consultant's team will execute the tasks, but not limited to them, as detailed below.

F. Terms of Reference for Consulting Services

International Experts

1. Team Leader/Senior Road Maintenance Engineer (International, 16 person-months)

18. The candidate should be an internationally recognized professional with preferably more than 20 years' experiences in the engineering fields of road maintenance planning, pavement and drainage, and traffic and axle load control for flexible road pavements. Must have a good all-round knowledge of road maintenance in Asia Pacific. Must have hands-on working experience in road maintenance of DBST pavement in rural areas of any developing nation. Must have successful experience in road asset management at senior levels. Must have demonstrated success working with wide range of road maintenance planning and axle load control of government agencies, and ability to work with senior government officials.

19. The Team Leader will undertake the following tasks but will not be limited to them:

(i) develop a draft Policy and Strategy for rural roads through the Government processes to achieve a legally supported document.
(ii) review MRD's current capabilities for road inventory and asset management and the methodologies and systems that are in use.
(iii) devise a suitable low-cost system for managing the road assets for use by MRD. The system may be spreadsheet based, but the consultant is not limited to this approach.
(iv) review MRD's system for annual and periodic budgeting, and enhance such systems to ensure rural national and development partners.
(v) manage all implementation, administration and financial requirements;
(vi) lead consultations on road maintenance in the project target area;
(vii) devise and implement a classified traffic counting system for MRD's road assets using national standard systems of classification and quantification including factors for vehicle loading based on data held by the MPWT, and include analysis in the prioritization of the network.
(viii) prepare and deliver effective formal and practical training programs, which is consistent with the Project's GAP to enhance the capability of MRD and its PDRD in the design, construction, maintenance, and management of both earth and gravel surfaced roads, and having developed an understanding for the current capability for paved roads, prepare and provide effective training for the management of paved roads.
(ix) provide management training, as well as technical training, to the PDRDs.
(x) support the BEC by preparing and delivering effective formal and practical training programs suitable for formal road engineering professional development to a national and international standard. Some of the training will be using the training network requirements captured and prioritized for effective investments in the network by training of the trainers approach to ensure sustainability.
(xi) support the BEC through the planning and undertaking of visits for senior BEC officials to a regional and international institute of substantial international

reputation to assist in their development of a suitable model for a professional body (BEC) for Cambodia.

(xii) based on an understanding of the capability of the existing national, provincial, and local contracting firms and entities, devise and assist in the development of a professional association to support the industry in Cambodia. Provide the same for the consulting firms. Devise suitable linkages from the professional associations to the BEC.

(xiii) develop and include a disaster mitigation strategy (essentially flooding) component into PDRD's capability by close coordination with the Climate Change Adaptation consultants.

(xiv) coordinate all aspects of the program with project stakeholders to inform and ensure the program is complementary in nature to the country-wide effort to achieve durable road infrastructure.

(xv) with the assistance of the MRD and the DDIS consultants on procurement and coordination, procure the necessary equipment, portable weigh scales for axle load control, and training materials and capacity building resources including the services of local consultants.

(xvi) provide manuals for road maintenance to the PDRD officers in target provinces and other key partners; and

(xvii) ensure complete and on-time submission of formal written reports, including the inception report, monthly report, quarterly reports, and completion report.

20. The Team Leader, through the effective leadership of the consultant team and effective cooperation with the DDIS consultants, will be responsible for all aspects of the consulting services leading to the successful implementation of the output.

2. Pavement Engineer (International, 2 person-months)

21. The Pavement Engineer, having a bachelor degree in civil engineering, will be an internationally qualified professional engineer with preferably more than 12 years' experience. He or she should have experience in pavement design, construction, and analysis of DBST pavement with capacity building outputs, and with extensive experience in Cambodia or tropical weather countries within similar geographical areas in the region.

(i) report to the team leader, and support the team leader in method of analysis for pavement performance of rural roads and capacity building materials;

(ii) analyze the reason of pavement failure of rural road networks and provide most suitable repair and maintenance method;

(iii) review and collect data on affordable pavement performance analysis equipment, and devise most suitable pavement evaluation system together with necessary equipment and relevant specification;

(iv) provide capacity building training on the pavement design and evaluation of pavement performance to MRD and PDRD officers;

(v) establish seminar plan on the pavement design, evaluation, and maintenance for MRD, PDRD officers, and other interested stakeholders;

(vi) devise pavement analysis manuals for the use of MRD and PDRDs in preparing periodic maintenance plan; and

(vii) provide regular and timely technical assistance and support on pavement maintenance to the PDRD officers in target provinces.

3. Axle Load Specialist (International, 6 person-months)

22. The Axle Load Specialist, having a bachelor degree of educational background, will be an internationally qualified professional engineer with preferably more than 10 years' experience. He or she should have experience in preparing regulation of axle load control, design of vehicle monitoring system, and monitoring the performance in axle load control with special experience in axle load control operations and in Cambodia.

(i) report to the team leader, and support the team leader in axle load control on rural roads and capacity building materials;
(ii) review existing laws and regulations on the vehicle axle load control and devise most suitable law or regulation for the control of axle load on the rural roads networks;
(iii) collect data on portable weigh scales which has a data recording and/or production function currently available in the international market, and prepare technical specification for procurement;
(iv) devise operation plan of axle load control team, including pilot plan and long-term master plan on the axle load control for rural roads networks;
(v) provide on-the-job training to PDRD officers on the method of checking axle loads and processing of data, and report procedures;
(vi) device organizational framework for axle load control including monitoring and audit procedures, etc.; and
(vii) monitoring the performance of the axle load control team and evaluate the outcome on the axle load control.

