

Environmental Monitoring Report

Semi-annual Report
January 2022

People's Republic of China: Shaanxi Mountain Road Safety Demonstration Project

Prepared by the Foreign Capital Utilization Center of Shaanxi Provincial Transport Department
for the Asian Development Bank.

Disclaimer: This environmental monitoring report is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, ADB does not intend to make any judgments as to the legal or other status of any territory or area.

CURRENCY EQUIVALENTS

(as of 31 December 2021)

Currency Unit	–	Yuan (CNY)
\$1.00	=	CNY6.3716

ABBREVIATIONS

ADB	–	Asian Development Bank
AMTB	–	Ankang Municipal Transport Bureau
C&D	–	Construction and Demolition
DO	–	Dissolved Oxygen
EA	–	Executing Agency
EHS	–	Environmental Health and Safety
EIA	–	Environmental Impact Assessment
EIR	–	environmental impact report
EMP	–	Environmental Management Plan
EMS	–	Environmental Monitoring Station
EPB	–	Environmental Protection Bureau
ESE	–	environmental supervision engineer
FCUC		Foreign Capital Utilization Center of Shaanxi Provincial Transport Department
FFPO	–	Foreign-fund Finance Project Office
GRM	–	grievance redress mechanism
HDTB	–	Hanyin District Transport Bureau
IA	–	Implementing Agency
LDI	–	Local Design Institute
LIC	–	Loan Implementation Consultant
LIEC	–	Loan Implementation Environmental Consultant
O&M	–	Operation and Maintenance
PCR	–	project completion report
PME	–	powered mechanical equipment
PMO	–	Project Management Office
PRC	–	People's Republic of China
RR	–	Rural Road
SCG	–	Shangnan County Government
SCTB	–	Shangnan County Transport Bureau
SPS	–	Safeguard Policy Statement
SPHB	–	Shaanxi Provincial Highways Bureau
SPTD	–	Shaanxi Provincial Transport Department
SS	–	Suspended Solid
SZETC	–	Shaanxi Zhengwei Environmental Testing Company
TSP	–	Total Suspended Particulate
USD	–	United States Dollar
WBG	–	World Bank Group
XCTB	–	Xunyang County Transport Bureau
XYEMC	–	Xi'an Yuanfang Environmental Monitoring Company

WEIGHTS AND MEASURES

cm	—	centimeter
dB	—	decibel
km	—	kilometer
km/h	—	kilometer per hour
m	—	meter
m ³	—	cubic meter
mg/L	—	milligram per liter
µg/m ³	—	microgram per cubic meter

NOTE

In the report, “\$” refers to US dollars.

TABLE OF CONTENTS

I. INTRODUCTION.....	1
A. The Report	1
B. Project Description	1
C. Institutional Arrangements and Responsibilities for EMP Implementation	3
II. PROJECT PROGRESS	5
A. Progress on Institutional Set up and Actions Taken by Institutions	5
B. Implementation of Loan Covenants	12
C. Implementation Progress of Environmental Contract Clauses	14
D. Overall Project Implementation Progress.....	21
E. Detailed Engineering Progress	21
1. Component 1: Trunk Road Rehabilitation	21
2. Component 2: Rural Road Upgrading	24
3. Component 3: Road Safety.....	26
III. IMPLEMENTATION OF THE ENVIRONMENTAL MANAGEMENT PLAN.....	28
A: Mitigation Measures Common to All Project Roads (including rural roads).....	29
B: Trunk Road G316 Xunyang - Ankang.....	38
C: Trunk Road S102 Xunyang - Xiaohe.....	39
D: Trunk Road S224 Shangnan - Yunxian.....	40
IV. IMPLEMENTATION OF ENVIRONMENTAL MONITORING PROGRAM	42
A. Implementation Status of Environmental Monitoring	42
B. Monitoring Results.....	52
V. INSTITUTIONAL CAPACITY BUILDING	54
VI. CONSULTATION, PARTICIPATION AND INFORMATION DISCLOSURE	55
VII. GRIEVANCE REDRESS MECHANISM.....	57
VIII. EMP BUDGET AND EXPENDITURE	58
IX. KEY ENVIRONMENTAL ISSUES.....	60
A. Key Issues Identified	60
B. Actions Taken to Mitigate Key Environmental Issues.....	60
X. CONCLUSIONS.....	60

Annex 1: Photographs

LIST OF TABLES

Table 1 Summary of Institutional Set up and Actions Taken by Institutions	5
Table 2 Contact Information of EHS Staff/Focal Points at Various Institutions	9
Table 3 Environment Related Project Agreements and Compliance Status	12
Table 4 Implementation Status of Environmental Contract Clauses	14
Table 5 Summary of Trunk Road Rehabilitation and Engineering Progress during the Reporting Period	21
Table 6 Bridge Construction and Engineering Progress during the Reporting Period.....	22
Table 7 Tunnel Construction and Engineering Progress during the Reporting Period	23
Table 8 Spoil Disposal Sites for Trunk Roads	23
Table 9 Summary of Rural Road Sections Proposed for Upgrade.....	24
Table 10 Spoil Disposal Sites for Rural Roads.....	25

Table 11 Additional Counter Measures for Road Safety Enhancement	26
Table 12 Summary of Potential Impacts and Mitigation Measures and Implementation Status ..	29
Table 13 Summary of Implementation Status of Environmental Quality Monitoring	43
Table 14 Summary of Air Quality Monitoring Results along G316	52
Table 15 Summary of Air Quality Monitoring Results along S102	52
Table 16 Summary of Air Quality Monitoring Results along S224	52
Table 17 Summary of Noise Monitoring Results along G316	53
Table 18 Summary of Noise Monitoring Results along S102	53
Table 19 Summary of Noise Monitoring Results along S224	53
Table 20 Training Program and Implementation Summary	54
Table 21 Public Consultation Plan and Implementation Summary	55
Table 22 Contact Information of GRM Focal Points at Various Institutions	57
Table 23 Estimated EMP Implementation Budget and Actual Expenditure During Reporting Period	59

LIST OF FIGURES

Figure 1 Map of Trunk Roads G316 and S102 and Seven Rural Roads in Ankang City	1
Figure 2 Map of Trunk Road S224 and One Rural Road in Shangluo City	2
Figure 3 Map of Road Safety Roads in Ankang and Shangluo Cities	2

BASIC PROJECT INFORMATION

ADB Loan No.	ADB Loan No.3294-PRC
Project Title	Shaanxi Mountain Road Safety Demonstration Project
Borrower	The People's Republic of China
Executing Agency	Shaanxi Provincial Transport Department
Implementing Agency	AnkangMunicipal Transport Bureau Shangnan County Government
Total Estimated Cost	\$399.96 million
ADB Loan	\$200 million
Counterpart Financing	\$199.96 million
Loan Approval Date	28 September 2015
Loan Agreement Signed Date	8 December 2015
ADB Loan Effectiveness Date	7 March 2016
Project Complete Date	31 December 2020
Original Loan Closing Date	30 June 2020
Updated Loan Closing Date	31 December 2020
Exchange Rate	\$1.00 = CNY6.3716
Date of Latest ADB Loan Review Mission	10-16 September 2020
Type of This Report	Semi-annual Environmental Monitoring Report
Period Covered by This Report	July to December 2021

I. INTRODUCTION

A. The Report

1. This report is the twelfth semi-annual environmental monitoring report of Shaanxi Mountain Road Safety Demonstration Project, covering the period from July to December 2021. This report is prepared by Foreign Capital Utilization Center (FCUC), which was previously Foreign-fund Finance Project Office (FFPO), with support from the loan implementation environment consultant (LIEC) based on site observation and information collected from the Executing Agency (EA), Implementation Agencies (IAs), environmental supervision engineers employed by the IAs as well as external environmental monitoring agencies. This report was reviewed by the EA, Shaanxi Provincial Transport Department (SPTD), prior to submission to the Asian Development Bank (ADB).

2. This environmental monitoring report is prepared in accordance with the project environmental management plan and environmental monitoring framework.

B. Project Description

3. The project areas are located in Ankang City and Shangluo City in southern Shaanxi Province. Trunk roads G316 and S102, and seven of the eight rural roads are in Ankang City. Trunk road S224 and one rural road are in Shangluo City. The 25 roads where road safety improvements will be made are distributed in Ankang and Shangluo Cities. The project consists of four components: (i) rehabilitation of trunk roads G316 Xunyang – Ankang (34.357 km), S102 Xunyang – Xiaohe (60.246 km), and S224 Shangnan – Yunxian (92.447 km); (ii) upgrading of eight rural roads totaling 139.656 km; (iii) implementation of road safety on 25 roads totaling 542 km; and (iv) capacity building. The project is categorized as A for the environment according to ADB SPS (2009). Locations of these roads are shown as in Figures 1 to 3.

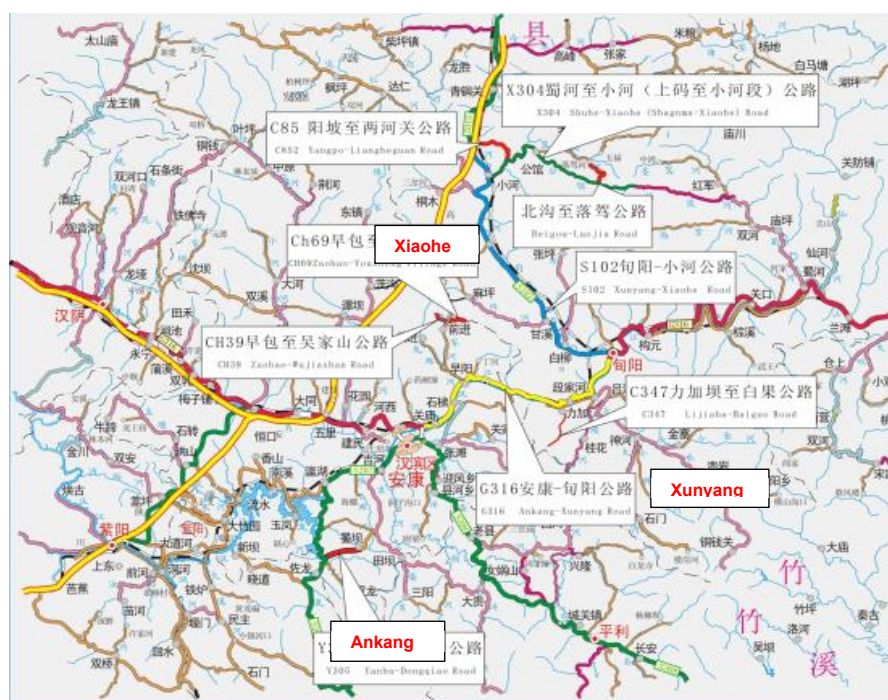


Figure 1 Map of Trunk Roads G316 and S102 and Seven Rural Roads in Ankang City

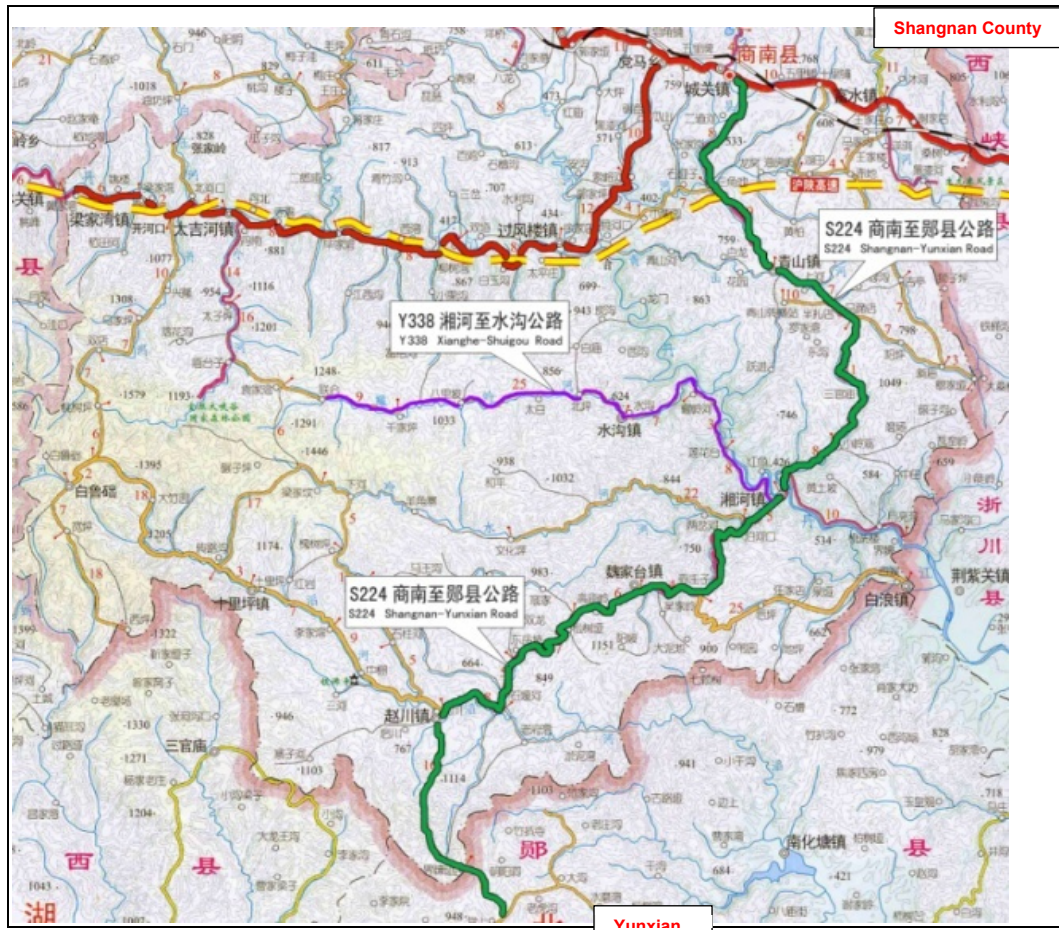


Figure 2 Map of Trunk Road S224 and One Rural Road in Shangluo City

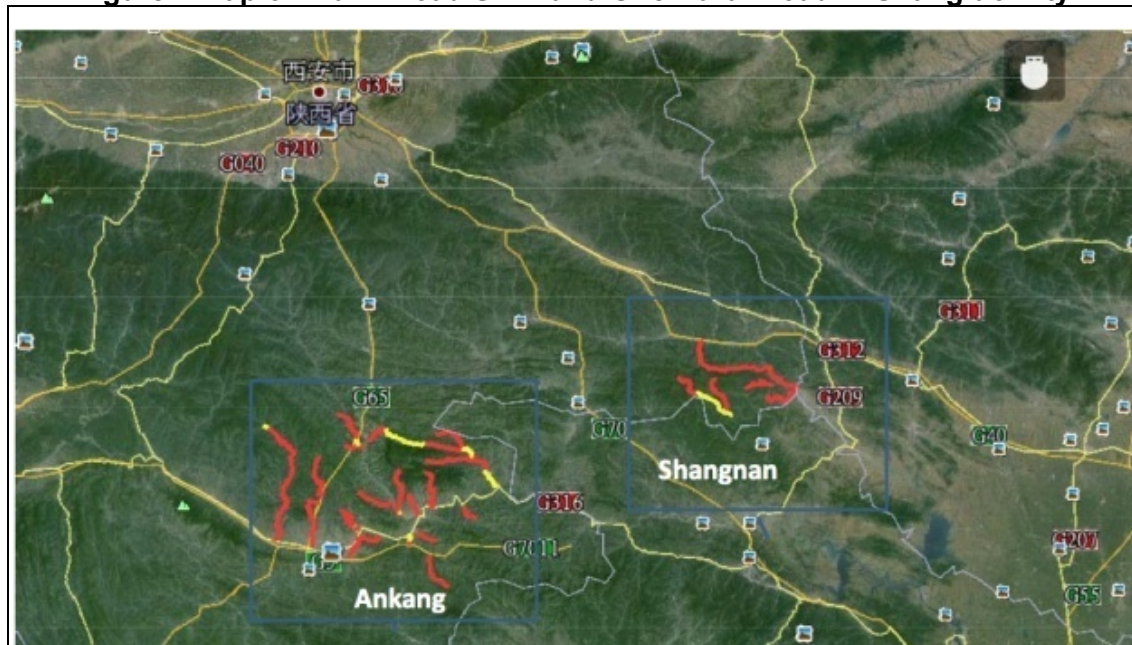


Figure 3 Map of Road Safety Roads in Ankang and Shangluo Cities

C. Institutional Arrangements and Responsibilities for EMP Implementation

1. **Executing Agency. Shaanxi Provincial Transport Department (SPTD)** is the Executing Agency (EA) of the project, who is responsible for overall implementation and compliance with loan assurances and the Environmental Management Plan (EMP).

2. **Project Management Office.** The EA established the **Foreign-Fund Finance Project Office (FFPO)** that has been renamed to Foreign Capital Utilization Center (FCUC), who is responsible, on behalf of the EA, for the day-to-day management of the project. The FCUC has the overall responsibility to supervise the implementation of environment mitigation and monitoring measures, coordinate the project grievance redress mechanism (GRM) and report to ADB. FCUC shall (i) appoint at least one environmental specialist on its staff to coordinate and manage EMP implementation, (ii) engage the loan implementation consultants (LIC) services, and (iii) supervise the procurement process. The FCUC environmental specialist shall (i) supervise contractors and their compliance with the EMP; (ii) conduct regular site inspections; (iii) act as local entry point for the project GRM; and (iv) submit environmental quality monitoring results provided by the IAs to the FCUC for verification. FCUC shall prepare quarterly project progress reports and semi-annual environment monitoring reports and submit them to ADB.

3. Implementing Agencies (IA) for the project consist of (i) the **Ankang Municipal Transport Bureau (AMTB)** for trunk roads G316 and S102, rural roads (RR) 1 to 7, and road safety improvement of 19 roads, and (ii) the **Shangnan County Government (SCG)** for trunk road S224, RR8 and road safety improvement of 6 roads. They shall implement project components, administer and monitor contractors and suppliers, and be responsible for construction supervision and quality control. To ensure that the contractors comply with the EMP provisions, the IAs shall ensure that the environmental specification clauses listed in the EMP are incorporated into the bidding documents. Each IA shall (i) contract the external environmental monitoring agencies to conduct environmental impact monitoring during the construction stage, in this case the Ankang EMS for G316, Xi'an Yuanfang Environmental Monitoring Company (XYEMC) for S102 and rural roads XY01 and XY02 (X304), XY03, XY04 and XY05, Shaanxi Zhengwei Environmental Testing Co., Ltd (SZETC) for S224 and rural road Xiangshui Road, and Shaanxi Huakang Monitoring Co. Ltd for rural road HB01, and (ii) contract an external Environmental Supervision Engineer (ESE) to conduct independent verification of EMP implementation and environmental impact monitoring results during the construction stage of the project. Each IA is recommended to have at least one environmental specialist on its staff to (i) supervise contractors and their compliance with the EMP, (ii) approval of contractors' site-specific environmental management plans (SEMP); (iii) conduct regular site inspections, and (iv) submit environmental quality monitoring results provided by the EMS to the FCUC and local Environmental Protection Bureau (EPB) (in this case the Ankang EPB and Shangluo EPB) for verification and confirmation.

4. **Construction contractors** are responsible for implementing the mitigation measures during construction under the supervision of the IAs (through the ESE) and FCUC. In their bids, contractors are required to respond to the environmental specifications in the bidding documents. Each contractor is required to develop site specific EMPs and will assign a person responsible for environment, health and safety. After project completion, environmental management responsibilities will be handed over to the operation and maintenance units.

5. **Operation and maintenance (O&M)** Units for this project consist of (i) Shaanxi Provincial Highways Bureau (SPHB) for trunk roads G316, S102 and S224; (ii) Xunyang County Transport Bureau (XCTB) for rural roads XY01 to XY05; (iii) Hanbin District Transport Bureau (HDTB) for rural roads HB01 and HB02; and (iv) Shangnan County Transport Bureau (SCTB) for rural road Xiangshui Road. During the operational phase, the IAs, Ankang EPB and Shangluo EPB will periodically verify and monitor (through a licensed monitoring entity) the environmental

management and implementation of mitigation measures by the O&M Units. The O&M units for the three trunk roads will be responsible for follow-up monitoring of medium term (year 2023) traffic noise impacts to sensitive receptors to determine if noise mitigation measures will be needed and to implement the measures if needed. The cost of monitoring and implementing mitigation measures in this phase will be borne by the relevant O&M Units.

