

Initial Environmental Examination Report

Project Number: 39399
September 2013

Proposed Loan and Administration of Grant for Additional Financing South Asia Tourism Infrastructure Development Project (Nepal Portion)

Prepared by the Government of Nepal
(Civil Aviation Authority of Nepal)

2013

CURRENCY EQUIVALENTS

(as of 31 August 2013)

Currency unit	=	Nepalese rupee/s (NRe/NRs)
NRe1.00	=	\$0.0102
\$1.00	=	NRs95.92

ABBREVIATIONS

AAQ	–	Ambient Air Quality
ADB	–	Asian Development Bank
AH	–	Affected Households
AP	–	Affected Persons
BOD	–	Biological Oxygen Demand
CAAN	–	Civil Aviation Authority of Nepal
CBS	–	Central Bureau of Statistics
CDO	–	Chief District Officer
CO	–	Carbon Monoxide
DSMC	–	Design, Supervision, and Management Consultant
DSC	–	Design and Supervision Consultants
EA	–	Executing Agency
EIA	–	Environmental Impact Assessment
EMP	–	Environmental Management Plan
EPA	–	Environment Protection Act, 1997
EPR	–	Environment Protection Regulation, 1997
GBA	–	Gautama Buddha Airport
GDP	–	Gross Domestic Product
GON	–	Government of Nepal
IA	–	Implementing Agency
ICAO	–	International Civil Aviation Organization
IEE	–	Initial Environment Examination
LDT	–	Lumbini Development Trust
MOCTCA	–	Ministry of Culture, Tourism and Civil Aviation
MOSTE	–	Ministry of Science, Technology and Environment
NGO	–	Nongovernmental Organization
NO _x	–	Nitrogen oxide
NPC	–	National Planning Commission
NRs	–	Nepalese Rupees
NRM	–	Nepal Resident Mission
NTB	–	Nepal Tourism Board
PAM	–	Project Administration Manual
PMU	–	Project Management Unit
RP	–	Resettlement Plan
RRP	–	Report and Recommendation of the President
SARD	–	South Asia Regional Department
SASEC	–	South Asia Subregional Economic Cooperation
SO ₂	–	Sulfur Dioxide
TIA	–	Tribhuvan International Airport
UNESCO	–	United Nations Educational, Scientific and Cultural Organization
VDC	–	Village Development Committee
WHS	–	World Heritage Site

Table of Contents

Abbreviations

1	Introduction	1
1.1	Name and Address of the Proponent	1
1.2	Background	1
1.3	History of GBA Project Preparation	2
1.4	Rationale of the IEE	2
1.5	Objectives of the IEE	2
2	Policy, Legal and Administrative Framework	3
2.1	Legal Provisions of the Government	3
2.2	Safeguard Policy Statement of ADB	5
2.3	ICAO's Norms and Standards	5
3	Description of the Project	6
3.1	Relevancy of the GBA Expansion and Upgrading	6
3.2	Scope of the Project	6
3.3	Location of the Project Area	7
3.4	Components and Activities of the Project	7
3.5	Introducing Electrical Vehicles in the Lumbini Area	8
3.6	Construction Approach	10
4	Description of Environment of the Project Area	10
4.1	Physical Environment	10
4.2	Biological Environment	144
4.3	Socio-Economic Environment	155
5	Analysis of Alternatives	17
5.1	With and Without Project Scenarios	17
5.2	Improvement of Gautam Buddha Airport	18
5.3	Location for Proposed Expansion	19
5.4	Alternatives for Ghaghara Khola Diversion	19
6	Anticipated Environmental Impacts and Mitigation Measures	22
6.1	Beneficial Impacts and Benefit Augmentation Measures	22
6.2	Pre-construction Impacts	244
6.3	Impacts during Construction	255
6.4	Impacts during Operation	31
6.5	Impacts from Solar/Electricity Charged Hybrid Electric Vehicle in Lumbini Area	34
7	Environmental Management Plan	35
7.1	Plan for Mitigation Measures	35
7.2	Environmental Monitoring	35
7.3	Environmental Auditing	477
7.4	Institutional Arrangements	477
7.5	Estimated EMP Budget	50
8	Public Consultation and Disclosure	52
8.1	Public Consultations	53
8.2	Public Notification	55
9	Grievance Redress Mechanism	566
10	Conclusion and Recommendations	57

List of Tables

Table 2.1:	Review of Environmental Acts, Regulations and Guidelines
Table 3.1:	Apron Dimension
Table 4.1:	Soil Property in the Project Area
Table 4.2:	Land use Pattern of Rupandehi District
Table 4.3:	Water Quality-Ghaghara Khola
Table 4.4:	Air Quality Data of Bhairahawa City
Table 4.5:	Aircraft Emission Data (A330-300)
Table 4.6:	List of Birds Sited around the Project Site
Table 4.7:	Educational Levels of AHs
Table 4.8:	Main Source of Income of AHs
Table 4.9:	Income Categories of Affected Households
Table 5.1:	Comparison of Alternatives
Table 6.2:	Typical Noise Levels of Construction Equipment
Table 6.1:	Summary of Resettlement Impacts
Table 6.3:	Proposed Emission Sources and Emission Rate
Table 7.1:	Proposed Plan for Benefit Augmentation Measure
Table 7.2:	Environmental Management Plan for GBA
Table 7.3:	Monitoring Parameters, Location, Schedules and Responsibilities
Table 7.4:	Training Modules for Institutional Strengthening on Environmental Management
Table 7.5:	Estimated Cost for Environment Protection Measures
Table 7.6:	Estimated Cost for Routine Environmental Monitoring and Operation of Safeguard Desk during Construction Stage of the Project
Table 7.7:	Estimated Cost for Impact Monitoring
Table 7.8:	Indicative Cost for Environmental Auditing
Table 7.9:	Summary Cost for EMP Implementation
Table 8.1:	Summary of Past Consultations

List of Figures

Figure 3.1:	Map of Nepal Showing Location of GBA and Lumbini
Figure 4.1:	Satellite Image of the GBA and Layout Showing Proposed Expansion
Figure 7.1:	Organization Arrangement for EMP Implementation
Figure 9.1:	Grievance Redress Procedure

Appendices

Appendix 1:	REA Checklist
Appendix 2:	Demographic Profile of the Project Area
Appendix 3:	Public Hearing at the Project Area
Appendix 4:	Public Notification on 28 September 2012
Appendix 5:	Map of Project Area Including GBA and Lumbini
Appendix 6:	A Schematic Diagram of Ghaghara Khola Diversion

1 Introduction

1.1 Name and Address of the Proponent

1. The name of the Proposal of this Initial Environmental Examination (IEE) is the “South Asia Tourism Infrastructure Development Project (Nepal Portion)” (the Project). The Civil Aviation Authority of Nepal (CAAN) is the Proponent for the Gaitam Buddha Airport (GBA) upgrading component, whereas the Lumbini Development Trust (LDT) is the Proponent for the Lumbini area improvement component. The Ministry of Culture, Tourism and Civil Aviation (MOCTCA) is the concerned ministry for the Project.

2. Following is the address of the proponents.

- (i) GBA Component:
Civil Aviation Authority of Nepal (CAAN)
Babar Mahal, Kathmandu
Telephone No: +977-1-4211620

- (ii) Lumbini Area Development Component:
Lumbini Development Trust
Sacred Garden Lumbini, Nepal
Telephone: +977-71-580189, 580196, 580200
Fax: +977-71-580181
Email: info@lumbinitrust.org

Liaison Office

GPO Box: 4072, Babarmahal, Kathmandu, Nepal
Tel: +977-1-4268494, 4268285
Fax: +977-1-4268286
Email: liaison@lumbinitrust.org

1.2 Background

3. Countries of South Asia, particularly Nepal, India and Bangladesh have high potentials to develop the subregion as the world’s destination for nature and culture-based tourism and significantly improve its economy through the tourism sector. However, inadequate connectivity and destination infrastructure, weak protection and management of heritage sites and inadequate community participation have constrained the subregion’s tourism growth potentiality and ability to significantly contribute to the economy and poverty reduction. The Government of Nepal (GON) has long recognized tourism a priority sector to improve its economy and source of foreign exchange.

4. To support tourism development in the subregion, the Asian Development Bank (ADB) approved the Project on 16 November 2009 with its expected closing date on 15 March 2015. The Project has separate portions for Bangladesh, India and Nepal with each portion comprising of connectivity enhancement and destination improvement, in addition to others. The main focus of the Project in Nepal is to develop the high priority tourism circuit of the subregion, covering Lumbini area of Nepal. Lumbini, the birth place of Lord Buddha, is a highly regarded shrine for the Buddhists all over the World, and is an important World Heritage Site of tourist destination in Nepal. The total cost of the Nepal portion of the Project is \$46.5 million.

5. One of the components of the Project aims to enhance air access to Lumbini by upgrading the GBA to a regional international standard at 4E category in accordance with the International Civil Aviation Organization (ICAO) guidelines. MOCTCA is the Executing Agency (EA) of the Project. CAAN is the implementing agency (IA) for development of air

transport infrastructure and services, and the LDT is the IA for planning, development and management of the Lumbini area.

1.3 History of GBA Project Preparation

6. In 2006, GON prepared a Master Plan to improve its aviation services and facilities as per the ICAO member countries standard. The Master Plan was updated through ADB TA 6504 in FY2009/10 for landing of ICAO 4D standard aircrafts. The updated Master Plan (2010) envisaged construction of a new 2,600x45m runway in GBA with a runway stripe of 3,000x300m with improvements in services facilities and terminal buildings for both international and domestic uses. Later, CAAN modified the Master Plan with extension of the new runway from 2,600x45m to 3,000x45m and a runway stripe of 3,202x300m for landing of ICAO 4E standard aircrafts. The Master Plan was again updated under the Project (ADB Loan 2579/Grant 0179) in 2012.

7. The updated Master Plan was revisited, and a concept paper for additional financing of the Project has been prepared, which intends to (i) increase the existing runway to a total of 3,000 meter by diverting Ghagharaa River (a small seasonal river which discharges in Tinau River) and public road; (ii) raise height of the new runway by a meter above the floodplain; (iii) construct a new international terminal building of 15,169 sq m; (iv) develop international aircraft apron with a capacity to park 3 wide-body aircrafts; and (v) add instrument landing system. Total cost of upgrading GBA to the proposed standard is \$85.6 million.

8. Given the urgency of constructing a second international airport in the country and importance of improving direct international connectivity to Lumbini, the GON has requested ADB to support upgrading the airport as per the new design by providing additional financing.

9. To minimize air pollution and mitigate climate change impact through reduction of CO₂ emissions by promoting operation of electrical vehicle-based transportation services in Lumbini area, and eventually expanding clean public transport services for important Buddhist sites in the vicinity, ADB is taking initiatives for an Clean Public Transport Services (CPTS) to be financed under the Asian Clean Energy Fund (ACEF) and implemented as part of the Project.

1.4 Rationale of the IEE

10. The Project is environment category B as per the ADB's new Safeguard Policy 2009, and requires an initial environmental examination (IEE) to determine the nature and extent of impact from implementation of the Project. An IEE is also required as per the provision of the Environment Protection Act and Regulations of GON. In this regard, an IEE for upgrading of GBA with 2,600m runway was prepared for ADB project processing in 2008. Since then, the runway length has been extended to 3,000m in the new Master Plan requiring changes in project components. This IEE is thus prepared considering the changed context with the proposed extended runway.

1.5 Objectives of the IEE

11. The main objective of the IEE is to identify impacts from the project implementation on physical, biological, socio-economic, and cultural environment of the project area, and to propose measures to avoid, minimize, mitigate, and compensate such impacts. The specific objectives of the proposed IEE are to:

- Establish baseline data of the proposed work area,
- Identify major issues that may arise as a result of the proposed works on bio-physical, socioeconomic and cultural environment of the project area,
- Recommend practical and site specific environmental mitigation and enhancement measures, and prepare and implement environmental monitoring plan, and
- Confirm that IEE is sufficient for the proposed work.

2 Policy, Legal and Administrative Framework

2.1 Legal Provisions of GON

12. GON has adopted various acts, regulations and guidelines to ensure environmental safeguards in their development investments. These legal documents were reviewed during the preparation of this IEE. Relevant legal provisions are briefly presented in Table 2.1.

Table 2.1: Review of Environmental Acts, Regulations and Guidelines

SN	Legal Provisions on Environment Protection	Description
Constitution and National Development Policies		
1	The Interim Constitution of Nepal, 2063 BS (2007 AD)	Article (63) requires the state to give priority to protect environment during physical development activities; increase awareness of people; and protect ecology, forest and bio-diversity with sustainable uses. This article guides to undertake environmental study for all development works to preserve right of all to live in clean environment, and get basic environmental services from the state.
2	Three Years Interim Plan, 2011-2013	Requires all projects to be formulated and constructed based on methods that optimally utilize the local skill and resources and generate employment opportunities.
3	Civil Aviation Policy, 2006	It recognizes that the expected growth of tourism industry is not possible without the development of a competent, strong and easily accessible air-transport; make air services strong and effective to draw tourists and help national economy by earning foreign currency. All services related to safe, efficient and regular air-transport and airport management shall be termed as vital service. It encourages private sector participation in national air transport sector.
4	Nepal Tourism Policy, 1995	GON's general tourism policy is based on twin objectives: improving quality of tourism industry and reputed placement of tourism in international markets. To fulfill these objectives, partnership between the Government and private sector stakeholders is felt necessary. The Nepal Tourism Board is the bridge between public and private sectors. It facilitates government-private partnership and develops tourism products and marketing. The policy stresses participation of private sector in development and expansion of tourism activities.
Act, Regulations, and Rule		
1	Environmental Protection Act, 1997	Any development project, before implementation, shall conduct environmental assessment of required level. Approval of the reports and environment clearance will be provided by a competent government agency as identified by the Act. The Act restricts polluting activities and authorizes the Government for monitoring and enforcement. The Act has provision of compensation to affected parties from environmental impacts and punishment to polluters.
2	Environment Protection Regulation (EPR) 1997 (amended 2007)	EPR and its schedules provide step-wise requirements to be followed while conducting EIA and IEE. It also obliges proponent to timely consult and inform the public on the contents of the proposal and findings of EIA and IEE. EPR also requires the proponent to collect comments and suggestions regarding the proposal through public notice pasted at local offices and "public hearings". Proponent has to submit recommendations of concerned stakeholders in the environmental management plan of EIA/IEE. It also guides on format of EIA/IEE and process of EIA/IEE approval by concerned ministry and the Ministry of Science, Technology

SN	Legal Provisions on Environment Protection	Description
		and Environment.
3	Forest Act, 1993	Requires decision makers to take account of all forest values, including environmental services and biodiversity, not just the production of timber and other commodities.
4	Forest Rules, 1995	Rule 65 stipulates that in case the execution of any project having national priority in any forest area causes any loss or harm to any local individual or community, the proponents of the Project itself shall bear the amount of compensation to be paid. Similarly, the entire expenses required for cutting and transporting the forest products in a forest area to be used by approved project should be borne by the proponents of the Project. While clearing forest, the implementing authority will coordinate with respective District Forest Office (DFO).
5	Soil Conservation and Watershed Conservation Act, 1982	The Act empowers the Government to declare any area as a protected watershed area. It also outlines essential parameters for proper watershed management (including both rivers and lakes) and prohibits activities such as excavation of soil, sand, boulders, and diversion and storage of water and logging that trigger soil erosion and landslide. It also authorizes to implement land use planning system, shift any existing settlement, industry, and acquire necessary lands in the conserved watershed area. Maximum penalty measures for violators include a fine of NRs1,000 or imprisonment for 1 year, or both.
6	Land Acquisition Act, 1977	The Act (in Sections 3 and 4) specifies procedural matters of land acquisition and compensation. GON can acquire land at any place in any quantity by giving compensation pursuant for the land required for any public purpose or for operation of any development project initiated by government institutions.
7	The Labor Act, 1992	The Act classifies people below 15 years as child. This has also made provision of department of labor and labor court. The Act provisions equal opportunity to women as men; and wage rates of the employees shall not be less than the rate fixed by concerned government offices. It emphasizes on occupational health and safety of workers and stipulates provision of necessary safety gears and adopting necessary precautionary measures against potentially hazardous machine/equipment in workplace. The Act also stipulates to make arrangements such as removal of waste accumulated during production process and prevention of dust, fume, vapor, and other waste materials, which adversely affect the health of workers.
8	Child Labor Prohibition and Regulation Act, 2001	Section 3 of the Act prohibits a child from engaging in work. Sub-clause 1 of the clause 3 states "nobody shall engage in work a child who has not completed fourteen years of age as a labor and sub-clause 2 states "nobody shall engage a child in a risk-full occupation or work set forth in the Schedule". Section 4 states "child not to be engaged in work against his/her will by temptation or fear or pressure or by any other means".
9	Nepal Civil Aviation Act 1958, and Civil Aviation Regulations, 1996	Civil Aviation Act, 1958 under clause 4 (a) explicitly spells that any area can be delineated and designated as airfields specifying its borders on gazette. The statutory civil aviation regulations were introduced under the Civil Aviation Act, 1959. Nepal obtained ICAO membership in 1960. CAAN was established as an autonomous regulatory body on 31 December 1998 under the Civil Aviation Act, 1996. CAAN has its prime goal to ensure flight safety and sustainability of civil aviation, and has responsibilities of constructing, operating and maintaining airports.
10	Nepal Tourism Act, 1978	The Act facilitates to increase tourist arrival in the country and encourages tourists and their handling agents in Nepal to minimize environmental intact during their visit. The Act also shows serious concerns about visitors' health, facilities and welfare, and empowers the Government to generate tourism revenue and establish plowback mechanism for tourism infrastructure development.
11	Nepal Tourism Board Act, 1996	The Nepal Tourism Board was established in 1998 to promote public-private partnership in tourism to maximize benefits from developing Nepal as a premier holiday destination with a definite brand image. The Board is promoting in domestic and international markets. The Board gets funds collected as tourist services fee (TSF) from air travelers upon their returning from Nepal, and thus keeping the Board financially independent. Currently, the Board collects NRs500 TSF per person. The

SN	Legal Provisions on Environment Protection	Description
		Board chaired by MOCTCA Secretary constitutes 11 members with four government representatives, six private sector representatives and the chief executive officer.
12	Water Resources Act, 1992	The Act intends to ensure rationale utilization, conservation, management, and development of water resources in the country. Sections 18, 19 and 20 concerns water quality standards, water pollution and adverse effect on the environment. The Act also envisages that all the water resources either falling on the alignment of the project components or located near the project components sites must be investigated for the probable impacts on the services provided by them.
13	Water Resources Regulations, 1993	The Regulations require measures are taken to conserve aquatic life and water environment for mitigating socioeconomic effects of project in concerned area. All water resources either falling on alignment of project or located near project site must be investigated for the probable impacts on the services provided by them.
Guidelines, work Procedure and Program		
1	National Environmental Impact Assessment Guidelines, 1993	The Guidelines provide guidance to project developer on integrating environmental mitigation measures, particularly on the management of quarries, borrow pits, stockpiling of materials and spoil disposal, operation of the work camps, earthworks and slope stabilization, and location of stone crushing plants.
2	Work Procedure for Providing the Forest Land for Other Uses, 2007	The Procedure reiterates the use of forest area only if other options are not available. Projects requiring forest land have to make alternative studies to minimize the forest land use. Development projects of national priority will be allocated such lands on the discretion of the Ministry of Forest and Soil Conservation. To compensate the forest area and resource lost, project proponents have to comply with the following provisions: <ul style="list-style-type: none"> ▪ Afforest the area equal to the forest area lost at the minimum, if the forest area occupied by the project is a barren land. The land area for afforestation will have to be decided based on discussions with respective District Forest Office. Or proponent could deposit required amount as per forest norms to DFO. ▪ Proponent should plant 25 trees for every lost tree of above 10cm DBH in areas designated by respective DFO and look after the plantation for 5 years to ensure their protection and growth. Or proponent should deposit required amount for plantation and protection for five years to DFO. ▪ The proponent will have to compensate the lost forest land for 30 years. The compensation amount will be as per the provisions of leasehold forest.
3	National Adaptation Program of Action (NAPA), 2010	NAPA has been instrumental in mainstreaming climate change in development planning. It has developed a framework for adaptation program, and has identified key adaptation needs, existing adaptation practices, and options for developed projects, including infrastructure.

2.2 Safeguard Policy Statement of ADB

13. ADB's Safeguard Policy Statement 2009 consists of three operational policies on environment, involuntary resettlement and indigenous peoples. It requires that (i) impacts are identified and assessed early in the project cycle, (ii) plans are prepared and implemented to avoid, minimize, mitigate or compensate potential adverse impacts, and (iii) affected people are informed and consulted during project preparation and implementation.

2.3 ICAO's Norms and Standards

14. International Civil Aviation Organization (ICAO) is an agency of the United Nations. It develops principles and techniques of international air navigation and fosters planning and development of international air transport to ensure safe and orderly growth.

15. ICAO Council adopts standards and recommended practices concerning air navigation, prevention of unlawful interference and facilitation of border-crossing procedures for international civil aviation. It defines protocols for air accident investigation followed by transport safety authorities in countries signatory to the Convention on International Civil Aviation, commonly known as the Chicago Convention. Nepal is enlisted under 9N category as per ICAO aircraft registration prefix lists.

3 Description of the Project

16. The Project has two major components: (i) expansion and upgrading of GBA; and (ii) upgrading of Lumbini Development Area. The details on the two components are presented in the following subsections.

3.1 Relevance of GBA Expansion and Upgrading

17. GON has long recognized tourism as a priority sector to boost the country's economy and source of foreign exchange. Lumbini, the birth place of Lord Buddha is one of the destinations for tourism development prioritized by GON. Lumbini was declared a UNESCO Cultural World Heritage Site (WHS) in 1997 in recognition of its universal religious and archaeological significance. The four primary destinations of Lumbini, Bodh Gaya, Sarnath, and Kushinagar hold particular significance for Buddhists all over the world. With an ever-increasing flow of pilgrims and tourists in Lumbini, transportation service demand continues to grow rapidly. In this regard, the principal objective of the Project is to upgrade GBA to an international airport with similar standard to the Tribhuvan International Airport (TIA) in Kathmandu. With upgrading of GBA, it is envisioned to enable Nepal to provide more air seat capacity for visitors that will increase the current volume of travelers. Another objective is to enhance the quality of tourism by creating employment opportunities to stimulate economic growth for poverty alleviation. There are currently no direct air services to Lumbini from South and Southeast Asian countries, and the proposed facility will assist development of the Nepal sub-circuit linking Kathmandu, Pokhara, Tansen–Palpa, Lumbini, Chitwan, and back to Kathmandu.

