

Gansu Cultural and Natural Heritage
Protection and Development Project

Consolidated

Environmental Assessment &
Environmental Management Plan

Executive Summary

World Bank Financed Gansu Cultural and
Natural Heritage Protection and
Development
Project Management Office
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1 INTRODUCTION

This is the Executive Summary of the Environmental Assessment and Environmental Management Plan (hereafter referred to as 'EA') of the proposed China: Gansu Cultural and Natural Heritage Protection and Development Project (USD 79.4 million, 2008-2013), hereafter referred to as 'the project'. The project will finance a series of priority investments at key cultural and natural tourism sites in Gansu Province, in addition to the institutional strengthening and training of tourism management in Gansu.

1.1 OBJECTIVES

The EA has the following objectives:

- To identify the potential environmental impacts of the proposed Gansu Cultural and Natural Heritage Protection and Development Project;
- To propose practical mitigation measures to avoid, manage or mitigate the environmental impacts of the project, through the preparation of an environmental management plan (EMP) for each tourism site;
- To set out a 'framework' of procedures to be applied during project implementation for the environmental assessment and management of the potential impacts of investments that are yet to be identified; and
- To identify the training and capacity building measures that are required for the effective implementation of the environmental management framework, and individual site EMPs.

1.2 BACKGROUND

1.2.1 Classification of the Project

The project will finance temporary construction activities that have potential environmental impacts, and will result in increased visitor numbers and ongoing site management with potential long-term impacts. If investments are not properly planned and managed, they may lead to the irreversible degradation of the cultural and natural resources of each site. The World Bank task team accordingly proposed that the project is assigned Category A (Full Assessment) under OP/BP 4.01, and this was endorsed by a safeguards review meeting held on 18th January 2006.

1.2.2 Preparation of the EA

The EA was prepared by the College of Earth and Environmental Sciences at Lanzhou University, between the dates of 20th November 2006 and 20th April 2007, based on environmental impact assessment reports and

environmental management plans for nine sites prepared by a range of institutes (College of Earth and Environmental Sciences at Lanzhou University, Lanzhou Coal Mining Design & Research Institute, Gansu Academy of Environmental Sciences (GAES), Tianshui Environmental Research Institute, Northwest Research Institute of Mining and Metallurgy (NRIMM), Northwest Institute of EIA, and the Engineering Center of the Railway Ministry).

The institutes above prepared EIA and EMP reports for individual sites according to Chinese environmental regulation requirements, in addition to World Bank safeguard policy requirements. Lanzhou University prepared this EA on the basis of the individual site EIA / EMP reports, their further quality control of the individual EIA / EMPs, and their analysis of the wider strategic impact of the project.

1.2.3 Safeguards Review Study

The environmental assessment was informed by an earlier safeguards review study which presented safeguards issues at provincial, municipal and site levels.

- At the strategic level, baseline information for the province and municipalities was gathered, and used to inform the overall geographical spread of the project;
- At the site level, each World Bank safeguard policy was considered when drawing conclusions on the requirements for an environmental assessment report, environmental management plan etc, and triggering the detailed assessments which fed into this report. Twelve sites were considered in total, nine of which are on the final list.

2 DESCRIPTION OF THE PROPOSED PROJECT

2.1 PROJECT DEVELOPMENT OBJECTIVE AND COMPONENTS

The project development objective (PDO) is:

To generate benefits for local communities from the development of sustainable cultural tourism in Gansu Province.

The project is comprised of two components, the first of which is conducted at each of nine key cultural and natural heritage sites within the following six municipalities in Gansu Province: Jiuquan and Jiayuguan Municipalities in the west; Zhangye, Baiyin and Lanzhou Municipalities in central Gansu; and Tianshui Municipality in the east. The second component, a provincially-managed institutional strengthening and capacity building component, will benefit the citizens, government officials and others at all nine project sites and within the municipal and provincial governments. The two components are as follows.

Component 1 – Protection and Development of Priority Sites. The following activities would be carried out at each of the nine project sites:

1.1 - Heritage Conservation and Presentation – preservation and conservation of key relics, restoration of historical buildings, heritage inventory, archaeological research, interpretation, and presentation of cultural and natural heritage assets;

1.2 - Infrastructure, Tourism Services and Environmental Protection – investment in high priority physical infrastructure at key cultural and natural heritage sites that raise local standards of living and have a high potential for promoting local economic development through tourism (including small-scale or link- roads and bridges, vehicle parking lots and buildings for tourism services and exhibitions, walkways, lookouts, signage and electric vehicles, landscaping and fencing, water supply and drainage facilities, sanitation facilities, toilets and wastewater treatment, solid waste collection and disposal, power and heating, and safety and security systems).

1.3 - Community training and studies – key site-specific planning and community training activities.

The nine priority sites are: Majishan Scenic Area, Qingcheng Ancient Town, Jiayuguan Great Wall, Yardang National Geological Park, Yellow River

Stone Forest National Park, Wei Jin Folk Culture Park, Suoyang Town, Mati Temple Scenic Park, and Lutusi Ancient Government Centre.

The location of the sites is presented in the map in *Figure 2.1*. The sites are presented in this report in order of the component cost, which ranges from USD 20.9 million at Majishan Scenic Area to USD 2.1 million at Lutusi.

Component 2 – Institutional Strengthening and Capacity Building includes project management strengthening, training of site managers, staff and local residents in heritage conservation, site management and tourism development, and implementation of several key province-wide tourism and heritage studies designed to assist the Gansu Provincial Government develop the tourism industry in Gansu.

2.2 PROJECT PREPARATION AND PLANNING

To address both World Bank OP 4.01 *Environmental Assessment*, requiring the consideration of alternatives as part of the EA, and project planning overall, a significant amount of planning has taken place during the preparation of the project, at provincial, municipal and site-levels. This has included detailed assessment of alternative sites, and iterative preparation of tourism development plans, heritage conservation plans, and feasibility study reports for each site. *Table 1* in *Annex A* presents the detail of these plans and reports.

2.3 IMPLEMENTATION ARRANGEMENTS

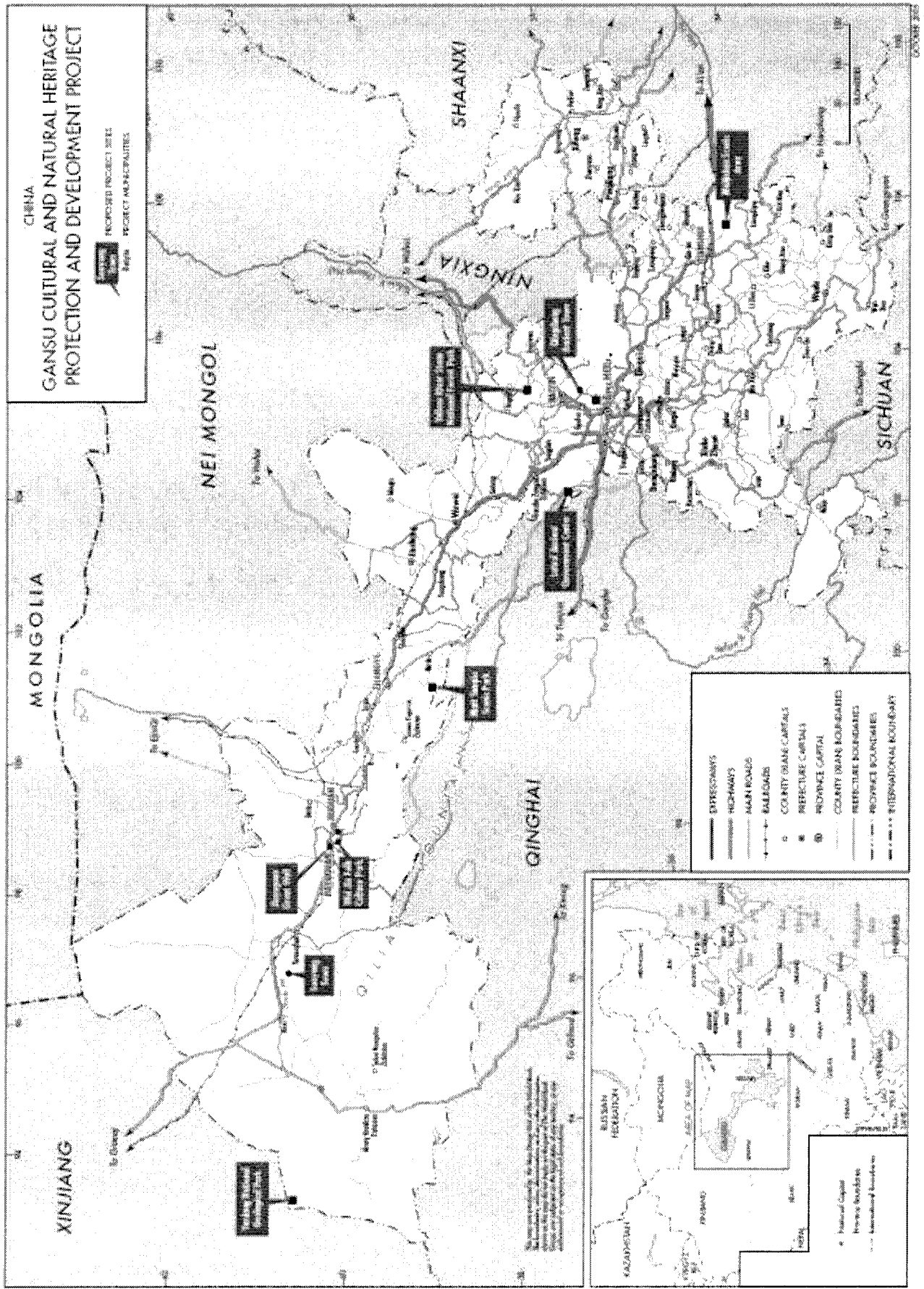
To manage and implement the project, Gansu Provincial Government has established a Project Leading Group (PLG) to lead the project and a Provincial Project Management Office (PPMO) to serve as the main organisational body leading the implementation of the project. Local PLG and PMO managers will be responsible for the management and implementation of project activities at each site.

Additionally, the PPMO has hired experts to form an Experts Panel. The Experts Panel is responsible for technical guidance to the implementation of the project, reviewing technical documents of the project, supervision and evaluation, and reporting the result of supervision and evaluation to the provincial PLG.

2.4 BUDGET

The total budget for the project is RMB 444.7 million (USD 57.0 million at 1 USD = RMB 7.8). World Bank financing is a total of USD 40.0 million.

Figure 2.1 Gansu Province, Showing the Location of the Nine Priority sites



3 POLICY AND LEGISLATIVE CONTEXT

The EA report provides details on relevant aspects of Chinese institutional and regulatory context. Key points of greatest pertinence are summarised below, and further details are provided in *Annex B*.

3.1 CHINESE INSTITUTIONS AND REGULATORY REQUIREMENTS

The key Chinese authorities responsible for environmental, health and safety management are the Gansu Provincial Environmental Protection Bureau and local Environmental Protection Bureaux, linked to the State Environmental Protection Administration (SEPA). In addition, Local Land Resources Bureaux, Water Resources Bureaux, the Yellow River Conservancy Commission (YRCC), and local EPB Construction Departments carry out specific permitting functions related to, respectively, land acquisition, water resources extraction, and construction, health and safety management.

Authorities concerned with tourism development and cultural and natural heritage are the Tourism Department of Gansu Province (responsible for the implementation of related tourism laws, regulations and policies, and establishing tourism strategies, guidelines, plans, policies, and standards in Gansu Province), the State Administration of Cultural Heritage (responsible for developing, promoting and regulating China's cultural relics and museum industry), and the Gansu Cultural Relic Bureau (responsible for the implementation of related cultural relic and museum laws, regulations and policies, and establishing cultural relic and museum strategies, guidelines, plans, policies, and measures in Gansu Province).

The most pertinent regulatory requirements are defined in the *Management Regulations on Environmental Protection for Construction Projects*, and China's environmental emission and discharging standards. The first of these sets out the process required for EIA, and securing a construction and operating permit. For this project, an EIA statement is required for each site, to be submitted to Gansu Provincial EPB for approval. Environmental emission and discharging standards concern ambient air quality, surface water quality, noise, emissions of air pollutants, wastewater discharge and irrigation water quality.

The basic EIA regulations are supported by a series of environmental protection laws and regulations. These concern nature reserves, cultural heritage protection, water and soil conservation, water extraction, construction completion inspection, and registration of discharged pollutants. Further details are provided in Annex B and the main report.

3.2 WORLD BANK SAFEGUARD POLICIES

The World Bank safeguard policies that are applicable to the activities at each site are summarised in Volume II of the EA report. This indicates that the following policies are triggered by the project: OP 4.01 Environmental Assessment; OP 4.04 Natural Habitats; OP 4.11 Physical Cultural Resources; OP 4.10 Indigenous Peoples; OP 4.12 Involuntary Resettlement; OP 4.37 Safety of Dams.

Civil works are to be carried out at all sites, triggering OP 4.01 (Environmental Assessment). Although civil works at several sites are relatively insignificant, the works are to be carried out in areas of sensitive cultural and natural heritage, and therefore the project is Category A.