6. Loan Implementation Environmental Consultant (LIEC). Under the loan implementation consultancy (LIC) services contracted by FCUC, a LIEC shall support the project. The LIEC, as an external monitor, shall:

- Assess the project components' environmental readiness prior to implementation based on the readiness indicators defined in Table EMP-3 in the EMP;
- Support FCUC in updating the EMP including environmental monitoring plan as necessary to revise or incorporate additional environmental mitigation and monitoring measures, budget and institutional arrangements, that may be required based on the detailed design; submit to ADB for approval and disclosure; ensure compliance with the People's Republic of China (PRC)'s environmental laws and regulations, ADB's Safeguard Policy Statement (2009) and Public Communications Policy (2011);
- If required, update the EIA (environmental impact assessment) and EMP reports for changes in the project during detailed design or project implementation (for example if there is a minor or major scope change) that would result in adverse environmental impacts not within the scope of the approved EIA/EMP;
- Assist FCUC to establish a GRM;
- Conduct regular EMP compliance assessments, undertake site visits as required, identify any environment-related implementation issues, and propose and oversee implementation of necessary corrective actions;
- Assist FCUC to prepare quarterly project progress reports and semi-annual environmental monitoring reports for ADB;
- Provide training to FCUC, IAs, O&M units and contractors on environmental laws, regulations and policies, SPS 2009, EMP implementation, and GRM in accordance with the training plan defined in the EMP (Table EMP-7); and
- Assist FCUC and IAs in conducting consultation meetings with relevant stakeholders as required, informing them of imminent construction works, updating them on the latest project development activities and GRM.

7. Environmental Supervision Engineer (ESE). Each IA shall contract an independent ESE to verify environmental performance during construction and whether the implementation of EMP items complies with the plan. The ESE shall review and approve the contractors' SEMP, review EMP implementation, monitoring activities and results, assess EMP implementation performance, visit the project sites and consult potentially affected people, discuss assessment with the FCUC and the respective IA; and suggest corrective actions. The ESE shall prepare monthly report for submission to the IA, which shall be submitted to and reviewed by FCUC during the preparation of the quarterly project progress reports for ADB and by the LIEC during the preparation of the semi-annual environment monitoring reports for ADB.

II. PROJECT PROGRESS

A. Progress on Institutional Set up and Actions Taken by Institutions

4. Table 1 shows the summary of institutional set up and actions taken by institutions.

Table 1 Summary of Institutional Set up and Actions Taken by Institutions

Institution	Implementation Stage	Responsibility	Actions Taken
SPTD (EA)	The Executing Agency (EA) for the project responsible for overall implementation and compliance with loan assurances and the EMP.		Close oversight on EMP implementation.
FCUC(PMO)	Engineering Detailed Design	<ul style="list-style-type: none"> Engage LDI Review updated EMP Confirm that mitigation measures have been included in engineering detail design 	<ul style="list-style-type: none"> LDI: (a) Shaanxi Transport and Road Design Company was engaged in March 2013 for G316 and HB01 and HB02 and road safety in Hanbin. (b) Shaanxi Transport and Road Design Company was engaged in November 2013 for S102; Shaanxi Hengwanda Traffic Technology Development Company and Ankang City Traffic Planning Design Institute were engaged for XY01 to XY05 and road safety in Xunyang, respectively. (c) Changan University Engineering Design Institute was engaged in October 2013 for S224. Shaanxi Zhongyu Traffic Development Company was engaged in April 2014 for Xiangshui Road and road safety. EMP was updated to include mitigation measures for COVID-19 control. Mitigation measures have been incorporated into detailed engineering design.
	Tendering & Pre-construction	<ul style="list-style-type: none"> Appoint at least one environmental specialist on staff Incorporate EIA/EMP clauses in tender documents and contracts Manage the procurement process Establish the project complaint center with hot-line Engage LIEC as part of the Loan Implementation Consulting Services 	<ul style="list-style-type: none"> Mr. Zhu Wei has been appointed as environmental specialist of FCUC since September 2016. EMP has been included as part of the tender documents and contracts. GRM has been established. LIEC was engaged.
	Construction	<ul style="list-style-type: none"> Supervise EMP implementation to ensure effectiveness. Inspect implementation of mitigation 	<ul style="list-style-type: none"> Close supervision over EMP implementation has been done by Mr. Zhu Wei, the

		<p>measures.</p> <ul style="list-style-type: none"> • Operate the project complaint center and coordinate the project environment GRM. • Prepare quarterly project progress reports and semi-annual environment monitoring reports and submit them to ADB • Conduct information disclosure and public consultation 	<p>environmental specialist of FCUC.</p> <ul style="list-style-type: none"> • Site inspection of mitigation measures is conducted every quarter. • FCUC supervises over operation of the GRM of the project established by each IA. • Quarterly project progress reports and semi-annual environmental monitoring report have been submitted as scheduled. • Information disclosure and public consultation activities are conducted in project cities/counties as arranged by FCUC.
	Operation	<ul style="list-style-type: none"> • Instruct the O&M units on environmental management requirements • Prepare quarterly project progress reports and semi-annual environmental monitoring reports until a PCR is issued 	<ul style="list-style-type: none"> • Environmental management requirements have been made to the O&M units. • Quarterly project progress report and semi-annual EMR are prepared as scheduled.
AMTB SCG (IAs)	Tendering & Pre-construction	<ul style="list-style-type: none"> • Incorporate EIA/EMP clauses in tender documents and contracts • Appoint at least one environmental specialist on staff (recommendation) • Engage AEMS and SEMS for environmental monitoring • Engage ESE for independent compliance monitoring 	<ul style="list-style-type: none"> • EMP has been incorporated as part of tender documents and contracts. • One environmental specialist has been appointed for each of AMTB and SCG. • AMTB has engaged AEMS for environmental monitoring of G316 and XYEMC for S102 and rural roads XY01 to XY05. Shaanxi Zhengwei Environmental Testing Co. Ltd was engaged in April 2017 for environmental monitoring of S224 and rural road Xiangshui Road. Shaanxi Huakang Monitoring Co. Ltd was engaged in August 2018 for environmental monitoring of rural road HB01. No environmental monitor was engaged for rural road HB02. • ESEs have been in place for each of the trunk roads and all the rural roads except for rural road HB02.
	Construction	<ul style="list-style-type: none"> • Supervise contractors and ensure 	<ul style="list-style-type: none"> • Close supervision over EMP

		compliance with the EMP <ul style="list-style-type: none"> • Approve contractors' SEMP and method statements • Coordinate construction supervision and quality control • Coordinate environmental monitoring according to the environmental monitoring program in the approved EMP • Act as a local entry point for the project GRM • Submit monthly monitoring results to FCUC, AEPB and SEPB 	implementaiton has been done by the IAs. <ul style="list-style-type: none"> • The contractors have followed common and particular requirements in the EMP. • Site inspection has been conducted by construction supervisor and IA engineer for quality control. • Environmental monitoring was done as required for G316, S102, rural roads XY01 to XY05, S224, RR HB01 and Xiangshui Road except for RR HB02. • Responsible persons and contact information are in place for the project GRM. • Monthly environmental monitoring reports for G316, S102 and rural roads XY01 to XY05, S224, rural roads HB01 and Xiangshui Road were submitted except for HB02.
	Operation	<ul style="list-style-type: none"> • Coordinate environmental monitoring according to the approved EMP until a PCR is issued 	<ul style="list-style-type: none"> • Operation period monitoring was done for the trunk roads.
Design Institutes	Engineering Detailed Design	<ul style="list-style-type: none"> • Incorporate mitigation measures defined in the approved EIRs and this EMP into engineering detailed designs • Update the EMP in cooperation with the LIEC 	<ul style="list-style-type: none"> • EIAs and EMP requirements have been included in engineering detailed design. • EMP was updated to include mitigation measures for COVID-19 control.
LIEC	Engineering Detailed Design	<ul style="list-style-type: none"> • Review updated EMP, confirm that mitigation measures have been included in engineering detailed design 	<ul style="list-style-type: none"> • EMP has been reviewed and mitigation measures have been included in the detailed design.
	Tendering & Pre-construction	<ul style="list-style-type: none"> • Review bidding documents to ensure that the EIA/EMP clauses are incorporated • Confirm project's readiness in respect of environmental management. 	<ul style="list-style-type: none"> • Bidding documents and contracts are reviewed. • Project readiness has been reviewed and confirmed.
	Construction	<ul style="list-style-type: none"> • Advise on mitigation measures • Provide technical support to FCUC, AMTB and SCG for environmental management • Conduct environmental training • Conduct semi-annual EMP compliance review • Support FCUC in preparing quarterly project progress reports and semi-annual environmental monitoring reports. • Review domestic environmental acceptance reports 	<ul style="list-style-type: none"> • Requirements have been made to the IAs and contractors for eligible implementation of mitigation measures. • Environmental training has been done as required. • EMP compliance site review was conducted. • Taking-over review and acceptance reports have been reviewed except for

		<ul style="list-style-type: none"> • Prepare environmental completion report. 	<ul style="list-style-type: none"> • rural roads HB01 and HB02. • Inputs have been made for the QPR and semi-annual EMR.
	Operation	<ul style="list-style-type: none"> • Conduct EMP compliance review • Support FCUC in instructing O&M units on environmental management requirements • Support FCUC in preparing quarterly project progress reports and semi-annual environmental monitoring report until a PCR is issued • Coordinate environmental monitoring until a PCR is issued 	<ul style="list-style-type: none"> • EMP compliance during operation was reviewed. • Quarterly project progress report and semi-annual EMR were prepared as scheduled. • Environmental monitoring during operation of all the trunk roads was done.
Contractors	Tendering & Pre-construction	<ul style="list-style-type: none"> • Ensure sufficient funding and human resources for proper and timely implementation of required mitigation and monitoring measures in the EMP throughout the construction phase 	<ul style="list-style-type: none"> • Funding for mitigation measures was included in the bid price.
	Construction	<ul style="list-style-type: none"> • Appoint an environment, health and safety (EHS) officer to oversee EMP implementation related to environmental, occupational health and safety on construction site • Ensure health and safety • Implement mitigation measures • Prepare site specific EMP (SEMP) containing method statements on the implementation of pollution control and mitigation measures listed in Table EMP-2, and submit to AMTB or SCG, and ESE for review and approval • Act as a local entry point for the project GRM 	<ul style="list-style-type: none"> • The contractors have appointed staff responsible for EHS management. • Mitigation measures for safety have been taken. • Specific site management measures have been required and have been taken by the contractors. • Focal points have been in place for the project GRM.
AEMS XYEMC SZETC SHMC	Construction	<ul style="list-style-type: none"> • Undertake environmental quality monitoring according to the environmental monitoring program in the approved EMP (contracted by AMTB and SCG) • Report monitoring data to ESE, AMTB and SCG monthly 	<ul style="list-style-type: none"> • AEMS was engaged for G316 by AMTB on 30 May 2016. XYEMC was engaged for S102 and rural roads XY01 to XY05 on 15 November 2016. Shaanxi Zhengwei Environmental Testing Co., Ltd was contracted for S224 and rural road Xiangshui Road on 14 April 2017. Shaanxi Huakang Monitoring Co. Ltd was engaged for rural road HB01. • Environmental monitoring reports were submitted monthly to the IA and ESEs for G316, S102 and rural roads XY01 to XY05, S224, rural roads HB01 and Xiangshui Road during construction.
	Operation	<ul style="list-style-type: none"> • Undertake environmental monitoring until a 	<ul style="list-style-type: none"> • Environmental monitoring

		<ul style="list-style-type: none"> PCR is issued (contracted by the O&M units) Submit monitoring results to the O&M units 	<ul style="list-style-type: none"> during operation of the trunk roads was done as required in the EMP. Monitoring reports were submitted to the O&M units.
ESE	Construction	<ul style="list-style-type: none"> Conduct independent verification of project's environment performance and compliance with the EMP (contracted by AMTB and SCG) Review monthly monitoring data submitted by AEMS and SEMS, and conduct compliance checking against applicable environmental standards Provide advice to contractors for resolving on-site environmental problems when monitoring data shows non-compliance. Submit quarterly compliance monitoring results to FCUC, AMTB and SCG 	<ul style="list-style-type: none"> Day-to-day site supervision and verification was conducted by the ESEs during construction. Monitoring reports were reviewed by the ESE. Corrective measures for environmental incompliance have been required and taken. Monthly environmental supervision reports for G316, S102, rural roads XY01 to XY05 were submitted during construction.
O&M Units: SPHB XCTB HDTB SCTB	Operation	<ul style="list-style-type: none"> Ensure proper operation of component facilities according to design standards Conduct follow up medium term (2023) noise monitoring to determine need for mitigation Implement mitigation measures if needed 	Operation period monitoring was conducted as required. Monitoring results show no additional mitigation measures are needed.

Notes: ADB = Asian Development Bank; AEMS = Ankang Environmental Monitoring Station; AEPB = Ankang Environmental Protection Bureau; AMTB = Ankang Municipal Transport Bureau; EA = Executing Agency; EHS = Environmental, Health & Safety; EIA = Environmental Impact Assessment; EIR = Environmental Impact Report; EMP = Environmental Management Plan; ESE = Environmental Supervision Engineer; FCUC = Foreign Capital Utilization Center; GRM = Grievance Redress Mechanism; HDTB = Hanyin District Transport Bureau; IA = Implementing Agency; LDI = local design institute; LIEC = Loan Implementation Environmental Consultant; PCR = Project Completion Report; O&M = Operation and Maintenance; SCG = Shangnan County Government; SCTB = Shangnan County Transport Bureau; SEMP = site specific environmental management plan; SEMS = Shangluo Environmental Monitoring Station; SEPB = Shangluo Environmental Protection Bureau; SPTD = Shaanxi Provincial Transport Department; SPHB = Shaanxi Provincial Highways Bureau; SZETC = Shaanxi Zhengwei Environmental Testing Co., Ltd; XCTB = Xunyang County Transport Bureau; XYEMC = Xi'an Yuanfang Environmental Monitoring Company; SHMC = Shaanxi Huakang Monitoring Co. Ltd.

5. Table 2 shows the detailed contact information of relevant environmental health and safety staff at various institutions and GRM focal persons.

Table 2 Contact Information of EHS Staff/Focal Points at Various Institutions

Institution	Name of Company	Position	Name of EHSS Staff	Contact Information (phone number/email)
FCUC(PM O)		Environmental Specialist	Mr. Zhu Wei	13709295981 344276053@qq.com
AMTB (IA)		Environmental Engineer	Mr. Chen Xunbin	18729955035 490008649@qq.com
SCG (IA)		Environmental Engineer	Mr. Wang Jian	13909146191
LIEC	Independent Consultant	Environmental Specialist	Ms. Tang Ying	15901484117 ty3721@163.com

Contractors	Sichuan Road and Bridge (Group) Corporation Ltd. (G316 subgrade)	Environmental and Safety Engineer	Mr. Li Jian	15680029135
	Hebei Construction Share-Holding Co. Ltd. (G316 pavement)	Environmental and Safety Engineer	Mr. Du Lingan	15389502927
	Shanhu Construction (Group) Corporation Ltd. (G316 greening)	Environmental and Safety Engineer	Wu Zhengyuan	18182490315
	China Tiesiju Civil Engineering Group Co. Ltd. (S102 subgrade)	Environmental and Safety Engineer	Mr. Lin Nan	15229102985
	HebeiGuangtong Road and Bridge Corp Co. Ltd. (S102 subgrade)	Environmental and Safety Engineer	Mr. SuoHanzhang	15324300009
	Sichuan Road and Bridge (Group) Corporation Ltd. (S102 subgrade)	Environmental and Safety Engineer	Mr. Wan Xiong	18828076599
	Lanhai Construction Group (S102 pavement)	Environmental and Safety Engineer	Mr. Yin Changchun	18355457700
	Shaanxi Construction Engineering Group (S102 greening)	Environmental and Safety Engineer	Mr. Liu Shaojie	18391412771
	Hebei Construction Group Co. Ltd (S224 subgrade)	Environmental and Safety Engineer	Mr. Wang Jie	18591952598
	SCEGC Mechanized Construction Group Co. Ltd (S224 subgrade)	Environmental and Safety Engineer	Mr. Wang Fuguo	18709149888
	Jiangxi Zhongmei Engineering Group Ltd. (S224 subgrade)	Environmental and Safety Engineer	Mr. Chen Jun	13909147916
	Heilongjiang Hualong Construction Co. Ltd (S224 subgrade)	Environmental and Safety Engineer	Mr. Sun Chengyu	18681251717
	Jiangsu Jialong Engineering Construction Co. Ltd. (S224 subgrade)	Environmental and Safety Engineer	Mr. Li Fuguo	13849793170
	Jiangxi ZhongmeiDecelopment Group (S224 pavement rehabilitation)	Environmental and Safety Engineer	Mr. CaiPeng	18161783898
	Zhejiang Jiaogong Road and Bridge Construction Company (S224 road pavement)	Environmental and Safety Engineer	Mr. Zhang Changwu	15249142789
	Jiangxi ZhongmeiDecelopment Group (S224 road pavement)	Environmental and Safety Engineer	Mr. Wang Xuwu	17809140066
	Lujian Group Co. Ltd. (Shangnan road safety, greening)	Environmental and Safety Engineer	Mr. Niu Liang	18992456058

	SCEGC Mechanized Construction Group Company Limited and Shaanxi Huayou Construction Company, Ltd. (for rural road XY01)	Environmental and Safety Engineer	Mr. Li Xiaotao	18792955296
	Shaanxi Zhongtong Road & Bridge Engineering Co., Ltd. and Shaanxi Modern Highway Mechanical Engineering Co. Ltd. (for rural road XY02)	Environmental and Safety Engineer	Mr. Wang Qizhou	13399252920
	Shanxi Jiaye Engineering Construction Co. Ltd. (for rural road XY03)	Environmental and Safety Engineer	Mr. He Guangbin	15929098098
	Shanxi Xinghan Road and Bridge Construction Co. Ltd (for rural road XY04)	Environmental and Safety Engineer	Mr. Zhaowei	18091544181
	Henan Qiankun Road and Bridge Construction Co. Ltd (for rural road XY05)	Environmental and Safety Engineer	Mr. Zhaowei	18091544181
	Jiangxi Haixi Transport Engineering Co. Ltd (for RR HB01)	Environmental and Safety Engineer	Mr. Lei Kangzhu	13636704699
	Henan ZhongzhouLuqiao Co. Ltd (for RR HB02 Lot 1)	Environmental and Safety Engineer	Mr. Wang Deyun	13891526900
	HebeiGuangtongLuqiao Co. Ltd (for RR HB02 Lot 2)	Environmental and Safety Engineer	Mr. Wang Biao	15349155850
	Huatong Road and Bridge Engineering Co. Ltd (two contracts of RR Xiangshui Road)	Environmental and Safety Engineer	Mr. Hu bo	18991463373
		Environmental and Safety Engineer	Mr. Du Xianliang	18309141088
ESE	Independent Consultant	Environmental Specialist	Ms. Tang Ying	15901484117 ty3721@163.com
	Shaanxi Bohou Construction Environmental Protection Engineering Ltd. (for G316)	Environmental Engineer	Mr. Jing Lijun	15209239001 515807792@qq.com
	Shaanxi Huankeyuan Engineering Supervision Limited Company (for S102)	Environmental Engineer	Mr. Liu Han	17791316059 496176040 @qq.com
	Shaanxi Limin Road Construction Consulting Service Company (for rural roads XY01 and XY02)	Environmental Engineer	Mr. Wang Minghui	15202921113 503586543@qq.com
	Shaanxi Daoke Road Construction Consulting Co. Ltd. (for rural roads XY03 to XY05)	Environmental Engineer	Mr. Liming Mr. ShuiBeiqing	18691485538 15196405709

	Ankang City Ruicheng Engineering Consulting Firm (for rural road HB01)	Environmental Engineer	Ms. Tang Dandan	15191548989
	Shaanxi Huankeyuan Engineering Supervision Limited Company (for S224 and rural road Xiangshui Road)	Environmental Engineer	Mr. JiaPeng	17782475095 34668527@qq.com

B. Implementation of Loan Covenants

6. The loan covenants of the project stipulate the following agreements on environmental safeguards. **Table 3** provides the compliance status of environment related project covenants during this reporting period.