3.2 Scope of the Project

18. The additional financing is related to two components: (i) GBA upgrading and expansion, and (ii) CPTS for Lumbini area, whose scopes are summarized below.

19. **GBA upgrading and expansion.** The proposed expansion of GBA consists (i) construction of a runway of 3,000m length and 45m width and 2 perpendicular exit taxiways of 142.5m length and 38m width; (ii) expansion of apron on either side of the existing apron of 300m length and 150m width, including construction of equipment yards on either side of the existing apron; (iii) grading of shoulder strips; (iv) construction of airport periphery road; (v) diversion of Ghaghra Kholra and outer road; (vi) chain link fencing around the acquired land; (vii) pavement markings; (viii) landscaping around buildings; (ix) refurbishing and expansion of the existing terminal building for use as domestic terminal building; (x) construction of one more storey or expansion in the terminal building under construction; (xi) refurbishing/expansion of the existing ground floor for use as international terminal building; (xii) construction of new control tower building with communication and navigation facilities; (xiii) construction of a new cargo building; and (xiv) miscellaneous buildings and unidentified works.

20. **Lumbini Clean Public Transport Services.** In order to minimize air pollution and mitigate climate change impact by promoting electrical vehicle-based transportation services in Lumbini area, and eventually expanding the services for important Buddhist sites in the

vicinity, ADB is taking initiatives for CPTS to be financed under ACEF for \$3 million grant. The CPTS will be processed as part of processing of the additional financing.

3.3 Location of the Project Area

21. GBA and Lumbini are located Rupandehi District in the country's western development region. GBA is located about 2 kms west from Siddhartha Nagar/Bhairahawa, the district headquarters and is situated at an altitude of 109 meters above mean sea level. Lumbini is 20 km towards west from GBA, connected with an all weather road. Location map of the project area is in Figure 3.1.

3.4 Components and Activities of the Project

3.4.1 GBA Upgrading

3. Runway

22. The new runway will be of 3,000m x 45m toward 182.5m south from the centerline of the existing 1,500m x 30m runway in the same direction. Design life of the aerodrome is estimated for 10 years and design aircraft is Boeing 777-300 series or equivalent.

4. Runway Strip

23. The runway strip will be of 3,202m length with 300m width. Either ends of runway strip is taken as runway end safety area.

5. Taxiway

24. The existing runway will be converted into parallel taxiway, and the existing taxiway will be retained and linked to apron to parallel taxiway by widening its width from 15m to 18m with 3.5m paved shoulders on each side of the taxiway.

6. Apron

25. Table 3.1 presents the apron dimension after upgrading of GBA.

Table 3.1: Apron Dimension

Apron	Length (m)	Width (m)	Aircraft Type
Existing	140	62	Code B and Code C
Upon completion	350	163	Code E and Code D(B 777 and B 737)

Source: CAAN

7. Aerodrome Pavement

26. Aerodrome pavement will be designed for Boeing 777-300 series or equivalent with design life of 10 years. The pavement will be flexible for runway, taxiway and some part of apron.

8. Drainage Improvement

27. Two parallel brick-lined side drainages will drain out water from the existing runway. The drains will outflow in a retention pond existing at the north-west corner of the runway, which discharges in Ghaghara Khola. The drainage improvement works include various drain outlets such as drop structures, sluice channel, culverts, inlets and outlets, and super passage.

9. **Car Parking**

28. A new parking is proposed at the backside of the new terminal building with a capacity of 60-80 vehicle parking.

10. **Terminal Building**

29. The new terminal building at the west side of the existing terminal building will be constructed, which will have all required facilities based on future needs.

11. **Service Road**

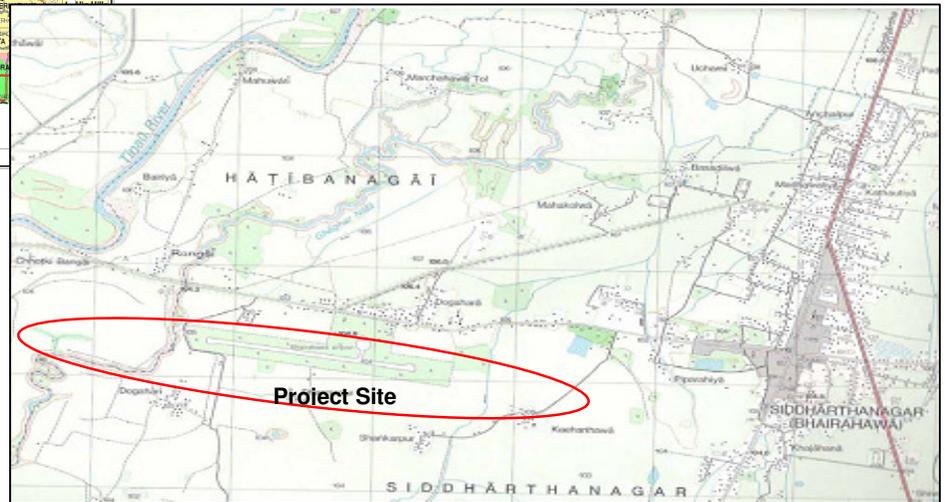
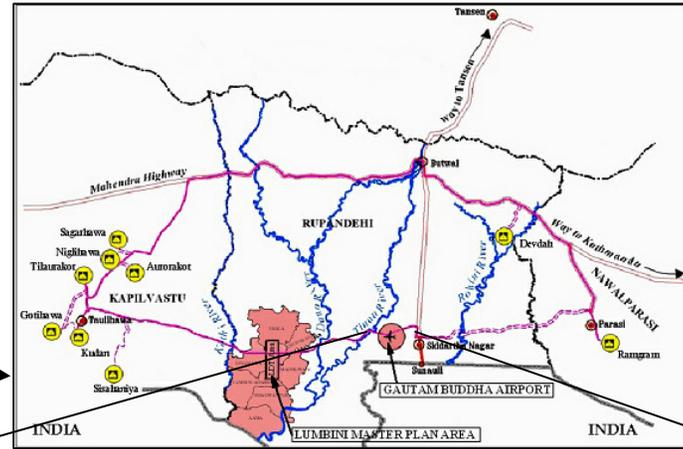
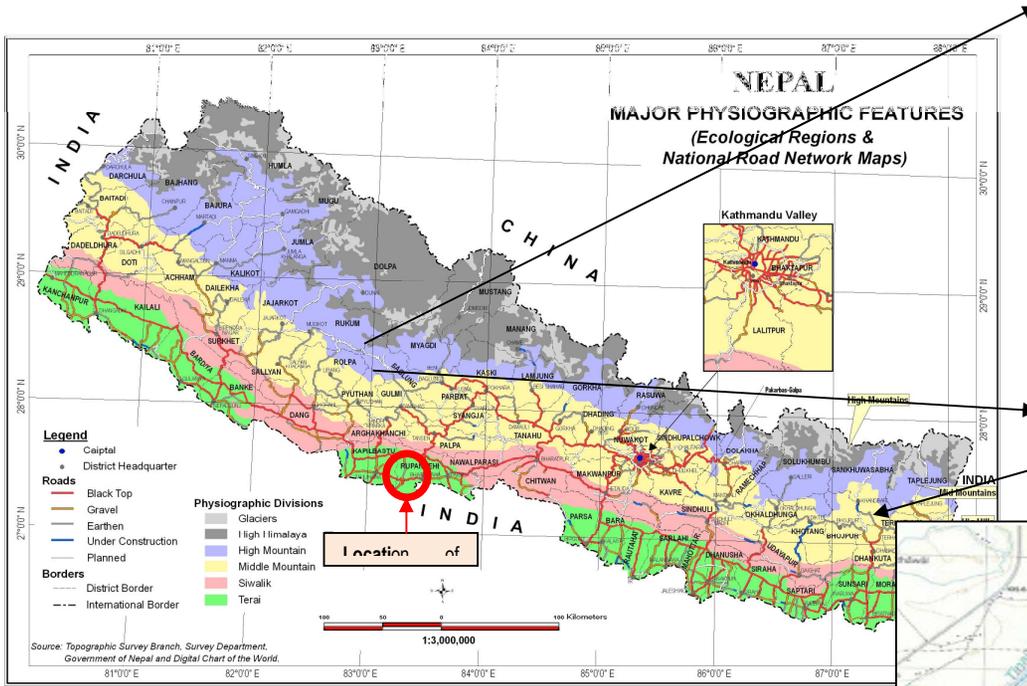
30. GBA is connected with Bhairahawa-Taulihawa road. The link road is of asphalt concrete surface. To facilitate movement, a new service road for entry and exit, access to service ramp, access to staff quarters and fire station will be constructed.

3.5 Introduction of Electrical Vehicles in the Lumbini Area

31. CPTS will be a part initiative for upgrading of the Lumbini area. Recently, a University of Tokyo team (led by K. Tange's distant successor, Y. Nishimura) financed through a Japanese trust fund under an UNESCO Project revised the Lumbini Master Plan, which includes a proposal for operation of electric vehicles for moving visitors to various parts within the heritage, archaeological and conservation sites within Lumbini.

Figure 3.1: Map of Nepal Showing Location of GBA and Lumbini

Figure 3.2: Project Location in Detail



32. CPTS will consist of two sub-schemes. The first sub-scheme for the heritage site is based on the revised Master Plan for the site presented by Y. Nishimura in July 2012, and the design work has already been undertaken under the Project. This sub-scheme, which is expected to proceed first, is envisaged to involve: (i) construction of a charging station/maintenance depot for electric carts; (ii) procurement of electric carts (and, possibly electric power-assisted modern rickshaws, which could be leased to incumbent rickshaw drivers); (iii) construction of seven covered bus stops; (iv) provision of electrical works including procurement and installation of a solar power supply system and energy storage system; and (v) construction works for minor road improvements.

33. The second sub-scheme, which serves longer distance between the heritage site and GBA (possibly other sites in the vicinity, including the two Nepal-India border-crossing points) will involve: (i) procurement of (clean diesel-electric hybrid) buses; (ii) construction of covered bus stops at several key locations; and (iii) local public transportation planning and coordination with parties concerned (including arrangements of franchising/licensing, and if necessary, leasing of buses to incumbent local transport service providers through a possible vehicle renewal program).

34. The second sub-scheme will be phased-out into bus services between the heritage site and GBA (in Phase 1); and the expanded local transportation services (in Phase 2) covering more sites in the vicinity.

3.6 Construction Approach

35. Implementation of the GBA upgrading and expansion works will be carried out through international competitive bidding.

4 Description of Environment of the Project Area

4.1 Physical Environment

4.1.1 Topography and Soil

36. The project area is generally flat, and the average altitude is 100m from the mean sea level. The project site comprises loose soil represented by clay loam (70%), sandy loam (10%) and loam soil (20%). Soil samples were taken from the project area during dry season and tested in a laboratory. Table 4.1 presents the soil properties.

Table 4.1: Soil Property in the Project Area

SN	Parameters	Values
1	pH	6.8
2	Alkalinity (mg/100g)	0.48
3	Chloride (mg/100 g)	5.68
4	Organic matter (mg/g)	8.3
5	Carbon (%)	1.1
6	Total Nitrogen (%)	1.2
7	Total Phosphorus (%)	2.31
8	Water Holding Capacity (%)	59.54
9	Water soluble salts (ppm)	0.0025

Source: Field Survey, 2006

4.1.2 Climate

37. GBA is located in tropical monsoon climate of Terai. Maximum rainfall occurs during June/July to August/September. The rest of the months remain comparatively dry. The average minimum and maximum temperatures are 8.75°C and 42.4°C, respectively. The average annual rainfall is about 1,391mm. The predominant wind flow direction is from west to east. The visibility of the proposed project area is always clear, with limited disruptions such as fog.

4.1.3 Geology and Seismology

38. The project site and its surrounding is made up of ill compacted sand silt and clay layers and represent the alluvial belt of greater Ganga basin. The lithological formations are termed as Gangatic Alluvium. Structurally, the region is stable and shows no major faults in the vicinity of the GBA.

4.1.4 Land Use

39. Rupandehi district has varied land use pattern. There is no dense forest at the vicinity of GBA. The land use classification of Rupandehi district is in Table 4.2 and Figure 4.1.

Table 4.2: Land use Pattern of Rupandehi District

SN	Type of land	Area (ha)	Percentage
1	Cultivated land	85,122	60.21
2	Forest	30,484	21.56
3	Grazing land	8,882	6.28
4	River, streams	2,460	1.74
5	Rocky areas	414	0.29
6	Settlement area	5,953	4.21
7	Other	8,052	5.71
	Total	141,367	100

Source: Rupandehi District Profile, 2007

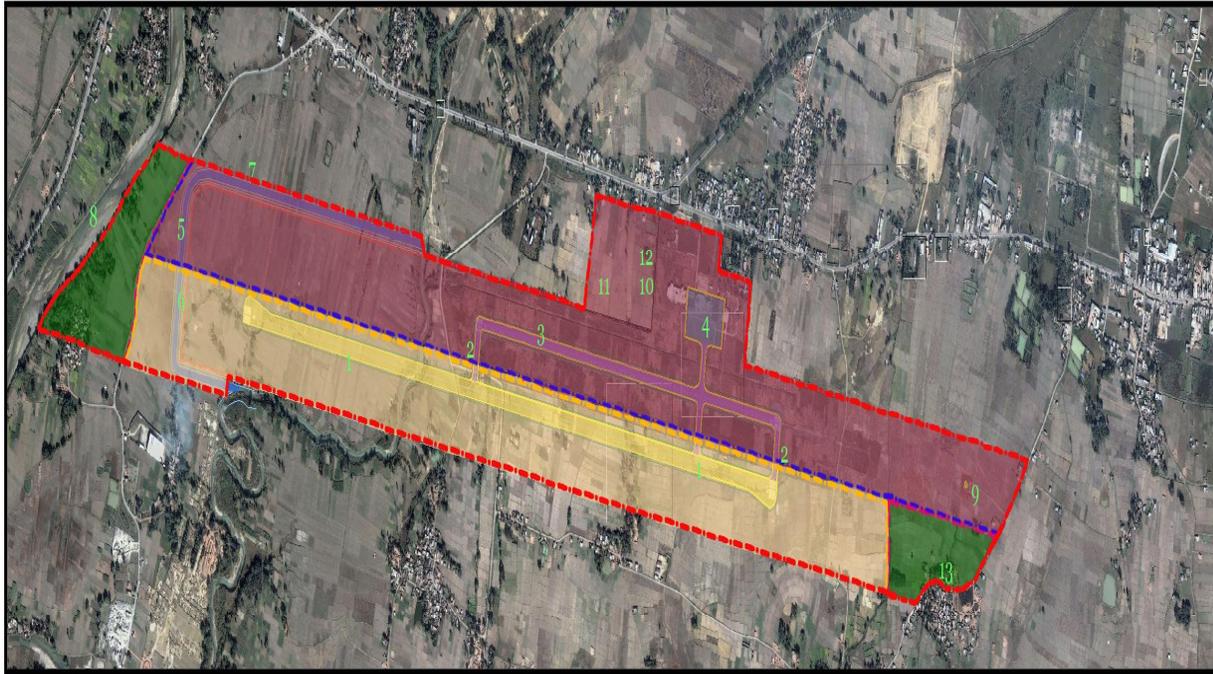
4.1.5 Water Resources

a. Surface Water

40. The Tinau River and its tributary Ghaghara Khola are the major water channels of the area, flowing from north to south. The Tinau River is about 1.5km to the west of GBA. The Ghaghara Khola is a stream originating from a lake about 10km north of the GBA. The Khola drains into the Danda Nala, a rivulet that ultimately drains into the Tinau River in India. The assessment of the water quality of the Ghaghara Khola indicates no major contamination (Table 4.3).

Figure 4.1: Satellite Image of the GBA and Layout Showing Proposed Expansion

“Priority Improvement work of Gautam Buddha Airport Developing as Regional / International Airport”

**LEGENDS:**

1. PROPOSED RUNWAY
2. PROPOSED EXITS
3. PROPOSED PARALLEL TAXIWAY
4. PROPOSED NEW APRON 180 m. x 120 m.
5. PROPOSED DIVERSION CHANNEL OF GHAGHAR KHOLA
6. PROPOSED EXTERNAL ROAD (BEYOND CHAINLINK FENCE PROTECTION)

ARIAL VIEW OF MASTER PLAN
(SHOWING NEW DEVELOPMENT)
Gautam Buddha Airport

7. PROPOSED FENCE BOUNDARY
8. TINAU RIVER
9. EXISTING V.O.R./D.M.E.
10. PROPOSED TERMINAL BUILDING
11. PROPOSED CONTROL TOWER
12. PROPOSED CAR PARKING
13. EXISTING SETTLEMENT TO BE REMOVED

Note: Dogahara village is in the north of GBA.

Table 4.3: Water Quality - Ghaghara Khola

SN	Parameters	Unit	Values	National
1	pH		7.9	
2	Conductivity	µ mho/cm	504	
3	Total Suspended Solids (TSS)	mg/liter	946	
4	Dissolved Oxygen (DO)	mg/liter	5.3	
5	Chloride	mg/liter	183	
6	Total Hardness	mg/liter	304.7	
7	Biological Oxygen Demand (BOD)	mg/liter	8.7	
8	Alkalinity	mg/liter	172.6	

Source: Field Survey, 2006

b. Groundwater

41. There are two main sources of groundwater in and around the project area: a deep aquifer which is exploited for irrigation in areas to the north by tubewells and a shallow phreatic aquifer. A GON report indicates that there is little interconnection between these two main aquifers. For the shallow aquifer, the depth to water level varies as a function of recharge (from rainfall). During monsoon, depth below ground level varies between 0.5m and 1.5m and fall progressively during

the dry season to 2m to 3m. The shallow aquifer is tapped for domestic water supplies and for irrigation in small areas.

4.1.6 Air Quality

42. The air quality of Siddhartha Nagar/Bhairahawa city is given in Table 4.4.

Table 4.4: Air Quality Data of Siddhartha Nagar/Bhairahawa City

Parameter	Units	Value	National Ambient Air Quality Standard of Nepal, 2003	Ambien Air Quality Standard of WHO
SO ₂	Ug/m ³	104.6	125	70
PM ₁₀	Ug/m ³	864.8	120	70
TSP	Ug/m ³	926.41	230	120-230
NO ₂	Ug/m ³	23.28	150	80
CO	Ug/m ³	1,145.48	100,000	100,000
Pb	Ug/m ³	0.13	0.5-1	-

Source: The World Conservation Union, September, 2001

43. There is no monitored air quality data for GBA. The location of GBA, and the mix of activities within and outside the airport reveals the air quality to be near to natural state. The air emission expected from aircraft engines during approach, landing, taxiing, take-off, and initial climb or also called 'Landing and Take-Off' cycle (LTO cycle) is limited to the period of aircraft landing and take-off. Table 4.5 presents the expected emissions from the aircraft operation in the ambient air during the LTO cycle.

Table 4.5: Aircraft Emission Data (A 330-300)

Parameter	Units	Small Aircraft
SO ₂	Kg/LTO Cycle	0.91
HC	Kg/LTO Cycle	0.27
CO	Kg/LTO Cycle	7.3
Nox	Kg/LTO Cycle	3.18
Total Emissions in gm/sec per LTO		
SO ₂	g/s	0.5
HC	g/s	0.3
CO	g/s	3.7
Nox	g/s	1.6

Source: Emission Data as per USEPA Standards

44. Currently, the GSE at GBA is minimal and comprises 4-5 vehicles (loaders and a tractor), which have minimal contribution of pollutants to the ambient air quality. Similarly, Ground Access Vehicles (GAVs) are also minimal (150 cars, 85 two/three wheelers and 8-10 buses in a day) and are not envisaged to pollute the ambient air quality.

4.1.7 Noise

45. The major noise generating sources at the airport is the noise from aircraft take-off and landing and ground operations of equipment apart from vehicular movement around the airport. The noise during take-off is dominant among all the sources. Aircraft movement is expected to produce maximum noise level of about 100-110 dB(A) during take-off and 90-100 dB(A) during landing, which will be instantaneous and depends on the type of aircraft. The STOL type of aircraft is operated at GBA about half a dozen times. Consequently, noise levels of upto 90-110 dB(A) exists for about 12 times for a duration of about 5 to 7 minutes in the surrounding environment. Given that the surrounding land use is predominantly agricultural, no major impacts of noise is envisaged to the nearby settlements. The impacts are perceptible on the two school buildings within 500m of the existing airport and the village Dharampur situated to the south of the proposed runway. However, the levels are higher than standards during landing and take-off. WHO guidelines on value of noise level categorize sound of 70-80 dBA as medium, 90-100 dBA as very high, and 120-130 dBA as uncomfortable.

4.2 Biological Environment

46. The GBA lies outside the boundaries of the protected areas for natural and archeological conservation. The nearest archeological site “The Lumbini” lies 20 km west of GBA.

4.2.1 Vegetation/Forest

47. The GBA site is predominately an agricultural area. A few trees exist along the banks of Tinau River and Ghaghara Khola, which are common species of the area (not the protected species).

48. The Lumbini area is surrounded by natural and planted forest. Natural forest consist the predominant species of *Shorea robusta* trees (Sal) associated with *Terminalia tomentosa*, *Dillenia pentagyna*, *Bauhinia purpurea*, *Ficus spp.*, *Bombax ceiba*, *Adina cordifolia*, and *Accacia catechu*. Whereas, planted forest consist of *Dalbergia sissoo*. In order to protect the legendary cranes (*Grus antigone*) of Lumbini, about 256 acres of the forested wetland area was leased for 50 years on 25 December 1994 to develop a crane sanctuary. The protected crane is the world’s tallest flying bird with a long-legged, long-necked and a naked red head.