OP 4.11 (Physical Cultural Resources) applies at seven of the sites, where the sites have profound, and sensitive cultural heritage value. OP 4.04 (Natural Habitats) is triggered by activities at three sites. Critical natural habitats will not be affected, but there are risks of impacts on each area's natural habitats. A range of minority groups live in the area of Mati Temple Scenic Area, requiring the preparation and implementation of a separate Indigenous Peoples Plan, under OP 4.10 (Indigenous Peoples). There are limited land acquisition requirements at three sites, triggering OP 4.12 (Involuntary Resettlement). Two existing dams will be rehabilitated at Majishan Scenic Area, triggering OP4.37 (Dam Safety).

4 BASELINE CONDITIONS

The EA report provides detail on the baseline environment, including summary information on the baseline environmental conditions at the nine priority sites in Volume II of the EA report, and further details on environmental conditions at each site in Annex B, Volume III. The baseline conditions in Gansu Province as a whole are summarised below.

4.1 ENVIRONMENTAL CONDITIONS IN GANSU PROVINCE

4.1.1 Location, Topography and Physiography

Gansu Province is situated in central China, at the upper reaches of the Yellow River. Gansu Province has a total land area of 425,800 km², occupies 4.72% of China, and is China's seventh largest province. The land area per capita is 1.82 ha, almost twice as high as the national average. Approximately 43% of the land area is not used directly for productive purposes, including desert, Gobi, alpine-arctic stone mountain, bare rock, saline-alkali lowland and wetlands.

The topography of Gansu Province consists of mixed mountainous regions, plateaus, plains, river valleys, and deserts, and forms six main regions with differing features. Soils in Gansu are mainly loess, and suffer severe wind and water erosion, and ongoing desertification.

4.1.2 Climate

Gansu has a strongly continental warm temperate monsoon climate. However, depending on elevation, temperatures vary greatly across the province, with the length of frostless periods showing significant provincial differences. Annual precipitation varies between 36.6 mm to 734.9 mm, and roughly decreases from southeast to northwest.

4.1.3 Hydrology

Surface Water

Surface water resources consist of the Yellow River, Changjiang River and inland river valleys. The total water runoff of all rivers in Gansu is 60.3 billion cubic meters per year. Seventy-eight of Gansu's rivers have a water flux of more than 0.1 billion cubic meters.

Surface Water Quality

According to the *Summary of Environmental Quality in Gansu Province in 2006*, among the 30 river sections subject to monitoring, only 16 sections meet the required standard. The main pollutants are domestic sewage, industrial wastewater discharges, and residues of chemical fertilizers and pesticides from adjacent areas.

Groundwater

The volume of groundwater resources in Gansu Province is 873.2 million cubic metres, which includes 513.8 million cubic metres under the inland river valley, 357.4 million cubic metres under the Yellow River valley and 2 million cubic metres under the Changjiang River Valley.

Groundwater Water Quality

Groundwater quality under the cities in the Hexi Corridor is good, but polluted to differing levels downstream of each city. The groundwater under the cities in the Hedong area is less polluted than would be expected for the scale and industrialisation of the cities.

4.1.4 Natural Habitats and Ecology

The terrestrial natural habitats of Gansu are mainly steppe grassland, and semi-natural pastureland. The total forest area in Gansu is approximately 8 million ha, which covers 16.5% of the land area, and consists of firs, spruces, oak, poplars, pines and birches.

There are 58 natural conservation areas in Gansu Province with a total area of 9,798,421 ha, occupying 23% of the province. Thirteen are nationally-designated, 41 are provincially-designated and 4 are designated at the county level. There are eight farms that breed rare or endangered animals and four farms that propagate rare plants.

Gansu Province is highly species-rich, owing to its position between four faunal regions and five floral regions. Eight hundred and sixty-four species of vertebrates are found in Gansu, equivalent to 27.8% China's vertebrates. One hundred and eight of these vertebrate species are national-level protected wild animals (29 are first class and 79 are second class). Four thousand insect species are found in Gansu, 10% of China's total. One hundred and thirty-six species in Gansu are included as priorities for conservation in the *China Biodiversity Conservation Action Plan*.

Amongst temperate plant species alone, there are over four thousand species of vascular plants, and Gansu's flora has a significant proportion of species with

economic uses. Thirty-four species of flora are included in the national key protected plant species catalogue. Ten species are included amongst the priority conservation species as listed in the *China Biodiversity Conservation Action Plan*.

4.1.5 Air Quality

Dust storms are an increasing problem. Dust storms occurred 16 times in Gansu Province in 2006, mainly in March and April, and were long in duration. This frequency is three times the number experienced in 2005. Particulate pollution aggravates air quality in cities in Gansu, contributing to a deterioration in air quality in nine out of thirteen cities.

4.1.6 Solid Waste Disposal

In 2005, the provincial general utilization rate of industrial solid waste is 29.4%. The storage rate is 49.1%. And the disposal rate is 21.4%. No information was available on the extent of recycling and reuse of waste, but this can be expected to be rare or at least informal.

4.1.7 Wastewater Management

In 2005, the total volume of discharged wastewater was 437.28 million cubic metres. *Table 4.1* provides details. Currently, there are 11 municipal wastewater treatment plants constructed and 14 are under construction.

Table 4.1 Wastewater and Pollutants Discharged in Gansu Province in 2005

Wastewater discharged (million cubic metres)			Chemical Oxygen Demand (Tonnes)			Ammonia nitrogen (Tonnes)		
Industrial	Domestic	Total	Industrial	Domestic	Total	Industrial	Domestic	Total
167.98	269.30	437.28	58831	123467	182298	21390	13011	34401

4.1.8 Health and Safety

In 2006, 2067 people died from various accidents in Gansu Province, which is below the national control target for the province. The number of deaths from construction accidents, 34, was also below the national control target. The top five infectious diseases in Gansu are hepatitis, dysentery, tuberculosis, gonorrhoea and measles.

4.2 BASELINE CONDITIONS AT THE NINE PRIORITY SITES

The full consolidated Environmental Assessment report provides relevant information on the baseline environmental conditions at the nine priority sites.

5 CULTURAL AND NATURAL HERITAGE

A detailed inventory of the heritage of each site is provided in Annex C, Volume III of the EA report. Key information on the cultural and natural heritage value of each of the nine priority sites is presented below.

5.1 OVERVIEW

The cultural and natural heritage of Gansu Province is of global significance, as recognised through the attainment of World Heritage status at some sites. In partnership with neighbouring provinces, Gansu Province is preparing an application for the Silk Road to be listed as a UNESCO World Cultural Heritage Route.

The nine project components cover a broad spectrum of attractions from natural and cultural heritage assets to stunning geological formations. They are roughly distributed along the ancient Silk Road, that runs along the Hexi Corridor in Gansu Province, with several sites located on the banks of the Yellow River. The project concept is roughly built around the historical and cultural themes of the history of the Silk Road, the political and military significance of the Great Wall, and the social and economic significance of the Yellow River in Chinese civilization.

5.2 HERITAGE VALUE OF THE NINE SITES

5.2.1 Majishan Scenic Area

A nationally-designated scenic area, encompassing grottoes with National Cultural Heritage Protection, near Tianshui city. In 2004, the site received 310,000 tourists and RMB 417.6 million in tourism revenue.

This is one of the four largest Buddhist cave complexes in China with 194 grottoes, 7,200 clay and stone statues and 1,300 square meters of murals. The earliest carvings date as early as 384 (Wei Dynasty) and continue over the next 1,500 years. The mountain, studded with caves and wrapped in rickety walkways and spiral stairs, rises dramatically from its surroundings.

Threats include unmanaged visitor numbers and damage to sacred documents by moths and mice, mold and rot.

Figure 5.1 Majishan Scenic Area

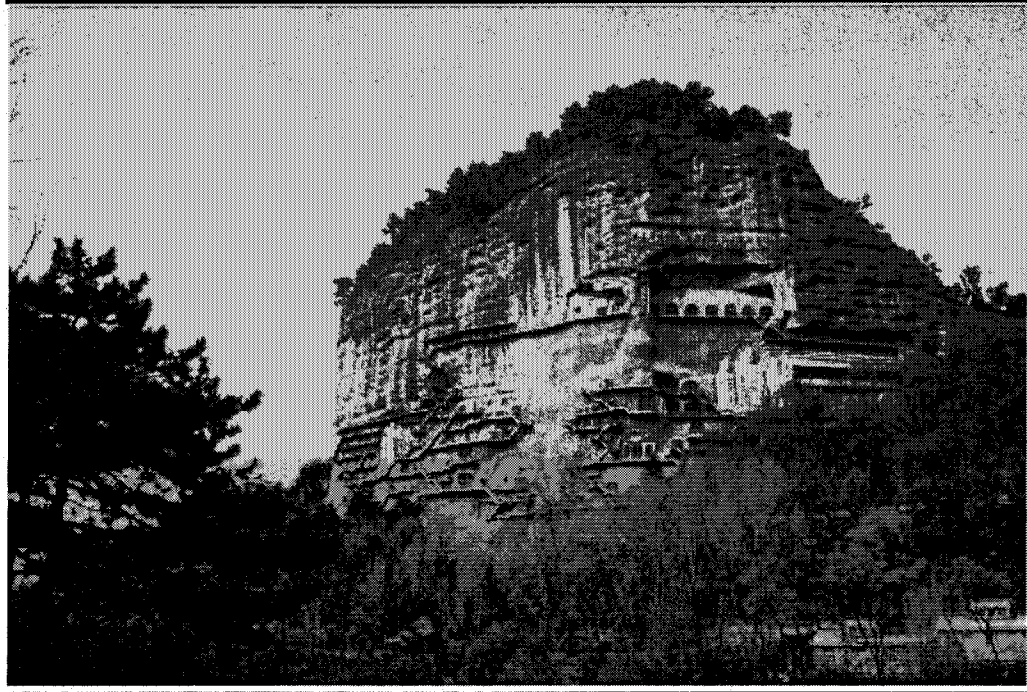
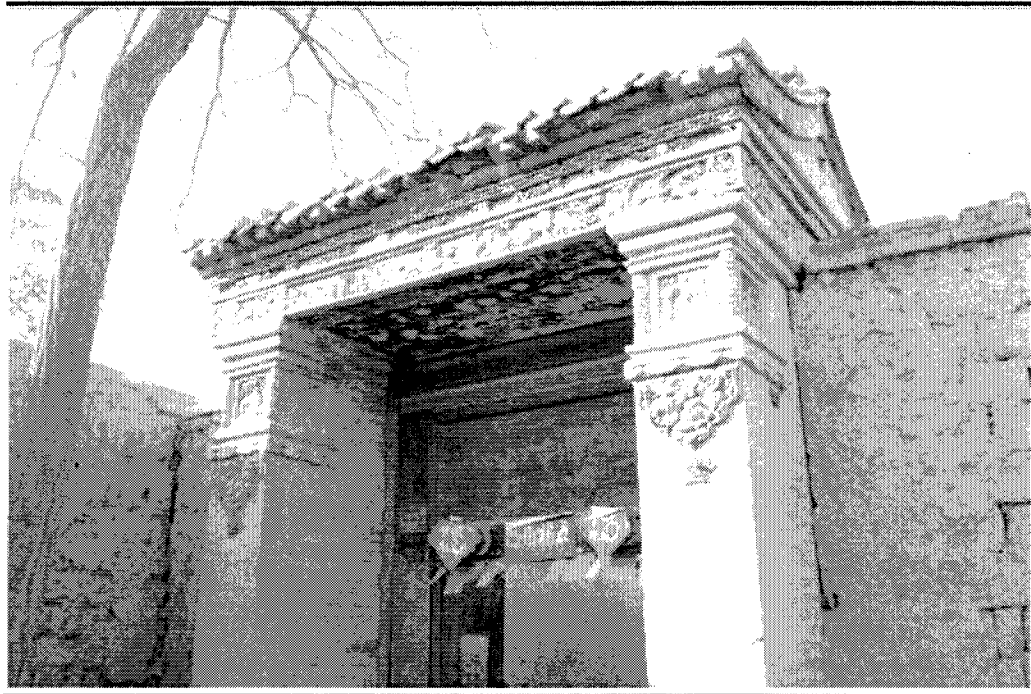


Figure 5.2 Qingcheng Ancient Town



5.2.2 Qingcheng Ancient Town

In Yuzhong county, 90 km from Lanzhou City, Qingcheng town encompasses courtyard houses under county level protection, and the Chenghuang Temple

under Provincial level protection. In 2004, there were 22,000 visitors to Qingcheng, generating RMB 380,000 in tourism revenue.

Qingcheng has a population of 22,600, and is a “living museum” of fine dwellings with exceptional woodcarving and highly decorated walls. The Ming and Qing Dynasty courtyard houses are the main cultural assets of the town. However, the structural integrity of many of the courtyard structures is poor and in urgent need of restoration.

Other heritage sites of interest include the Gao Family Ancestral Temple, the City Academy, the Chenghuang Temple and the ancient ferry crossing. Lotus ponds to the east of Qingcheng complement the tranquil village environment and a functional water wheel on the northern bank of the Yellow River (opposite Qingcheng) may also be of interest to tourists.

