The European Union's Tacis Programme

Pre-Feasibility & Feasibility Studies for Road Sections of the Termez - Dushanbe - Sary Tash Road

Project No. EuropeAid/121985/C/SV/Multi

Project Completion Report

Reporting Period:
1 December 2007 – 13 May 2008

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Cover Page

Project Title	: Pre-Feasibility and Feasibility Studies for Road Sections of the Termez - Dushanbe – Sary Tash Road
Project Number	: 110 - 465
Beneficiary Country	: Kyrgyzstan

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Date of Report: 14.04.2008

Reporting period: 1 December 2007 – 13 May 2008

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Project Synopsis

Project Title	: Pre-Feasibility and Feasibility Studies for Road Sections of the Termez - Dushanbe - Sary Tash Road
Project Number	: 110-465
Country	: Kyrgyzstan

Project objectives: To contribute in the development of economic relations, trade and transport communications in Central Asia through improving regional road infrastructures

Planned outputs:
- Pre-Feasibility study with various alternatives
- Feasibility study for bankable project
- Detailed design
- Tender documents for construction
- Specific studies (hydrology, structures, environmental impact, social impact, toll/transit fees, financial management)
- Training of local staff

Project activities:
- Regional economic analysis
- Traffic surveys
- Topographical surveys
- Geotechnical surveys
- Hydrological studies
- Structural studies
- Environmental Impact assessment
- Social impact assessment
- Maintenance studies
- Analysis of design options
- Toll/Transit fees studies
- Financial Management assessment

Detailed design
Tender documents
Training

Project starting date	:	14 November 2006
Project duration	:	18 months

2. Summary of Project Progress since the Start of the Project

The Project started on 14 November 2006 for duration of 18 months.
As site surveys can be undertaken only from May to October due to hard climate conditions (continuous presence of snow), a unique site survey campaign could be organized from May to August 2007 for both Preliminary and Final Design.
Topographical, geotechnical and traffic surveys have been subcontracted to Kyrgyzdortransproekt.
Technical studies (in particular hydrology, slope stability and structures) could be carried out from May 2007 with thorough visual inspection on the site. Social and Environmental Assessment have been carried out in the same time.

The Asian Development Bank (ADB) jointly with the Ministry of Transport and Communications (MOTC) of Kyrgyzstan decided in April 2007 to incorporate the present Project into the ADB proposed China-Kyrgyzstan-Tajikistan Regional Road Corridor Improvement Project for which the ADB Appraisal mission took place in July 2007.
Consequently a Pre-Feasibility Engineering report with preliminary cost estimates and traffic estimates was issued end of July and given to the ADB Appraisal mission. An alignment alternative has then been selected by MOTC.
It was the basis for the approval by the Board of ADB in November 2007 of the so-called CAREC Regional Road Corridor Improvement Project. The corresponding grant to the Kyrgyz Republic will in particular cover reconstruction costs of the Project Road from Sary Tash to the Tajikistan border for a total amount of USD 20 millions plus contingencies.

The results of the topographical and geotechnical surveys with laboratory tests could be available only in August-September. The Feasibility Study with Preliminary Design could then be undertaken to confirm the Pre-Feasibility Study.
In parallel, due to the important future transit traffic from China to Tajikistan on the Project Road, a cross border facilitation study has been carried out. Recommendations have been made for the customs post at the Kyrgyz-Tajik border.

As the grant of ADB to the Kyrgyz Republic for the reconstruction of the Project Road was approved in November 2007, the MOTC and ADB desired that the construction works start as soon as possible during summer 2008. So Tender Documents derived from the Preliminary design were handed over to MOTC in mid-February.
It has been agreed with MOTC and ADB that the Final Technical Drawings and the Final Bill of Quantities derived from the Final Design will be delivered at the end of the Project period (beginning of May 2008). They will consequently be handed over to the successful bidder of the construction works, for revision of its price with the final quantities.
The tender for construction works was launched by MOTC on 20 March 2008, with bids requested from contractors for 6 May 2008.

Training is also part of the project. A first seminar was organised at the end of the Inception phase. The three local long term experts have been also trained regularly in order to be able to present in February 2008 the contents of the Feasibility Study in a second seminar.

3. Project Progress in Final Project Period

3.1. Background

During the preceding period, from June to November 2007, all technical surveys (traffic, topographical and geotechnical) have been carried out, processed and analysed. The Preliminary Design of the Road has been also completed, as well as traffic forecasts and Economic Analysis.

The complete Feasibility Study Report has been then prepared. It was initially planned for end November 2007. But after the changes of pavement requested by MOTC in the beginning of November, it was mutually agreed to postpone issuance of the Feasibility Study Report to end of December 2007 (see Progress Report N°2).

3.2. Finalisation of the Feasibility Study Report

The Feasibility Study Report was issued, as planned, end of December 2007, in both English and Russian versions.

It consists in a Main Report with the 15 following Annexes:

Annex 1 – Road Cross Sections Description
Annex 2 – Visibility and Road Safety Black Spot inventory
Annex 3 – Geotechnical Report
Annex 4 – Slope Stability Assessment Report
Annex 5 – River Erosion Protection Structures Design
Annex 6 – Drainage Structures Design
Annex 7 – Bridge Inspection and Design Report / Bridge Preliminary Design
Annex 8 – Pavement Design Report
Annex 9 – Maintenance Report
Annex 10 – Preliminary Engineering Drawings
Annex 11 – Project Cost Estimate
Annex 12 – Traffic, Economic and Financial Report
Annex 13 – Social Impact Assessment Report
Annex 14 – Environmental Impact Assessment Report
Annex 15 – Cross Border Facilitation Report

The Executive Summary of the Main Report is appended as Annex 1 to the present Project Completion Report.