Table 3 Environment Related Project Agreements and Compliance Status

Environment Related Project Agreements	Compliance Status
1. SPG shall cause SPTD to, and SPTD shall ensure that the preparation, design, construction, implementation, operation, maintenance, monitoring and decommissioning of the Project and all Project facilities comply with (a) all applicable laws and regulations of the Borrower relating to environment, health and safety; (b) the Environmental Safeguards; and (c) all measures and requirements set forth in the domestic environmental impact reports (EIRs), the environmental impact registration forms (EIRFs), the soil and water conservation report (SWCR), the EIA, the EMP, and any corrective or preventative actions (i) set forth in a Safeguards Monitoring Report; or (ii) which are subsequently agreed between ADB and the SPTD.	Being complied with
2. SPG shall cause SPTD to, and SPTD shall prepare, at the outset of each Project component implementation, detailed internal monitoring programs to be implemented by the contractors during construction and operation phases, and to incorporate such mitigation and monitoring measures into the design of Project components, relevant bidding documents and construction contracts. Throughout Project implementation, SPG shall cause SPTD to and SPTD shall review any changes to the Project design that may potentially cause negative environmental impacts, and in consultation with ADB, update the EIA and the EMP by revising mitigation measures as necessary to assure full environmental compliance.	Being complied with
3. SPG shall cause SPTD to, and SPTD shall ensure that the Project Implementing Agency has sufficient resources and full-time personnel for monitoring EMP implementation and making appropriate use of external independent environmental monitoring stations.	Being complied with
4. SPG shall cause SPTD to, and SPTD shall ensure that the FFPO project management office is trained in project monitoring and evaluation and engages a qualified environmental staff to manage all aspects of the environmental supervision, monitoring and reporting during construction and operation.	Being complied with
5. SPG shall cause SPTD to, and SPTD shall ensure that each Project Implementing Agency has at least one environmental specialist to supervise, monitor and report environmental impacts and implement the EMP	Being complied with except for rural road HB02, for which no external

during construction and operational stages and each Project Implementing Agency engages an external environmental supervision agency to supervise the implementation of the environmental safeguards requirements.	environmental supervision agency was employed.
6. SPG shall cause SPTD to, and SPTD shall ensure that the Project Implementing Agencies are required to provide semi-annual environmental monitoring reports in a format acceptable to ADB throughout the construction period to FFPO, which will in turn submit the semi-annual environmental monitoring reports to ADB	Being complied with
7. SPG shall cause SPTD to, and SPTD shall ensure that all temporary land take areas for construction of trunk road G316 will be located outside the boundary of the Shaanxi Han River Wetland, and that no solid waste from the Project will be disposed within the wetland boundary and also within 1 km from the boundary of the wetland.	Complied with.
8. SPG shall cause SPTD to, and SPTD shall ensure that all excavated spoil and construction and demolition waste generated during construction will be temporarily stored or permanently disposed of at designated locations only and that these locations shall be at least 300 meters from any water body.	Complied with.
9. SPG shall cause SPTD to, and SPTD shall ensure that measures described in the approved EIRs and the EIA and EMP for traffic noise mitigation will be implemented. These measures include the provision of double-glazed windows at sensitive receptors along all three trunk roads as identified in the approved EIRs and the EIA, and for trunk road S102 installation of barrier wall at Tangxin Primary School and noise barrier at Liangheguan Primary School.	Being complied with. Environmental monitoring during operation of all the trunk roads was done. Monitoring results indicate no further noise mitigation measures are needed. Liangheguan Primary School does not exist and noise barrier is not needed for Tangxin Primary School as noise monitoring results meet applicable standard.
10. SPG shall cause SPTD to, and SPTD shall ensure that measures described in the approved EIRs and the EIA and the EMP for protection of five Category II rivers and two drinking water collection sumps shall be implemented. These measures include the installation of 70 retention/sedimentation tanks along trunk road G316 and 40 retention/sedimentation tanks along trunk road S224.	Being complied with. Measures have been taken to prevent any discharge into Category II rivers. Construction activities did not cause damage to the drinking water collection sumps, and associated pipelines affected have been relocated. Technical justification/clarification was done for design of retention tanks along G316 and S224 and revisions were made to the detailed technical design. Retention tanks are included in engineering detailed design of G316 and 20 retention tanks at 16 bridges have been designed and built. For S224, finalized detailed design does not include construction of retention tanks as alternative drainage plan is adopted.
11. SPG shall cause SPTD to, and SPTD shall take into consideration climate change adaptation recommendations from the ADB-funded climate change assessment study in the design of the Project roads.	Being complied with.

Engineering design has been revised for climate change adaptation.
--

C. Implementation Progress of Environmental Contract Clauses

7. The following contract clauses for safeguarding the environment during construction have been incorporated into all tender documents, except the last three clauses which are only applicable to S102, S224 and G316, respectively.

Table 4 Implementation Status of Environmental Contract Clauses

Proposed Environmental Contract Clauses	Implementation Status
<p>a.) <u>Site specific environmental management plan (SEMP):</u> (i) The contractors shall prepare a site-specific environmental management plan prior to the commencement of construction works, and shall submit the plan to the implementing agency and the environmental supervision engineer for review and approval. The plan shall include method statements on the implementation of pollution control and mitigation measures, as well as an emergency spill contingency plan for containing and cleaning up accidental chemical spills on construction sites. The SEMP shall be updated as needed as and when environmental issues not covered by the plan arise. SEMP's should be prepared for each individual work package.</p>	<p>Included in all construction contracts. The EMP is included as one of the contract documents.</p>
<p>b.) <u>Siting of construction facilities:</u> (i) Locations of all spoil disposal sites shall be at least 300 m from the nearest water body. (ii) No spoil disposal site and construction staging areas shall be located within the boundary of the Shaanxi Han River Wetland. (iii) Locations of asphalt mixing stations, and concrete batching plants shall be at least 300 m upwind of the nearest household. (iv) Locations of borrow areas shall be at least 500 m from residential areas. (v) Borrow areas and spoil disposal sites with long, steep slopes, susceptible to erosion shall be avoided and shall include small level cut-off drains to break up and redirect run-off. (vi) Access and haul roads shall be constructed at sufficient distances from residential areas, in particular, local schools and hospitals.</p>	<p>Included in all construction contracts.</p>
<p>c.) <u>Construction time:</u> (i) For all new road sections including new tunnels and new bridges, there shall be no night time (between 22:00 and 06:00 hours) construction. (ii) For existing road sections, night time construction shall be avoided. Yet, recognizing that construction occasionally would require some works to be conducted at night to take advantage of less road traffic or to avoid worsening day time traffic conditions, night time construction work if needed shall prevent using high sound power level equipment and nearby residents shall be notified of such night time activities well</p>	<p>Included in all construction contracts.</p>

beforehand.	
<p>d.) <u>Protection of air quality</u></p> <p>(i) To suppress dust, hauling and access roads shall be sprayed with water regularly (at least once a day but frequency to be responsive to season and local conditions) and hoarding shall be erected around dusty activities</p> <p>(ii) The storage time of construction and demolition wastes on site shall be minimized by regularly removing them off site.</p> <p>(iii) Asphalt, hot mixing and batching plants shall be equipped with fabric filters and/or wet scrubbers to reduce the level of dust emissions.</p> <p>(iv) Vehicles with an open load-carrying case, which transport potentially dust-producing materials, shall have proper fitting sides and tail boards. Dust-prone materials shall not be loaded to a level higher than the side and tail boards, and shall always be covered with a strong tarpaulin.</p> <p>(v) Vehicle speed on unpaved haul roads shall be restricted to 10 km/h or less.</p> <p>(vi) Construction vehicles and machinery shall be kept in good working order, regularly serviced and with engines turned off when not in use.</p> <p>(vii) Wheel washing equipment shall be installed or manual wheel washing will be conducted at each exit of the works area to prevent trucks from carrying muddy or dusty substance onto public roads.</p> <p>(viii) In periods of high wind, dust-generating operations shall not be permitted within 200 m of residential areas. Special precautions need to be applied in the vicinity of sensitive areas such as schools, kindergartens and hospitals.</p> <p>(ix) Material stockpiles shall be covered with dust shrouds. For the earthwork management for backfill, measures shall include surface press and periodical spraying and covering. The extra earth or dredge shall be cleared from the project site in time to avoid long term stockpiling.</p> <p>(x) Unauthorized burning of construction and demolition waste material and refuse on site shall be strictly prohibited, and shall be subject to penalties for the Contractor, and withholding of payment.</p>	Included in all construction contracts.
<p>e.) <u>Protection of the acoustic environment</u></p> <p>(i) During daytime construction, the contractor shall ensure that: (i) noise levels from equipment and machinery conform to the PRC standard for Noise Limits for Construction Sites (GB12523-2011) and the World Bank Group's Environmental Health and Safety Standards, and machinery properly maintained to minimize noise; (ii) equipment with high noise and high vibration are not used near village or township areas and only low noise machinery or the equipment with sound insulation or exhaust muffling devices is employed.</p> <p>(ii) Temporary noise barriers or hoardings shall be deployed around the equipment to shield residences when there are residences within 80 m of the noise source.</p> <p>(iii) Noise levels at the construction site boundaries shall be monitored regularly. If noise standards are exceeded by</p>	Included in all construction contracts.

<p>more than 3 dB, equipment and construction conditions shall be checked, and mitigation measures shall be implemented to rectify the situation.</p> <p>(iv) The speed of bulldozer, excavator, crusher and other transport vehicles travelling on site shall be controlled. Noise reduction measures on equipment shall be adopted, with regular equipment repair and maintenance to keep them in good working condition.</p> <p>(v) The speed of vehicles travelling on construction sites and haul roads shall be limited to 10 km/h or less. The use of horns shall be forbidden unless absolutely necessary. The use of whistles shall be minimized.</p> <p>(vi) Construction activities shall be planned in consultation with local communities so that activities with the greatest potential to generate noise and vibration are planned during periods of the day that will result in least disturbance.</p>	
<p>f.) <u>Protection of water quality</u></p> <p>(i) Portable toilets and small package wastewater treatment plants and/or septic tanks shall be provided on construction sites and construction camps for the workers. If there are nearby public sewers, interim storage tanks and pipelines will be installed to convey wastewater to public sewers. Construction sites and construction camps shall also have drainage provisions to collect and treat site runoff.</p> <p>(ii) Sedimentation tanks shall be installed on construction sites (including tunneling sites) to treat process water (e.g. concrete batching for bridge construction) and muddy runoff with high concentrations of suspended solids. If necessary, flocculants such as polyacryl amide shall be used to facilitate sedimentation.</p> <p>(iii) Construction of river crossing road bridge foundations shall avoid the rainy season from May to October to minimize potential water quality impact. Mitigation measures such as placement of sandbags or berms around foundation and shoreline works to contain muddy water runoff shall be adopted. Slurry from pile drilling in the river bed shall be pumped to shore and properly disposed of.</p> <p>(iv) Construction machinery shall be repaired and washed at designated locations. No onsite machine repair and washing shall be allowed.</p> <p>(v) Storage and refueling facilities for fuels, oil, and other hazardous materials shall be within secured areas on impermeable surfaces, and provided with bunds and cleanup kits. If refueling in the field is required, it shall be done from road-licensed fuel trucks away from watercourses or other environmentally sensitive areas.</p> <p>(vi) The contractors' fuel suppliers must be properly licensed, follow proper protocol for transferring fuel, and must be in compliance with Transportation, Loading and Unloading of Dangerous or Harmful Goods (JT 3145-88). (application of Regulations for Transportation of Hazardous Goods by Motor Vehicle (JT3130-88) was required in domestic EIA)</p> <p>(vii) Material stockpiles shall be protected against wind and runoff waters which might transport them to surface waters. There shall be no storage of materials and equipment in river</p>	<p>Included in all construction contracts.</p>

<p>channels or close to sensitive receptors. Temporary storage of materials and equipment on river banks, if necessary, shall be short-term and protected to prevent run-off polluting river water.</p> <p>(viii) Any spills shall be cleaned up according to PRC norms and codes within 24 hours of the occurrence, with contaminated soils and water treated according to PRC norms and codes. Records must be handed over without delay to the FCUC and local EPB. An emergency spill contingency plan shall be prepared by the Contractors as part of the SEMP and personnel shall be trained in its use.</p> <p>(ix) Mitigation of water quality impact during river crossing bridge construction shall be based on water quality monitoring results. At each river crossing bridge construction location, upstream and downstream monitoring stations will be set up and SS levels monitored. When the SS levels at the downstream impact station is 130% higher than the SS levels at the upstream control station, the contractor shall adopt alternative construction methods or additional mitigation measures until the downstream SS level is less than 130% above the upstream SS level.</p>	
<p>g.) <u>Protection of biological resources and wildlife</u></p> <p>(i) Construction workers are prohibited from capturing any wildlife during construction.</p> <p>(ii) Existing vegetation where no construction activity is planned shall be preserved.</p> <p>(iii) Existing trees and grassland shall be protected during construction. Where a tree has to be removed or an area of grassland disturbed, replant trees and re-vegetate the area after construction.</p> <p>(iv) Trees or shrubs shall be removed only as the last resort if they impinge directly on the permanent works or necessary temporary works.</p>	<p>Included in all construction contracts.</p>
<p>h.) <u>Solid waste management and material re-use</u></p> <p>(i) Prior to main earthworks, the top soil (10-30 cm) shall be removed and stored temporarily, which shall be re-used on site for restoration works.</p> <p>(ii) Attempts shall be made to maximize the re-use of earth cut materials and construction and demolition wastes on the project, including the re-use of old asphalt or concrete road pavements.</p> <p>(iii) Old asphalt waste is a hazardous waste and shall only be transported by licensed companies and disposed of at approved hazardous waste treatment facilities.</p> <p>(iv) Contractors shall develop spoil disposal site management and restoration plans, to be approved by the local EPBs. The contractors shall only use material from borrow pits that have been licensed and approved.</p> <p>(v) Construction activities in borrow areas and spoil disposal sites shall be planned so that the open area is minimized and rehabilitation shall be completed progressively.</p> <p>(vi) Restoration of spoil disposal sites and borrow areas shall follow the completion of works in full compliance with all applicable standards and specifications, and shall be required before final acceptance and payment under the terms of contracts.</p>	<p>Included in all construction contracts.</p>

<p>i.) <u>Construction site sanitation</u></p> <p>(i) Contractor shall provide adequate and functional systems for sanitary conditions, toilet facilities, waste management, labor dormitories and cooking facilities. The site shall be effectively cleaned and disinfected. During site formation, the site shall be sprayed with phenolated water for disinfection. Toilets and refuse bins shall be disinfected and timely removal of solid waste shall be ensured.</p> <p>(ii) Rodents on site shall be exterminated at least once every 3 months. Mosquitoes and flies shall be exterminated at least twice each year.</p> <p>(iii) Public toilets shall be provided in accordance with the requirements of labor management and sanitation departments in the living areas on construction site, and designated staff responsible for cleaning and disinfection shall be appointed.</p> <p>(iv) Work camp wastewater shall be discharged into the municipal sewer system or treated on-site using portable systems or septic tanks.</p>	<p>Included in all construction contracts.</p>
<p>j.) <u>Occupational safety</u></p> <p>(i) A person responsible for environmental, health and safety during construction shall be appointed for the project.</p> <p>(ii) Personal protective equipment (safety hats and shoes and high visibility vests) shall be provided to all construction workers.</p> <p>(iii) Ear defenders for hearing protection shall be provided to workers operating and working near noisy power mechanical equipment.</p> <p>(iv) Safety goggles and respiratory masks shall be provided to workers doing asphalt road paving.</p> <p>(v) Method statements shall be prepared and approvals obtained for hazardous activities such as blasting, tunnel works, excavation and working near water.</p>	<p>Included in all construction contracts.</p>
<p>k.) <u>Food safety</u></p> <p>(i) Food hygiene in canteens on site shall be inspected and supervised regularly. Canteen workers must have valid health permits.</p> <p>(ii) If food poisoning is discovered, effective control measures shall be implemented immediately to prevent it from spreading.</p>	<p>Included in all construction contracts.</p>
<p>l.) <u>Disease prevention and health services</u></p> <p>(i) All contracted labor shall undergo a medical examination which shall form the basis of an (obligatory) health/accident insurance and welfare provisions to be included in the work contracts. The contractors shall maintain records of health and welfare conditions for each person contractually engaged.</p> <p>(ii) Health clinic shall be established at location where workers are concentrated, which shall be equipped with common medical supplies and medication for simple treatment and emergency treatment for accidents.</p> <p>(iii) A person responsible for health and epidemic prevention and education and training on food hygiene and disease prevention shall be specified (by the IA and contractors) to raise the awareness of workers.</p>	<p>Included in all construction contracts.</p>

(iv) Induction and training by local health departments on prevention and management of communicable diseases shall be provided.	
m.) <u>Social conflict prevention</u> (i) The following shall be prioritized: (i) employ local people for works, (ii) ensure equal opportunities for women and men, (iii) pay equal wages for work of equal value, and to pay women's wages directly to them; and (iv) not employ child or forced labor.	Included in all construction contracts.
n.) <u>Community health and safety</u> (i) A traffic control and operation plan shall be prepared together with the local traffic police prior to any construction. The plan shall include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings with an emphasis on ensuring public safety through clear signs, controls and planning in advance. Haulage routes and schedules shall be assigned to avoid transport occurring in the central areas, traffic intensive areas or residential areas. (ii) Residents and businesses shall be informed in advance of the road improvement activities, given the dates and duration of expected disruption, dusty and noisy activities, and access to the grievance redress mechanism. Local communities shall be alerted of the time and location of hazardous activities such as blasting. Construction billboards, which include construction contents, schedule, responsible person and complaint hotline number, will be erected at each construction site. (iii) Clear signs shall be placed at construction sites in view of the public, warning people of potential dangers such as moving vehicles, hazardous materials, excavations etc. and raising awareness on safety issues. Heavy machinery shall not be used at night, where possible and all such equipment shall be returned to its overnight storage area/position before night. All sites shall be made secure, discouraging access by members of the public through appropriate fencing, signage and/or security personnel, as appropriate. (iv) Continual communication with the villages and communities along the road alignments shall be maintained and the grievance redress mechanism shall be accessible and effective.	Included in all construction contracts.
o.) <u>Utility interruption</u> (i) Contractors shall assess construction locations in advance and identify potential for disruption to services and risks before starting construction. Any damage or hindrance/disadvantage to local businesses caused by the premature removal or insufficient replacement of public utilities shall be subject to full compensation, at the full liability of the contractor who causes the problem. (ii) If temporary disruption is unavoidable the contractor shall, in collaboration with relevant local authorities such as Power Company, Water Supply Company and Communication Company, develop a plan to minimize the disruption and communicate the dates and duration in advance to affected persons.	Included in all construction contracts and have been complied with.

<p>p.) <u>Specific Clause for blasting on S102</u></p> <p>(i) A pre-construction dilapidation survey of properties within blasting zone of influence (area to be determined by contractor based on level of charge) shall be carried out to confirm existing structural condition. All prominent defects in the form of cracks, settlement, movement, water seepage, spalling concrete, distortion, subsidence and other building defects will be recorded in photographs and supporting notes.</p> <p>(ii) Noise and vibration shall be monitored at Hongyantan, Xiaohe Town, Yujiawan and Goujiashan during blasting for the construction of tunnels Hongyantan #1, Hongyantan #2, Yujiawan and Goujiashan on S102. Based on monitoring results, reduce the charge for each blast if necessary.</p>	<p>Included in all construction contracts and have been done.</p>
<p>q.) <u>Specific Clause for protection of drinking water sources on S224</u></p> <p>(i) Road side hoarding shall be placed at the three locations of drinking water collection sumps on trunk road S224 as barriers to prevent contamination of these drinking water sources by construction materials and wastes. No stockpiling of construction materials and aggregates shall be permitted within 300 m from these sumps. All wastewater generated from road construction within 300 m of these sumps shall be treated and diverted to downstream of these sumps for discharge. Cut-off and diversion drains shall be installed at these locations and other sensitive receptors, as required, to divert run-off away.</p>	<p>Included in all construction contracts and have been complied with.</p>
<p>r.) <u>Specific Clause for protection and restoration of valuable tree and shrub species on G316:</u></p> <p>(i) Construction workers shall avoid damage to and removal of the Gingko Trees and Camphor Trees which are nationally protected species:</p> <p>a) Gingko Trees in the gully underneath the medium bridge between chainage K6+215 to K6+301.</p> <p>b) Camphor Trees on both sides of G316 from the Guanmiaogou Bridge (chainage K33+559.7) to the end point (chainage K34+801).</p> <p>(ii) Road side tree planting shall use local species such as Black Locust, fruit trees and plants in accordance with the surrounding plant community, with the exception of areas located within the towns.</p> <p>(iii) Plant shrubs and trees in nearby empty land to attract bird species such as the Yellow Breasted Bunting and Red-billed Blue Magpie. These include the Chinese Pistache <i>Pistacachinensis</i>, Caprifoliaceae plants such as the Linden <i>Viburnum dilatatum</i> and Amur Honeysuckle <i>Lonicera maackii</i>, and Shrubby Bush-clover <i>Lespedeza bicolor</i>. Crops such as grains and corns are also favorite food for these two bird species.</p> <p>(iv) Restoration measures for the temporary staging areas shall comply with the former land cover type to maximize native biodiversity:</p> <p>a) For temporary land take areas in gullies (the four spoil disposal sites at chainages K3+250, K18+650, K21+100 and K21+940; and on pre-casting yard at chainage K6+010), plant local tree and shrub species with fruits to provide food for birds;</p>	<p>Included in all construction contracts and have been complied with.</p>

b) For the asphalt mixing station at chainage K2+250, restore the Black Locust woodland similar to the original land cover; c) For the asphalt mixing station at chainage K18+100, restore the orchard landscape to match with the surrounding land cover; and d) For the other pre-casting yards, restore the farmland land cover.	
---	--

D. Overall Project Implementation Progress

8. As of the end of this reporting period, construction of all the trunk and rural roads and road safety improvements have been completed.