4.2.2 Wild Fauna

49. The GBA site is located outside of any forest area, and lacks wildlife habitat of significance. Occasional common wildlife visit at night time in the surrounding agricultural fields are reported by farmers, which includes fox (*Canuis aureus*), jungle cat (*Felis chaus*), monkey (*Maccaca spp.*), squirrel (*herptstis urva*) and mongoose (*Ratufa spp.*). The GBA site haa presence of a number of reptiles and amphibians, including *Cobra*, *Dhaman*, *Karet*, *garden lizards*, *wall lizards*, and *frogs*. The local stakeholders reported that pythons (*Python moluras moluras*) are also found. Airport officials also reported that blue bull (*Boselaphus tragocamalus*) and wild boar (*Sus scrofa*) visited the airport area in the past for grass from nearby forests in India and Lumbini. To avoid any untoward incident during take-off and landing of aircrafts, the airport management has trimmed down tall grasses, which has helped to keep the animals away from the airport.

50. Table 4.6 presents the common bird species found in the vicinity of GBA.

Table 4.6: List of Birds Available around the Project Site

SN	Common Name	Scientific Name
1	Vulture	<i>Neophron spp.</i>
2	Crow	<i>Corvus splendens</i>
3	Dove	<i>Streptopelia sp.</i>
4	Titra	<i>Farnolinus</i>
5	Crane	<i>Grus grus</i>
6	Cheer	<i>Catreus wallichii</i>
7	Myna	<i>Acridotheres tristis</i>
8	Koili	<i>Cuculus mocoptyerus</i>

Source: Field Survey, 2006, updated 2013.

4.2.3 Aquatic Life

51. Tinau River and Ghaghara Khola are the major natural drainages near GBA. These are not significant habitat of fish and aquatic lives, and a few common species of fish are reported in the rivers during monsoon when there is water in the channel.

4.3 Socioeconomic Environment

4.3.1 Demography

52. The GBA area is located in Siddhartha Nagar Municipality and Hatibangai VDC, which have 52,569 and 6,722 population comprising 9,419 and 985 households, respectively.

4.3.2 Ethnic Composition

53. *Brahmin, Chhetri, Tharu, Magar, Musalman, Yadav, apart from Dalits and Janjatis*, live in Siddhartha Nagar Municipality and Hatibangai VDC. In terms of religions, the population in Siddhartha Nagar Municipality comprises of Hindu 82.9%, Buddhist 4.6 %, Muslim 12.01%, Christian 0.22%, Jain 0.07%, and others 0.09%. The Hatibangai VDC also has almost similar religious composition.

4.3.3 Settlements

54. Settlement pattern of Siddhartha Nagar Municipality and Hatibangai VDC is cluster type and somehow scattered. The core area of the Municipality and Ward No. 1 of Hatibangai VDC is compact type due to location of district headquarters, and out skirts are of clustered and dispersed types. The patterns of settlement also differ ethnically. The settlement of *Brahmin* and *Chhetri* are dispersed while *other* settlements are clustered.

55. Apart from Siddhartha Nagar, which is 2 km east of GBA, villages in its vicinity are Dharmapur (just abutting the proposed boundary of the airport after expansion), Shankarpur (500m to the south of the proposed boundary and Dogahara (along the Siddharthanagar-Lumbini road, within 500m to the northern side of GBA). In all these locations, there are sensitive land uses in terms of residences, apart from health and educational institutions. The modeling of air and noise pollution impacts due to the proposed improvement of GBA does not indicate any significant adverse impacts on these receptors.

4.3.4 Literacy

56. Literacy rate for both sexes in Rupandehi district is 66%, with male and female literacy of 76% and 56%, respectively. The literacy rate of the Siddhartha Nagar Municipality and Hatibangai VDC is 31.09% and 38.07%, respectively. The Municipality has 44 educational institutions and 9 Urdu schools whereas the VDC has 3 educational institutions.

4.3.5 Agriculture

57. Rupandehi district has 85,122 ha agricultural land out of which 44,373 ha land has irrigation facility. Siddhartha Nagar Municipality and Hatibangai VDC have 2,726 ha and 658 ha agricultural land, respectively.

4.3.6 Occupation and Employment

58. About 70% of population in the age groups of 15 to 60 years residing in the GBA area are engaged in agricultural profession, and the remaining depend on agricultural/industrial labour and small cottage basket and mat making industries. A significant number of people are also employed as labor in the GBA area.

4.3.7 Touristic and Culturally Important Sites

59. Rupandehi district is famous as a tourist destination for religious and cultural significance of Lumbini, which is the birth place of Lord Buddha and located at 20 km from GBA. In addition to Lumbini, there are other Buddhist sites, most of which are archaeological remains of palaces. These sites have potential for further development to attract more visitors. Other major religious sites located around the Project are temples of Goddesses such as Radhakrishna, Narayan,

Karanimai, Kalika, Durga, Shiva, Buddha Bihar, Jeetwan Bihar, Bishwakarma, and Kalimai, and Bihars of Buddha and Jeewan. Aesthetic and recreational sites at the vicinity of 15m from the project area include Mahendra Park, Mayadevi Park, Buddha Park, and Panchvatika.

4.3.8 Trade, Commerce and Industry

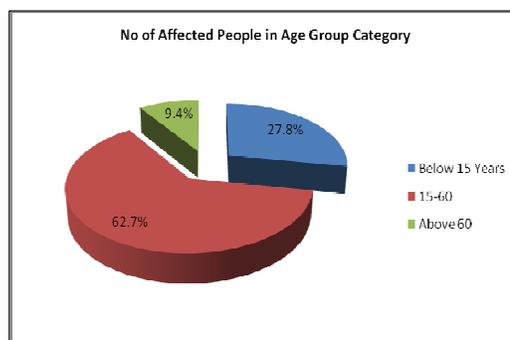
60. Siddharth Nnagar (Bhairahawa), the headquarters of Rupandehi district is one of the major gateways to India in the western Nepal. Hence, a number of export oriented industries have been established in the district and its vicinity. Fertile irrigated land underline the prospects of agro-based industries in the district. The Lumbini area is providing prospects to establish tourism industries. Construction of the international airport will encourage accelerated implementation of the Government's special economic zone in the Terai belt located near GBA.

4.3.9 Infrastructure

61. The project site has facilities of black-topped and gravel motorable roads. The airport has access to a 300km Siddhartha Nager-Lumbini highway, which is of an intermediate lane (5.5m wide carriageway) configuration. The present capacity of the road will be sufficient to carry traffic of about 10,000-12,000.

62. The Municipality and VDC have telecommunication services. Similarly, markets in Siddhartha Nagar Municipality and Hatibangai VDC have telecommunication facilities. Both the Municipalities and all VDCs in the district have postal services.

63. Kerosene, gas, fuel wood, cow/buffalo dungs, and electricity are the principal sources of energy. Out of the total 85,122 ha agricultural land in the district, 44,373 ha is irrigated. The project area has piped and tubewell water sources for household consumption. About 65% people of the district have access to potable drinking water. Water borne diseases such as diarrhea, dysentery, encephalitis, and fever are common diseases in the project area, and the available health centers are not well-equipped though there are few nursing homes, medical college, and hospitals. All the households of the project area have toilet facilities. There are 4 public toilets in the project area alone.



4.3.10 Socioeconomic Profile of Project Affected People (AF)

64. The PAF households in the sub-project area represents 98% Hindus and 4% Muslims. Nearly 80% of the affected households speak local dialects while the remaining speaks Nepali. Of the 1222 number of surveyed persons 767 (62.7%) are in the working age group of 15-60 years.

65. **Literacy.** Literacy profile of the 1,222 affected people (AP) show 230 (33.4%) males and 322 (60.4%) females. Details on educational status are in Table 4.7.

Table 4.7: Educational Levels of AHs

Education Levels of Household Heads	No of Affected Households	Percentages
Illiterate	121	60.8
Literate	14	7
Upto 4 th	14	7
5 th	15	7.5
6 th – 8 th	20	10.1
9 – 10 th	20	10.1
11 – 12 th	5	2.5
Graduate	3	1.5
Professional	1	0.5
Grand Total	199	100.00

Source: Field Survey, 2012

66. **Caste and Gender.** Out of the 199 households, 102 (51.2%) were *Janjatis*, 10 *Dalits* and the remaining 87 were other caste groups. Only 7% of the total households have property in women's name; 86% women are not formally employed; and 60% women take active part in household decision making.

67. **Occupation.** About 79% of the households are farmers. Very few of these households are involved in activities like business, trade and driving. Details of main source of income are given in Table 4.8.

Table 4.8: Main Source of Income of AHs

Main Source of Income of the Head of the Household	No. of Ahs	Percent
Cultivator	164	79.4
Agricultural Labourer	10	5
Salaried	9	4.5
Business/Trade	2	1
Others (Drivers, NRI, House help)	5	2.5
Not in Workforce	9	4.5
Total	199	100

Source: Field Survey, 2012

68. Income category of AHs is presented in Table 4.9.

Table 4.9: Income Categories of AHs

Income Category (NRs)	AHs	Percentages
Less than 26,400 (BPL)	26	13
26,400-36,000	36	18
36,000-72,000	52	26
>72,000	86	43
Total HH	199	100

Source: Field Survey, 2012

69. Among the 199 surveyed Ahs, 170 reported having permanent residences with concrete roof and wall. Twenty respondents said that they have semi-permanent residential house made of asbestos, brick and tin. With respect to tenure, most are legal owners of their residences with of them 4 staying in rented accommodation or sharing without rent.

70. Vehicle ownership amongst the AHs is very limited with only 20% of them owning either a bicycle or a motorbike. Similarly, the asset ownership in terms of consumer goods is very limited with hardly any consumer goods ownership apart from television and mobile phones. With respect to indebtedness, 67 respondents reported having loan from either bank or private money lenders. The average loan amount is NRs117,000. Twenty four of these respondents used their land as collateral.

5 Analysis of Alternatives

5.1 With and Without Project Scenario

71. If BGA is not upgraded to an international standard, the lack of regional connectivity to Lumbini and the other Buddhist sites will continue and targets to develop the regional tourism for national economic development will remain unachieved. Given the unique religious significance of the Lumbini heritage site, especially to the Buddhists around the world, the tourist inflow is increasing steadily. To cater to the increased tourist inflow, additional small flights will be required. As a consequence, people of mountain and high Himalayan sectors will suffer from fewer flights¹ available.

¹ Given limited number of flights being operated so far, airlines divert flights to prospective sectors, and based on demand.

72. With the increased number of flights of smaller aircrafts to cater for increased tourists, there will be higher concentrations of noise levels as against the operation of lesser numbers of larger aircrafts with the airport expansion.

73. Currently, Nepal has no airport having advanced facilities suitable for widebody aircrafts except for the Tribhuvan International Airport (TIA). It is utmost necessary to have an additional international airport to increase air seat capacity for tourism promotion. This will also help for safe delivery of cargo and rescue of air-travelers in case of emergency. Therefore, the without project scenario for the GBA would be a serious constraint for both safety and economy.

74. The economic analysis for GBA improvement and expansion has been conducted in accordance with ADB's Guidelines for the Economic Analysis of Projects (1997). The Project is selected on the basis of the following three economic considerations:

- (i) Consistency with effective demand,
- (ii) Cost effective way of meeting demand, in terms of scale, location, technology, and timing, and
- (iii) Economic benefits exceeding economic costs.

75. Implementation of the Project will have some insignificant changes in land use and environmental impacts. The project design integrates environmental principles in construction as good engineering practices. Mitigating measures have been formulated on the basis of feedback from stakeholders. In addition to good engineering practices, the following special mitigation measures have been worked out as part of the environmental management plan (EMP):

- (i) Development of vegetative buffer in the periphery of GBA to minimize air and noise pollution impacts from the airport,
- (ii) Improvement of environmental quality at the airport through provision of better basic services related to water, sanitation and waste management, and
- (iii) Provisioning mitigation measures by contractor to address construction related impacts during construction.

76. To ensure effective implementation of the mitigation measures as per the EMP, an action plan with provision of capacity development support has been designed.

77. Environment mitigation or protective measures have been developed on the basis of least-cost analysis. Best option has been chosen after a careful analysis. Detailed lifecycle cost estimates of the selected EMP options and related capacity building support have been included in the project cost and economic analysis.

78. Economic analysis has considered measurable project benefits such as visa fee, passenger fee, taxes from tourists, expenditure from incremental passengers, net tourism revenue through incremental passengers and their expenditure, and employment to communities. The EIRR has been estimated 17.1%.

79. Improved environmental conditions, resulting from effective implementation of mitigation measures will be a major positive environmental benefit, in addition to the benefits associated with improved socioeconomic conditions from the upgraded airport and the consequent poverty reduction impacts.

80. The financial sensitivity analysis of the Project indicates that investment in upgrading GBA is financially viable. The FIRR has been 13%.

5.2 Improvement of Gautam Buddha Airport (GBA)

81. The revised GBA design (2012) suggests construction of bigger different infrastructures to upgrade the airport to 4E category as per ICAO standard. The design includes aerodrome structures (runway, taxiway and apron) for landing and take-off of Boeing 777-300 series and

medium type of Air Buses 340 with a design life of 10 years. To cope with the ICAO standard, the runway strip should be 3,000m, and for this about 94 hectares of land located in the south of the current runway has been acquired following a resettlement plan. The design also requires a channel for diverting Ghaghara Khola. After the construction, the new runway strip will be 3,202m x 300m from east to west. The existing runway of 1,500m x 30m will be used as taxiway after upgrading of GBA.

82. The above alternative was compared with a shorter runway, which would minimize land acquisition and also avoid diversion of the Ghaghara Khola. If the airport is improved below ICAO standard, bigger aircrafts requiring 4E category airport will not operate, which will significantly lower the number of tourist visiting Lumbini. The main objective of the regional connectivity will not be met. This will have serious adverse impacts on economic and social development of the region.

83. The aim of providing an alternative international airport by upgrading GBA to 4E standard for regional connectivity, reduce traffic flow in TIA, and avail an alternative international airport in cases of diversion of aircraft from TIA will not be met if the proposed improvement works are not undertaken.

84. Thus, upgrading of GBA below the ICAO 4E category is not a viable alternative.

5.3 Location for Proposed Expansion

85. The proposed expansion would require an additional strip of 250m land, which has been acquired. Prior to finalization of the expansion option and proposed layout, the following options were weighed (i) expansion of the airport to the north of the existing runway, and (ii) expansion to the south of existing runway. This is equivalent to land acquisition of 92.89 hectares. Widening of the proposed southern area was found more appropriate in terms of siting facilities, and minimizing land acquisition requirements. The northern side has more (575) numbers of residential and commercial structures and realignment of the Siddhartha Nagar-Lumbini highway (also refer figure 4.1, which shows location of Doghara village on the north of the existing airport).

86. Extension of the runway to the east was also considered as an alternative. However, this alternative was not found feasible due to: (i) the extended airport will be within 1 km from the main city of Siddhartha Nagar Municipality, which has been an increasing settlement in recent years; (ii) while the extent of land acquisition will be the same, impacts on residential structures will be higher (125 houses); (iii) the runway widening to the east require diversion of yet another stream; and (iv) it will require diversion of an intermediate access road connecting Kaeharihawa and Shankarpur villages. A comparative table of comparative impacts for expansion of GBA is presented in Table 5.1.

5.4 Alternatives for Ghaghara Khola Diversion

87. The Ghaghara Khola (local stream) flows across the proposed runway extension (Figure 5.2). Since management of Ghaghara Khola is mandatory for expansion/upgrading GBA, three alternatives were analyzed:

- Alternative I: direct underground crossing of the stream beneath the runway;
- Alternative II: diverting and channelizing the stream along the outer periphery of the airport; and
- Alternative III: Expansion of runway towards eastern direction (refer para. 81).

88. Alternative I requires a 30m wide crossing structure of 300m length to match the runway strip width. This alternative is less feasible because of high cost, durability and security reasons. The box type culvert may cause flooding of the airport and the nearby areas if the inlet and outlet gets are blocked. Thus, this alternative was found less feasible.

89. Alternative II requires construction of lined channel for diverting the stream along the periphery of the runway. This channel will be designed for 1:100 year return flood flow at 250 m³/sec discharge capacity. The length of the trapezoidal shaped channel will be 1,810m, with 1:1.5

side slopes. Concrete lining will be provided at bends to prevent erosion. A submerged type spillway of 0.5m high will be provided at 1+688 of the diversion channel to turn away base flow to off-take channel to divert base flow to Ghaghara Khola immediately downstream of the runway.

Table 5.1: Comparison of Alternatives

Indicator	Alternative 1: Expansion to South (the selected alternative)	Alternative 2: Expansion to North	Alternative 2: Expansion to East	Alternative 2: Expansion to West
Land use	Agricultural	Residential/commercial	Agricultural/residential	Agricultural
Ponds affected	Nil	Nil	Nil	Nil
Trees affected	132	50	About 200	132
Rivers	Ghaghara Khola	Ghaghara Khola	Ghaghara Khola	A drain that caters to groundwater recharge in the surrounding agricultural lands
Sensitive Receptors	2 primary schools	1 private hospital, 1 clinic, 2 primary schools	None	2 primary schools
Loss of agricultural land	Significant	Not significant	Significant	Significant
No of structures impacted	About 17 residential structures, mostly temporary	575 residential and commercial structures, mostly in Dogahara village	About 75 residential and commercial structures, mostly in Kaeharihawa village	About 17 residential structures, mostly temporary
Cultural properties	1 shrine	1 temple, 3 shrines	2 shrines	1 shrine
Technical issues	Widening on south would enable utilization of the present access and the terminal building	Would result in the total rebuilding of the airport infrastructure, terminals, access road and parking area	The village access road to Shankarpur and Kaeharihawa will require realignment	Village access road to Badki Piphariya and other localities behind the present airport will require realignment
Connectivity	No connectivity issues	Would require an alternative road access to be worked out, also would require realignment of the Siddharta Nagar-Lumbini Highway, which provides access to the airport	Expansion of the airport will be towards and only a kilometer away from the rapidly expanding Siddharta Nagar city causing much noise nuisance by approaching aircrafts	Access to this area has been limited, largely due to presence of the airport and the non-availability of through access to the lands behind the airport
Land values	Land holding sizes relatively larger, mostly agricultural plots	Significantly high, land holding sizes smaller, plots mostly non-agricultural	Land holding sizes relatively larger, mostly agricultural plots	Land holding sizes relatively larger, mostly agricultural plots

90. The diversion channel will be bifurcated into two canals: the first will lead to an outfall to the downstream of Ghaghara Khola through which about 75% of the discharge will flow; and the remainder will be discharged by an off-take channel to irrigate the nearby agricultural land currently irrigated by Ghaghara Khola.

91. This alternative is cost-effective, and will enhance drainage management mass balance for excavated earth. This option will have the shortest possible diversion to minimize any adverse impact. Construction of an off-taken channel will reduce possibilities of flood. The existing gravel road outside the western boundary of the airport will be relocated along the new periphery of the expanded runway parallel to the proposed diversion channel as perimeter road to the airport. The road will be 6m wide with a buffer area of 4 - 5m between road and the diversion channel. The existing course of Ghaghara Khola will be filled-up with excavated earth from the proposed diversion channel.

6. Anticipated Environmental Impacts and Mitigation Measures

92. The impacts will be both beneficial and adverse. Beneficial impacts will be maximized with promotional measures, whereas adverse impacts will be avoided, minimized or compensated using proper mitigation measures. Table 6.1 provides a summary of the key negative impacts and the mitigation measures proposed.

6.1 Beneficial Impacts and Benefit Augmentation Measures

6.1.1 Construction Phase

6.1.1.1 Employment and Income Generation

93. **Impact:** One of the major direct beneficial impacts of the proposed GBA upgrading during the construction stage is creation of employment opportunities. The opportunities will be direct by working in the construction work and indirect by providing services to the construction crew. The construction work will create 1,000 person-days of unskilled and 500 person-days of skilled employment. A total of 400 skilled and 700 unskilled people will get direct employment in the construction work for at least 90 days. Employment generation for the local people will minimise seasonal migration to other parts of the country or in India. More than NRs2,000 million will be injected in local economy during the construction. The amount of money that is earned in wages will directly support undertaking of various economic activities and enterprise development. This impact is direct, of high significance, regional and short-term in nature.

94. **Benefit augmentation measure:** The following measures will be implemented:

- Recommend the contractor to employ local people by giving priority to women and vulnerable groups
- Ensure equal wages to male and female for equal amount and type of work
- Promote use of local materials, particularly consumables items.

6.1.1.1 Skill Enhancement

95. **Impact:** Employment in the construction work is likely to enhance skills of workers, and a large number of people will get practical or hands-on training. This will enhance their technical skills, which could get them good job in future. The skill and knowledge acquired from the Project during construction will enhance employment opportunities. Such trained human resource can earn livelihoods from similar project in future. This impact is indirect but of high significance, regional, and long-term in nature.

96. **Benefit augmentation measures:** Workers will be encouraged to develop skill while working with international contractors through hands-on training.

6.1.1.2 Enterprise Development and Business Promotion

97. Different types of commercial activities will come into operation during the construction period in order to meet the demand of workers. Since they will have good purchasing power, they will regularly demand for different types of food, beverage and other daily necessary items. To meet these demands, many local and outside people may operate a number of small shops and restaurants around the the construction camp. Similarly, construction work will demand construction materials like aggregate, steel and cement. This will increase market for national industries. The impact is indirect, of medium significance, local, and short term in nature.

98. **Benefit augmentation measures:** Use of local consumable and construction materials will be given priority.

6.1.2 Operation Phase

6.1.2.1 Improvement in Accessibility and Regional Connection

99. Upgrading of GBA to ICAO 4E standard will make it an international airport where large and widebody aircrafts (Boeing 777 and Airbus 340) can land. The airport will provide an alternate landing facility in case of requirement of diversion of aircraft from TIA. With improved access, the volume of visitors and tourists in the area will significantly increase. Demand for lodging, fooding and travelling will increase, which in turn will increase business for travel and tours agenes, hotels, restaurants, and releted service providers. The airport will thus play a catalytic role in improving the local economy, earning foreign exchange and contributing to national GDP. This impact will be indirect, of high signifiance, regional, and long-term.