The Economic Feasibility of the Project was confirmed in consistence with the Pre-Feasibility Report issued by BCEOM in July 2007 for the needs of the ADB Appraisal Mission.
It is also consistent with the subsequent ADB Report and Recommendation of the President to the Board of Directors for the CAREC Regional Road Improvement Project, issued in October 2007, covering road sections of the Dushanbe – Sary Tash Road in both Tajikistan and Kyrgyzstan.

Three pavement design options of the Project Road meeting the economic feasibility have been proposed, two of which consistent with the 20 M USD envelope of the ADB grant.

MOTC decided on 16 January 2008 to select the option 2b, consisting in asphalt concrete pavement on the first 50 km of the Road from Sary Tash and on the 6 km across the village of Daroot Korgon, and gravel surface on the remaining 80 km (see Minutes of Meeting in Annex 2).
In the same time MOTC approved the Feasibility Study.

3.3. Tender Documents / Bill of Quantities

As the grant of ADB to the Kyrgyz Republic for the reconstruction of the Project Road was approved in November 2007, the MOTC and ADB desired that the construction works start as soon as possible during summer 2008. It is reminded that due to climate conditions works cannot be carried out in winter.

It was then requested that the Tender Documents for the construction works be prepared for end of January 2008 (see Progress Report N° 2).
A first draft was handed over to MOTC end of January 2008, and after slight modifications final documents were delivered mid-February to MOTC.

The Technical Drawings and the Bill of Quantities, which are part of these Tender Documents, have been derived from the Preliminary Design of the Feasibility Study.

It has been agreed with MOTC and ADB that the Final Technical Drawings and the Final Bill of Quantities derived from the Final Design will be delivered at the end of the Project period (beginning of May 2008). They will consequently be handed over to the successful bidder of the construction works, for revision of its price with the final quantities.

The tender for construction works was launched by MOTC on 20 March 2008, with bids requested from contractors for 6 May 2008 (see letter from MOTC in Annex 3).

3.4. Seminar

A seminar was organised on 29 February 2008 in MOTC conference room in order to present the results of the Feasibility Study.

As requested by the Terms of Reference, the presentation was made by the three Long Term Local Experts, i.e. Transport Economist, Highway Engineer and Geotechnical Engineer, to demonstrate their knowledge of the Project and the relevant training they have received.

Four presentations were given: traffic estimates and forecasts, geometric design of the road with software used, geotechnical issues and pavement design, economic feasibility and presentation of options. It was followed by questions answered by the international experts.
The seminar was attended by about 40 people from the Ministry Headquarters, but also from the operational regions.

An additional presentation by the Pavement International Expert was also organised in continuation of this seminar, at the request of MOTC. It dealt with surface dressing of roads and use of Double Bituminous Surface Treatment (DBST).

3.5. Financial Management Assessment

The Financial Management Assessment Report has been produced in March 2008, by updating the previous similar reports issued for the ADB for other studies in MOTC.

In particular the questionnaire has been updated taking into account the new organisation of MOTC.

3.6. Detailed Design

The Detailed Design of the road started immediately after completion of the Preliminary Design in December 2007.
There are only few modifications in Detailed Design compared with Preliminary Design.

A new Bill of Quantities will be produced. The Final Design Technical Drawings and the Bill of Quantities will be handed over to MOTC early May 2008 to be subsequently given to the successful contractor(s) after submission of offers on 6 May (see Annex 3: letter of MOTC).

A Final Design Report will be also produced and issued before mid-May 2008.

TABLE 1: PROJECT PROGRESS REPORT

Project title : Pre-Feasibility and Feasibility Studies for Road Sections of the Termez-Dushanbe-Sary Tash Road	Project number : 110-465	Country : Kyrgyzstan	Page : 1
Planning period : 01/12/2007 – 13/05/2008	Prepared on : 14/04/2008	EC Consultant : Egis BCEOM International	

Project objectives: To contribute in the development of economic relations, trade and transport communications in Central Asia through improving regional road infrastructures.
Feasibility of the reconstruction of the road Sary Tash – Tajik border to be clarified and tender documents for bankable project to be produced.

No	ACTIVITIES IMPLEMENTED	TIME FRAME Months						INPUTS : PERSONNEL (working days)							
								Long Term Foreign		Long Term Local		Short Term Foreign		Short Term Local	
		Dec. 2007	Jan. 2008	Feb. 2008	March 2008	April 2008	May 2008	Planned	Utilised	Planned	Utilised	Planned	Utilised	Planned	Utilised
14	Preliminary Design and Quantity Estimates	x						+	+	+	+				
17	Preparation of Feasibility Study Report	x						+	+	+	+				
18	Seminar			x				+	+	+	+				
19	Financial Management Assessment		x	x	x			+	+	+	+				
23	Detailed Design and Engineering Drawings	x	x	x	x	x		+	+	+	+	15	10 (e)	116 Senior 262 Junior	115(e)Senior 262(e)Junior
25	Tender Documents	x	x	x				+	+	+	+	10	15 (e)		
26	Detailed Design Report					x	x	+	+	+	+				
							TOTAL	235	236(e)	252	251(e)	25	25 (e)	116 Senior 262 Junior	115(e)Senior 262(e)Junior

TABLE 2: RESOURCE UTILISATION REPORT

Project title : Pre-Feasibility and Feasibility Studies for Road Sections of the Termez - Dushanbe - Sary Tash Road	Project number : 110-465	Country : Kyrgyzstan	Page : 1
Planning period : 01/12/2007 – 13/05/2008	Prepared on : 14/04/2008	EC Consultant : Egis BCEOM International	
Project objectives: To contribute in the development of economic relations, trade and transport communications in Central Asia through improving regional road infrastructures. Feasibility of the reconstruction of the road Sary Tash – Tajik Border to be clarified and tender documents for bankable project to be produced.			