5.2.3 Jiayuguan Great Wall

Close to Jiayuguan City, Jiayuguan Great Wall is a National-level Cultural Heritage site, and a UNESCO World Heritage Site. In 2004, there were 329,000 visitors, generating RMB 66 million in tourism revenue.

Jiayuguan Pass was built in the late Ming Dynasty, around 1372 near an oasis that was then on the extreme western edge of China. The walls in the northwest region were originally constructed under the Han, and remains of the Han wall have been found near Dunhuang, but the portions of the wall standing at Jiayuguan date from about 600 years ago.

Threats include inappropriate building and site planning, unplanned visitor management, and building weathering.

5.2.4 Yardang National Geological Park

This is a National Geological Park, located 180 km northwest of Dunhuang City. It covers an area of 25 km by 18 km, and consists of a spectacular “yardang” scenery, formed through the weathering of sand-laden winds. Since June 2001, the site has received 400,000 tourists.

Despite its appearance, the surface of the Gobi desert is fragile. The surface has formed over thousands of years due to wind blowing away the fine material, leaving a surface layer of gravel that protects the underlying material. Vehicle movements on the Gobi surface disturb this gravel layer, exposing the underlying material. Under high wind conditions, these vehicle tracks can quickly become scars that take many years to recover. Site management to date has been successful in restricting vehicles to a single black-top road.

Figure 5.3 *Jiayuguan Great Wall*

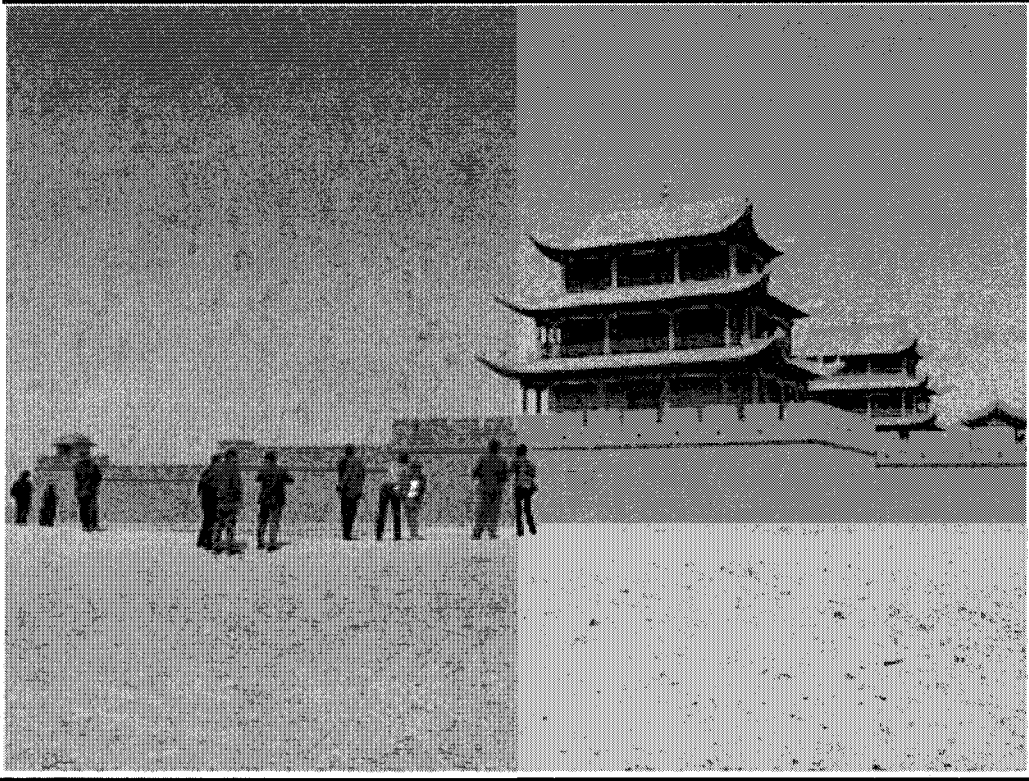
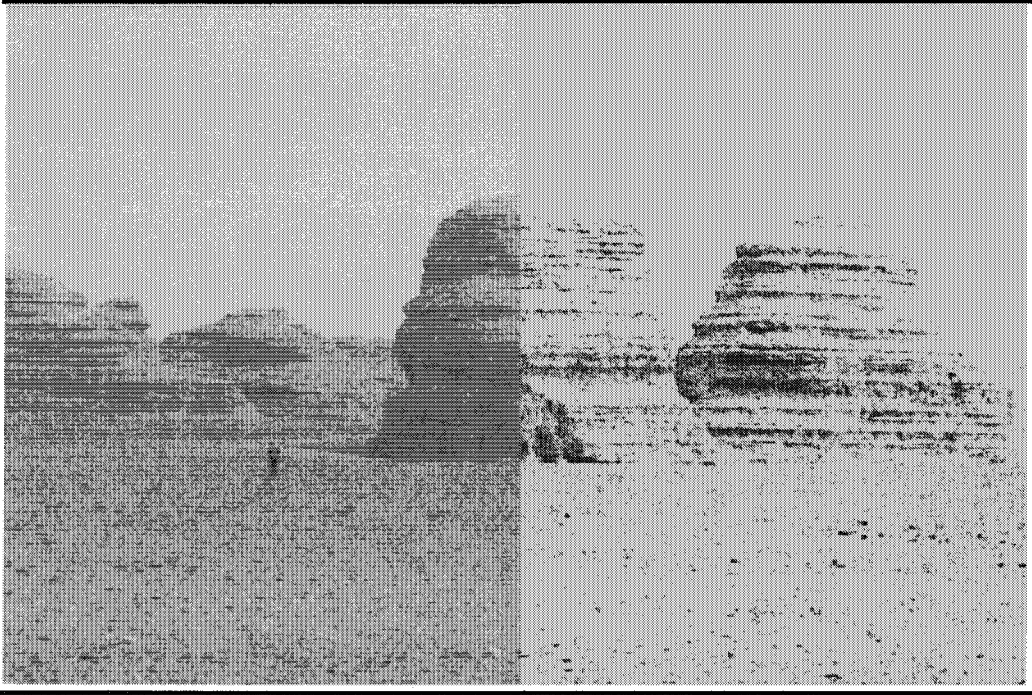


Figure 5.4 *Wind-eroded Scenery at Yardang National Geological Park*



5.2.5 Yellow River Stone Forest Park

Yellow River Stone Forest Park is a National Geological Park, located near Longwan Village in Jingtai County.

It includes a unique geological formation created over a period of more than 4 million years. The site remained beyond tourists' reach until a road was completed in 2003. Tourists are able to travel along a scenic gravel road along the valley floor for approximately 2 km, with spectacular views of near-vertical eroded cliffs on both sides. The main threat to the site is unplanned visitor management.

5.2.6 Wei Jin Folk Culture Park

With National-level Cultural Heritage Protection, located about 25 km northeast of Jiayuguan City, the site comprises over 1,400 tombs covering an area of about 20 sq km. In 2004, the site received 14,000 visitors, 86% of them from overseas.

The tombs were built of brick during the Wei and Jin Dynasties (220-420). The tombs are known as the largest subterranean art gallery in the world because they house a large number of vivid and colourful murals. The site was excavated in 1972.

5.2.7 Suoyang City

Located in Anxi County, with National-level Cultural Heritage Protection, Suoyang City was first constructed in the Han Dynasty, while the accompanying fortress was subsequently built in the beginning of the Tang Dynasty. The site was once a county seat of the Dunhuang prefecture in the Han Dynasty and later a Tang Dynasty prefecture, and is of high historical archaeological research value owing to its relation to the history of the Silk Road. Threats to the archaeological heritage include wind erosion, unrestricted visitor access, and the loss of artefacts prior to adequate archaeological investigation.

5.2.8 Mati Temple Scenic Park

A National-level Nature Conservation area, encompassing cultural sites with national-level protection, located 65 km south of Zhangye City in the Sunnan Tibetan Autonomous Prefecture. In 2004, the site received 100,000 visitors, generating tourism revenue of RMB 6 million, but is threatened by theft and vandalism.

The site is valued for its Buddhist cave complex, including a Jinta Temple which contains a mummified body that has been decorated in the form of Asparas, the Chinese flying goddess, and that is preserved by the dry Gansu climate.

Figure 5.5 *Yellow River Stone Forest National Park*



Figure 5.6 *Wei Jin Folk Culture Park*



Figure 5.7 Suoyang City

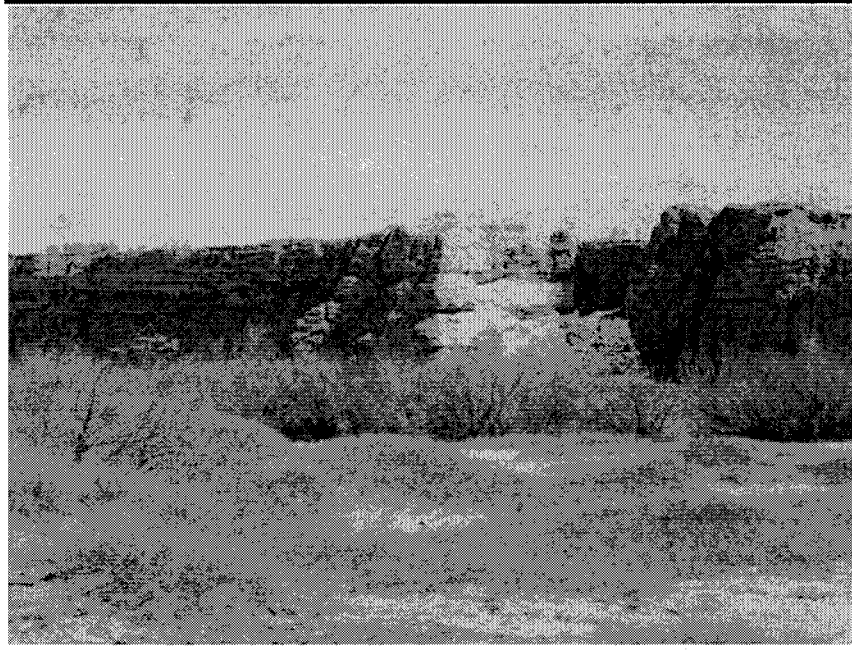
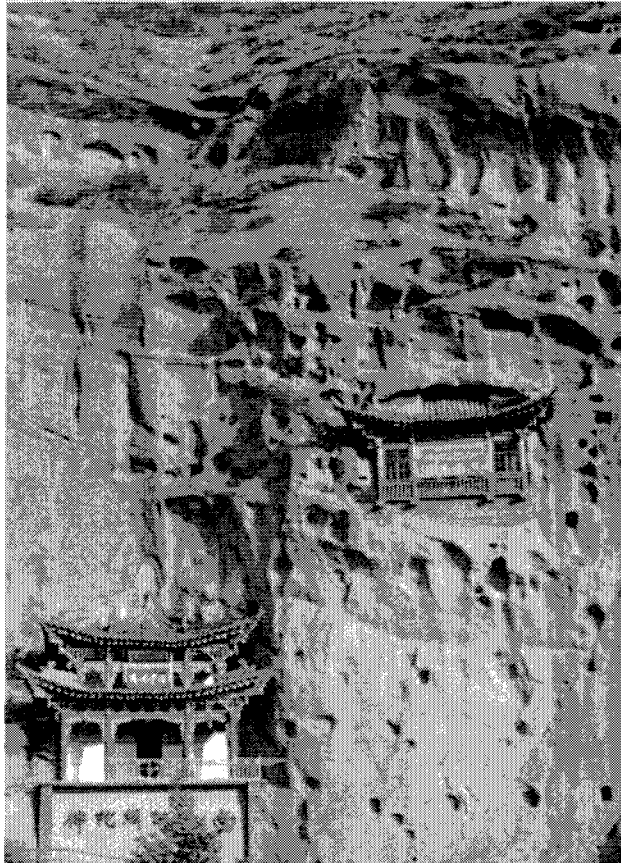


Figure 5.8 Mati Temple Scenic Park



5.2.9 Lutusi Ancient Government Complex Site

Located in Yongdeng County, Lanzhou City, the site has National Cultural Heritage Protection. The complex was used by local leaders under the Minority Rule System. It is the oldest, largest and most complete example of an administrative building complex used by local leaders under the Minority Rule System in the late 14th Century.

Threats include the risk of unsympathetic or overenthusiastic restoration, and there is already some evidence of inappropriate material use at the site.

Figure 5.9 Lutusi Ancient Government Complex



6 ASSESSMENT OF ALTERNATIVES

6.1 ASSESSMENT AT THE PROGRAMME-LEVEL

At the programme level, screening of an original seventeen proposed sub-components, a strategic overview study, and a safeguards review study contributed to the assessment of alternatives. *Table 2, Annex A* lists the original seventeen sites.

At the outset of the preparation of the project, GPG proposed sub-components at seventeen sites for appraisal by the World Bank. Screening began during the pre-identification mission in July 2005 and continued until the pre-appraisal mission in March 2007, when the list of programme sub-components was finalised. Proposals were screened against criteria of cultural and natural heritage content, financial viability, potential for local economic development, market potential, and the need for immediate protection.