E. Detailed Engineering Progress

1. Component 1: Trunk Road Rehabilitation

9. This component has the rehabilitation of three trunk roads (G316, S102 and S224) totaling approximately 187.06 km in the Qinba Mountain area in southern Shaanxi Province. **Tables 5to8** summarize engineering progress of each trunk road.

10. By the end of last reporting period, all physical works had been completed. Professional review and acceptance for taking over was done for G316 in November 2020, for S102 in June 2021 and for S224 in June 2021, and completion review and acceptance is scheduled two years later since taking-over acceptance. Taking-over review and acceptance reports of the three trunk roads indicate that these roads are built in good quality, although some issues are found and need to be corrected. These issues include damaged stormwater pipe and traffic sign and culvert blockage associated with G316, and damaged traffic sign and damaged stormwater pipe inspection well cover associated with S102. Corrective actions have been taken.

Table 5 Summary of Trunk Road Rehabilitation and Engineering Progress during the Reporting Period

Trunk Road	Chainage	Engineering Progress Status
G316 Xunyang-Ankang (34.36 km)	K0+000 – K4+085 K4+085 – K5+300 K5+300 – K24+460 K24+460 – K34+425	Completed
S102 Xunyang-Xiaohe (60.25 km)	K0+000 – K17+400 K17+401 – K19+610 K19+611 – K23+951 K23+952 – K27+872 K27+873 – K33+899 K33+900 – K34+600 K34+601 – K38+000 K38+000 – K40+474 K40+475 – K52+239 K52+240 – K52+926 K52+927 – K55+650 K55+651 – K58+788 K58+789 – K59+832 K59+833 – K60+246	Completed
S224	K000 – K6+000	

Trunk Road	Chainage	Engineering Progress Status
Shangnan-Yunxian (92.45 km)	K6+000 – K54+220 K54+220 – K92+347	Completed

Table 6 Bridge Construction and Engineering Progress during the Reporting Period

No.	Chainage	Bridge Name or Location	Size L=large M=medium S=small			Length (m)	Engineering Progress Status
			L	M	S		
G316 Xunyang–Ankang							
1	K1+518	Xiantanzi		√		86	• Completed
2	K1+839	K1+839		√		66	• Completed
3	K2+049	Zushimiao	√			166	• Completed
4	K2+625	Datangou	√			189	• Completed
5	K3+199.5	Caojiagou	√			311.54	• Completed
6	K5+853	K5+853		√		84.44	• Completed
7	K6+023	K6+023		√		88.04	• Completed
8	K6+258	K6+258		√		86	• Completed
9	K20+628	K20+628		√		66	• Completed
10	K22+021	Yushugou	√			106	• Completed
11	K23+223	Nianzigou	√			170	• Completed
12	K23+663.7	Aijiahe	√			No Data	• Completed
		Total:	6	6	0		
S102 Xunyang – Xiaohe							
1	K3+150	Dangjiaba	√			395	• Completed
2	K6+247	Caopingdagou		√		46	• Completed
3	K7+585	Qingniwan		√		62	• Completed
4	K8+033	Laoquanshuigou			√	14	• Completed
5	K10+592	Songmugou			√	27	• Completed
6	K11+044	Jianggou		√		60	• Completed
7	K12+420	Hujiagou			√	27	• Completed
8	K13+333	Leijiawan	√			47	• Completed
9	K14+726	Muzhutan		√		75	• Completed
10	K17+600	Ganxi No.1	√			366	• Completed
11	K18+893	Ganxi No.2	√			866	• Completed
12	K26+054	Daling	√			278	• Completed
13	K27+008	Shangoutang		√		46	• Completed
14	K31+397	Yanwogou	√			108	• Completed
15	K32+762	Hujiazhuang			√	13	• Completed
16	K34+655	Chenjiagou	√			186.4	• Completed
17	K35+000	Luduba	√			126	• Completed
18	K35+685	Zhaowan No.1	√			286	• Completed
19	K36+520	Zhanwan No.2	√			346	• Completed
20	K37+505	Yatougou		√		57	• Completed
21	K40+675	Fanjiazhuang No.1		√		60.8	• Completed
22	K40+840	Fanjiazhuang No.2		√		73	• Completed
23	K43+035	Wanggou	√			151	• Completed
24	K49+795	Liangheguan No.1	√			286	• Completed
25	K50+085	Liangheguan No.2	√			163.4	• Completed

No.	Chainage	Bridge Name or Location	Size L=large M=medium S=small			Length (m)	Engineering Progress Status
			L	M	S		
			12	9	4	4165.6	
S224 Shangnan – Yunxian							
1	K6+80500	Sanjiaochi		√		69.04	• Completed
2	K10+664.0	Ganlugou #2		√		87.04	• Completed
3	K13+158.5	Xiaoqiao			√	16.54	• Completed
4	K14+737.5	Yuangou			√	18.04	• Completed
5	K17+529.5	Shanghe		√		77.0	• Completed
6	K22+464.5	Matidian			√	19.04	• Completed
7	K25+600	Danjiagou			√	5.0	• Completed
8	K27+431.9	Jiangjiatai		√		78.0	• Completed
9	K32+463	Xiaoxigou Community			√	16.0	• Completed
10	K32+594.0	Xiaoxigou		√		23.04	• Completed
11	K34+622.8	Yindonggou		√		99.0	• Completed
12	K36+883.0	Hongyu			√	22.54	• Completed
13	K37+483.0	Hongyukou		√		72.88	• Completed
14	K50+036.0	Sizhuangzi No.1		√		47.04	• Completed
15	K50+105.0	Sizhuangzi No.2		√		46.04	• Completed
16	K51+623.0	Sigoukou			√	19.04	• Completed
17	K52+088.0	Liushubian		√		37.04	• Completed
Total:			0	10	7	752.32	

Table 7 Tunnel Construction and Engineering Progress during the Reporting Period

No.	Chainage	Name of Tunnel	Length (m)	Engineering Progress Status
S102 Xunyang–Xiaohe				
1	K19+950-K20+790	Luomazhai	840	• Completed
2	K21+565-K22+340	Daling	775	• Completed
3	K24+045-K24+880	Wangjiaya	835	• Completed
4	K33+745-K34+565	Chengjiagou	820	• Completed
5	K39+570-K39+735	Qiushuping	165	• Completed
6	K53+590-K54+390	Xiaohe	800	• Completed
7	K57+150-K57+638	Yujiawan	488	• Completed
8	K59+490-K59+975	Goujiashan	485	• Completed
S224: Shangnan – Yunxian				
1	K10+827 – K11+089	Shuangmiaoling #1	262	• Completed
2	K11+760 – K12+010	Shuangmiaoling #2	250	• Completed
3	K23+840 – K24+148	Baishagou	308	• Completed
4	K45+188 –K45+276	Baihecun	88	• Completed

Table 8 Spoil Disposal Sites for Trunk Roads

Trunk Road	Site Identification	Near Chainage	Engineering Progress Status
G316	Site #1	K3+250	• Restored
Xunyang- Ankang	Site #2	K9+000	• Restored

Trunk Road	Site Identification	Near Chainage	Engineering Progress Status
	Site #3	K18+650	• Restored
	Site #4	K21+443	• Restored
S102 Xunyang – Xiaohe	Site #1	Old Road K192+500	• Restored
	Site #2	K22+450	• Restored
	Site #3	K22+850	• Restored
	Site #4	K23+900	• Restored
	Site #5	K26+150	• Restored
	Site #6	K31+400	• Restored
	Site #7	Old Road k175+650	• Restored
	Site #8	K50+350	• Restored
	Site #9	K54+550	• Restored
	Site #10	K59+030	• Restored
S224 Shangnan – Yunxian	Site #1	K21+180	• Restored
	Site #2	K24+840	• Restored
	Site #3	K26+800	• Restored
	Site #4	K33+600	• Restored
	Site #5	K34+500	• Restored
	Site #6	K43+180	• Restored
	Site #7	K48+700	• Restored
	Site #8	K49+000	• Restored
	Site #9	K49+883	• Restored
	Site #10	K51+300	• Restored
	Site #11	K52+400	• Restored

2. Component 2: Rural Road Upgrading

11. Component 2 is to upgrade eight rural roads (RR) totaling 139.656 km. **Table 9** summarizes the key features of these roads and their engineering progress status during this reporting period. This component also has spoil deposit sites, which was identified during the project appraisal. **Table 10** shows the summary of engineering progress status of these deposit sites during this reporting period.

12. By the end of last reporting period, all physical works had been completed. Taking-over review and acceptance was done in December 2020 for rural roads XY01 to XY05 and in January 2020 for Xiangshui Road. Taking-over review and acceptance reports show that these rural roads are well built except some minor defects are to be corrected. These defects include damaged road wearing course and culvert blockage associated with XY01 to XY05 and damaged wearing course and unstable cut slope associated with Xiangshui Road. Corrective actions have been taken. Taking-over review and acceptance for rural roads HB01 and HB02 is scheduled by June 2022.

Table 9 Summary of Rural Road Sections Proposed for Upgrade

Rural Road	Location			Road Length (m)	Engineering Progress Status
	Ankang City		Shangluo City		
	Xunyang County	Hanbin District	Shangnan County		
XY01 and XY02 (X304): Shangma–Xiaohe	√			38.405	• Completed
XY03: Lijiaba – Baiguo	√			7.879	• Completed

Rural Road	Location			Road Length (m)	Engineering Progress Status
	Ankang City		Shangluo City		
	Xunyang County	Hanbin District	Shangnan County		
XY04: Beigou – Luojia	√			7.253	• Completed
XY05: Yangpo – Liangheguan	√			16.618	• Completed
HB01: Yanba – Dongqiao		√		10.697	• Completed
HB02 (Lot 1): Zaobao – Yousheng Village		√		4.157	• Completed
HB02 (Lot 2): Zaobao – Wujiashan		√		9.335	• Completed
Xiangshui Road: Xianghe – Shuigou			√	45.312	• Completed

Table 10 Spoil Disposal Sites for Rural Roads

Rural Road	Site Identification	Near Chainage	Engineering Progress Status
XY01 and XY02 (X304) Shangma - Xiaohe	Site #1	K52+694	• Restored
	Site #2	K55+655	• Restored
	Site #3	K62+480	• Restored
	Site #4	K66+060	• Restored
	Site #5	K71+400	• Restored
	Site #6	K76+120	• Restored
	Site #7	K82+000	• Restored
	Site #8	K85+310	• Restored
XY03	Site #1	K2+760	• Restored
XY04 Beigou – Luojia	Site #1	K0+800	• Restored
	Site #2	K2+490	• Restored
	Site #3	K3+810	• Restored
	Site #4	K5+257	• Restored
XY05 Yangpo - Liangheguan	Site #1	K2+555	• Restored
	Site #2	K4+928	• Restored
	Site #3	K8+225	• Restored
	Site #4	K9+380	• Restored
	Site #5	K11+350	• Restored
	Site #6	K14+050	• Restored
HB01 Yangba – Dongqiao	Site #1	K6+400	• Restored
	Site #2	K5+900	• Restored
	Site #3	K6+800	• Restored
	Site #4	K7+280	• Restored
	Site #5	K8+050	• Restored
	Site #6	K8+600	• Restored
	Site #7	K9+300	• Restored
	Site #8	K10+380	• Restored
	Site #9	K4+480	• Restored
HB02 (Lot 1)	Site #1	K3+240	• Restored
HB02 (Lot 2)	Site #1	K2+250	• Restored
Xiangshui Road Xianghe-Shuigou	Site #1	K4+000	• Restored
	Site #2	K10+100	• Restored
	Site #3	K14+420	• Restored
	Site #4	K28+580	• Restored
	Site #5	K38+700	• Restored

3. Component 3: Road Safety

13. Road safety enhancement component is designed to apply to the three trunk roads, the eight rural roads and an additional 25 township and county roads totaling 542km, with the target of achieving a 3-star road safety rating for the majority of these roads.

Table 11 Additional Counter Measures for Road Safety Enhancement

No.	Proposed Counter Measure	Trunk Roads			8 Rural Roads	25 Road Safety Roads	Engineering Progress Status
		G316	S102	S224			
1	Bicycle lane (off-road)					√	Completed
2	Bicycle lane (on-road)				√		Completed
3	Central hatching	√	√		√	√	Completed
4	Clear roadside hazards (bike lane)	√	√				Completed
5	Clear roadside hazards –driver side	√		√		√	Completed
6	Clear roadside hazards – passenger side	√	√	√	√	√	Completed
7	Delineation and signing (intersection)	√	√	√	√	√	Completed
8	Footpath provision driver side (adjacent to road)	√	√	√	√	√	Completed
9	Footpath provision passenger side (adjacent to road)	√	√	√	√	√	Completed
10	Footpath provision driver side (informal path >1 m)	√	√	√	√	√	Completed
11	Footpath provision passenger side (informal path >1 m)	√	√		√	√	Completed
12	Footpath provision driver side (>3 m from road)	√	√	√	√		Completed
13	Footpath provision passenger side (>3 m from road)	√	√	√	√		Completed
14	Improve curve delineation	√	√	√	√	√	Completed
15	Improve delineation				√	√	Completed
16	Lane widening (>0.5 m)				√	√	Completed
17	Lane widening (up to 0.5 m)				√	√	Completed
18	Parking improvements	√	√	√	√	√	Completed
19	Pave road surface					√	Completed
20	Pedestrian fencing			√	√		Completed
21	Protected turn lane (unsignalized 3 leg)	√	√				Completed
22	Refuge island			√			Completed
23	Roadside barriers (bike lane)	√					Completed
24	Roadside barriers – driver side	√	√	√	√	√	Completed
25	Roadside barriers – passenger side	√	√	√	√	√	Completed
26	Roundabout		√				Completed
27	Shoulder sealing driver side (<1 m)				√	√	Completed
28	Shoulder sealing driver side (> 1 m)		√		√		Completed
29	Shoulder sealing passenger side (<1 m)				√	√	Completed
30	Shoulder sealing passenger side (> 1 m)	√	√		√		Completed
31	Side road signalized pedestrian crossing		√				Completed
32	Side road unsignalized pedestrian crossing	√	√			√	Completed
33	Sight distance (obstruction removal)	√	√	√	√	√	Completed

No.	Proposed Counter Measure	Trunk Roads			8 Rural Roads	25 Road Safety Roads	Engineering Progress Status
		G316	S102	S224			
34	Skid resistance (paved road)					√	Completed
35	Skid resistance (unpaved road)					√	Completed
36	Street lighting (intersection)		√	√	√		Completed
37	Street lighting (mid-block)		√				Completed
38	Traffic calming	√	√		√	√	Completed
39	Unsignalized crossing	√	√	√	√	√	Completed
40	Upgrade pedestrian facility quality			√	√		Completed
41	Wide centerline	√	√		√		Completed

III. IMPLEMENTATION OF THE ENVIRONMENTAL MANAGEMENT PLAN

8. This Environmental Management Plan (EMP) is developed for the Shaanxi Mountain Road Safety Demonstration Project, which identifies the potential project environmental impacts and defines mitigation measures and monitoring requirements for the design, construction, and operational stages of the project. It also defines the institutional arrangements and mechanisms, the roles and responsibilities of different institutions, procedures and budgets for implementation of the EMP. The EMP seeks to ensure environmental protection activities during preconstruction, construction, and operation continuously improve in order to prevent, reduce or mitigate adverse environmental impacts and risks.

9. Potential environmental issues and impacts during pre-construction, construction and operation phases, and corresponding mitigation measures. **Table 12** shows the summary of implementation status on mitigation measures during this reporting period.

10. As project scope and project features remain unchanged compared with project design in this reporting period, update or modification of the EMP associated with project scope change is not needed, although minor change has occurred in width of some road sections of S102 to contend with some localized geological conditions. In response to COVID-19 event occurred since early 2020 in China, the EMP has been updated to include necessary mitigation measures for health and safety management during construction and operation.

Table 12 Summary of Potential Impacts and Mitigation Measures and Implementation Status

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
A: Mitigation Measures Common to All Project Roads (including rural roads)				
A.1: Detailed Design Stage				
Conservation of natural resources	Soil resources	Loss of land and topsoil and increased risk of erosion	<ul style="list-style-type: none"> Minimize permanent and temporary land take for development. Retain/incorporate landscape features of interest in design. Optimize balance between cut and fill and avoid deep cuts and high embankments to minimize earthworks. Maximize reuse of spoil and old asphalt paving material within the construction or adjacent construction works. Agree spoil disposal sites, management and rehabilitation plan with local Environment Protection Bureau Specify removal and storage of topsoil (10-30cm) for restoration works prior to main earthworks. Specify vegetation that serves specific bioengineering functions and is of local provenance. Design appropriate drainage systems for slopes to reduce soil erosion. 	<ul style="list-style-type: none"> Design has been carefully reviewed to minimize soil erosion impact. Disposal approach of old asphalt paving material has been agreed by local EPB and concerned parties. Program for disposal of old asphalt paving material in G316 and S102 has been optimized. For G316 approximately 80% of the demolished material was reprocessed in place and used for new paving of G316, and the remaining 20% was reused as fill for rural roads. For S102 small quantity of waste asphalt pavement material has been used for embankment construction and in-situ cold reprocessing is adopted to use existing road pavement to lower layer of the new pavement structure same as G316. For S224, asphalt solid waste is disposed of through reuse for road construction and landfilling in the disposal site.
	Materials	Efficient use of resources	<ul style="list-style-type: none"> Specify energy efficient lighting systems. Specify materials that are recycled, have recycled content or are from sustainable sources, particularly for street furniture and fixtures/fittings. Specify the use of renewable energy (such as photovoltaic panels) for signs, lighting, where appropriate. Specify the recycling and reuse of existing asphalt pavement for rehabilitating road sections. 	<ul style="list-style-type: none"> Topsoil has been stored and reused as needed for road greening. Drainage systems have been designed for disposal sites to improve slope stability. Locations of the spoil disposal sites have been agreed by local authorities. Vegetation has been included in detailed design to use as much as local species.
Design of road alignment, road surface, drainage,			<ul style="list-style-type: none"> Consider potential impacts from extreme weather events due to climate change in designing road subgrade, pavement, road-side slopes, drainage system, bridges and culverts. Adopt appropriate protective measures such as vegetation cover, geotextiles, settling basins, permeable paving, infiltration ditches, 	<ul style="list-style-type: none"> Disposal approach of old asphalt paving material has been agreed by local EPB and concerned parties. Energy-efficient lighting systems have been considered in the detailed design.
	Extreme weather event due to climate change	Road surface cracking due to extreme hot or cold weather, landslide and flooding due to torrential rainfall		<ul style="list-style-type: none"> Measures to mitigate potential impacts from extreme weather events have been included in the detailed design, particularly for bridge design. Protective measures for soil

