EIA Technical Review Guidelines: Energy Generation and Transmission

Volume I Part 2
Example EIA Terms of Reference

Regional Document prepared under the CAFTA DR Environmental Cooperation Program to Strengthen Environmental Impact Assessment (EIA) Review

Prepared by CAFTA-DR and U.S. Country EIA and Energy Experts with support from:

USAID FROM THE AMERICAN PEOPLE | USAID ENVIRONMENT AND LABOR EXCELLENCE FOR CAFTA-DR PROGRAM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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The EIA Technical Review Guidelines for Energy Power Generation and Transmission were developed as part of a regional collaboration to better ensure successful identification, avoidance, prevention and/or mitigation of potential adverse impacts and enhancement of potential beneficial impacts of proposed energy projects undergoing review by government officials, non-governmental organizations and the general public throughout the life of the projects. The guidelines are part of a broader program to strengthen environmental impact assessment (EIA) review under environmental cooperation agreements associated with the "CAFTA-DR" free trade agreement between the United States and five countries in Central America and the Dominican Republic.

The guidelines were prepared by regional experts from the CAFTA-DR countries and the United States in both the government organizations responsible for the environment and energy and leading academics designated by the respective Ministers supported by the U.S. Agency for International Development (USAID) contract for the Environment and Labor Excellence Program and grant with the Central America Commission for Environment and Development (CCAD). The guidelines draw upon existing materials from within and outside these countries and from international organizations and do not represent the policies, practices or requirements of any one country or organization.

The guidelines are available in English and Spanish on the international websites of U.S. Environmental Protection Agency (U.S. EPA), the International Network for Environmental Compliance and Enforcement (INECE), and the Central American Commission on Environment and Development (CCAD): www.epa.gov/oita/ www.inece.org/ www.sica.int/ccad/ Volume 1 contains the guidelines with a glossary and references which track with internationally recognized elements of environmental impact assessment; Volume 2 contains Appendices with detailed information on energy power generation and transmission, requirements and standards, predictive tools, and international codes; and Volume 1 Part 2 contains example Terms of Reference cross-referenced to Volumes 1 and 2 for 1) thermal/combustion power generation, 2) hydroelectric power generation, 3) other renewable power sources i.e. geothermal, wind and solar, and 4) transmission projects respectively for use by the countries as they prepare their own EIA program requirements.

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EXAMPLE TERMS OF REFERENCE (TORs)

Terms of Reference are used by countries to describe both general and specific expectations for the preparation of an environmental impact assessment, in this instance tailored to proposed projects for the generation and transmission of electric power. Volume 1, Part 2 contains example Terms of Reference (TORs) cross-referenced to Volumes 1 and 2 of the "EIA Technical Review Guideline for Energy Power Generation and Transmission Projects". It is printed separately to facilitate use by countries as they prepare their own EIA program requirements for energy power generation and transmission projects.

Four example Terms of Reference (TORs) are provided below:

In each of the example TORs there is an overview section that describes general expectations for the preparation of an environmental impact assessment. This is followed by sections addressing each element of the EIA analysis and documentation including details on what should be included in the description of the proposed project and alternatives; environmental setting; assessment of impacts; mitigation and monitoring measures; an environmental management plan; a signed commitment statement; and key supporting materials.

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1 TERMS OF REFERENCE (TOR) FOR THERMAL/COMBUSTION POWER GENERATION PROJECTS

A. OVERVIEW

These terms of reference (TOR) describe the minimum requirements for the preparation of the Environmental Impact Assessment (EIA) for proposed thermal power plants that convert the combustion of fuel (coal, oil, natural gas, biomass, etc.) into electrical power. Both the TOR and the cross referenced "*EIA Technical Review Guidelines for Energy Power Generation and Transmission Projects*" should be used to establish minimally acceptable conditions for satisfying the requirement to submit an EIA. There are four different TORs for energy projects which are designed with a common overview and distinct TORs for different types of energy power generation and transmission. Part A, Overview, is common to all of them but Part B is tailored respectively to: 1. Thermal/Combustion Power Generation Projects, 2. Hydropower Generation Projects, 3. Other Renewable Energy Generation Projects, and 4. Transmission Lines. The four TORs are structured to facilitate mixing and matching as appropriate to the purpose and need for a proposed project and alternatives.

The basic format for the EIA document that should be followed is:

- Table of Contents
- Acronyms and Abbreviations
- Executive Summary
- General Information
- Project and Alternatives Description
- Environmental Setting
- Assessment of Impacts
- Mitigation and Monitoring Measures
- Environmental Management Plan
- Commitment Statement
- Annexes

In general, the EIA must identify and address:

- Applicable environmental standards, norms, and requirements set forth at the international, national, regional and/or local levels including those designed to meet the objectives of resource management and/or land use plans that may be in effect in and around the jurisdiction(s) in which you propose to develop the project and in which the proposed project might have a potential impact. In the absence of such standards, identify a set of benchmarks that can be used in the analysis and the basis for your selection. The guideline identifies standards in use by various countries and international organizations in Appendix C.

- Public/Stakeholder concerns related to impacts in and around the proposed project and alternatives at least for stakeholders within the geographic scope of potential impact. The project proponent should document specific steps taken to engage the public and other stakeholders, and engage these publics as early as possible before undertaking to prepare the EIA. Concerned publics include: local governments, persons living and working in the vicinity of the project, those with interests in resources that may be affected i.e., indigenous peoples, and those concerned about protected areas and prime agricultural lands. A summary of public outreach activities, audience, number of persons, organizations involved, concerns raised, responses to comments and actual copies of written comments received should be included in the Annex.

- All relevant plans related to the proposed energy project, for example, engineering and site preparation plans, operations and decommissioning/closure, environmental management, and mitigation in whatever form these may take.

- All phases of the project from feasibility studies to site preparation to operations to closure and also plans to expand capacity at the current or adjacent sites.

- Alternative approaches to meeting the purpose and need for the proposed energy project include alternative fuels (including renewable fuels), siting, designing, constructing, operating and closing the project firstly to avoid and prevent, or secondly to reduce or minimize adverse or improve beneficial environmental or socioeconomic impacts. The EIA should assess as appropriate the impacts of a range of reasonable and technically feasible alternatives as well as the proposed project. The alternatives to the project must include a "no action" alternative, indicating what would happen in the absence of the proposed project as well as consideration of best practices that may not otherwise have been incorporated in the proposed project. Other alternatives should be developed as needed to address significant issues with the proposal.

- Direct, indirect and cumulative impacts and their significance level.

- Uncertainty and how that uncertainty will be addressed through monitoring and contingency plans as may be needed to reduce risk of adverse impacts in the future.

- Specific commitments, including who is responsible, what will be done, when and how it will be monitored, reported and audited to confirm that commitments are met.

Finally, a key part of the TOR is obtaining a legally binding commitment from the project proponent that the approved EIA will be implemented as presented. Such a commitment adds to the legal enforceability of the outcomes of the EIA process.

B. DETAILS FOR THERMAL/COMBUSTION POWER PROJECTS

0 Table of Contents

A general Table of Contents for the Environmental Impact Assessment (EIA) shall be provided. The Table of Contents shall be organized in such a manner as to facilitate the use of the EIA by reviewers and project implementers. EIAs for larger projects should have a more detailed Table of Contents than those for smaller projects. At a minimum, the Table of Contents shall include the following:

- Acronyms and Abbreviations
- Executive Summary
- General Information
  - Objectives and Justification
  - Project Proponents
  - Project Team
  - Legal and Regulatory Framework
- Project and Alternatives Description
- Environmental Setting
  - Physical Environment
    - Geologic Resources
    - Soil Resources
    - Water Resources
    - Air and Climate
    - Noise and Vibration
    - Aesthetic Resources
  - Biological Environment
    - Vegetation/Flora
    - Aquatic and Terrestrial Wildlife/Fauna
    - Ecosystems: Terrestrial, Wetlands, Aquatic, Marine
    - Endangered or Threatened Species and Habitat
    - Protected Areas
  - Social-Economic-Cultural Environment
    - Socio-Economic Conditions
    - Infrastructure
    - Cultural, Archeological, Ceremonial and Historic Resources
    - Land Use
- Assessment of Impacts to resources described in the Environmental Setting
- Mitigation and Monitoring Measures
- Environmental Management Plan
  - Overview of Environmental Management Plan Organization and Policy
  - Project-wide Mitigation Plan
  - Project- wide Monitoring Plan
  - Management of Other On- or Off-Site Pollution Controls and Infrastructure
  - Contingency Plans
    - Performance-related Contingency Plan
    - Natural Disaster Risk Response Plan
    - Other Risk Response Plans
- Signed Commitment Statement
- Annexes
  - Public Consultation
    - Public Consultation Plan
    - Summary of Public Outreach Activities
    - Summary of Responses to Comments
    - Copies of Written Comments
  - Technical Supporting Materials
    - Maps and Plans, in the sequence mentioned in the EIA document
    - Charts and Figures
    - Details about predictive modeling used, calculations and assumptions
    - Special Studies
  - References

1 Acronyms and Abbreviations

All acronyms and abbreviations used in the EIA must be clearly and succinctly defined and described in this section. This will relieve the reader of the need to search for the first occurrence of a word and the citing of the acronym or abbreviation in the text.

2 Executive Summary

A general summary of the EIA shall be provided in this section. The summary shall be written using a vocabulary that can be easily understood by the public. It shall include at least the following information about the project from the EIA:

- Objectives and Justification
- Location
- Project Proponents
- Project Description
- Other Project Alternatives
- Environmental Setting
- Evaluation of Impacts
- Mitigation and Monitoring Measures
- Environmental Management Plan
- Issues raised by stakeholders and any outstanding issues

3 General Information

3.1 Objectives of and Justification for the Proposed Project

3.1.1 **Objectives:** A statement of the general and specific objectives (purpose) of the proposed project, including whether it is a new project, an expansion of an existing project (e.g., increase in land area or increase in annual production) or modernization of an existing operation.

3.1.2 **Justification for the Project:** Provide a justification for the proposed project (need) highlighting the benefits to surrounding communities and economic development of the region and country.

3.2 Project Proponents

3.2.1 Names, addresses, telephone numbers, and applicable legal documentation of proponents (including developers, major equipment suppliers if part of project team, shareholders and providers of financing, and representatives).

3.2.2 Names and contact information for responsible parties within the organization.

3.2.3 Financial viability of the company (including a certified banking statement indicating that the company is financially stable and reputable).

3.2.4 Bonding requirements and proof of ability to meet bonding requirements sufficient to cover the anticipated costs of environmental management during all phases, as well as the costs, by a third party, of decommissioning and long-term post-closure liabilities associated with the project.

C.2 Documentation of Purpose and Need

3.3 Project Team

This section shall provide information on the multidisciplinary team that prepares the EIA. The types of professionals included in the team shall be appropriate to the type of project and the type of environment in which the project is located and may include (but not be limited to) engineers, architects, biologists, geologists, hydrologists, air quality experts, archeologists, anthropologists, sociologists and economists. The information provided for each member of the EIA project team includes the following:

3.3.1 Names, addresses and registry numbers of contractors.

3.3.2 Names, contact information, qualifications and registry numbers of key personnel involved in the study; as well as an affidavit indicating their area of participation.

3.3.3 List of professionals/experts participating in the EIA, their areas of expertise, degrees, experience, professional registrations and stamps, seals and signatures.

G.4 Financial Assurance

3.4 Legal and Regulatory Framework

This section of the EIA shall define the legal framework under which the EIA is being completed listing and summarizing requirements or alternatives used as benchmarks, and evidence of non-applicability or compliance, including:

3.4.1 Information that demonstrates rights and access:

3.4.1.1 Ownership with written authorization

3.4.1.2 Governmental authorization (if required)

3.4.1.3 Period of lease/permit

3.4.1.4 Maps showing the lease/permit area

3.4.2 Applicable environmental standards, norms and requirements set forth at the international, national, regional and/or local levels

3.4.2.1 In the absence of such standards, identify a set of benchmarks used in the analysis

3.4.3 Required regulatory approvals and/or permits for all stages and their status

3.4.4 Applicable land use requirements (demonstrate conformity and compliance with applicable plans)

3.4.5 Applicable natural resource management or protected area management plans and responsible agency(ies) (demonstrate conformity and compliance with all applicable plans)

4 Project and Alternatives Description

The project proponent shall submit a full description and location of the proposed project and reasonable alternatives including ancillary facilities and operations such as the camp/housing for construction and operation phases, borrow and disposal areas, sanitary services, waste disposal and transportation infrastructure, etc. as addressed through 4.1 to 4.3 below. It shall include at a minimum:

4.1 Location

The general location of the project and associated activities in terms of:

4.1.1 Political-administrative location (region, district, town or other relevant political-administrative units) with accompanying location map

4.1.2 Means of site access – i.e., by air, river, road, train or vehicle

4.1.3 Latitude and longitude of project area

4.1.4 Maps of project area at a scale of no less than 1:50,000 or as required by the regulatory agency

4.1.4.1 Project plat plan and location on a fold-out 11" X 17" page.

4.1.4.2 Indicate the project area and the direct and indirect areas of influence for the physical, biological and social-economic-cultural impacts

- For Biomass and Biofuel projects that will use agricultural or forest products as raw materials, include the areas of production in the area of influence

4.1.4.3 All drawings should present scale and key coordinates or benchmarks as latitude/longitude, Universal Transverse Mercator (UTM) coordinates, or local survey plate that can be cross-referenced to latitude/longitude or UTM coordinates

C. Proposed Project Description and Alternatives

4.2 Summary of Proposed Project and Alternatives

All project alternatives that are reasonable and feasible and meet the purpose and need for the proposed project shall be identified, summarized in this section, and evaluated in the EIA as appropriate. In addition to the proposed project, such alternatives include alternative locations, alternative fuels, alternative site configuration of elements of the project, alternative size and output capacity, and alternative plans for construction, operation and decommissioning of the power plant including best practices that may avoid and/or reduce the adverse impacts to the physical, biological or social-economic-cultural environments.

If the project area or the buffer zone of the project area for an alternative is in an ecologically fragile are, the description of the alternative must include a clear justification for not opting for another site. Identify which alternatives will be carried through the analysis in the EIA and the basis for that decision.

C.3 Project and Alternative Description

4.3 Project and Alternatives Details

The EIA shall provide specific project details for the proposed project and each alternative as identified in subsections 4.3.1 through 4.3.5. The level of detail presented shall be the same for the proposed project and each alternative evaluated. The following project details shall be provided:

4.3.1 Project facilities

4.3.1.1 Type and nature of the project

- Type (external combustion with steam turbine, or internal combustion with combined cycle turbine, simple cycle combustion turbine, or reciprocating engine)
- Capacity: maximum, minimum and average power output as MW, and as MWhrs by month and season

4.3.1.2 Fuel

- Type of fuel or mix, indicating:
  - Amounts required per day and month
  - Storage requirements
  - Where it will come from
  - How it will be transported to site
  - BTU, water content, and other characteristics that will determine how well combustion will take place and resulting air emissions
  - Required processing or cleaning
- Amount, type and constituents of the waste from fuel combustion
- Heat and extent of associated thermal discharge
- Transport to site
  - Roads, railways or waterways (see section 4.4.2
  - Conveyor belts
    - Location, design, construction and operation
    - Source
    - Stream and road crossing designs to prevent falling debris
    - Dust control
    - Maintenance
  - Pipelines
    - Location, design, construction and operation
    - Source
    - Length in km
    - Stream and road crossing designs
- Biomass (additional information required for power plants using biomass as fuel)
  - Source of biomass (specific locations of production centers, including solid waste facilities if applicable)
  - Land dedicated to growing/producing crops or trees for biomass
    - Development of support facilities, such as irrigation systems including diversions, reservoirs, canals, etc.
    - Chemical use and storage for pesticides and fertilizers on production lands
  - Design details for any treatment required before use
    - Energy demands and sources for treatment
    - Releases to the environment
  - Storage of raw and treated materials
- Biofuel (information required in addition to those above for plants using biofuel)
  - Design details for conversion plants
    - Raw materials used
    - Energy demands and sources for conversion
    - Releases to the environment

4.3.1.3 Project operations

- Description of how the project would operate (seasonally, monthly, daily, hourly, as appropriate)
- Mode of operation (peaking, base load)

4.3.1.4 Design and engineering features of the main power plant

Describe the composition, dimensions, and configuration of each of the following:

- Flow diagram for the generation of power showing all components of the plant including (as appropriate):
  - Combustion chambers
  - Fuel flows, including storage and preparation
  - Air intakes
  - Exhaust gas flows, treatment systems and discharge points
  - Boilers
  - Water intakes

C.3 Project and Alternative Description

C.3 Project and Alternative Description

C.4 Project Alternatives

C.4.3 Thermal/Fossil Fuel Power

C.4.4 Thermal/Biomass Power

Appendix A. What is Energy Generation and Transmission

- Steam flow and controls
- Condensers, cooling systems (towers) and water discharges
- Ash, dust, sludge and slag collection and disposal
- Turbines and electrical generators
- Transformers and transmission lines

- Design details for each power generation component (as appropriate)
  - Combustion chambers
  - Boilers
  - Steam controls
  - Turbines
  - Generators
  - Cooling systems
  - Fuel storage
  - Storage and disposal of combustion ash and/or slag
  - Treatment and emission of exhaust gases
    - Use of air pollution control devices (electrostatic precipitators, baghouses, cyclones, scrubbers, dust suppressants, steam injection, limestone or ammonia injection, fuel cleaning and or use of cleaner fuels, and other control measures)
    - Disposal of dust and slag from treatment systems
    - Optimization of stoichiometry of combustion
    - Limitation of process rates or hours of operation
    - Design of stacks to minimize downwash or near field plume impacts
- Transmission lines (any connections and new lines associated with the hydropower project)
  - Plans to connect to existing transmission lines
  - New transmission lines (making following bullets a lower order
    - Line voltage
    - Total length of line in km
    - Minimum height of conductors over ground level
    - Width of the right of way in meters
    - Source
    - Destination
    - Number and types of towers
    - Height of towers
    - Number of circuits, stations and transformer yards
    - Points of interconnection between existing and new
- Other works

  Describe additional works as appropriate

4.3.1.5 Design drawings for project facilities

- Plan (overhead view)
- Elevations (front view)
- Profiles (side view)
- Sections

4.3.1.6 Onsite support facilities

Location and design information – composition, dimensions, and configuration including site drawing (digitized) showing project layout of all project components and their relationship to each other for the following:

- Offices and onsite housing
- Laboratories
- Power generation
- Storage
- Repair shops
- Fuel stations
- Sanitary Facilities

Table C-1

- Water supply
  - Requirements (m^3/day)
  - Rights
  - Sources
  - Distribution
- Waste handling and disposal
- Fencing

4.3.2 Access

4.3.2.1 Roads

- Identify all new and existing roads to be used (including closed roads that will be reopened, if applicable)
  - Traffic volume, operating speeds and trip times
  - Closed roads that will be reopened
- Detailed information on any roads to be constructed or upgraded
  - Location
  - Timing of construction
  - Road surface and shoulder width and barriers
  - Grade
  - Construction methods including clearing and grubbing
  - Construction materials
  - Compaction
  - Stream crossings and associated designs
  - Animal crossings
  - Sedimentation and erosion prevention and control structures and practices
  - Stabilization methods for cuts and fills
  - Typical elevations for each type and situation of road displaying construction materials, levels of compaction and erosion and sedimentation features
  - Location and size (area and volume of material) of borrow pits
  - Operation
  - Closure plan
  - Traffic volume, operating speeds and trip times
- Dust control for construction and operation
- Maintenance
- Roster for construction and maintenance equipment, specifying type and quantity by size, motor size, and fuel requirements

4.3.2.2 Other transport systems (if applicable)

- Rail transport – Same as for Roads with the addition of:
  - Tightest curves
  - Track construction materials
  - Turnouts and sidings
  - Railroad communications and signaling
- Waterways
  - Location, design, construction and operation of loading docks
  - Rosters of boats used to move barges, specifying type and quantity by: size, motor size, and fuel requirements
  - Maintenance

4.3.3 Construction phase and timetable

4.3.3.1 Schedule for each phase of construction for all project and ancillary facilities including, but not limited to:

- Mobilization
- Road construction and improvements
- Land clearing
- Blasting
- Borrow and spoil disposal
- Erosion and sediment control
- Excavation and subgrade preparation

C.5 Electric Power Transmission

C.7 Onsite Support Facilities

C.6 Transportation Facilities

- Foundation preparation
- Concrete work
- Construction or installation of each project facility
- Stabilization of disturbed areas

4.3.3.2 A GANTT or critical path management chart for the entire project, from start to finish

4.3.3.3 Equipment

- Equipment Roster, specifying type and quantity by size, weight, motor size, and fuel requirements for each piece of equipment or machinery used in each activity
- Transportation mobilization and mobilization frequency
- Machinery and equipment mobilization routes to be used, as well as the features of the ways on which they will be transported, including a map of routes, as applicable, and mobilization.

4.3.3.4 Labor during construction

- Number and type of employees (by local hire and non-local hire) by field of expertise
- Days per week
- Hours per day
- Shifts per day

4.3.3.5 Raw materials to be used for construction

- Give a complete list of the raw materials and construction materials to be used, indicating the amounts per day, month, and the storage means
- Include an inventory of chemical, toxic or hazardous substances, active elements, sites and storage means, safety aspects regarding transportation and handling and any other relevant information

4.3.3.6 Construction camp (if applicable)

Description of the camp including but not limited to:

- A map showing all facilities at a legible scale appropriate to the size of the project
  - Buildings by type (use) and size
  - Roads
  - Electrical transmission lines and/or substation
  - Drainage
- Water supply and distribution
  - Distribution system
  - Use (m3/day)
  - Rights
  - Sources
- Waste handling and disposal components
  - Sewers
  - Wastewater treatment
  - Solid waste facilities
- Energy generation and use requirements
- Closure or transition from construction camp to final onsite housing

4.3.4 Operation phase

4.3.4.1 Pre-operation Phase: cooling pond filling plan (if appropriate) including, but not limited to:

- Proposed filling rate with definite hold periods for observation
- Options to control filling
- Schedule for inspection and evaluation of structures and instrumentation

4.3.4.2 Operation information

- Roster of equipment and machinery to be used during operation, specifying type and quantity by size, weight, motor size, and fuel requirements for each activity
- Labor during operation

C.9 Manpower and Local Purchases

- Number and type of employees (by local hire and non-local hire) by field of expertise
- Days per week
- Hours per day
- Shifts per day

- Overall energy requirements and sources
- Raw materials to be used for operation
  - List of the raw materials to be used, indicating the amounts per day, month, and the storage means
  - Inventory of chemical, toxic or hazardous substances, active elements, sites and storage means, safety aspects regarding transportation and handling and any other relevant information

C.9 Manpower and Local Purchases

C.7 Onsite Support Facilities

4.3.5 Closure and decommissioning plan

If it becomes clear that closure will be required, or when the project nears the end of its service life, the project operator shall contact the proper regulatory agency(ies) to obtain the environmental guidelines to carry out the closure or decommissioning.

4.3.5.1 The project description shall include at least a general Restoration and Closure Plan, recognizing that terms of closure may be very different when this phase approaches

4.3.5.2 The description of restoration measures should include the size of the area to be restored as well as concurrent, temporary and final restoration measures to be used and their schedules. For each measure include:

- Area to be addressed
- Timing and schedule for executing measures
- Equipment and structure removal or conversion
- Remedial measures, including success indicators and contingency measures if initial efforts are unsuccessful

C.8 Closure and Decommissioning Plan

5 Environmental Setting

Based on information available from the literature, government and special studies or other sources, the EIA shall provide information on environmental setting for the different types of physical, biological and social-economic-cultural environments for the current situation, important trends and predicted situation in the absence of the proposed project. All sources of data must be cited in the EIA when and where they are used. Indicate the direct and indirect and cumulative impact areas of influence for physical, biological, and social-economic-cultural impacts and basis for defining area. This section shall include at a minimum, the following information:

D. Environmental Setting

Physical Environment:

5.1 Geologic Resources and Hazards

5.1.1 Cross sections of the geology including soil horizons

5.1.1.1 Geologic characteristics at all project facility locations and in the area of influence.

5.1.1.2 Geological map of the project area and area of influence at a scale of 1:10,000.

Submit a map of the area displaying all characteristics described. Include geological profiles and cuts, as well as stratigraphic columns.