Eight of the original proposals were ultimately screened out. For example Moon Crescent Lake was screened out of the programme during this stage, largely due to environmental and technical concerns associated with proposals for artificially recharging the aquifer.

A Strategic Overview Study was completed, which contributed to the screening process. A total of 526 cultural heritage sites protected at or above the provincial level were compiled by the study, indicating the range of potential alternative sub-components for project-financing.

6.2 ALTERNATIVES AT THE SITE LEVEL

At the site level, several mechanisms were built into project preparation to ensure the consideration of alternatives, including a review of Heritage Master Plans; and the preparation of environmental assessment reports or environmental management plans which assessed alternatives.

6.2.1 *Heritage Master Plan Review*

A detailed review of heritage site master plans was carried out. The review commented on the adequacy of existing site management plans and tourism strategies, and developed strategic and technical proposals that would improve the quality of the plans.

The overall conclusion of the review led to the development of the institutional strengthening component of the project, to address shortcomings in the system of financing tourism and heritage, in the management and planning of tourism and

heritage and in the institutional capacity at provincial, municipal and local levels in the province.

6.2.2 Preparation of Environmental Assessment and Environmental Management Plans

Environmental assessments at each site have also contributed to the assessment of specific measures. Examples of alternatives cited in the site assessments include: alternative solid waste management (especially landfill) options at Mati Temple Scenic Area, Qincheng, Lutusi, Majishan, and Yellow River Stone Forest; alternative wastewater treatment plants at Yellow River Stone Forest; alternative road routings at Yardang National Geological Park; and alternative parking lots at Lutusi Ancient Government Centre.

Alternative Solid Waste Management Options

Solid waste management options were considered for six sites. At Majishan Scenic Area, alternatives included improvement to an existing landfill, contracting the service out, or the construction of a new landfill for the sole use of the scenic area. At Qincheng Ancient Town, consideration of alternatives led to the site of the landfill being shifted by 500m up the valley to reduce the land area of the landfill. At Yardang National Geological Park and at Yellow River Stone Forest, potential off-site landfill of solid waste was considered, but rejected in favour of improvements to existing small-scale disposal sites, including wind protection, fencing and coverage. At Mati Temple Scenic Area, alternative sites for a landfill were considered, but all rejected, particularly because the amount of solid waste generated is small and can easily be transported to an existing nearby landfill. A similar solution was found at Lutusi Ancient Government Complex.

Alternative Road Routings at Yardang National Geological Park:

Two alternative routes for the road at the park were assessed: (i) a 19 km road entirely in the experimental area of the nature reserve zone; (ii) a 23 km road, starting from the same point, but passing through a saline area for 1 km. The 19 km road was selected, on the basis of lower ecological ground impacts, and in accordance with reserve regulations.

Alternative Wastewater Treatment Plans at Yellow River Stone Forest:

Two alternative schemes for wastewater treatment were assessed: Sequence Batch Reactor, and A/O (anaerobic-aerobic) process. The former was selected on the basis of the lower amount of sludge generated, low water volume requirements, and its ease of operation.

Alternatives at Lutusi Ancient Government Centre

Two alternative parking lot locations were compared at Lutusi: (i) 60 metres south of the heritage pedestrian street and west of Minmen Road, and (ii) at the southeast corner of the junction between the heritage pedestrian street and Minmen Road. The second scheme was recommended by the site environmental assessment, on the basis of lower solid waste and noise impacts, and the adoption of mitigation measures for the disposal of construction waste and tourism safety.

Also at Lutusi, two alternative schemes for toilets were assessed: (i) water flushing toilets and (ii) dry toilets without water flushing. The assessment concluded that the toilets with water flushing are recommended, except for a single location where (water supply is limited) a dry toilet will be used.

7 PREDICTED IMPACTS

This chapter describes the predicted environmental benefits and adverse environmental impacts of the project. Details of the predicted impacts and mitigation measures for each site are provided in Volume A.

7.1 ENVIRONMENTAL BENEFITS AND IMPACTS OF THE PROJECT

7.1.1 Overall Benefits

The project addresses the sustainable development of Gansu's cultural and natural heritage, and therefore can be predicted to deliver *significantly positive benefits* in improved heritage preservation and conservation. The project will instil a commitment to, and provide practical experience in, sustainable approaches to tourism development amongst the GPG and the public in Gansu, resulting in enhanced cultural heritage appreciation, environmental sustainability and economic development of isolated populations.

Owing to the national significance of Gansu's heritage, the project also has the potential to make a substantive contribution to the development of sustainable tourism approaches in China as a whole.

The project also can be predicted to deliver positive environmental and social benefits. Social and economic benefits can be realised through increasing the number of tourists to accelerate service industry development, and with associated improvements in working conditions for employees. Economic development driven by tourism will increase job opportunities and enhance incentives for the protection of natural and cultural heritage.

7.1.2 Risks of Adverse Impacts

However, there are the following risks of adverse impacts, both at a strategic, provincial level, and at the level of the nine key sites of investment.

- **Inappropriate, unsustainable tourism development**

There are risks that the project will fail to deliver its predicted benefits for cultural heritage preservation at particular sites, or overall. In the worst case scenario, significant investments may be made, at any particular site, in inappropriate infrastructure, resulting in a reduction in the economic and cultural value of the site.

- **Damage to physical cultural heritage**

There is a risk of damage to physical cultural heritage from demolition, reconstruction or inappropriate restoration of physical monuments, structures

and significant architecture and from unintended archaeological “chance-finds” during construction.

- **Distribution of benefits**

There is a risk that the economic benefits arising from increasing levels of tourism may not be evenly spread through local communities. People who are particularly vulnerable, for example the elderly and disabled, may not have the capabilities to benefit from the tourism industry, but may be adversely affected by an increased demand of local resources or higher prices. Men or women may disproportionately benefit, leading to social and family tensions. At one site where there are a range of ethnic groups, some groups may benefit to a greater extent than others, leading to inter-ethnic resentment and conflict.

- **Induced development**

If the numbers of tourist visits to Gansu, and to each site, increase as planned, it is inevitable that additional developments will be made to cater for the increased numbers. At each site, this may threaten the visual beauty or cultural heritage of the site, and create environmental pollution risks. However, at each site, zoning plans (core zone, buffer zone etc) are in place to control induced development.

Increased tourism in Gansu will contribute to the pressure for increasing development (in hotels, water infrastructure, waste management etc), but the contribution of increasing tourism is insignificant, in comparison to investment trends in the province from other sectors.

- **Introduction of social ills**

Unplanned development of the tourism sector may carry the risk of increasing social ills, such as begging and prostitution. These may arise if the industry attracts numbers of migrant workers in excess of the availability of new jobs, or if revenues from tourism fail to trickle down to local communities. The adoption of clear employment policies during construction and programmes to support the development of small enterprises are required mitigation measures at each site.

7.2 SPECIFIC ENVIRONMENTAL RISKS LIKELY AT ALL SITES

There are risks of adverse environmental impacts at each site, but all can be avoided, and none are so significant or severe that they cannot be readily mitigated or managed. *Table 7.1* lists the impacts applicable to all sites, and proposed mitigation measures.

The most significant potential impacts are at the Jiayuguan Great Wall (related to the restoration of the First Signal Tower that is in a precarious position) and Majishan Scenic Area (related to the rehabilitation of two small-scale dams). All other impacts are of more limited significance and can be readily mitigated.

Table 7.1 *Impacts and Mitigation Measures Applying at All Sites*

Impact	Mitigation Measures (Site Level only)
Prior to Construction	
Visual impact of new facilities, if not located, designed or constructed in sympathy with the local heritage and surroundings	Construction of all facilities according to minimum standards of design, and in keeping with a site design that enhances its visual and landscape value
During Construction	
Adverse impacts of construction activities including fugitive dust and noise, soil erosion	Construction Management Plan
Risk of injury of labourers and the public during construction and rehabilitation activities	Design and enforcement of Site Health and Safety Plans encompassing protective clothing, safe working at height, and prevention of public access.
Casual disposal of solid waste and construction waste materials in the local environment	Implementation of Site Waste Management Plans
Reduced local availability of groundwater or surface water	Identify permitted level of water extraction, and limit extraction within this level, taking steps to reduce water consumption through water reuse, and capture of rainwater, where necessary
Disposal of wastewater into surface water courses	Prevent disposal of wastewater that exceeds environmental quality standards to local water courses
Loss of 'chance finds' of archaeological artefacts during rehabilitation or construction	Education of labourers in the recognition of potential artefacts, and use of a protocol for steps to take in the event of chance finds.
Risk of damage to cultural heritage through vibrations created during construction	Use of professional contractors with experience of working in areas where fragile cultural relics are present. Temporary removal of cultural relics if feasible.
Impacts associated with use of materials (water, timber, cement etc) from unsustainable sources	Use only materials from sources approved as sustainable
During Operation	
Reduced local availability of groundwater or surface water, disposal of wastewater into surface water courses, unmanaged disposal of solid waste.	Adoption and implementation of an environmental policy by the site
Risk of injury of public and staff	Design and enforcement of Site Health and Safety Plans encompassing protective clothing, safe working at height, prevention of public access, and planning for emergencies.
Induced environmental impacts of traders and public gathering around the site, adverse social impacts associated with increased tourism to the area	

7.2.1 Visual impact

Poor design of the infrastructural civil works, poor planning of the location of facilities, and the construction of facilities that are not warranted by realistic predictions of visitor numbers, threaten the visual and aesthetic features of the

sites, which are vital to their economic value. It is imperative that infrastructure is in keeping with the local heritage and environment, and is built in accordance with each site plan.

Careful infrastructure design, also offers an opportunity to create a consistency of building designs, roads and paths, and signage etc across Gansu's heritage sites, contributing to the development of a Gansu tourism 'brand'.

7.2.2 Disposal of solid waste and construction waste

Construction and renovation activities will create construction waste which will require responsible disposal. Increased visitor numbers will also result in increased solid waste arisings. An approach to solid waste management is required that: minimises waste arisings, promotes the re-use of waste, promotes local recycling and composting, and is based on 'circular economy' principles. Landfill should be used only as a last resort, and landfill sites must be suitably located. If environmental constraints prevent onsite landfill disposal, solid waste must be transferred to off-site disposal facilities.

There is an opportunity to develop and implement waste management strategies for Gansu's tourism sites that encompass minimisation, reuse and recycling. The strategies could contribute to the development of small waste management enterprises, amongst local communities. In particular, a coordinated provincial waste management strategy would contribute to Gansu's tourism marketing strategy and brand. Waste management strategies would be particularly important for the town sites of Lutusi and Qingcheng.

7.2.3 Procurement of materials from sustainable sources

The use of construction materials from sources that have an impact on the environment should be avoided. This would include stone, cement, gravel and sand, and bitumen used in building and road construction. There is an opportunity for the PMO to investigate options to maximise the procurement of materials from sustainable sources. A successful 'sustainable procurement' strategy would contribute to Gansu's tourism marketing strategy and brand, through the use of traditional, local materials from sustainable or renewable sources.

7.2.4 Unsustainable groundwater and surface water extraction

Construction of buildings and roads, and ongoing maintenance of the facilities, will use water. The availability of groundwater and surface water varies from site to site, and is extremely limited in some cases. Extraction of water must therefore be kept within the amounts permitted in the *Detail Implementation Rules of Water Extraction Permit in Gansu Province* inspections by the Water Resource

Bureau. Depending on local levels of precipitation, there may be opportunities for rainwater and snowmelt harvesting, and collection of roof-collected water.

7.2.5 Pollution of local surface water courses with wastewater

Disposal of wastewater to local surface water courses will have adverse impacts on the local ecology, and on human health. In all cases, disposal of wastewater to water courses must be avoided. The location, construction and maintenance of cesspits and wastewater treatment plants must be managed to avoid any leakage of effluents to watercourses.

7.2.6 Risk of injury to workers and the public

Key issues at all sites will be the health and safety of construction workers, and the prevention of access to the site by the public. At some sites in particular (Jiayuguan Fortress and First Signal Tower), workers will be operating at great height, requiring meticulous attention to health and safety. The public will also be at a low probability of injury when the sites are open to the public. An emergency response procedure is required for all sites during construction, and it should be adapted and kept in place during operation.

7.3 SPECIFIC ENVIRONMENTAL RISKS APPLYING TO INDIVIDUAL SITES

At some sites, there are environmental risks that are a result of the sites unique environment, or the particular investments to be made at the site. The most significant risks are expected at Jiayuguan Great Wall, related to the restoration of the First Signal Tower, and at Majishan Scenic Area, related to the restoration of two small-scale dams.

7.3.1 Jiayuguan Great Wall

Structural enhancement to the foundation of the First Signal Tower, and the reconstruction of the river embankment of the First Signal Tower have the potential to cause significant damage to the First Signal Tower, and disturbance to the river.

The First Signal Tower is located in a precarious position at the top of a cliff adjacent to the gorge of the Yellow River. Works at the tower will have to be carried out with extreme care to avoid *undermining* its foundation, and to avoid highly serious health and safety risks for both workers and the public.