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
flood control, lighting and construction staging areas			stepped slopes, riprap, crib walls, retaining walls and intercepting ditches to reduce the speed of surface run-off.	conservation have been fully included in the detailed design.
	Ecology	Protected plant species	<ul style="list-style-type: none"> Conduct a tree survey along the project road alignments to identify the locations of those tree species that are under international, national and provincial protection. Mark and fence off the protected trees 	<ul style="list-style-type: none"> Survey has been done. No trees that are under national or local protection.
		Loss of vegetation	<ul style="list-style-type: none"> Technical design of new road sections will avoid intact mixed evergreen and deciduous broad-leaf woodland and deciduous broad-leaf woodland, as well as any trees that are on the international, national and provincial protection list. If avoidance is not possible, design replanting schemes for compensation 	<ul style="list-style-type: none"> Have been considered in the design. No trees are under protection at any level.
	Health and safety	Protection of vulnerable road users	<ul style="list-style-type: none"> Design must ensure public health and safety, especially pedestrians and school zones 	<ul style="list-style-type: none"> Protective measures have been included in the design.
	Air emissions	Construction emissions	<ul style="list-style-type: none"> Specify local materials from licensed providers that minimize transport distance. Locations for borrow areas, asphalt mixing and concrete batching stations must be at least 300 m downwind of the nearest household. 	<ul style="list-style-type: none"> Local suppliers are used as many as possible. No borrow area for this project. Concrete and asphalt batching stations were set far away from the household.
	Water quality	Polluted run-off into water bodies	<ul style="list-style-type: none"> Technical design of road drainage to ensure that drainage design and discharge locations minimize risk of polluting nearby water bodies. Need for pollution interceptors and treatment should be considered. Technical design of road drainage must include in the construction drawings the sedimentation tanks on G316 and S224 (see Error! Reference source not found. of the EIA) specified in the approved domestic Environmental Impact Reports. Locations of borrow areas and spoil disposal sites must be at least 300 m from the nearest water body. 	<ul style="list-style-type: none"> Further technical justifications were made on design of retention tanks along G316 and S224. Improved detailed design includes 20 retention tanks for G316 and none for S224. No borrow area for this project. Locations of spoil disposal sites are in compliance with River Course Regulation.
A.2: Pre-construction Stage				
Institutional strengthening	-	Lack of environmental management capacities within FCUC, AMTB, SCG and O&M units	<ul style="list-style-type: none"> Appoint qualified environment specialist on staff within FCUC. Contract loan implementation environment consultant (LIEC) within loan implementation consultant (LIC) services within three months after loan approval; Conduct environment management training. 	<ul style="list-style-type: none"> Appointed. LIEC and LIC have been contracted on schedule.
	-	Lack of environmental monitoring capability and qualification	<ul style="list-style-type: none"> Contract Ankang Environmental Monitoring Station (AEMS) and Shangluo Environmental Monitoring Station (SEMS) to conduct environmental quality monitoring during construction. 	<ul style="list-style-type: none"> Environmental monitoring was contracted for G316, S102, S224 and RRsXY01 to XY05, HB01 and Xiangshui Road except for rural road HB02.
	-	-	<ul style="list-style-type: none"> Contract AEMS and SEMS upon acceptance approval of the project road to conduct environmental quality monitoring during the operational stage. 	<ul style="list-style-type: none"> Environmental quality monitoring during operation was done for all the trunk roads as required.
EMP Update		-	<ul style="list-style-type: none"> Review mitigation measures defined in this EMP, update as required to reflect detailed design, disclose updated EMP on project website. 	<ul style="list-style-type: none"> EMP was updated to include mitigation measures for COVID-19 control.
Tender documents		Environmental safeguard contract clauses	<ul style="list-style-type: none"> Put into tender documents the environmental clauses listed in Section J of this EMP 	<ul style="list-style-type: none"> EMP has been included as part of the tender documents.
A.3: Construction Stage				

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
Construction site good practice	Soil resources	Spoil disposal and borrow area	<ul style="list-style-type: none"> Strip and store topsoil in a stockpile for reuse in restoration. Use spoil disposal sites approved by AEPB and SEPB and manage in accordance with approved plan. The contractors will only use material from borrow pits that have been licensed and approved. Avoid side casting of spoil on slopes. Co-ordinate with water resources bureau monitoring station on effectiveness of soil erosion prevention measures and any need for remedial action. Spoil disposal sites and borrow areas shall be at least 300 m from any water body. Borrow areas should be sited at least 500m from residential areas so as to reduce dust and noise from these areas. Borrow areas and spoil disposal sites with long, steep slopes, susceptible to erosion should be avoided and should include small level cut-off drains to break up and redirect run-off. The contractors should plan their work in borrow areas and spoil disposal sites so that the open area is minimised and rehabilitation can be completed progressively Restoration of spoil disposal sites and borrow areas will follow the completion of works in full compliance with all applicable standards and specifications, and will be required before final acceptance and payment under the terms of contracts. Conduct project completion audit to confirm that spoil disposal site and borrow area rehabilitation meets required standard, contractor liable in case of non-compliance. 	<ul style="list-style-type: none"> Topsoil has been stored as needed. Spoil disposal sites have been agreed by local authorities and majority have been restored as planned. No borrow area for this project. Technical improvement has been done for slope protection during road construction. Local water resources bureau is involved in implementation of soil erosion prevention measures. No borrow area for this project. Siting of spoil disposal sites is in compliance with river course regulation. Slope stability has been fully considered, and drainage system is designed and built for each spoil disposal site. Restoration has been included in detailed design of the disposal sites, and is included in the contract. All the disposal sites have been restored.
		Soil erosion	<ul style="list-style-type: none"> Ensure contractors aware of all soil erosion requirements as set out in the approved plan in the Soil and Water Conservation Report (SWCR) and have developed appropriate method statements and management proposals. Avoid rainy season. If necessary, construct berms to direct rainwater runoff away from exposed surface. Install drainage ditches and sedimentation tanks in temporary construction areas to prevent soil erosion and to manage run-off. Stabilize all cut slopes, embankments and other erosion-prone working areas while works are ongoing. Implement permanent stabilization measures as soon as possible, at least within 30 days. Pay close attention to drainage provision and establishment of vegetation cover on backfilled areas to prevent soil erosion. If restoration is carried out during periods of hot or extreme weather, ensure adequate aftercare to maximize survival. 	<ul style="list-style-type: none"> Soil erosion prevention requirements have been reflected in the design and mitigation measures have been done by the contractors. No construction activities in rainy days, and mitigation facilities have been built to divert rainwater. Drainage ditches and sedimentation sites have been built on bridge and tunnel construction sites. Vegetation restoration for slope protection during road construction is done in a timely manner. All the disposal sites have been restored through greening. Drainage provision is fully considered.
		Soil contamination	<ul style="list-style-type: none"> Develop spill response plan. Keep a stock of absorbent materials (e.g. sand, earth or commercial products) on site to deal with spillages and train staff in their use. If there is a spill take immediate action to prevent entering drains, watercourses, unmade ground or porous surfaces. Do not hose the spillage down or use any detergents. Use oil absorbents and dispose of 	<ul style="list-style-type: none"> Spill response measures have been taken on site. Strict requirements for spill response have been made to the contractors by the IAs and ESEs. No spill accidents occurred.

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
			<ul style="list-style-type: none"> used absorbents at a waste management facility. Record any spill events and actions taken in environmental monitoring logs and report to LIEC. Properly store petroleum products, hazardous materials and waste in clearly labeled containers on an impermeable surface in secure and covered areas, preferably with a containment tray for any leaks. 	<ul style="list-style-type: none"> No petroleum or hazardous materials are stored on site. Solid waste from construction workers has been collected in containers.
	Air quality	Dust (TSP) during construction	<ul style="list-style-type: none"> Provide dust masks to operating personnel. Spray water regularly on hauling and access roads (at least once a day dependent on local conditions, increase/decrease frequency as required) to suppress dust; and erect hoarding around dusty activities. Minimize the storage time of construction and demolition wastes on site by regularly removing them off site. Mount protective canvasses on all trucks which transport material that could generate dust. Build access and haulage roads at sufficient distances from residential areas, in particular, from local schools and hospitals. Assign haulage routes and schedules to avoid transport occurring in the central areas, traffic intensive areas or residential areas. Vehicle speed on unpaved haul roads will be restricted to 10 km/h or less. Keep construction vehicles and machinery in good working order, regularly service and turn off engines when not in use. Vehicles with an open load-carrying case, which transport potentially dust-producing materials, shall have proper fitting sides and tail boards. Dust-prone materials shall not be loaded to a level higher than the side and tail boards, and shall always be covered with a strong tarpaulin. Install wheel washing equipment or conduct wheel washing manually at each exit of the works area to prevent trucks from carrying muddy or dusty substance onto public roads. In periods of high wind, dust-generating operations shall not be permitted within 200 m of residential areas. Special precautions need to be applied in the vicinity of sensitive areas such as schools, kindergartens and hospitals. Equip material stockpiles and concrete mixing equipment with dust shrouds. For the earthwork management for backfill, measures will include surface press and periodical spraying and covering. The extra earth or dreg should be cleared from the project site in time to avoid long term stockpiling. Unauthorized burning of construction and demolition waste material and refuse shall be subject to penalties for the Contractor, and withholding of payment. Keep the public informed of construction schedules, dusty and noisy activities, and access to the grievance redress mechanism. Post the complaint hotline number at all work site and construction camp entrances. 	<ul style="list-style-type: none"> Dust masks were provided. Water was sprayed as needed to mitigate dust impact. Covered transportation. Access to schools and hospitals were fully ensured. Due to limitation of local condition, central area and residential areas can not be avoided, but transportation schedule and vehicle speed were well managed. Proper maintenance was done regularly for vehicles and machinery. Covered transportation of dust-prone material has been required and followed. Trucks were washed regularly and as needed. Operation in high windy days is strictly managed. Sites have been cleaned and restored where concrete batching station for subgrade construction and asphalt batching station for pavement were set. No burning of construction or demolition wastes on site. Such information is posted at construction camps and on public media.
		Fumes and particulate matter from asphalt mixing plant, concrete	<ul style="list-style-type: none"> Site asphalt mixing stations at least 300 meters downwind of the nearest household. Equip asphalt, hot mix and batching plants with fabric filters and/or wet 	<ul style="list-style-type: none"> Onsite asphalt mixing stations were reset associated with S224 and S102 road pavement construction. Information

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
		batching plant and other equipment and machinery	<ul style="list-style-type: none"> scrubbers to reduce the level of dust emissions. Regularly inspect and certify vehicle and equipment emissions and maintain to a high standard. 	<p>collected indicates there are no sensitive receptors within 300m of the plant and necessary environmental protection measures have been taken.</p> <ul style="list-style-type: none"> Wet scrubbers or particulate capture equipment are installed for the plants. Proper vehicle and equipment maintenance is made regularly. Asphalt mixing sites associated with S224 and S102 have been restored. No onsite asphalt mixing stations is set for G316 paving.
	Noise and vibration	Noise from PME and vehicles	<ul style="list-style-type: none"> During daytime construction, the contractor will ensure that: (i) noise levels from equipment and machinery conform to the PRC standard for Noise Limits for Construction Sites (GB12523-2011) and the WBG EHS Standards, and properly maintain machinery to minimize noise; (ii) equipment with high noise and high vibration are not used near village or township areas and only low noise machinery or the equipment with sound insulation is employed; (iii) sites for asphalt-mixing plants and similar activities will be located at least 300 m away from the nearest sensitive receptor; and (iii) temporary anti-noise barriers or hoardings will be installed around the equipment to shield residences when there are residences within 80 m of the noise source. For all new road sections including new tunnels and new bridges, there will be no night time (between 22:00 and 06:00 hours) construction. For existing road sections, night time construction shall be avoided. Yet, recognizing that construction occasionally would require some works to be conducted at night to take advantage of less road traffic or to avoid worsening day time traffic conditions, night time construction work if needed should prevent using high sound power level equipment and nearby residents should be notified of such night time activities well beforehand. Regularly monitor noise at sensitive areas (refer to the monitoring plan). If noise standards are exceeded by more than 3 dB, equipment and construction conditions shall be checked, and mitigation measures shall be implemented to rectify the situation. Provide the construction workers with suitable hearing protection (ear muffs) according to the worker health protection law of the PRC. Control the speed of bulldozer, excavator, crusher and other transport vehicles travelling on site, adopt noise reduction measures on equipment, ensure regular equipment repair and maintenance to keep them in good working condition. Limit the speed of vehicles travelling on construction sites and haul roads (less than 8 km/h), forbid the use of horns unless absolutely necessary, minimize the use of whistles. Maintain continual communication with the villages and communities along the road alignments and ensure GRM is accessible and effective. 	<ul style="list-style-type: none"> Noise control measures are well implemented. No night construction for all the new constructions. No night construction for existing road sections. Noise monitoring at sensitive areas were conducted regularly for G316 and S102, S224 and rural roads XY01 to XY05, HB01 and Xiangshui Road during construction. Personal protection equipment for the construction workers has been improved and safety training has been enhanced by the construction supervisor and ESE. Speed was limited on site, and proper maintenance of equipment was done. Vehicle speed was limited. All the villages and communities along the road are familiar with the GRM channels.

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
		Blasting	<ul style="list-style-type: none"> A pre-construction dilapidation survey of properties within blasting zone of influence (area to be determined by contractor based on level of charge) should be carried out to confirm existing structural condition. All prominent defects in the form of cracks, settlement, movement, water seepage, spalling concrete, distortion, subsidence and other building defects should be recorded in photographs and supporting notes. Monitor noise and vibration at Hongyantan, Xiaohu Town, Yujiawan and Goujiashan during blasting for the construction of tunnels Hongyantan #1, Hongyantan #2, Yujiawan and Goujiashan on S102. Based on monitoring results, reduce the charge for each blast if necessary. 	<ul style="list-style-type: none"> Pre-construction property survey has been done within blasting zone of influence of S102. Noise and vibrating have been monitored during tunnel blasting. Tunnel construction has been completed.
	Water quality	Construction site runoff and wastewater discharge	<ul style="list-style-type: none"> Portable toilets and small package wastewater treatment plants and or septic tanks will be provided on construction sites for the workers. If there are nearby public sewers, interim storage tanks and pipelines will be installed to convey wastewater to public sewers. Construction sites and construction camps shall also have drainage provisions to collect and treat site runoff. Sedimentation tanks will be installed on construction sites (including tunneling sites) to treat process water (e.g. concrete batching for bridge construction) and muddy runoff with high concentrations of suspended solids. If necessary, flocculants such as polyacryl amide (PAM) will be used to facilitate sedimentation. Construction of river crossing road bridge foundations will avoid the rainy season from July to September to minimize potential water quality impact. Mitigation measures such as placement of sandbags or berms around foundation and shoreline works to contain muddy water runoff will be adopted. Slurry from pile drilling in the river bed will be pumped to shore and properly disposed of. This will reduce the disturbance of sediments and the impact on water quality. Construction machinery will be repaired and washed at designated locations. No onsite machine repair and washing shall be allowed. Storage and refueling facilities for fuels, oil, and other hazardous materials will be within secured areas on impermeable surfaces, and provided with bunds and cleanup kits. If refueling in the field is required, it will be done from road-licensed fuel trucks away from watercourses or other environmentally sensitive areas. The contractors' fuel suppliers must be properly licensed, follow proper protocol for transferring fuel, and must be in compliance with <i>Transportation, Loading and Unloading of Dangerous or Harmful Goods</i> (JT 3145-88). Material stockpiles will be protected against wind and runoff waters which might transport them to surface waters. There shall be no storage of materials and equipment in river channels or close to sensitive receptors. Temporary storage of materials and equipment on river banks, if necessary, shall be short-term and protected to prevent run-off polluting river water. Any spills are to be cleaned up according to PRC norms and codes within 24 hours of the occurrence, with contaminated soils and water 	<ul style="list-style-type: none"> Simple toilets were built on construction sites. Residential houses are rented as construction camp, which is connected to municipal drainage system. Sedimentation tanks were built on construction sites (including tunnel and bridge sites). Construction of all tunnels and bridges has been completed. Sedimentation tanks were built on site for foundation works of river-crossing bridge. Construction of all river-crossing bridges has been completed. No onsite machine repair or washing. No fuel storage on site. Public fuel suppliers are used. Material stockpiles are well sheltered/covered and retained. Spill management has been well implemented.

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
			<p>treated according to PRC norms and codes. Records must be handed over without delay to the FCUC and local EPB. An emergency spill contingency plan shall be prepared by the Contractor as part of the SEMP and personnel will be trained in its use.</p> <ul style="list-style-type: none"> Mitigation of water quality impact during river crossing bridge construction will be based on water quality monitoring results. At each river crossing bridge construction location, upstream and downstream monitoring stations will be set up and SS levels monitored. When the SS levels at the downstream impact station is 130% higher than the SS levels at the upstream control station, the contractor shall adopt alternative construction methods or additional mitigation measures until the downstream SS level is less than 130% above the upstream SS level. 	
	Solid waste	Construction site refuse and construction and demolition (C&D) waste disposal	<ul style="list-style-type: none"> Temporary storage and permanent disposal of C&D waste at designated sites only. These sites shall be at least 300 m from any water body. Attempts will be made to maximize the re-use of earth cut materials and C&D wastes on the project, including the re-use of old asphalt or concrete road pavements. Asphalt waste must be disposed of at approved hazardous waste treatment center. Transport construction waste in enclosed containers; Establish enclosed waste collection points on site, with separation of domestic, construction and recyclable waste streams;; Set up centralized domestic waste collection point and transport offsite for disposal regularly by sanitation department. 	<ul style="list-style-type: none"> The designated disposal sites meet River Course Regulation and have been approved by local water resources authority. Local EPB has been consulted for disposal approach of waste asphalt. Covered transportation. Demolished waste asphalt has been reused as much as possible. Solid wastes on site are collected separately. Domestic waste is collected and sent to public solid waste facility regularly.
	Ecology	Destruction of vegetation	<ul style="list-style-type: none"> Conduct a tree survey along the road alignments and mark and fence off all the protected tree species within the project area of influence. Avoid damage to the protected tree species during construction. If unavoidable, transplant these trees to safe location. Construction workers are prohibited from capturing any wildlife during construction; Preserve existing vegetation where no construction activity is planned; Protect existing trees and grassland during construction; where a tree has to be removed or an area of grassland disturbed, replant trees and re-vegetate the area after construction in particular existing mountain gullies underneath the project bridges; Remove trees or shrubs only as the last resort if they impinge directly on the permanent works or necessary temporary works. 	<ul style="list-style-type: none"> No protected trees along the roads. No capturing of any wildlife by construction workers. Existing vegetation is reserved as much as possible. Mitigation measures have been required and taken to protect the trees and grassland. Replanting has been included in the design and is being done. Removing trees shall be subject to approval of local forest bureau or gardening bureau.
	Physical cultural resources	Destruction of buried cultural relics	<ul style="list-style-type: none"> Contractor must comply with PRC's <i>Cultural Relics Protection Law</i> and <i>Cultural Relics Protection Law Implementation Regulations</i> if such relics are discovered, stop work immediately and notify the local cultural authority, adopt measures to protect the site. 	No buried cultural relics were discovered.