D.2 Physical Environment

5.1.2 Topography and slope conditions and geomorphology

5.1.3 Seismicity and stability characteristics

D.2.1 Geology and Soils

5.1.3.1 Indicate the general seismic and tectonic features of the surrounding areas:

- Seismic sources close to the project area
- Seismic history
- Maximum expected magnitudes and intensity
- Period of seismic repetition
- Outcome of threats based on peak acceleration for the site
- Periods of vibration of the site
- Micro zoning in terms of the geological map

5.1.3.2 Volcanic activity (must be provided by all the projects that are located within a radius of 30 km from an active volcanic emission center)

- Indicate the general volcanic features of the area near the site
- Historical eruptions
- Period of recurrence
- Type of eruptions
- Affected areas and high risk areas

5.1.3.3 Describe project areas susceptible to soil liquefaction; planned, active, and abandoned mines; karst terrain; and areas of potential ground failure, such as subsidence, slumping, and landsliding

5.2 Soil Resources

The EIA shall describe baseline soil resources, and make use of maps, tables and accompanying narrative text to describe the soils at the facility site, along new or reconditioned access routes and along new transmission corridors associated with the facility and included in the EIA.

5.2.1 Types, capacity and uses
5.2.2 Fertility and potential uses of the land for agriculture
5.2.3 Stability and permeability
5.2.4 Erosion and sedimentation potential
5.2.5 Quantity and quality available for revegetating and restoring the disturbed area at time of closure

D.2.1 Geology and Soils

5.3 Water Resources

5.3.1 Surface water

5.3.1.1 Names and locations on maps of all permanent and intermittent streams, rivers, wetlands, lakes and reservoirs within the area of influence

5.3.1.2 River mile designation or other reference point for the intake and discharge points of the project (if project will be using surface water for cooling)

5.3.1.3 Flow (if project will be using surface water for cooling)

- The monthly minimum, mean and maximum recorded flows in m^3/s of the river at the diversion point
- A monthly flow duration curve (i.e., flow exceedance curve) indicating the period of record and location of gauging stations where data were gathered to derive the curves

5.3.1.4 Seasonal fluctuations in area and volume of wetlands, lakes and reservoirs

5.3.1.5 For any proposed or existing cooling ponds, surface area, volume, maximum depth, mean depth, flushing rate, shoreline length, substrate composition

5.3.1.6 Delineation of watersheds and water drainage pattern in the area of influence using cadastral/aerial/remote sensing satellite imageries (map)

- Runoff characteristics of watersheds

5.3.1.7 Inventories of consumptive and non-consumptive use

5.3.1.8 Surface water balance (existing withdrawal of surface water)

- Existing uses by type and volume
- Capacity

D.2.2 Water Resources

5.3.2 Groundwater

Provide a map and identify and describe aquifers and underground waters adjacent to the project, indicating the depth of the water table along with trend data:

5.3.2.1 Hydrogeologic characteristics of the facility site, including fuel storage areas and cooling ponds (vadose zone and aquifers)

- Flow regime
- Flow direction
- Influences of geologic structures (faults, contacts, bedrock fracturing, etc) and surface water bodies

5.3.2.2 Location and characteristics of all existing springs and wells in the area of influence (on topographic map)

- Flow/yield data for each spring and well (including water levels in wells)
- Depth and construction information for each well
- Existing uses by type and volume

- Capacity available

5.3.2.3 Groundwater recharge data

5.3.2.4 Groundwater potential yield

- Availability
- Water table levels (dry and rainy season)

5.3.3 Water quality (if project will discharge cooling water and/or will use cooling ponds)

5.3.3.1 Existing water quality data

- Locations of all water quality monitoring stations in and around the project area (with direction and distance from the site)
- Water quality data for each station for those parameters likely to be affected by project construction, operation, or maintenance
- Physical, chemical and biological water quality characteristics, including water temperature and dissolved oxygen concentrations
- For any proposed or existing cooling ponds water temperature and dissolved oxygen concentrations, including seasonal vertical profiles

5.3.3.2 Supplemental sampling and analysis (if existing data is not adequate to characterize water quality)

Sampling and Analysis Program in annex

- Water quality information upstream of the location of water intake, at the point of discharge and downstream from discharge point
- Proposed locations of representative monitoring stations upstream and downstream of proposed project activities
- Monitoring program design with at least a year of baseline data being collected
  - Parameters (including as appropriate, physical, chemical and biological)
  - Frequency of collection
  - Analytic methods

5.3.3.3 Surface water and groundwater standards that apply to the project

- Current uses
- Standards for current uses (in the absence of such standards, identify a set of benchmarks used in the analysis)

5.4 Air and Climate

Baseline information for air resources shall be collected for at least one year or as required by the regulatory agency and shall include at a minimum the following:

D.2.3 Air and Climate

5.4.1 Climate and meteorology

5.4.1.1 Source of data (meteorological station(s) from which climatological data have been obtained)

5.4.1.2 Temperature variations

5.4.1.3 Relative humidity

5.4.1.4 Solar radiation and evaporation rates

5.4.1.5 Rainfall (total precipitation, rainfall intensity, and duration by month)

5.4.1.6 Wind Rose (Wind direction and speed, 24 hourly data)

5.4.1.7 Air dispersion characteristics and how meteorology affects air quality levels

5.4.1.8 Statistical analysis of the data

5.4.2 Air quality monitoring data

5.4.2.1 Source of data (locations of monitoring stations, both upwind and downwind, with direction and distance from the project)

5.4.2.2 Constituents sampled (representatives of potential emissions from the project such as PM, SO_2, NO_X, CO, CO_2 N_2O, CH_4, heavy metals, visibility and fugitive dust)

5.4.2.3 Results, including current levels and trends of air pollutants and whether they pose a risk to health and welfare and/or visibility for important vistas

5.4.3 Sources of Air Pollutant Emissions

5.4.3.1 Inventory of current air pollutant emission sources (including greenhouse gases) in the area of influence

5.4.3.2 Levels of current emissions

5.5 Noise and Vibration

Present a description of the noise and vibration levels for receptors near where noise generating activities of the project may occur. The EIA shall include:

D.2.4 Noise and Vibration

5.5.1 Location of monitoring stations
5.5.2 Daytime and night time noise levels (measured in decibels)
5.5.3 Inventory of existing noise sources

5.6 Aesthetic and Visual Resources

5.6.1 Photos presenting baseline panoramic views of the facility site from potential viewpoints
5.6.2 Viewsheds or other aesthetic or landscape resources
5.6.3 Existing sources of light contamination

D.2.5 Aesthetic Resources

Biological Environment

The EIA shall provide detailed information on the location and condition of ecosystems in and around the project area in the form of narrative, maps and tables, including the following:

D.3 Biological Environment

5.7 Vegetation/Flora

5.7.1 Vegetative mapping of terrestrial and wetland habitats (aquatic and marine if appropriate) for project area, including in the area of transmission lines and other areas affected by the project (e.g., facility sites, areas around new roads, areas in the airshed of stack emissions)
5.7.2 Species and structure (abundance, density, status, plant communities, presence of invasive species, etc.)

D.3.1 Flora

5.8 Aquatic and Terrestrial Wildlife/Fauna

5.8.1 Fish and Aquatic Resources
5.8.1.1 Identification of fish, mussel, macroinvertebrate and other aquatic species
- Spatial and temporal distribution
- Species life stage composition
- Standing crop
- Age and growth data
- Spawning run timing
- Extent and location of spawning, rearing, feeding and wintering habitat

5.8.2 Wildlife Resources
5.8.2.1 Species (including status, i.e., endemic, migratory, exotic, endangered, threatened, keystone, etc.), life history, and seasonal use
5.8.2.2 Breeding areas
5.8.2.3 Mating and brooding areas
5.8.2.4 Migratory corridors (if applicable)
5.8.2.5 Important wildlife use areas (roosts, clay licks, etc.)

D.3.2 Fauna

D.3.3 Ecosystems

5.9 Ecosystems: Terrestrial, Wetlands, Aquatic, Marine

Much if not all that will be needed to address the environmental setting for terrestrial, wetlands, aquatic and/or marine ecosystems will have been covered in Sections 5.7 and 5.8. This section is not intended to duplicate that information; rather, it should integrate the information to ensure that the structure and function of each ecosystem is adequately presented.

5.10 Endangered or Threatened Species and Habitats

Sections 5.7 and 5.8 should identify all species in the project area. This section should highlight all endangered and threatened species and critical habitat that potentially occur in the vicinity of the project.

D.3.4 Endangered or Threatened Species and Habitats

5.11 Protected Areas

Identify on maps the specific locations and boundaries of relevant national parks, sanctuaries, reserves, etc., as well as any areas proposed for protection. Provide a brief narrative description of each area.

D.3.5 Protected Areas

Social-Economic-Cultural Environment

5.12 Socio-Economic Conditions

Identify nearby human settlements including the following information for each settlement:

5.12.1 Population (size, gender and age distribution)
5.12.2 Cultural characteristics (religion, ethnic composition, languages spoken, etc.)
5.12.3 Economic activities (employers, employment and incomes)
5.12.4 Tax base
5.12.5 Crime rates
5.12.6 Literacy rates
5.12.7 Community organizations
5.12.8 Public Health and Safety
- 5.12.8.1 Diseases in the project area (including the sources of data and the methodology used to collect and analyze the data)
- 5.12.8.2 Level of emergency services and access to clinics, doctors and hospitals
- 5.12.8.3 Existing practice for assessment of occupational health
- 5.12.8.4 Existing electromagnetic fields

5.12.9 Skills, services and goods availability in the communities

D.4 Social-Economic-Cultural Environment

D.4.1 Socio-Economic Conditions

5.13 Infrastructure

For each human settlement identified in subsection 5.12, describe the infrastructure in or serving the settlement, including the following information:

5.13.1 Transportation infrastructure

5.13.1.1 Roads

This section of the EIA addresses baseline conditions of transportation and traffic patterns on existing roads. The EIA shall provide information on following:

- Location and condition of all existing roads
  - Surface materials
  - Erosion and sediment control
  - Maintenance programs (what, when and whom)
- Description of anticipated third-party improvements (government or entity other than the proponent)
- Traffic patterns and densities on roads within affected project vicinity
- Safety levels and current circulation issues, and capacity

5.13.1.2 Airports or airstrips, and their capacity and trends in use
5.13.1.3 Other transportation infrastructure as applicable such as rail, pipelines, harbors etc.

5.13.2 Public health infrastructure
- 5.13.2.1 Drinking water supplies and treatment
- 5.13.2.2 Wastewater treatment and management
- 5.13.2.3 Solid and hazardous waste management and treatment

5.13.3 Communications infrastructure
- 5.13.3.1 Types of communications systems
- 5.13.3.2 Types of transmission (wired or wireless)
- 5.13.3.3 Locations of transmission lines (if applicable)
- 5.13.3.4 Locations of microwave towers and/or antennae (if applicable)

5.13.4 Energy infrastructure
- 5.13.4.1 Types of energy
- 5.13.4.2 Sources including location and description of generating facilities in the area of influence
- 5.13.4.3 Transmission lines and/or pipelines
- 5.13.4.4 Fuel storage facilities

D.4.2 Infrastructure

5.14 Cultural, Archeological, Ceremonial and Historic and Resources

Identify all cultural, archaeological, ceremonial and historic resources within the area of influence, including the following information:

5.14.1 Data and maps relating to archeological, cultural, ceremonial, and historic sites in the direct vicinity of the project

5.14.2 Information on indigenous people or other traditional cultures, if any

D.4.3 Cultural, Archeological, Ceremonial and Historic Resources

5.15 Land Use

Describe actual and potential land use showing location, size and proximity within and surrounding the project area, including land use maps, and to extent possible, integrated into one map.

5.15.1 Population centers, including information and locations of
- 5.15.1.1 Schools
- 5.15.1.2 Cemeteries
- 5.15.1.3 Churches
- 5.15.1.4 Other public buildings
- 5.15.1.5 Housing (including housing density)
- 5.15.1.6 Commercial areas

5.15.2 Agricultural lands

5.15.3 Forested lands

5.15.4 Protected areas (including but not limited to)
- 5.15.4.1 National parks
- 5.15.4.2 Wildlife refuges

5.15.5 Wetlands and Mangroves

5.15.6 Other environmentally sensitive areas

5.15.7 Tourism and recreation areas
- 5.15.7.1 Recreation facilities
- 5.15.7.2 Eco-cultural-tourist locations

5.15.8 Culturally sensitive areas

5.15.9 Flood plains and water bodies

5.15.10 Coastal zones

5.15.11 Other land uses as appropriate

D.4.4 Land Use

6 Assessment of Impacts

The EIA shall provide information on potential impacts (direct, indirect and cumulative) and the magnitude and frequency of potential impacts on physical, biological, social-economic-cultural resources resulting from construction, operation and closure of the proposed project and alternatives. The assessment shall use standardized predictive methods, such as models, to determine the specific range of impacts on environmental and socio-economic resources. The EIA shall identify which impacts are significant and the criteria used to make this judgment. Critical data input from project description and environmental setting analysis projecting the conditions in the environmental setting in the absence of the proposed project shall be used as the baseline upon which potential impacts are forecast. The EIA shall also identify sources of data used in the analysis and the uncertainties associated with the outputs of each method used.

E. Potential Impacts

F. Assessing Impacts: Predictive Tools and Considerations

Appendix F. Asian Development Bank Rapid Environmental Assessment Checklists

Physical Impacts

E.2 Physical Environment
Tables E-1 and E-2

6.1 Geologic Resources and Hazards

Potential impacts to geologic resources and potential affects on facility shall be described including but not limited to the following:

6.1.1 Geologic hazards and potential affects on facility

6.1.2 Dam failure (if cooling ponds are proposed)

6.1.3 Impacts on mineral resources (current/future mining)

6.1.4 Changes in topography and drainage patterns

6.1.5 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.1 Geology and Soils

6.2 Soil Resources

Potential impacts to soil resources shall be described. For projects calling for the production of biomass from new areas, the analysis shall include the impacts on soils in those new production areas. The analysis shall include, but not be limited to the following:

F.3 Soils and Geology Impact Assessment Tools

6.2.1 Soil quality

6.2.1.1 Contamination

- Disposal of cooling water sludge
- Disposal of ash, dust and slag
- Airborne – linked to air quality impacts
- Salinization due to irrigation
- Use of pesticides and chemical fertilizers

E.2.1 Geology and Soils

6.2.1.2 Impacts on use

F.3 Soils and Geology Impact Assessment Tools

6.2.2 Erosion, slope alteration, vegetation removal and drainage patterns

6.2.2.1 Models for soil erosion should be included using methods like USLE, defining the areas with high erosion potential

6.2.2.2 Sediment accumulation and transport

6.2.2.3 Sediment and hazardous waste removal and disposal

F.4 Solid Waste Impact Assessment Tools

6.2.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.3 Water Resources

Potential impacts to surface water and groundwater shall be described. For projects calling for the production of biomass from new areas, the analysis shall include the impacts on water resources in those new production areas. The analysis shall include but not be limited to the following:

Appendix D: Erosion and Sedimentation

6.3.1 Geomorphology

6.3.1.1 Location of all stream or wetland crossings by right-of-ways and access roads.

6.3.1.2 Modification/diversion in the existing drainage pattern

6.3.1.3 Downstream scouring and upstream head cutting

6.3.1.4 Bank erosion (surface water discharges, stream crossings and dredging)

6.3.1.5 Potential for increased flash flooding

6.3.2 Quantity

6.3.2.1 Water bodies likely to be created (e.g., cooling ponds or irrigation reservoirs)

6.3.2.2 Impact of water diversion on surface water and groundwater, including specific uses

- Model results
- Water table levels
- Well production
- Spring and stream flows

E.2.2 Water Resources

6.3.2.3 Effects of dams on downstream seepage

6.3.3 Quality

6.3.3.1 Effects of project construction and operation on water quality parameters in surface water and groundwater, including the results of any water quality modeling

- Description of effects due to runoff, erosion, and sedimentation from roads, disturbed areas, and stream crossings, including sources, receiving waters, and effects on physical, chemical, and biological parameters
- Description of impact from wastewater discharges (if applicable)
- Description of effects of project operations on dissolved oxygen and total dissolved gas concentrations, and other parameters

F.5 Water Resource Impact Assessment Tools

6.3.3.2 Chemical contamination from agricultural chemicals applied to fields or forests producing biomass for the project

6.3.3.3 Spills and accidents

- Chemical, hazardous waste and fuel spills
- Overflows from cooling ponds during storm events or electricity failures

Tables F-1 and F-2

- Containment failures

6.3.4 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.4 Air and Climate

Potential impacts to air resources shall be described including but not limited to the following:

6.4.1 Air quality modeling
- 6.4.1.1 Basis for model selection
- 6.4.1.2 Input requirements
- 6.4.1.3 Modeling results

6.4.2 Impacts on ambient air quality
- 6.4.2.1 Sources (e.g., windblown dust, fuel storage, combustion, stacks, fixed and mobile equipment)
- 6.4.2.2 Concentrations
  - Isopleth distribution
  - Tabular
- 6.4.2.3 Receptors (e.g., communities, schools, soils, water bodies, ecosystems)
- 6.4.2.4 Greenhouse gas generation.

6.4.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.5 Noise and Vibration

Potential impacts from noise shall be described including but not limited to the following:

6.5.1 Noise modeling
- 6.5.1.1 Basis for model selection
- 6.5.1.2 Input requirements
- 6.5.1.3 Modeling results

6.5.2 Potential noise levels at different representative sites in the project area and in communities near the project area

6.5.3 Potential vibration due to blasting and movement of heavy equipment, and related damage to materials and structures

6.5.4 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.6 Aesthetic and Visual Resources

Potential impacts to Aesthetic Resources, including light pollution, shall be described including but not limited to the following:

6.6.1 Impacts on visual resources and landscapes

6.6.2 Impacts on visibility

6.6.3 Increases in light contamination

6.6.4 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

Biologic Impacts

Potential impacts to biological resources shall be described and quantified including but not limited to the following:

6.7 Vegetation/Flora and Associated Ecosystems

Describe and quantify alterations in vegetative cover due to:

6.7.1 Deforestation or wetlands destruction, including conversion for purposes of producing biomass to be used as fuel or as an input to biofuel

6.7.2 Inundation of vegetated areas by cooling ponds (if applicable)

6.7.3 Other vegetative type conversions
- 6.7.3.1 Direct vegetative removal
- 6.7.3.2 Indirect (e.g., poisoning by dust and air contaminants)

6.7.4 Wildfires

6.7.5 Increased road access in remote areas leading to destruction of existing

E.2.3 Air Resources

F.6 Air Resources Impact Assessment Tools

Table F-3

E.2.4 Noise and Vibration

F.7 Noise Impact Assessment Tools

vegetative cover (land use changes)
6.7.6 Spread of noxious or invasive species
6.7.7 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.5 Aesthetic Resources

F.8 Aesthetic and Visual Resources Impact Assessment Tools

Table F-4

6.8 Aquatic and Terrestrial Wildlife/Fauna and Associated Ecosystems

Describe and quantify alterations in aquatic and terrestrial wildlife populations due to:

6.8.1 Fish and Aquatic Resources
- 6.8.1.1 Loss in habitat (e.g., spawning, rearing, juvenile, or adult habitats) from changes in water quality (temperature, dissolved oxygen and other parameters) and instream flow
- 6.8.1.2 Disturbance of aquatic resources during construction, operations, or maintenance activities, including equipment noise, erosion and sedimentation, vehicular movements, or blasting
- 6.8.1.3 Entrainment and mortality effects on fish populations from water intakes for cooling water

6.8.2 Wildlife Resources
- 6.8.2.1 Loss of habitat, migratory routes/corridors, and breeding areas due to changes in vegetative cover/wetlands loss
- 6.8.2.2 Disturbance of habitat, migratory routes/corridors and breeding areas due to project construction, operation, and maintenance, recreational use, and human settlement associated with the project (e.g., noise, vibration, illumination, vehicular movement)
- 6.8.2.3 Loss or contamination of drinking water for wildlife species
- 6.8.2.4 Poisoning (e.g., air emissions, direct contact with toxic waster/substances)
- 6.8.2.5 Animals attracted to garbage and food waste at construction camps or onsite facilities
- 6.8.2.6 Electrocution of large birds
- 6.8.2.7 Increased hunting

6.8.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.3 Biological Environment

E.3.1 Flora, Fauna and Ecosystems

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

6.9 Endangered or Threatened Species or Habitats

Describe and quantify impacts to endangered or threatened species or habitats

6.9.1 Biodiversity
6.9.2 Individual species (with special emphasis on endemic, rare, threatened and endangered species)
6.9.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.3.1 Flora, Fauna and Ecosystems

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

Table F-5

6.10 Protected Areas

Social-Economic-Cultural Impacts

The EIA shall assess potential positive and negative impacts to social-economic-cultural resources including but not limited to the following:

6.11 Socio-Economic Conditions

6.11.1 Increased individual incomes
- 6.11.1.1 Direct employment at the project
- 6.11.1.2 Indirect employment generated by project activities
- 6.11.1.3 Increased purchases from local businesses
- 6.11.1.4 Other economic activities stimulated in the community as a result of the project

6.11.2 Employment opportunities for local residents
6.11.3 Increased tax base
6.11.4 Displacement and relocation of current settlements, residents or community resources
6.11.5 Displacement or disruption of people's livelihoods (e.g., fishing, hunting, grazing,

farming, forestry and tourism)

6.11.6 Public finance requirements – will more infrastructure need to be built and maintained to meet the demands of increased population in the areas of public education and public service (water, sanitation, roads, emergency services, etc.)

6.11.7 Reduction in quality of life for residents from visual and noise impacts

6.11.8 Change in crime rate (drugs, alcohol, prostitution, etc.)

6.11.9 Change in population (temporary or permanent)

6.11.10 Change in character of community

6.11.11 Change in religious, ethnic or cultural makeup of community

6.11.12 Potential hazard to the public from facility components resulting from accidents or natural catastrophes and how these events will affect reliability

6.11.13 Hazards, environmental impact and service interruptions which could reasonably ensure from failure of proposed facilities

6.11.14 Impacts on public health

6.11.14.1 Creation of new electromagnetic fields near residences, including their strength and extent

6.11.14.2 Water-related vector diseases (malaria, dengue, etc.)

6.11.14.3 Health impacts of pesticide and fertilizer use

6.11.15 Impacts on worker health and safety

6.11.15.1 Identification of hazardous jobs and number of workers exposed with duration of exposure

6.11.15.2 Occupational diseases due to exposure to dust and other project related activities such as handling of explosives, solvents, petroleum products, etc.

6.11.15.3 Identification of physical risks and safety aspects

6.11.16 Potential for fires

6.11.17 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.12 Infrastructure

6.12.1 Transportation infrastructure

This section of the EIA addresses impacts of transportation and traffic patterns on existing roads. The impacts of new and existing roads on water quality, biological resources and land use should be addressed in those respective sections. The EIA shall assess potential impacts to transportation systems including but not limited to the following:

6.12.1.1 Potential changes to traffic patterns, densities, and traffic safety issues in area affected by project

- A determination of vehicular traffic density in the project area (before, during, and after the proposed activities)
- Potential for traffic accidents
- Congestion
- Noise

6.12.1.2 Potential impacts to previously inaccessible areas from improvement of roads

6.12.2 Public health infrastructure

6.12.2.1 Increased need for public health infrastructure

6.12.2.2 Alterations to public health infrastructure

6.12.3 Communications infrastructure

6.12.3.1 Increased need for communications infrastructure

6.12.3.2 Alterations to communications infrastructure

6.12.4 Energy infrastructure

6.12.4.1 Increased need for energy infrastructure

6.12.4.2 Alterations to energy infrastructure

6.12.5 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.3.2 Endangered or Threatened Species and Habitats and Protected Areas

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

E.4 Social-Economic-Cultural Environment

E.4.1 Socio-Economic Conditions

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.13 Cultural, Archeological, Ceremonial and Historic and Resources

6.13.1 Destruction during construction
6.13.2 Damage and alteration
6.13.3 Removal from historic location
6.13.4 Introduction of visual or audible elements that diminish integrity
6.13.5 Neglect that causes deterioration
6.13.6 Loss of medicinal plants
6.13.7 Loss of access to traditional use areas
6.13.8 Impacts to previously inaccessible resources from development/improvement of roads
6.13.9 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.4.2 Infrastructure

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.14 Land Use

6.14.1 Temporary and permanent changes in land use by both area and location
6.14.2 Alternative uses of the bio materials if they were not used for the purpose of generating energy
6.14.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context
6.14.4 Social infrastructure (schools, cemeteries, churches, other public buildings, communication systems and housing)
  6.14.4.1 Increased need for additional infrastructure
  6.14.4.2 Alterations to social infrastructure
6.14.5 Tourism and recreation infrastructure
  6.14.5.1 Change in tourist activities
  6.14.5.2 Increased need for tourism and recreation infrastructure
  6.14.5.3 Alterations to tourism and recreation infrastructure
6.14.6 Housing market (during construction and operation and after closure)
6.14.7 Identification of any components of the proposed project that would fall within 25- or 100-year flood plains

E.4.3 Cultural, Archeological, Ceremonial and Historic Resources

F.10 Socio-Economic-Cultural Impact Assessment Tools

E.4.4 Land Use

F.10 Socio-Economic-Cultural Impact Assessment Tools

7 Mitigation and Monitoring Measures

This section of the EIA must include measures designed to mitigate potential adverse impacts to physical, biological and social-economic-cultural resources from construction, operation and closure of the proposed project and alternatives. These shall include measures to avoid and prevent, and if needed, to reduce or minimize adverse impacts. The project proponent must include measures considered to be "best practices" in the design of all alternatives.