6.1.2.2 Increase in Trade, Commerce and Development of Market Centers

100. With the improved airport in operation, international connectivity will take place. Volume of traders, visitors and tourists in the area will significantly increase. Increase in demand for lodging, fooding and traveling requirement will enhance business opportunities for smaller aircrafts to transfer people to other parts of te country, travel and tours agencies, hotels, restaurants, markets, and other service providers. Service businesses in Lumbini area will proliferate. Nearby trading and tourism related areas like Butwal, Taulihawa, Tansen, and Chitwan will have impact in their local economy. The upgraded GBA will thus play a catalytic role in supporting local economy, earning foreign exchange and contributing to the national GDP. This impact will be indirect, of high signifiance, regional and long-term.

6.1.2.3 Growth of City

101. Siddhartha Nagar is expected to grow with many service infrastructures to cater travelers and tourists after operation of GBA to an international standard, having international flights. Growth of city with increase in land price will also facilitate increased loan opportunity for people to start or upscale their investments by mortgagaging their land. This impact will be indirect, of high signifiance, regional and long-term.

6.1.2.4 Improvement in Air Quality and Socio-economics of Local Rickshaw Pullers

102. Introduction of energy efficient electric vehicles for transporting people from GBA to Lumbin and surrounding heritage sites under Lumbini CPTS, under the component 2 of the Project, will support in improving air quality of the Lumbini area by reducing CO₂ emissions from the continued use of the current transportation arrangements using diesel and gasoline engine-powered vehicles. The Project will develop and operate appropriate public transportation services partly based on the use of electrical vehicles, using a solar energy charging stations as the primary source of energy. The Project fits within the country strategy that targets the use of alternative energy in public and private transportation operations in order to minimize pollution, and contribute to the mitigation of climate change through reduction in CO₂ emissions.

103. local public transportation planning and coordination with parties concerned, including procurement of electric carts and, possibly electric power-assisted modern rickshaws, which could be leased to incumbent rickshaw drivers will help them to avoid physically pulling rickshaw in a harsh and hot environment, and make additional income by adding number of passengers in the motor-driven vehicle. Arrangements of franchising/licensing and if necessary, leasing of buses to incumbent local transport service providers through a possible vehicle renewal program will also avail opportunities for the stakeholders to increase income and improve their socioeconomic status. This impact will be direct, of high significance, local and long-term.

6.2 Pre-construction Impacts

104. One of the key impacts of the project location is the physical and economic displacement of people due to loss of residential structures and agricultural land. Table 6.1 presents summary of the likely impacts.

Table 6.1: Summary of Resettlement Impacts

Impact	GBA Subproject
Impacts on Land	
Permanent Agricultural Land to be Acquired (ha)	91.08
Permanent Residential Land to be Acquired (ha)	0.34
Permanent Commercial Land to be Acquired (ha)	0.91
Affected Persons (APs)	
Households Affected by Loss of Agricultural Land (APs in bracket)	389 (2,295)
Households Affected by Loss of Residence (APs in bracket)	17 (102)
Loss of Livelihood	
Households Losing Agricultural Income from Farming their Own Land (APs in bracket)	389 (2,295)
Agricultural Laborers	98
School Staff*	0
Affected Vulnerable Households	
BPL ¹ Households (APs in bracket)	45 (270)
Female-headed AH (APs in bracket)	39 (230)
Households Losing 100% Land Holdings	94 (564)
Affected Structures	
Affected Houses	17
Affected Structures	2 (Schools)
Affected Road	1
Affected Shrine	1
Affected Trees/Crops	
Fruit Trees	76
Timber Trees	56
Other Affected Assets	
Bore Wells	23
Pump Shed	1
Cow Sheds	4
*No loss of livelihood is envisaged as these employees/staff (17 for the schools) will be employed in the relocated schools.	

¹ Below Poverty Line

105. **Mitigation Measures.** The Project has acquired the required land as per a resettlement plan after distributing compensation. Location of the Project is selected such that less residential houses and private properties are affected. A shrine affected by the Project will be relocated in consultation and agreement with local community.

6.3 Impacts during Construction

6.3.1 Impact on Physical Environment

6.3.1.1 Impact on Land Use

106. **Impact.** A total of 91.08 ha of agriculture land will be converted into airport runway, infrastructure and utilities. Since the area is predominantly agriculture land, conversion of the acquired land is expected not to make any significant impact on productivity, with an estimated annual loss of 110mt of cereals costing NRs2.2 million. This is 0.02 % with respect to total annual productivity of Rupandehi district. Similarly, new channel for Ghaghara Khola will pass through public land, whereas the existing channel will be filled up to construct runway.

107. Land will be required for construction of charging station/maintenance depot for electric carts and buses. Lands will also be required for construction of seven covered bus stops in phase 1 and more in phase 2. Although the bus stops may be constructed in the right of way of the existing roads, the charging station and maintenance depot needs to be located without deviating from the Lumbini Master Plan. This impact will be direct, of low significance, site specific and long-term.

108. **Mitigation Measure.** Land use change from agriculture to infrastructure facility will be permanent. The Project will convert only essential land with impervious infrastructure. Other lands will be developed in open green and pervious areas as garden, open area, and right of way of the runway, which will remain as groundwater recharge area. According to the Master Plan, only 18ha of the acquired land (19%) will be covered by runway and infrastructure.

109. The charging station and maintenance depot may be located within parking lot. The structure should be in line with provisions in the Master Plan.

6.3.1.2 Impact on Soil and Top Soil

110. **Impact.** The land in the airport has more or less flat profile; therefore the additional earthwork involved in leveling the land will be minimal. Topsoil from 91.08 ha of productive agricultural land may be lost if not properly collected, stored and later used in garden or lawn. A significant quantity of earth will be generated from excavation for constructing diversion channel of Ghaghara Khola for a proposed length of 1,800m. This impact will be direct, of medium significance, site specific, and long-term.

111. **Mitigation Measure.** The topsoil from borrow areas, areas of cutting and areas to be permanently covered will be stripped to a specified depth of 150mm and stored in stockpile storage area located away from water course and drainage areas. The stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile is to be restricted to 2m. Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles will be covered with gunny bags or tarpaulin. It will be ensured by the contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be returned to cover the disturbed area. Leakage of fuel, lubricants and chemicals on soil will be avoided by storing them on impervious surface with proper peripheral drainage. Grit chamber and oil sump will be provided in the chemical storage area to collect and remove waste material and oil before discharging water into natural drainages. The existing retention pond could also be utilized for sediment control. Spoil generated during construction will be used in reclaiming low lying areas. Earth from excavation of diversion channel for diversion of Ghaghara Khola will be used to fill the existing river channel.

6.3.1.3 Quarry Sites

112. **Impact.** Tinau Khola, Dano River and Rohini River are the major construction material sources for coarse aggregates and sand required for construction. Unplanned quarrying in stream

beds may change river morphology and cause flood induced disasters. Further, unregulated quarrying along the stream may increase suspended solids in water hence impairing the water quality. This impact will be direct, of medium significance, site specific and long-term.

113. **Mitigation Measure.** Contractor will procure materials for the Project from licensed operating quarries, or operate quarry at designated area with proper environmental management plan with closing and landscaping measures. Borrow areas required for the Project will be from approved borrow areas, and the borrow area locations will avoid productive agricultural lands and the lands vulnerable to flooding. All lands temporarily acquired for borrowing will be restored prior to handing over. Adequate safety precautions will be ensured during transportation of quarry material from quarries to the construction site. Vehicles transporting the material will be covered to prevent spillage. If quarry is operated by the contractor, it shall get clearance from the Engineer on location, quarry operation plan and closing plan. Borrow pits operation will be done without major impacts to river morphology.

6.3.1.4 Impact on Air Quality

114. **Impact.** The main sources of dust emission during the construction, which is inorganic and non-toxic in nature, are the movement of equipment at site and dust emitted during earth work, the rate of which depends on type of soil and humidity. The dust particles are expected to settle soon and will not be carried over long distance. The dust generation will be reduced if aggregates are procured from existing crusher industries. The impact due to dust nuisance is likely to be direct, of low significance, confined to construction area (which is away from settlement), and short-term (during construction).

115. Exhaust from project vehicles and equipment during construction phase may result in marginal increase in the levels of SO₂, NO_x, SPM, CO, and unburnt hydrocarbons. It may, therefore, be deduced that construction activities may cause changes in the suspended particulate matter levels locally. The impact will, however, be reversible, low significance, local and short term in duration.

116. **Mitigation Measure.** Good engineering practices will be adopted along with use of good quality fuel and regular maintenance of equipment and vehicles. Water sprinklers will be used to suppress dust particles in construction area and at dust generating equipment. Material transportation and dust generating construction activities will be scheduled to avoid impacts to communities living nearby the area. Hot mix plants and batching plants will be sited at least 500m away from settlements and opposite to direction of wind. Construction materials will be covered during transportation or at storage sites. Workers will be provided with face mask and goggles to protect from dust particles.

6.3.1.5 Impact on Noise Levels

117. **Impact.** Heavy construction traffic for loading and unloading, fabrication, drilling and breaking, and handling of equipment and construction materials may generate noise (Table 6.2). The areas affected will be those close to the construction site. At the peak of the construction, marginal increase in noise levels at 85-90 dB (A) is expected to occur locally. Since the populated areas, including the sensitive receptors such as schools and clinics are at least 500m from the construction site, the noise levels are considered to have insignificant impacts. Since no receptors are located within 100m of construction area, the impact due to noise nuisance is predicted to be direct, of low significance, confined to construction area, and short-term.

118. **Mitigation Measure.** Cushions and good silencers or cover will be provided to suppress noise from equipment and vehicles. These will be regularly maintained, and heavy machineries will be operated during off-time of the two nearby schools. Construction equipment will be kept at considerable distances from settlements. Workers will be provided with earmufflers and earplugs. Noise generating works will be scheduled only during day time and duration and frequency of operation of construction equipment will be minimized.

Table 6.2: Typical Noise Levels of Construction Equipment

Particulars	Noise Levels dB (A)	Particulars	Noise Levels dB
Earth Movers		Stationary Equipment	
Front End Loaders	72-84	Pumps	69-71
Earth Movers Backhoes	72-93	Generators	71-82
Tractors	76-96	Compressors	74-86
Scrapers, Graders	80-93	Pile Driving	95-100
Pavers	86-88		
Trucks	82-94		
Material Handlers		Stationary Equipment	
Concrete mixers	75-88	Pumps	69-71
Concrete pumps	81-88	Generators	71-82
Cranes (movable)	75-86	Compressors	74-86
Cranes (derrick)	86-88	Pile Driving	95-100

6.3.1.6 Impact on Water Resources and Quality

119. **Impact.** The major source of water pollution during construction will be from spillage of chemicals and oil/lubricants, washing of vehicles in water bodies, cement slurry from construction sites, and open defecation by workers. Diversion of Ghaghara Khola will involve excavation of about 150,000cum of earth, which might find its way in the river flow. Excavation and exposed surface may cause extensive erosion and sedimentation in the river. The impact on water quality is predicted to be direct, of medium significance, confined to construction area, and short-term.

120. **Mitigation Measure.** Seepage and spillage of chemicals, oil and lubricants will be avoided by storing them on impervious surface with proper drainage. Grit chamber and oil interceptor will be used to remove pollutants and oil from wastewater before discharging them in natural drainage. Proper study will be done of Ghaghara Khola with 100 year flood forecast, channel cross-section survey and design new channel at peak discharge in the stream to avoid flooding. Water conserving technologies will be used during construction. Washing of project vehicles in water bodies will be restricted. Water will not be pumped from Ghaghara Khola, and extraction of groundwater for construction and during operational use will be controlled and based on investigation on groundwater recharge ratio. Construction materials shall be stockpiled on impervious surface with surrounding drainage away from natural drainage to avoid them reaching in Ghaghara Khola and other water bodies. Sanitation facilities (soak pits/septic tanks) will be provided for disposal of sewage generated by the work force from labor and construction camps.

6.3.1.7 Stockpiling of Construction Material

121. **Impact.** Storage of construction materials may be an eye sore if not managed and stored properly. Material may also get leaked or washed to water bodies polluting the aquatic environment. Uncovered aggregates may be blown by wind and cause dust nuisance in the area. The impact will be direct, of low significance, confined to construction area, and short-term.

122. **Mitigation Measures.** Construction materials will be kept on an impervious surface with dyked enclosure and catch drains around them. Diesel and other fuels will be stored in separate dyke enclosures. Wherever possible, hazardous raw materials to be substituted by non-hazardous materials, e.g. cleaning solvents can be replaced with film-free biodegradable cleaners, usage of non-chlorinated strippers instead of strippers containing methylene chloride and substitution of water based paints for oil-based ones. Separate storage of waste paints and thinners, contaminated rags and brushes to facilitate recycling and reuse. Rags will be laundered for reuse. Haphazard disposal of construction materials will be strictly prohibited. Vehicle maintenance area will be designed to prevent contamination of groundwater by accidental spillage of oil.

6.3.1.8 Handling of Construction Material

123. **Impact.** Handling of construction materials, particularly chemicals, will always pose risk to workers handling these. Any leakage or spillage may enter into soil and water body, thus contaminating water and damaging productivity of soil. The impact on water quality is predicted to be direct, of low significance, confined to construction area, and short-term.

124. **Mitigation Measures.** All workers employed on mixing asphaltic material, cement and concrete will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works, would be provided with welder's protective eye-shields. Workers engaged in stone breaking activities will be provided with protective goggles and clothing and will be seated at sufficiently safe intervals. The use of any toxic chemical will be strictly prohibited in accordance with the manufacturer's instructions. The Engineer will be given at least 6 working days notice for approval of the proposed use of any hazardous chemicals. A register of all toxic chemicals delivered to the site will be kept and maintained up to date by the contractor. The register will include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.

6.3.1.9 Closure of Construction Camps

125. **Impact.** The contractor is required to properly remove all temporary structures built for operation of construction and workers camps. While doing so, the land will be brought back to original state. The impact is predicted to be direct, of medium significance, confined to construction area, and short-term.

126. **Mitigation Measures.** Contractor will prepare site restoration plans for approval by the Engineer. The plan will be implemented by the contractor prior to demobilization. Upon completion of the works, all temporary structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the contractor's expense, to the entire satisfaction of the Engineer. Residual topsoil will be distributed on spoil disposal area, barren areas as identified by the Engineer in a layer of thickness of 75mm-150mm with proper turfin and vegetation.

6.3.2 Impact on Biological Environment

6.3.2.1 Impact on Flora and Fauna

127. **Impact.** The project area does not have significant patch of forest and wildlife, and is characterized by tropical type of vegetation, and the proposed expansion will result in cutting of 132 private trees. Some protected animals like python is reported to be found around the airport vicinity, due to presence of many streams and grassland in the airport and availability of prey (rodents, birds). Blue bull and wild boar is reported infrequently visiting the airport area for grazing and feeding. Habitat of crane is conserved in Lumbini area. Plying of clean electric vehicles with reduced noise on the existing road around the crane sanctuary and periphery of Lumbini will not affect the birds. Despite this, the impact on flora and fauna is predicted to be direct, of low significance, confined to construction area, and short-term.

128. **Mitigation Measure.** The Project will distribute (i) seedlings of fruit or timber tree to the households who lost their tree during acquisition of land by the Project; (ii) plant trees at the periphery and garden of the airport in order to increase green cover in the area; (iii) restrict the workers in killing or harassing of birds and wildlife; (iv) securely fence the airport area; (v) regularly mow the grasses; and (vi) use non-destructive methods to keep birds away from the GBA area.

6.3.2.2 Impact on Aquatic Ecology

129. **Impact.** Impact on riverine aquatic ecology may occur especially during diversion of Ghaghara Khola, and due to construction induced water pollution in Tinau, Dano and Rohini Rivers. However, such impact is predicted to be minimal as the rivers are not a rich habitat of fish and other aquatic flora and fauna. The impact on aquatic ecosystem is predicted to be direct, of low significance, confined to construction area, and short-term.

130. **Mitigation Measure.** The Project will (i) adopt construction method that minimizes discharge of cement slurry, earth or construction chemicals into the water bodies; (ii) protect measures for construction activities around Ghaghara Khola; and (iii) restrict washing of vehicles in water bodies.

6.3.3 Socioeconomic and Cultural Environment

6.3.3.1 Land Acquisition and Compensation and Reinstatement of Community Structures

131. **Impact.** The Resettlement Plan prepared under the original project is under implementation. A total of 389 households with 869 plots and 17 residential structures were affected due to the proposed project. About 95% of the acquired plots and assets from 356 (92%) households have already been compensated and deed transferred to CAAN. The additional financing does not require acquisition of additional land and assets because the land acquired for the original project includes land for a 3,000m runway and associated infrastructure proposed to be constructed under the additional financing. A total of 37 plots of 33 households remain to be compensated. The compensation payment for 20 households is under process and 13 households who are out of contact are recorded as absentee households. Apart from the construction related impacts, the other impacts will be loss of access due to need to shift section of existing village roads; damage of irrigation system; and damage of water supply pipes. The impact is predicted to be direct, of high significance, local, and long-term.

132. **Mitigation Measures.** The Project will (i) expedite payment of any outstanding compensation; (ii) and reconstruct community structures, irrigation system, roads, and water supply pipelines at alternative alignment in consultation with beneficiaries without disrupting the services.

6.3.3.2 Occupational Health and Safety

133. **Impact.** Huge number of workers will be working in the Project, and may include both national and foreign workers. They will be directly exposed to risks of occupational injury or accident, including risks from dust, gaseous emission, noise, and vibration. The workers will be staying in labor camps that can be prone to unsafe and unhygienic conditions if not maintained properly. The impact is predicted to be direct, of high significance, local, and short-term.

134. **Mitigation Measures.** Contractor will arrange proper camping facility with rooms with good ventilation, natural light, fan, and mosquito net. The contractor will give priority to employ local workers, particularly poor and vulnerable people, which will reduce the need of establishing labor camp. Clean drinking water supply, toilets and solid waste management system will be available to the workers in their camps. The contractor will (i) restrict use of firewood for cooking and heating and will supply kerosene or gas in the mess of workers; (ii) supply food items to the camps giving priority to local products; (iii) ensure all the workers contractor will prepare and implement a safety plan approved by the Engineer; (iv) supply safety gears to all the workers depending on their nature of work, and make mandatory to use them; (v) keep fire fighting facility and first aid box in camps and work sites with facility of a health assistant; (vi) make arrangements with local hospital in case of emergency; and (vii) arrange adequate security with fencing and lighting around camp sites and material storage areas to ensure that unauthorized people and animals do not enter in the area and get exposed to the potential hazards of construction activities.

6.3.3.3 Socially Undesirable Activities

135. **Impact.** The workers may use alcohol and other forms of intoxication, gambling, quarrel with locals, disrespect local culture and religion, and may promote socially undesirable activities in and around the project area. The impact is predicted to be direct, of medium significance, local, and short-term.

136. **Mitigation Measures.** The Project will (i) restrict movement of workers out of camp after certain hours in the night; (ii) restrict use of alcohol and gambling in the camp; (iii) supply water, daily consumable items and communication facility in the camp so as not to create additional pressure on the local services; (iv) show respect to local tradition and culture; (v) prepare a code of conduct for all project staff, orient them and monitor that these are effectively followed by all; (vi) assign a public relation officer to keep close and regular consultation and coordination with local communities; and (vii) regularly follow up and monitor on workers behavior and take appropriate measure on defiers.

6.3.3.4 Properties of Archeological Importance

137. **Impact.** The Lumbini area is one of the most holy shrines of Buddhists all over the world. Rupandehi area is rich in Buddha time relics and archeological artifacts. There could be possibility of unearthing some structures while excavating foundation of structures, and damage them knowingly or unknowingly. The impact is predicted to be direct, of high significance, local, and long-term.

138. **Mitigation Measures.** The contractor will take reasonable precautions to prevent workers or any other staff from removing and damaging any such article or object and will, immediately upon discovery thereof and before removal, inform the Engineer of such discovery and carry out the Engineer's instructions for dealing with these, awaiting which all work will be stopped 100m all directions from the site of discovery. The Engineer will seek direction from the Archaeological Department or LDT before instructing the contractor to recommence work on the site.

6.3.3.5 Gender and Child Labour

139. **Impact.** Gender discrimination may occur as the contractor may not be sensitive towards gender equity. For sake of low wage, contractors may use women and sometimes child as labor. Construction area may not be gender friendly with required facilities. The impact is predicted to be direct, of high significance, local, and long-term.

140. **Mitigation Measures.** The Project will ensure to (i) provide equal wage to male and female for similar nature of work; (ii) restrict use of child below 16 years of age in labor work (as per the ILO Standard); and (iii) provide female friendly construction environment with separate toilet for women, child care facility for women with babies, suitable work categorization for women, and recovery room during sickness.

6.3.3.6 Health and Sanitation

141. **Impact.** Construction workers may practice open defecation due to lack or inadequate number of toilets facility. Built up toilets may be drained out to water bodies or even in irrigation canals. This may lead to contamination and cause diseases. Proper management will be required for bio-degradable and non bio-degradable wastes generated in camps and project sites. Unmanaged waste may induce health hazard by spreading communicable disease as the area is hot and humid. In such environment, bacterial and vector disease could spread beyond control. The impact is predicted to be direct, of medium significance, local, and long-term.

142. **Mitigation Measures.** The Project will ensure to (i) provide sufficient number of toilets in camps and work sites for both male and female; (ii) dispose construction debris at designated spoil disposal site; and initiate garbage collection system by establishing bins at places in the construction area.

6.3.3.7 Infection of STDs and Other Communicable Diseases

143. **Impact.** Workers with increased income may get indulged in prostitution and unsafe sex, which may not be socially acceptable to local people. Such undesirable activities may lead to possibilities of transmission of infectious diseases like STDs and HIV/AIDS. The impact is predicted to be indirect, of high significance, local, and long-term.

144. **Mitigation Measures.** The Project will (i) restrict alcohol, gambling and socially undesirable activities by workers living in labor camps; (ii) arrange awareness program to the workers and local communities on STDs and HIV/AIDS; (iii) erect posters on safety practices to prevent from STDs; and (iv) distribute free condoms to workers as a part of educating them.