In addition, intentional or unintentional disposal of construction debris into the adjacent river during construction could potentially damage the riverine ecological communities, and affect downstream users of the river water. The renovation of the embankment adjacent to the river, intended to protect the cliff from further erosion that threatens the foundation of the First Signal Tower, is

likely to alter the river sedimentation processes, leading to downstream erosion, or the erosion of the new river embankment.

Mitigation measures required are:

- The construction of the river embankment according to engineering design that takes full account of river sedimentation and erosion;
- Appointment of a competent contractor to carry out foundation enhancement, with a demonstrable work track record of this nature.

7.3.2 *Majishan Scenic Area*

At Majishan, the location of buildings, paths and roads etc and all construction activities should take place within spatial and seasonal constraints, based on important habitats and rare or endangered species, and avoidance of disturbance to these areas, in order to avoid disturbance to the ecological integrity of the area.

In addition, activities at Majishan will include two activities of potential significance:

- Yinyue Lake protection in Shimen sub-area, including engineering enhancement to the existing dam (10 m high, 60 m long) through the new sluice gate, building lake embankment of 300 meter long on north side, 1000 m of footpaths, dredging of 6,000 m³ of mud, constructing administration building of 500 m² floor space;
- Xianren Lake protection in Xianrenya sub-area, including engineering enhancement to the existing dam, landscaping and ecological restoration to the surrounding hills; dredging of 3 creeks at entrances to the future lake.

These activities have been subject to initial dam safety analysis in April 2007, which has concluded the following.

Yinyue Lake

The height of the dam is 10 m. The dam consultant concluded that the structure with the planned restoration is safe, and at the limited storage water level of 1.20 m. Based on a 1 in 50 year flood in 2005, discharge capacity is large enough to pass floods and meets the flood control requirement. In addition, based on the geological condition and 50 year's natural operation, the structure of the discharge tunnel can be also considered safe, with necessary lining treatment.

The consultant recommended that dam operation and management is assigned to management personnel and an OMS manual is prepared (Proposed content of the OMS Manual is included in the consultant's report in *Annex E* of the Main Report), and that an EPP be prepared (a proposed content of the EPP is included in *Annex E*).

Xianren Lake

The maximum height of the dam is 20 m. The dam safety consultant recommended:

- A comprehensive dam safety appraisal according to “The Method of Dam Safety Appraisal” and “Guidelines on Dam Safety Evaluation”, to clarify the safety situation and make recommendations for dam operation.
- Assignment of dam operation and management personnel and preparation of OMS manuals. (A proposed content of the OMS Manual is included in the consultant’s report).
- Preparation of an Emergency Preparedness Plan (EPP) to ensure the safety of tourists and protect the ecological environment of the scenic area (A proposed content of EPP is included in the consultant’s report);
- Several specific recommendations concerning dam and mechanism structures.

7.4 SOCIAL IMPACTS

Direct social impacts of the project are the temporary or permanent displacement of people due to land acquisition, and (at one site) potential impacts on ethnic communities.

7.4.1 Land Acquisition and Resettlement

A separate Resettlement Action Plan (RAP) has been prepared, based on detailed social surveys and consultation. The RAP concerns only Qingcheng and Lutusi sites, because they are the only sites that will physically or economically displace people. Part of the RAP provides a policy framework to guide provincial and local PMOs to meet the objectives of the RAP, if further displacement is inevitable at the other nine sites or elsewhere, during the implementation of the project. For example at Yellow River Stone Forest Park and Maijishan Scenic Area the exact location of infrastructure is still under consideration and not confirmed at the time of the RAP’s preparation.

Key impacts on project-affected people (PAP) are:

- Loss of land;
- Loss of productive assets (for e.g. crops, trees and livestock pens etc.) and other assets (for e.g. facility, small businesses);
- Loss of houses (for e.g. dwelling house) and structures (for e.g. wall, shelter);
- Loss of assets by vulnerable groups; and
- Effects on public utilities and assets.

Project Land Take and Affected Population

At Qincheng, in total, 13.5 mu ⁽¹⁾ (8,932m²) land of four villages (Chenghe, Dongtan, Xiaping and Wayao) of Qingcheng Town will be permanently used for the Qingcheng project. Road and bridge construction will temporarily occupy a small amount of land along the road totalling 6 mu within 7 villages. People will be compensated for their standing crops at the site of the landfill. The land in the area is collectively-owned.

At Lutusi, in total, 9.46 mu ⁽²⁾ (6500m²) of land of two Village Groups (No.3 and No.9), Liancheng Village, Liancheng Town will be permanently used for the Lutusi project.

Further details are provided in *Annex C*.

Vulnerable Groups

There are two households identified as vulnerable groups in the Lutusi Project through the household survey and consultation. One household was displaced several years ago as a result of local urban development and did not receive any compensation from that project developer. The household has not yet paid its debts resulting from the first resettlement and would become extremely vulnerable due to the secondary relocation. The second household is an elderly couple both over 60 years old and unable to work. Special support will be given to these households.

7.4.2 Impacts on Minorities at Mati Temple Scenic Area

People of Yugu, Tibetan and Mongol ethnicity, in addition to the national majority of Han, live at Mati Temple Scenic Area. A separate Indigenous People's Plan has been prepared to set out the measures required to ensure free, prior and informed consultation with these groups, and to ensure they benefit from project activities.

The benefits of the project for the ethnic minorities in the area will be: income diversification, and a reduced reliance on herding; personal skills development; and preservation of ethnic culture through ethnic characteristic tourism.

Predicted adverse impacts include:

1. Rapid tourism development might cause environmental pollution, resulting in adverse impacts to the local ecology and environment on which ethnic communities are dependent. There is some environmental damage in the

(1) 1 MU= 667 m²

(2) 1 MU= 667 m²

Mati Temple scenic area, related to a lack of solid waste management, littering, and inappropriate burning of wastes, due to the pressure of visiting populations and low awareness of environmental protection. Smoke from burning waste does not dissipate quickly in sheltered areas, especially near Mati Temple.

2. Some forms of modern civilization would come with tourism development, which might generate cultural shock against certain local ethnic traditions and culture. For example, fewer people may engage in the traditional livelihood of livestock farming, social structural changes might take place amongst the traditional community of ethnic minorities, and younger generations may be less keen to carry forward their ethnic traditions and culture.

The project will finance the gathering and documentation of cultural resources for display at the 2,000 m² Yugu folk cultural heritage centre. Consultations with World Bank specialists on OP 4.10, has confirmed that these activities do not constitute "commercial development" as set out in paragraphs 18 and 19 of OP 4.10. The project will not finance the commercial development of the knowledge or cultural resources of any of the ethnic minorities at Mati Scenic Area.

None of the activities to be financed by the project will restrict physical access to sites or areas of customary value in the area.

8 CONSULTATION AND DISCLOSURE

8.1 PUBLIC CONSULTATION

Public consultation during the preparation of this project was carried out using a questionnaire survey, expert consultation, workshops and a public hearing. Participants in public consultation mainly included the organisations and individuals potentially affected by environmental impacts, NGOs and experts.

Participants in the questionnaire surveys included residents, tourists, scenic area managers, government staff, teachers in local schools, members of social groups and village committees. The number of responses was around 100 at each site, and response rates were above 90% (in three cases it was 100%). Public consultation workshops were held at seven sites (all except Suoyang, and Majishan), including participants from the local residents, EPB, site management, DRC, and village committee members.

Generally the responses from the questionnaire surveys and workshops indicate that the majority of the public believe that the project is necessary and that it will promote economic development, bringing benefits to local residents. Suggestions were received on the specific requirements for environmental protection measures at each site.

8.1.1 Additional Consultation at Mati Temple Scenic Area

During the preparation of the Indigenous People's Plan, consultations with communities at the Mati Temple Scenic Area were carried out in July 2006 over a period of four days and in late June 2007. During the first round of consultation, the team responsible for the IPP preparation consulted 7 tourism investors (out of a total of 11 investors, 64%), 30 employees (18%) and 40 visitors at random in the scenic area. In addition, a workshop involving 29 people also was held by the scenic area committee. The second round of consultation included interviews with 4 households in 3 villages, 1 tourism investor, 5 commercial service households (small shops in the scenic area), 4 horse-service households and 2 employees. Findings are provided in the Indigenous People's Plan.

8.2 DISCLOSURE

Information on the project and potential environmental impacts has been publicly disclosed through various means, over March-May 2007. The information disclosed at each site was a briefing on the project to be carried out at the site, with the site EIA report or a summary of the site EIA or EMP report. The means of disclosure included bulletins at the site, distribution of printed materials, disclosure on the site's website, and newspaper articles.

The sites of the Mati Temple, Qingcheng, Jiuquan Museum ,Shi Chuan, Suoyang and Yardang have selected public representatives to supervise environmental protection during construction and operation. These representatives will report the environmental problems existing in these sites and provide relevant suggestions to the site managers and EPB, and will take part in the EPB inspection of completed civil works.

9 ENVIRONMENTAL MANAGEMENT PLAN

The elements of the Environmental Management Plan (EMP) that will be used by the project are summarised below. Specific mitigation measures concerning construction management, health and safety, cultural heritage preservation etc are set out in the individual site tables in Volume II of the main report. An environmental mitigation plan, monitoring plan, costs and training requirements are provided in *Annex D*.

9.1 ENVIRONMENTAL MANAGEMENT MEASURES

Assessment of the potential impacts of the project, and its activities at each site, shows that there is a wide range of mitigation measures that are applicable to all sites, as well as actions required of the PPMO to support environmental management.

The measures can be summarised as follows.

Preparation

- Appointment of the PPMO environmental management officer, and appointment or identification of officers with responsibility for environmental management at each site;
- Detailed design of the investments at each site to ensure minimum standards of design, and production of a design that enhances visual and landscape value;
- Review of the detailed designs for all investments to identify feasible options for the use of sustainable environmental technologies at each site;
- Design of a project-wide chance finds policy, consistent with Chinese regulations, and precedents on previous Bank-financed projects.

Measures Required Prior to Construction

- Preparation of the detailed requirements of sound construction management, including the measures required to avoid damage to fragile cultural heritage, to include in the bidding process for contracted operations as well as operations to be carried out directly by government agencies;
- Attaining all required permits, including (i) formal approval of each site-level EIA / EMP from the relevant EPB; (ii) a water abstraction permit obtained from the Water Resources Bureau for all water supply developments; (iii) approval of a Construction Management Plan from the relevant EPB Construction Department; (iv) approval of Health and Safety plans from the relevant EPB Construction Department.

Please note that Construction Management Plans are required to be submitted to the local EPB, and must be approved before construction can begin. The plans will be reviewed by the PPMO environmental officer, third party supervising engineer, and EPB. Construction Management Plans will be a contractual requirement of all construction contractors. The third party supervising engineer will monitor adherence to the plans.

Measures Required During Construction

Implementation of:

- Construction Management Plans, encompassing erosion control, noise control, wastewater management and solid waste management, and the minimisation of use of construction materials from non-sustainable sources;
- Site Health and Safety Plans encompassing protective clothing, safe working at height, safe use of pesticides, procedures to follow in the event of an emergency, and prevention of public access;
- 'Chance finds' policies.

In addition, there is a requirement for independent third party supervision of construction management, health and safety, and third party supervision of cultural heritage preservation.

Measures Required During Operations:

- Adoption and implementation of environmental policies by each site, incorporating water and wastewater management plans, vehicle management, air quality management etc;
- Site Health and Safety Plans encompassing public safety and emergency procedures, in addition to worker health and safety;
- Ensure that a water abstraction permit has been obtained from the Water Resources Bureau when surface water or groundwater is required for site operations;
- Community engagement to maximise benefits from tourism for local communities, and prevent unplanned gathering of vendors and beggars.

9.1.1 Specific Measures at Each Site

Specific mitigation measures that will be taken at each site concerning a range of impacts that are unique to particular sites. These include adequate design of river embankments at the Jiayuguan First Signal Tower and Yellow River Stone Forest, adequate design of the construction works to support the foundation of the First Signal Tower, dam safety measures at Majishan Scenic Area, and the implementation of sufficient mitigation measures concerning small landfill facilities or solid waste management at the Mati Temple Scenic Area, Qingcheng,

Lutusi, Majishan Scenic Area, Yellow River Stone Forest and Yargdang National Park.

More specific suggestions concerning construction management, health and safety, cultural heritage preservation etc are set out in the individual site tables in Volume II.

9.2 ENVIRONMENTAL ASSESSMENT OF ADDITIONAL INVESTMENTS

In the unlikely event that the project is required to finance infrastructure at sites other than the nine priority sites, or infrastructure that is not part of the currently envisaged activities at the nine priority sites, steps will be taken to ensure compliance with Chinese environmental regulations and World Bank safeguard policies.

9.2.1 In the Event of Amendment of Activities at the Existing Priority Sites

If activities at any of the existing sites are amended, the Municipal PMO will discuss the changes with the PPMO, and reach one of the following decisions:

- To update the EIA / EMP for the site, in cases where significant changes are planned, for example a change in the siting of a parking lot, or a wastewater treatment plant;
- To update the relevant plans and policies of the site (ie construction management plan, solid waste management plan etc), if necessary, to take account of the new activities.