Here and/or in the Environmental Management Plan section, proposed mitigation shall be described in auditable terms and at a level of detail sufficient to demonstrate its effectiveness in addressing the concern or performance criterion, including its anticipated level of effectiveness and/or measurable performance, and design specifications.

The monitoring plan must include monitoring throughout the life of the project for each potential mitigation to confirm the effectiveness of the measure and support contingency plans to provide assurance that the project, at the site preparation, construction, operation, expansion, and closure stages will meet applicable environmental requirements/standards by law, and fall within the limits of impacts deemed acceptable upon approval of the EIA. Some important items to address in the mitigation plan and associated monitoring plans include, but are not limited to the following:

G. Mitigation and Monitoring Measures

G.3 Monitoring and Oversight

G.5 Auditable and Enforceable Commitment Language

Physical Impacts

7.1 Geologic Resources and Hazards

7.1.1 Pre-excavation, onsite geological inspection and geotechnical study protocols to determine slope stability and landslide risks
7.1.2 Slopes built and maintained to avoid landslides and favor revegetation and soils formation
7.1.3 Slope stabilization by constructing retaining walls, using vegetation, geotextile membranes, or other mechanical methods
7.1.4 Blasting Plan, if applicable (summary of relevant measures with full document in

Annex)
7.1.5 Use of signage to mark areas where slopes are not stable as a preventive measure in the event of a landslide
7.1.6 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

7.2 Soil Resources

7.2.1 Topsoil management measures including specifically future use for agriculture
7.2.2 Erosion and sediment temporary and permanent control measures including when each will be installed or implemented, how often it will be checked and the process for and timing of removal of temporary measures
7.2.3 Spoil and disposal measures
7.2.4 Best management practices to minimize soil disturbance
7.2.5 Decommissioning/Rehabilitation Plan-if needed (summary of relevant measures with full document in Annex)
7.2.6 Restrictions on discharge to or impacts of pollutants impacting the soil
7.2.7 Mitigation measures unique to specific alternatives

G.2.1 Seismic Events Associated with Geothermal Developments

7.3 Water Resources

7.3.1 Quality
- 7.3.1.1 Water Quality Management Plan (summary of relevant measures with full document in Annex)
  - Cooling water discharges
  - Sewage and domestic wastewater
  - Nonpoint sources – runoff, erosion and sediment control prevention measures
- 7.3.1.2 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)
- 7.3.1.3 Solid Waste Management Plan (summary of relevant measures with full document in Annex)
- 7.3.1.4 Hazardous Waste Management Plan (summary of relevant measures with full document in Annex)
- 7.3.1.5 Transport system construction and maintenance to avoid erosion and sedimentation including:
  - Elevation or rerouting
  - Design for proper run-off control and catchment
  - Provision of culverts to allow flow that might otherwise be impeded by roadways or other rights of way
  - Appropriate traffic control
- 7.3.1.6 Off-road vehicle use restrictions
- 7.3.1.7 Waste minimization practices

7.3.2 Quantity
- 7.3.2.1 Operational measures, such minimum flows to protect important species
- 7.3.2.2 Flow gauging to monitor water quantity
- 7.3.2.3 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

Tables G-1, G-2 and G-4

G.2.2 Process and Wastewater Discharges

7.4 Air and Climate

7.4.1 Dust control measures
7.4.2 Energy use efficiency
7.4.3 Process modification
7.4.4 Selection of fuels or other materials, the processing of which may result in less polluting emissions
7.4.5 Emissions control measures
- 7.4.5.1 Emissions reduction equipment
- 7.4.5.2 Location of the emitting facility relative to other sources
- 7.4.5.3 Stack height
- 7.4.5.4 Maintenance and inspection of equipment and vehicles using combustion engines to reduce emissions

7.4.6 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)
7.4.7 Hazardous Materials Management Plan (summary of relevant measures with full

document in Annex)
7.4.8 Mitigation measures unique to specific alternatives

7.5 Noise and Vibration

7.5.1 Noise control measures
- 7.5.1.1 Noise reduction technologies (suppression equipment, sound-absorbing structures, vibration dampening devices, berms, noise barriers, etc.)
- 7.5.1.2 Rerouting of traffic and other infrastructure related activities to minimize impacts of noise and vibration
- 7.5.1.3 Time of day limitations on blasting and movement of heavy equipment when in close proximity to houses not being operated during evening hours

7.5.2 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)
7.5.3 Mitigation measures unique to specific alternatives

7.6 Aesthetic and Visual Resources

7.6.1 Relocation of facilities to another site
7.6.2 Redesign of placement of facilities on site
7.6.3 Redesign height and location of structures blocking view or light
7.6.4 Lighting minimization
7.6.5 Visual/Landscape Management Plan (summary of relevant measures with full document in Annex)
7.6.6 Mitigation measures unique to specific alternatives

Biological Impacts

7.7 Vegetation/Flora and Associated Ecosystems

7.7.1 Control of noxious and invasive weeds
7.7.2 Surface water diversion limitations to maintain in-stream values
7.7.3 Measures to compensate for loss or damage of forests, wetlands or other critical ecosystems, including establishment of new protected areas
7.7.4 Restoration/Rehabilitation Plan for disturbed areas (summary of relevant measures with full document in Annex)
7.7.5 Mitigation measures unique to specific alternatives

7.8 Aquatic and Terrestrial Wildlife/Fauna and Associated Ecosystems

7.8.1 Fish and Aquatic Resources
- 7.8.1.1 Intake screening
- 7.8.1.2 Maintain adequate instream flow
- 7.8.1.3 Scheduling construction to avoid critical or important fish life history periods (e.g., spawning)
- 7.8.1.4 Flow gauging and water quality monitoring
- 7.8.1.5 Relocation of sensitive, threatened or endangered species
- 7.8.1.6 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)
- 7.8.1.7 Mitigation measures unique to specific alternatives

7.8.2 Wildlife Resources
- 7.8.2.1 Controls on hunting within the project area
- 7.8.2.2 Modify facility and activity locations and timing to avoid critical ecosystems, migratory routes and breeding areas
- 7.8.2.3 Scheduling construction to avoid critical or important wildlife history periods (e.g., breeding, nesting)
- 7.8.2.4 Transmission line design to minimize or avoid electrocution of raptors and other large birds
- 7.8.2.5 Relocation of sensitive, threatened or endangered species
- 7.8.2.6 Blasting plan, if applicable (summary of relevant measures with full document in Annex)
- 7.8.2.7 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

G.2.3 Air Emissions from Fossil Fuel- and Biomass-Fired Plants

G.5.1 Fossil Fuel Fired Air Emission Limits Example

Tables G-1, G-2 and G-5

G.2.4 Noise

Tables G-1 and G-2

Tables G-1 and G-2

Tables G-1 and G-2

Social-Economic-Cultural Impacts

7.9 Socio-Economic Conditions

7.9.1 Selection of an alternate site for the project, and if not possible then adhering to requirements of an internationally recognized Resettlement Action Plan (RAP)

7.9.2 Rehabilitation Program for people displaced by the project (summary of relevant measures with full document in Annex)

7.9.3 Training local residents for employment in the project

7.9.4 Development of a "Code of Conduct" (with associated training program) for workers to show respect to the local populations and their culture and social rules

7.9.5 Measures proposed to protect public from failure of proposed facilities

7.9.6 Design and operational measures to avoid or reduce risk

7.9.7 Measures to exclude public from hazardous areas

7.9.8 Public Health Program to protect local population from potential health problems caused by the project operation (summary of relevant measures with full document in Annex)

7.9.9 Development of an Occupational Health, Industrial Safety and Accidents Prevention Program with appropriate accident prevention program, reporting and periodic review (summary of relevant measures with full document in Annex) including provision of routine training and testing, and proper safety equipment such as hearing protection, hardhats, steel-toed shoes, safety railings, fall arrestors, sensors for notification on reaching of warning and action limits for exposure to hazardous gases and liquids or impending catastrophic failures.

7.9.10 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)

7.9.11 Hazardous Materials Management Plan (summary of relevant measures with full document in Annex)

7.9.12 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

7.10 Infrastructure

7.10.1 Transportation infrastructure

This section of the EIA addresses mitigation measures for transportation and traffic patterns on existing roads. Mitigation of impacts of new and existing roads on water quality and biological resources and land use should be addressed in those respective sections.

7.10.1.1 Transportation Plan (summary of relevant measures with full document in Annex)

- Placement of traffic signals
- Establishing, posting and enforcing speed limits for the vehicles that transport material
- Training employees, contractors and subcontractors on measures to reduce or avoid potential accidents
- Hiring and training security personnel devoted exclusively to preventing accidents in the access road and controlling the speed of the vehicles transporting project material

7.10.2 Public health infrastructure

7.10.3 Communications infrastructure

7.10.4 Energy Infrastructure

7.10.5 Mitigation measures unique to specific alternatives

7.11 Cultural, Archeological, Ceremonial and Historic and Resources

7.11.1 Modify facility and activity locations to avoid significant archeological, cultural, ceremonial and historic sites

7.11.2 If avoidance is not possible, conduct appropriate resource recovery operations before disturbing the sites

7.11.3 Clearly delineate boundaries and post signs identifying existing archeological, cultural and historic sites on roadsides and within the project area boundaries so that they are easily recognized by the machinery operators and other workers

7.11.4 Development of a training program so that staff recognize and respect culturally

Tables G-1 and G-2

and archeological sensitive areas

7.11.5 Development protocols for use during construction and operation stages for identifying and responding to archeological, cultural, ceremonial and historic sites not identified during the preliminary surveys

7.11.5.1 In the event such a site is found, they will stop activities at the site and report to the government relocation of cultural or historical resources, for their physical protection.

Tables G-1 and G-2

7.11.6 Mitigation measures unique to specific alternatives

7.12 Land Use

7.12.1 Criteria and method for calculating compensation for loss of land and crops

7.12.2 Compensation to farmers and ranchers for crop or forage losses and restore lost agricultural lands at the end of the project.

Tables G-1 and G-2

7.12.3 Compensation to property owners for relocation of their homes in the event the relocation is unavoidable.

7.12.4 Mitigation measures unique to specific alternatives

8 Environmental Management Plan

The EIA shall include an Environmental Management Plan to prevent, mitigate and monitor each impact identified in the EIA. Plans will describe actions to be taken in sufficient detail to provide a basis for subsequent auditing of compliance with commitments made in the EIA process including who is responsible, how and when it will be implemented, what will be done and what results will be achieved, why it is being done, and how to know whether it is effective in addressing the underlying concerns. The Environmental Management Plan shall have the following elements:

H. Environmental Management Plan

8.1 Overview of Environmental Management Plan Organization and Policy

8.1.1 Describe the project management and how environmental management and organization relates to overall project responsibility. Describe the personnel and performance accountability system for design, operation, maintenance and closure for implementation of mitigation and monitoring measures

8.1.2 Describe the environmental policy that will govern the Project throughout its implementation, including at least the objectives, scope, commitment to continuous improvement, control and environmental monitoring and good relationship with neighboring populations and countries, as well as the commitment to internal controls such as compliance and environmental monitoring and routine audits

8.1.3 Identify the persons responsible for the implementation of mitigation measures, in each phase

8.2 Project-wide Mitigation Plan including an implementation schedule. It has two elements:

Table H-1

8.2.1 Environmental resource mitigation (such as air, water)

8.2.2 Socio-economic-cultural mitigation (relocation, etc.)

8.3 Project-Wide Monitoring Plan (usually specific to monitoring of surface and ground water)

8.3.1 Short-term and long-term monitoring of resource condition, including but not limited to:

8.3.1.1 Slope stability

8.3.1.2 Water Quality Monitoring Program

- Where, how and when monitoring shall be conducted
- Parameters to be monitored
- Monitoring frequencies
- Sampling and analytical protocols to be used

8.3.1.3 Air Quality Monitoring Program

- Where, how and when monitoring shall be conducted
- The Parameters to be monitored
- The monitoring frequencies
- The sampling and analytical protocols to be used

8.3.1.4 Noise and Vibration

8.3.1.5 Cultural, ceremonial archeological and historic resources in the vicinity of

the mine

8.3.2 Short-term and long-term monitoring to ensure that the mitigation measures are functioning as predicted and that rehabilitation is working

8.4 Management of Other On- or Off-Site Environmental Pollution Control and Infrastructure

This section should address management of critical elements of pollution control and infrastructure that are not otherwise included in the mitigation plan because they were considered an essential part of the proposed project.

8.5 Contingency Plans

Contingency plans shall be prepared and described to address a) failure to meet specific performance criteria established by law or necessary for the project to meet its commitments in the EIA and b) respond to natural and other risks previously identified and mitigated in the EIA in the event reasonable and feasible mitigation measures to address the risks are inadequate.

8.5.1 Performance-related Contingency Plans, indicating the steps that will be taken should monitoring indicate that:

- 8.5.1.1 Environmental standards are not being met
- 8.5.1.2 Impacts are greater than predicted
- 8.5.1.3 The mitigation measures and/or rehabilitation are not performing as predicted

8.5.2 Natural Disaster Risk Response Plan (assumes that risk identification and risk reduction have been addressed in other parts of the EIA)

8.5.3 Other Risks Response Plans (assumes that risk identification and risk reduction have been addressed in other parts of the EIA)

8.5.4 Contingency plans for maintaining service or reducing downtime in the event of accidents or natural catastrophes that disrupt facility operation

9 Signed Commitment Statement

The EIA shall contain a legally binding signed letter of commitment to meeting the terms of the EIA. The statement must be signed by the authorized representative of the proponent company with assurance that all financial surety measures as required by the regulatory agency have been met.

10 Annexes

These shall be numbered and duly referenced in the text.

10.1 Public Consultation

10.1.1 Public consultation plan

10.1.2 A summary of public outreach activities including: audience, number of persons, organizations involved, concerns raised, responses to comments

10.1.3 Summary of response to comments

10.1.4 Actual copies of written comments

B.2 Public Participation

10.2 Technical Supporting Documents

10.2.1 Include maps, plans, charts and figures in the sequence mentioned in the EIA document

10.2.2 Zoning maps with resources and results of impacts

10.2.3 Special Studies if relevant but not readily accessible

10.2.4 Detailed materials on predictive tools/models and assumptions used for the assessment but too detailed for the body of the EIA

10.3 References

Submit a list of all references, (books, articles, technical reports and other information sources) cited in the various chapters of the EIA study with full biographic references, and the following conventional procedures cited in the literature: author, year, title, source, number of pages, and city of publication or issuance.

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2 TERMS OF REFERENCE (TOR) FOR HYDROPOWER GENERATION PROJECTS

A. OVERVIEW

These terms of reference (TOR) describe the minimum requirements for the development of the Environmental Impact Assessment (EIA) for proposed hydropower generation projects, designed to generate and distribute electrical power. Both the TOR and the cross referenced "*EIA Technical Review Guidelines for Energy Power Generation and Transmission Projects*" should be used to establish minimally acceptable conditions for satisfying the requirement to submit an EIA. There are four different TORs for energy projects which are designed with a common overview and distinct TORs for different types of energy power generation and transmission. Part A, Overview, is common to all of them but Part B is tailored respectively to: 1. Thermal/Combustion Power Generation Projects, 2. Hydropower Generation Projects, 3. Other Renewable Energy Generation Projects, and 4. Transmission Lines. The four TORs are structured to facilitate mixing and matching as appropriate to the purpose and need for a proposed project and alternatives.

The basic format for the EIA document that should be followed is:

- Table of Contents
- Acronyms and Abbreviations
- Executive Summary
- General Information
- Project and Alternatives Description
- Environmental Setting
- Assessment of Impacts
- Mitigation and Monitoring Measures
- Environmental Management Plan
- Commitment Statement
- Annexes

In general, the EIA must identify and address:

- Applicable environmental standards, norms, and requirements set forth at the international, national, regional and/or local levels including those designed to meet the objectives of resource management and/or land use plans that may be in effect in and around the jurisdiction(s) in which you propose to develop the project and in which the proposed project might have a potential impact. In the absence of such standards, identify a set of benchmarks that can be used in the analysis and the basis for your selection. The guideline identifies standards in use by various countries and international organizations in Appendix C.

- Public/Stakeholder concerns related to impacts in and around the proposed project and alternatives at least for stakeholders within the geographic scope of potential impact. The project proponent should document specific steps taken to engage the public and other stakeholders, and engage these publics as early as possible before undertaking to prepare the EIA. Concerned publics include: local governments, persons living and working in the vicinity of the project, those with interests in resources that may be affected i.e., indigenous peoples, and those concerned about protected areas and prime agricultural lands. A summary of public outreach activities, audience, number of persons, organizations involved, concerns raised, responses to comments and actual copies of written comments received should be included in the Annex.

- All relevant plans related to the proposed energy project, for example, engineering and site preparation plans, operations and decommissioning or closure, environmental management, and mitigation in whatever form these may take.

- All phases of the project from feasibility studies to site preparation to operations to closure and also plans to expand capacity at the current or adjacent sites.

- Alternative approaches to meeting the purpose and need for the proposed energy project include alternative siting, alternative configuration on the site, designing, constructing, operating and decommissioning the project firstly to avoid and prevent, or secondly to reduce or minimize adverse or improve beneficial environmental or socio-economic impacts. The EIA should assess as appropriate the impacts of a range of representative reasonable and technically feasible alternatives as well as the proposed project. The alternatives to the project must include a "no action" alternative, indicating what would happen in the absence of the proposed project as well as consideration of best practices that may not otherwise have been incorporated in the proposed project. Other alternatives should be developed as needed to address significant issues with the proposal.

- Direct, indirect and cumulative impacts and their significance level.

- Uncertainty and how that uncertainty will be addressed through monitoring and contingency plans as may be needed to reduce risk of adverse impacts in the future.

- Specific commitments, including who is responsible, what will be done, when and how it will be monitored, reported and audited to confirm that commitments are met.

Finally, a key part of the TOR is obtaining a legally binding commitment from the project proponent that the approved EIA will be implemented as presented. Such a commitment adds to the legal enforceability of the outcomes of the EIA process.

B. DETAILS FOR HYDROPOWER GENERATION PROJECTS (TOR)

0 Table of Contents

A general Table of Contents for the Environmental Impact Assessment (EIA) shall be provided. The Table of Contents shall be organized in such a manner as to facilitate the use of the EIA by reviewers and project implementers. EIAs for larger projects should have a more detailed Table of Contents than those for smaller projects. At a minimum, the Table of Contents shall include the following:

- Acronyms and Abbreviations
- Executive Summary
- General Information
  - Objectives and Justification
  - Project Proponents
  - Project Team
  - Legal and Regulatory Framework
- Project and Alternatives Description
- Environmental Setting
  - Physical Environment
    - Geologic Resources
    - Soil Resources
    - Water Resources
    - Air and Climate
    - Noise and Vibration
    - Aesthetic Resources
  - Biological Environment
    - Vegetation/Flora
    - Aquatic and Terrestrial Wildlife/Fauna
    - Ecosystems: Terrestrial, Wetlands, Aquatic, Marine
    - Endangered or Threatened Species and Habitat
    - Protected Areas
  - Social-Economic-Cultural Environment
    - Socio-Economic Conditions
    - Infrastructure
    - Cultural, Archeological, Ceremonial and Historic Resources
    - Land Use
- Assessment of Impacts to resources described in the Environmental Setting
- Mitigation and Monitoring Measures
- Environmental Management Plan
  - Overview of Environmental Management Plan Organization and Policy
  - Project-wide Mitigation Plan
  - Project- wide Monitoring Plan
  - Management of Other On- or Off-Site Pollution Controls and Infrastructure
  - Contingency Plans
    - Performance-related Contingency Plan
    - Natural Disaster Risk Response Plan
    - Other Risk Response Plans
- Signed Commitment Statement
- Annexes
  - Public Consultation
    - Public Consultation Plan
    - Summary of Public Outreach Activities
    - Summary of Responses to Comments
    - Copies of Written Comments
  - Technical Supporting Materials
    - Maps and Plans, in the sequence mentioned in the EIA document
    - Charts and Figures
    - Details about predictive modeling used, calculations and assumptions
    - Special Studies
  - References

1 Acronyms and Abbreviations

All acronyms and abbreviations used in the EIA must be clearly and succinctly defined and described in this section. This will relieve the reader of the need to search for the first occurrence of a word and the citing of the acronym or abbreviation in the text.

2 Executive Summary

A general summary of the EIA shall be provided in this section. The summary shall be written using a vocabulary that can be easily understood by the public. It shall include at least the following information about the project from the EIA:

- Objectives and Justification
- Location
- Project Proponents
- Project Description
- Other Project Alternatives
- Environmental Setting
- Evaluation of Impacts
- Mitigation and Monitoring Measures
- Environmental Management Plan
- Issues raised by stakeholders and any outstanding issues

3 General Information

3.1 Objectives of and Justification for the Proposed Project

3.1.1 **Objectives:** A statement of the general and specific objectives (purpose) of the proposed project, including whether it is a new project, an expansion of an existing project (e.g., increase in land area or increase in annual production) or modernization of an existing operation.

3.1.2 **Justification for the Project:** Provide a justification for the proposed project (need) highlighting the benefits to surrounding communities and economic development of the region and country.

C.2 Documentation of Purpose and Need

3.2 Project Proponents

3.2.1 Names, addresses, telephone numbers, and applicable legal documentation of proponents (including developers, major equipment suppliers if part of project team, shareholders and providers of financing, and representatives).

3.2.2 Names and contact information for responsible parties within the organization.

3.2.3 Financial viability of the company (including a certified banking statement indicating that the company is financially stable and reputable).

3.2.4 Bonding requirements and proof of ability to meet bonding requirements sufficient to cover the anticipated costs of environmental management during all phases, as well as the costs, by a third party, of decommissioning and long-term post-closure liabilities associated with the project.

G.4 Financial Assurance

3.3 Project Team

This section shall provide information on the multidisciplinary team that prepares the EIA. The types of professionals included in the team shall be appropriate to the type of project and the type of environment in which the project is located and may include (but not be limited to) engineers, architects, biologists, geologists, hydrologists, air quality experts, archeologists, anthropologists, sociologists and economists. The information provided for each member of the EIA project team includes the following:

3.3.1 Names, addresses and registry numbers of contractors.

3.3.2 Names, contact information, qualifications and registry numbers of key personnel involved in the study; as well as an affidavit indicating their area of participation.

3.3.3 List of professionals/experts participating in the EIA, their areas of expertise, degrees, experience, professional registrations and stamps, seals and signatures.

3.4 Legal and Regulatory Framework

This section of the EIA shall define the legal framework under which the EIA is being completed listing and summarizing requirements or alternatives used as benchmarks, and evidence of non-applicability or compliance, including:

3.4.1 Information that demonstrates rights and access:

3.4.1.1 Ownership with written authorization

3.4.1.2 Governmental authorization (if required)
3.4.1.3 Period of lease/permit
3.4.1.4 Maps showing the lease/permit area
3.4.2 Applicable environmental standards, norms and requirements set forth at the international, national, regional and/or local levels
3.4.2.1 In the absence of such standards, identify a set of benchmarks used in the analysis
3.4.3 Required regulatory approvals and/or permits for all stages and their status
3.4.4 Applicable land use requirements (demonstrate conformity and compliance with applicable plans)
3.4.5 Applicable natural resource management or protected area management plans and responsible agency(ies) (demonstrate conformity and compliance with all applicable plans)

4 Project and Alternatives Description

The project proponent shall submit a full description and location of the proposed project and reasonable alternatives including ancillary facilities and operations such as the camp/housing for construction and operation phases, borrow and disposal areas, sanitary services, waste disposal and transportation infrastructure, etc. as addressed through 4.1 to 4.3 below. It shall include at a minimum:

4.1 Location

The general location of the project and associated activities in terms of:

C. Proposed Project Description and Alternatives

4.1.1 Political-administrative location (region, district, town or other relevant political-administrative units) with accompanying location map
4.1.2 Means of site access – i.e., by air, river, road, train or vehicle
4.1.3 Latitude and longitude of project area
4.1.4 Maps of project area at a scale of no less than 1:50,000 or as required by the regulatory agency
4.1.4.1 Project plat plan and location on a fold-out 11" X 17" page.
4.1.4.2 Indicate the project area and the direct and indirect areas of influence for the physical, biological and social-economic-cultural impacts

C.3 Project and Alternative Description

4.1.4.3 All drawings should present scale and key coordinates or benchmarks as latitude/longitude, Universal Transverse Mercator (UTM) coordinates, or local survey plate that can be cross-referenced to latitude/longitude or UTM coordinates

4.2 Summary of Proposed Project and Alternatives

All project alternatives that are reasonable and feasible and meet the purpose and need for the proposed project shall be identified, summarized in this section, and evaluated in the EIA as appropriate. In addition to the proposed project, such alternatives include alternative locations, alternative fuels, alternative site configuration of elements of the project, alternative size and output capacity, and alternative plans for construction, operation and decommissioning of the power plant including best practices that may avoid and/or reduce the adverse impacts to the physical, biological or social-economic-cultural environments.