6.4 Impacts during Operation

6.4.1 Impact on Physical Environment

6.4.1.1 Impact on Air Quality

145. **Impact.** Air quality may deteriorate from exhaust of aircraft engines during landing and take-off cycle. The emissions may contain unburnt hydrocarbons (HC), carbon monoxide (CO), oxides of nitrogen (NO_x), and soot and sulfate particles. Based on the flight movement data of CAAN (CA Report 2011, CAAN), fuel consumption was 315mt/day and CO₂ emission was 985.5mt/day in Nepalese sky. Air pollution by suspended particulate matter, NO_x, SO₂ and CO will be generated from the operation of 5 MW DG set used as the standby captive power plant in case of the power supply failure. Air emissions will also generate from the operation of vehicular traffic at the airport, which will be mainly CO, HC and NO_x.

146. Prediction of impacts on air has been carried out employing mathematical model based on a steady state gaussian plume dispersion model designed for multiple volume and point sources for short-term modeling developed by the United States Environmental Protection Agency (USEPA) is as provided in Table 6.3.

Table 6.3: Proposed Emission Sources and Emission Rate

Sources	Emission Rate of Pollutants (g/s)			
	SO ₂	Nox	CO	HC
Aircraft	8.0	17.6	96	62.4
DG Set	2.94	3.1	--	--
Vehicular	--	1.3	7.6	2.1
Total	10.94	22.0	103.6	64.5

147. About 25% of the emissions in case of SO₂ and NO_x are found from diesel generators, which would not be operating continuously. Hence, incremental contribution in case of these compounds during normal working of the airport without generators would be limited to 3.1 and 6.05 µg/m³ respectively, which are not significant to contribute to environmental pollution. Based on the predicted concentrations and the post project concentrations of various pollutants, it can be inferred that air impact from pollution will be direct, of low significance, local and long-term for short periods only.

148. **Mitigation Measures.** The Project will (i) encourage use of lead free and less pollutant gasoline; (ii) try to introduce more efficient and direct ATS route, direct STARs, continuous descend approach; (iii) adopt improved air traffic flow management (ATFM) to avoid unnecessary holding of aircraft on ground and air; (iv) maintain vehicles and generators regularly; (v) shut down combustion engines when not in use; (vi) provide adequate buffer zones where pollution concentrations is highest (diesel generator and vehicle parking areas); (vii) plan suitable green belt around the airport to reduce impact of air pollution; and (viii) allow within the airport premises only those vehicles with green sticker confirming to emission standard.

6.4.1.2 Noise Nuisance

149. **Impact.** Aircraft movement will be the major source of noise pollution from the proposed Project. Noise will also be generated from vehicular movements in and around the airport, but will be confined mostly to the airport boundary in comparison to aircraft noise. Hence, noise from aircraft movement at the international airport was assessed through dispersion modeling.

150. Surrounding land use being predominantly agricultural and nearest settlement being 500m farther from the runway, the incremental noise levels from the aircraft operations would be less than 60 dBA (WHO standard categorize as peaceful to medium level of sound). The contribution of aircraft noise thus is found to be minimal and is subject to further attenuation with the intervening green cover. Impact from noise will be direct, of high significance, local and long-term, but every incidence will last for short period only during landing and taking-off by the aircrafts.

151. **Mitigation Measures.** The Project will (i) adopt the ICAO suggested measures to reduce noise; (ii) plant vegetation and construct sound barrier wall around the periphery of the airport to develop green belt to suppress noise of aircraft; (iii) ensure during flight operations that the landing and take-off directions are from west to east and vice versa as development is sparse on the western side of the airstrip; (iv) develop regulations to avoid developments in the air funnel zone enforced by CAAN in coordination with the municipality; (v) declare airport as horn restricted area; and ; and (vi) use noise dampening materials such as thin rubber/lead sheet for wrapping the work places like compressor room DG room. The DG set will be provided with exhaust muffler capable of effective noise reduction of 25 dB; (ii) use noise absorbing material in construction of hangers and terminal building; and (iii) provide ear plug/mufflers for persons working in noisy areas to reduce noise impacts.

6.4.1.3 Impact on Water Resources

152. **Impact.** Water requirement of the existing airport will be met by extracting groundwater. The water requirement/day during operation of the airport is likely to be about 80-90 KLD. Extraction of the amount will not result in any impact on the groundwater reserve. Impact on water quality will be direct, of low significance, local and long-term.

153. **Mitigation Measures.** The Project will (i) take proper care not to extract water in excess of recharge rate; (ii) promote use of water efficient systems in the airport terminal; (iii) if required, adopt roof-top rain harvesting system.

6.4.1.4 Wastewater Management

154. **Impact.** Wastewater generated in the airport may pollute waterbodies and shallow groundwater if discharged without treatment. The impact is predicted to be indirect, low significance, local and long-term in nature.

155. **Mitigation Measures.** The Project will ensure that (i) wastewater is treated by augmenting existing septic tank; (ii) oil and grease interceptors are installed at wastewater outlets from the maintenance hangers, building and flight catering; (iii) proper drainage for storm water along new runway, taxiway, access roads are provided and used for recharging groundwater through rainwater harvesting structure; (iv) low flow fixtures and appliances are used for reduced water consumption such as low flush water closets and cisterns and photo-sensitive taps; (v) sewage generated are treated in the sewage treatment plant and reused for green belt development, cooling system and floor washing to reduce the fresh water requirement.

6.4.1.5 Flood and River Bank Erosion

156. **Impact.** The location requires diversion of Ghaghara Khola. The diversion location is about 1km east from the Tinau River. There could be a risk of flood of Tinau River entering into Ghaghara Khola during monsoon, and may flood the project area. Flood of the Tinau River breached its bank in monsoon of about two decades back in Hatibangai VDC, and had entered

into Ghagara Khola, which safely discharged the flood water in Danda River. This hydrological and disaster event should be taken into account during the design of the diversion channel of Ghagara Khola. The impact of flood potential is predicted to be indirect, of low significance, local, and short-term.

157. **Mitigation Measures.** The Project will make provision of bank protection works with proper embankment and spillways along the weak spots of the Tinau River and diversion channel of Ghaghara Khola. Confluence of Ghaghara Khola with Danda River will be designed to avoid backwater flow in Ghagara Khola. Provision will also be made for emergency/standby pumping facility to mitigate any emergency flood situation in and around the GBA area.

6.4.2 Impact on Biological Environment

6.4.2.1 Impact on Ecology

158. **Impact.** The baseline flora and fauna shows the area to be agricultural land with no wildlife habitat. Common birds are found in the area. Presence of birds around airport increases hazard of bird hit by aircrafts while landing and take-off. Keeping away birds by using hazardous poisonous pesticides to kill insects on which bird come to feed may kill them and other aquatic and terrestrial lives. The impact will be indirect, of medium significance, local and long term.

159. **Mitigation Measures.** The airport management will be careful to use non-hazardous measures to keep birds away from the airport are by good management of solid waste and control of pest in the field. Spraying of poisonous pesticide will be discouraged, which may kill rodents, reptiles and amphibians of the area. The poison may also affect aquatic lives if washed to water bodies.

6.4.3 Impact on Socioeconomic Environment

6.4.3.1 Solid Waste Management

160. **Impact.** Solid waste generated from the proposed expansion of GBA would comprise sludge generated from STP, separated oil from oily wastewater treatment units, garbage/food waste from the restaurants and airport operations, and paper and packaging waste generated in cargo section. The impact will be direct, of high significance, local and long-term.

161. **Mitigation Measures.** Solid waste from the airport is currently collected in bins located at various points within the airport. Third party collects the waste and transports to municipal waste disposal site. The , vehicles transporting waste will be adequately covered to prevent spillages during transportation, collection bins will be regularly sprayed with disinfectants and sludge will be dried and reused as soil conditioner in the garden or agriculture field.

6.4.3.2 Spread of Communicable Disease through Air Travel

162. **Impact.** Spread of communicable diseases through air travel is an issue already recognized by ICAO, WHO, and World Aviation Communities. ICAO requirements, standards and recommended practices (SARPs) guide for public health emergencies (PHE) preparedness. Article 14 of the Chicago Convention states that each contracting state agrees to take effective measure to prevent spread of communicable diseases such as Cholera, Typhoid, Smallpox, Yellow Fever, Plague, and SARS by means of air travel.

163. **Mitigation Measures.** The airport management will (i) follow ICAO provision and international health regulation 2005 of WHO to prevent, protect, control, and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoids unneeded interference with international traffic and trade; (ii) prepare airport emergency plan including arrangements with hospitals for emergency treatment; and (iii) establish emergency operation center at the airport.

6.4.3.3 Firefighting Facility

164. **Impact.** Proper and standard emergency fire fighting and rescue facility is required in an international airport. The emergency may occur due to outbreak of fire in terminal, or due to crash landing of aircrafts. Standard operation procedure is required to be followed.

165. **Mitigation Measures.** (i) Proper firefighting and rescue arrangement will be established in the GBA; (ii) a separate crash fire fighting area with all required staff, firerighting equipment and emergency medical supplies will be established within the airport area; (iii) well trained fire fighting crew will always remain at standby to respond to emergency situations; and (iv) firefighting vehicles and equipment will be kept ready and well maintained.

6.4.3.4 Solid Waste Management

166. **Impact.** Solid waste generated from the proposed expansion of GBA would comprise sludge generated from STP, separated oil from oily wastewater treatment units, garbage/food waste from the restaurants and airport operations, and paper and packaging waste generated in cargo section. The impact will be direct, of high significance, local and long-term.

167. **Mitigation Measures.** Solid waste from the airport is currently collected in bins located at various points within the airport. The third party collects the waste and transports to municipal waste disposal site. These measures will be continued. The vehicles transporting waste will be adequately covered to prevent spillages during transportation; collection bins will be regularly sprayed with disinfectants; and sludge will be dried and reused as soil conditioner in the garden or agriculture field.

6.5 Impacts from Solar/Electricity Charged Hybrid Electric Vehicle in Lumbini Area

168. **Impact.** Electric vehicles (EV) are seen as an important part of cutting emissions and reducing global warming. However, environmental impact of electric vehicle needs to be assessed in terms of their life-cycle impact. Some studies have suggested that despite sweeping public opinion and the huge amount in subsidies granted to EV makers, the energy intensive materials used in manufacturing electric cars, as well as the life-cycle and disposal of the batteries, negate EV's environmental benefits. A study by Massachusetts Institute of Technology (MIT), USA reported that lithium, copper and zinc used in the batteries are extracted in ways that are energy intensive and harmful to the earth. People living in regions where these compounds are extracted are at risk of exposure to toxic groundwater contamination and air pollution. Batteries can also be hazardous if not properly disposed of at the end of their life-cycle. A study by Norwegian University of Science and Technology has reported that the environmental benefits of EV can be judged from learning how clean are the electricity grids both for charging the battery and for producing cars. Electricity from coal, which is the most polluting way to generate power, drastically reduces the environmental advantage for EVs.

169. **Mitigation Measures.** Impacts from manufacturing, operation and maintenance of EVs will be assessed based on a study of their life-cycle impact considering both the forward and backward linkages. Proper and clear recycling plan will be prepared for used batteries and junk vehicles. Close consultation will be done with the local rickshaw pullers on the introduction of the EVs, their capital cost, operation and maintenance cost, and financing facilities. Construction of charging stations, bus shelters, maintenance depot will be developed in compliance with the Lumbini Master Plan and without causing any impact on the heritage site. Possibility of introducing Waste to Energy (WTE) technology will be explored, which can complement solar technology and will help to reduce dependency on fossil fuels resulting into less CO₂ emissions.

7. Environmental Management Plan

7.1 Plan for Mitigation Measures

7.1.1 Beneficial Impacts Augmentation Measures

170. The proponent is committed to implement the following benefits augmentation measures, as discussed in Chapter 6.

Table 7.1: Proposed Plan for Benefit Augmentation Measure

SN	Prescribed Activity	Location	Time	Monitoring Method	Responsibility
1	Employment opportunity for local people	Project VDCs	Construction	Include Clause in bidding document of both contractor and consultant	Project and Contractor
2	Setting up of standard wage/salary and regular and timely full payment without any disparity for men and women in familiar nature of work.	Project area	Construction	Checking salary sheet; inquiry with workers	Project and Contractor
3	Encourage use of local products by project crew	Project and its surroundings	Construction	Observation and inquiry with local shop owners and workers	People involved in project activity/supervisory body
4	Awareness campaign	Project and its surrounding	Construction	Posters, brochures, pamphlets, public consultation meetings	Project
5	Field based and demonstrative training for staffs and workers	Airport area	Pre-construction and construction	Slide shows, lectures, handouts, site visits	Project

7.1.2 Adverse Impact Mitigation Measures

171. A number of mitigation measures including preventive, corrective and compensatory measures (refer table 7.2) are proposed for safeguarding environment during project implementation and operation.

7.2 Environmental Monitoring

172. The EA (MOCTCA) is responsible for ensuring environmental protection in project activities, whereas CAAN (IA) is responsible to implement EMP. The IA will conduct baseline monitoring, compliance monitoring and impact monitoring as guided by the GON provisions and safeguard policy requirement of ADB.

7.2.1.1 Baseline Monitoring

173. A baseline monitoring will be conducted on basic environmental parameters in the area surrounding the proposed project before construction begins, if construction could not begin within three years of the IEE baseline data collection. The baseline monitoring will include but not limited to (i) changes in land use pattern; (ii) changes in vegetation pattern; (iii) increased infrastructure and other services; (iv) demographic and cultural status of the area; and (v) air, water, and noise quality.

7.2.1.2 Compliance Monitoring

174. A periodic sampling method or continuous recording of specific environmental quality indicators or pollution level will be monitored to ensure if (i) mitigation requirements and

specifications are included in the design; (ii) adequate budget for implementation of prescribed mitigation measures and monitoring is included in project cost; (iii) mitigation and monitoring requirements in tender document and contract agreement are incorporated; and (iv) contractor complies with the mitigation measures during construction work.

7.2.1.3 Impact Monitoring

175. The impact monitoring detects the changes in environmental parameters and estimates inherent variation within the environment, establishes long-term trends in the natural system, and derives conclusions by making comparison against a standard or target. Impact monitoring will thus include monitoring of (i) construction related safety measures; (ii) loss of vegetation and compensatory plantation; and (iii) likely impacts of the project on environmental and socioeconomic resources.

Table 7.2: Environmental Management Plan for GBA

SN	Environmental Issues	Nature	Magnitude	Extent	Duration	Reversibility	Mitigation Measures	Responsibility
1 Location Impacts								
1.1	The proposed expansion of airport would require additional land and hence about 97.27 ha is acquired. Similarly, electric charging station, maintenance depot, and covered bus stops for electric vehicles will also require land.	D	L	SS	LT	IR	The affected people have been compensated in accordance with their entitlements. Land required for EVs shall be public land or ROW or road. If personal property is required, the resettlement plan of the project will be followed with proper acquisition and compensation.	PMIU/LDT
1.2	Flooding by the rivers flowing adjacent to airport boundary	ID	M	SS	LT	R	Project will be designed to avoid overtopping and flooding from the rivers. Adequate bank protection measures would be undertaken to avoid erosion from the flowing water. Proper river bank protection measures will be included in the design.	PMIU/DSC
2 Design and Pre-construction Impacts								
2.1	Alterations of drainage pattern of the site	D	M	SS	LT	R	Diversion of Ghaghara Khola will be undertaken considering physical, social and ecological impacts associated with its diversion. Adequate cross section capable of holding highest flood flows in the stream will be designed with bank and erosion protection measures.	PMIU
2.2	Landuse change	D	M	SS	LT	IR	Built up area will be avoided from acquisition. Attempts will be made to accommodate facilities within the acquired land. However, if additional land acquisition is unavoidable, the land owners will be adequately compensated as per the resettlement framework.	PMIU/DSC
2.3	Relocation of public utilities; and restoration of access roads	D	M	SS	ST	IR	All community infrastructures will be avoided, to the extent possible, during design. Infrastructure affected by the Project will be relocated or rehabilitated in consultation with community.	PMIU/DSC
3 Pre-construction Activities by Contractor								
3.1	Location selection, design and layout of construction camps	D	M	SS	ST	R	The construction camps will be located at least 500m away from settlement at identified sites, and at least 1,000m away from drainage channels	Contractor/PMIU/DSC
3.2	Water availability and arrangement for drinking and construction purposes	D	M	SS	ST	R	The contractor will be responsible for arrangement of clean drinking water in every workplace for the whole construction period. Sufficient supply of construction water will be arranged with storage facility without giving any pressure on community supply.	Contractor/PMIU/DSC
3.3	Identification of spoil disposal sites	D	H	SS	ST	IR	Location of spoil disposal sites will not be located within designated environmentally sensitive zones and the concerned Engineer will certify the location.	Contractor/PMIU/DSC
3.4	Quarry operations	ID	M	SS	LT	R	Tinau, Dano and Rohini Rivers are the major sources of construction material such as aggregates, and other materials in the area. Contractor to give priority to procure aggregates from crusher plants holding government licence.	Contractor/PMIU/DSC

SN	Environmental Issues	Nature	Magnitude	Extent	Duration	Reversibility	Mitigation Measures	Responsibility
3.5	Batching plant location	D	M	SS	ST	R/IR	Batching plants will be located sufficiently away from habitation within the airport premises.	Contractor/PMIU/DSC
3.6	Labour employment and gender disparity in wage structure	D	L	SS	ST	R	Contractor will be encouraged to employ local labour for construction activities. A standard wage rate without gender bias will be established.	Contractor/PMIU/DSC
4 Construction Impacts								
Physical Environment								
4.1	Impacts of landuse change	D	M	SS	ST	IR	Agriculture land will be converted into infrastructure facility. The Project will convert only essential land with impervious infrastructure. Other land will be developed in open green and pervious areas as garden, open area, and right of way of the runway, which will remain as groundwater recharge area.	Contractor/PMIU/DSC
4.2	Stripping, stocking and preservation of top soil	D	M	SS	LT	R	The topsoils from borrow areas, areas of cutting and areas to be permanently covered will be stripped to a specified depth of 150mm, and stored in stockpiles. The stockpile will be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the piles is to be restricted to 2m. Stockpiles will not be surcharged or otherwise loaded and multiple handling will be kept to a minimum to ensure that no compaction will occur. The stockpiles will be covered with gunny bags or tarpaulin. The contractor will ensure that the topsoils will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoils will be returned to cover the disturbed area.	Contractor/PMIU/DSC
4.3	Quarry/borrow pits operations	D	M	SS	LT	R	Adequate safety precautions will be ensured during transportation of quarry material from quarries to the construction site. Vehicles transporting the material will be covered to prevent spillage. The contractor will operate as per the Engineer's direction and satisfaction. Borrow pits operation will be carried out done without major impact to river morphology.	Contractor/PMIU/DSC
4.4	Air quality deterioration due to dust and exhaust from equipment	D	L	SS	ST	R	The contractor will take every precaution including spraying water to reduce the levels of dust at construction sites to the satisfaction of the Engineer. All earthwork to be protected/covered to minimise dust generation. The road surfaces will be watered using necessary equipment. Maintenance of vehicles, equipment and machinery will be regular to keep low exhaust. All vehicles and equipment used for construction will be fitted with exhaust silencers. Construction material in transportation shall be properly covered. Dust generating plant and equipment will be placed at considerable distance from settlement areas. Workers will be provided with face mask and goggles to protect from dust particles.	Contractor/PMIU/DSC
4.5	Noise nuisance	D	L	SS	ST	R	Cushions and good silencers or cover will be provided and vehicles kept at good operable condition to suppress noise below 75 dBA. Construction equipment will be kept at considerable distance from settlements. Workers will be provided earmufflers and earplugs. The noise generating works will be scheduled only for during daytime, and frequency of operation of construction equipments will be minimized.	Contractor/PMIU/DSC
4.6	Soil and water pollution due to fuel	D	M	SS	ST	R	The fuel storage and vehicle cleaning area will be stationed at least 300m away	Contractor/PMIU/DSC

SN	Environmental Issues	Nature	Magnitude	Extent	Duration	Reversibility	Mitigation Measures	Responsibility
	and lubricants, construction waste						from the nearest drain/water body. Oil interceptor will be provided at construction vehicle parking area, vehicle repair area and workshops ensuring that all wastewater flows into the interceptor prior to its discharge. Soil and water pollution parameters will be monitored as per monitoring plan.	
4.7	Spillage of construction wastes into nearby water bodies	D	M	SS	ST	R	Construction site will be adequately bunded on the side of the diverted water channel to protect from spillage of construction wastes. Extraneous construction wastes will be transported to the pre-identified disposal site for safe disposal.	Contractor/PMIU/DSC
4.8	Material handling at site	D	M	SS	ST	R	All workers employed on mixing asphaltic material, cement and concrete will be provided with protective footwear and protective goggles. Workers, who are engaged in welding works would be provided with welder's protective eye-shields. Workers engaged in stone breaking activities will be provided with protective goggles and clothing, and will be seated at sufficiently safe intervals. Toxic chemical will used in accordance with the manufacturer's instructions. The Engineer will be given at least 6 working days notice of the proposed use of any chemical. A register of all toxic chemicals delivered to the site will be kept and maintained up to date by the contractor. The register will include the trade name, physical properties and characteristics, chemical ingredients, health and safety hazard information, safe handling and storage procedures, and emergency and first aid procedures for the product.	Contractor/PMIU/DSC
4.9	Flooding and erosion of river banks	ID	M	SS	ST	R	Bank protection works with proper embankment and spillways will be provisioned along the diverted channel of Ghaghara Khola, confluence of Ghaghara Khola with Danda River, and weak banks of Tinau River to avoid embankment breach, flood and riverbank erosion. Provision of emergency pumping facility shall be kept at standby to pump out any emergency flood situation.	Contractor PMIU/DSC
4.10	Clearing of construction camps and restoration of the area	D	M	SS	ST	R	Contractor will prepare site restoration plans for approval by the Engineer. The plan will be implemented by the contractor prior to demobilization. On completion of the works, all temporary structures will be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the site left clean and tidy, at the contractor's expense, to the entire satisfaction of the Engineer. Residual topsoil will be distributed on adjoining/proximate barren/rocky areas as identified by the Engineer in a layer of thickness of 75mm-150mm.	Contractor/PMIU/DSC
Biological Environment								
4.1	Clearance of trees and impact on flora and fauna	D	L	SS	ST	R	Distribute seedlings of fruit or timber trees to the households who lost their tree during acquisition of land by the Project. Plant trees at the periphery and garden of the airport in order to increase green cover in the area. Restrict the workers in killing or harassing of birds and wildlife.	Contractor/PMIU/DSC
4.2	Impact on aquatic ecology	ID	L	SS	ST	R	Adoption of construction method to minimize discharge of cement slurry, earth or construction chemicals into the water bodies; protection measures for	Contractor/PMIU/DSC