The PPMO will seek approval for this decision from the Gansu EPB member of the PLG. Approval by the Municipal EPB of the updated EIA or plans will be required, prior to PPMO approval of the amended activities.

9.2.2 In the Event of Additional Investment at Other Sites

In the event that the project finances new investments at additional sites, the normal procedure for EIA will be followed. EIA approval is a necessary prerequisite for securing a construction and operating permit. Based on the severity of possible impacts on the environment, the EIA may be a simple Environmental Impact Registration (EIR), an EIA Form (EIF), or an EIA Statement. This will be determined by the *Classification Management Catalogue of Environmental Protection for Construction Projects* (issued by the SEPA and effective on the 1st of January 2003).

Through the PPMO, the relevant Municipal PMO will notify the Gansu EPB member of the PLG of the required EIA, and describe how the EIA will be produced.

The PPMO will advise the Municipal PMO to produce an EIA for the site that results in a practical environmental management plan.

Approval by the Gansu EPB of the updated EIA or plans will be required, prior to PPMO approval of the new site activities.

9.3 RESPONSIBILITIES FOR THE ENVIRONMENTAL MANAGEMENT PLAN

Site management at the nine priority sites will establish “environmental protection management offices” (EPMOs) and recruit 1 or 2 experienced environmental protection management persons. The EPMO will supervise the implementation of environmental protection measures to comply with national regulations and legislations, and obtain provincial level approvals. The EPMO also has to establish close relations with the local EPB in order to properly arrange the implementation of environmental monitoring at each stage properly. Environmental monitoring during construction operation will be carried out by the environmental stations at municipal levels. Ultimate responsibility for EMP implementation lies with the PLG.

9.3.1 Reporting

Two levels of reporting will be followed:

- **Annual Reporting** on progress in implementation against the measures and commitments set out in this EMP, by the PPMO, reporting to PLG and the World Bank;
- Detailed **Quarterly** reporting on the implementation of the individual policies and plans that are part of the EMP, by site managers, to the Municipal PMO and relevant government agencies (eg reporting on Health and Safety to the Safe Manufacture Supervision Bureau), and in turn to the PPMO.

In addition, a formal annual audit of environmental performance will be carried out by an independent entity.

Site Management / Municipal PMO reporting will describe progress in detail against the measures set out in the individual plans and policies of the site (eg health and safety policy, construction management plans, site waste management plans etc), in addition to the monitoring parameters set out in *Section 9.4*. Reports will be submitted to the local EPB.

9.3.2 Supervision and Corrective Measures

Supervising organisations are the SEPA, Gansu Provincial EPB, the project 'expert panel', and municipal level EPBs. The main report sets out the supervision responsibilities of each of these organisations.

Corrective actions and disciplinary procedures will be set out, and where possible, included in contractual agreements. Where the municipal PMO finds that the contractor or operator has violated the environmental measures set out in their contractual agreement(s), corrective action, and *in extremis*, disciplinary action will be taken.

9.4 MONITORING

Environmental monitoring plans have been developed for each of the nine sites. These outline monitoring indicators, locations, and frequencies. Monitoring reports will be disclosed using the same means at each site as used during preparation (for example at Jiayuguan, through a bulletin at the site, and the site website. Details of monitoring are set out in *Annex D*.

9.5

TRAINING REQUIREMENTS

In order to ensure effective environmental management for the project, it is recommended that those responsible for project management, and contractors undertake training to strengthen their capacity to implement mitigation measures, and monitoring. The training will be developed and delivered by the PPMO environmental manager, and will consist of: a brief summary of World Bank safeguard policies; relevant Chinese environmental legislation and standards; EMP contents and requirements; responsible construction management; cultural heritage background and requirements; the scenic area management system. *Annex D* sets out the cost of the training. There are slightly differing costs between each of the sites.

9.6 COSTS

The total cost of implementing the EMP is **USD 822,186**. This consists of third party supervision of civil works at each site, selected additional work (for example preparation of operation and maintenance plans for small dams at Majishan Scenic Area), monitoring costs, salary costs and expenses for the PPMO and site environmental managers, and training costs. Details of costs are set out in *Annex D*.

9.7 MITIGATION OF SOCIAL IMPACTS

9.7.1 Resettlement

The RAP sets out full details of eligibility for compensation, rates of compensation, grievance procedures, organisational responsibilities etc.

Resettlement will be compensated as follows:

- Compensation for dwellings will be made as replacement dwellings;
- Otherwise, compensation will be made in cash;
- Compensation will be paid to affected parties prior to the commencement of construction activities on the affected land; and
- (Where relevant) To counteract the risk of livelihood deterioration from the loss of land, the project will assist in providing employment opportunities in the non-agricultural sector.

The budgets for resettlement compensation at Qingcheng and Lutusi are RMB 719,540 (USD 93,446) and RMB 3,397,863 (USD 441,280) respectively, total RMB 4,117,403 (USD 534,727).

Annex C sets out the details of compensation.

9.7.2 Ethnic Minorities

Steps will be taken to provide an effective way to consult with ethnic communities at the Mati Temple Scenic Area, in a timely manner. These include:

- The Management Committee of Mati Temple scenic area will appoint the Administrative Division as the organization responsible for issuing information on the project, collecting public opinions, and informing the public where they can take their complaints;
- Sunan county government will address and deal with public opinions collected by the Administrative Division, the Management Committee of Mati Temple scenic area;
- Regular meetings involving local community representatives and the project parties will be organised;
- Easily readable brochures on all related project information will be prepared and copies made available to the public;
- MTSAAC will collect any comments or suggestions from the public from five suggestions boxes set up within the scenic area;

- Information on the project will be made available by internet.

Measures to enhance project benefits for ethnic communities at Mati will be taken. This will include: training to address ethnic communities' concerns that they have insufficient skills or knowledge of their traditional culture; an RMB 840,000 project on relics and folk handicraft preservation, collection and training; presentations at an Ethnic Cultural Exhibition Centre; a workshop for the development of ethnic and folk handicraft; research and development for the marketing of traditional ethnic food and recipes; and research on ethnic and folk culture. Full details are set out in the IPP.

Annex A

Detailed Tables

Table 1

Tourism Development Plans, Heritage Conservation Plans and Feasibility Study Reports

Site	Tourism Development Plan	Heritage Conservation Plan		Feasibility Study Report	
		Completion	Prepared by	Completion	Prepared by
Yadang National Geological Park	Completed thoroughly	None		Completed and waiting for approval	Lanzhou Coal Mining Design & Research Institute; Jingwei Environmental Engineering Technology Co., Ltd
Suoyang City	Completed thoroughly	Completed	Institute of Architectural History of Chinese Architectural Design and Research Academy	Completed and waiting for approval	Forestry Investigation and Planning Institute of Gansu Province
Jiayuguan Great Wall	Completed thoroughly	Second draft completed	China Academy of Urban Planning and Design	Completed and waiting for approval	College of Tourism, Northwest Normal University
Wei Jin Folk Culture Park	Completed thoroughly	Outline	Lanzhou University; Dunhuang Academy	Completed and waiting for approval	College of Tourism of Northwest Normal University
Mati Temple Scenic Park	Completed thoroughly	Under preparing	Cultural Relics Protection Institute of Zhangye City	Completed and waiting for approval	Engineering Consultation Center of Zhangye City
Qingcheng Ancient Town	Completed thoroughly	Draft	Lanzhou Engineering Research Institute of Nonferrous Metallurgy Co.; Gansu Cultural Relics Protection and Maintenance Research Institute; Institute of Dunhuang Studies of Lanzhou University.	Completed and waiting for approval	Lanzhou Engineering Research Institute of Nonferrous Metallurgy Co.; Gansu Highway Communication Surveying and Design Corp.; Institute of Dunhuang Studies of Lanzhou University.
Lutusi Ancient Government Center	Completed thoroughly	Completed and waiting approval	China National Institute of Cultural Property	Completed and waiting for approval	Forestry Investigation and Planning Institute of Gansu Province; School of Management of Lanzhou University
Yellow River Stone Forest Park	Completed thoroughly	None		Completed and waiting for approval	Forestry Investigation and Planning Institute of Gansu Province

Site	Tourism Development Plan	Heritage Conservation Plan		Feasibility Study Report	
		Completion	Prepared by	Completion	Prepared by
Majishan Scenic Area	Completed thoroughly	On a bidding		Completed and waiting for approval	Yuanjian tourism research Co., Ltd
The whole project	Completed by Chinese Academy of Sciences and waiting for approval	None		Completed and waiting for approval	Forestry Investigation and Planning Institute of Gansu Province

Table 2

Initial Seventeen Sites Screened for Potential Inclusion

	Municipality	Site Name
1	Jiuquan	Moon Crescent Lake
2		Yadang National Geological Park
3		Yang Guan Gate
4		Western Han Dynasty Park (Wine Spring)
5		Jianshui Jinguan Military Gate
6a, 6b		Suoyang Town, Qiaowan Town
7		Huo Shao Gou Tribal Village
7a		XiLiang King Tomb/Jiuquan Museum
8	Jiayuguan	Jiayuguan Great Wall
9		Wei Jin Folk Culture Park
10		July 1st Glacier
11		International Gliding Facility
12	Tianshui	Majishan Scenic Area
13	Lanzhou	Lutusi Ancient Government Center
14		Shi Chuan Ancient Pear Orchard
15		Qingcheng Ancient Town
16	Baiyin	Yellow River Stone Forest Park
17	Zhangye	Mati Temple Scenic Park

Annex B

Policy and Legislative Context

B1.1 CHINESE INSTITUTIONAL CONTEXT

B1.1.1 Authorities Responsible for Environmental, Health and Safety Management

These include the National Development and Reform Commission (NDRC), Provincial Environmental Protection Bureaus (EPBs), under the State Environmental Protection Administration (SEPA), Local EPBs responsible for the routine inspection of sites, the Ministry of Land and Resources (MOLAR), Water Resources Bureaus, the Yellow River Conservancy Commission (YRCC), the State Administration of Work Safety (SAWS) and Municipal Work Safety Bureaus, the Ministry of Health, and local Health Supervision Bureaus (HSB), the the Centre of Disease Prevention and Control (CDC), and local Fire Fighting Bureaus (FFB).

B1.1.2 Authorities Responsible for Tourism Management, and Cultural and Natural Heritage

China National Tourism Administration (CNTA) is responsible for developing, promoting and regulating China's tourism industry. The Tourism Department of Gansu Province is responsible for the implementation of related tourism laws, regulations and policies, and establishes tourism strategies, guidelines, plans, policies, and standards in Gansu Province.

State Administration of Cultural Heritage (SACH) is responsible for developing, promoting and regulating China's cultural relics and museum industry. The Gansu Cultural relic bureau is responsible for the implementation of related cultural relic and museum laws, regulations and policies, and establishes cultural relic and museum strategies, guidelines, plans, policies, and measures in Gansu Province.

B1.1.3 Applicable Laws and Regulations

Key laws and regulations are:

- Regulation on the Management of Nature Reserves of the People's Republic of China (1994) regulates construction activities within nature reserves, according to core, buffer and experimental areas.
- The Cultural Heritage Protection Law of the People's Republic of China (1982), the Law of Cultural Relic Protection (2002) and associated regulations that provide the legal basis for protection of cultural relics in China.
- The Environmental Impact Assessment (EIA) Law, applicable to all construction projects that may cause negative impacts on the environment.
- The *Law on Water and Soil Conservation* promotes the sustainable use of water and soil resources.
- The *Water Law of the People's Republic of China (2002)* and *Implementation Regulations for Water Extraction Licence Policy (1993)*, requiring that an

application for water abstraction must be submitted to the local Water Resource Bureau for approval;

- The *Management Method of Water Resource Demonstration of Construction Project (2002)* stipulates that a water resource demonstration report shall be submitted to the Water Resource Bureau in combination with the groundwater abstraction application.
- The *Management Regulations of Environmental Protection for Construction Projects (1998)* stipulates the detailed requirements for the Completion Inspection policy. The project shall apply to the Gansu Provincial EPB for the Completion Inspection within three months of the commencement of the trial operation.
- The *Management Regulation on the Registration of Discharged Pollutants (1992)* setting out detailed requirements for pollutants discharge registration.

Presently, there are no specific laws concerning tourism development in China, rather a series of technical standards have been developed in recent years to provide technical guidance on tourism planning and facility development.

B1.1.4 Environmental Impact Assessment (EIA) Law

According to the *Management Regulation on Environmental Protection for Construction Projects*, an EIA must be prepared during the project feasibility stage. EIA approval is a necessary prerequisite for securing a construction and operating permit. For this project, the EIA statement for each site is required.

Beside the basic EIA regulations, the Chinese EIA regulatory framework is supported by a series of environmental protection laws and regulations.

An EIA shall be prepared and submitted for approval to either the local EPB or SEPA, depending on the project proposal's approved government level, the scale of investment, and severity of pollution. For this project, EIAs should be submitted to Gansu EPB for approval.