If the project area or the buffer zone of the project area for an alternative is in an ecologically fragile are, the description of the alternative must include a clear justification for not opting for another site. Identify which alternatives will be carried through the analysis in the EIA and the basis for that decision.

C.3 Project and Alternative Description

4.3 Project and Alternatives Details

The EIA shall provide specific project details for the proposed project and each alternative as identified in subsections 4.3.1 through 4.3.5. The level of detail presented shall be the same for the proposed project and each alternative evaluated. The following project details shall be provided:

4.3.1 Project facilities
4.3.1.1 Type and nature of the hydropower project
- Type (conventional, pump storage, dam/reservoir, diversion, run-of-river, marine, hydrokinetic, etc.)
- Capacity: maximum, minimum and average power output as MW, and as MWhrs by month and season

4.3.1.2 Project operations
- Description of how the project would operate (seasonally, monthly, daily, hourly, as appropriate)

C.3 Project and

- Mode of operation (peaking, base load, run-of-river, storage)

4.3.1.3 Design and engineering features of the main hydropower plant

Describe the composition, dimensions, and configuration of each of the following:

- Intake

  Describe the water point of intake in terms of:
  - Peak level in m above mean sea level (AMSL)
  - Length in m
  - Operation mechanisms such as grids, gates, useful volume, dead volume etc.
- Dam (if applicable)
  - Type
  - Height, height of crown and length in m
  - Type and number of gates
- Reservoir (if applicable)
  - Surface area
  - Maximum and minimum operational pool level in m AMSL
  - Total volume in m^3
  - Operational volume in m^3
  - Information on reservoir strata and limnology
  - Sediment storage in m^3
  - Retention time
  - Height-volume curve
  - Lining (if applicable)
- Power house
  - Number and type of turbines
  - Minimum and maximum hydraulic capacity of turbines
  - Cooling system
  - Generators
  - Other special equipment
- Tunnels and canals
  - Lengths in km
  - Cross sections indicating size in m and construction materials
- Penstocks and pipelines
  - Lengths in km
  - Cross sections indicating size in m and construction materials
- Transmission lines (any connections and new lines associated with the hydropower project)
  - Plans to connect to existing transmission lines
  - New transmission lines (making following bullets a lower order
    - Line voltage
    - Total length of line in km
    - Minimum height of conductors over ground level
    - Width of the right of way in meters
    - Source
    - Destination
    - Number and types of towers
    - Height of towers
    - Number of circuits, stations and transformer yards
    - Points of interconnection between existing and new
- Other works

  Describe additional works such as spillways, gates, fishways, oscillation tanks or balance shafts, flow protection works, infrastructure and flow metering equipment, water and power quality.
- For hydrokinetic projects, the description does not need to include any items listed above that are not pertinent, but should include the physical composition, dimension, and general configuration of the power generation facility, and any anchoring, mooring, transmission

Alternative Description

C.4 Project Alternatives

C.4.5 Hydropower

Appendix A. What is Energy Generation and Transmission?

Table C-1

C.5 Electric Power Transmission

line, or other structures

4.3.1.4 Design Drawings for Project Facilities
- Plan (overhead view)
- Elevations (front view)
- Profiles (side view)
- Sections

4.3.1.5 Onsite Support Facilities

Location and design information – composition, dimensions, and configuration including site drawing (digitized) showing project layout of all project components and their relationship to each other for the following:

- Offices and onsite housing
- Laboratories
- Power generation
- Storage
- Repair shops
- Fuel stations
- Sanitary Facilities
- Water supply
  - Requirements (m^3/day)
  - Rights
  - Sources
  - Distribution
- Waste handling and disposal
- Fencing

C.7 Onsite Support Facilities

4.3.2 Access

4.3.2.1 Roads
- Identify all new and existing roads to be used (including closed roads that will be reopened, if applicable)
  - Traffic volume, operating speeds and trip times
  - Closed roads that will be reopened
- Detailed information on any roads to be constructed or upgraded
  - Location
  - Timing of construction
  - Road surface and shoulder width and barriers
  - Grade
  - Construction methods including clearing and grubbing
  - Construction materials
  - Compaction
  - Stream crossings and associated designs
  - Animal crossings
  - Sedimentation and erosion prevention and control structures and practices
  - Stabilization methods for cuts and fills
  - Typical elevations for each type and situation of road displaying construction materials, levels of compaction and erosion and sedimentation features
  - Location and size (area and volume of material) of borrow pits
  - Operation
  - Closure plan
  - Traffic volume, operating speeds and trip times
- Dust control for construction and operation
- Maintenance
- Roster for construction and maintenance equipment, specifying type and quantity by size, motor size, and fuel requirements

C.6 Transportation Facilities

4.3.2.2 Other transport systems (if applicable)
- Rail transport – Same as for Roads with the addition of:
  - Tightest curves

- Track construction materials
- Turnouts and sidings
- Railroad communications and signaling

- Waterways
  - Location, design, construction and operation of loading docks
  - Rosters of boats used to move barges, specifying type and quantity by: size, motor size, and fuel requirements
  - Maintenance
- Overland conveyors
  - Location, design, construction and operation of conveyors
  - Stream and road crossing designs to prevent falling debris
  - Dust control for construction and operation
  - Maintenance

4.3.3 Construction phase and timetable

4.3.3.1 Schedule for each phase of construction for all project and ancillary facilities including, but not limited to:

- Mobilization
- Road construction and improvements
- Land clearing
- Blasting
- Borrow and spoil disposal
- Erosion and sediment control
- Cofferdam construction and removal
- Dewatering wells
- Excavation and subgrade preparation
- Foundation preparation
- Concrete work
- Construction or installation of each project facility
- Embankment earthwork
- Stabilization of disturbed areas

4.3.3.2 A GANTT or critical path management chart for the entire project, from start to finish

4.3.3.3 Equipment

- Equipment Roster specifying type and quantity by size, weight, motor size, and fuel requirements for each piece of equipment or machinery used in each activity
- Transportation mobilization and mobilization frequency
- Machinery and equipment mobilization routes to be used, as well as the features of the ways on which they will be transported, including a map of routes, as applicable, and mobilization.

4.3.3.4 Labor during construction

- Number and type of employees (by local hire and non-local hire) by field of expertise
- Days per week
- Hours per day
- Shifts per day

4.3.3.5 Raw materials to be used for construction

- Give a complete list of the raw materials and construction materials to be used, indicating the amounts per day, month, and the storage means
- Include an inventory of chemical, toxic or hazardous substances, active elements, sites and storage means, safety aspects regarding transportation and handling and any other relevant information

4.3.3.6 Construction camp (if applicable)

Description of the camp including but not limited to:

- A map showing all facilities at a legible scale appropriate to the size of the project
  - Buildings by type (use) and size

- Roads
- Electrical transmission lines and/or substation
- Drainage

C.9 Manpower and Local Purchases

- Water supply and distribution
  - Distribution system
  - Use (m^3/day)
  - Rights
  - Sources

C.9 Manpower and Local Purchases

- Waste handling and disposal components
  - Sewers
  - Wastewater treatment
  - Solid waste facilities
- Energy generation and use requirements
- Closure or transition from construction camp to final onsite housing

4.3.4 Operation phase

C.7 Onsite Support Facilities

4.3.4.1 Pre-operation Phase: reservoir filling plan (if appropriate) including, but not limited to:

- Proposed filling rate with definite hold periods for observation
- Options to control filling
- Schedule for inspection and evaluation of structures and instrumentation

4.3.4.2 Operation information

- Roster of equipment and machinery to be used during operation, specifying type and quantity by size, weight, motor size, and fuel requirements for each activity
- Labor during operation
  - Number and type of employees (by local hire and non-local hire) by field of expertise
  - Days per week
  - Hours per day
  - Shifts per day
- Overall energy requirements and sources
- Raw materials to be used for operation
  - List of the raw materials to be used, indicating the amounts per day, month, and the storage means
  - Inventory of chemical, toxic or hazardous substances, active elements, sites and storage means, safety aspects regarding transportation and handling and any other relevant information

4.3.5 Closure and decommissioning plan

If it becomes clear that closure will be required, or when the project nears the end of its service life, the project operator shall contact the proper regulatory agency(ies) to obtain the environmental guidelines to carry out the closure or decommissioning.

C.8 Closure and Decommissioning Plan

4.3.5.1 The project description shall include at least a general Restoration and Closure Plan, recognizing that terms of closure may be very different when this phase approaches.

4.3.5.2 The description of restoration measures should include the size of the area to be restored as well as concurrent, temporary and final restoration measures to be used and their schedules. For each measure include:

- Area to be addressed
- Timing and schedule for executing measures
- Equipment and structure removal or conversion
- Remedial measures, including success indicators and contingency measures if initial efforts are unsuccessful

5 Environmental Setting

Based on information available from the literature, government and special studies or other sources, the EIA shall provide information on environmental setting for the different types of physical, biological and social-economic-cultural environments for the current situation, important trends and predicted situation in the absence of the proposed project. All sources of data must be cited in the EIA when and where they are used. Indicate the direct and indirect and cumulative impact areas of influence for physical, biological, and social-economic-cultural impacts and basis for defining area. This section shall include at a minimum, the following information:

D. Environmental Setting

Physical Environment

5.1 Geologic Resources and Hazards

D.2 Physical Environment

D.2.1 Geology and Soils

5.1.1 Cross sections of the geology including soil horizons

5.1.1.1 Geologic characteristics at all project facility locations and in the area of influence.

5.1.1.2 Geological map of the project area and area of influence at a scale of 1:10,000.

Submit a map of the area displaying all characteristics described. Include geological profiles and cuts, as well as stratigraphic columns.

5.1.2 Topography and slope conditions and geomorphology

5.1.3 Seismicity and stability characteristics

5.1.3.1 Indicate the general seismic and tectonic features of the surrounding areas:

- Seismic sources close to the project area
- Seismic history
- Maximum expected magnitudes intensity
- Period of seismic repetition
- Outcome of threats based on peak acceleration for the site
- Periods of vibration of the site
- Micro zoning in terms of the geological map

5.1.3.2 Volcanic activity (must be provided by all the projects that are located within a radius of 30 km from an active volcanic emission center)

- Indicate the general volcanic features of the area near the site
- Historical eruptions
- Period of recurrence
- Type of eruptions
- Affected areas and high risk areas

5.1.3.3 Describe project areas susceptible to soil liquefaction; planned, active, and abandoned mines; karst terrain; and areas of potential ground failure, such as subsidence, slumping, and landsliding

5.2 Soil Resources

The EIA shall describe baseline soil resources, and make use of maps, tables and accompanying narrative text to describe the soils upstream, downstream and in the area of the project.

D.2.1 Geology and Soils

5.2.1 Types, capacity and uses

5.2.2 Fertility and potential uses of the land for agriculture

5.2.3 Stability and permeability

5.2.4 Erosion and sedimentation potential

5.2.5 Quantity and quality available for revegetating and restoring the disturbed area at time of closure

5.3 Water Resources

D.2.2 Water Resources

5.3.1 Surface water

5.3.1.1 Names and locations on maps of all permanent and intermittent streams, rivers, wetlands, lakes and reservoirs within the area of influence

5.3.1.2 River mile designation or other reference point for the intake and discharge points of the project

5.3.1.3 Area covered by the basin to the dam in square kilometers (km^2)

5.3.1.4 Area covered by the basin in km^2 at the discharge area

5.3.1.5 Flow

- The monthly minimum, mean and maximum recorded flows in m3/s of the river at the diversion point or powerhouse intake (if no

diversion), specifying any adjustments needed to account for evaporation, dam leakage, minimum flow releases, or other reductions in available flow
- A monthly flow duration curve (i.e., flow exceedance curve) indicating the period of record and location of gauging stations where data were gathered to derive the curves

5.3.1.6 For any proposed or existing project reservoirs or lakes, surface area, volume, maximum depth, mean depth, flushing rate, shoreline length, substrate composition

5.3.1.7 Seasonal fluctuations in area and volume of wetlands, lakes and reservoirs

5.3.1.8 Delineation of watersheds and water drainage pattern in the area of influence using cadastral/aerial/remote sensing satellite imageries (map)
- Runoff characteristics of watersheds

5.3.1.9 Inventories of consumptive and non-consumptive use, especially those who are in the floodplain between intake and discharge points and downstream of the discharge

5.3.1.10 Surface water balance (existing withdrawal of surface water)
- Existing uses by type and volume
- Capacity

5.3.1.11 Riverbed gradient for downstream reaches directly affected by the proposed project, including reaches bypassed by flow diversions

5.3.2 Groundwater

Provide a map and identify and describe aquifers and underground waters adjacent to the project, indicating the depth of the water table along with trend data:

5.3.2.1 Hydrogeologic characteristics of the area (vadose zone and aquifers)
- Flow regime
- Flow direction
- Influences of geologic structures (faults, contacts, bedrock fracturing, etc) and surface water bodies

5.3.2.2 Location and characteristics of all existing springs and wells in the area of influence (on topographic map)
- Flow/yield data for each spring and well (including water levels in wells)
- Depth and construction information for each well
- Existing uses by type and volume
- Capacity available

5.3.2.3 Groundwater recharge data

5.3.2.4 Groundwater potential yield
- Availability
- Water table levels (dry and rainy season)

5.3.3 Water quality

5.3.3.1 Existing water quality data
- Locations of all water quality monitoring stations in and around the project area (with direction and distance from the site)
- Water quality data for each station for those parameters likely to be affected by project construction, operation, or maintenance
- Physical, chemical and biological water quality characteristics, including water temperature and dissolved oxygen concentrations
- For any proposed or existing project reservoirs or lakes, water temperature and dissolved oxygen concentrations, including seasonal vertical profiles

5.3.3.2 Supplemental sampling and analysis (if existing data is not adequate to characterize water quality)

Sampling and Analysis Program in annex
- Water quality information upstream of the reservoir, within the reservoir, location of water intake, intermediary points between intake and discharge points, at the point of discharge, and

downstream from discharge point
- Proposed locations of representative monitoring stations upstream and downstream of proposed project activities
- Monitoring program design with at least a year of baseline data being collected
  - Parameters (including as appropriate, physical, chemical, heavy metals, radiological and biological)
  - Frequency of collection
  - Analytic methods

5.3.3.3 Surface water and groundwater standards that apply to the project
- Current uses
- Standards for current uses (in the absence of such standards, identify a set of benchmarks used in the analysis)

5.4 Air and Climate

Baseline information for air resources shall be collected for at least one year or as required by the regulatory agency and shall include at a minimum the following:

5.4.1 Climate and meteorology
- 5.4.1.1 Source of data (meteorological station(s) from which climatological data have been obtained)
- 5.4.1.2 Temperature variations
- 5.4.1.3 Relative humidity
- 5.4.1.4 Solar radiation and evaporation rates
- 5.4.1.5 Rainfall (total precipitation, rainfall intensity and duration by month)
- 5.4.1.6 Wind rose (Wind direction and speed, 24 hourly data)
- 5.4.1.7 Statistical analysis of the data

D.2.3 Air and Climate

5.5 Noise and Vibration

Present a description of the noise and vibration levels for receptors near where noise generating activities of the project may occur. The EIA shall include:

5.5.1 Location of monitoring stations
5.5.2 Daytime and night time noise levels (measured in decibels)
5.5.3 Inventory of existing noise sources

D.2.4 Noise and Vibration

5.6 Aesthetic and Visual Resources

5.6.1 Photos presenting baseline panoramic views of the facility site from potential receptors
5.6.2 Viewsheds or other aesthetic or landscape resources
5.6.3 Existing sources of light contamination

D.2.5 Aesthetic Resources

Biological Environment

The EIA shall provide detailed information on the location and condition of ecosystems in and around the project area in the form of narrative, maps and tables, including the following:

D.3 Biological Environment

5.7 Vegetation/Flora

5.7.1 Vegetative mapping of terrestrial and wetland habitats (aquatic and marine if appropriate) for project area, including in the area of transmission lines and any downstream area affected by the project
5.7.2 Species and structure (abundance, density, status, plant communities, presence of invasive species, etc.)

D.3.1 Flora

5.8 Aquatic and Terrestrial Wildlife/Fauna

5.8.1 Fish and Aquatic Resources
- 5.8.1.1 Identification of fish, mussel, macroinvertebrate and other aquatic species
  - Spatial and temporal distribution
  - Species life stage composition
  - Standing crop
  - Age and growth data
  - Spawning run timing
  - Extent and location of spawning, rearing, feeding and wintering habitat

5.8.2 Wildlife Resources
- 5.8.2.1 Species (including status, i.e., endemic, migratory, exotic, endangered, threatened, keystone, etc.), life history, and seasonal use
- 5.8.2.2 Breeding areas
- 5.8.2.3 Mating and brooding areas
- 5.8.2.4 Migratory corridors (if applicable)
- 5.8.2.5 Important wildlife use areas (roosts, clay licks, etc.)

D.3.2 Fauna

5.9 Ecosystems: Terrestrial, Wetlands, Aquatic, Marine

Much if not all that will be needed to address the environmental setting for terrestrial, wetlands, aquatic and/or marine ecosystems will have been covered in Sections 5.7 and 5.8. This section is not intended to duplicate that information; rather, it should integrate the information to ensure that the structure and function of each ecosystem is adequately presented.

D.3.3 Ecosystems

5.10 Endangered or Threatened Species and Habitats

Sections 5.7 and 5.8 should identify all species in the project area. This section should highlight all endangered and threatened species and critical habitat that potentially occur in the vicinity of the project.

D.3.4 Endangered or Threatened Species and Habitats

5.11 Protected Areas

Identify on maps the specific locations and boundaries of relevant national parks, sanctuaries, reserves, etc., as well as any areas proposed for protection. Provide a brief narrative description of each area.

D.3.5 Protected Areas

Social-Economic-Cultural Environment

D.4 Social-Economic-Cultural Environment

5.12 Socio-Economic Conditions

Identify nearby human settlements including the following information for each settlement:

D.4.1 Socio-Economic Conditions

5.12.1 Population (size, gender and age distribution)
5.12.2 Cultural characteristics (religion, ethnic composition, languages spoken, etc.)
5.12.3 Economic activities (employers, employment and incomes)
5.12.4 Tax base
5.12.5 Crime rates
5.12.6 Literacy rates
5.12.7 Community organizations
5.12.8 Public Health and Safety
- 5.12.8.1 Diseases in the project area (including the sources of data and the methodology used to collect and analyze the data)
- 5.12.8.2 Level of emergency services and access to clinics, doctors and hospitals
- 5.12.8.3 Existing practice for assessment of occupational health
- 5.12.8.4 Existing electromagnetic fields

5.12.9 Skills, services and goods availability in the communities

5.13 Infrastructure

For each human settlement identified in subsection 5.12, describe the infrastructure in or serving the settlement, including the following information:

D.4.2 Infrastructure

5.13.1 Transportation infrastructure
- 5.13.1.1 Roads

  This section of the EIA addresses baseline conditions of transportation and traffic patterns on existing roads. The EIA shall provide information on following:
  - Location and condition of all existing roads
    - Surface materials
    - Erosion and sediment control
    - Maintenance programs (what, when and whom)
  - Description of anticipated third-party improvements (government or entity other than the proponent)
  - Traffic patterns and densities on roads within affected project vicinity
  - Safety levels and current circulation issues, and capacity
- 5.13.1.2 Airports or airstrips, and their capacity and trends in use
- 5.13.1.3 Other transportation infrastructure as applicable such as rail, pipelines, harbors etc.

5.13.2 Public health infrastructure
- 5.13.2.1 Drinking water supplies and treatment

5.13.2.2 Wastewater treatment and management
5.13.2.3 Solid and hazardous waste management and treatment
5.13.3 Communications Infrastructure
5.13.3.1 Types of communications systems
5.13.3.2 Types of transmission (wired or wireless)
5.13.3.3 Locations of transmission lines (if applicable)
5.13.3.4 Locations of microwave towers and/or antennae (if applicable)
5.13.4 Energy Infrastructure
5.13.4.1 Types of energy
5.13.4.2 Sources including location and description of generating facilities in the area of influence
5.13.4.3 Transmission lines and/or pipelines
5.13.4.4 Fuel storage facilities

5.14 Cultural, Archeological, Ceremonial and Historic Resources

Identify all cultural, archaeological, ceremonial and historic resources within the area of influence, including the following information:

D.4.3 Cultural, Archeological, Ceremonial and Historic Resources

5.14.1 Data and maps relating to archeological, cultural, ceremonial, and historic sites in the direct vicinity of the project
5.14.2 Information on indigenous people or other traditional cultures, if any

5.15 Land Use

Actual and potential showing location, size and proximity within and surrounding the project area, including land use maps, and to extent possible, integrated into one map.

D.4.4 Land Use

5.15.1 Population centers, including information and locations of
5.15.1.1 Schools
5.15.1.2 Cemeteries
5.15.1.3 Churches
5.15.1.4 Other public buildings
5.15.1.5 Housing (including housing density)
5.15.1.6 Commercial areas
5.15.2 Agricultural lands
5.15.3 Forested lands
5.15.4 Protected areas (including but not limited to)
5.15.4.1 National parks
5.15.4.2 Wildlife refuges
5.15.5 Wetlands and Mangroves
5.15.6 Other environmentally sensitive areas
5.15.7 Tourism and recreation areas
5.15.7.1 Recreation facilities
5.15.7.2 Eco-cultural-tourist locations
5.15.8 Culturally sensitive areas
5.15.9 Flood plains and water bodies
5.15.10 Coastal zones
5.15.11 Other land uses as appropriate

6 Assessment of Impacts

The EIA shall provide information on potential impacts (direct, indirect and cumulative) and the magnitude and frequency of potential impacts on physical, biological, social-economic-cultural resources resulting from construction, operation and closure of the proposed project and alternatives. The assessment shall use standardized predictive methods, such as models, to determine the specific range of impacts on environmental and socio-economic resources. The EIA shall identify which impacts are significant and the criteria used to make this judgment. Critical data input from project description and environmental setting analysis projecting the conditions in the environmental setting in the absence of the proposed project shall be used as the baseline upon which potential impacts are forecast. The EIA shall also identify sources of data used in the analysis and the uncertainties associated with the outputs of each method used.