SN	Environmental Issues	Nature	Magnitude	Extent	Duration	Reversibility	Mitigation Measures	Responsibility
							construction activities around khola; restriction of washing vehicles in water bodies	
Socio-economic and Cultural Environment								
4.1	Acquisition and compensation for private and public properties	D	H	SS	LT	IR	<p>Address impact in accordance with the resettlement framework provisions prior to the initiation of civil works; compensate the two schools following resettlement framework provision; reconstruct community structures, irrigation system, roads, and water supply pipelines at alternative alignment in consultation with beneficiaries without disrupting the services.</p> <p>All water sources potable or else used by the community e.g. water tanks along the streams if lost due to the project works and due to diversion of Ghagara Khola will be replaced immediately. Relocation of the source of water will be decided in consultation with the local people. Replacement will be carried out prior to demolition of the existing structure/source of water/diversion works.</p> <p>The contractor will provide safe and convenient passage for vehicles, pedestrians and livestock on major roads intersecting the proposed site.</p>	PMIU/DSC
4.2	Trampling of agriculture lands	D	L	SS	ST	R	To minimize soil compaction, construction vehicle, machinery and equipment will move or be stationed in designated area (construction site, haul roads as applicable) only. The haul roads for construction materials will be routed to avoid agricultural areas. Any damage to standing crops of agriculture field will be compensated by the contractor.	Contractor/PMIU/DSC
4.3	Occupational health and safety	D	H	SS	ST	R	The contractor will arrange proper camping facility with water supply and sanitation facilities; restrict use of firewood for cooking and heating; supply food items to the camps giving priority to local products; insure all workers; contractor prepare and implement a safety plan approved by the Engineer; contractor supply safety gears to all workers depending upon their nature of work; keep fire fighting facility and first aid box in camps and work sites; contractor arrange local hospital in case of emergency; and arrange adequate security with fencing and lighting.	Contractor/PMIU/DSC
4.5	Socially undesirable activities	D	M	SS	ST	R	Restrict movement of workers out of camp after certain hours in the night; restrict use of alcohol and gambling in the camp; supply water, daily consumable items, communication facility in the camp so as not to create additional pressure on the local services; show respect to local tradition and culture; prepare a code of conduct for all project staff; and assign a public relation officer to keep close consultations with local communities.	Contractor/PMIU/DSC
4.6	Gender discrimination and child labor	D	H	SS	ST	IR	Ensure equal wage to male and female for similar nature of work; restrict use of child below 16 years of age in labor work (as per ILO standard); provide female friendly construction environment with separate toilet for women, childcare facility for women with babies, suitable work categorization for women, and recovery room during sickness.	Contractor/PMIU/DSC
4.7	Health and sanitation	D	M	SS	ST	R	Provide sufficient number of toilets in camps and work sites for both male and female; dispose construction debris at designated spoil disposal site; and	Contractor/PMIU/DSC

SN	Environmental Issues	Nature	Magnitude	Extent	Duration	Reversibility	Mitigation Measures	Responsibility
							initiate garbage collection system by establishing bins at places in the construction area.	
4.8	Infection of STDs, HIV/AIDS and other communicable diseases	ID	H	SS	ST	R	Restrict alcohol, gambling and socially undesirable activities by workers living in labor camps; arrange awareness program to the workers and local communities on STDs and HIV/AIDS; erect posters on safe practices to prevent from STDs; and distribute free condoms to workers as part of educating them.	Contractor/PMIU/DSC
4.9	Religious structures	D	M	SS	ST	R	All necessary and adequate care will be taken to minimize impact on cultural properties. One temple requiring relocation will be done in consultation with the communities. No work will spill over to these properties, premises and precincts.	Contractor/PMIU/DSC
4.10	Properties of archaeological importance	D	M	SS	LT	IR	The contractor will take reasonable precaution to prevent worker or any other staff from removing and damaging any such article/object and will, immediately upon discovery thereof and before removal, inform the Engineer of such discovery and carry out the Engineer's instructions for dealing with the same, awaiting which all work will be stopped 100m all directions from the site of discovery. The Engineer will seek direction from the Archaeological Department or LDT before instructing the contractor to recommence work on the site.	Contractor/PMIU/DSC
5 Operation and Maintenance Stage Impacts								
Physical Environment								
5.1	Impact on air quality	D	L	SS	LT	IR	Use of lead free and less pollutant gasoline will be encouraged; vehicles and generator will be regularly maintained; combustion engines will be shut down when not in use; adequate buffer zones will be provided where pollution concentrations is highest to reduce impact of emissions; suitable green belt will be planned around the airport to reduce impact of air pollution; and only vehicles with green sticker confirming to emission standard will be allowed within airport premises.	CAAN/GBA
5.2	Noise nuisance	D	H	SS	LT	IR	Various methods for noise reduction measures as suggested by ICAO will be adopted; plant vegetation and noise barrier wall around the periphery of airport will be constructed to develop green belt to suppress noise of aircraft; and ensure during flight operations that the landing and take-off directions are from west to east and vice versa as development is sparse on the western side of the airstrip. CAAN will enforce development regulations to avoid developments in the air funnel zone in coordination with the Municipality. Declare airport as horn restricted area and use noise dampening materials such as thin rubber/lead sheet for wrapping the work places like compressor and DG rooms. Noise absorbing material in construction of hangers and terminal building will be used and persons working in noisy areas will be provided with ear plugs/mufflers to reduce noise impacts.	CAAN/GBA
5.3	Water quality and groundwater table depletion	D	L	SS	LT	R	Proper care will be given not to extract water in excess of recharge rate; use of water efficient systems will be promoted in the airport terminal; and, if required, roof top rain harvesting system may be adopted.	CAAN/GBA

SN	Environmental Issues	Nature	Magnitude	Extent	Duration	Reversibility	Mitigation Measures	Responsibility
5.4	Wastewater management	ID	L	SS	LT	IR	Wastewater will be treated by augmenting existing septic tank; oil and grease interceptors will be installed at wastewater outlets from the maintenance hangers, building and flight catering; proper drainage for storm water along new runway, taxiway and access roads will be provided and used for recharging groundwater through rainwater harvesting structure; low flow fixtures and appliances will be used for reduced water consumption such as low flush water closets and cisterns and photo-sensitive taps; and generated sewage will be treated in the sewage treatment plant and reused for green belt development, cooling system and floor washing to reduce the fresh water requirement.	CAAN/GBA
Biological Environment								
5.1	Impact on ecology	D	M	SS	LT	IR	The airport management will be careful to use non-hazardous measures to keep birds away from airport by good management of solid waste and control of pest in the field. Spraying of poisonous pesticide will be discouraged, which may kill rodents, reptiles and amphibians found the area. The poison may also affect aquatic lives if washed to water bodies.	CAAN / GBA
Socio-economic and Cultural Environment								
5.1	Solid waste management	D	H	SS	LT	IR	Solid waste from the airport will be currently collected in bins located at various points within the airport. Third party will collect the waste and transport to municipal waste disposal site. These measures will be continued. Vehicles transporting waste will be adequately covered to prevent spillages during transportation. Collection bins will be regularly sprayed with disinfectants. Sludge will be dried and reused as soil conditioner in the garden/agriculture field.	CAAN/GBA
5.2	Fire related emergencies	ID	H	SS	ST	IR	Proper firefighting and rescue arrangement will be established in GBA. A separate crash fire fighting area with all required staff, firefighting equipment and emergency medical supplies will be established within the airport area. Well trained fire fighting crew will always remain at standby to respond to emergency situations. Firefighting vehicles and equipment will be kept ready and well maintained.	CAAN/GBA
5.3	Communicable disease	ID	M	transboundary	LT	R	Follow ICAO provision and international health regulation 2005 of WHO to prevent, protect, control, and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoids unnecessary interference with international traffic and trade. Prepare airport emergency plan, including arrangement with hospitals for emergency treatment and establish emergency operation center in the airport.	MOCTCA/CAAN/GBA
5.4	Induced development impacts	D	H	SS	LT	IR	There could be a tendency to unplanned growth around airport, highway sides and Lumbini area due to influx of tourists after operation of GBA. The local government, particularly Siddhartha Nagar Municipality (SNM), must implement a planned development with zoning concept and strictly control the growth.	SNM
Impacts Related to Introduction of Electrical Vehicle								

SN	Environmental Issues	Nature	Magnitude	Extent	Duration	Reversibility	Mitigation Measures	Responsibility
6.1	Land required for establishing charging station and maintenance depot; covered bus stops	D	H	SS	LT	IR	Land required for EVs shall be public land or right of way of road. If personal property is required, the resettlement plan of the Project will be followed with proper acquisition and compensation.	LDT/MOCTCA
6.2	Impact from manufacturing, operation and recycling of EV	D/ID	H	Global	LT	IR	Proper assessment of environmental and carbon footprint of energy used in processing of EV manufacturing materials and equipment, manufacturing of EVs and their operation and maintenance will be done with assessment of life-cycle impact. EVs manufactured by using fossil fuel will not be procured. Manufacturing of battery will also be assessed with forward and backward linkages.	LDT/MOCTCA
6.3	Socioeconomic impact on current rickshaw puller families	D	H	SS	LT	R	Open and sufficient consultation will be done with the current rickshaw pullers to appreciate their response in switching from human powered rickshaw (which is also a source of clean energy) to solar and electricity powered electric carts. The capital cost, operation and maintenance cost, availability of spareparts in Nepal, and financing facility and loan repayment schedule will be clearly communicated and their response will be collected before implementing the EV component.	LDT/MOCTCA

Note:

Nature	D = Direct	IN = Indirect	
Magnitude	H = High	M = Moderate	L = Low (depending on the scale or severity of change.)
Extent	R = Regional	LC = Local	SS = Site-specific
Duration	LT = Long-term (more than 20 years)	MT = Medium-term (3-20 years)	ST = Short-term (less than 3 years)
Reversibility	R = Reversible	IR= Irreversible	

Legend:

DSC	Design and Supervision Consultant
LDA	Lumbini Development Authority
PMIU	Project Management and Implementation Unit

7.2.2 Environmental Monitoring Plan

176. The proponent (the IA) is committed to adhere to the environmental monitoring parameters in terms of location, schedule and responsibilities as provided in Table 7.3.

Table 7.3: Monitoring Parameters, Location, Schedules, and Responsibilities

Subject	Parameters	Location	Schedule	Responsibilities
Pre-Construction Phase				
Physical Environment				
Air quality	TSP, Particulate	GBA surrounding; Lumbini area	Once during design	Design consultant for the Project
Water quality	Turbidity and pH, DO, BOD,	Ghaghara Khola	Once during design	Design consultant for the Project
Noise and vibration	Intensity measurement	GBA area	Once during design	Design consultant for the Project
Land use	Land use pattern, soil/slope stability	GBA area	Once during design	Design consultant for the Project
Biological Environment				
Avian species	Types of avain species	GBA and Lumbini area including Crane Sanctuary	Once during design	Design consultant for the Project
Aquatic life	Types of aquatic species	Ghaghara Khola; Tinau River	Once during design	Design consultant for the Project
Chemical Environment				
Vehicular emission	Emission level, leakage status	GBA area	Once during design	Design consultant for the Project
Socioeconomic and Cultural Environment				
Demographic characteristics	Population and household including caste, ethnicity and gender	GBA related VDCs	Once during design	Design consultant for the Project
Religion, culture, and festivals	Rituals, religion	GBA related VDCs	Once during design	Design consultant for the Project
Cultural and religious monuments	Temples, historical sites	GBA area	Once during design	Design consultant for the Project
Tourism	Hotels lodge and tourist service facilities	GBA area; Siddhartha Nager Municipality; Lumbini area	Once during design	CAAN
Employment	No of local people involved in different occupation	GBA area; Siddhartha Nager Municipality; Lumbini area	Once during design	CAAN/NTB

Subject	Parameters	Location	Schedule	Responsibilities
Tourist related commercial activities	Selling of consumer, souvenir and other items	GBA area; Siddhartha Nager Municipality; Lumbini area	Once during design	CAAN/NTB
Inflation/ Market Price	Value of land commodities, social services	In and around GBA	Once during design	Design consultant for the Project
Construction Phase				
Physical Environment				
Air quality	TSP, Particulate	GBA area; Lumbini Garden	Quarterly	Supervision consultant for the Project
Water quality	Turbidity and pH, Do, BOD,	Ghaghara Khola	Quarterly	Supervision consultant for the Project
Noise and vibration	Intensity measurement	GBA area	Quarterly	Supervision consultant for the Project
Land use	Area converted to built-up area	GBA area	Quarterly	Supervision consultant for the Project
Waste disposal	Biodegradable/non-biodegradable waste	GBA area	Quarterly	Supervision consultant for the Project
Biological Environment				
Avian species	Types of avain species	GBA area; Lumbini area and Crane Sanctuary	Yearly	Supervision consultant for the Project
Aquatic life	Types of aquatic life	Ghaghara Khola	Yearly	Supervision consultant for the Project
Chemical Environment				
Vehicular emission and other possible leakage of chemicals due to the vehicular movement and bitumen mixing	Chemical and toxic material emisi3n/leakage status	GBA area	Quarterly	Supervision consultant for the Project
Socioeconomic and Cultural				
Population Influx	Migrant number	In and around GBA area	Quarterly	Project/VDC/DDC
Gender	Male/female population in construction works, salary scale, child labour	GBA construction record	Quarterly	Supervision consultant for the Project supported by contractor
Cultural and religious monuments	Temples, historical sites	GBA area	Quarterly	Supervision consultant, VDC record

Subject	Parameters	Location	Schedule	Responsibilities
Tourist traffic	Traffic volume	GBA area	Quarterly	Project/NTB
Hotel, lodge and tourism services facilities	Number increased or decreased	GBA surrounding, Siddhartha Nagar Municipality, Lumbini area	Quarterly	Project/SNM/NTB
Inflation	land value, commodities, social services	In and around GBA area	Quarterly	Project/VDC/DDC
Employment	Number of people employed	GBA area	Quarterly	Supervision consultant for the Project supported by contractor
Solid waste	Waste management	GBA area	Quarterly	Supervision consultant for the Project
Operation Phase				
Physical Environment				
Air quality	TSP, Particulate	GBA area; Lumbini Garden	Once in a year	CAAN/LDT
Water quality	Turbidity and pH, Do, BOD,	Ghaghara Khola	Once in a year	CAAN
Noise and vibration	Intensity measurement	GBA area	Once in a year	CAAN
Land Use	Land sue pattern	GBA area	Once in a year	CAAN
Waste Disposal	Biodegradable/nonbiodegradable waste	GBA area	Once in a year	CAAN
Biological Environment				
Avian species	Types of avain species, their movement around airport cooridor	GBA and Lumbini area	Once in a year	CAAN/LDT
Chemical Environment				
Vehicular emission and other possible leakage	Leakage status, emission level	GBA area; Lumbini area	Once in a year	CAAN/LDT
Socioeconomic and Cultural Environment				
Population influx	Migrant number	GBA area	Once in a year	VDC/SNM
Gender	Gender friendly airport	GBA	Once in a year	CAAN
Cultural and religious monuments	Number of temples, historical sites	GBA area	Once in a Year	VDC
Tourist traffic	Traffic volume	GBA area; Lumbini Area	Once in a year	NTB/LDT

Subject	Parameters	Location	Schedule	Responsibilities
Hotel, lodge and tourism services	Number increased or decreased	In and around GBA area	Two seasons of a year	CAAN/NTB
Inflation/market value	Increase or decrease in land value, commodities, social services	SNM and Lumbini	Once in a year	DDC/SNM
Employment	Number of people employed in tourism related business	GBA area	Once in a year	CAAN/VDC/DDC/SNM
Waste management	Proper disposal of solid waste	GBA area	Once in a year	CAAN/SNM

CAAN = Civil Aviation Authority of Nepal; DDC = District Development Committee; GBA = Gautam Buddha Airport; LDT = Lumbini Development Trust; NTB = Nepal Tourism Board; SNM = Siddhartha Nagar Municipality; VDC = Village Development Committee

7.3 Environmental Auditing

177. As per the EPR, 1997 of GON, MOSTE has the authority to conduct environmental audit of projects within two years of operation. Hence, MOSTE, in consultation with concerned ministries, will carry out environmental auditing of the Project. CAAN will facilitate and support in conducting the audit. MOSTE may hire a team of experts to prepare the audit report.

7.4 Institutional Arrangements

7.4.1 Relevant Institutions

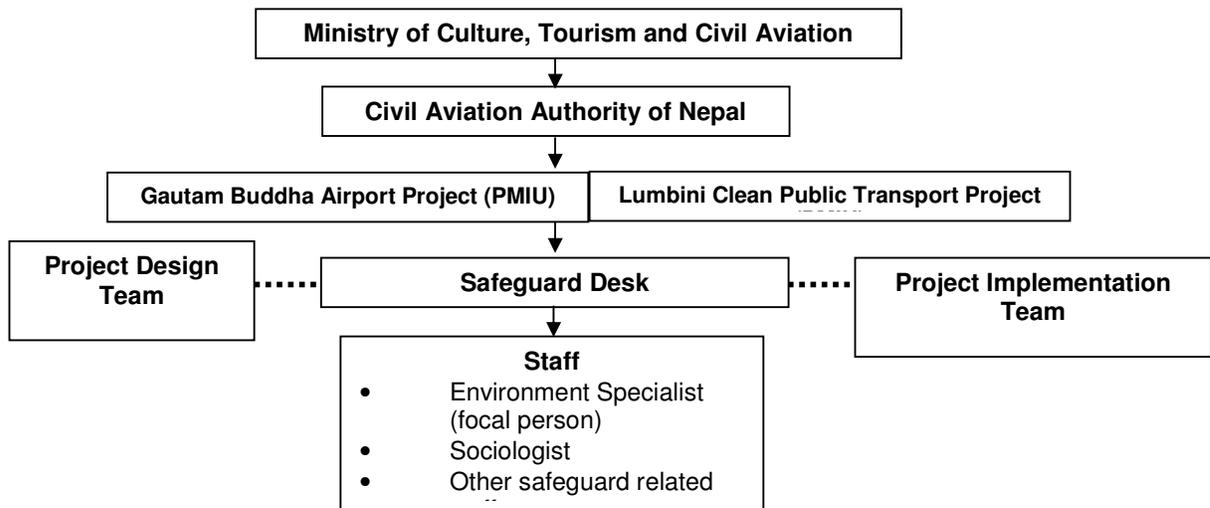
178. Different national agencies are playing pivotal role in development of transport and tourism. The agencies involved in the implementation of the Project and clearance of environmental assessment document are following:

- Ministry of Culture, Tourism and Civil Aviation (MOCTCA)
- Civil Aviation Authority of Nepal (CAAN) as a Proponent with PMIU
- Lumbini Development Trust with PMIU
- Ministry of Science, Technology and Environment (MOSTE)
- Nepal Tourism Board (NTB)

179. MOSTE is the apex body for formulating environmental policy, acts and rules and their enforcement. The EPR has delegated authority of EIA approval to MOSTE and IEE approval to the concerned ministry, i.e. MOCTCA in case of this IEE report.

7.4.2 Organizational Arrangement

180. Sole responsibility of overall project implementation safeguarding environmental lies with MOCTCA, whereas CAAN and LDT are responsible for compliance monitoring of the EMP. A separate Safeguard Desk (SD) will be established in the Project to monitor EMP implementation, coordinate with safeguard and technical team on safeguards compliance, undertake corrective measures, document environment monitoring details, and report progress (Figure 7.1).

Figure 7.1: Organization Arrangement for EMP Implementation

181. Safeguard monitoring shall be done by using the automated safeguard monitoring program prepared by the Nepal Resident Mission of ADB. ADB will provide orientation on use of the program by concerned project staff.

7.4.3 Institutional Strengthening

182. Capacity building and training on environmental safeguards will be organized by the Project for staff of IAs, members of safeguard desk, and other local stakeholders. A draft of training program is presented in Table 7.9.

Table 7.4: Training Modules for Institutional Strengthening on Environmental Management

Programme	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
A. Pre-Construction Stage					
Sensitization workshop	Introduction to environment <ul style="list-style-type: none"> Basic concept of environment Environmental Regulations and statutory requirements as per GON and ADB 	Director General, Chief Engineer Superintending Engineers, Airport Managers of CAAN, PMIU team and SD members	Workshop	1/2 working day	Environment specialist of the consultant; expert resource person. An orientation session by ADB.
Session I					
Module I	Introduction to environment <ul style="list-style-type: none"> Basic concept of environment Environmental Regulations and Statutory requirements as per GON and ADB 	Engineers of CAAN, Airport Managers (CAAN), SD	Lecture	1/4 working day	Environment specialist of the consultant; expert resource person.

Programme	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
Module II	Environmental considerations in airport development projects <ul style="list-style-type: none"> Environmental concerns during construction and operation stages Activities causing pollution during construction and operation stages Good practices in managing environment in airport development projects 	Engineers of CAAN, Airport Managers (CAAN), SD	Workshop	1/4 working day	Environment specialist of the consultant; expert resource person.
Module III	EIA/IEE/EMP <ul style="list-style-type: none"> EIA/IEE and EMP preparation requirement and methodology EMP monitoring Typical mitigation measures 	Engineers of CAAN, and SD	Lecture/ field visits	1/2 working day	Environment specialist of the consultant; expert resource person.
Module IV	Improved coordination with other ministries, departments for approval and implementation of mitigation measures	Engineers of CAAN, Airport Managers (CAAN) and SD	Lecture/ interactive sessions	1/2 working day	Environment specialist of the consultant; expert resource person.
Module V	Special issues in airport development projects	Engineers of CAAN, Airport Managers (CAAN) and SD	Lecture	1/2 working day	Environment specialist of the consultant; expert resource person.
B. Construction Stage					
Session II					
Module VI	Role during construction <ul style="list-style-type: none"> Roles and responsibilities of officials/ contractors/ consultants towards protection of environment Role and responsibility of SD Coordination and networking 	Engineers of CAAN, and SD, and contractors	Lecture/ interactive sessions	1/2 working day	Environment specialist of the consultant; expert resource person.
Module VII	Monitoring and reporting	PMIU (Technical Unit) and SD, and contractors	Lecture/ interactive sessions	1/2 working day	Environment specialist of consultant; expert resource person.