4. Reorganization Specialist (International, 4 person-months)

23. The Reorganization Specialist, having a bachelor degree of educational background, will be an internationally qualified professional engineer with preferably more than 12 years' experience. He or she should have experience in evaluation, analysis, and reorganization of institutional framework of government organization and/or associations, with capacity building outputs, and with extensive experience within similar geographical areas in the region.

(i) review MRD's current capabilities for road inventory and asset management, and the methodologies and systems that are in use.
(ii) review MRD's system for annual and periodic budgeting, and enhance such systems to ensure rural, national, and development partners;
(iii) support the BEC through the planning and undertaking of visits for senior BEC officials to a regional and international institute of substantial international reputation to assist in their development of a suitable model for a professional body (BEC) for Cambodia;
(iv) based on an understanding of the capability of the existing national, provincial, and local contracting firms and entities, devise and assist in the development of a professional association to support the industry in Cambodia;
(v) provide the same for the consulting firms. Devise suitable linkages from the professional associations to the BEC; and
(vi) provide capacity building training to MRD and PDRD officers on the organizational framework, duties, and responsibilities on the road asset management; and
(vii) follow-up and evaluation of performance of those associations established on the Road Asset Management Consultant (RAMC) scheme.

National Experts

1. Deputy Team Leader/Road Maintenance Engineer (National, 36 person-months)

24. The candidate should be a road maintenance engineer with a bachelor degree, preferably more than 15 years' experience in the engineering fields of road maintenance planning, budgeting, design, and construction of DBST pavement road in Cambodia. Must have hands-on working experience in road maintenance of provincial and/or rural roads. The deputy team leader will assist the team leader on overall activities of RAMC, and works as acting team leader and carry out administration of the consultant and prepare monthly report and quarterly report while the team leader is away from the project. The Deputy Team Leader will undertake the following tasks but will not be limited to them:

(i) assist team leader in devising a draft Policy and Strategy for rural roads through the Government processes to achieve a legally supported document.
(ii) review MRD's current capabilities for road inventory and asset management and the methodologies and systems that are in use.
(iii) devise a suitable low-cost system for managing the road assets for use by MRD. The system may be spreadsheet based, but the consultant is not limited to this approach.
(iv) review MRD's system for annual and periodic budgeting, and enhance such systems to ensure rural, national, and development partners.
(v) manage all implementation, administration, and financial requirements;
(vi) lead consultations on road maintenance in the project target area during absence of team leader;
(vii) support Reorganization Specialist in developing a professional association of contractors and consultants to support the industry in Cambodia; and
(viii) ensure complete and on-time submission of formal written reports, including the inception report, monthly report, quarterly reports, and completion report.

2. Pavement Engineer (National, 4 person-months)

25. The pavement engineer should have preferably more than 10 years' experience with a bachelor's degree in pavement design, construction, and analysis of DBST pavement in Cambodia. The tasks and responsibilities of pavement engineer are the same as the international pavement engineer.

3. Axle Load Specialist (National, 16 person-months)

26. The Axle Load Specialist shall have preferably more than 10 years' experience with a bachelor's degree in preparing regulation of axle load control, design of vehicle monitoring system, and monitoring the performance in axle load control. The tasks and responsibilities of axle load control specialist are the same as the international axle load control specialist.

4. Institutional Analysis Specialist (National, 4 person-months)

27. The reorganization specialist shall have preferably more than 10 years' experience with a bachelor's degree in evaluation, analysis, and reorganization of institutional framework of government organization and/or associations. The tasks and responsibilities of reorganization specialist are the same as the international reorganization specialist.

5. Legal Expert (National, 4 person-months)

28. The legal expert shall have preferably more than 10 years' experience with a bachelor's degree in law, with experience in analysis and reorganization of institutional framework of government organization and/or associations. The tasks and responsibilities of the expert are to provide advice to the team leader and the international and national institutional analysis specialists to deal with local legal issues as encountered in the output implementation.

6. Database Manager (National, 24 person-months)

29. The specialist shall have preferably more than 10 years' experience with a bachelor's degree in Information Technology (IT) systems, dealing with database-related software. The tasks and responsibilities of this specialist are basically to maintain and update the databases created in Loan 2670 for road asset management. He or she needs to create additional databases, as required for the output.

7. Geographical Information System (GIS) Specialist (National, 12 person-months)

30. The GIS specialist shall have preferably more than 10 years' experience with a bachelor's degree in IT systems managing GIS databases for civil engineering type of works. The tasks and responsibilities of the specialist is to create new GIS systems as required for the project in asset management, ensuring the compatibility with other ongoing interventions within MRD of similar nature.

G. Reporting

31. The consultants will submit reports to ADB, MRD, and the Government of Australia as shown in the table below.

Table 2: Reports for Submission to ADB, MRD, and Government of Australia

Report	ADB	MRD	GOA
Inception Report (after six weeks)	3	3	3
Monthly Progress Reports	3	3	3
Quarterly Reports	3	3	3
Project Completion Report	3	3	3

ADB =Asian Development Bank; GOA = Government of Australia, MRD =Ministry of Rural Development.

H. Cost Estimate

32. The following table gives the indicative cost estimate for the output.

Table 3: Indicative Cost Estimates

Item	Cost ($)
International Road Asset Management Consultant and per diem	532,000
International travel	24,000
Land travel	43,000
Communication and reporting	36,000
National consultant services and per diem	220,000
Office Equipment	20,000
Field equipment	180,000
Training, etc.	46,000
Contingencies	110,000
Total	**1,211,000**