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
	Overall disturbance to communities	Excessive disturbance to communities due to prolonged construction times	<ul style="list-style-type: none"> Contractors to identify and adhere to strict schedule for completion of each section and to avoid prolonged construction, disturbance 	Well implemented.
Health and Safety	Occupational health and safety	Construction site sanitation	<ul style="list-style-type: none"> Effectively clean and disinfect the site. During site formation, spray with phenolated water for disinfection. Disinfect toilets and refuse piles and timely remove solid waste; Exterminate rodents on site at least once every 3 months, and exterminate mosquitoes and flies at least twice each year; Minimise the risk of fly- or mosquito-borne diseases by maintaining well-drained and hygienic project sites; Remove standing water bodies and cover drums and other containers to avoid formation of stagnant water; Ensure personnel are aware of potential disease risks; Enforce on-site hygiene regulations to prevent litter; Provide public toilets in accordance with the requirements of labor management and sanitation departments in the living areas on construction site, and appoint designated staff responsible for cleaning and disinfection. Work camp wastewater shall be discharged into the municipal sewer system or treated on-site with portable system to the required standard. 	<ul style="list-style-type: none"> Disinfection of the camp was done regularly. Extermination has been done regularly. Sites were maintained clean. Residential house are rented as construction camp with very good sanitation condition. Construction workers have been given health training. There is strict hygiene management on site. Residential houses with municipal sewers are rented. Staff for EHS has been appointed. Public facilities are used for worker camp.
		Occupational safety	<ul style="list-style-type: none"> Provide safety hats and shoes to all construction workers and enforce their use by the workers; Provide appropriate ear defenders to workers working near noisy PME and blasting activities. 	<ul style="list-style-type: none"> Personal protective equipment has been provided to the workers. Safety training by construction supervisor has been done throughout construction.
		Food safety	<ul style="list-style-type: none"> Inspect and supervise food hygiene in cafeteria on site regularly. Cafeteria workers must have valid health permits. If food poisoning is discovered, implement effective control measures immediately to prevent it from spreading. 	<ul style="list-style-type: none"> Food hygiene in cafeteria was inspected regularly. Food poisoning shall be reported to local health authority and effective control measures should be done immediately as required. No food poisoning accidents occurred.
		Disease prevention and safety awareness	<ul style="list-style-type: none"> Construction workers must have physical examination before start working on site. If infectious disease is found, the patient must be isolated for treatment to prevent the disease from spreading. From the 2nd year onwards, conduct physical examination on 20% of the workers every year. Establish health clinic at location where workers are concentrated, which should be equipped with common medical supplies and medication for simple treatment and emergency treatment for accidents. Specify the persons responsible for health and epidemic prevention, education on food hygiene, and disease prevention, to raise the awareness of workers. 	<ul style="list-style-type: none"> Physical examination has been done for the workers. Infectious disease shall be reported to local health authority and measures should be taken as required. No infectious disease was reported. Public health facilities are used as very near to worker camp. Persons responsible for EHS have been specified by each contractor. <p>For COVID-19 control, the following measures have been taken by the EA, all the IAs, construction supervisors and the contractors in accordance with national and local</p>

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
				<p>regulations:</p> <ul style="list-style-type: none"> • Application should be submitted and reviewed before construction activities are resumed. • In accordance local regulations, emergency responsive plan for COVID-19 control has been developed by the chief construction supervision office and reported to the IA for review, which includes organization structure, dedicated staff, closure of construction camp, arrangements for provision of protection supplies, health check and documentation of construction staff, reporting procedure of suspected cases, as well as information dissemination and education. • Specific control plan has been prepared by the contractor, which includes organization and responsible staff, staff list that return to the site, health check and documentation, catering management, availability and provision of protection supplies, reporting, control of personal behaviors, quarantine arrangements, health check and reporting. <p>These control measures have been well implemented. No confirmed cases or suspected cases associated with this Project were reported.</p>
	Community health and safety		<ul style="list-style-type: none"> • A traffic control and operation plan will be prepared together with the local traffic management authority prior to any construction. The plan shall include provisions for diverting or scheduling construction traffic to avoid morning and afternoon peak traffic hours, regulating traffic at road crossings with an emphasis on ensuring public safety through clear signs, controls and planning in advance. 	<ul style="list-style-type: none"> • Traffic control plan has been fully coordinated with local traffic management authority before and during construction.
			<ul style="list-style-type: none"> • Residents and businesses will be informed in advance through media and community posting of the construction activities, given the dates and duration of expected disruption. 	<ul style="list-style-type: none"> • Information of construction activities and traffic control has been posed on site and through media.
			<ul style="list-style-type: none"> • Clear signs will be placed at construction sites in view of the public, warning people of potential dangers such as moving vehicles, hazardous materials, excavations etc and raising awareness on safety issues. 	<ul style="list-style-type: none"> • Signs are placed at construction site entrance and on site.
			<ul style="list-style-type: none"> • All sites will be made secure, discouraging access by members of the public through appropriate fencing whenever appropriate. 	<ul style="list-style-type: none"> • Safety measures have been taken such as appropriate covering, and warning signs are placed.

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
		Utility services interruptions	<ul style="list-style-type: none"> Assess construction locations in advance for potential disruption to services and identify risks before starting construction. If temporary disruption is unavoidable, develop a plan to minimize disruption with relevant authorities e.g. power company, water supply company, communication company, and communicate dates and duration in advance to all affected people. 	<ul style="list-style-type: none"> Close coordination has been made with the concerned utilities and authorities as required. Relocation shall be done by professional utilities or approved prior to construction by concerned utilities.
Grievance redress mechanism	Social & environmental	Handling and resolving complaints on contractors	<ul style="list-style-type: none"> Establish a GRM, appoint a GRM coordinator within FCUC. Brief and provide training to GRM access points (FCUC, AMTB, contractors). Disclose GRM to affected people before construction begins at the main entrance to each construction site. Maintain and update a Complaint Register to document all complaints. 	<ul style="list-style-type: none"> A GRM has been established for the project. Training on GRM has been provided. GRM has been disclosed to the affected people before construction. All complaints have been fully documented and addressed.
A.4: Operational Stage				
Project roads	Climate change	Increased flood risk	Co-ordinate with reservoir operators on flood storage to help ensure road infrastructure is protected during periods of heavy rainfall.	Being complied with.
	Traffic	Road and drainage condition	Regularly inspect and maintain the road surface and drainage system.	Road surface and drainage system are well maintained.
		Road safety and traffic accidents	Strictly enforce traffic law to improve road safety and reduce traffic accidents.	Being complied with.
B: Trunk Road G316 Xunyang - Ankang				
B.1: Detailed Design Stage				
Design of spoil disposal sites and construction staging areas	Protected area	Impact on Shaanxi Han River Wetland	No spoil disposal site and construction staging area shall be located within the Shaanxi Han River Wetland boundary.	<ul style="list-style-type: none"> No reserves within project area. Location of the spoil disposal site is in compliance with River Course Regulation.
Design of retention/ sedimentation tanks	Water quality	Road runoff during rainfall event polluting Category II Han River	Detailed design to include 70 retention/sedimentation tanks along the alignment in accordance with the sizes and locations specified in the approved EIR for trunk road G316 and this EIA. (construction cost to be included in the civil works contract)	Detailed design has been further improved after further field investigation and technical justification. 20 retention tanks at 16 locations are included in the finalized detailed design. All the 20 retention tanks have been built. Technical clarifications have been provided by the IA.
B.2: Construction Stage				
Disposal of solid waste	Protected area	Impact on Shaanxi Han River Wetland	No solid waste generated during construction shall be disposed of within the boundary and up to 1 km from the boundary of the Shaanxi Han River Wetland	Disposal of solid waste is in compliance with River Course Regulation.
Wastewater discharge	Water quality	Impact on Category II Han River	No wastewater from the construction sites and temporary land take areas shall be discharged into Category II Han River	No discharge of wastewater into Han River.
Ecology	Habitat protection and restoration	Tree planting using local species	<ul style="list-style-type: none"> Road side tree planting shall use local species such as Black Locust, fruit trees and plants in accordance with the surrounding plant community, with the exception of areas located within the towns. Plant shrubs and trees in nearby empty land to attract bird species such as the Yellow Breasted Bunting and Red-billed Blue Magpie. These include the Chinese Pistache <i>Pistacia chinensis</i>, Caprifoliaceae plants 	<ul style="list-style-type: none"> Local tree species have been fully considered in the design. Planting has been fully designed and are being done.

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
			such as the Linden <i>Viburnum Viburnum dilatatum</i> and Amur Honeysuckle <i>Lonicera maackii</i> , and Shrubby Bush-clover <i>Lespedeza bicolor</i> . Crops such as grains and corns are also favorite food for these two bird species.	
		Restoration of temporary land take areas	<p>Restoration measures for the temporary staging areas shall comply with the former land cover type to maximize native biodiversity:</p> <ul style="list-style-type: none"> For temporary land take areas in gullies (the four spoil disposal sites at chainages K3+250, K18+650, K21+100 and K21+940; and on pre-casting yard at chainage K6+010), plant local tree and shrub species with fruits to provide food for birds For the asphalt mixing station at chainage K2+250, restore the Black Locust woodland similar to the original land cover For the asphalt mixing station at chainage K18+100, restore the orchard landscape to match with the surrounding land cover For the other pre-casting yards, restore the farmland land cover 	All the disposal sites have been restored. Concrete batching sites have been restored. No asphalt batching station was set for G316.
		Avoid damage to protected plant species	<ul style="list-style-type: none"> Construction workers shall avoid damage to and removal of the Ginkgo Trees and Camphor Trees which are nationally protected species: Ginkgo Trees in the gully underneath the medium bridge between chainage K6+215 to K6+301 Camphor Trees on both sides of G316 from the Guanmiaogou Bridge (chainage K33+559.7) to the end point (chainage K34+801) 	Although the very a few Ginkgo trees are not under national or local protection, protective measures have been taken to avoid damage during construction.
B.3: Operational Stage				
Installation of double glazed windows	Traffic noise	Traffic noise affecting existing sensitive receptors	Install double glazed windows at sensitive receptors identified in the approved EIR for trunk road G316 and this EIA.	Traffic noise at the sensitive receptors was monitored during road operation. Monitoring results show that installation of double glazed windows is not needed.
C: Trunk Road S102 Xunyang - Xiaohe				
C.1: Detailed Design Stage				
Design flood heights of bridges	Climate change	Risk of flood	Raise Liangheguan Bridge by 0.3m.	Already included in the detailed design and done.
Design noise barrier	Traffic noise	Traffic noise affecting schools	<p>Detailed design to include the following road-side noise mitigation measures as specified in the approved EIR for trunk road S102 and this EIA (Error! Reference source not found.)</p> <ul style="list-style-type: none"> 100-m long, 3-m high boundary wall at Tangxing Primary School (K46+480-K46+550). 150-m long, 3-m high noise barrier at Liangheguan Primary School (K53+650-K53+700)(construction cost to be included in the civil works contract). 	<p>Already included in the detailed design.</p> <p>Liangheguan Primary School was closed and does not exist now.</p> <p>Noise barrier is not needed for Tangxing Primary School as noise monitoring results meet applicable standard.</p>
C.2: Pre-construction Stage				
Tender document	Noise	Blasting noise and vibration	Put the following into the tender document for S102 as shown in Section J of this EMP: Specific Clause for blasting on S102 (i) A pre-construction dilapidation survey of properties within blasting zone of influence (area to be determined by contractor based on level of charge) shall be carried out to confirm existing structural condition. All	EMP has been included as part of the tender documents. Pre-construction dilapidation survey of properties and vibration monitoring were done before and during construction, respectively.

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
			<p>prominent defects in the form of cracks, settlement, movement, water seepage, spalling concrete, distortion, subsidence and other building defects will be recorded in photographs and supporting notes.</p> <p>(ii) Noise and vibration shall be monitored at Hongyantan, Xiaohu Town, Yujiawan and Goujiashan during blasting for the construction of tunnels Hongyantan #1, Hongyantan #2, Yujiawan and Goujiashan on S102. Based on monitoring results, reduce the charge for each blast if necessary.</p>	
C.3: Operational Stage				
Installation of double glazed windows	Traffic noise	Traffic noise affecting existing sensitive receptors	Install double glazed windows at sensitive receptors identified in the approved EIR for trunk road S102 and this EIA (Error! Reference source not found.)	Traffic noise at the sensitive receptors was monitored during road operation. Monitoring results show that installation of double glazed windows is not needed.
D: Trunk Road S224 Shangnan - Yunxian				
D.1: Detailed Design Stage				
Design of retention/sedimentation tanks	Water quality	Road runoff during rainfall event polluting Category II rivers and drinking water collection sumps	<ul style="list-style-type: none"> Detailed design to include 40 retention/sedimentation tanks along the alignment in accordance with the sizes and locations specified in the approved EIR for trunk road S224 and this EIA (Error! Reference source not found.). Detailed design to include protective guardrails along the alignment at locations specified in the approved EIR for trunk road S224 and this EIA (Error! Reference source not found.) to protect Category II rivers and drinking water collection sumps (construction cost to be included in the civil works contract) Detailed design to include a sealed cover over the drinking water collection sump at Weijiatai Village 	<ul style="list-style-type: none"> After further site investigation and technical justification, alternative drainage plan was adopted and no construction of retention tanks is included in the finalized detailed design. Technical clarifications have been provided by the IA. Guardrails have been designed and installed where needed. Drinking water collection sumps have been covered.
D.2: Pre-construction Stage				
Tender document	Water quality	Protection of drinking water collection sumps	Put environmental specifications for protection of water quality into the tender document for S224 as shown in Section J of this EMP:	EMP has been included as part of the tender documents.
D.3: Construction Stage				
Drinking water collection sumps	Water quality	Protection of drinking water collection sumps	<ul style="list-style-type: none"> Road side hoarding will be placed at the three locations of drinking water collection sumps on trunk road S224 as barriers to prevent contamination of these drinking water sources by construction materials and wastes. No stockpiling of construction materials and aggregates is permitted within 300 m from these sumps. All wastewater generated from road construction within 300 m of these sumps will be treated and diverted to downstream of these sumps for discharge. Cut-off and diversion drains will be installed at these locations and other sensitive receptors, as required, to divert run-off away. 	<ul style="list-style-type: none"> The drinking water collection sumps are quite far away from the road, and construction activities have no adverse impact to them. No sockpiling near these sumps. No wastewater generated during road construction. Diversion of rainwater has been fully considered during construction.
Wastewater	Water quality	Protection of Category II rivers	No wastewater from the construction sites shall be discharged into the Xian River, Dan River, Xiang River and Tao River	No discharge of wastewater into these rivers.
D.4: Operational Stage				

Item	Impact Factor	Potential Impact and/or Issues	Mitigation Measures	Implementation Status
Installation of double glazed windows	Traffic noise	Traffic noise affecting existing sensitive receptors	Install double glazed windows at sensitive receptors identified in the approved EIR for trunk road S224 and this EIA (Error! Reference source not found.)	Traffic noise at the sensitive receptors was monitored during road operation. Monitoring results show that installation of double glazed windows is not needed.
Key: ADB = Asian Development Bank; AEMS = Ankang Environmental Monitoring Station; AMTB = Ankang Municipal Transport Bureau; EIA = Environmental Impact Assessment; EIR = Environmental Impact Report; EMP = environmental management plan; ESE = Environmental supervision engineer; FCUC = Foreign Capital Utilization Center; HDTB = Hanyin District Transport Bureau; LIC = Loan Implementation Consultant; LIEC = Loan implementation environmental consultant; O&M = operation & maintenance; PME = powered mechanical equipment; SCG = Shangnan County Government; SCTB = Shangnan County Transport Bureau; SEMS = Shangluo Environmental Monitoring Station; SPHB = Shaanxi Provincial Highways Bureau; SS = suspended solid; TSP = total suspended particulates; XCTB = Xunyang County Transport Bureau				

IV. IMPLEMENTATION OF ENVIRONMENTAL MONITORING PROGRAM

11. This section presents the progress of environmental monitoring framework in details and the summary of environmental monitoring results.

A. Implementation Status of Environmental Monitoring

12. **Table 13** shows the summary of implementation status on environmental quality monitoring, which was designed for this project. Environmental quality monitoring will include monitoring of air quality, noise and water quality during construction, and air quality and noise monitoring during operation. Monitoring was done by *Ankang EMS (contracted by AMTB for the construction phase of G316)*, by XYEMC (contracted by XCTB for construction phase of S102 and rural roads XY01 to XY05), by Shaanxi Zhengwei Environmental Testing Co. Ltd (contracted by SCG for construction phase of S224 and rural road Xiangshui Road) and by Shaanxi Huakang Monitoring Co. Ltd for rural road HB01. No environmental monitoring has been done for rural road HB02. In this reporting period, all the constructions have been completed. Environmental monitoring during operation was done for all the trunk roads in December 2021.

Table 13 Summary of Implementation Status of Environmental Quality Monitoring

Item	Monitoring Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementation Status
G316 Xunyang – Ankang				
Construction Stage				
Air quality	TSP; (SO ₂ & NO ₂ only if there is asphalt mixing within 500 m)	14 locations 1. Duanjiahe Town Health Clinic 段家河镇卫生院 (K5+800) 2. Duanjiahe Junior High School 段家河初级中学 (K6+200) 3. Mingde Primary School 明德小学 (K6+250) 4. Duanjiahe Town Kindergarten 段家河镇幼儿园 (K6+350) 5. Longquan Village Health Clinic 龙泉村卫生院 (K20+900) 6. Zaoyang Town 早阳镇 (K25+500 – K25+700) 7. Dongzhan Village First Group 东站村一组 (K32+800) 8. Chuangxin Vocational Training School 创新职业培训学校 (K33+000) 9. Dongzhan Village Second Group 东站村二组 (K33+850) 10. Ankang City Children's Welfare Institute 安康市儿童福利院 (K34+500) 11. Guanniao Town Central Health Clinic 关庙镇中心卫生院 (K34+850) 12. Jinxing Village 金星村 (K35+000-K36+000) 13. Tuanjie Primary School 团结小学 (K35+750) 14. Hualian Vocational Training School 华联职业培训学校 (K36+370)	1 day (24-hr) per month (Monitor only when road section has construction activities within 500 m)	Done during construction.
Noise	L _{Aeq}	14 locations 1. Duanjiahe Town Health Clinic 段家河镇卫生院 (K5+800) 2. Duanjiahe Junior High School 段家河初级中学 (K6+200) 3. Mingde Primary School 明德小学 (K6+250) 4. Duanjiahe Town Kindergarten 段家河镇幼儿园 (K6+350) 5. Longquan Village Health Clinic 龙泉村卫生院 (K20+900) 6. Zaoyang Town 早阳镇 (K25+500 – K25+700) 7. Dongzhan Village First Group 东站村一组 (K32+800) 8. Chuangxin Vocational Training School 创新职业培训学校 (K33+000) 9. Dongzhan Village Second Group 东站村二组 (K33+850) 10. Ankang City Children's Welfare Institute 安康市儿童福利院 (K34+500) 11. Guanniao Town Central Health Clinic 关庙镇中心卫生院	2 times per day (day time and night time); 1 day per month (Monitor only when road section has construction activities within 500 m)	Done during construction.

Item	Monitoring Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementation Status
		(K34+850) 12. Jinxing Village 金星村 (K35+000-K36+000) 13. Tuanjie Primary School 团结小学 (K35+750) 14. Hualian Vocational Training School 华联职业培训学校 (K36+370) [Note: <i>night time monitoring not needed at #4, #13 and #14</i>]		
Water quality	DO, SS, TPH	Set up 2 stations for water quality monitoring at each river/stream crossing bridge locations as follows: 1. Control station: 50 m upstream of the bridge alignment 2. Impact station 100m downstream of the bridge alignment (Note: if downstream impact station data > 130% of upstream control station data (DO <130%), mitigation measures are needed)	1 time per day; 1 day per month during bridge construction	Done during construction.
Operational Stage				
Air quality	PM ₁₀ , NO ₂	8 locations: 1. Xuejiawan First Group 薛家湾一组 (K5+300-K5+600) 2. Duajiahe Town Health Clinic 段家河镇卫生院 (K5+800) 3. Duanjiahe Town Kindergarten 段家河镇幼儿园 (K6+350) 4. Longquan Village Health Clinic 龙泉村卫生院 (K20+900) 5. Zhoujiahe 周家河 (K21+900-K22+350) 6. Zaoyang Town 早阳镇 (K25+500 – K25+700) 7. Dongzhan Village First Group 东站村一组 (K32+800) 8. Dongzhan Village Second Group 东站村二组 (K33+850)	7 consecutive days every 3 months (until a PCR is issued)	Monitored in December 2021.
Noise	L _{Aeq}	5 locations: 1. Duajiahe Town Health Clinic 段家河镇卫生院 (K5+800) 2. Duanjiahe Town Kindergarten 段家河镇幼儿园 (K6+350) 3. Longquan Village Health Clinic 龙泉村卫生院 (K20+900) 4. Guanmiao Town Central Health Clinic 关庙镇中心卫生院 (K34+850) 5. Hualian Vocational Training School 华联职业培训学校 (K36+370) [Note: no night time needed at #2 and #5]	2 times per day (day time and night time), 2 consecutive days every 3 months (until a PCR is issued)	Noise during operation was monitored in December 2021.
S102 Xunyang - Xiaohu				
Construction Stage				
Air quality	TSP; (SO ₂ & NO ₂ only if there is asphalt mixing within 500 m)	20 locations 1. Petrol Station Staff Dormitory 小河北加油站家属区 (K0+050) 2. Fengjingjiayuan 枫景花园 (K1+200=K1+600) 3. Liuwan 刘湾 (K1+850-K2+550) 4. Kanghuayuan 康华园 (K2+350)	1 day (24-hr) per month (Monitor only when road section has construction activities within 500 m)	Done during construction.