Programme	Description	Participants	Form of Training	Duration/ Location	Training Conducting Agency
Module VIII	Use of automated safeguard monitoring software (NRM)	PMIU staff, consultant, contractor, safeguard desk staff	Lecture/ Practical Sessions	1 day	Environment specialist of the consultant; expert resource person.

7.5 Estimated EMP Budget

183. Cost for implementation of EMP is estimated, which will be included in the project cost.

7.5.1 Cost of Mitigation Measures

184. Mitigation cost does not include cost required for engineering construction works, which will be included in civil works bill of quantities (BOQ). Other costs for implementing EMP measures are presented in Table 7.4.

Table 7.5: Estimated cost for Environment Protection Measures

SN	Particulars	Unit Cost (NRs)	Total Cost (NRs)
1	Tree plantation and improvement in greenery of surrounding environment; tree plantation as vegetative means of sound barrier.	Lump sum	1,000,000
2	Land and property acquisition	Rate agreed by compensation determination committee (CDC)	As per resettlement plan
3	Sign board on safety and HIV/AIDS awareness	Lump sum	50,000
4	Insurance of workers		Contractor's BOQ
5	Occupational Health and Safety measures		Contractor's BOQ
6	Emergency safety measures	Lump sum	500,000
7	Relocation of religious structure		Project cost as per design
8	River training and supporting for regeneration of aquatic ecosystem in rechannelized section of Ghaghara Khola		Project cost as per design
9	Support for improving community infrastructure facility		Project cost as per design
10	Skill development training for 100 persons		100,000
11	Support for women development		50,000
12	Miscellaneous environment protection measure		500,000
	Sub-total		2,200,000
	Contingencies (10% of subtotal)		220,000
	Total		2,420,000

7.5.2 Environment Monitoring Cost

185. Environmental monitoring activities will be conducted by a safeguard desk formed within PMIU (Table 7.5). Estimated cost for monitoring by the Project is in Table 7.6.

Table 7.6: Estimated Cost for Routine Environmental Monitoring and Operation by Safeguard Desk during Construction Stage

SN	Description	Unit	Quantity	Rate(NRs)	Total Amount
1	Personnel				
	Environmental specialist (focal person of SD, intermittent involvement for project period)	Environmental specialist involved as per the agreement with Design and Supervision Consultant			
	Sociologist (intermittent involvement for project period)	Social safe gard expert involved as per the agreement with Design and Supervision Consultant			
	Other experts as and when required	M/M	5	80,000	400,000
	Support staff for supporting SD	Lump sum		Lump sum	200,000
	Subtotal (A)				600,000
2	Office establishment	month	18	–	CAAN will provide office space
3	Furniture			–	CAAN will share the facilities
4	Computer (2) and printer (1)	Number		Lump sum	250,000
5	Office supplies/ consumables	Month	18	10,000	180,000
6	Facilitation cost for inter-agency monitoring team (transportation, per diem)			Lump sum	300,000
	Subtotal (B)				730,000
				Sub-total (A+B)	1,330,000
				Contingencies (10% of subtotal)	133,000
				Total	1,463,000

7.5.3 Impact Monitoring Cost

186. The Project will carry out impact monitoring at the end of project period to assess the implementation of mitigation measures and check their effectiveness. Table 7.7 presents an estimated cost required for impact monitoring.

Table 7.7: Estimated Cost for Impact Monitoring

SN	Description	Unit	Quantity	Rate (NRs)	Total (NRs)	Amount
1	Personnel					
	Environmental specialist (Team Leader)	M/M	2	80,000		160,000
	Civil engineer	M/M	1	60,000		60,000
	Biologist	M/M	1	60,000		60,000
	Socioeconomist	M/M	1	60,000		60,000
	Support staffs	M/M	2	20,000		40,000
2.	Field Measurement					
	Air quality, Noise quality	Sample	1	100,000		100,000
	Water quality	Sample	1	100,000		100,000
3.	Miscellaneous					
	Transportation			Lump sum		30,000
	Report preparation			Lump sum		50,000
	Sub-total					660,000
	Contingency (10% of subtotal)					66,000

SN	Description	Unit	Quantity	Rate (NRs)	Total (NRs)	Amount
	Grand Total					726,000

7.5.4 Environment Audit Cost

187. MOSTE is the responsible agency for conducting environmental audit after 2 years of operation of the Project. An estimated cost for environmental audit is in Table 7.8, which should be provisioned in the project cost.

Table 7.8: Estimated Cost for Environmental Auditing

SN	Description	Unit	Quantity	Rate (NRs)	Total Cost (NRs)
1	Personnel				
	Environment specialist	p-m	2	80,000	160,000
	Civil engineer	p-m	1	60,000	60,000
	Biologist	p-m	1	60,000	60,000
	Socioeconomist	p-m	1	60,000	60,000
	Support (field) staff	p-m	2	20,000	40,000
2	Daily allowance, vehicles, logistics			Lump sum	100,000
3	Office supplies/consumables			Lump sum	50,000
4	Report production			Lump sum	20,000
	Sub-total				550,000
	Contingency (10% of the subtotal)				55,000
	Total				605,000

7.5.5 Summary of EMP and Environment Audit Cost

188. Table 7.9 presents summary of cost for implementation of EMP.

Table 7.9: Summary of Cost for EMP Implementation

SN	Activities	Estimated Cost (NRs)
1	Environmental protection measures	2,420,000
2	Environmental monitoring	1,463,000
3	Impact monitoring	726,000
4	Environment audit	605,000
	Total	5,214,000

8. Public Consultations and Disclosure

189. Public consultations on environmental and resettlement issues were organized by the Project. Consultations with the communities, especially the affected persons (APs) were carried out at different stages of project preparation and environment assessment. The consultation process included (i) preliminary consultations with the communities; (ii) consultations with various government agencies, including Chief District Officer on issues pertaining to the diversion of the Ghaghara Khola, land acquisition and compensation; (iii) census and socioeconomic survey of the APs; (iv) consultations with other APs and communities including the schools, poultry farm, and communities worshipping the local religious shrine required to be relocated; and (v) a formal public hearing for disclosing the findings of IEE.

190. Consultation with public has been going on since the inception of the Project. This IEE has also incorporated the issues recorded during public consultations while preparing

EIA for the purpose of GON and IEE for ADB while processing the original project (before the change in design requiring the proposed additional financing).

191. CAAN published a public notice on Rajdhani, a national daily on 28 March 2006 requesting concerned stakeholders to send their comments and suggestions regarding potential positive and adverse impacts of the proposal. Copies of the notice were also pasted on the notice board of the concerned VDCs, DDCs, schools, health posts, project field office, and affected areas. A public hearing was organized by CAAN in the project area on 30 April 2008, where more than 80 local stakeholders participated along with media persons, local authorities and local political leaders. In the process of preparing the additional financing, public consultation was organized with the concerned stakeholders on 29 July 2013 at the project site. Some of the key issues raised by the local stakeholders during these public consultations were as follows:

- Diversion of the Ghaghara Khola shall be designed with sufficient protection measures to avoid flooding of the area;
- Expansion of the airport shall be designed with proper drainage facilities such that the surrounding lands, agricultural fields and houses would not be in risks of flooding;
- Compensation rate shall be commensurate with the market value;
- The process for obtaining compensation shall be simple without requiring long time;
- The Project will impact a school building. Thus, an alternate site for siting of the school near to the current location shall be provided by the Project; and
- Rickshaw pullers in Lumbini are interested in replacing manual rickshaw with electric carts.

192. The local people were informed by the Project that the issues pertaining to flood and drainage will be addressed in the detailed engineering design, and that the Project will have mechanisms in place to address land acquisition and compensation related issues along with provision of grievance redress mechanism. Also, proper possible measures for minimizing impact of noise from the aircraft while landing and take-off will be included in the design and implemented.

8.1 Public Consultations

193. Focus group discussions were held during preparation of the original project to acquire desired information at the various locations of the project site. Key informant interviews including those with seriously project affected families were also organized. As the additional financing does not require acquisition of additional land, the results of the original consultations are still valid for the additional financing.

Table 8.1: Summary of Past Consultations

Consulted Persons, Location and Date	Total No. of Participants	Summary of Major Points and Issues discussed
Parag Urau, Principal, Buddha English School, 30 July 2013		<ul style="list-style-type: none"> • Compensation received for school property. A new school with RCC structure is being constructed behind the acquired old school building.
Tilak Ram Tharu and Dalli Tharu, GBA office, 30 July 2013		<ul style="list-style-type: none"> • Received compensation for land. • Compensation for cowshed and mud walled residential building is remaining.
Rupandehi	A dozen local	<ul style="list-style-type: none"> • Upgrading of GBA to international standard will play a

Consulted Persons, Location and Date	Total No. of Participants	Summary of Major Points and Issues discussed
District Chamber of Commerce and Industries (DCCI) office, 29 July 2013	businessmen and DCCI representatives	<p>catalytic role in development of the entire western development region.</p> <ul style="list-style-type: none"> • Due to Lumbini, Siddhartha Nagar is an important touristic religious place for Buddhists all over the world. Direct flights from Japan, Korea, Thailand, Myanmar, and Sri Lanka will directly bring scores of tourists by air once GBA is upgraded to an international standard. • Location of special economic zone and other increasing industrial, trade and commercial activities will get a boost due to availability of an airport of international standard.
GBA Office 29 July 2013	9 local stakeholders and 3 GBA officials	<ul style="list-style-type: none"> • Proper design measures should be taken to minimize sound from aircraft during landing and take-off. • Embankment protection should be done in the river bank of Tinau River and Ghagar Khola to prevent flooding in the area. • Local people should be given priority in labor work in the construction activity. • Local people have full support for the Project.
Hatibangai VDC, Siddhartha Nagar Municipality 23 June 2008	26 (included APs)	<ul style="list-style-type: none"> • The APs are well aware of the proposed international airport coming in Siddhartha Nagar. Information regarding the Project was disseminated to them through visits and consultations by CAAN officials and media. • People are ready to part with their land voluntarily for the proposed international airport in return of similar land in the nearby areas or suitable compensation packages, and job for one of the educated members of the affected family. • People want the current market rate to be taken into consideration by the Government for paying the compensation. • Further, the APs would like to receive full payments for their land at one time rather than in installments over a period. • In case where more than 75% of their land is going to be acquired, AP would like CAAN to acquire the remaining land also, as it is not economical for them to cultivate on the remaining small patch of land.
Dharmapur Tola, Ward 10, Bhujouli, Siddharthanagar Municipality 24 June 2008	75 (included APs, ward secretaries, and local political leaders)	<ul style="list-style-type: none"> • APs want CAAN to allow the original land owners to cultivate their land after completion of the process of acquisition and payment of compensation and before the initiation of the actual project work rather than the current practice of leasing out the acquired land by CAAN through bidding. • People advised the Project to relocate the school building before dismantling. • APs would like to have land for land if land is available close to their existing place of residence. In case land is not available, then they want enough cash compensation to buy similar proportion of land elsewhere in Nepal.
Shankarpur, Ward 10, Siddhartha Nagar Municipality 28 June 2008	15 (included APs people)	<ul style="list-style-type: none"> • People had confusion regarding the plots of land to be acquired and the boundary marked by CAAN officials.

Consulted Persons, Location and Date	Total No. of Participants	Summary of Major Points and Issues discussed
Founder Principal of Buddha Tara English School, Dharampur 29 June 2008	One	<ul style="list-style-type: none"> • The founder principal is the owner of the land on which the school is constructed. • Around 300 students are currently enrolled in the school. • Altogether 9 teachers are employed by the school with their salary structure varying between NRs3,500-4,000/month. • The owner has no other income source other than from his school. • The school structure hasn't been cleared by the municipality since it has been constructed within the airport zone. • The owner has agreed to shift voluntarily. He wants suitable compensation for the land and the structure so that he can relocate the school in close proximity. He owns another 6 kattha of unaffected land nearby.
Rupandehi Chief Distrit Officer (CDO) Mr. Dhruva Raj Wagle 24 and 29 June 2008	One	<ul style="list-style-type: none"> • Information regarding land acquisition is given through national newspaper and in consultations with Aps. • A Compensation Determination Committee (CDC) is formed with the CDO as the Chair. The committee includes representations from: <ol style="list-style-type: none"> a. Survey Office b. Land Registration Office c. Siddhartha Nagar Municipality d. Representation from the APs and political parties. e. Implementing agency. • Land acquisition is done based on the Land Acquisition Act, 1978. • In case AP does not have land record in his/her name but is cultivating the land or residing there for long, the AP needs to give an application to the land record office. The application will be investigated by the CDC through consultations, and land records transferred accordingly. • In case where one household has multiple plots of land in different names and all are getting affected, compensation will be paid to each land owner. • In case where one household has land in one persons name the compensation will be paid to the land owner with a signed agreement from him/her of sharing the money with all his family members. • In case the affected land has been leased out by owner, the owner gets the compensation for the land value whereas the lessee gets compensated for his/her investments on the land. • No special provision for squatters or encroachers occupying land except for compensation to move their structure elsewhere. No special provision for women headed households. • In case AP is not satisfied with the compensation package he/she can take grievance to Greviance Redress Committee of the Project, the Home Ministry, or can appeal in the Court.

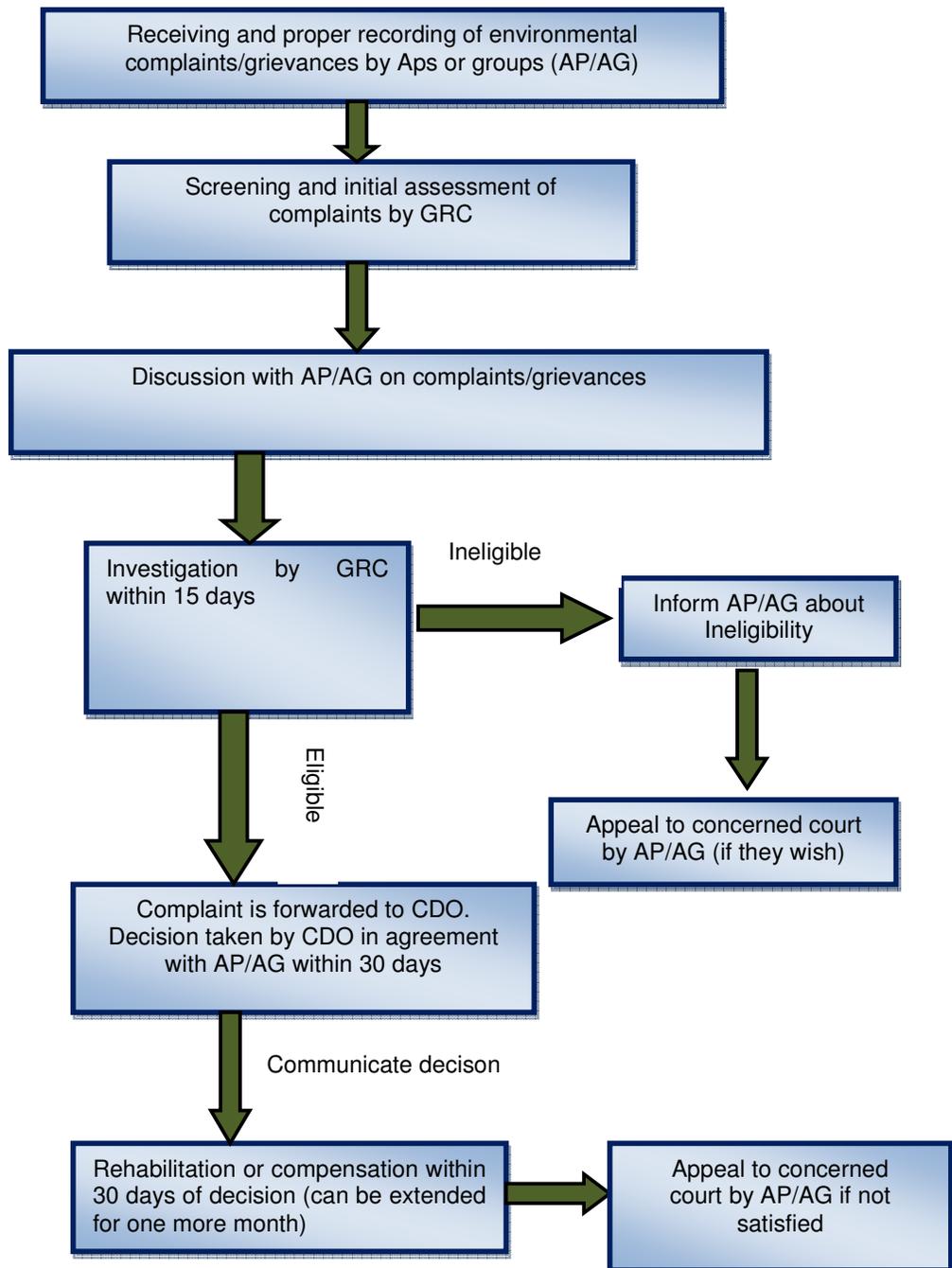
8.2 Public Notification

194. After completion of design works with the final Master Plan in 2012, CAAN published a public notification in Rajdhani national daily on 28 September 2012 informing concerned stakeholders on the planned development of the GBA, and requested to solicit their concerns and suggestions.

9. Grievance Redress Mechanism

195. During the course of the project implementation and operation, people may have concerns and issues with the Project's environmental performance. These will be addressed by the Project by establishing a grievance redress mechanism. Any concerns needs to be addressed quickly and transparently, and without retribution to APs or community. The Project will establish a grievance redress committee (GRC) and adopt the following process as an attempt to sort out any grievances directly at project level, to the extent possible. If this cannot be resolved at local level, the grievance moves to the resolution following a process outlined below.

Figure 9.1: Grievance Redress Procedure



196. Most complaints during construction are expected to be related to land acquisition and compensation, which has been almost completed by the IA. The resettlement plan has been updated, with only a few absentee land holders remaining to turn up to receive their compensation amount. In general, the complainant will register their complaint with the Grievance Redress Committee (GRC) led by Chief District Officer (CDO), and having project engineer, VDC representative, safeguard desk focal person, AP and concerned government line agency as an invitee. All complaints raised to the GRC will be entered in a register by date, name, contact address, and reason of complaint. A duplicate copy of the entry is given to the AP for record at the time of registering the complaint. The register will show who has been directed to deal with the complaint and the date when this was made together with the date when the AP was informed of the decision and how the decision was conveyed to the AP. The register is then signed by the person making the complaint. The duplicate copy given to the AP will also show the procedure that will be followed in assessing the complaint, together with a statement affirming the rights of the AP to make a complaint. No cost will be charged to the AP for making a complaint.

197. The GRC will first discuss the issue with the DSC and contractor, as applicable, on the complaint and try to resolve the matter at field level within a maximum of seven days. If required, the complaint will be discussed with the Site Chief of the IA and PMIU, and make efforts to resolve the matter in consultation with the AP/AG. If the complaint is dismissed, the AP will be informed of their rights in taking to next step. A copy of the decision will be kept for record, and status is reported in routine progress report.

198. If the AP/AG is not satisfied, the GRC may take the complaint to the CDO in accordance with Section 17 of the Environment Protection Act, and as stipulated in Rule 45 of the Environment Protection Rules. The matter will be mutually discussed, and all efforts shall be made to resolve the matter as per the fact supported by evidences.

199. If the AP/AG is still not satisfied with the decision made by GRC and CDO, they may take the complaint to legal course, apply at the Appellate Court, and finally to the Supreme Court for a final decision.

10. Conclusions and Recommendations

200. The IEE of the proposed GBA upgrading subproject in Siddhartha Nagar and establishment of CPTS in Lumbini do not lie in any environmentally sensitive area, and these will not have major adverse environmental impacts. Those adverse impacts predicted are of low significance and short-term, as well as of reversible in nature. The beneficial impacts that come with the upgrading of GBA and establishing CPTS will enhance tourism industry and regional integration supporting improved quality of life of the people. In addition, local people will get direct employment as workers, which will significantly contribute to improving their livelihood. The benefits from the proposed investments are more significant and long-term compared to the adverse impacts, most of which can be mitigated or avoided. Relevant issues raised during public consultations have also been addressed in the mitigation measures.

201. Findings of the IEE have indicated that none of the anticipated environmental impact by upgrading of GBA and establishing CPTS is significant enough to need a detailed follow-up EIA. Therefore, this IEE is sufficient for approval of the additional financing. Hence, upgrading of GBA to an international standard in Siddhartha Nagar and establishment of

CPTS in Lumbini are recommended with incorporation of the environmental management plan.