E. Potential Impacts

F. Assessing Impacts: Predictive Tools and Considerations

Appendix F. Asian Development Bank Rapid Environmental Assessment Checklists

Physical Impacts

6.1 Geologic Resources and Hazards

Potential impacts to geologic resources and potential effects on facility shall be described including but not limited to the following:

6.1.1 Geologic hazards and potential effects on facility

6.1.2 Dam failure
6.1.3 Impacts on mineral resources (current/future mining)
6.1.4 Changes in topography and drainage patterns
6.1.5 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2 Physical Environment
Tables E-1 and E-2

E.2.1 Geology and Soils

F.3 Soils and Geology Impact Assessment Tools

6.2 Soil Resources

Potential impacts to soil resources shall be described including but not limited to the following:

6.2.1 Erosion, slope alteration, vegetation removal and drainage patterns
- 6.2.1.1 Models for soil erosion should be included using methods like USLE, defining the areas with high erosion potential
- 6.2.1.2 Sediment accumulation and transport
- 6.2.1.3 Sediment and hazardous waste removal and disposal

6.2.2 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.1 Geology and Soils

F.3 Soils and Geology Impact Assessment Tools

6.3 Water Resources

Potential impacts to surface water and groundwater shall be described including but not limited to the following:

6.3.1 Geomorphology
- 6.3.1.1 Location of all stream or wetland crossings by right-of-ways and access roads.
- 6.3.1.2 Modification/diversion in the existing drainage pattern
- 6.3.1.3 Downstream scouring and upstream head cutting
- 6.3.1.4 Bank erosion (surface water discharges, stream crossings and dredging)
- 6.3.1.5 Potential for increased flash flooding

6.3.2 Quantity
- 6.3.2.1 Water bodies likely to be created or dewatered (e.g., bypass stretches)
- 6.3.2.2 Impact of water diversion on surface water and groundwater, including specific uses
  - Model results
  - Water table levels
  - Well production
  - Spring and stream flows
- 6.3.2.3 Effects of dams on downstream seepage

6.3.3 Quality
- 6.3.3.1 Effects of project construction and operation on water quality parameters in the existing or newly formed reservoir, within any bypassed reaches, downstream areas and groundwater, including the results of any water quality modeling
  - Description of effects due to runoff, erosion, and sedimentation from roads, disturbed areas, and stream crossings, including sources, receiving waters, and effects on physical, chemical, and biological parameters
  - Description of impact from wastewater discharges (if applicable)
  - Description of effects of project operations on dissolved oxygen and total dissolved gas concentrations, and other parameters
- 6.3.3.2 Spills and accidents, including hazardous waste and fuel spills

6.3.4 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

Appendix D: Erosion and Sedimentation

E.2.2 Water Resources

F.5 Water Resource Impact Assessment Tools

Tables F-1 and F-2

6.4 Air and Climate

Potential impacts to air resources shall be described including but not limited to the following:

6.4.1 Impacts on ambient air quality
- 6.4.1.1 Sources (e.g., windblown dust and fixed and mobile equipment emissions)
- 6.4.1.2 Concentrations
- 6.4.1.3 Receptors (e.g., communities, schools, water bodies, ecosystems)

6.4.1.4 Greenhouse gas generation.

6.4.2 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.3 Air Resources

6.5 Noise and Vibration

Potential impacts from noise shall be described including but not limited to the following:

F.6 Air Resources Impact Assessment Tools

6.5.1 Noise modeling

6.5.1.1 Basis for model selection

6.5.1.2 Input requirements

6.5.1.3 Modeling results

Table F-3

6.5.2 Potential noise levels at different representative sites in the project area and in communities near the project area

6.5.3 Potential vibration due to blasting and movement of heavy equipment, and related damage to materials and structures

6.5.4 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.4 Noise and Vibration

F.7 Noise Impact Assessment Tools

6.6 Aesthetic and Visual Resources

Potential impacts to Aesthetic Resources, including light pollution, shall be described including but not limited to the following:

6.6.1 Impacts on visual resources and landscapes

6.6.2 Increases in light contamination

6.6.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

Biologic Impacts

Potential impacts to biological resources shall be described including but not limited to the following:

E.2.5 Aesthetic Resources

F.8 Aesthetic and Visual Resources Impact Assessment Tools

6.7 Vegetation/Flora and Associated Ecosystems

Describe and quantify alterations in vegetative cover due to:

6.7.1 Deforestation or wetlands destruction

6.7.2 Inundation of vegetated areas by reservoirs (if applicable)

6.7.3 Other vegetative type conversions

6.7.3.1 Direct vegetative removal

6.7.3.2 Indirect (e.g., poisoning by dust and air contaminants)

Table F-4

E.3 Biological Environment

6.7.4 Operational effects on plant communities (reservoir fluctuations and changes in flow regime)

6.7.5 Wildfires

6.7.6 Increased road access in remote areas leading to destruction of existing vegetative cover (land use changes)

6.7.7 Spread of noxious or invasive species

6.7.8 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.3.1 Flora, Fauna and Ecosystems

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

6.8 Aquatic and Terrestrial Wildlife/Fauna and Associated Ecosystems

Describe and quantify alterations in aquatic and terrestrial wildlife populations due to:

6.8.1 Fish and Aquatic Resources

6.8.1.1 Loss or gains in habitat (e.g., spawning, rearing, juvenile, or adult habitats) from changes in flow releases, reservoir storage, and flow diversions, including the effects of any associated changes in water temperature and dissolved gas and dissolved oxygen concentrations

6.8.1.2 Disturbance of aquatic resources during construction, operations, or maintenance activities, including equipment noise, erosion and sedimentation, vehicular movements, or blasting

E.3.1 Flora, Fauna and Ecosystems

6.8.1.3 Entrainment and turbine mortality effects on fish populations in the project area

6.8.1.4 Entrapment of large woody debris and stream gravel in reservoirs and associated effects on downstream fish habitats
6.8.1.5 Effects of project-induced recreational activities on fish habitats and fish populations
- Competing flows (i.e., flows for recreation versus flows for fish habitat)
- Disturbance of spawning of spawning and other habitats (noise, vibration, direct contact of habitat from wading and other in-water activities, etc.)

6.8.2 Wildlife Resources
6.8.2.1 Loss of habitat, migratory routes/corridors, and breeding areas due to changes in vegetative cover/wetlands loss, reservoir fluctuations, and changes in flow regime
6.8.2.2 Disturbance of habitat, migratory routes/corridors and breeding areas due to project construction, operation, and maintenance, recreational use, and human settlement associated with the project (e.g., noise, vibration, illumination, vehicular movement)
6.8.2.3 Loss or contamination of drinking water for wildlife species
6.8.2.4 Poisoning (e.g., air emissions, direct contact with toxic waster/substances)
6.8.2.5 Animals attracted to garbage and food waste at construction camps or onsite facilities
6.8.2.6 Electrocution of large birds
6.8.2.7 Increased hunting
6.8.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

Table F-5

6.9 Endangered or Threatened Species or Habitats

Describe and quantify impacts to endangered or threatened species or habitats

6.9.1 Biodiversity
6.9.2 Individual species (with special emphasis on endemic, rare, threatened and endangered species)
6.9.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.3.2 Endangered or Threatened Species and Habitats and Protected Areas

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

6.10 Protected Areas

Social-Economic-Cultural Impacts

The EIA shall assess potential positive and negative impacts to social-economic-cultural resources including but not limited to the following:

E.4 Social-Economic-Cultural Environment

6.11 Socio-Economic Conditions

6.11.1 Increased individual incomes
6.11.1.1 Direct employment at the project
6.11.1.2 Indirect employment generated by project activities
6.11.1.3 Increased purchases from local businesses
6.11.1.4 Other economic activities stimulated in the community as a result of the project
6.11.2 Employment opportunities for local residents
6.11.3 Increased tax base
6.11.4 Displacement and relocation of current settlements, residents or community resources
6.11.5 Displacement or disruption of people's livelihoods (e.g., fishing, hunting, grazing, farming, forestry and tourism)
6.11.6 Public finance requirements – will more infrastructure need to be built and maintained to meet the demands of increased population in the areas of public education and public service (water, sanitation, roads, emergency services, etc.)
6.11.7 Reduction in quality of life for residents from visual and noise impacts
6.11.8 Change in crime rate (drugs, alcohol, prostitution, etc.)

E.4.1 Socio-Economic Conditions

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.11.9 Change in population (temporary or permanent)
6.11.10 Change in character of community
6.11.11 Potential hazard to the public from facility components resulting from accidents or natural catastrophes and how these events will affect reliability
6.11.12 Hazards, environmental impact and service interruptions which could reasonably ensure from failure of proposed facilities
6.11.13 Change in religious, ethnic or cultural makeup of community
6.11.14 Impacts on public health
- 6.11.14.1 Creation of new electromagnetic fields near residences, including their strength and extent
- 6.11.14.2 Water-related vector diseases (malaria, dengue, etc.)
- 6.11.14.3 Health impacts of pesticide and fertilizer use

6.11.15 Impacts on worker health and safety
- 6.11.15.1 Identification of hazardous jobs and number of workers exposed with duration of exposure
- 6.11.15.2 Occupational diseases due to exposure to dust and other project related activities such as handling of explosives, solvents, petroleum products, etc.
- 6.11.15.3 Identification of physical risks and safety aspects

6.11.16 Potential for fires
6.11.17 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.12 Infrastructure

6.12.1 Transportation infrastructure

This section of the EIA addresses impacts of transportation and traffic patterns on existing roads. The impacts of new and existing roads on water quality, biological resources and land use should be addressed in those respective sections. The EIA shall assess potential impacts to transportation systems including but not limited to the following:

- 6.12.1.1 Potential changes to traffic patterns, densities, and traffic safety issues in area affected by project
  - A determination of vehicular traffic density in the project area (before, during, and after the proposed activities)
  - Potential for traffic accidents
  - Congestion
  - Noise
- 6.12.1.2 Potential impacts to previously inaccessible areas from improvement of roads

6.12.2 Public health infrastructure
- 6.12.2.1 Increased need for public health infrastructure
- 6.12.2.2 Alterations to public health infrastructure

6.12.3 Communications infrastructure
- 6.12.3.1 Increased need for communications infrastructure
- 6.12.3.2 Alterations to communications infrastructure

6.12.4 Energy infrastructure
- 6.12.4.1 Increased need for energy infrastructure
- 6.12.4.2 Alterations to energy infrastructure

6.12.5 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.4.2 Infrastructure

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.13 Cultural, Archeological, Ceremonial and Historic and Resources

6.13.1 Destruction during construction
6.13.2 Damage and alteration
6.13.3 Removal from historic location
6.13.4 Introduction of visual or audible elements that diminish integrity
6.13.5 Neglect that causes deterioration
6.13.6 Loss of medicinal plants
6.13.7 Loss of access to traditional use areas

E.4.3 Cultural, Archeological, Ceremonial and Historic Resources

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.13.8 Impacts to previously inaccessible resources from development/improvement of roads

6.13.9 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.4.4 Land Use

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.14 Land Use

6.14.1 Changes in land use by both area and location

7 Mitigation and Monitoring Measures

This section of the EIA must include measures designed to mitigate potential adverse impacts to physical, biological and social-economic-cultural resources from construction, operation and closure of the proposed project and alternatives. These shall include measures to avoid and prevent, and if needed, to reduce or minimize adverse impacts. The project proponent must include measures considered to be "best practices" in the design of all alternatives.

Here and/or in the Environmental Management Plan section, proposed mitigation shall be described in auditable terms and at a level of detail sufficient to demonstrate its effectiveness in addressing the concern or performance criterion, including its anticipated level of effectiveness and/or measurable performance, and design specifications.

The monitoring plan must include monitoring throughout the life of the project for each potential mitigation to confirm the effectiveness of the measure and support contingency plans to provide assurance that the project, at the site preparation, construction, operation, expansion, and closure stages will meet applicable environmental requirements/standards by law, and fall within the limits of impacts deemed acceptable upon approval of the EIA. Some important items to address in the mitigation plan and associated monitoring plans include, but are not limited to the following:

G. Mitigation and Monitoring Measures

G.3 Monitoring and Oversight

G.5 Auditable and Enforceable Commitment Language

Physical Impacts

7.1 Geologic Resources and Hazards

7.1.1 Pre-excavation, onsite geological inspection and geotechnical study protocols to determine slope stability and landslide risks

7.1.2 Slopes built and maintained to avoid landslides and favor revegetation and soils formation

7.1.3 Slope stabilization by constructing retaining walls, using vegetation, geotextile membranes, or other mechanical methods

7.1.4 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)

Tables G-1 and G-2

7.1.5 Use of signage to mark areas where slopes are not stable as a preventive measure in the event of a landslide

7.1.6 Mitigation measures unique to specific alternatives

7.2 Soil Resources

7.2.1 Topsoil management measures including specifically future use for agriculture

7.2.2 Erosion and sediment temporary and permanent control measures including when each will be installed or implemented, how often it will be checked and the process for and timing of removal of temporary measures

7.2.3 Spoil and disposal measures

7.2.4 Best management practices to minimize soil disturbance

7.2.5 Decommissioning/Rehabilitation Plan-if needed (summary of relevant measures with full document in Annex)

7.2.6 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

7.3 Water Resources

7.3.1 Quality

7.3.1.1 Water Quality Management Plan (summary of relevant measures with full document in Annex)

- Project operation measures including minimum flows, aeration, flow energy dissipation, or modification of the intake withdrawal depth
- Sewage and domestic wastewater
- Nonpoint sources – runoff, erosion and sediment control prevention measures

Tables G-1, G-2 and G-4

G.2.2 Process and Wastewater Discharges

7.3.1.2 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)

7.3.1.3 Solid Waste Management Plan (summary of relevant measures with full document in Annex)
7.3.1.4 Hazardous Waste Management Plan (summary of relevant measures with full document in Annex)
7.3.1.5 Transport system construction and maintenance to avoid erosion and sedimentation including:
- Elevation or rerouting
- Design for proper run-off control and catchment
- Provision of culverts to allow flow that might otherwise be impeded by roadways or other rights of way
- Appropriate traffic control

7.3.1.6 Off-road vehicle use restrictions
7.3.1.7 Waste minimization practices
7.3.2 Quantity
7.3.2.1 Operational measures, such minimum flows or reservoir level fluctuation limits, to protect important species
7.3.2.2 Use of guaranteed stream maintenance flow device to guarantee release of minimum agreed upon flow
7.3.2.3 Flow gauging to monitor water quantity
7.3.3 Mitigation measures unique to specific alternatives

G.5.2 Hydropower Example

Tables G-1 and G-2

7.4 Air and Climate Resources

7.4.1 Dust control measures
7.4.2 Emissions control measures
7.4.2.1 Emissions reduction equipment
7.4.2.2 Maintenance and inspection of equipment and vehicles using combustion engines to reduce emissions
7.4.3 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)
7.4.4 Hazardous Materials Management Plan (summary of relevant measures with full document in Annex)
7.4.5 Mitigation measures unique to specific alternatives

G.2.3 Air Emissions from Fossil Fuel- and Biomass-Fired Plants

Tables G-1, G-2 and G-5

7.5 Noise and Vibration

7.5.1 Noise control measures
7.5.1.1 Noise reduction technologies (suppression equipment, sound-absorbing structures, vibration dampening devices, berms, noise barriers, etc.)
7.5.1.2 Rerouting of traffic and other infrastructure related activities to minimize impacts of noise and vibration
7.5.1.3 Time of day limitations on blasting and movement of heavy equipment when in close proximity to houses not being operated during evening hours
7.5.2 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)
7.5.3 Mitigation measures unique to specific alternatives

G.2.4 Noise

Tables G-1 and G-2

7.6 Aesthetic and Visual Resources

7.6.1 Relocation of facilities to another site
7.6.2 Redesign of placement of facilities on site
7.6.3 Redesign height and location of structures blocking view or light
7.6.4 Lighting minimization
7.6.5 Visual/Landscape Management Plan (summary of relevant measures with full document in Annex)
7.6.6 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

Biological Impacts

7.7 Vegetation/Flora and Associated Ecosystems

7.7.1 Control of noxious and invasive weeds
7.7.2 Surface water diversion limitations to maintain in-stream values
7.7.3 Measures to compensate for loss or damage of forests, wetlands or other critical

ecosystems, including establishment of new protected areas

7.7.4 Restoration/Rehabilitation Plan for disturbed areas (summary of relevant measures with full document in Annex)

7.7.5 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

G.5.2 Hydropower Example

7.8 Aquatic and Terrestrial Wildlife/Fauna and Associated Ecosystems

7.8.1 Fish and Aquatic Resources

- 7.8.1.1 Control of instream flows, powerhouse discharge rates (i.e., ramping rates), and reservoir levels
- 7.8.1.2 Fish passage, intake screening, tailrace screens
- 7.8.1.3 Artificial propagation of fish and other aquatic species
- 7.8.1.4 Large woody debris or gravel management
- 7.8.1.5 Habitat enhancement (e.g., creation of pools)
- 7.8.1.6 Relocation of sensitive, threatened or endangered species
- 7.8.1.7 Scheduling construction to avoid critical or important fish life history periods (e.g., spawning)
- 7.8.1.8 Flow gauging and water quality monitoring
- 7.8.1.9 Recreation use and associated fish monitoring (e.g., evaluate the effects of boating releases on fish spawning)
- 7.8.1.10 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)
- 7.8.1.11 Mitigation measures unique to specific alternatives

7.8.2 Wildlife Resources

- 7.8.2.1 Controls on hunting within the project area
- 7.8.2.2 Modify facility and activity locations and timing to avoid critical ecosystems, migratory routes and breeding areas
- 7.8.2.3 Scheduling construction to avoid critical or important wildlife history periods (e.g., breeding, nesting)
- 7.8.2.4 Transmission line design to minimize or avoid electrocution of raptors and other large birds
- 7.8.2.5 Relocation of sensitive, threatened or endangered species
- 7.8.2.6 Blasting plan, if applicable (summary of relevant measures with full document in Annex)
- 7.8.2.7 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

Social-Economic-Cultural Impacts

7.9 Socio-Economic Conditions

7.9.1 Selection of an alternate site for the project, and if not possible then adhering to requirements of an internationally recognized Resettlement Action Plan (RAP)

7.9.2 Rehabilitation Program for people displaced by the project (summary of relevant measures with full document in Annex)

7.9.3 Training local residents for employment in the project

7.9.4 Development of a "Code of Conduct" (with associated training program) for workers to show respect to the local populations and their culture and social rules

7.9.5 Measures proposed to protect public from failure of proposed facilities

7.9.6 Design and operational measures to avoid or reduce risk

7.9.7 Measures to exclude public from hazardous areas

7.9.8 Public Health Program to protect local population from potential health problems caused by the project operation (summary of relevant measures with full document in Annex)

7.9.9 Development of an Occupational Health, Industrial Safety and Accidents Prevention Program with appropriate accident prevention program, reporting and periodic review (summary of relevant measures with full document in Annex) including provision of routine training and testing, and proper safety equipment such as hearing protection, hardhats, steel-toed shoes, safety railings, fall arrestors, sensors for notification on reaching of warning and action limits for exposure to hazardous gases and liquids or impending catastrophic failures.

Tables G-1 and G-2

7.9.10 Spill Prevention and Containment Plan (summary of relevant measures with full

document in Annex)
7.9.11 Hazardous Materials Management Plan (summary of relevant measures with full document in Annex)
7.9.12 Mitigation measures unique to specific alternatives

7.10 Infrastructure

7.10.1 Transportation infrastructure

This section of the EIA addresses mitigation measures for transportation and traffic patterns on existing roads. Mitigation of impacts of new and existing roads on water quality and biological resources and land use should be addressed in those respective sections.

7.10.1.1 Transportation Plan (summary of relevant measures with full document in Annex)

- Placement of traffic signals
- Establishing, posting and enforcing speed limits for the vehicles that transport material
- Training employees, contractors and subcontractors on measures to reduce or avoid potential accidents
- Hiring and training security personnel devoted exclusively to preventing accidents in the access road and controlling the speed of the vehicles transporting project material

7.10.2 Public health infrastructure
7.10.3 Communications infrastructure
7.10.4 Energy Infrastructure
7.10.5 Mitigation measures unique to specific alternatives

7.11 Cultural, Archeological, Ceremonial and Historic and Resources

7.11.1 Modify facility and activity locations to avoid significant archeological, cultural, ceremonial and historic sites
7.11.2 If avoidance is not possible, conduct appropriate resource recovery operations before disturbing the sites
7.11.3 Clearly delineate boundaries and post signs identifying existing archeological, cultural and historic sites on roadsides and within the project area boundaries so that they are easily recognized by the machinery operators and other workers
7.11.4 Development of a training program so that staff recognize and respect culturally and archeological sensitive areas
7.11.5 Development protocols for use during construction and operation stages for identifying and responding to archeological, cultural, ceremonial and historic sites not identified during the preliminary surveys

7.11.5.1 In the event that such a site is found, they will stop activities at the site and report to the government relocation of cultural or historical resources, for their physical protection.

7.11.6 Mitigation measures unique to specific alternatives

7.12 Land Use

7.12.1 Criteria and method for calculating compensation for loss of land and crops
7.12.2 Compensation to farmers and ranchers for crop or forage losses and restore lost agricultural lands at the end of the project.
7.12.3 Compensation to property owners for relocation of their homes in the event the relocation is unavoidable.
7.12.4 Mitigation measures unique to specific alternatives

8 Environmental Management Plan

The EIA shall include an Environmental Management Plan to prevent, mitigate and monitor each impact identified in the EIA. Plans will describe actions to be taken in sufficient detail to provide a basis for subsequent auditing of compliance with commitments made in the EIA process including who is responsible, how and when it will be implemented, what will be done and what results will be achieved, why it is being done, and how to know whether it is effective in addressing the underlying concerns. The Environmental Management Plan shall have the following elements:

8.1 Overview of Environmental Management Plan Organization and Policy

8.1.1 Describe the project management and how environmental management and

H. Environmental Management Plan

Table H-1

organization relates to overall project responsibility. Describe the personnel and performance accountability system for design, operation, maintenance and closure for implementation of mitigation and monitoring measures

8.1.2 Describe the environmental policy that will govern the Project throughout its implementation, including at least the objectives, scope, commitment to continuous improvement, control and environmental monitoring and good relationship with neighboring populations and countries, as well as the commitment to internal controls such as compliance and environmental monitoring and routine audits

8.1.3 Identify the persons responsible for the implementation of mitigation measures, in each phase

8.2 Project-wide Mitigation Plan including an implementation schedule. It has two elements:

G. Mitigation and Monitoring Measures

8.2.1 Environmental resource mitigation (such as air, water)

8.2.2 Socio-economic-cultural mitigation (relocation, etc.)

8.3 Project-Wide Monitoring Plan (usually specific to monitoring of surface and ground water)

8.3.1 Short-term and long-term monitoring of resource condition, including but not limited to:

8.3.1.1 Slope stability

8.3.1.2 Water Quality Monitoring Program

- Where, how and when monitoring shall be conducted
- Parameters to be monitored
- Monitoring frequencies
- Sampling and analytical protocols to be used

8.3.1.3 Air Quality Monitoring Program

G.3 Monitoring and Oversight

- Where, how and when monitoring shall be conducted
- The Parameters to be monitored
- The monitoring frequencies
- The sampling and analytical protocols to be used

8.3.1.4 Noise and Vibration

8.3.1.5 Cultural, ceremonial archeological and historic resources in the vicinity of the mine

8.3.2 Short-term and long-term monitoring to ensure that the mitigation measures are functioning as predicted and that rehabilitation is working

8.4 Management of Other On- or Off-Site Environmental Pollution Control and Infrastructure

This section should address management of critical elements of pollution control and infrastructure that are not otherwise included in the mitigation plan because they were considered an essential part of the proposed project.

Table H-1

8.5 Contingency Plans

Contingency plans shall be prepared and described to address a) failure to meet specific performance criteria established by law or necessary for the project to meet its commitments in the EIA and b) respond to natural and other risks previously identified and mitigated in the EIA in the event reasonable and feasible mitigation measures to address the risks are inadequate.

8.5.1 Performance-related Contingency Plans, indicating the steps that will be taken should monitoring indicate that:

8.5.1.1 Environmental standards are not being met

8.5.1.2 Impacts are greater than predicted

8.5.1.3 The mitigation measures and/or rehabilitation are not performing as predicted

8.5.2 Natural Disaster Risk Response Plan (assumes that risk identification and risk reduction have been addressed in other parts of the EIA)

8.5.3 Other Risks Response Plans (assumes that risk identification and risk reduction have been addressed in other parts of the EIA)

8.5.4 Contingency plans for maintaining service or reducing downtime in the event of accidents or natural catastrophes that disrupt facility operation

9 Signed Commitment Statement

The EIA shall contain a legally binding signed letter of commitment to meeting the terms of the EIA. The statement must be signed by the authorized representative of the proponent company with assurance that all financial surety measures as required by the regulatory agency have been met.

10 Annexes

These shall be numbered and duly referenced in the text.

10.1 Public Consultation

10.1.1 Public consultation plan
10.1.2 A summary of public outreach activities including: audience, number of persons, organizations involved, concerns raised, responses to comments
10.1.3 Summary of response to comments
10.1.4 Actual copies of written comments

10.2 Technical Supporting Documents

10.2.1 Include maps, plans, charts and figures in the sequence mentioned in the EIA document
10.2.2 Zoning maps with resources and results of impacts
10.2.3 Special Studies if relevant but not readily accessible
10.2.4 Detailed materials on predictive tools/models and assumptions used for the assessment but too detailed for the body of the EIA

10.3 References

Submit a list of all references, (books, articles, technical reports and other information sources) cited in the various chapters of the EIA study with full biographic references, and the following conventional procedures cited in the literature: author, year, title, source, number of pages, and city of publication or issuance.

B.2 Public Participation

3 TERMS OF REFERENCE (TOR) FOR OTHER RENEWABLE ENERGY GENERATION PROJECTS

A. OVERVIEW

These terms of reference (TOR) describe the minimum requirements for the development of the Environmental Impact Assessment (EIA) for proposed wind, solar and geothermal energy generation projects. Both the TOR and the cross referenced "*EIA Technical Review Guidelines for Energy Power Generation and Transmission Projects*" should be used to establish minimally acceptable conditions for satisfying the requirement to submit an EIA. There are four different TORs for energy projects which are designed with a common overview and distinct TORs for different types of energy power generation and transmission. Part A, Overview, is common to all of them but Part B is tailored respectively to: 1. Thermal/Combustion Power Generation Projects, 2. Hydropower Generation Projects, 3. Other Renewable Energy Generation Projects, and 4. Transmission Lines. The four TORs are structured to facilitate mixing and matching as appropriate to the purpose and need for a proposed project and alternatives.

The basic format for the EIA document that should be followed is:

- Table of Contents
- Acronyms and Abbreviations
- Executive Summary
- General Information
- Project and Alternatives Description
- Environmental Setting
- Assessment of Impacts
- Mitigation and Monitoring Measures
- Environmental Management Plan
- Commitment Statement
- Annexes

In general, the EIA must identify and address:

- Applicable environmental standards, norms, and requirements set forth at the international, national, regional and/or local levels including those designed to meet the objectives of resource management and/or land use plans that may be in effect in and around the jurisdiction(s) in which you propose to develop the project and in which the proposed project might have a potential impact. In the absence of such standards, identify a set of benchmarks that can be used in the analysis and the basis for your selection. The guideline identifies standards in use by various countries and international organizations in Appendix C.