Item	Monitoring Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementation Status
Noise		5. Lido Community 丽都小区 (K3+500) 6. Wangpo 王坡 (K5+350-K5+700) 7. Caoping Village 草坪村 (K6+350-K7+250) 8. Qingniwan 清泥湾 (K7+650-K9+600) 9. Liu Village Primary School 柳村小学 (K11+620-K11+650)) 10. Muzhutan 母猪滩 (K14+750-K15+600) 11. Ganxitang 甘溪淌 (K19+250-K19+520) 12. Jijiangping 季家坪 (K21+150-K21+870) 13. Hongyantan Primary School 红岩滩小学 (K34+220-K34+260) 14. Luduba 碌碁坝 (K37+250-K38+250) 15. Zhaowan Primary School 赵湾小学 (K39+380) 16. Tangxin Primary School 塘兴小学 (K46+480-K46+550) 17. Liangheguan Primary School 两河关小学 (K53+650-K53+700) 18. Kangjiaping 康家坪 (K54+520-K54+850) 19. Xiaohetown 小河镇 (K56+800-K57+500) 20. Xiaohetown Middle School 小河中学 (K57+080-K57+200)		
	L _{Aeq}	20 locations 1. Petrol Station Staff Dormitory 小河北加油站家属区 (K0+050) 2. Fengjingjiayuan 枫景花园 (K1+200=K1+600) 3. Liuwan 刘湾 (K1+850-K2+550) 4. Kanghuayuan 康华园 (K2+350) 5. Lido Community 丽都小区 (K3+500) 6. Wangpo 王坡 (K5+350-K5+700) 7. Caoping Village 草坪村 (K6+350-K7+250) 8. Qingniwan 清泥湾 (K7+650-K9+600) 9. Liu Village Primary School 柳村小学 (K11+620-K11+650) 10. Muzhutan 母猪滩 (K14+750-K15+600) 11. Ganxitang 甘溪淌 (K19+250-K19+520) 12. Jijiangping 季家坪 (K21+150-K21+870) 13. Hongyantan Primary School 红岩滩小学 (K34+220-K34+260) 14. Luduba 碌碁坝 (K37+250-K38+250) 15. Zhaowan Primary School 赵湾小学 (K39+380) 16. Tangxin Primary School 塘兴小学 (K46+480-K46+550) 17. Liangheguan Primary School 两河关小学 (K53+650-K53+700) 18. Kangjiaping 康家坪 (K54+520-K54+850) 19. Xiaohetown 小河镇 (K56+800-K57+500)	2 times per day (day time and night time); 1 day per month (Monitor only when road section has construction activities within 500 m)	Done during construction.

Item	Monitoring Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementation Status
	L _{Aeq} and vibration	20. Xiaohe Middle School 小河中学 (K57+080-K57+200) [Note: night time monitoring needed at all the school locations] 4 locations during blasting for construction of tunnels Hongyantan #1, Hongyantan #2, Yujiawan and Goujiashan 1. Hongyantan红岩滩 (K34+050-K34+400) 2. Xiaohe Town 小河镇 (K56+800-K57+500) 3. Yujiawan俞家湾 (K60+150-K60+250) 4. Goujiashan苟家山 (K62+680)	Once per day during blasting.	Done during construction.
Water quality	DO, SS, TPH	Set up 2 stations for water quality monitoring at each river/stream crossing bridge location as follows: 1. Control station: 50 m upstream of the bridge alignment 2. Impact station 100m downstream of the bridge alignment (Note: if downstream impact station data > 130% of upstream control station data (DO <130%), mitigation measures are needed)	1 time per day; 1 day per month during bridge construction	Done during construction.
Operational Stage				
Air quality	PM ₁₀ , NO ₂	11 locations 1. Fengjingjiayuan枫景花园 (K1+200=K1+600) 2. Lido Community丽都小区 (K3+500) 3. Caoping Village草坪村 (K6+350-K7+250) 4. Liu Village Primary School 柳村小学 (K11+620-K11+650) 5. Ganxitang甘溪淌 (K19+250-K19+520) 6. Hongyantan Primary School红岩滩小学 (K34+220-K34+260) 7. Luduba碌碁坝 (K37+250-K38+250) 8. Zhaowan赵湾 (K38+750-K40+500) 9. Tangxin Primary School 塘兴小学 (K46+480-K46+550) 10. Liangheguan Primary School 两河关小学 (K53+650-K53+700) 11. Xiaohe Town 小河镇 (K56+800-K57+500)	7 consecutive days every 3 months (until a PCR is issued)	Done in December 2021.
Noise	L _{Aeq}	8 locations 1. Fengjingjiayuan枫景花园 (K1+200=K1+600) 2. Lido Community丽都小区 (K3+500) 3. Liu Village Primary School 柳村小学 (K11+620-K11+650) 4. Yuanxigou院寺沟 (K23+380-K23+650) 5. Liangshuiquan凉水泉 (K29+850-K30+380) 6. Luduba碌碁坝 (K37+250-K38+250) 7. Tangxin Primary School 塘兴小学 (K46+480-K46+550) 8. Liangheguan Primary School 两河关小学 (K53+650-K53+700)	2 times per day (day time and night time); 2 consecutive days every 3 months (until a PCR is issued)	Noise during operation was monitored in December 2021.

Item	Monitoring Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementation Status
	L _{Aeq}	<p>[Note: night time monitoring needed at all the school locations]</p> <p>Follow up noise monitoring in 2023 at the following 3 locations</p> <ol style="list-style-type: none"> 1. Danjiawan 单家湾 (K17+150-K17+350) 2. Xiaohe Middle School/小河中学 (K57_080-K57+200) 3. Yujiawan 俞家湾 (K60+150-K60+250) 	2 times per day (day time and night time); 2 consecutive days every 6 months in year 2023	N/A during this reporting period.
S224 Shangnan - Yunxian				
Construction Stage				
Air quality	TSP; (SO ₂ & NO ₂ only if there is asphalt mixing within 500 m)	<p>10 locations</p> <ol style="list-style-type: none"> 1. Xiangnan County Estate 商南县小区 (K0+100-K0+400) 2. Erdaohe Village 二道河村 (K0+500 –K1+100) 3. Dongfan Estate 东坂小区 (K3+700-K3+800) 4. Sanjiaochi Primary School 三角池小学 (K7+700-K7+800) 5. Dagudong Primary School 打鼓洞小学 (K31+100-K31+200) 6. Xianghe Town Center Kindergarten 湘河镇中心幼儿园 (K37+260) 7. Xianghe Central Health Clinic 湘河中心卫生院 (K39+510-K39+560) 8. Dongyuepo Village 东岳坡村 (K67+230-K69+300) 9. Qianchuan Village 前川村 (K77+400-K79+100) 10. Bujiagou Village Nongtai Group 布家沟村弄台组 (K82+420-K83+120) 	1 day (24-hr) per month (Monitor only when road section has construction activities within 500 m)	Done during construction.
Noise	L _{Aeq}	<p>10 locations</p> <ol style="list-style-type: none"> 1. Xiangnan County Estate 商南县小区 (K0+100-K0+400) 2. Erdaohe Village 二道河村 (K0+500 –K1+100) 3. Dongfan Estate 东坂小区 (K3+700-K3+800) 4. Sanjiaochi Primary School 三角池小学 (K7+700-K7+800) 5. Dagudong Primary School 打鼓洞小学 (K31+100-K31+200) 6. Xianghe Town Center Kindergarten 湘河镇中心幼儿园 (K37+260) 7. Xianghe Central Health Clinic 湘河中心卫生院 (K39+510-K39+560) 8. Dongyuepo Village 东岳坡村 (K67+230-K69+300) 9. Qianchuan Village 前川村 (K77+400-K79+100) 10. Bujiagou Village Nongtai Group 布家沟村弄台组 (K82+420-K83+120) 	2 times per day (day time and night time); 1 day per month (Monitor only when road section has construction activities within 500 m)	Done during construction.
Water quality	DO, SS, TPH	<p>Set up 2 stations for water quality monitoring at each river/stream crossing bridge location as follows:</p> <ol style="list-style-type: none"> 1. Control station: 50 m upstream of the bridge alignment 2. Impact station: 100m downstream of the bridge alignment 	1 time per day; 1 day per month during bridge construction	Done during construction.

Item	Monitoring Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementation Status
Operational Stage				
Air quality	PM ₁₀ , NO ₂	<p>(Note: if downstream impact station data > 130% of upstream control station data (DO <130%), mitigation measures are needed)</p> <p>10 locations</p> <ol style="list-style-type: none"> Xiangnan County Estate 商南县小区 (K0+100-K0+400) Erdaohe Village 二道河村 (K0+500 –K1+100) Dongfan Estate 东坂小区 (K3+700-K3+800) Sanjiaochi Primary School 三角池小学 (K7+700-K7+800) Dagudong Primary School 打鼓洞小学 (K31+100-K31+200) Xianghe Town Center Kindergarten 湘河镇中心幼儿园 (K37+260) Xianghe Central Health Clinic 湘河中心卫生院 (K39+510-K39+560) Dongyuepo Village 东岳坡村 (K67+230-K69+300) Qianchuan Village 前川村 (K77+400-K79+100) Bujiagou Village Nongtai Group 布家沟村弄台组 (K82+420-K83+120) 	7 consecutive days every 3 months (until a PCR is issued)	Monitoring during operation was done in December 2021.
Noise	L _{Aeq}	<p>8 locations</p> <ol style="list-style-type: none"> Xiangnan County Estate 商南县小区 (K0+100-K0+400) Dongfan Estate 东坂小区 (K3+700-K3+800) Nanwan Village 南湾村 (K5+100-K5+700) Huayuan Village Second Group 花园村二组 (K14+570 – K14+740) Matidian Fifth Group 马蹄店五组 (K22+500-K23+100) Sanguanmiao Village Baishegou Group 三官庙村白蛇沟组 (K25+340) Xianghe Town Center Kindergarten 湘河镇中心幼儿园 (K37+260) Xianghe Central Health Clinic 湘河中心卫生院 (K39+510-K39+560) 	2 times per day (day time and night time); 2 consecutive days every 3 months (until a PCR is issued)	Monitoring during operation was done in December 2021..
	L _{Aeq}	<p>Follow up noise monitoring in 2023 at the following 14 locations</p> <ol style="list-style-type: none"> Erdaohe Village 二道河村 (K0+500-K1+100) Zhangjiagang Village Xiahe Group 张家岗村下河组 (K6+460-K6+520) Zhangjiagang Village First Group 张家岗村一组 (K7+360-K7+510) Qingshan Town Resettlement Estate 青山镇移民小区 (K16+100) 	2 times per day (day time and night time); 2 consecutive days every 6 months in year 2023	N/A during this reporting period.

Item	Monitoring Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementation Status
		5. Matidian Seventh Group 马蹄店七组 (K23+600-K24+620) 6. Sanguanmiao Village Sanlibian Group 三官庙村三里编组 (K30+300) 7. Hongyu Village First Group 红鱼村一组 (K36+500-K36+900) 8. Xianghe Town Junior High School 湘河镇初级中学 (K37+300) 9. Lianhua Estate 莲花小区 (K39+340-K39+400) 10. Xianghejie Group 湘河街组 (K40+000-K40+300) 11. Liushubian 柳树边 (K52+320-K52+410) 12. Weijiatai Town 魏家台镇 (K53+900-K54+720) 13. Buijiagou Village Nongtai Group 布家沟村弄台组 (K82+420-K83+120) 14. Buijiagou Village Tudiling Group 布家沟村土地岭组 (K83+400)		
Rural Roads 1 - 7				
Construction Stage				
Air quality	TSP	17 locations on the following rural roads (RR): 1. RR1: Longwantan Seventh Group 龙王滩七组 (K83+200) 2. RR1: Kangjiaping Fourth Group 康家坪四组 (K76+100) 3. RR1: Zhangliang Fourth Group 张良四组 (K66+400) 4. RR1: Xiaohe Town Junior High School 小河镇初级中学 5. RR1: Xiaohe Town Center Primary 'School 小河镇中心小学 6. RR2: Baiguoshu Fifth Group 白果树五组 (K7+200) 7. RR3: Beigou Village First Group 北沟村一组 (K0+000) 8. RR4: Pinghuai Second Group 坪槐二组 (K0+000) 9. RR4: Zhangjiagou Third Group 张家沟三组 (K6+700) 10. RR4: Caoling Primary School 曹玲小学 (K8+200) 11. RR4: Shuangni Primary School 双泥小学 (K11+750) 12. RR5: Yanba Town Center Primary School 晏坝镇中心小学 (K0+000) 13. RR5: Yanba Town Center Kindergarten 晏坝镇中心幼儿园 (K0+300) 14. RR5: Yanba Town Junior High School 晏坝镇初级中学 (K0+400) 15. RR6: Zaoyang Town Qianjin Primary School 早阳镇前进小学 (K0+000) 16. RR6: Lianghe Village Sixth Group 两河村六组 (K6+300) 17. RR7: Maliu Village Eleventh Group 麻柳村十一组 (K0+000)	1 day (24-hr) per month (Monitor only when road section has construction activities within 500 m)	Done during construction.
Noise	L _{Aeq}	17 locations on the following rural roads (RR): 1. RR1: Longwantan Seventh Group 龙王滩七组 (K83+200)	2 times per day (day time and night time); 1 day per	Done during construction.

Item	Monitoring Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementation Status
		2. RR1: Kangjiaping Fourth Group 康家坪四组 (K76+100) 3. RR1: Zhangliang Fourth Group 张良四组 (K66+400) 4. RR1: Xiaohetown Junior High School 小河镇初级中学 5. RR1: Xiaohetown Center Primary School 小河镇中心小学 6. RR2: Baiguoshu Fifth Group 白果树五组 (K7+200) 7. RR3: Beigou Village First Group 北沟村一组 (K0+000) 8. RR4: Pinghuai Second Group 坪槐二组 (K0+000) 9. RR4: Zhangjiagou Third Group 张家沟三组 (K6+700) 10. RR4: Caoling Primary School 曹玲小学 (K8+200) 11. RR4: Shuangni Primary School 双泥小学 (K11+750) 12. RR5: Yanba Town Center Primary School 晏坝镇中心小学 (K0+000) 13. RR5: Yanba Town Center Kindergarten 晏坝镇中心幼儿园 (K0+300) 14. RR5: Yanba Town Junior High School 晏坝镇初级中学 (K0+400) 15. RR6: Zaoyang Town Qianjin Primary School 早阳镇前进小学 (K0+000) 16. RR6: Lianghe Village Sixth Group 两河村六组 (K6+300) 17. RR7: Maliu Village Eleventh Group 麻柳村十一组 (K0+000) Set up 2 stations for water quality monitoring at each of the river crossings as follows: 1. Control station: 50 m upstream of the river crossing 2. Impact station 100m downstream of the river crossing (Note: if downstream impact station data > 130% of upstream control station data (DO <130%), mitigation measures are needed)	month (Monitor only when road section has construction activities within 500 m)	
Water quality	DO, SS, TPH		1 time per day; 1 day per month when road construction activity is within 500 m of the river	Done during construction.
Rural Road 8 (Xiangshui Road)				
Construction Stage				
Air quality	TSP	5 locations on the following rural roads (RR): 1. RR8: Hongyu Village Eighth Group 红鱼村八组 (K4+100) 2. RR8: Lianhuatai Primary School 莲花台小学 (K5+900) 3. RR8: Shuigou Village Second Group 水沟村二组 (K11+800) 4. RR8: Balipo Primary School 八里坡小学 (K30+800) 5. RR8: Qianjiaping Primary School 千家坪小学 (K39+600)	1 day (24-hr) per month (Monitor only when road section has construction activities within 500 m)	Done during construction.
Noise	L _{Aeq}	5 locations on the following rural roads (RR): 1. RR8: Hongyu Village Eighth Group 红鱼村八组 (K4+100) 2. RR8: Lianhuatai Primary School 莲花台小学 (K5+900)	2 times per day (day time and night time); 1 day per month (Monitor only when road section has construction activities within 500 m)	Done during construction.

Item	Monitoring Parameter	Monitoring Location	Monitoring Frequency & Duration	Implementation Status
		3. RR8: Shuigou Village Second Group 水沟村二组 (K11+800) 4. RR8: Balipo Primary School 八里坡小学 (K30+800) 5. RR8: Qianjiaping Primary School 千家坪小学 (K39+600)	section has construction activities within 500 m)	
Water quality	DO, SS, TPH	Set up 2 stations for water quality monitoring at each of the river crossings as follows: 1. Control station: 50 m upstream of the river crossing 2. Impact station 100m downstream of the river crossing (Note: if downstream impact station data > 130% of upstream control station data (DO <130%), mitigation measures are needed)	1 time per day: 1 day per month when road construction activity is within 500 m of the river	Done during construction.
Notes: AEMS = Ankang Environmental Monitoring Station; AMTB = Ankang Municipal Transport Bureau; ESE = Environmental Supervision Engineer; FCUC = Foreign Capital Utilization Center; PCR = Project Completion Report;; TSP = total suspended particulates; PM₁₀ = particulate matter with diameter ≥10 micron; SO₂ = sulfur dioxide; NO₂ = nitrogen dioxide; L_{Aeq} = A-weight equivalent sound pressure level; DO = dissolved oxygen; SCG = Shangnan County Government; SEMS = Shangluo Environmental Monitoring Station; SPHB = Shaanxi Provincial Highways Bureau; SS = suspended solids; TPH = total petroleum hydrocarbon;				

B. Monitoring Results

13. Air quality and noise were monitored during operation of the trunk roads in this reporting period, as required in the monitoring plan. Monitoring parameters include NO₂, PM₁₀ and noise, as shown in **Table 14** to **Table 19**.

1. Air Quality

Table 14 Summary of Air Quality Monitoring Results along G316

Value Parameter	Monitoring Location			
	Xuejiawan First Group 1 (K5+300-K5+600)	Duanjiahe Town Health Clinic (K5+800)	Duanjiahe Town Kindergarten (K6+350)	Longquan Village Clinic (K20+900)
NO ₂	0.023	0.023	0.021	0.022
PM ₁₀	0.099	0.091	0.069	0.074
	Zhoujiahe (K21+900 - K22+350)	Zaoyang Town (K25+500 - K25+700)	Dongzhan Village Group 1 (K32+800)	Dongzhan Village Group 1 (K33+850)
NO ₂	0.021	0.022	0.021	0.023
PM ₁₀	0.083	0.088	0.094	0.099
Ambient Air Quality Standards (GB 3095-2012) Class 2: 0.080 mg/m ³ for NO ₂ and 0.15 mg/m ³ for PM ₁₀ .				

Table 15 Summary of Air Quality Monitoring Results along S102

Value Parameter	Monitoring Location				
	Lidu Community (K3+500)	Caoping Village (K6+350-K7+250)	Liucun Primary School (K11-620 - K11+650)	Ganxitang (K19+250 - K19+520)	Fengjingjiayuan Community (K1+200 - K1+600)
NO ₂	0.023	0.022	0.021	0.020	0.022
PM ₁₀	0.089	0.102	0.062	0.077	0.091
	Hongyantian Primary School (K34+220 - K34+260)	Luduba (K37+250-K38+250)	Zhaowan (K38+750-K40+500)	Tangxing Primary School (K46+480-K46+550)	Xiaohe Twon (K56+800 - K57+500)
NO ₂	0.023	0.022	0.022	0.023	0.021
PM ₁₀	0.062	0.089	0.073	0.058	0.072
Ambient Air Quality Standards (GB 3095-2012) Class 2: 0.080 mg/m ³ for NO ₂ and 0.15 mg/m ³ for PM ₁₀ .					

Note: Liangheguan Primary School was no longer in use and no monitoring was done.

Table 16 Summary of Air Quality Monitoring Results along S224

Value Parameter	Monitoring Location			
	Sanjiaochi Primary School	Qingshan Town Government	Dagudong Village	Xianghe Town Kindergarten
NO ₂	0.028	0.029	0.030	0.028
PM ₁₀	0.072	0.071	0.058	0.057
	Yaolinghe Village Jiandaoping	Weijiatan Village Committee	Zhaochuan Town	
NO ₂	0.031	0.030	0.029	
PM ₁₀	0.055	0.052	0.059	
Ambient Air Quality Standards (GB 3095-2012) Class 2: 0.080 mg/m ³ for NO ₂ and 0.15 mg/m ³ for PM ₁₀ .				

Note: EIA was done in 2013 and monitoring locations during operation were adjusted as discussed between external environmental monitor and the IA.

2. Noise

Table 17 Summary of Noise Monitoring Results along G316

Monitoring Site	Day (L _{Aeq})	Night (L _{Aeq})
Duanjiahe Town Health Clinic (K5+800)	68	49
Duanjiahe Town Kindergarten (K6+350)	65	/
Longquan Village Clinic (K20+900)	66	48
Guanmiao Town Central Clinic (K34+850)	65	54
Hualian Occupational Training School (K36+370)	64	/
Environmental Quality Standard for Noise (GB 3096-2008), Category 2: 60/50 dB(A), Category 4a: 70/55 dB(A)		

Table 18 Summary of Noise Monitoring Results along S102

Monitoring Site	Day (L _{Aeq})	Night (L _{Aeq})
Liqu Residential Community (K3+500)	68	45
Liucun Primary School (K11-620 - K11+650)	66	/
Yuansigou (K23+380 - K23+650)	67	49
Fengjingjiayuan Community (K1+200 - K1+600)	69	48
Xiheguan Primary School (K53+650 - K53+700)	63	/
Tangxing Primary School (K46+480 - K46 +550)	64	/
Luduba (K37+250 - K38 +250)	67	43
Liangshuiquan (K29+850 - K30+380)	61	41
Environmental Quality Standard for Noise (GB 3096-2008), Category 2: 60/50 dB(A), Category 4a: 70/55 dB(A)		

Table 19 Summary of Noise Monitoring Results along S224

Monitoring Site	Day (L _{Aeq})	Night (L _{Aeq})
Dongfan Residential Area	53	44
Sanjiaochi Primary School	49	42
Xianghe Town Kindergarten	48	42
Xianghe Town Health Center	54	43
Huayuan Village	50	43
Qingshan Town	52	44
Environmental Quality Standard for Noise (GB 3096-2008), Category 2: 60/50 dB(A), Category 4a: 70/55 dB(A)		

Note: EIA was done in 2013 and monitoring locations during operation were adjusted as discussed between external environmental monitor and the IA.