INPUTS – PERSONNEL (working days)	TOTAL PLANNED	ALREADY REALISED	PERIOD PLANNED	PERIOD REALISED	TOTAL REALISED
LONG TERM FOREIGN					
Team Leader	361	258	103	103 (e)	361 (e)
Highway Design Engineer	321	224	97	96 (e)	320 (e)
Geotechnical Engineer	200	165	35	37	202
Sub-total	882	647	235	236 (e)	883 (e)
LONG TERM LOCAL					
Transport Economist	305	242	63	62	304
Highway Design Engineer	354	249	105	108 (e)	357 (e)
Geotechnical Engineer	311	227	84	81	308
Sub-total	970	718	252	251 (e)	969 (e)
SHORT TERM					
Senior Foreign Experts	155	130	25	25 (e)	155 (e)
Senior Local Experts	594	478	116	115 (e)	593 (e)
Junior Local Experts	521	259	262	262 (e)	521 (e)
Sub-total	1270	867	403	402 (e)	1269 (e)
TOTAL	3122	2232	890	889 (e)	3121 (e)

TABLE 3: OUTPUT PERFORMANCE REPORT

Project title : Pre-Feasibility and Feasibility Studies for Road Sections of the Termez – Dushanbe –Sary Tash Road	Project number : 110-465	Country : Kyrgyzstan	Page : 1
Prepared on : 14/04/2008	Planning Period : 1/12/2007 – 13/05/2008	EC Consultant : Egis BCEOM International	
Output results	Deviation original plan	Reason for deviation	Comment on constraints & assumptions
- Feasibility Study Report with 15 Technical Annexes	Submitted 12/2007 in agreement with MOTC		
- Tender Documents	Submitted 02/2008 in agreement with MOTC and ADB		
- Seminar about Feasibility Study	Held on 29/02/2008 in agreement with MOTC and EC		
- Financial Management Assessment Report	Submitted 03/2008		
- Detailed Design	Submitted 04/2008		

4. Overall Report on the Total Project

4.1. General

The Project started on 14 November 2006 with arrival in Bishkek of the Team Leader.
A first mission was organised in mid-December 2006 to visit the Project site. The Project Road from Sary Tash to the Tajikistan border next to Karamyk is of difficult access from Bishkek, particularly in winter. No accommodation is possible in winter close to the Project Road.
This Road elevating from 3200 m in Sary Tash to 2500 m at the Tajikistan border is almost continuously covered with snow from November to April.
So no site survey (particularly topographical and geotechnical) could be reasonably carried out before May 2007.

4.2. Preliminary Office Work

As almost no site work could be undertaken during the first months after implementation of the team, this period was devoted to office work in Bishkek with collection of all existing data and all relevant existing studies.
The economy of the Project area has been extensively studied. It is a low populated poorly developed area, mainly devoted to traditional agriculture. Prospects of coal mining with export to China are nevertheless bright and will be significant for a large portion of the Project Road.
Standards designs have been collected for future use in the Project. Preliminary unit costs have been also collected from previous studies.

4.3. Subcontracting of Site Surveys

It was planned to subcontract the different site surveys (topographical, geotechnical and traffic) to a Kyrgyz entity. Kyrgyzdortransproekt (KDTP) happened to be the lowest and most responsive bidder due to its large experience in the Kyrgyz territory.
Negotiations have been concluded with KDTP for subcontracting to them all topographic works, soil investigations and relevant laboratory tests, and traffic counts, axle load surveys and origin-destination surveys.
All these works started on 11 May 2007. Processed results have been made available progressively from July to September 2007.

4.4. Specific Technical Studies

Specific technical studies could be also initiated in May 2007 with relevant site visits.
They concern hydrology, slope stability and structures in addition to existing road geometry.
Hydrology was the first theme to be dealt with due to the very severe problems of erosion encountered on the road which follows the Kyzyl Suu River.
Slope stability problems have also been exhaustively surveyed.
All 13 existing bridges on the present road have been thoroughly inspected. For each one, decision was made for repair or complete reconstruction.

A complete study of road geometry conditions was also carried out; data have been collected about existing geometry, roadside facilities, visibility conditions and risk zones during winter period.

In addition to these pure technical engineering surveys, the environment and social impact studies have been also undertaken during the summer period with relevant site surveys.

4.5. Asian Development Bank (ADB) Appraisal Mission / Pre-Feasibility Engineering Report

The Asian Development Bank (ADB) jointly with the Ministry of Transport and Communications (MOTC) of the Kyrgyz Republic decided in April 2007 to incorporate the present Project Road from Sary Tash to the Tajik border into the ADB proposed China-Kyrgyzstan-Tajikistan regional Road Corridor Improvement Project for which the ADB Appraisal mission took place in July 2007.

Consequently a Pre-Feasibility Engineering report with traffic estimates and preliminary cost estimates of various options was issued end of July and given to the ADB Appraisal mission. An alignment alternative, with in particular the by-pass of the village of Karamyk, was then selected by MOTC.

It was the basis for the approval by the Board of ADB in November 2007 of the so-called CAREC Regional Road Corridor Improvement Project. The corresponding grant to the Kyrgyz Republic will in particular cover reconstruction costs of the Project Road from Sary Tash to the Tajikistan border for a total amount of USD 20 millions plus contingencies.