- Public/Stakeholder concerns related to impacts in and around the proposed project and alternatives at least for stakeholders within the geographic scope of potential impact. The project proponent should document specific steps taken to engage the public and other stakeholders, and engage these publics as early as possible before undertaking to prepare the EIA. Concerned publics include: local governments, persons living and working in the vicinity of the project, those with interests in resources that may be affected i.e., indigenous peoples, and those concerned about protected areas and prime agricultural lands. A summary of public outreach activities, audience, number of persons, organizations involved, concerns raised, responses to comments and actual copies of written comments received should be included in the Annex.

- All relevant plans related to the proposed energy project, for example, engineering and site preparation plans, operations and decommissioning or closure, environmental management, and mitigation in whatever form these may take.

- All phases of the project from feasibility studies to site preparation to operations to closure and also plans to expand capacity at the current or adjacent sites.

- Alternative approaches to meeting the purpose and need for the proposed energy project include alternative siting, alternative configuration on the site, designing, constructing, operating and decommissioning the project firstly to avoid and prevent, or secondly to reduce or minimize adverse or improve beneficial environmental or socio-economic impacts. The EIA should assess as appropriate the impacts of a range of representative reasonable and technically feasible alternatives as well as the proposed project. The alternatives to the project must include a "no action" alternative, indicating what would happen in the absence of the proposed project as well as consideration of best practices that may not otherwise have been incorporated in the proposed project. Other alternatives should be developed as needed to address significant issues with the proposal.

- Direct, indirect and cumulative impacts and their significance level.

- Uncertainty and how that uncertainty will be addressed through monitoring and contingency plans as may be needed to reduce risk of adverse impacts in the future.

- Specific commitments, including who is responsible, what will be done, when and how it will be monitored, reported and audited to confirm that commitments are met.

Finally, a key part of the TOR is obtaining a legally binding commitment from the project proponent that the approved EIA will be implemented as presented. Such a commitment adds to the legal enforceability of the outcomes of the EIA process.

B. DETAILS FOR OTHER RENEWABLE ENERGY PROJECTS (TOR)

0 Table of Contents

A general Table of Contents for the Environmental Impact Assessment (EIA) shall be provided. The Table of Contents shall be organized in such a manner as to facilitate the use of the EIA by reviewers and project implementers. EIAs for larger projects should have a more detailed Table of Contents than those for smaller projects. At a minimum, the Table of Contents shall include the following:

- Acronyms and Abbreviations
- Executive Summary
- General Information
  - Objectives and Justification
  - Project Proponents
  - Project Team
  - Legal and Regulatory Framework
- Project and Alternatives Description
- Environmental Setting
  - Physical Environment
    - Geologic Resources
    - Soil Resources
    - Water Resources
    - Air and Climate
    - Noise and Vibration
    - Aesthetic Resources
  - Biological Environment
    - Vegetation/Flora
    - Aquatic and Terrestrial Wildlife/Fauna
    - Ecosystems: Terrestrial, Wetlands, Aquatic, Marine
    - Endangered or Threatened Species and Habitat
    - Protected Areas
  - Social-Economic-Cultural Environment
    - Socio-Economic Conditions
    - Infrastructure
    - Cultural, Archeological, Ceremonial and Historic Resources
    - Land Use
- Assessment of Impacts to resources described in the Environmental Setting
- Mitigation and Monitoring Measures
- Environmental Management Plan
  - Overview of Environmental Management Plan Organization and Policy
  - Project-wide Mitigation Plan
  - Project- wide Monitoring Plan
  - Management of Other On- or Off-Site Pollution Controls and Infrastructure
  - Contingency Plans
    - Performance-related Contingency Plan
    - Natural Disaster Risk Response Plan
    - Other Risk Response Plans
- Signed Commitment Statement
- Annexes
  - Public Consultation
    - Public Consultation Plan
    - Summary of Public Outreach Activities
    - Summary of Responses to Comments
    - Copies of Written Comments
  - Technical Supporting Materials
    - Maps and Plans, in the sequence mentioned in the EIA document
    - Charts and Figures
    - Details about predictive modeling used, calculations and assumptions
    - Special Studies
  - References

1 Acronyms and Abbreviations

All acronyms and abbreviations used in the EIA must be clearly and succinctly defined and described in this section. This will relieve the reader of the need to search for the first occurrence of a word and the citing of the acronym or abbreviation in the text.

2 Executive Summary

A general summary of the EIA shall be provided in this section. The summary shall be written using a vocabulary that can be easily understood by the public. It shall include at least the following information about the project from the EIA:

- Objectives and Justification
- Location
- Project Proponents
- Project Description
- Other Project Alternatives
- Environmental Setting
- Evaluation of Impacts
- Mitigation and Monitoring Measures
- Environmental Management Plan
- Issues raised by stakeholders and any outstanding issues

3 General Information

3.1 Objectives of and Justification for the Proposed Project

3.1.1 **Objectives:** A statement of the general and specific objectives (purpose) of the proposed project, including whether it is a new project, an expansion of an existing project (e.g., increase in land area or increase in annual production) or modernization of an existing operation.

3.1.2 **Justification for the Project:** Provide a justification for the proposed project (need) highlighting the benefits to surrounding communities and economic development of the region and country.

C.2 Documentation of Purpose and Need

3.2 Project Proponents

3.2.1 Names, addresses, telephone numbers, and applicable legal documentation of proponents (including developers, major equipment suppliers if part of project team, shareholders and providers of financing, and representatives).

3.2.2 Names and contact information for responsible parties within the organization.

3.2.3 Financial viability of the company (including a certified banking statement indicating that the company is financially stable and reputable).

3.2.4 Bonding requirements and proof of ability to meet bonding requirements sufficient to cover the potential costs of environmental management during all phases, as well as the costs, by a third party, of decommissioning and long-term post-closure liabilities associated with the project.

G.4 Financial Assurance

3.3 Project Team

This section shall provide information on the multidisciplinary team that prepares the EIA. The types of professionals included in the team shall be appropriate to the type of project and the type of environment in which the project is located and may include (but not be limited to) engineers, architects, biologists, geologists, hydrologists, air quality experts, archeologists, anthropologists, sociologists and economists. The information provided for each member of the EIA project team includes the following:

3.3.1 Names, addresses and registry numbers of contractors.

3.3.2 Names, contact information, qualifications and registry numbers of key personnel involved in the study; as well as an affidavit indicating their area of participation.

3.3.3 List of professionals/experts participating in the EIA, their areas of expertise, degrees, experience, professional registrations and stamps, seals and signatures.

3.4 Legal and Regulatory Framework

This section of the EIA shall define the legal framework under which the EIA is being completed listing and summarizing requirements or alternatives used as benchmarks, and evidence of non-applicability or compliance, including:

3.4.1 Information that demonstrates rights and access:

3.4.1.1 Ownership with written authorization

3.4.1.2 Governmental authorization (if required)
3.4.1.3 Period of lease/permit
3.4.1.4 Maps showing the lease/permit area
3.4.2 Applicable environmental standards, norms and requirements set forth at the international, national, regional and/or local levels
3.4.2.1 In the absence of such standards, identify a set of benchmarks used in the analysis
3.4.3 Required regulatory approvals and/or permits for all stages and their status
3.4.4 Applicable land use requirements (demonstrate conformity and compliance with applicable plans)
3.4.5 Applicable natural resource management or protected area management plans and responsible agency(ies) (demonstrate conformity and compliance with all applicable plans)

4 Project and Alternatives Description

The project proponent shall submit a full description and location of the proposed project and reasonable alternatives including ancillary facilities and operations such as the camp/housing for construction and operation phases, borrow and disposal areas, sanitary services, waste disposal and transportation infrastructure, etc. as addressed through 4.1 to 4.3 below. It shall include at a minimum:

C. Proposed Project Description and Alternatives

4.1 Location

The general location of the project and associated activities in terms of:

4.1.1 Political-administrative location (region, district, town or other relevant political-administrative units) with accompanying location map
4.1.2 Means of site access – i.e., by air, river, road, train or vehicle
4.1.3 Latitude and longitude of project area
4.1.4 Maps of project area at a scale of no less than 1:50,000 or as required by the regulatory agency
4.1.4.1 Project plat plan and location on a fold-out 11" X 17" page.
4.1.4.2 Indicate the project area and the direct and indirect areas of influence for the physical, biological and social-economic-cultural impacts
4.1.4.3 All drawings should present scale and key coordinates or benchmarks as latitude/longitude, Universal Transverse Mercator (UTM) coordinates, or local survey plate that can be cross-referenced to latitude/longitude or UTM coordinates

C.3 Project and Alternative Description

4.2 Summary of Proposed Project and Alternatives

All project alternatives that are reasonable and feasible and meet the purpose and need for the proposed project shall be identified, summarized in this section, and evaluated in the EIA as appropriate. In addition to the proposed project, such alternatives include alternative locations, alternative fuels, alternative site configuration of elements of the project, alternative size and output capacity, and alternative plans for construction, operation and decommissioning of the power plant including best practices that may avoid and/or reduce the adverse impacts to the physical, biological or social-economic-cultural environments.

If the project area or the buffer zone of the project area for an alternative is in an ecologically fragile are, the description of the alternative must include a clear justification for not opting for another site. Identify which alternatives will be carried through the analysis in the EIA and the basis for that decision.

C.3 Project and Alternative Description

C.4 Project Alternatives

4.3 Project and Alternatives Details

The EIA shall provide specific project details for the proposed project and each alternative as identified in subsections 4.3.1 through 4.3.7. The level of detail presented shall be the same for the proposed project and each alternative evaluated. The following project details shall be provided:

4.3.1 General
4.3.1.1 Type and nature of the project
- Type (wind, solar thermal, solar photovoltaic, solar dish engine, geothermal)
- Capacity: maximum, minimum and average power output as MW, and as MWhrs by month and season

4.3.1.2 Flow diagram for the generation of power showing all components of the plant and their relationships to each other
4.3.1.3 General plan for the facility, showing the location and layout of all project

C.4.6 Solar Power

C.4.7 Wind Power

C.4.8 Geothermal Power

Appendix A. What is Energy Generation and Transmission?

components and their relationship to each other

4.3.1.4 Project operations

- Description of how the project would operate (seasonally, monthly, daily, hourly, as appropriate)
- Mode of operation (peaking, base load, run-of-river, storage)

4.3.1.5 Transmission lines (any connections and new lines associated with the hydropower project)

- Plans to connect to existing transmission lines
- New transmission lines (making following bullets a lower order
  - Line voltage
  - Total length of line in km
  - Minimum height of conductors over ground level
  - Width of the right of way in meters
  - Source
  - Destination
  - Number and types of towers
  - Height of towers
  - Number of circuits, stations and transformer yards
  - Points of interconnection between existing and new

4.3.1.6 Onsite Support Facilities

Location and design information – composition, dimensions, and configuration including site drawing (digitized) for the following:

- Offices and onsite housing
- Laboratories
- Power generation
- Storage
- Repair shops
- Fuel stations
- Sanitary Facilities
- Water supply
  - Requirements (m^3/day)
  - Rights
  - Sources
  - Distribution
- Waste handling and disposal
- Fencing

4.3.2 Design details for each power generation component – number, materials of construction, dimensions and configuration. Specific components in the TOR will vary with type of project, as presented below:

4.3.2.1 Wind

- Towers
- Wind turbines
  - Type
  - Nameplate capacity
  - Height
    - Hub height
    - Rotor diameter
    - Total height
  - Foundations
- Electrical collector lines
- System controls
- Collector substation
- Transformers
- Energy storage, if applicable
- Backup energy source, if applicable
- Other works: describe additional works not covered above

4.3.2.2 Solar photovoltaic

- Solar panels

C.5 Electric Power Transmission

C.7 Onsite Support Facilities

Table C-1

- Type
- Capacity

- Electrical collector lines
- System controls
- Collector substation
- Transformers
- Water sources, amounts and storage for regularly washing the collector surfaces
- Energy storage, if applicable
- Backup energy source, if applicable
- Other works: describe additional works not covered above.

4.3.2.3 Solar dish engine

- Mirror array (concentrators)
  - Type
  - Design
  - Foundations
  - Tracking controls
- Receivers
  - Type
  - Specifications
- Engines
  - Type
  - Specifications
  - Capacity
  - Cooling system
- Electrical collector lines
- System controls
- Collector substation
- Transformers and/or alternators
- Water sources, amounts and storage for regularly washing the mirrors and reflective surfaces
- Energy storage, if applicable
- Backup energy source, if applicable
- Other works: describe additional works not covered above.

4.3.2.4 Solar thermal

- Type (parabolic trough, power tower, etc.)
- Mirror array (concentrators)
  - Type
  - Design
  - Foundations
  - Tracking controls, if applicable
- Heating fluid
  - Type – chemical composition
  - Quantity
  - Storage
  - Disposal of spent fluid
- Piping for fluid conveyance from collectors to plant
- Heat exchangers
- Boilers
- Steam controls
- Cooling system
- Cooling water
  - Quantity
  - Source(s)
  - Intakes
  - Treatment and discharge
- Cleaning water for regularly washing the mirrors and reflective surfaces

- Quantity
- Source(s)
- Storage

- Turbines
- Electrical generators
- Transformers
- Energy storage, if applicable
- Backup energy source, if applicable
- Other works: describe additional works not covered above.

4.3.2.5 Geothermal

- Descriptions of all geothermal wells, including both exploratory wells and production wells
  - Number
  - Location
  - Depth and diameter
  - Design
  - Materials used
- Equipment used for drilling wells
  - Disposition of waste material during drilling
  - Water intakes
  - Water discharges including reinjection
  - Turbines and electrical generators
  - Transformers and transmission lines
- Piping for water conveyance from wells to plant
- Heat exchangers
- Boilers
- Steam controls
- Cooling system
- Cooling water
  - Quantity
  - Source(s)
  - Intakes
  - Treatment and discharge
- Treatment of "spent" thermal water
  - Type (reinjection or surface discharge)
  - Locations
  - Specifications
  - Treatment, if applicable
- Turbines
- Electrical generators
- Transformers
- Air emissions controls for "open" systems, if applicable
- Other works: Describe additional works not covered above.

4.3.3 Design Drawings for project facilities

4.3.3.1 Plan (overhead view)

4.3.3.2 Elevations (front view)

4.3.3.3 Profiles (side view)

4.3.3.4 Sections

4.3.4 Access

C.6 Transportation Facilities

4.3.4.1 Roads

- Identify all new and existing roads to be used (including closed roads that will be reopened, if applicable)
  - Traffic volume, operating speeds and trip times
  - Closed roads that will be reopened
- Detailed information on any roads to be constructed or upgraded (including on-site roads)
  - Location
  - Timing of construction

- Road surface and shoulder width and barriers
- Grade
- Construction methods including clearing and grubbing
- Construction materials
- Compaction
- Stream crossings and associated designs
- Animal crossings
- Sedimentation and erosion prevention and control structures and practices
- Stabilization methods for cuts and fills
- Typical elevations for each type and situation of road displaying construction materials, levels of compaction and erosion and sedimentation features
- Location and size (area and volume of material) of borrow pits
- Operation
- Closure plan
- Traffic volume, operating speeds and trip times

- Dust control for construction and operation
- Maintenance
- Roster for construction and maintenance equipment, specifying type and quantity by size, motor size, and fuel requirements

4.3.4.2 Other transport systems (if applicable)

- Rail transport – Same as for Roads with the addition of:
  - Tightest curves
  - Track construction materials
  - Turnouts and sidings
  - Railroad communications and signaling
- Waterways
  - Location, design, construction and operation of loading docks
  - Rosters of boats used to move barges, specifying type and quantity by: size, motor size, and fuel requirements
  - Maintenance
- Overland conveyors
  - Location, design, construction and operation of conveyors
  - Stream and road crossing designs to prevent falling debris
  - Dust control for construction and operation
  - Maintenance

4.3.5 Construction phase and timetable

4.3.5.1 Schedule for each phase of construction for all project and ancillary facilities including, but not limited to:

- Mobilization
- Road construction and improvements
- Land clearing
- Drilling
- Blasting
- Borrow and spoil disposal
- Erosion and sediment control
- Excavation and subgrade preparation
- Foundation preparation
- Concrete work
- Construction or installation of each project facility
- Stabilization of disturbed areas

4.3.5.2 A GANTT or critical path management chart for the entire project, from start to finish

4.3.5.3 Equipment

- Equipment Roster specifying type and quantity by size, weight, motor size, and fuel requirements for each piece of equipment or machinery used in each activity

- Transportation mobilization and mobilization frequency
- Machinery and equipment mobilization routes to be used, as well as the features of the ways on which they will be transported, including a map of routes, as applicable, and mobilization.

4.3.5.4 Labor during construction — **C.9 Manpower and Local Purchases**

- Number and type of employees (by local hire and non-local hire) by field of expertise
- Days per week
- Hours per day
- Shifts per day

4.3.5.5 Raw materials to be used for construction — **C.9 Manpower and Local Purchases**

- Give a complete list of the raw materials and construction materials to be used, indicating the amounts per day, month, and the storage means
- Include an inventory of chemical, toxic or hazardous substances, active elements, sites and storage means, safety aspects regarding transportation and handling and any other relevant information

4.3.5.6 Construction camp (if applicable)

Description of the camp including but not limited to: — **C.7 Onsite Support Facilities**

- A map showing all facilities at a legible scale appropriate to the size of the project
  - Buildings by type (use) and size
  - Roads
  - Electrical transmission lines and/or substation
  - Drainage
- Water supply and distribution
  - Distribution system
  - Use (m^3/day)
  - Rights
  - Sources
- Waste handling and disposal components
  - Sewers
  - Wastewater treatment
  - Solid waste facilities
- Energy generation and use requirements
- Closure or transition from construction camp to final onsite housing

4.3.6 Operation phase

4.3.6.1 Pre-operation Phase: cooling pond filling plan (if appropriate) including, but not limited to:

- Proposed filling rate with definite hold periods for observation
- Options to control filling
- Schedule for inspection and evaluation of structures and instrumentation

4.3.6.2 Operation information

- Roster of equipment and machinery to be used during operation, specifying type and quantity by size, weight, motor size, and fuel requirements for each activity
- Labor during operation
  - Number and type of employees (by local hire and non-local hire) by field of expertise
  - Days per week
  - Hours per day
  - Shifts per day
- Overall energy requirements and sources
- Inventory of chemical, toxic or hazardous substances used during operation
  - Active elements,
  - Storage means

- Safety aspects regarding transportation and handling
- Other relevant information

4.3.7 Closure and decommissioning plan

If it becomes clear that closure will be required, or when the project nears the end of its service life, the project operator shall contact the proper regulatory agency(ies) to obtain the environmental guidelines to carry out the closure or decommissioning.

C.8 Closure and Decommissioning Plan

4.3.7.1 The project description shall include at least a general Restoration and Closure Plan, recognizing that terms of closure may be very different when this phase approaches

4.3.7.2 The description of restoration measures should include the size of the area to be restored as well as concurrent, temporary and final restoration measures to be used and their schedules. For each measure include:

- Area to be addressed
- Timing and schedule for executing measures
- Equipment and structure removal or conversion
- Remedial measures, including success indicators and contingency measures if initial efforts are unsuccessful

4.3.7.3 Plans for the decommission of system components, including disposal of potentially hazardous wastes incorporated into components

5 Environmental Setting

Based on information available from the literature, government and special studies or other sources, the EIA shall provide information on environmental setting for the different types of physical, biological and social-economic-cultural environments for the current situation, important trends and predicted situation in the absence of the proposed project. All sources of data must be cited in the EIA when and where they are used. Indicate the direct and indirect and cumulative impact areas of influence for physical, biological, and social-economic-cultural impacts and basis for defining area. This section shall include at a minimum, the following information:

D. Environmental Setting

Physical Environment

5.1 Geologic Resources and Hazards

5.1.1 Cross sections of the geology including soil horizons

D.2 Physical Environment

5.1.1.1 Geologic characteristics at all project facility locations and in the area of influence.

5.1.1.2 Geological map of the project area and area of influence at a scale of 1:10,000.

Submit a map of the area displaying all characteristics described. Include geological profiles and cuts, as well as stratigraphic columns.

D.2.1 Geology and Soils

5.1.2 Topography and slope conditions and geomorphology

5.1.3 Seismicity and stability characteristics

5.1.3.1 Indicate the general seismic and tectonic features of the surrounding areas:

- Seismic sources close to the project area
- Seismic history
- Maximum expected magnitudes intensity
- Period of seismic repetition
- Outcome of threats based on peak acceleration for the site
- Periods of vibration of the site
- Micro zoning in terms of the geological map

5.1.3.2 Volcanic activity (must be provided by all the projects that are located within a radius of 30 km from an active volcanic emission center)

- Indicate the general volcanic features of the area near the site
- Historical eruptions
- Period of recurrence
- Type of eruptions
- Affected areas and high risk areas

5.1.3.3 Describe project areas susceptible to soil liquefaction; planned, active, and abandoned mines; karst terrain; and areas of potential ground failure, such as subsidence, slumping, and landsliding

5.2 Soil Resources

The EIA shall describe baseline soil resources, and make use of maps, tables and accompanying narrative text to describe the soils at the facility site, along new or reconditioned access routes and along new transmission corridors associated with the facility and included in the EIA.

D.2.1 Geology and Soils

5.2.1 Types, capacity and uses
5.2.2 Fertility and potential uses of the land for agriculture
5.2.3 Stability and permeability
5.2.4 Erosion and sedimentation potential
5.2.5 Quantity and quality available for revegetating and restoring the disturbed area at time of closure

5.3 Water Resources

D.2.2 Water Resources

5.3.1 Surface water
- 5.3.1.1 Names and locations on maps of all permanent and intermittent streams, rivers, wetlands, lakes and reservoirs within the area of influence
- 5.3.1.2 River mile designation or other reference point for the intake and discharge points of the project (if project will be using surface water for cooling)
- 5.3.1.3 Flow (if project will be using surface water for cooling)
  - The monthly minimum, mean and maximum recorded flows in m3/s of the river at the diversion point
  - A monthly flow duration curve (i.e., flow exceedance curve) indicating the period of record and location of gauging stations where data were gathered to derive the curves
- 5.3.1.4 Seasonal fluctuations in area and volume of wetlands, lakes and reservoirs
- 5.3.1.5 For any proposed or existing cooling ponds, surface area, volume, maximum depth, mean depth, flushing rate, shoreline length, substrate composition
- 5.3.1.6 Delineation of watersheds and water drainage pattern in the area of influence using cadastral/aerial/remote sensing satellite imageries (map)
  - Runoff characteristics of watersheds
- 5.3.1.7 Inventories of consumptive and non-consumptive use, especially those who are in the floodplain between intake and discharge points and downstream of the discharge (if project will be using surface water for cooling)
- 5.3.1.8 Surface water balance (if project will be using surface water for cooling)
  - Existing uses by type and volume
  - Capacity

5.3.2 Groundwater (if project will be using groundwater for cooling and/or will use cooling ponds)

Provide a map and identify and describe aquifers and underground waters adjacent to the project, indicating the depth of the water table along with trend data:

- 5.3.2.1 Hydrogeologic characteristics of the area (vadose zone and aquifers)
  - Flow regime
  - Flow direction
  - Influences of geologic structures (faults, contacts, bedrock fracturing, etc) and surface water bodies
- 5.3.2.2 Location and characteristics of all existing springs and wells in the area of influence (on topographic map)
  - Flow/yield data for each spring and well (including water levels in wells)
  - Depth and construction information for each well
  - Existing uses by type and volume
  - Capacity available
- 5.3.2.3 Groundwater recharge data
- 5.3.2.4 Groundwater potential yield
  - Availability
  - Water table levels (dry and rainy season)

5.3.3 Water quality (if project will discharge cooling water and/or will use cooling ponds)

5.3.3.1 Existing water quality data

- Locations of all water quality monitoring stations in and around the project area (with direction and distance from the site)
- Water quality data for each station for those parameters likely to be affected by project construction, operation, or maintenance
- Physical, chemical and biological water quality characteristics, including water temperature and dissolved oxygen concentrations
- For any proposed or existing cooling ponds water temperature and dissolved oxygen concentrations, including seasonal vertical profiles

5.3.3.2 Supplemental sampling and analysis (if existing data is not adequate to characterize water quality)

Sampling and Analysis Program in annex

- Water quality information upstream of the location of water intake, at the point of discharge and downstream from discharge point
- Proposed locations of representative monitoring stations upstream and downstream of proposed project activities
- Monitoring program design with at least a year of baseline data being collected
  - Parameters (including as appropriate, physical, chemical and biological)
  - Frequency of collection
  - Analytic methods

5.3.3.3 Surface water and groundwater standards that apply to the project

- Current uses
- Standards for current uses (in the absence of such standards, identify a set of benchmarks used in the analysis)

5.4 Air and Climate

Baseline information for air resources shall be collected for at least one year or as required by the regulatory agency and shall include at a minimum the following:

5.4.1 Climate and meteorology

5.4.1.1 Source of data (meteorological station(s) from which climatological data have been obtained)

5.4.1.2 Temperature variations

5.4.1.3 Relative humidity

5.4.1.4 Solar radiation and evaporation rates

5.4.1.5 Rainfall (total precipitation, rainfall intensity and duration by month)

5.4.1.6 Wind rose (Wind direction and speed, 24 hourly data)

5.4.1.7 Statistical analysis of the data

D.2.3 Air and Climate

5.5 Noise and Vibration

Present a description of the noise and vibration levels for receptors near where noise generating activities of the project may occur. The EIA shall include:

5.5.1 Location of monitoring stations

5.5.2 Daytime and night time noise levels (measured in decibels)

5.5.3 Inventory of existing noise sources

D.2.4 Noise and Vibration

5.6 Aesthetic and Visual Resources

5.6.1 Photos presenting baseline panoramic views of the facility site from potential receptors

5.6.2 Viewsheds or other aesthetic or landscape resources

5.6.3 Existing sources of light contamination

D.2.5 Aesthetic Resources

Biological Environment

The EIA shall provide detailed information on the location and condition of ecosystems in and around the project area in the form of narrative, maps and tables, including the following:

D.3 Biological Environment

5.7 Vegetation/Flora

5.7.1 Vegetative mapping of terrestrial and wetland habitats (aquatic and marine if appropriate) for project area, including in the area of transmission lines and any downstream area affected by the project

5.7.2 Species and structure (abundance, density, status, plant communities, presence of invasive species, etc.)

D.3.1 Flora

5.8 Aquatic and Terrestrial Wildlife/Fauna

5.8.1 Fish and Aquatic Resources

5.8.1.1 Identification of fish, mussel, macroinvertebrate and other aquatic species

- Spatial and temporal distribution
- Species life stage composition
- Standing crop
- Age and growth data
- Spawning run timing
- Extent and location of spawning, rearing, feeding and wintering habitat

5.8.2 Wildlife Resources

5.8.2.1 Species (including status, i.e., endemic, migratory, exotic, endangered, threatened, keystone, etc.), life history, and seasonal use

5.8.2.2 Breeding areas

5.8.2.3 Mating and brooding areas

5.8.2.4 Migratory corridors (if applicable)

5.8.2.5 Important wildlife use areas (roosts, clay licks, etc.)

D.3.2 Fauna

5.9 Ecosystems: Terrestrial, Wetlands, Aquatic, Marine

Much if not all that will be needed to address the environmental setting for terrestrial, wetlands, aquatic and/or marine ecosystems will have been covered in Sections 5.7 and 5.8. This section is not intended to duplicate that information; rather, it should integrate the information to ensure that the structure and function of each ecosystem is adequately presented.