14. Air quality monitoring results meet applicable standard in terms of NO₂ and PM₁₀ at all monitoring locations along the three trunk roads. Noise at all locations along S224 fully meets applicable standards. Noise at special sensitive receptors (school, hospital) along G316 and S102 very slightly violates applicable standard (Category 2) but meets category 4a and is acceptable. Similar to situation during construction, relatively high background noise from human activities contributed a lot to noncompliance with applicable standard during daytime and this standard was met at all locations during night when there were little human activities.

V. INSTITUTIONAL CAPACITY BUILDING

15. The environmental training program has been designed to improve the capacity of FCUC, AMTB, SCG, O&M units and contractors' staff in EMP implementation and supervision. Table 20 shows the training program designed for the project and implementation summary during this reporting period.

16. In harmony with environmental health and safety matters, occupational health and safety receives continuing scrutiny through all levels of the construction industry in the PRC. The national standard requirements for construction contractors and individuals to be certified, authorized and permitted to operate and practice are the foundations on which the standards that pertain to occupational health and safety are imbedded in the project construction contracts in accordance with those regulations.

17. Although the standards are clear and present, continuing improvement in awareness and knowledge, implementation and enforcement of those standards receives persistent attention. Routine and periodic training, consistent with regulations, of all staff including upper level management, engineers and construction site operatives is mandatory. Trainings of construction personnel are carried out on and off site by duly accredited agencies and individuals and by in-house resources of the construction contractors. Therein routine awareness training and site specific trainings are undertaken.

18. Through this being a demonstration project having the ADB as a participating stakeholder the project carries an elevated degree of oversight in relation to similar projects in the area. By the periodic visits of ADB representatives and through the active participation of the consultants appointed to facilitate ADB mandated safeguards oversight comes greater occupational health and safety good practice.

Table 20 Training Program and Implementation Summary

Training	Attendees	Contents	Times	Period (days)	No. of persons	Training Implemented
EMP adjustment and implementation	FCUC, AMTB, SCG, O&M units, contractors	Development and adjustment of the EMP, preparation of the site specific EMP, roles and responsibilities, monitoring, supervision and reporting procedures, review of experience (after 12 months)	Twice - Once prior to, and once after the first year of project implementation	2	20	All trainings have been implemented as required.
Grievance Redress Mechanism	FCUC, AMTB, SCG, contractors, AEPB, SEPB	Roles and responsibilities, procedures, review of experience (after 12 months)	Twice - Once prior to, and once after the first year of project implementation	1	15	Training has been implemented as required.
Environmental protection	FCUC, AMTB, SCG, contractors	Pollution control on construction sites (air, noise, wastewater, solid waste)	Once (prior to construction commencing)	2	15	Training has been implemented as required.

Training	Attendees	Contents	Times	Period (days)	No. of persons	Training Implemented
Environmental monitoring	FCUC, AMTB, SCG, O&M units, contractors	Monitoring methods, data collection and processing, reporting systems	Once (at beginning of project construction)	1	10	Training has been implemented as required.
Notes: AEPB = Ankang Environmental Protection Bureau, AMTB = Ankang Municipal Transport Department, FCUC = Foreign Capital Utilization Center, SCG = Shangnan County Government, SEPB = Shangluo Environmental Protection Department, O&M = operation and maintenance.						

VI. CONSULTATION, PARTICIPATION AND INFORMATION DISCLOSURE

19. Plans for public involvement during construction and operation stages were developed during project preparation. **Table 21** shows the public consultation plan and summary of its implementation status during this reporting period.

Table 21 Public Consultation Plan and Implementation Summary

Organizer	Format	No. of Times	Subject	Targetted Attendees	Implementation Status
Construction Stage					
FCUC	Public consultation & site visit	4 times: 1 time before construction commences and 1 time each year during construction	Adjusting of mitigation measures, if necessary; construction impact; comments and suggestions	Residents adjacent to components, representatives of social sectors	Continuously conducted throughout construction, in the form of face-to-face consultation and response by onsite contractor, environmental supervisor and the IA.
FCUC	Expert workshop / press conference	As needed based on public consultation	Comments / suggestions on mitigation measures, public opinions	Experts of various sectors, media	No expert workshop/press conference was carried out during this reporting period.
FCUC	Resettlement survey	As required by relevant resettlement plan	Comments on resettlement, improvement of living conditions, livelihood, and poverty reduction; comments and suggestions	Persons affected by resettlement and relocation	Done already.
Operational Stage					
FCUC, O&M Units	Public consultation and site visits	Once in the first year	Effectiveness of mitigation measures, impacts of operation, comments and suggestions	Residents adjacent to component sites, social sectors	Site visit was conducted during this reporting period. Public consultation activities on traffic noise impact and road safety will be conducted in early 2022.
FCUC, O&M Units	Expert workshop or	As needed based on	Comments and suggestions on	Experts of various sectors, media	Not needed in this reporting period.

Organizer	Format	No. of Times	Subject	TargettedAttendees	Implementation Status
	press conference	public consultation	operational impacts, public opinions		
Notes: FCUC= Foreign Capital Utilization Center; O&M = operation and maintenance.					

VII. GRIEVANCE REDRESS MECHANISM

20. A project-level grievance redress mechanism (GRM) was developed in accordance with the ADB's SPS requirement so to receive and facilitate resolution of affected person's concerns and complaints about the project's environmental performance during construction as well as operation phase of the project. The project GRM includes a procedure for receiving grievances, recording/documenting key information, and evaluating and responding to the complainants in a reasonable period of time. Any concerns raised through the GRM will need to be addressed promptly and transparently.

21. Project specific GRM has been disclosed to the public during project preparation and during construction, through public consultation, disclosure of EIA report and onsite disclosure of project information. Focal persons have been appointed at IAs and by contractors. No complaint was received in this reporting period.

Table 22 Contact Information of GRM Focal Points at Various Institutions

Institution	Name of Company	Position	Name of GRM Staff	Contact Information (phone number/email)
FCUC(PMO)			/	/
AMTB (IA)		Facilitator	Wan Jie	13409151666 297203102@qq.com
SCG (IA)		Vice Director	KeXianggang	13399146999 695426863@qq.com
Contractors	Sichuan Road and Bridge (Group) Corporation Ltd. (G316 subgrade)	Office Director	Zhou Lei	15680017832 260228966@qq.com
	Hebei Construction Share-Holding Co. Ltd. (G316 pavement)	Environmental and Safety Engineer	Du Lingan	15389502927
	Shanhu Construction (Group) Corporation Ltd. (G316 greening)	Environmental and Safety Engineer	Wu Zhengyuan	18182490315
	China Tiesiju Civil Engineering Group Co. Ltd. (S102 subgrade)	Site Engineer	Wu Weishe	15829228258 2502829550@qq.com
	HebeiGuangtong Road and Bridge Corp Co. Ltd. (S102 subgrade)	Site Engineer	Wang Bin	15291033555 76469126@qq.com
	Sichuan Road and Bridge (Group) Corporation Ltd. (S102 subgrade)	Site Engineer	ShuiBeiqing	15196405709 1214117884@qq.com
	Hebei Construction Group Co. Ltd (S224 subgrade)	Facilitator	Li Jie	13700219654 617283026@qq.com
	Lanhai Construction Group (S102 pavement)	Environmental and Safety Engineer	Yin Changchun	18355457700
	Shaanxi Construction Engineering Group (S102 greening)	Environmental and Safety Engineer	Liu Shaojie	18391412771
	SCEGC Mechanized Construction Group Co. Ltd (S224 subgrade)	Project Manager	Wang Fuguo	18709149888 2462800090@qq.com
	Jiangxi Zhongmei Engineering Group Ltd. (S224 subgrade)	Engineer	Luo Lulu	15891370230 1872523655@qq.com

	Heilongjiang Hualong Construction Co. Ltd (S224 subgrade)	Project Manager	Wang Chunlin	13673895355 732287986@qq.com
	Jiangsu Jialong Engineering Construction Co. Ltd. (S224 subgrade)	Facilitator	Liu Hongyu	15891529118 3153765382@qq.com
	SCEGC Mechanized Construction Group Company Limited and Shaanxi Huayou Construction Company, Ltd. (for RR XY01)	Project Manager	Zhang Bing	18700260705 191576059@qq.com
	Shaanxi Zhongtong Road & Bridge Engineering Co., Ltd. and Shaanxi Modern Highway Mechanical Engineering Co. Ltd. (for RR XY02)	Engineer	GuoJunqiang	13709151022 793706178@qq.com
	Shanxi Jiaye Engineering Construction Co. Ltd. (for rural road XY03)	Environmental and Safety Engineer	He Guangbin	15929098098
	Shanxi Xinghan Road and Bridge Construction Co. Ltd (for rural road XY04)	Environmental and Safety Engineer	Zhaowei	18091544181
	Henan Qiankun Road and Bridge Construction Co. Ltd (for rural road XY05)	Environmental and Safety Engineer	Zhaowei	18091544181
	Jiangxi Haixi Transport Engineering Co. Ltd (for RR HB01)	Engineer	Mr. Zhu Lingwen	18391986866
	Henan ZhongzhouLuqiao Co. Ltd (for RR HB02 Lot 1)	Environmental and Safety Engineer	Mr. Wang Deyun	13891526900
	HebeiGuangtongLuqiao Co. Ltd (for RR HB02 Lot 2)	Environmental and Safety Engineer	Mr. Wang Biao	15349155850
	Jiangxi Zhongmei Development Group (S224 pavement rehabilitation)	Project Manager	Yan Fujun	13772993939
	Zhejiang Jiaogong Road and Bridge Construction Company (S224 road pavement)	Office Management	Wang Chen	13488305008
	Jiangxi ZhongmeiDecelopment Group (S224 road pavement)	Engineer	Wang Yanling	13759612572
	Lujian Group Co. Ltd. (Shangnan road safety and greening)	Chief Engineer	Lu Hao	18991461778
	Huatong Road and Bridge Engineering Co. Ltd (two contracts of RR Xiangshui Road)	Associate Project Managemer	Hu Bo	18991463373
		Project Managemer	Du Xianliang	18309141088

VIII. EMP BUDGET AND EXPENDITURE

22. The total cost for EMP implementation comprises six items: (i) mitigation measures; (ii) internal environmental quality monitoring by external monitoring entities; (iii) external independent

EMP compliance monitoring by ESE; (iv) public consultation; (v) training; and (vi) the LIEC. The total cost of \$4,806,500 was estimated during the project appraisal.

23. Table 23 shows the summary of expenditure of EMP implementation cost in this reporting period. Responsibilities for operation and maintenance of all the roads have been taken over by the O&M units and costs are covered under routine operational budget.

Table 23 Estimated EMP Implementation Budget and Actual Expenditure During Reporting Period

EMP Item	Estimated Cost, \$		Actual Expenditure, \$	
	EA Funded	ADB Funded	EA Funded	ADB Funded
Mitigation measures	4,026,500	0	0	0
Internal environmental quality monitoring (by AEMS & SEMS)	116,000	0	0	0
External EMP compliance monitoring by ESE	600,000	0	0	0
External monitoring by LIEC	0	40,000	0	0
Training	15,000	0	0	0
Public consultation	9,000	0	0	0
Subtotal:	4,766,500	40,000	0	0
Total:	4,806,500		0	
Note: \$4,026,500 for mitigation measures includes \$3,350,000 for installation of double-glazed windows to mitigate traffic noise.				

IX. KEY ENVIRONMENTAL ISSUES

A. Key Issues Identified

24. As project completion report (PCR) has not been issued, additional EMRs should be prepared and monitoring during operation of the trunk roads should continue as required by ADB in last reporting period. Environmental monitoring during operation of the three trunk roads was done in this reporting period.

B. Actions Taken to Mitigate Key Environmental Issues

25. Environmental monitoring during operation of the trunk road was done in December 2021. Monitoring results have been included in this semi-annual EMR.

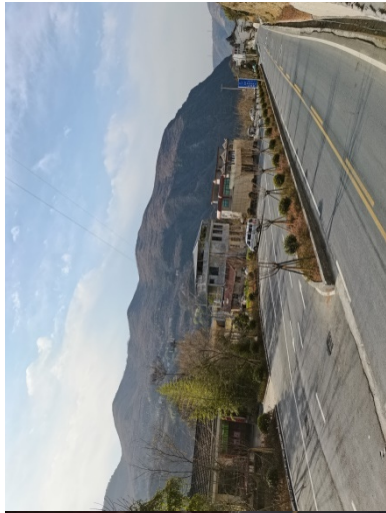
X. CONCLUSIONS

26. All the mitigation measures specified in the EMP have been taken and are acceptable. Monitoring during operation of the three trunk roads has been done and monitoring results show that environmental impacts during operation are effectively mitigated and acceptable.

Annex 1: Photographs



G316 Road Completed



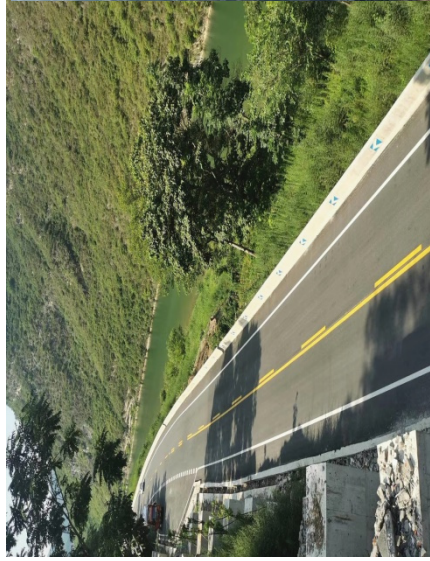
G316 Road Completed



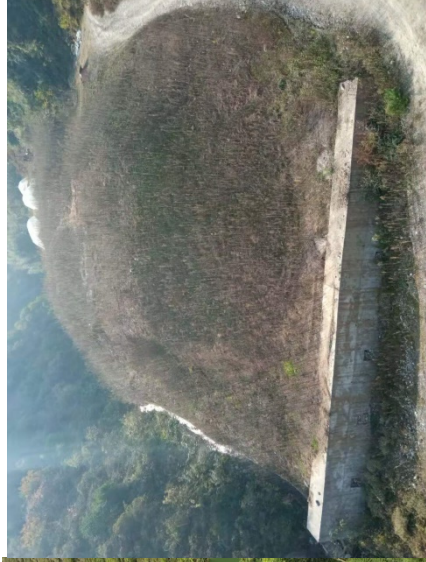
G316 Road Completed



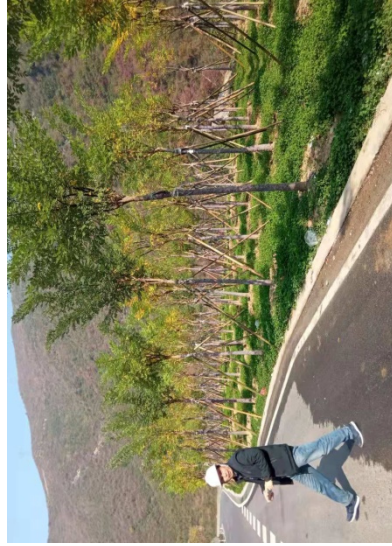
G316 Road Completed



S102 Road Completed



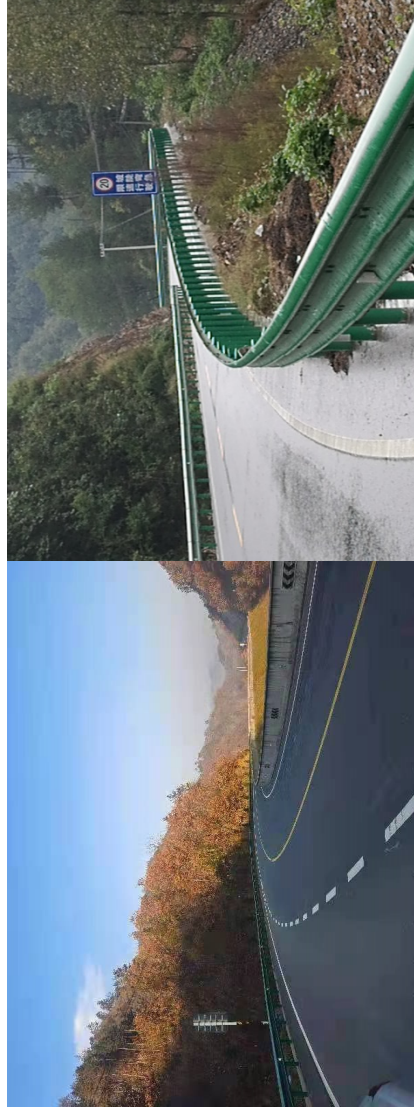
S102 Daling Disposal Site



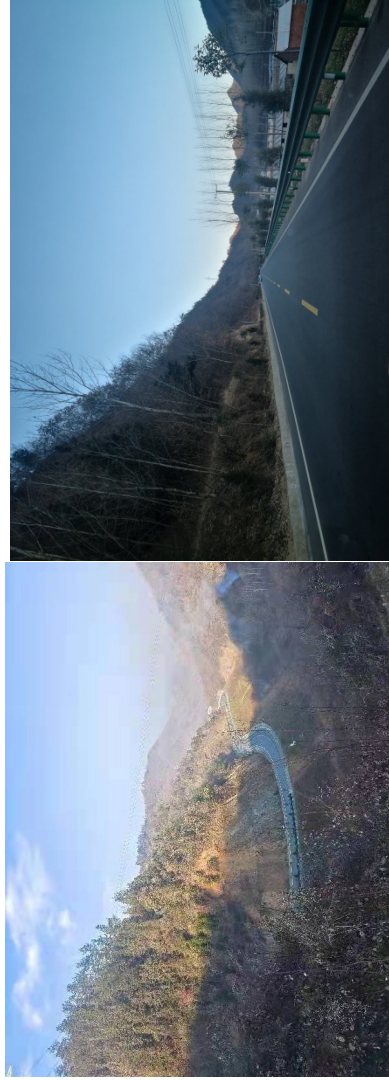
S102 Road Greening



S102 Dust Control

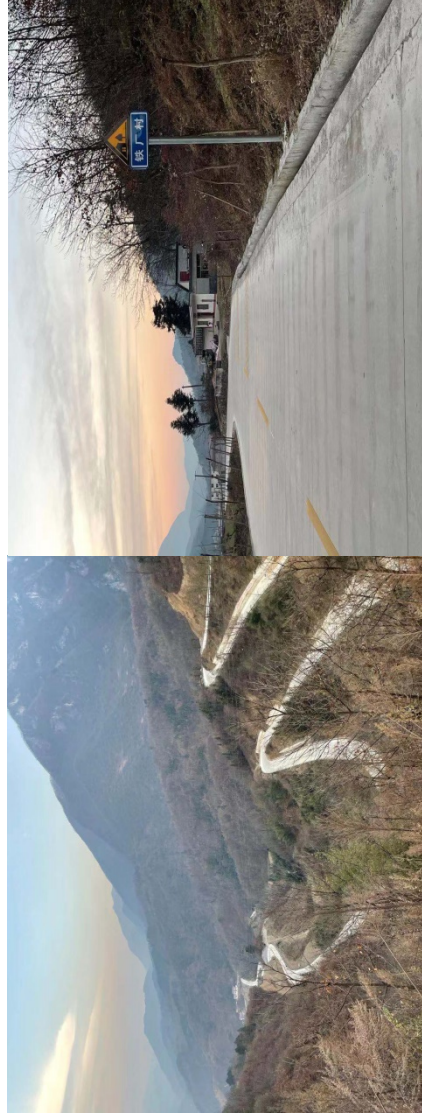


S224 Road CompletedS224 Road Completed



S224 Road Completed

S224 Road Completed



Rural Road – Xunyang

Rural Road – Xunyang



Rural Road – Xunyang

Rural Road – Xunyang



Road Safety Improvement



Road Safety Improvement