B1.1.5 Environmental Quality and Discharging Standards

Environmental Emission and Discharging standards

Prevention of pollution during project construction and operation is subject to the pollutant discharge standards in China. The relevant applicable environmental emission and discharging standards for the Project are the following:

- Ambient Air Quality Standard (GB3095-1996)
- Environmental Quality Standards for Surface Water (GB3838-2002)
- Quality Standards for Ground Water (GB/T 14848-93)
- Standard of Environmental Noise of Urban Area (GB3096-93)
- Integrated Emission Standard of Air Pollutants (GB16297-1996)

- Noise Limits for Construction Site (GB12523-90)
- Integrated Wastewater Discharge Standard (GB8978-1996)
- Standards of Irrigation Water Quality (GB5084-52)

B1.2 WORLD BANK SAFEGUARD POLICIES

The World Bank safeguard policies that are applicable to the activities at each site are summarised in Volume II. This indicates that the following policies are triggered by the project: OP 4.01 Environmental Assessment; OP 4.04 Natural Habitats; OP 4.11 Physical Cultural Resources; OP 4.10 Indigenous Peoples; OP 4.12 Involuntary Resettlement; OP 4.37 Safety of Dams.

Civil works are to be carried out at all sites, requiring OP 4.01 Environmental Assessment. Although civil works at several sites are relatively insignificant, the works are to be carried out in areas of sensitive cultural and natural heritage, and therefore the project is Category A.

OP 4.11 Physical cultural resources applies at seven of the sites, where the sites are of profound, and sensitive cultural heritage value.

OP 4.04 Natural habitats is triggered by activities at three sites. Majishan Scenic Area and Mati Temple Scenic Area are sites of significant natural beauty, and Yardang National Geological Park has significant geological interest. Critical natural habitats will not be affected, but there are risks of impacts on each area's natural habitats.

A range of minority groups live in the area of Mati Temple Scenic Area, requiring the preparation and implementation of a separate Indigenous Peoples Plan, under OP 4.10 Indigenous Peoples, to consult with and engage minority groups effectively in the activities in the area.

There are limited land acquisition requirements at three sites, Lutusi Ancient Government Complex, Qincheng Ancient Town and Yellow River Stone Forest, triggering OP 4.12 Involuntary Resettlement.

Two existing dams will be rehabilitated at Majishan Scenic Area, triggering OP4.37 Dam Safety.

Annex C

Land Acquisition

Table 1 Land Take and Affected Population in Qingcheng

Project Activities	Permanent Land Take				Temporary Land Take				Note		
	Area (mu)	Type of Land	Physically displaced people		Economically displaced people		Physically displaced people			Economically displaced people	
			HH	PP	HH	PP	HH	PP		HH	PP
Road widening	6	Class II Irrigated Land	--	--	14	74	--	--	--	--	
Water supply	0.5	Class III Irrigated Land	--	--	91 *	382*	--	--	--	--	Collectively owned land
Wastewater treatment plant	2	Class I Irrigated Land	--	--	4	15	--	--	--	--	
Landfill	5	Class III Irrigated Land	--	--	120 *	446*	--	--	--	--	Collectively owned land
Road and bridge	--	--	--	--	--	--	6 mu within 7 villages				Collectively owned land
			--	--	--	--	--	--	1	1	Residential house
			--	--	--	--	--	--	28	104	Small businesses
			--	--	--	--	--	--	1	18	Collectively owned office building
Rehabilitation of Ancient Street	--	--	--	--	--	--	--	--	1	5	Collectively owned house
			--	--	--	--	--	--	1 unit	0	Taxation Office
			--	--	--	--	--	--	1 unit	5	Bank
			--	--	--	--	--	--	1 unit	4	Telecommunications Office
Total	13.5	--	0	0	18	89	--	--	34	137	--

Note: the data with * is the total household and population of the village group losing collectively owned land; these numbers are not included in the total of permanently economically displaced people.

Table 2 Land Take and Affected Population in Lutusi

Project Activities	Permanent Land Take				Temporary Land Take				Notes		
	Area (mu)	Type of Land	Physically Displaced People		Economically Displaced People		Physically Displaced People			Economically Displaced People	
			HH	PP	HH	PP	HH	PP		HH	PP
	2.73	House plots and farmland	7	30	1	5	--	--	--	--	Acquisition of land of 1.1 mu was taken from the house plots; 1.63 mu was taken from the land of yard around the houses
Parking Lot	0.3	Small businesses	--	--	8	27	--	--	--	--	This consists of: five households (9 people) that rent business premises in this area; and three households (18 people) that own these premises.
Host site for people displaced from parking lot area	5.5	Class III Irrigated Farmland	--	--	5	26	--	--	--	--	The land belongs to 5 households and will be taken for 7 households and the police station.
	--		--	--	--	--	--	--	5	19	Residential house
			--	--	--	--	--	--	15	72	Private business
Rehabilitation of Ancient Street	--		--	--	--	--	--	--	5	7	People that rent the house for small business
			--	--	--	--	--	--	4	6	Collectively owned business
			1 unit	6	--	--	--	--	--	--	A police station will be resettled.
Landfill site	1	Barren land									The land compensation will be given to the village

Project Activities	Permanent Land Take				Temporary Land Take				Notes		
	Area (mu)	Type of Land	Physically Displaced People		Economically Displaced People		Physically Displaced People			Economically Displaced People	
			HH	PP	HH	PP	HH	PP		HH	PP
Waste water treatment plant	0.3	Class III Irrigated Farmland	-	-	1	3	-	-	-	-	The land belongs to 1 household of Langpai village
Total	9.83	--	7 hh and 1 police station	36	15	61	--	--	29	104	--

Note: 1 mu=667m²

Table 3 *Eligibility of PAPs at Qingcheng*

Project Activity	Impact	Description of Compensation for Permanent Land Acquisition	Eligibility
Road widening	Acquisition of land belonging to 5 households, 20 people	Land compensation	80% for the land user, and 20% for the rural collective organization (village committee)
		Resettlement allowance	Land user
		Cash compensation for land and standing crops	Land user
Waste water treatment plant	Acquisition of irrigated land class one 2 mu belonging to 4 HHs, 15 persons	Cash compensation for land	Land user
Water supply and Landfill	Acquisition of irrigated land class three 5.5	Cash compensation for land and standing crops	Land compensation for collective; standing crops compensation for land user
Rehabilitation of Ancient St	Reconstruction of walls along the Ancient St of two households / 5 people	Project developer is responsible for reconstruction of the walls	Property Owner
	Temporary displacement of business and collective units: 28 small businesses / 104 people; 1 collective business / 10 people; 4 collective units / 19 people.	Transition allowance and compensation to business loss as described in Table 7.8	Property Owner

Table 4 Eligibility of PAPs at Lutusi

Project Activity	Impact	Description of Compensation for Permanent Land Acquisition	Eligibility	
Parking Lot		Relocation of houses, including cash compensation for demolition of old houses, provision of land of 200m ² maximum to reconstruct new houses	Household	
		Demolition of 7 houses, 30 people affected	Cash compensation for area of land above 200m ²	Household
			Compensation for standing crops	Household
			Compensation of attachments	Household
			Provision of infrastructure at replacement housing area	Household
			Moving allowance	Household
			Additional payment to vulnerable households	Identified Vulnerable households
		Loss of 1 household's house plots	Relocation of house plot land	Household
			Cash compensation for area of land above 200m ²	Household
			Compensation for standing crops	Household
Displacement of 5 households renting the businesses premises	Loss of 3 households' small business premises	Relocation of small businesses at the same street after construction of the parking lot	Household	
		Moving allowance	Household	
		Moving allowance	Renter / Business Owner	
Land of host site for people displaced from parking lot area	5 HH, 26 PP	Land compensation	80% for the land user, and 20% for the rural collective economic organization (village committee)	
		Resettlement allowance	Land user	
		Cash compensation to standing crops	Land user	
		Construct new houses/shops to the affected	House/shop Owner	
Rehabilitation of Ancient Road	Relocation of a police station	24 HH, 97 PP	Transition Allowance	House/shop Owner
			Compensation to discontinuation business	House/shop Owner
			Cash compensation for demolition of old houses, moving allowance and provision of land to reconstruct new building	Police station
			The attachments and infrastructure will be restored by the project developer	Police station
Landfill of the solid waste Waste water treatment plant	Collective land	Cash compensation for the land acquisition to Langpai village	Langpai villager	
	Collective land	Cash compensation for the land acquisition to the land user	Group 7, Liancheng village	

Annex D

Further Details of the
Environmental Management
Plan

Table 1. Environmental Mitigation Plan

Measures	Responsibility	Timing	Incremental Cost (RMB)
Preparation			
Detailed design of the investments at each site to ensure minimum standards of design, and production of a design that enhances visual and landscape value	PPMO director, through appointment of design consultants	YR 0	Nil (in IST component)
Review of the detailed designs for all investments to identify feasible options for the use of sustainable environmental technologies at each site	PPMO director, through appointment of suitable consultants	YR 0	Nil (in IST component)
Design of a project-wide chance finds policy.	PPMO	YR 1	Nil (to be carried out by PPMO)
Measures Required Prior to Construction			
Employment of PPMO environmental management officer, continuing through project implementation	PPMO director	YRS 1-6	20,000 per annum X 6 years = 120,000
Employment of officer with responsibility for environmental management at each site, continuing through project implementation	Site PIUs	YRS 1-6	20,000 per annum X 6 years X 10 sites = 1,200,000
Preparation of the detailed requirements of sound construction management	Site management	In advance of bidding for construction	Nil (to be carried out by site management)
Attain approval of EIA / EMP from relevant EPB	Municipal PMOs	YR 0	Nil
Attaining all required permits for each investment, including water abstraction permit, approval of a Construction Management Plan, and approval of Health and Safety plans from the relevant EPB Construction Department	Site Management / Municipal PMOs	In advance of bidding for construction	Nil
Appointment of independent third parties	Site management / Municipal PMOs	In advance of bidding for construction	Nil
Measures Required During Construction			
Implementation of Construction Management Plans	Contractors or Government Construction Depts	During construction	Nil
Implementation of Site Health and Safety Plans	Contractors or Government Construction Depts	During construction	Nil
Implementation of 'Chance finds' policies	Contractors or Government Construction Depts	During construction	Nil
Independent third party supervision of construction management, health and safety, and cultural heritage	Third party contractors	During construction	Total of USD 305,455 (details set out for each

preservation			site in Volume II)
Measures Required During Operations:			
Adoption and implementation of environmental policies	Site management / Municipal Authorities	Following completion of construction works and continuing through operation	Nil (covered by ongoing operating costs)
Implementation of Site Health and Safety Plans	Site management / Municipal Authorities		
Ensure that a water abstraction permit has been obtained for continuing water extraction	Site management / Municipal Authorities		
Community engagement	Site management / Municipal Authorities		

Table 2. Additional Mitigation Measures Specific to Certain Sites

Measures	Responsibility	Timing	Incremental Cost (RMB)
<i>Preparation</i>			
Majishan Scenic Area: Implementation of measures recommended in dam safety reports, prepare Operation and Maintenance plans and Emergency Preparedness Plans	Site management, Municipal PMO	YR 0	2000 RMB per day for dam safety consultant X 20 days = 40,000 RMB / USD 5195
Qingcheng: Design of landfill to avoid pollution from leachate, and inclusion of adequate stream crossing on approach to landfill site	Municipal PMO	YR 0	Nil
Jiayuguan First Signal Tower: Design of river embankment according to engineering design that takes full account of river sedimentation and erosion	Municipal PMO	YR 0	Nil
Jiayuguan First Signal Tower: Risk of damage to the First Signal Tower during strengthening of the cliff, owing to its precarious position on the cliff top: design of works and to avoid risk to First Signal Tower	Municipal PMO	YR 0	Nil
Yellow River Stone Forest: Design river embankment on sound principles of river geomorphology, and minimise the size of the embankment to reduce habitat loss	Municipal PMO	YR 0	Nil
<i>Measures Required Prior to Construction</i>			
Majishan Scenic Area: Identification of the spatial and seasonal constraints to the location of building, paths and roads etc and to construction operations, based on important habitats and rare or endangered species, and avoidance of disturbance to these areas.	Site management	YR 1	Nil
Majishan Scenic Area: Construction supervision and quality assurance of dam safety work, Implementation of operation and maintenance plans, and emergency preparedness plans	Site management and supervising engineers	YR 1 for construction supervision, YRS 1-5 for O&M and EPP plans	USD 93,506 for supervision
Majishan: Completion of full environmental assessment of proposed site for landfill, as part of procurement of a new landfill through contractors.	Municipal PMO	YR 1	Nil (included in cost of contracting landfill construction and operation)
Jiayuguan First Signal Tower: Appointment and monitoring of contractor with full understanding of	Municipal PMO, Supervision Management Engineer	YR 1	USD 31,169 for supervision