D.3.3 Ecosystems

5.10 Endangered or Threatened Species and Habitats

Sections 5.7 and 5.8 should identify all species in the project area. This section should highlight all endangered and threatened species and critical habitat that potentially occur in the vicinity of the project.

D.3.4 Endangered or Threatened Species and Habitats

5.11 Protected Areas

Identify on maps the specific locations and boundaries of relevant national parks, sanctuaries, reserves, etc., as well as any areas proposed for protection. Provide a brief narrative description of each area.

D.3.5 Protected Areas

Social-Economic-Cultural Environment

D.4 Social-Economic-Cultural Environment

5.12 Socio-Economic Conditions

Identify nearby human settlements including the following information for each settlement:

D.4.1 Socio-Economic Conditions

5.12.1 Population (size, gender and age distribution)

5.12.2 Cultural characteristics (religion, ethnic composition, languages spoken, etc.)

5.12.3 Economic activities (employers, employment and incomes)

5.12.4 Tax base

5.12.5 Crime rates

5.12.6 Literacy rates

5.12.7 Community organizations

5.12.8 Public Health and Safety

5.12.8.1 Diseases in the project area (including the sources of data and the methodology used to collect and analyze the data)

5.12.8.2 Level of emergency services and access to clinics, doctors and hospitals

5.12.8.3 Existing practice for assessment of occupational health

5.12.8.4 Existing electromagnetic fields

5.12.9 Skills, services and goods availability in the communities

5.13 Infrastructure

For each human settlement identified in subsection 5.12, describe the infrastructure in or serving the settlement, including the following information:

5.13.1 Transportation infrastructure

5.13.1.1 Roads

D.4.2 Infrastructure

This section of the EIA addresses baseline conditions of transportation and traffic patterns on existing roads. The EIA shall provide information on following:

- Location and condition of all existing roads
  - Surface materials
  - Erosion and sediment control
  - Maintenance programs (what, when and whom)
- Description of anticipated third-party improvements (government or entity other than the proponent)
- Traffic patterns and densities on roads within affected project vicinity
- Safety levels and current circulation issues, and capacity

5.13.1.2 Airports or airstrips, and their capacity and trends in use
5.13.1.3 Other transportation infrastructure as applicable such as rail, pipelines, harbors etc.
5.13.2 Public health infrastructure
5.13.2.1 Drinking water supplies and treatment
5.13.2.2 Wastewater treatment and management
5.13.2.3 Solid and hazardous waste management and treatment
5.13.3 Communications Infrastructure
5.13.3.1 Types of communications systems
5.13.3.2 Types of transmission (wired or wireless)
5.13.3.3 Locations of transmission lines (if applicable)
5.13.3.4 Locations of microwave towers and/or antennae (if applicable)
5.13.4 Energy Infrastructure
5.13.4.1 Types of energy
5.13.4.2 Sources including location and description of generating facilities in the area of influence
5.13.4.3 Transmission lines and/or pipelines
5.13.4.4 Fuel storage facilities

5.14 Cultural, Archeological, Ceremonial and Historic Resource

Identify all cultural, archaeological, ceremonial and historic resources within the area of influence, including the following information:

5.14.1 Data and maps relating to archeological, cultural, ceremonial, and historic sites in the direct vicinity of the project
5.14.2 Information on indigenous people or other traditional cultures, if any

D.4.3 Cultural, Archeological, Ceremonial and Historic Resources

5.15 Land Use

Actual and potential showing location, size and proximity within and surrounding the project area, including land use maps, and to extent possible, integrated into one map.

D.4.4 Land Use

5.15.1 Population centers, including information and locations of
5.15.1.1 Schools
5.15.1.2 Cemeteries
5.15.1.3 Churches
5.15.1.4 Other public buildings
5.15.1.5 Housing (including housing density)
5.15.1.6 Commercial areas
5.15.2 Agricultural lands
5.15.3 Forested lands
5.15.4 Protected areas (including but not limited to)
5.15.4.1 National parks
5.15.4.2 Wildlife refuges
5.15.5 Wetlands and Mangroves
5.15.6 Other environmentally sensitive areas
5.15.7 Tourism and recreation areas
5.15.7.1 Recreation facilities
5.15.7.2 Eco-cultural-tourist locations
5.15.8 Culturally sensitive areas
5.15.9 Flood plains and water bodies
5.15.10 Coastal zones

5.15.11 Other land uses as appropriate

6 Assessment of Impacts

The EIA shall provide information on potential impacts (direct, indirect and cumulative) and the magnitude and frequency of potential impacts on physical, biological, social-economic-cultural resources resulting from construction, operation and closure of the proposed project and alternatives. The assessment shall use standardized predictive methods, such as models, to determine the specific range of impacts on environmental and socio-economic resources. The EIA shall identify which impacts are significant and the criteria used to make this judgment. Critical data input from project description and environmental setting analysis projecting the conditions in the environmental setting in the absence of the proposed project shall be used as the baseline upon which potential impacts are forecast. The EIA shall also identify sources of data used in the analysis and the uncertainties associated with the outputs of each method used.

E. Potential Impacts

F. Assessing Impacts: Predictive Tools and Considerations

Appendix F. Asian Development Bank Rapid Environmental Assessment Checklists

Physical Impacts

6.1 Geologic Resources and Hazards

Potential impacts to geologic resources and potential effects on facility shall be described including but not limited to the following:

E.2 Physical Environment
Tables E-1 and E-2

6.1.1 Geologic hazards and potential effects on facility
6.1.2 Dam failure (if cooling ponds are proposed)
6.1.3 Impacts on mineral resources (current/future mining)
6.1.4 Changes in topography and drainage patterns
6.1.5 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.1 Geology and Soils

F.3 Soils and Geology Impact Assessment Tools

6.2 Soil Resources

Potential impacts to soil resources shall be described including but not limited to the following:

6.2.1 Soil quality
- 6.2.1.1 Contamination (accidental spills of fuel, oil or other hazardous substances)
- 6.2.1.2 Disposal of heat transfer fluids and component parts of photovoltaic cells
- 6.2.1.3 Impacts on use

6.2.2 Erosion, slope alteration, vegetation removal and drainage patterns
- 6.2.2.1 Models for soil erosion should be included using methods like USLE, defining the areas with high erosion potential
- 6.2.2.2 Sediment accumulation and transport
- 6.2.2.3 Sediment and hazardous waste removal and disposal

6.2.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.1 Geology and Soils

F.3 Soils and Geology Impact Assessment Tools

F.4 Solid Waste Impact Assessment Tools

6.3 Water Resources

Potential impacts to surface water and groundwater resources shall be described including but not limited to the following:

6.3.1 Geomorphology
- 6.3.1.1 Location of all stream or wetland crossings by right-of-ways and access roads.
- 6.3.1.2 Modification/diversion in the existing drainage pattern
- 6.3.1.3 Downstream scouring and upstream head cutting
- 6.3.1.4 Bank erosion (surface water discharges, stream crossings and dredging)
- 6.3.1.5 Potential for increased flash flooding

6.3.2 Quantity (applicable for projects requiring significant cooling water)
- 6.3.2.1 Water bodies likely to be created
- 6.3.2.2 Impact of water diversion on surface water and groundwater, including specific uses
  - Model results
  - Water table levels
  - Well production
  - Spring and stream flows
- 6.3.2.3 Effects of dams on downstream seepage

6.3.3 Quality
- 6.3.3.1 Effects of project construction and operation on water quality parameters

Appendix D: Erosion and Sedimentation

E.2.2 Water Resources

in surface water and groundwater, including the results of any water quality modeling
- Description of effects due to runoff, erosion, and sedimentation from roads, disturbed areas, and stream crossings, including sources, receiving waters, and effects on physical, chemical, and biological parameters
- Description of impact from wastewater discharges (if applicable)
- Description of effects of project operations on dissolved oxygen and total dissolved gas concentrations, and other parameters

6.3.3.2 Chemical contamination from agricultural chemicals applied to fields or forests producing biomass for the project

6.3.3.3 Spills and accidents
- Chemical, hazardous waste and fuel spills
- Overflows from cooling ponds during storm events or electricity failures
- Containment failures

6.3.4 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

F.5 Water Resource Impact Assessment Tools

Tables F-1 and F-2

E.2.3 Air Resources

6.4 Air and Climate

Potential impacts to air resources shall be described including but not limited to the following:

6.4.1 Impacts on ambient air quality

6.4.1.1 Sources (e.g., off-gases from open geothermal systems, fumes, windblown dust, and fixed and mobile equipment emissions)

6.4.1.2 Concentrations

6.4.1.3 Receptors (e.g., communities, schools, water bodies, ecosystems)

6.4.1.4 Greenhouse gas generation.

6.4.2 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

F.6 Air Resources Impact Assessment Tools

Table F-3

E.2.4 Noise and Vibration

6.5 Noise and Vibration

Potential impacts from noise shall be described including but not limited to the following:

6.5.1 Noise modeling

6.5.1.1 Basis for model selection

6.5.1.2 Input requirements

6.5.1.3 Modeling results

6.5.2 Potential noise levels at different representative sites in the project area and in communities near the project area

6.5.3 Potential vibration due to blasting and movement of heavy equipment, and related damage to materials and structures

6.5.4 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

F.7 Noise Impact Assessment Tools

E.2.5 Aesthetic Resources

6.6 Aesthetic and Visual Resources

Potential impacts to Aesthetic Resources, including light pollution, shall be described including but not limited to the following:

6.6.1 Impacts on visual resources and landscapes

6.6.2 Increases in light contamination

6.6.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

F.8 Aesthetic and Visual Resources Impact Assessment Tools

Table F-4

E.3 Biological Environment

Biologic Impacts

Potential impacts to biological resources shall be described including but not limited to the following:

E.3.1 Flora, Fauna and Ecosystems

6.7 Vegetation/Flora and Associated Ecosystems

Describe and quantify alterations in vegetative cover due to:

F.9 Flora, Fauna, Ecosystems and

6.7.1 Deforestation or wetlands destruction
6.7.2 Inundation of vegetated areas by cooling ponds (if applicable)
6.7.3 Other vegetative type conversions
6.7.3.1 Direct vegetative removal
6.7.3.2 Indirect (e.g., poisoning by dust and air contaminants)
6.7.4 Wildfires
6.7.5 Increased road access in remote areas leading to destruction of existing vegetative cover (land use changes)
6.7.6 Spread of noxious or invasive species
6.7.7 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

Protected Areas Impact Assessment Tools

E.3.1 Flora, Fauna and Ecosystems

6.8 Aquatic and Terrestrial Wildlife/Fauna and Associated Ecosystems

Describe and quantify alterations in aquatic and terrestrial wildlife populations due to:

6.8.1 Fish and Aquatic Resources
6.8.1.1 Loss in habitat (e.g., spawning, rearing, juvenile, or adult habitats) from changes in water quality (temperature, dissolved oxygen and other parameters) and instream flow
6.8.1.2 Disturbance of aquatic resources during construction, operations, or maintenance activities, including equipment noise, erosion and sedimentation, vehicular movements, or blasting
6.8.1.3 Entrainment and mortality effects on fish populations from water intakes for cooling water
6.8.2 Wildlife Resources
6.8.2.1 Loss of habitat, migratory routes/corridors, and breeding areas due to changes in vegetative cover/wetlands loss
6.8.2.2 Disturbance of habitat, migratory routes/corridors and breeding areas due to project construction, operation, and maintenance, recreational use, and human settlement associated with the project (e.g., noise, vibration, illumination, vehicular movement)
6.8.2.3 Loss or contamination of drinking water for wildlife species
6.8.2.4 Poisoning (e.g., air emissions, direct contact with toxic waster/substances)
6.8.2.5 Animals attracted to garbage and food waste at construction camps or onsite facilities
6.8.2.6 Electrocution of large birds
6.8.2.7 Increased hunting
6.8.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

Table F-5

E.3.2 Endangered or Threatened Species and Habitats and Protected Areas

6.9 Endangered or Threatened Species or Habitats

Describe and quantify impacts to endangered or threatened species or habitats

6.9.1 Biodiversity
6.9.2 Individual species (with special emphasis on endemic, rare, threatened and endangered species)
6.9.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

6.10 Protected Areas

Social-Economic-Cultural Impacts

The EIA shall assess potential positive and negative impacts to social-economic-cultural resources including but not limited to the following:

E.4 Social-Economic-Cultural Environment

6.11 Socio-Economic Conditions

6.11.1 Increased individual incomes
6.11.1.1 Direct employment at the project
6.11.1.2 Indirect employment generated by project activities
6.11.1.3 Increased purchases from local businesses

E.4.1 Socio-Economic Conditions

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.11.1.4 Other economic activities stimulated in the community as a result of the project
6.11.2 Employment opportunities for local residents
6.11.3 Increased tax base
6.11.4 Displacement and relocation of current settlements, residents or community resources
6.11.5 Displacement or disruption of people's livelihoods (e.g., fishing, hunting, grazing, farming, forestry and tourism)
6.11.6 Public finance requirements – will more infrastructure need to be built and maintained to meet the demands of increased population in the areas of public education and public service (water, sanitation, roads, emergency services, etc.)
6.11.7 Reduction in quality of life for residents from visual and noise impacts
6.11.8 Change in crime rates (drugs, alcohol, prostitution, etc.)
6.11.9 Change in population (temporary or permanent)
6.11.10 Change in character of community
6.11.11 Change in religious, ethnic or cultural makeup of community
6.11.12 Impacts of subsidence on houses and other structures (geothermal projects only)
6.11.13 Potential hazard to the public from facility components resulting from accidents or natural catastrophes and how these events will affect reliability
6.11.14 Hazards, environmental impact and service interruptions which could reasonably ensure from failure of proposed facilities
6.11.15 Impacts on public health
6.11.15.1 Creation of new electromagnetic fields near residences, including their strength and extent
6.11.15.2 Health impacts of pesticide and fertilizer use
6.11.16 Impacts on worker health and safety
6.11.16.1 Identification of hazardous jobs and number of workers exposed with duration of exposure
6.11.16.2 Occupational diseases due to exposure to dust and other project related activities such as handling of explosives, solvents, petroleum products, etc.
6.11.16.3 Identification of physical risks and safety aspects
6.11.17 Potential for fires
6.11.18 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.4.2 Infrastructure

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.12 Infrastructure

6.12.1 Transportation infrastructure

This section of the EIA addresses impacts of transportation and traffic patterns on existing roads. The impacts of new and existing roads on water quality, biological resources and land use should be addressed in those respective sections. The EIA shall assess potential impacts to transportation systems including but not limited to the following:

6.12.1.1 Potential changes to traffic patterns, densities, and traffic safety issues in area affected by project
- A determination of vehicular traffic density in the project area (before, during, and after the proposed activities)
- Potential for traffic accidents
- Congestion
- Noise

6.12.1.2 Potential impacts to previously inaccessible areas from improvement of roads
6.12.2 Public health infrastructure
6.12.2.1 Increased need for public health infrastructure
6.12.2.2 Alterations to public health infrastructure
6.12.3 Communications infrastructure
6.12.3.1 Increased need for communications infrastructure
6.12.3.2 Alterations to communications infrastructure

6.12.4 Energy infrastructure
6.12.4.1 Increased need for energy infrastructure
6.12.4.2 Alterations to energy infrastructure
6.12.5 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.13 Cultural, Archeological, Ceremonial and Historic and Resources

E.4.3 Cultural, Archeological, Ceremonial and Historic Resources

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.13.1 Destruction during construction
6.13.2 Damage and alteration
6.13.3 Removal from historic location
6.13.4 Introduction of visual or audible elements that diminish integrity
6.13.5 Neglect that causes deterioration
6.13.6 Loss of medicinal plants
6.13.7 Loss of access to traditional use areas
6.13.8 Impacts to previously inaccessible resources from development/improvement of roads
6.13.9 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.14 Land Use

E.4.4 Land Use

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.14.1 Changes in land use by both area and location
6.14.2 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

7 Mitigation and Monitoring Measures

G. Mitigation and Monitoring Measures

G.3 Monitoring and Oversight

G.5 Auditable and Enforceable Commitment Language

This section of the EIA must include measures designed to mitigate potential adverse impacts to physical, biological and social-economic-cultural resources from construction, operation and closure of the proposed project and alternatives. These shall include measures to avoid and prevent, and if needed, to reduce or minimize adverse impacts. The project proponent must include measures considered to be "best practices" in the design of all alternatives.

Here and/or in the Environmental Management Plan section, proposed mitigation shall be described in auditable terms and at a level of detail sufficient to demonstrate its effectiveness in addressing the concern or performance criterion, including its anticipated level of effectiveness and/or measurable performance, and design specifications.

The monitoring plan must include monitoring throughout the life of the project for each potential mitigation to confirm the effectiveness of the measure and support contingency plans to provide assurance that the project, at the site preparation, construction, operation, expansion, and closure stages will meet applicable environmental requirements/standards by law, and fall within the limits of impacts deemed acceptable upon approval of the EIA. Some important items to address in the mitigation plan and associated monitoring plans include, but are not limited to the following:

Physical Impacts

7.1 Geologic Resources and Hazards

Tables G-1 and G-2

7.1.1 Pre-excavation, onsite geological inspection and geotechnical study protocols to determine slope stability and landslide risks
7.1.2 Slopes built and maintained to avoid landslides and favor revegetation and soils formation
7.1.3 Slope stabilization by constructing retaining walls, using vegetation, geotextile membranes, or other mechanical methods
7.1.4 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)
7.1.5 Use of signage to mark areas where slopes are not stable as a preventive measure in the event of a landslide
7.1.6 Mitigation measures unique to specific alternatives

7.2 Soil Resources

7.2.1 Topsoil management measures including specifically future use for agriculture
7.2.2 Erosion and sediment temporary and permanent control measures including when each will be installed or implemented, how often it will be checked and the process for and timing of removal of temporary measures
7.2.3 Spoil and disposal measures
7.2.4 Best management practices to minimize soil disturbance
7.2.5 Decommissioning/Rehabilitation Plan-if needed (summary of relevant measures with full document in Annex)
7.2.6 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

7.3 Water Resources

7.3.1 Quality
- 7.3.1.1 Water Quality Management Plan (summary of relevant measures with full document in Annex)
  - Cooling water discharges
  - Sewage and domestic wastewater
  - Nonpoint sources – runoff, erosion and sediment control prevention measures
- 7.3.1.2 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)
- 7.3.1.3 Solid Waste Management Plan (summary of relevant measures with full document in Annex)
- 7.3.1.4 Hazardous Waste Management Plan (summary of relevant measures with full document in Annex)
- 7.3.1.5 Transport system construction and maintenance to avoid erosion and sedimentation including:
  - Elevation or rerouting
  - Design for proper run-off control and catchment
  - Provision of culverts to allow flow that might otherwise be impeded by roadways or other rights of way
  - Appropriate traffic control
- 7.3.1.6 Off-road vehicle use restrictions
- 7.3.1.7 Waste minimization practices

7.3.2 Quantity
- 7.3.2.1 Operational measures, such minimum flows or reservoir level fluctuation limits, to protect important species
- 7.3.2.2 Flow gauging to monitor water quantity

7.3.3 Mitigation measures unique to specific alternatives

Tables G-1, G-2 and G-4

G.2.2 Process and Wastewater Discharges

7.4 Air and Climate

7.4.1 Dust control measures
7.4.2 Emissions control measures
- 7.4.2.1 Emissions reduction equipment
- 7.4.2.2 Maintenance and inspection of equipment and vehicles using combustion engines to reduce emissions

7.4.3 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)
7.4.4 Hazardous Materials Management Plan (summary of relevant measures with full document in Annex)
7.4.5 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

G.2.3 Air Emissions from Fossil Fuel- and Biomass-Fired Plants

7.5 Noise and Vibration

7.5.1 Noise control measures
- 7.5.1.1 Noise reduction technologies (suppression equipment, sound-absorbing structures, vibration dampening devices, berms, noise barriers, etc.)
- 7.5.1.2 Rerouting of traffic and other infrastructure related activities to minimize impacts of noise and vibration
- 7.5.1.3 Time of day limitations on blasting and movement of heavy equipment when in close proximity to houses not being operated during evening hours

Tables G-1, G-2 and G-5

G.2.4 Noise

7.5.2 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)
7.5.3 Mitigation measures unique to specific alternatives

7.6 Aesthetic and Visual Resources

Tables G-1 and G-2

7.6.1 Relocation of facilities to another site
7.6.2 Redesign of placement of facilities on site
7.6.3 Redesign height and location of structures blocking view or light
7.6.4 Lighting minimization
7.6.5 Visual/Landscape Management Plan (summary of relevant measures with full document in Annex)
7.6.6 Mitigation measures unique to specific alternatives

Biological Impacts

7.7 Vegetation/Flora and Associated Ecosystems

Tables G-1 and G-2

7.7.1 Control of noxious and invasive weeds
7.7.2 Surface water diversion limitations to maintain in-stream values
7.7.3 Measures to compensate for loss or damage of forests, wetlands or other critical ecosystems, including establishment of new protected areas
7.7.4 Restoration/Rehabilitation Plan for disturbed areas (summary of relevant measures with full document in Annex)
7.7.5 Mitigation measures unique to specific alternatives

7.8 Aquatic and Terrestrial Wildlife/Fauna and Associated Ecosystems

Tables G-1 and G-2

7.8.1 Fish and Aquatic Resources
- 7.8.1.1 Intake screening
- 7.8.1.2 Maintain adequate instream flow
- 7.8.1.3 Scheduling construction to avoid critical or important fish life history periods (e.g., spawning)
- 7.8.1.4 Flow gauging and water quality monitoring
- 7.8.1.5 Relocation of sensitive, threatened or endangered species
- 7.8.1.6 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)
- 7.8.1.7 Mitigation measures unique to specific alternatives

7.8.2 Wildlife Resources
- 7.8.2.1 Controls on hunting within the project area
- 7.8.2.2 Modify facility and activity locations and timing to avoid critical ecosystems, migratory routes and breeding areas
- 7.8.2.3 Scheduling construction to avoid critical or important wildlife history periods (e.g., breeding, nesting)
- 7.8.2.4 Transmission line design to minimize or avoid electrocution of raptors and other large birds
- 7.8.2.5 Relocation of sensitive, threatened or endangered species
- 7.8.2.6 Blasting plan, if applicable (summary of relevant measures with full document in Annex)
- 7.8.2.7 Mitigation measures unique to specific alternatives

Social-Economic-Cultural Impacts

7.9 Socio-Economic Conditions

Tables G-1 and G-2

7.9.1 Selection of an alternate site for the project, and if not possible then adhering to requirements of an internationally recognized Resettlement Action Plan (RAP)
7.9.2 Rehabilitation Program for people displaced by the project (summary of relevant measures with full document in Annex)
7.9.3 Training local residents for employment in the project
7.9.4 Development of a "Code of Conduct" (with associated training program) for workers to show respect to the local populations and their culture and social rules
7.9.5 Measures proposed to protect public from failure of proposed facilities
7.9.6 Design and operational measures to avoid or reduce risk
7.9.7 Measures to exclude public from hazardous areas

7.9.8 Public Health Program to protect local population from potential health problems caused by the project operation (summary of relevant measures with full document in Annex)
7.9.9 Development of an Occupational Health, Industrial Safety and Accidents Prevention Program with appropriate accident prevention program, reporting and periodic review (summary of relevant measures with full document in Annex) including provision of routine training and testing, and proper safety equipment such as hearing protection, hardhats, steel-toed shoes, safety railings, fall arrestors, sensors for notification on reaching of warning and action limits for exposure to hazardous gases and liquids or impending catastrophic failures.
7.9.10 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)
7.9.11 Hazardous Materials Management Plan (summary of relevant measures with full document in Annex)
7.9.12 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

7.10 Infrastructure

7.10.1 Transportation infrastructure

This section of the EIA addresses mitigation measures for transportation and traffic patterns on existing roads. Mitigation of impacts of new and existing roads on water quality and biological resources and land use should be addressed in those respective sections.