4.6. Cross Border Facilitation and Toll

A Cross Border Facilitation study has been also carried out, as planned. After a survey of the facilities at the Tajik and Chinese borders and extensive interviews with customs officials and trade professionals, recommendations have been prepared to facilitate cross border trade.
The Project Road from Sary Tash to the Tajik border will indeed be an important transit corridor between People's Republic of China on one side, and Tajikistan on the other side.

Preliminary drawings of customs facilities in Karamyk at the Kyrgyz – Tajik border have been prepared. Two options have been considered: separate Kyrgyz facilities, or – as recommended – joint Kyrgyz / Tajik facilities on the Kyrgyz territory.

Recommendations of toll or transit fees for the Project Road have also been made. A moderate toll would be perceived at the border customs post in Karamyk. It would mostly affect the international transit traffic and leave local Kyrgyz traffic free on the Road.

4.7. Preliminary Design / Economic Analysis / Feasibility Study

The Preliminary Design could be carried out after complete reception of the topographical and geotechnical surveys. The horizontal and vertical alignments have been defined as well as various options of pavement.
Preliminary design of reconstructed bridges, hydraulic structures and river erosion protection structures has been also carried out.

Construction cost estimates have been then derived from the preliminary design.
A full maintenance study has been conducted with estimates of yearly maintenance costs for the economic analysis.

Economic analysis has been performed comparing discounted yearly benefits to the construction and maintenance costs in the alternatives with and without Project. Benefits have been derived from traffic estimates and vehicle operating costs previously assessed.
A financial analysis has been also carried out to assess sustainability for Government's budget. Proposed tolls were eventually taken into account.

The Executive Summary of the Main Report is appended as Annex 1 to the present Project Completion Report.

The Economic Feasibility of the Project was confirmed in consistence with the Pre-Feasibility Report issued by BCEOM in July 2007 for the needs of the ADB Appraisal Mission.
It is also consistent with the subsequent ADB Report and Recommendation of the President to the Board of Directors for the CAREC Regional Road Improvement Project, issued in October 2007, covering road sections of the Dushanbe – Sary Tash Road in both Tajikistan and Kyrgyzstan.

Three pavement design options of the Project Road meeting the economic feasibility have been proposed, two of which consistent with the 20 M USD envelope of the ADB grant.

MOTC decided on 16 January 2008 to select the option 2b, consisting in asphalt concrete pavement on the first 50 km of the Road from Sary Tash and on the 6 km across the village of Daroot Korgon, and gravel surface on the remaining 80 km.
In the same time MOTC approved the Feasibility Study.

4.8. Tender Documents

As the grant of ADB to the Kyrgyz Republic for the reconstruction of the Project Road was approved in November 2007, the MOTC and ADB desired that the construction works start as soon as possible during summer 2008. It is reminded that due to climate conditions works cannot be carried out in winter.

So Tender Documents were handed over to MOTC in mid-February.
The Technical Drawings and the Bill of Quantities, which are part of these Tender Documents, have been derived from the Preliminary Design of the Feasibility Study.
It has been agreed with MOTC and ADB that the Final Technical Drawings and the Final Bill of Quantities derived from the Final Design will be delivered at the end of the Project period (beginning of May 2008). They will consequently be handed over to the successful bidder of the construction works, for revision of its price with the final quantities.

The tender for construction works was launched by MOTC on 20 March 2008, with bids requested from contractors for 6 May 2008.

4.9. Training / Seminars

Training of the local staff has been also essential part of the Project. Particularly the three Long Term Local Experts have been extensively trained all over the duration of the Project.

Two seminars have also been organised within MOTC.
The first one after Inception Phase in April 2007 was dedicated to modern highway engineering with two presentations of our International Experts.
The second one in February 2008 was a presentation of the results of the Feasibility Study. It was presented by the three Long Term Local Experts to demonstrate their full knowledge of the Project. They were supported by the International Experts, particularly for the various questions raised.

4.10. Detailed Design

The Detailed Design of the road started immediately after completion of the Preliminary Design.
There are only few modifications in Detailed Design compared with Preliminary Design.

A new Bill of Quantities is being produced. The Final Design Technical Drawings and the Bill of Quantities will be handed over to MOTC early May 2008 to be subsequently given to the successful contractor(s) after submission of offers on 6 May (see Annex 3: letter of MOTC).

A Final Design Report will be also produced and issued before mid-May 2008.

TABLE 4: PROJECT COMPLETION REPORT

Project title : Pre-Feasibility and Feasibility Studies for Road Sections of the Termez – Dushanbe - Sary Tash Road	Project nr : 110-465	Country : Kyrgyzstan	Page : 1
Reporting period : 14/11/2006 – 13/05/2008	Prepared on : 14/04/2008	EC Consultant : Egis BCEOM International	

REPORTING PERIOD	MAIN ACTIVITIES UNDERTAKEN	INPUTS UTILISED (working days)			
		Long Term Foreign	Long Term Local	Short Term Foreign	Short Term Local
14/11/2006 – 31/05/2007	Data Collection, Economic Forecasts, Design Standards, Unit Costs, Preliminary Site Investigations	294	337	40	63 Senior 34 Junior
01/06/2007 – 30/11/2007	Traffic Surveys, Topographical and Geotechnical Surveys, Environment and Social Studies, Maintenance Study, Preliminary Design, Economic Analysis, Customs/Toll Study	353	381	90	415 Senior 225 Junior
01/12/2007 – 13/05/2008	Quantity Estimates, Feasibility Study Report, Tender Documents, Financial Management Assessment, Detailed Design	236 (e)	251 (e)	25 (e)	115 (e) Senior 262 (e) Junior
	TOTAL	883 (e)	969 (e)	155 (e)	593 (e) Senior 521 (e) Junior