Appendix 1: REA Checklist

Rapid Environmental Assessment (REA) Checklist

Country/Project Title: Nepal: South Asia Tourism Infrastructure Development Project (Nepal Portion) - Additional Financing

Sector Division: Nepal Resident Mission, South Asia Regional Department

Screening Questions	Yes	No	Remarks
A. PROJECT SITING IS THE PROJECT AREA ADJACENT TO OR WITHIN ANY OF THE FOLLOWING ENVIRONMENTALLY SENSITIVE AREAS?			
▪ Cultural Heritage Site		√	Lumbini, the birthplace of Lord Buddha, and a world heritage site is about 20km away from GBA. Operation of electric vehicle will not require any physical construction. Clean energy vehicles will assist in reducing air pollution in the area.
▪ Protected Area		√	
▪ Wetland		√	
▪ Mangrove		√	
▪ Estuarine		√	
▪ Buffer Zone of Protected Area		√	
▪ Special Area for Protecting Biodiversity		√	
B. POTENTIAL ENVIRONMENTAL IMPACTS WILL THE PROJECT CAUSE...			
▪ Encroachment on precious ecology resulting in loss or damage to terrestrial or aquatic habitats (e.g., wetlands or sensitive or protected areas)?		√	
▪ Encroachment on historical/cultural monuments or areas?		√	
▪ Decrease in value of land in the area due to noise and other nuisances such as traffic congestion and degradation of environmental aesthetics?		√	The land price is in an increasing trend due to the news of GBA being upgraded to an international standard. Price has almost quadrupled since last three years.
▪ Dislocation or involuntary resettlement of people?	√		Proper resettlement plan is prepared. Almost 95% APs have taken their compensation, and the remaining are absentees or land without proper ownership.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> Disproportionate impacts on the poor, women and children, IPs or other vulnerable groups? 		√	
<ul style="list-style-type: none"> Noise and vibration disturbances? 	√		The settlement at the front of airport is at 200m distance. But, the settlements are about 1km away in the east, west and south.
<ul style="list-style-type: none"> Short-term ecological disturbances such as soil erosion, water quality deterioration (surface and groundwater), air pollution, noise and vibrations from construction equipment? 	√		Not significant, and is confined to construction site.
<ul style="list-style-type: none"> Creation of slum communities following airport construction? 		√	No slum communities are present around GBA todate.
<ul style="list-style-type: none"> Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation? 	√		Not significant, and is confined to construction site, and workers camp. Contract will be ICB and the site will be managed as per requirements prescribed in contract agreement.
<ul style="list-style-type: none"> Communicable disease hazards? 		√	Low risk and mitigable.
<ul style="list-style-type: none"> Accidental disruption of utilities? 		√	Planned development of road along periphery of the GBA, and some electric poles will require relocation.
<ul style="list-style-type: none"> Traffic congestion at airport access and exit? 		√	
<ul style="list-style-type: none"> Short-term air quality degradation due to dredging-related operations? 		√	
<ul style="list-style-type: none"> Noise and vibration due to aircraft take-off and landing? 	√		The settlement at the front of airport is at 200m distance. But, the settlements are about 1km away in the east, west and southern direction. People have requested to design required measures to reduce sound by constructing vegetative and structural sound barriers.
<ul style="list-style-type: none"> Social conflicts if workers from other regions or countries are hired? 	√		Priority will be given to hire workers from members of affected households.
<ul style="list-style-type: none"> Large population influx of construction causes increased burden on social infrastructure and services (such as water supply and sanitation systems)? 		√	
<ul style="list-style-type: none"> Hazards to traffic on highways near airport due to proximity of planes taking off and landing? 		√	

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> Risks to community health and safety due to the transport, storage, and use and/or disposal of materials likely to create physical, chemical and biological hazards during construction and operation? 		√	
<ul style="list-style-type: none"> Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the Project (e.g., runways) are accessible to members of the affected community or where their failure could result in injury to the community throughout GBA construction, operation and decommissioning? 		√	

Climate Change and Disaster Risk Questions	Yes	No	Remarks
<p>The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.</p>			
<ul style="list-style-type: none"> Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)? 	√		Nepal is located in a high seismic risk zone. Proper seismic design safety factors will be applied to address this risk.
<ul style="list-style-type: none"> Could changes in precipitation, temperature, salinity, or extreme events over the Project lifespan affect its sustainability or cost? 		√	
<ul style="list-style-type: none"> Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (e.g. high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)? 		√	
<ul style="list-style-type: none"> Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., increasing traffic or housing in areas that will be more prone to flooding, by encouraging settlement in earthquake zones)? 		√	

Appendix 2: Demographic Profile of Project Area

GBA is located in Ward No. 10 of the Siddhartha Nagar Municipality, which comprises 389 households and 2,543 population. The extended land lies in Ward No. 1 of Hatibangai VDC with 163 households and 1,139 population. Details are provided below.

Population of Rupandehi District, Siddhartha Nagar Municipality and Hatibangai VDC

Description	No. of HH	Total Population	Male	Female
Rupandehi District	163,916	880,196	432,193	448,003
Percentage			49.10	50.90
Siddarth Nagar Municipality	12,497	63,483	31,673	31,810
Percentage			49.89	50.11
Hatibangai VDC	1,247	7,954	4,011	3,943
Percentage			50.42	49.58

Source: National Population and Housing Census, 2011

Demographic Pattern of Siddhartha Nagar Municipality

Ward No.	No. of HHs	Male	Female	Total	Percentage	
					Male	Female
1	1,066	2,787	2,918	5,705	48.85	51.15
2	498	1,446	1,559	3,005	48.12	51.88
3	1,285	3,324	3,300	6,624	50.18	49.82
4*	813	2,493	2,407	4,900	50.88	49.12
5	193	538	513	1,051	51.19	48.81
6	1,633	4,543	4,488	9,031	50.30	49.70
7	952	2,016	1,974	3,990	50.53	49.47
8	2,078	4,421	4,451	8,872	49.83	50.17
9	1,352	3,396	3,472	6,868	49.45	50.55
10*	467	1,495	1,437	2,932	50.99	49.01
11	335	1,204	1,183	2,387	50.44	49.56
12	886	1,972	1,995	3,967	49.71	50.29
13	939	2,038	2,113	4,151	49.10	50.90
Total	12,497	31,673	31,810	63,483	49.89	50.11

Source: Census Report, 2011

Demographic Pattern of Hatibangai VDC*

Ward No.	No. of HH	Male	Female	Total	Percentage	
					Male	Female
1	198	725	644	1,369	52.96	47.04
2	109	390	354	744	52.42	47.58
3	103	264	301	565	46.73	53.27
4	274	683	726	1,409	48.47	51.53
5	179	504	494	998	50.50	49.50
6	105	362	381	743	48.72	51.28
7	87	336	332	668	50.30	49.70
8	79	329	303	632	52.06	47.94
9	113	418	408	826	50.61	49.39
Total	1,247	4,011	3,943	7,954	51.68	48.32

Source: Population Census, 2011

* Project Area

Population Distribution by Age Group and Sex

Age Groups (Years)	Siddhartha Nagar Municipality			Hatibangai VDC		
	Male	Female	Total	Male	Female	Total
0-4	2,511	2,390	4,901	411	357	768
5-9	3,296	3,018	6,314	509	455	964
10-14	3,854	3,588	7,442	561	506	1,067
15-19	3,740	3,599	7,339	498	466	964
20-24	3,208	3,338	6,546	335	373	708
25-29	2,897	3,220	6,117	285	338	623
30-34	2,485	2,600	5,085	241	277	518
35-39	2,261	2,303	4,564	215	251	466
40-44	2,089	1,819	3,908	174	208	382
45-49	1,607	1,513	3,120	191	182	373
50-54	1,389	1,272	2,661	150	143	293
55-59	980	907	1,887	130	108	238
60-64	851	855	1,706	107	103	210
65-69	586	563	1,149	97	93	190
70-74	442	430	872	60	44	104
75 & above	475	480	955	47	39	86
Total	32,671	31,895	64,566	4,011	3,943	7,954

Source: Population Census, 2011

Agricultural Production in Siddhartha Nagar Municipality and in Rupandehi District

Crop	District		Siddhartha Nagar Municipality	
	Area (ha)	Production (MT)	Area (ha)	Production (MT)
Paddy	72,900	15,390	1,859	5,391.1 (2.9/ha)
Wheat	30341.5	60,683	950	2,565 (2.7/ha)
Corn	1,979	1,979		
Dalhan (Dal)	5,527	2,745	85	85 (1.0/ha)
Telhan (Oil seed)	5,683	3,885	350	245 (0.7/ha)
Potato	2,365.5	23,655	55	715 (13/ha)
Vegetables	1,505	15,802.5	25	375 (15/ha)
Fruits	849	4,245	NA	NA

Source: Siddhartha Nagar Municipality Profile, 2006

Appendix 3: Public Hearing at Project Area

SN	Name, Address and Date	Issues Raised
1	Parag Urau, Principal, Buddha English School 30 July 2013	<ul style="list-style-type: none"> • Compensation received for school property. A new school with RCC structure is being constructed behind the acquired old school building.
2	Tilak Ram Tharu and Dalli Tharu 30 July 2013	<ul style="list-style-type: none"> • Received compensation for land. • Compensation for cowshed and mud-walled residential building is remaining.
3	A dozen local businessmen and Rupandehi DCCI officials, Siddhartha Nagar 29 July 2013	<ul style="list-style-type: none"> • Upgrading of GBA to an international standard will play a catalytic role in development of the entire western development region. • Due to Lumbini, Siddhartha Nagar is an important touristic and religious place for Buddhists all over the world. Direct flights from Japan, Korea, Thailand, Myanmar, and Sri Lanka will bring scores of tourists by air once GBA is upgraded to an international standard. • Location of special economic zone and other increasing industrial, trade and commercial activities will get a boost due to availability of an airport of international standard.
4	Shakti P. Thakali, Vijay N. Dhawal, Hari R. Kohar, Ram P. Dhobi, Ram U. Yadav, Trijugi Koiri, Pahalad Barai from SNM; and Nathu P. Yadav and Binod Yadav from Hatibangai VDC 29 July 2013	<ul style="list-style-type: none"> • Proper design measures should be taken to minimize noise from aircraft during landing and take-off.; • Embankment protection should be done in the bank of Tinau River and Ghagar Khola to prevent flooding in the area. • Local people should be given priority in labor work in the construction activity. • Local people have full support for the Project.
5	Bikramaditya Pandey, Hattibangai VDC Ward No. 1 30 July 2013	<ul style="list-style-type: none"> • Positive on the extension and development of GBA and ready to hand over his land to GON without any special demand. • Advised to distribute the compensation through the GBA office by forming special task force for the compensation for their acquired land by GBA. • Not to elevate the airport area, which can flood the nearby agricultural and residential lands.
6	Satish K. Chaudhary Siddhartha Nagar Municipality, Ward No. 4, Kachrihawa, Bhairhawa 30 July 2013	<ul style="list-style-type: none"> • Noise pollution that can be created by heavy aircraft after upgrading of GBA. So, to reduce the level of noise pollution proper technology, rules and regulations have to be implemented. • The status of Ward No. 8 and 10 of the Siddhartha Nagar Municipality, which are less developed compared to other wards because of their remote location and lack of facilities. So, the two wards should not be ignored after upgrading of GBA. • Pay reasonable compensation to land as per the rules created by CDC with participation of local people, political parties member and local government body.
7	Lekhat B. Thapa,	<ul style="list-style-type: none"> • Risk exists of not getting reasonable compensation. Advised government

	Siddhartha Nagar Municipality, Ward No. 4, Kachrihawa 30 July 2013	officials and donor institutions to visit the project area, understand real problems and demand of local people, and take decisions accordingly.
8	Nathu Ram Hattibangai VDC, Ward No. 1 30 July 2013	<ul style="list-style-type: none"> • Risk of not getting compensation on time. Survey and Land Revenue Office staff are delaying with corruption intentions. Advised to create a special task force for reasonable distribution of compensation by GBA office.
9	Krishna Shakya Siddhartha Nagar Municipality, Ward No. 4 30 July 2013	<ul style="list-style-type: none"> • Wanted to develop a park in between the north boundary of GBA and adjoining road, where this area is currently used as a wasteland. • Need to develop standards and guidelines for construction of houses nearby the airport so that heavy aircraft will not disturb or damage the houses to be constructed in future.
10	Madhav P. Adhikari, Priest, Siddhartha Nagar Municipality, Ward No. 4, Dharmapur 30 July 2013	<ul style="list-style-type: none"> • He is the priest of Kalimai temple, which is located just south of the Airport. His concern was to have the land of temple as a guthi land, not in a name of any individual. He asked the airport authority and other government officials to take special note regarding this.
11	Babulal Yadav Siddhartha Nagar Municipality, Ward No. 4, Kachrihawa 30 July 2013	<ul style="list-style-type: none"> • he does not have a drawing of his house, so he was in a dilemma of whether he will be able to get compensation of his home or not. Again he added that the road condition of the adjoining will be properly maintained and developed.
12	Bijaya Dhawal Siddhartha Nagar Municipality, Ward No. 10	<ul style="list-style-type: none"> • After the demolition of school building new school building has to be constructed nearby the area of current location. So, he cautioned the concerned authorities not to spoil the future of school children.

Photograph of Public Hearing



29 July 2013



June 2008

Appendix 4: Public Notification 28 September 2012

सामाजिक राजधानी दैनिक



राजधानी

काठमाडौं, धरान र बुटवलबाट एकैसाथ प्रकाशित

क ११७, काठमाडौं शुरुबार १२ असोज २०६२, नेपाल संवत् १९३२ | www.rajdhani.com | Email : rajdhani@caanepal.org | RAJDHANI Nepali National Daily | Kathmandu, Friday 28 September 2012 | पृष्ठ : C+8 कृपया रु. ५/-

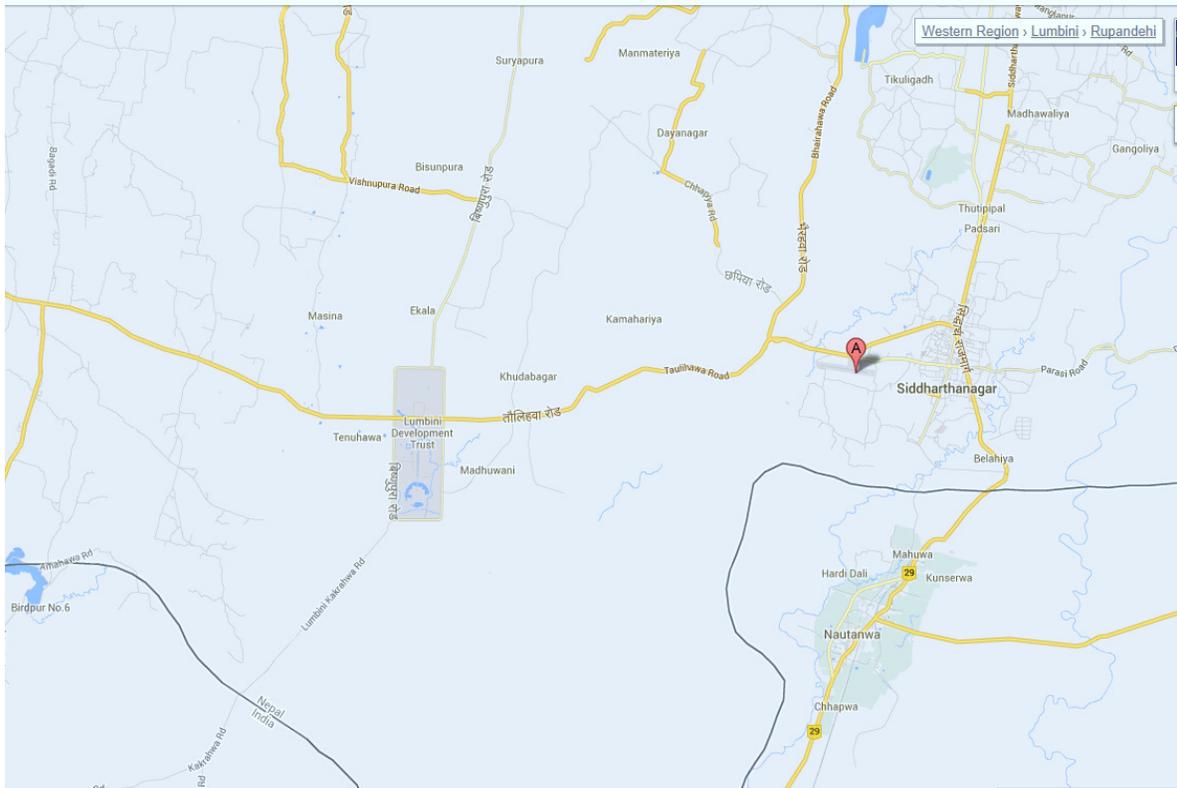
बेदधिक गोजगर विभागबाट थम स्वीकृत
साथ बेदधिक गोजगरमा ज्ञानुपदेख ।
'यसरी गएमा काठमाडौंमा पर्दा उद्वे
सकन्छ, दुपेटमा पर्दा विना लगायत
आधिक सहायता र हतियारी पाइन्छ ।
संयोजक : राजधानी दैनिक ।
गलत कागजात लगाएर वा visit visa
चिपरी विमानस्थल प्रयोग गरेर जानु
उनीमा पर्न वा हिसामा पर्न सकिन्छ ।
राजधानी दैनिक, काठमाडौं ।
अनामनाथ, काठमाडौं ।

गौतमबुद्ध विमानस्थल, भैरहवाको
वातावरणीय अध्ययन प्रतिवेदन बारे
सार्वजनिक सूचना

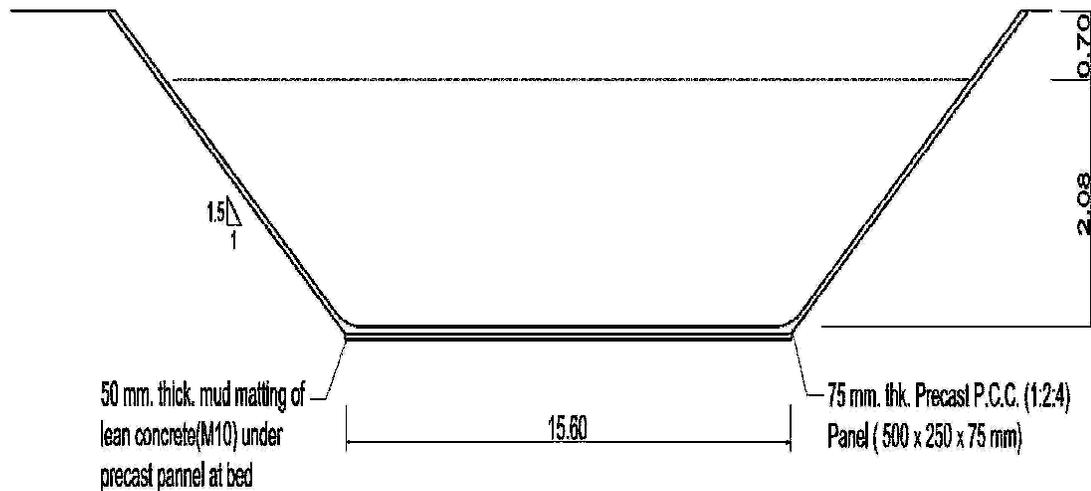
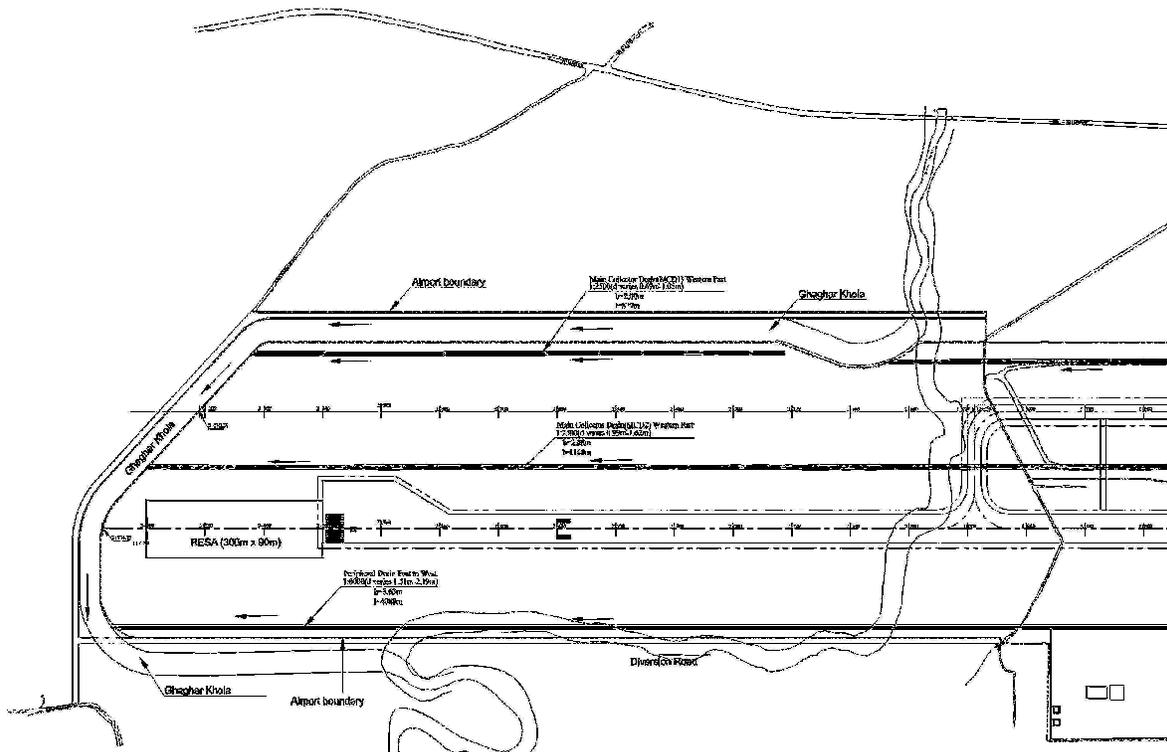
उपरोक्त विषयमा हाल अवस्थित गौतमबुद्ध विमानस्थललाई विस्तार गरी
क्षेत्रीय स्तरको अन्तर्राष्ट्रिय विमानस्थलको रूपमा रूपमा विकास गर्न आवनमान
३००० मी लम्बाई र ७५ मी चौडाईको बनाउने योजना सर्वोदित छ । उक्त
प्रयोजनको लागि वातावरणीय मूल्यांकन प्रतिवेदन तयार गरी उक्त प्रतिवेदन
समेत वातावरण, विज्ञान, तथा प्रविधि मन्त्रालयबाट स्वीकृत भैसकेको छ ।
गौतमबुद्ध विमानस्थल सुदृढिकरण आयोजना अन्तर्गत स्तर उन्नतीको डिजाईन
कार्य सम्पन्न भैसकेको र अब निर्माण चरणमा जान लागेका कुरा सम्पूर्ण
सरोकारवालाहरूलाई जानकारी गराउँदछौं । तयार निर्माण पूर्व उक्त प्रतिवेदनमा
सम्बन्धीत व्यक्ति वा सरोकारवालाहरूको कुनै राय नुमाव भए तनको उठातासा
पढाइनुहुन हार्दिक अनुरोध गर्दछौं ।

गौतमबुद्ध विमानस्थल सुदृढिकरण आयोजना
गौतमबुद्ध नागरिक उड्डयन बोर्डाले
भैरहवा, रुपन्देही
फोन नं. ०५१-५२०११०, फ्याक्स : ०५१-५२०११०
ईमेल : gau@caanepal.org.np

Appendix 5: Map of Project Area including GBA and Lumbini



Appendix 6: A Schematic Diagram of Ghaghara Khola Diversion



Ghaghara Khola Typical Section
 (Slope = 1:3600, length = 2500 meter)