Cansu Water Resources and Hydropower Design Institute's designs for river embankment	Municipal PMO, Supervision Management Engineer	YR 3	As above for supervision
Jiayuguan First Signal Tower: Appointment and monitoring of contractor with full understanding of the Ministry of Railways' designs for cliff strengthening works	Scenic Area Administration	YR 1	Nil
Mati Scenic Area: Incorporation of adequate screening (tree planting) around the site to limit visual and odour impact.	Municipal PMO	YR 0	Nil
Lutusi: Provide assurance that solid waste will be disposed of at the nearest sanitary landfill, and monitoring of this.			
<i>Measures Required During Construction</i>			
Yellow River Stone Forest: Measures to limit visual impact and assure sound management of solid waste disposal site (tree planting, etc)	Site PIU	YR 1	100,000 RMB / 12,987 USD
Yardang: Measures to limit visual impact and assure sound management of solid waste disposal site	Site PIU	YR 1	100,000 RMB / 12,987 USD

Table 3. Environmental Monitoring Plan - Construction Phase

Aspect	Monitoring Parameters	Monitoring Locations	Monitoring Timing and Frequency
Majishan Scenic Area			
Ambient Air	TSP	At each construction site	Twice monthly
Noise	Leq(A)	At each construction site	Once per week, at least 10 minutes per time
Water quality	pH, COD, BOD, Suspended Solids	At at least three selected streams in the scenic area (in Quxi, Xianren, Yinyue)	Once monthly
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	At Fortress Site and FST	Continuous
Qingcheng Ancient Town			
Ambient air	TSP	At all construction sites	Five days of successive monitoring, once during heating period.
Noise	Leq(A)	At all construction sites	Monitoring during day and night times once per year.
Wastewater effluent from construction sites	pH, SS, COD	At all construction sites	Once weekly
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	At all construction sites	Continuous
Jiayuguan Great Wall			
Ambient Air	TSP	Three locations (2 at Fortress, one at FST)	Twice monthly
Noise	Leq(A)	Four monitoring points in sensitive project areas	Once per week, at least 10 minutes per time
Water quality	pH, COD, BOD, Suspended Solids	Two sites: Jiu Yan Quan Lake at Fortress, Taolai River	Once monthly
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	At Fortress Site and FST	Continuous
Yardang Geological Park			

Ambient air	TSP	Construction site roadside	Duplicate samples every two months
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Site-wide	Continuous
Yellow River Stone Forest			
Ambient air	TSP	Around road, building and embankment construction sites	Four times per day for three successive days during peak construction period.
Noise	Leq(A)	Around road, building and embankment construction sites	A whole day monitoring (day and night) during peak construction period.
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	At construction sites	Continuous
Wei Jin Folk Culture Park			
Ambient Air	TSP	Building and parking lot construction sites	Twice monthly
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Building and parking lot construction sites	Continuous
Suoyang City			
Ambient air	TSP		
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Site-wide	Continuous
Mati Temple Scenic Area			
Ambient Air	TSP	At road and building construction sites	Twice monthly
Noise	Leq(A)	At road and building construction sites	Once per week, at least 10 minutes per time
Water quality	pH, COD, BOD, Suspended Solids	Matihe River and Xiaolinghe River	Once monthly
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Scenic area-wide	Continuous

Lutusi Ancient Government Complex

Ambient air	TSP	Backyard garden of <i>Lutusi</i> Yamun and <i>Liancheng</i> Middle School	Five days of successive monitoring, once during heating period.
Noise	Leq(A)	<ul style="list-style-type: none"> • Screen wall in front of <i>Lutusi</i> Yamun; • In front of <i>Liancheng</i> Kindergarten, <i>Liancheng</i> Primary School and Ancestor Hall of <i>Lutusi</i> Yamun; • Car park entrance; • Plaza boundaries; and • In front of <i>Dengshan</i>. 	Monitoring during day and night times once per year.
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	At all construction sites	Continuous

Table 4. Monitoring Plan – Operational Phase

Aspect	Monitoring Parameters	Monitoring Locations	Monitoring Timing and Frequency
Majjishan Scenic Area			
Ambient air	TSP	Sensitive areas including roadsides and car park surrounding areas	Once monthly
Noise	Leq(A)	Sensitive areas including roadsides and car park surrounding areas (3-4 points)	Once monthly
Water quality	pH, COD, BOD	In selected streams	Three times per year
Solid waste	Conditions of solid waste collection and disposal	Restaurant, guesthouse, hotel, office, waste collection at the service area, and waste transfer point	Peak tourism seasons
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)		Continuous
Qingcheng Ancient Town			
Discharge of wastewater treatment station	pH, SS, COD, BOD	Wastewater treatment station discharge point	Quarterly, both day and night
Landfill leachate	COD, BOD ₅ , Ammonia nitrogen, Total iron content, Chlorides	Leachate collection well	Twice per year
Groundwater	Standard water quality monitoring	Up and downstream groundwater at landfill site	Once per year
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Town-wide	Continuous
Jiayuguan Great Wall			
Ambient air	TSP	Sensitive areas including roadsides and car park surrounding areas	Twice monthly
Noise	Leq(A)	Sensitive areas including roadsides and car park surrounding areas (3-4 points)	Twice monthly
Water quality	pH, COD, BOD	Taolai River	Three times per year

Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	At Fortress Site and FST	Continuous
Yardang Geological Park			
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Site-wide	Continuous
Yellow River Stone Forest			
Noise	Leq(A)	Roadsides	Twice monthly
Discharge of wastewater treatment station	pH, SS, COD, BOD, Ammonia nitrogen, petroleum	Wastewater treatment station discharge point	Quarterly, both day and night
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Site-wide	Continuous
Wei Jin Folk Culture Park			
Conditions inside tombs	Humidity and temperature	Underground tombs	To be determined
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Building and parking lot construction sites	Continuous
Suoyang City			
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Site-wide	Continuous
Mati Temple Scenic Area			
Ambient air	TSP	Matisi Temple scenic site	Twice per year
Noise	Leq(A)	Matisi scenic site	Twice per year
Surface water	pH, COD, BOD, Suspended Solids	Mathe River and Xiaolinghe River	Twice per year
Landfill leachate	COD, BOD5, Ammonia nitrogen, Total iron content, Chlorides	Leachate collection well	Twice per year
Groundwater	Standard water quality monitoring	Up and downstream groundwater at landfill site	Once per year
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Scenic area-wide	Continuous

Lutusi Ancient Government Complex			
Ambient air	TSP	Backyard garden of <i>Lutusi Yamun</i> and <i>Limcheng</i> Middle School	Five days of successive monitoring once per heating period
Noise	Leq(A)	In front of Ancestor Hall of Lutusi Yamun; Car park entrance; and Plaza boundaries	Annually both day and night.
Discharge of wastewater treatment station	pH, SS, COD, BOD, Ammonia nitrogen, petroleum	Wastewater treatment station discharge point	Quarterly, both day and night
Safety incidents	Number and type of incidents concerning safety of workers and public (including near misses, and injuries)	Town-wide	Continuous

Table 5. Training Costs

Site Name	Phase	Personnel	Total No.	unit price (RMB Yuan/person)	cost (RMB Yuan)
Majjshan Scenic Area	Construction period	Project Environment Managers	9	2250	20250
	Operation period	Contractor	10	2550	25500
Qingcheng Ancient Town	Construction period	Project Environment Managers	3	2,050	6,150
	Operation period	Contractor	2	2,250	4,500
Jiayuguan Great Wall	Construction period	Project Environment Managers	2	2050	4100
	Operation period	Contractor	2	2250	4500
Yardang National Geological Park	Construction period	Project Environment Managers	2	1,500	3,000
	Operation period	Contractor	2	1,700	3,400
Yellow River Stone Forest National Park	Construction period	Project Environment Managers	6	1,900	1,1400
	Operation period	Contractor	2	2,250	4,500
Wei Jin Folk Culture Park	Construction period	Project Environment Managers	2	1,650	3,300
	Operation period	Contractor	2	1,950	3,900
Suoyang Town	Construction period	Project Environment Managers	3	1,900	5,700
	Operation period	Contractor	2	2,250	4,500

Mati Temple Scenic Park	Construction period	Project Environment Managers	2	1,900	3,800
	Operation period	Contractor	2	2,250	4,500
Lutusi Ancient Government Centre	Construction period	Project Environment Managers	2	1,800	3,600
		Contractor	2	1,900	3,800
	Operation period	Project Environment Managers	2	2,250	4,500
		Contractor	1	1,800	1,800
Total				176,000	

Table 6. EMP Costs

Description	Rate	Unit	Number	Expenditure Classification	Base Cost (1 USD = 7.7 RMB)	
					Yuan	USD
Majishan Scenic Area						
Third Party supervision of construction works	2000	Days	360	Services	720,000	93,506
Preparation of O&M and EPP plans for dams	2000	Days	20	Services	40,000	5,195
Monitoring During Construction						
Ambient Air	40	Yuan	612	Services	24,480	3,179
Noise	75	Yuan	1326	Services	99,450	12,916
Water quality	366	Yuan	108	Services	39,528	5,134
Monitoring During Operation						
Ambient air	40	Yuan	240	Services	9,600	1,247
Noise	75	Yuan	240	Services	18,000	2,338
Water quality	234	Yuan	18	Services	4,212	547
TOTAL					955,270	124,061
Qingcheng						
Third party supervision of construction works	2000	Days	100	Services	200,000	25,974
Monitoring During Construction						
Air	40	Yuan	130	Services	5,200	675
Noise	75	Yuan	26	Services	1,950	253
Effluent from construction sites	1206	Yuan	676	Services	815,256	105,877
Monitoring During Operation						
WWTP discharge	326	Yuan	12	Services	3,912	508
Landfill leachate	241	Yuan	6	Services	1,446	188
Groundwater	1206	Yuan	3	Services	3,618	470
TOTAL					1,031,382	133,946
Jiayuguan Great Wall						

Third Party supervision of construction works	2000	Days		120	Services	240,000	31,169
Monitoring During Construction							
Ambient Air	172	Yuan		144	Services	24,768	3,217
Noise	300	Yuan		416	Services	124,800	16,208
Water quality	366	Yuan		48	Services	17,568	2,282
Monitoring During Operation						0	0
Ambient air	172	Yuan		144		24,768	3,217
Noise	300	Yuan		192		57,600	7,481
Water quality	366	Yuan		6		2,196	285
TOTAL						491,700	63,857
Yandang National Geological Park							
Third party supervision of construction works	2000	Days		100	Services	200,000	25,974
Measures to limit visual and odor impact of solid waste disposal site	100000	Lump sum		1	Civil works	100,000	12,987
Monitoring During Construction							
Ambient Air	40	Yuan		48	Services	1,920	249
TOTAL						301,920	39,210
Yellow River Stone Forest							
Third party supervision of construction works	2000	Days		100	Services	200,000	25,974
Measures to limit visual and odor impact of solid waste disposal site	100000	Lump sum		1	Civil works	100,000	12,987
Monitoring During Construction							
Ambient Air	40	Yuan		78	Services	3,120	405
Noise	75	Yuan		7	Services	488	63
Monitoring During Operation							

Ambient air	40	Yuan			48	Services	1,920	249
Wastewater Treatment Plant Discharge	326	Yuan			16	Services	5,216	677
TOTAL							310,744	40,356
Wei jin								
Third party supervision of construction works	2000	Days			72	Services	144,000	18,701
<i>Monitoring During Construction</i>								
Ambient Air	184	Yuan			36	Services	6,624	860
<i>Monitoring During Operation</i>								
Humidity and Temperature in Tombs	10000	Lump sum			1	Services	10,000	1,299
TOTAL							160,624	20,860
Suoyang								
Third party supervision of construction works	2000	Days			72	Services	144,000	18,701
<i>Monitoring During Construction</i>								
Ambient Air	120	Yuan			1	Services	120	16
Noise	225	Yuan			1	Services	225	29
TOTAL							144,345	18,746
Mati Temple Scenic Area								
Third party supervision of construction works	2000	Days			180	Services	360,000	46,753
<i>Monitoring During Construction</i>								
Air	40	Yuan			192	Services	7,680	997
Noise	75	Yuan			416	Services	31,200	4,052
Water quality	1206	Yuan			36	Services	43,416	5,638
<i>Monitoring During Operation</i>								
Air	40	Yuan			6	Services	240	31
Noise	75	Yuan			6	Services	450	58

Surface water	1206	Yuan				6	Services	7,236	940
Landfill leachate	241	Yuan				6	Services	1,446	188
Groundwater	1206	Yuan				3	Services	3,618	470
TOTAL								455,286	59,128
Lutusi									
Third party supervision of construction works	2000	Days				72	Services	144,000	18,701
Monitoring During Construction									
Air	40	Yuan				30	Services	1,200	156
Noise	75	Yuan				21	Services	1,575	205
Monitoring During Operation									
Air	40	Yuan				30	Services	1,200	156
Noise	75	Yuan				9	Services	675	88
Discharge from WWTP	326	Yuan				12	Services	3,912	508
TOTAL								152,562	19,813
Provincial									
PfMO Environmental Manager	20000	Annual Salary				6	Services	120,000	15,584
PIU Environmental Managers	20000	Annual Salary				54	Services	1,080,000	140,260
Lump for transport etc	20000	Annual lump per employee				42	Services	840,000	109,091
Annual independent audit of environmental performance	20000	Expert fees plus expenses				6	Services	120,000	15,584
TOTAL								2,160,000	280,519
TRAINING								167,000	21,688
GRAND TOTAL								6,330,833	822,186