TABLE 5: OUTPUT PERFORMANCE SUMMARY

Project title : Pre-Feasibility and Feasibility Studies for Road Sections of the Termez – Dushanbe – Sary Tash Road	Project nr : 110-465	Country : Kyrgyzstan	Page : 1
Prepared on : 14/04/2008		EC Consultant : Egis BCEOM International	
Output results	Deviation original plan + or - %	Reason for deviation	Comment on constraints & assumptions
- Seminar after Inception Phase			
- Pre-Feasibility Study Engineering Report	Not planned	At ADB Request for needs of their Appraisal Mission	
- Feasibility Study Report with 15 Technical Annexes	Postponed 1 Month	At MOTC Request	
- Tender Documents	Anticipated 3 Months	At MOTC and ADB Request to meet Construction Works Tender Schedule	
- Seminar about Feasibility Study			
- Financial Management Assessment Report			
- Detailed Design			

5. Lessons learnt and Recommendations

The present Project was a classical infrastructure Feasibility Study with subsequent Detailed Design and construction Tender Documents.
The major issues which might have raised problems have been time schedule and liaison with the Asian Development Bank (ADB) for the financing of the implementation and construction of the Project.

The Project site, which is difficult to reach from Bishkek, is located in a high valley between 2500 and 3200 m above sea level. It is therefore covered with snow almost continuously in winter from November to April. Technical site surveys can be then reasonably undertaken only from May to October.
Starting the Project in November 2006 was then not optimal at all. There was a loss of time during the first months, but the major consequence was that only one survey campaign could be organised in summer 2007 for both Feasibility Study and Final Design which was a little detrimental for the topographical works.
But, as explained below, the Project time schedule happened to be by chance consistent with the Asian Development Bank own time schedule for financing the Project implementation.

It was requested from the beginning to liaise with ADB for the financing of construction of the Project. In April 2007 it appeared that ADB could finance shortly the Project if major elements of the Feasibility Study could be available for ADB Appraisal mission in July 2007.
Our time schedule was then quickly changed and a Pre-Feasibility Engineering Report could be anticipated and issued end of July 2007. This allowed approval of the Project and of the associated grant to the Kyrgyz Republic by the ADB Board in November 2007.
Similarly, in order to launch the tender for construction as soon as March 2008 so that works can start during summer 2008, the Tender Documents had to be issued in February 2008 much earlier than planned and based on the Preliminary Design of the Feasibility Study.
Flexibility has then been a major characteristic in the life of the Project.
It has allowed having a very successful and unsurpassable overall time schedule, as the construction contractor will be selected in May 2008 immediately after the completion of the present Project.
Excellent contacts between Consultant, EC Project Manager, MOTC Project Implementation Unit Manager and ADB Project Officers have also facilitated this flexibility.

Annex 1: Executive Summary of the Feasibility Study

Introduction

This Report presents the Feasibility Study prepared by BCEOM for the rehabilitation of the road from Sary Tash to the Tajik border in Kyrgyzstan. The report includes the results of the engineering surveys, the preliminary engineering design, the economic and financial appraisal derived from the project cost estimate and traffic forecast, the environmental and social impact assessment, and recommendations on cross-border facilitation.

This Feasibility Study Report follows the Pre-Feasibility Engineering Report prepared by BCEOM at the request of the ADB for their project appraisal mission in July 2007. Alternative alignment options together with some preliminary cost estimates were presented in the Pre-Feasibility Engineering Report, and based on this the MOTC and ADB selected the preferred road alignment and main design criteria, which were retained for the Feasibility Study.

The Kyrgyz Republic obtained a Grant from the ADB in October 2007 to finance the rehabilitation of the road from Sary Tash to the Tajik border under the "*CAREC Regional Road Improvement Project*", of which $20M were allocated to civil works (excluding taxes and contingencies). This took place before the Consultant was expected to complete the Feasibility Study according to the timeframe agreed with the European Commission, and while completing engineering studies and refining preliminary cost estimates, it appeared that the cost of the Consultant's recommended option ($23.4M) presented further below would be higher than the funding limit set through the ADB Grant. Efforts have therefore been made to provide alternative pavement options that would make the total Project cost fit within the $20M envelope, under the understanding that the MOTC would secure additional financing within some five years to upgrade the pavement up to the recommended minimum requirements.

Existing Road Assessment

The existing road from Sary Tash to the summit of Karamyk Pass, which materializes the Kyrgyz / Tajik border, is about 140km long. It is classified as a Category IV road for 100-1,000 vpd (vehicle per day) with 6.0m wide pavement plus 2 x 2.0m shoulders. In fact traffic is barely at 100 vpd and in a few places the road does not satisfy Category IV requirements, in particular where it is subject to washouts by the Kyzyl Suu river, and on the ascent from Karamyk to Karamyk Pass.

The road is generally flat and runs east to west along the bed of the river valley occasionally rising onto the gravel terraces which form the predominant lower slopes of the surrounding mountains. The river bed is poorly defined in places, and erosion damage and washouts are frequent. Protective dykes and river defences have been successful in places but inadequate in others; and the existence of the roadway is seriously at risk in several places. Road diversions are already in place where the original road disappeared into the river.

The existing alignment is generally satisfactory with only local improvements required to some horizontal curves, and to allow improvements to drainage and erosion protection. At Karamyk, however, the existing alignment through the village is very poor, and a bypass has been proposed to go straight from the entrance of Karamyk to Karamyk Pass.

The existing pavement consists of an old asphaltic concrete surfacing from km 0 to km 24 and 3kms through Daroot Korgon. The remainder is gravel surfaced although some of the damaged/diverted sections, and the ascent to Karamyk Pass, are little more than unsurfaced tracks. The condition is poor to very poor throughout. Maintenance is inadequate.

There are 13 bridges on the existing road, 2 across the Kyzyl Suu river and 11 across tributary streams. Most are in poor condition, and are in need of strengthening and/or repair, especially to the bridge decks, or even full reconstruction.

The main drainage pattern is transversal to the road with many minor and seasonal streams crossing the road. Drainage is often inadequate with insufficient and/or silted pipes and culverts, some of which have collapsed. There is also insufficient drainage leading to the pipes and culverts. Erosion around culverts is a major problem both upstream and downstream; and protection of the road from silting up, mud slides and gravel from flood deposits is a concern.

Minor rock falls and slides onto the road in cuttings is not a major problem compared with many roads in Kyrgyzstan.

Road Alignment and Geometric Design

Based on the projected traffic, Category IV road design standards were adopted for the Project road, with 6.0m wide pavement plus 2 x 2.0m shoulders. As agreed between the ADB and the MOTC based on the Pre-Feasibility Engineering Report, only one significant change to the existing alignment was retained, in order to by-pass the existing narrow winding road in the village of Karamyk. The proposed bypass consists in a new road that goes directly westwards to Karamyk Pass before the existing road turns to the north towards Karamyk. This bypass is shorter than the existing road by some 4kms. In other locations the existing alignment was kept, except from Km 67+500 to km 67+800 and from 123+800 to km 142+100 (near Shive river) in order to provide improvements to the poor road geometry. It is to be noted that none of the proposed realignments will require land acquisition or resettlement.

It is proposed to raise the vertical alignment in general way to provide minimum space for the new pavement structures. Due to funding limitations, the proposed embankment elevation will however not provide sufficient protection against the snow accumulation or some existing drainage problems; it is expected that winter maintenance will be assured through the help of snow cleaning engines.

River Erosion Control

River flood waters during the snow melt season threaten the stability of the road in some 10 locations. The road embankment is likely to collapse in the near future at km 67+300, 67+800, 120+600, and 124+900; it is therefore deemed urgent to carry out the proposed river bank stabilization works. A combination of river training works is proposed depending on the location including alluvial dykes protected by rip-rap, rip-rap placed on the river bank slope, or retaining walls built with gabions.

Bridge Reconstruction

The proposed bypass at Karamyk requires one new structure across the Ak Suu River at the entrance of Karamyk. Two types of structures have been contemplated: (i) bridge or (ii) multiple culverts. Due to funding limitations, we recommend the implementation of multiple culverts at this location.

Based on our bridge condition assessment, five existing bridges require complete reconstruction: Taldyk Suu, Kashka Suu, Kyzyl Suu (km 98.7), Tarasha and Shive, whereas the remaining seven bridges require maintenance and repair. Considering logistic difficulties and

the generally poor performance of locally produced materials we incline to recommend the implementation of precast elements as much as possible; a standardization of the bridge spans

will allow to set up one prefabrication workshop near the building site, which will serve for all the bridges to be reconstructed.

Taking into account the relatively small deck lengths, 2 deck types are proposed:

- Composite steel / concrete deck without intermediate piers for spans ranging from 20m to 100m; this is recommended for the bridge over the Kyzyl Suu river at km 98.7, and also suitable for the Tarasha bridge.
- Precast reinforced concrete beams for spans from 10m to 20m; this is recommended for Taldyk Suu, Kashka Suu and Shive bridge.

Pavement Options

Pavement design was carried out for a 20 year design life in accordance with AASHTO procedures, based on subgrade strength and projected cumulative axle loads. The road was basically divided in two main sections: west of km 72 and east of km 72. Km 72 is significant in that this is where the Bell Alma coal mine will connect to the Project road. Heavy trucks from this mine are expected to represent approximately 80% of the traffic expressed in equivalent standard axle load terms (ESAL) on the Project road between km 0 and km 72.

We recommend a pavement structure between km 0 and km 72 consisting of 50mm of Asphalt Concrete over a granular base and subbase, and, between km 72 and km 136, a DBST seal (surface dressing) on granular base and subbase. The cost of this type of pavement structure is approximately $11.2M, i.e., $3.5M more than is available from the ADB Grant of $20M of which only approximately $7.7M would be available for pavements.

We have therefore considered other pavement options that would fit within the available budget, under the understanding that the MOTC would secure additional financing within some five years to upgrade the pavement up to the recommended minimum requirements indicated above. We finally retained the pavement options shown in the table below for the MOTC's consideration:

Option No.	**Surface Type**				**Pavement Cost**	**Total Project Cost**
	km 0 – 72	**Km 72 - 93**	**Km 93 – 99 (Daroot K.)**	**Km 99 - 136**		
1	50 mm Asphalt Seal on Granular Base and Subbase	DBST Surface on Granular Base and Subbase	DBST Surface on Granular Base and Subbase	DBST Surface on Granular Base and Subbase	$11.2M	$23.5
2a	DBST Surface on Granular Base and Subbase	Gravel Surface	DBST Surface on Granular Base and Subbase	Gravel Surface	$7.4M	$19.7M
	Km 0 - 50	**Km 50 - 93**	**Km 93 – 99 (Daroot K.)**	**Km 99 - 136**		
2b	50 mm Asphalt Seal on Granular Base and Subbase	Gravel Surface	50 mm Asphalt Seal on Granular Base and Subbase	Gravel Surface	$7.5M	$19.8M

Option 1 is the Consultant's recommended option from an engineering standpoint, which is however above the available budget. Option 2a and 2b both fit within the total $20M budget. Should funds indeed be limited to $20M, we would recommend to implement Option 2a because a gravel road on km 50 – 72 as proposed in Option 2b would rapidly deteriorate with the projected heavy coal truck traffic. It is however the understanding that the MOTC might not be in favor of DBST surface due to the risk of poor construction quality; in that case Option 2b would allow for AC surfacing on the first 50km as well as in Daroot Korgon, and gravel surface on the remaining sections.

Project Cost Estimate

Summary cost estimates for the civil works (excluding VAT and physical and price contingencies) are shown in the table below for each pavement option described in the previous section.

		Total Amount (excl. VAT) in $M		
Item No.	Description of the Bill Item	Option 1	Option 2a	Option 2b
1	General Provisions	1.84	1.84	1.84
2	Setting Out	0.17	0.17	0.17
3	Earthworks	3.07	3.07	3.07
4	Drainage	1.31	1.31	1.31
5	Pavement	11.20	7.40	7.50
6	Bridges	3.75	3.75	3.75
8	Road Furniture	0.39	0.39	0.39
9	Miscellaneous	0.40	0.40	0.40
10	Dayworks	0.04	0.04	0.04
11	River Erosion Protection Works	1.28	1.28	1.28
	Total	**23.45**	**19.65**	**19.75**

Traffic Forecast

Domestic traffic volumes on the Project road amount to less than 100 vpd (vehicles per day), with little to no international traffic at present. The very poor geometry and condition of the road corridor in some locations between Dushanbe and Sary Tash, in particular close to the Tajik / Kyrgyz border, undoubtedly create critical barriers to international traffic.

Domestic traffic is expected to increase through growth in normal traffic, traffic generated by the completion of the Osh – Sary Tash road rehabilitation, which will "unlock" the Project area, and traffic generated by the Project. Domestic traffic projections by the end of the appraisal period in 2030 thus amount to some 450 vpd between Sary Tash and Daroot Korgon and 230 vpd between Daroot Korgon and the Tajik border.

The Project's primary objective is to facilitate regional trade by reducing transport costs; hence international and transit traffic on the Project road are expected to grow rapidly once the corridor is improved, consisting mainly of (i) coal truck traffic between the Bell – Alma coal mine connecting to the Project road at km 72 and the PRC; (ii) general cargo truck traffic between the PRC and Tajikistan; and (iii) general cargo truck traffic between the PRC and Afghanistan. International and Transit traffic projections by the end of the appraisal period in 2030 amount to some 1,000 vpd between Sary Tash and km 72, and 800 vpd between km 72 and the Tajik border.

Economic Analysis

We carried out the economic analysis for the main pavement options described further above:

- Option 1: with AC surface (50mm Asphalt Concrete) from Sary Tash to km 72 and DBST surface from km 72 to the Tajik border, which is the preferred option from an engineering standpoint, although the corresponding total cost ($23.4M) exceeds the available budget.
- Option 2a: with DBST surface from Sary Tash to km 72 and gravel surface from km 72 to the Tajik border, which fits within the $20.0M budget.

The two Project options are found to be economically viable. The Economic Internal Rate of Return (EIRR) is 14.5% and the Net Present Value (NPV) is US$ 5.3M for Option 1 (AC / DBST). The EIRR is 13.7% and the NPV is US$ 3.1M for Option 2a (DBST / Gravel). Results would be similar, although a bit lower, for Option 2b, due to the rapid deterioration of the gravel section between km 50 and km 72. It would therefore be advisable to prefer Option 1 from an economic standpoint, if the required funding could be made available.

Sensitivity analysis was carried out to test the effects of negative changes in the key parameters that determine the benefits and costs of the Project. Results indicate that the economic returns in both options are relatively robust to decrease in transit traffic or coal traffic, which provides some comfort given the high uncertainty in the traffic forecast. However, they are quite sensitive to reductions in Vehicle Operating Cost savings. It is therefore of utmost importance to ensure good quality of works and good maintenance in line with international standards as proposed under the Project to achieve the expected riding conditions.

Financial Sustainability

Maintenance costs on the Project road are expected to amount to around US$0.43M per year in average in the with-project scenarios with the recommended improved maintenance practices. This represents more than 10% of the Government's budget for road maintenance for the whole Kyrgyz road network in 2005. It is therefore deemed unlikely that the MOTC may be able to provide adequate financing for road maintenance from its own limited budget. Without a cost-recovery mechanism, the sustainability of the Project may be jeopardized.

We have therefore analyzed the financial impact of a possible toll implementation on the Project road. A cash flow analysis shows that the following toll levels would generate adequate revenues to finance road maintenance:

- $2 per foreign medium truck (i.e., $0.014/veh-km)
- $3 per foreign articulated truck (i.e., $0.021/veh-km)
- $3 per coal truck (i.e., $0.021/veh-km).

Cross-Border Facilitation

The projected international and transit traffic, and thereby the bulk of the Project's economic benefits, will not materialize unless significant efforts are made in order to facilitate vehicle transit at the Karamyk and Irkeshtam border posts. At Karamyk we recommend to implement a juxtaposed national control office, in which the border guards and customs officers of both countries (Kyrgyzstan and Tajikistan) will act in concert. A single border office will rationalize and harmonize controls, facilitate crossing by travelers and goods, provide economies of scale, and intensify cooperation between services in the fight against crime and smuggling of narcotics.

At least within the three months prior to inauguration of the Karamyk crossing point, the Decree establishing the powers of the border office shall be modified changing them from bilateral to multilateral. Furthermore, in the case of a juxtaposed national control office, a decision *sui generis* will be necessary, as the current Customs regulations in Kyrgyzstan and Tajikistan do not cover this.

Environmental Impact Assessment

The Initial Environmental Examination (IEE) conducted in accordance with ADB guidelines recommends that the Project be categorized under environmental Category B. The Project will not impact upon protected areas or densely populated areas nor will it create any conflict in development or resource allocation. Potentially adverse environmental impacts that may arise from project activities in terms of air quality, surface water quality, soils and erosion, noise and vibration, and flora and fauna, range from insignificant to moderate.

The adverse impacts are amenable to mitigation, and a number of mitigation measures have been identified for impacts anticipated to occur during the construction and operation phases. No significant environmental impacts will occur during either the rehabilitation activities or ongoing maintenance works provided that the proposed Environmental Management Plan and Environmental Monitoring Plan are implemented.

Social Impact Assessment

No land acquisition, relocation or resettlement is expected under the proposed Project based on the recommended alignment.

Although the Project does not directly target poverty reduction, it will indirectly benefit some 30,000 people in the Project area, of whom 52% are poor. They will benefit from increased mobility and accessibility to markets and social services, lower transport costs for inputs and products, better access to and interaction with other regions, in particular the Osh area, and employment opportunities during and after construction.

Annex 2

Minutes of Meeting of MOTC Technical Counsel (Translation)

Bishkek city

16 January 2008.

Agenda: Consideration and conformation of Feasibility Study under "CAREC Regional Road Corridor Improvement Project", for the Sary Tash – Tajik Border Road Section.

Participants;

Mamaev K. A.	State –Secretary	MOTC of KR
Aidarov Z. K.	Head of RMA	MOTC of KR
Alibegashvili L. M.	Director	KDTP
Ibraimov S.K.	Director	PIU of MOTC
Sarbagyshev S.	Highway engineer	PIU of MOTC

From egis BCEOM International:

Francois CHATAIN	Project Team Leader
Sevdalin Berberov	Senior Highway Engineer
DIU Konstantin	Local Geotechnical Engineer

Participants spoke about the following questions of agenda;
- Francois CHATAIN informed about the main parameters and quantities of the submitted Feasibility Study under "CAREC Regional Road Corridor Improvement Project", for the Sary Tash – Tajik Border Road Section.
The accent was made about impossibility to complete the rehabilitation of the project road due to limited funds. Therefore in the Pre Feasibility and Feasibility Studies with recommendation of MOTC, different combinations have been envisaged particularly on asphalt surface laying, as surface is a very expensive item. For allowing traffic on whole length of corridor, which is requirement of ADB, it was necessary to provide construction and reparation of structures, river protection works and minimal level of earth works on maximal length of sections with asphalt surface. According to these conditions three different options were developed with various combinations on asphalt surface laying, including;
Option 1 – the length of asphalt concrete surface layer is 72 km, on remaining sections is DBST surface on granular base, total cost is 23, 5 million US Dollars;
Option 2a – without asphalt concrete surface layer but DBST on 78 km length and on the remaining sections with gravel surface, total pavement cost is 19.7 million US Dollars;
Option 2b – overall length of asphalt concrete surface is 56 km. for the remaining of section is gravel surface; total cost is 19, 8 million US Dollars.
For further work on preparation of final drawings we would like to have decision of Employer on his preferred option.

- Mamaev K.A.: “At Present Time taking into account extend of funds of this project from options which were submitted in Feasibility Study, in my opinion option 2 b with the amount of 19, 75 million US Dollars is the most preferred option. We will have 56 km of one asphalt surface layer on km 0 - 50 and 6 km in Daroot – Korgon and completely earthwork and Structures. This option will allow traffic on whole corridor and in the future, depending on decision of funds issue with other donors, asphalt concrete layer could be put at minimal cost and at the necessary time.

After all discussions it was decided the following;

1. To approve egis BCEOM international company’s submitted Feasibility Study under ““CAREC Regional Road Corridor Improvement Project”, for the Sary Tash – Tajik Border Road Section.
2. To chose option 2b from submitted Feasibility Study for further developmental work and preparation of detailed drawings.
3. During construction provide (DBST) on one asphalt concrete surface for providing reliable work of surface. Additional funds will be from project resource saving or\ and from republic budget.

Were signed by;

Mamaev R.A.
Aidarov Z.K.
Alibegashvili L. M.
Ibraimov S.K.
Sarbagyshev S.

Francois CHATAIN
Sevdalin Berberov
DIU Konstantin

Annex 3

Translation of Letter from MOTC (19 March 2008)

MOTC of KR received the approval from ADB for package of Bid Documents for civil works Project “CAREC Regional Improvement of Road Transport Corridor”, ADB Grand 0084 – KGZ (SF).
According to procedure of procurement, announcement about tender will be in the newspaper “Vecherniy Bishkek” Friday 21 of March 2008 and in the newspaper “Team of central Asia” Thursday 20 of March 2008 also, and deadline for submission of Bid Documents defined at 6 of May 2008.

It is necessary to submit completed package of detailed drawings in April 2008 for execution of tender procedure in proper time, and the Employer should have opportunity for checking and provide appropriate corrections if necessary up to May 2008, as it was discussed before.

Signed: Mamaev
State Secretary