7.10.1.1 Transportation Plan (summary of relevant measures with full document in Annex)

- Placement of traffic signals
- Establishing, posting and enforcing speed limits for the vehicles that transport material
- Training employees, contractors and subcontractors on measures to reduce or avoid potential accidents
- Hiring and training security personnel devoted exclusively to preventing accidents in the access road and controlling the speed of the vehicles transporting project material

7.10.2 Public health infrastructure
7.10.3 Communications infrastructure
7.10.4 Energy Infrastructure
7.10.5 Mitigation measures unique to specific alternatives

7.11 Cultural, Archeological, Ceremonial and Historic and Resources

7.11.1 Modify facility and activity locations to avoid significant archeological, cultural, ceremonial and historic sites

Tables G-1 and G-2

7.11.2 If avoidance is not possible, conduct appropriate resource recovery operations before disturbing the sites
7.11.3 Clearly delineate boundaries and post signs identifying existing archeological, cultural and historic sites on roadsides and within the project area boundaries so that they are easily recognized by the machinery operators and other workers
7.11.4 Development of a training program so that staff recognize and respect culturally and archeological sensitive areas
7.11.5 Development protocols for use during construction and operation stages for identifying and responding to archeological, cultural, ceremonial and historic sites not identified during the preliminary surveys
7.11.5.1 In the event that such a site is found, they will stop activities at the site and report to the government relocation of cultural or historical resources, for their physical protection.
7.11.6 Mitigation measures unique to specific alternatives

7.12 Land Use

7.12.1 Criteria and method for calculating compensation for loss of land and crops

Tables G-1 and G-2

7.12.2 Compensation to farmers and ranchers for crop or forage losses and restore lost agricultural lands at the end of the project.
7.12.3 Compensation to property owners for relocation of their homes in the event the relocation is unavoidable.

7.12.4 Mitigation measures unique to specific alternatives

8 Environmental Management Plan

The EIA shall include an Environmental Management Plan to prevent, mitigate and monitor each impact identified in the EIA. Plans will describe actions to be taken in sufficient detail to provide a basis for subsequent auditing of compliance with commitments made in the EIA process including who is responsible, how and when it will be implemented, what will be done and what results will be achieved, why it is being done, and how to know whether it is effective in addressing the underlying concerns. The Environmental Management Plan shall have the following elements:

H. Environmental Management Plan

Table H-1

8.1 Overview of Environmental Management Plan Organization and Policy

8.1.1 Describe the project management and how environmental management and organization relates to overall project responsibility. Describe the personnel and performance accountability system for design, operation, maintenance and closure for implementation of mitigation and monitoring measures.

8.1.2 Describe the environmental policy that will govern the Project throughout its implementation, including at least the objectives, scope, commitment to continuous improvement, control and environmental monitoring and good relationship with neighboring populations and countries, as well as the commitment to internal controls such as compliance and environmental monitoring and routine audits.

8.1.3 Identify the persons responsible for the implementation of mitigation measures in each phase.

8.2 Project-wide Mitigation Plan including an implementation schedule. It has two elements:

8.2.1 Environmental resource mitigation (such as air, water)

8.2.2 Socio-economic-cultural mitigation (relocation, etc.)

8.3 Project-Wide Monitoring Plan (usually specific to monitoring of surface and ground water)

8.3.1 Short-term and long-term monitoring of resource condition, including but not limited to:

- 8.3.1.1 Slope stability
- 8.3.1.2 Water Quality Monitoring Program
  - Where, how and when monitoring shall be conducted
  - Parameters to be monitored
  - Monitoring frequencies
  - Sampling and analytical protocols to be used
- 8.3.1.3 Air Quality Monitoring Program
  - Where, how and when monitoring shall be conducted
  - The Parameters to be monitored
  - The monitoring frequencies
  - The sampling and analytical protocols to be used
- 8.3.1.4 Noise and Vibration
- 8.3.1.5 Cultural, ceremonial archeological and historic resources in the vicinity of the mine

8.3.2 Short-term and long-term monitoring to ensure that the mitigation measures are functioning as predicted and that rehabilitation is working

G. Mitigation and Monitoring Measures

G.3 Monitoring and Oversight

8.4 Management of Other On- or Off-Site Environmental Pollution Control and Infrastructure

This section should address management of critical elements of pollution control and infrastructure that are not otherwise included in the mitigation plan because they were considered an essential part of the proposed project.

8.5 Contingency Plans

Contingency plans shall be prepared and described to address a) failure to meet specific performance criteria established by law or necessary for the project to meet its commitments in the EIA and b) respond to natural and other risks previously identified and mitigated in the EIA in the event reasonable and feasible mitigation measures to address the risks are inadequate.

8.5.1 Performance-related Contingency Plans, indicating the steps that will be taken should monitoring indicate that:

- 8.5.1.1 Environmental standards are not being met

8.5.1.2 Impacts are greater than predicted
8.5.1.3 The mitigation measures and/or rehabilitation are not performing as predicted

8.5.2 Natural Disaster Risk Response Plan (assumes that risk identification and risk reduction have been addressed in other parts of the EIA) — **Table H-1**

8.5.3 Other Risks Response Plans (assumes that risk identification and risk reduction have been addressed in other parts of the EIA)

8.5.4 Contingency plans for maintaining service or reducing downtime in the event of accidents or natural catastrophes that disrupt facility operation

9 Signed Commitment Statement

The EIA shall contain a legally binding signed letter of commitment to meeting the terms of the EIA. The statement must be signed by the authorized representative of the proponent company with assurance that all financial surety measures as required by the regulatory agency have been met.

10 Annexes

These shall be numbered and duly referenced in the text.

10.1 Public Consultation

10.1.1 Public consultation plan

10.1.2 A summary of public outreach activities including: audience, number of persons, organizations involved, concerns raised, responses to comments — **B.2 Public Participation**

10.1.3 Summary of response to comments

10.1.4 Actual copies of written comments

10.2 Technical Supporting Documents

10.2.1 Include maps, plans, charts and figures in the sequence mentioned in the EIA document

10.2.2 Zoning maps with resources and results of impacts

10.2.3 Special Studies if relevant but not readily accessible

10.2.4 Detailed materials on predictive tools/models and assumptions used for the assessment but too detailed for the body of the EIA

10.3 References

Submit a list of all references, (books, articles, technical reports and other information sources) cited in the various chapters of the EIA study with full biographic references, and the following conventional procedures cited in the literature: author, year, title, source, number of pages, and city of publication or issuance.

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4 TERMS OF REFERENCE (TOR) FOR TRANSMISSION LINES

A. OVERVIEW

These terms of reference (TOR) describe the minimum requirements for the development of the Environmental Impact Assessment (EIA) for proposed transmission lines to distribute electrical power. Both the TOR and the cross referenced "*EIA Technical Review Guidelines for Energy Power Generation and Transmission Projects*" should be used to establish minimally acceptable conditions for satisfying the requirement to submit an EIA. There are four different TORs for energy projects which are designed with a common overview and distinct TORs for different types of energy power generation and transmission. Part A, Overview, is common to all of them but Part B is tailored respectively to: 1. Thermal/Combustion Power Generation Projects, 2. Hydropower Generation Projects, 3. Other Renewable Energy Generation Projects, and 4. Transmission Lines. The four TORs are structured to facilitate mixing and matching as appropriate to the purpose and need for a proposed project and alternatives.

The basic format for the EIA document that should be followed is:

- Table of Contents
- Acronyms and Abbreviations
- Executive Summary
- General Information
- Project and Alternatives Description
- Environmental Setting
- Assessment of Impacts
- Mitigation and Monitoring Measures
- Environmental Management Plan
- Commitment Statement
- Annexes

In general, the EIA must identify and address:

- Applicable environmental standards, norms, and requirements set forth at the international, national, regional and/or local levels including those designed to meet the objectives of resource management and/or land use plans that may be in effect in and around the jurisdiction(s) in which you propose to develop the project and in which the proposed project might have a potential impact. In the absence of such standards, identify a set of benchmarks that can be used in the analysis and the basis for your selection. The guideline identifies standards in use by various countries and international organizations in Appendix C.

- Public/Stakeholder concerns related to impacts in and around the proposed project and alternatives at least for stakeholders within the geographic scope of potential impact. The project proponent should document specific steps taken to engage the public and other stakeholders, and engage these publics as early as possible before undertaking to prepare the EIA. Concerned publics include: local governments, persons living and working in the vicinity of the project, those with interests in resources that may be affected i.e., indigenous peoples, and those concerned about protected areas and prime agricultural lands. A summary of public outreach activities, audience, number of persons, organizations involved, concerns raised, responses to comments and actual copies of written comments received should be included in the Annex.

- All relevant plans related to the proposed energy project, for example, engineering and site preparation plans, operations and decommissioning or closure, environmental management, and mitigation in whatever form these may take.

- All phases of the project from feasibility studies to site preparation to operations to closure and also plans to expand capacity at the current or adjacent sites.

- Alternative approaches to meeting the purpose and need for the proposed energy project include alternative siting, alternative configuration on the site, designing, constructing, operating and decommissioning the project firstly to avoid and prevent, or secondly to reduce or minimize adverse or improve beneficial environmental or socio-economic impacts. The EIA should assess as appropriate the impacts of a range of representative reasonable and technically feasible alternatives as well as the proposed project. The alternatives to the project must include a "no action" alternative, indicating what would happen in the absence of the proposed project as well as consideration of best practices that may not otherwise have been incorporated in the proposed project. Other alternatives should be developed as needed to address significant issues with the proposal.

- Direct, indirect and cumulative impacts and their significance level.

- Uncertainty and how that uncertainty will be addressed through monitoring and contingency plans as may be needed to reduce risk of adverse impacts in the future.

- Specific commitments, including who is responsible, what will be done, when and how it will be monitored, reported and audited to confirm that commitments are met.

Finally, a key part of the TOR is obtaining a legally binding commitment from the project proponent that the approved EIA will be implemented as presented. Such a commitment adds to the legal enforceability of the outcomes of the EIA process.

B. DETAILS FOR TRANSMISSION LINES (TOR)

0 Table of Contents

A general Table of Contents for the Environmental Impact Assessment (EIA) shall be provided. The Table of Contents shall be organized in such a manner as to facilitate the use of the EIA by reviewers and project implementers. EIAs for larger projects should have a more detailed Table of Contents than those for smaller projects. At a minimum, the Table of Contents shall include the following:

- Acronyms and Abbreviations
- Executive Summary
- General Information
  - Objectives and Justification
  - Project Proponents
  - Project Team
  - Legal and Regulatory Framework
- Project and Alternatives Description
- Environmental Setting
  - Physical Environment
    - Geologic Resources
    - Soil Resources
    - Water Resources
    - Air and Climate
    - Noise and Vibration
    - Aesthetic Resources
  - Biological Environment
    - Vegetation/Flora
    - Aquatic and Terrestrial Wildlife/Fauna
    - Ecosystems: Terrestrial, Wetlands, Aquatic, Marine
    - Endangered or Threatened Species and Habitat
    - Protected Areas
  - Social-Economic-Cultural Environment
    - Socio-Economic Conditions
    - Infrastructure
    - Cultural, Archeological, Ceremonial and Historic Resources
    - Land Use
- Assessment of Impacts to resources described in the Environmental Setting
- Mitigation and Monitoring Measures
- Environmental Management Plan
  - Overview of Environmental Management Plan Organization and Policy
  - Project-wide Mitigation Plan
  - Project- wide Monitoring Plan
  - Management of Other On- or Off-Site Pollution Controls and Infrastructure
  - Contingency Plans
    - Performance-related Contingency Plan
    - Natural Disaster Risk Response Plan
    - Other Risk Response Plans
- Signed Commitment Statement
- Annexes
  - Public Consultation
    - Public Consultation Plan
    - Summary of Public Outreach Activities
    - Summary of Responses to Comments
    - Copies of Written Comments
  - Technical Supporting Materials
    - Maps and Plans, in the sequence mentioned in the EIA document
    - Charts and Figures
    - Details about predictive modeling used, calculations and assumptions
    - Special Studies
  - References

1 Acronyms and Abbreviations

All acronyms and abbreviations used in the EIA must be clearly and succinctly defined and described in this section. This will relieve the reader of the need to search for the first occurrence of a word and the citing of the acronym or abbreviation in the text.

2 Executive Summary

A general summary of the EIA shall be provided in this section. The summary shall be written using a vocabulary that can be easily understood by the public. It shall include at least the following information about the project from the EIA:

- Objectives and Justification
- Location
- Project Proponents
- Project Description
- Other Project Alternatives
- Environmental Setting
- Evaluation of Impacts
- Mitigation and Monitoring Measures
- Environmental Management Plan
- Issues raised by stakeholders and any outstanding issues

3 General Information

3.1 Objectives of and Justification for the Proposed Project

3.1.1 **Objectives:** A statement of the general and specific objectives (purpose) of the proposed project, including whether it is a new project, an expansion of an existing project or modernization of an existing operation.

3.1.2 **Justification for the Project:** Provide a justification for the proposed project (need) highlighting the benefits to surrounding communities and economic development of the region and country.

C.2 Documentation of Purpose and Need

3.2 Project Proponents

3.2.1 Names, addresses, telephone numbers, and applicable legal documentation of proponents (including developers, major equipment suppliers if part of project team, shareholders and providers of financing, and representatives).

3.2.2 Names and contact information for responsible parties within the organization.

3.2.3 Financial viability of the company (including a certified banking statement indicating that the company is financially stable and reputable).

3.2.4 Bonding requirements and proof of ability to meet bonding requirements sufficient to cover the anticipated costs of environmental management during all phases, as well as the costs, by a third party, of decommissioning and long-term post-closure liabilities associated with the project.

G.4 Financial Assurance

3.3 Project Team

This section shall provide information on the multidisciplinary team that prepares the EIA. The types of professionals included in the team shall be appropriate to the type of project and the type of environment in which the project is located and may include (but not be limited to) engineers, architects, biologists, geologists, hydrologists, air quality experts, archeologists, anthropologists, sociologists and economists. The information provided for each member of the EIA project team includes the following:

3.3.1 Names, addresses and registry numbers of contractors.

3.3.2 Names, contact information, qualifications and registry numbers of key personnel involved in the study; as well as an affidavit indicating their area of participation.

3.3.3 List of professionals/experts participating in the EIA, their areas of expertise, degrees, experience, professional registrations and stamps, seals and signatures.

3.4 Legal and Regulatory Framework

This section of the EIA shall define the legal framework under which the EIA is being completed listing and summarizing requirements or alternatives used as benchmarks, and evidence of non-applicability or compliance, including:

3.4.1 Information that demonstrates rights and access:

3.4.1.1 Ownership with written authorization

3.4.1.2 Governmental authorization (if required)

3.4.1.3 Period of lease/permit

3.4.1.4 Maps showing the lease/permit area

3.4.2 Applicable environmental standards, norms and requirements set forth at the international, national, regional and/or local levels

3.4.2.1 In the absence of such standards, identify a set of benchmarks used in the analysis

3.4.3 Required regulatory approvals and/or permits for all stages and their status

3.4.4 Applicable land use requirements (demonstrate conformity and compliance with applicable plans)

3.4.5 Applicable natural resource management or protected area management plans and responsible agency(ies) (demonstrate conformity and compliance with all applicable plans)

4 Project and Alternatives Description

The project proponent shall submit a full description and location of the proposed project and reasonable alternatives including ancillary facilities and operations such as the camp/housing for construction, borrow and disposal areas, sanitary services, waste disposal and transportation infrastructure, etc. as addressed through 4.1 to 4.3 below. It shall include at a minimum:

C. Proposed Project Description and Alternatives

4.1 Location

The general location of the project and associated activities in terms of:

4.1.1 Political-administrative location (region, district, town or other relevant political-administrative units) with accompanying location map

4.1.2 Means of site access – i.e., by air, river, road, train or vehicle

4.1.3 Maps of project area at a scale of no less than 1:50,000 or as required by the regulatory agency

C.3 Project and Alternative Description

4.1.3.1 Indicate proposed route and alternative routes

4.1.3.2 Locate towers, manholes, substations and other project facilities using latitude/longitude, Universal Transverse Mercator (UTM) coordinates

4.1.3.3 Indicate the project area and the direct and indirect areas of influence for the physical, biological and social-economic-cultural impacts

4.2 Summary of Proposed Project and Alternatives

All project alternatives that are reasonable and feasible and meet the purpose and need for the proposed project shall be identified, summarized in this section, and evaluated in the EIA as appropriate. In addition to the proposed project, such alternatives include alternative locations, alternative fuels, alternative site configuration of elements of the project, alternative size and output capacity, and alternative plans for construction, operation and decommissioning of the power plant including best practices that may avoid and/or reduce the adverse impacts to the physical, biological or social-economic-cultural environments.

If the project area or the buffer zone of the project area for an alternative is in an ecologically fragile are, the description of the alternative must include a clear justification for not opting for another site. Identify which alternatives will be carried through the analysis in the EIA and the basis for that decision.

4.3 Project and Alternatives Details

The EIA shall provide specific project details for the proposed project and each alternative as identified in subsections 4.3.1 through 4.3.5. The level of detail presented shall be the same for the proposed project and each alternative evaluated. The following project details shall be provided:

4.3.1 Project facilities

4.3.1.1 Type and nature of the project

- Source(s) and destination(s) of power
- Capacity

C.3 Project and Alternative Description

4.3.1.2 Design and engineering features of transmission lines

- Line voltage
- Total length of line in km (disaggregated by overhead and buried if applicable)
- Conductors
  - Number of lines and circuits
  - Composition and diameter (disaggregated by overhead and buried if applicable)
  - Minimum height over ground level for overhead lines
  - Depth and trench and fill specifications for buried lines (if applicable)

C.4 Project Alternatives

C.5 Electric Power Transmission

Appendix A. What is Energy Generation and Transmission?

- Shield wire composition
- Number, type, composition and dimensions of towers
- Number, type, composition and dimensions of manholes (if applicable)
- Number and designs of substations to be constructed or modified and operated in conjunction with the transmission line (include all component parts, i.e., transformers, switches, fuses, etc.)
- Points of interconnection with the existing grid
- Right-of-way
  - Width in meters
  - Initial and maintenance vegetative treatments, including disposal of waste material
- Number, type, composition and dimensions of other ancillary structures (e.g., communication towers)

Table C-1

4.3.1.3 Design drawings for towers, manholes, trenches, substations and other facilities

- Plan (overhead view)
- Elevations (front view)
- Profiles (side view)
- Sections

4.3.2 Access

4.3.2.1 Identify means of access for each stretch of the route

4.3.2.2 Roads

- Identify all new and existing roads to be used
  - Traffic volume, operating speeds and trip times
- Detailed information on any roads to be constructed
  - Location
  - Timing of construction
  - Road surface and shoulder width and barriers
  - Grade
  - Construction methods including clearing and grubbing
  - Construction materials
  - Compaction
  - Stream crossings and associated designs
  - Animal crossings
  - Sedimentation and erosion prevention and control structures and practices
  - Stabilization methods for cuts and fills
  - Typical elevations for each type and situation of road displaying construction materials, levels of compaction and erosion and sedimentation features
  - Location and size (area and volume of material) of borrow pits
  - Operation
  - Closure plan
  - Traffic volume, operating speeds and trip times
- Dust control for construction and operation
- Maintenance
- Roster for construction and maintenance equipment, specifying type and quantity by size, motor size, and fuel requirements

C.6 Transportation Facilities

4.3.3 Construction phase and timetable

4.3.3.1 Identify and provide a schedule for each phase of construction for all project and ancillary facilities including, but not limited to:

- Mobilization
- Road construction and improvements
- Land clearing
- Blasting
- Borrow and spoil disposal
- Erosion and sediment control

- Excavation and subgrade preparation
- Foundation preparation
- Concrete work
- Construction or installation of each project facility
- Embankment earthwork
- Stabilization of disturbed areas

4.3.3.2 A GANTT or critical path management chart for the entire project, from start to finish

4.3.3.3 Equipment

- Equipment Roster specifying type and quantity by size, weight, motor size, and fuel requirements for each piece of equipment or machinery used in each activity
- Transportation mobilization and mobilization frequency
- Machinery and equipment mobilization routes to be used, as well as the features of the ways on which they will be transported, including a map of routes, as applicable, and mobilization.

4.3.3.4 Labor during construction

- Number and type of employees (by local hire and non-local hire) by field of expertise
- Days per week
- Hours per day
- Shifts per day

4.3.3.5 Raw materials to be used for construction

- Give a complete list of the raw materials and construction materials to be used, indicating the amounts per day, month, and the storage means
- Include an inventory of chemical, toxic or hazardous substances, active elements, sites and storage means, safety aspects regarding transportation and handling and any other relevant information

C.9 Manpower and Local Purchases

4.3.3.6 Construction camp (if applicable)

Description of the camp including but not limited to:

C.9 Manpower and Local Purchases

- Location of the camp, including locations at various phases of construction, if the camp will move as work on the transmission line progresses
- A plan showing all facilities at a legible scale appropriate to the size of the project
  - Buildings by type (use) and size
  - Roads
  - Electrical transmission lines and/or substation
  - Drainage
- Water supply and distribution
  - Distribution system
  - Use (m^3/day)
  - Rights
  - Sources
- Waste handling and disposal components
  - Sewers
  - Wastewater treatment
  - Solid waste facilities
- Energy generation and use requirements
- Material Storage
- Repair shops
- Fuel stations
- Closure or conversion to other use

C.7 Onsite Support Facilities

4.3.4 Operation phase

4.3.4.1 Roster of equipment and machinery to be used during operation, specifying type and quantity by size, weight, motor size, and fuel requirements for each activity

4.3.4.2 Labor during operation
- Number and type of employees (by local hire and non-local hire) by field of expertise
- Days per week
- Hours per day
- Shifts per day

4.3.5 Closure and decommissioning plan

If it becomes clear that closure will be required, or when the project nears the end of its service life, the project operator shall contact the proper regulatory agency(ies) to obtain the environmental guidelines to carry out the closure or decommissioning.

4.3.5.1 The project description shall include at least a general Restoration and Closure Plan, recognizing that terms of closure may be very different when this phase approaches.

4.3.5.2 The description of restoration measures should include the size of the area to be restored as well as concurrent, temporary and final restoration measures to be used and their schedules. For each measure include:
- Area to be addressed
- Timing and schedule for executing measures
- Equipment and structure removal or conversion
- Remedial measures, including success indicators and contingency measures if initial efforts are unsuccessful

C.8 Closure and Decommissioning Plan

5 Environmental Setting

Based on information available from the literature, government and special studies or other sources, the EIA shall provide information on environmental setting for the different types of physical, biological and social-economic-cultural environments for the current situation, important trends and predicted situation in the absence of the proposed project. All sources of data must be cited in the EIA when and where they are used. Indicate the direct and indirect and cumulative impact areas of influence for physical, biological, and social-economic-cultural impacts and basis for defining area. This section shall include at a minimum, the following information:

D. Environmental Setting

Physical Environment

5.1 Geologic Resources and Hazards

5.1.1 Cross sections of the geology including soil horizons

5.1.1.1 Geologic characteristics at all project facility locations and in the area of influence.

5.1.1.2 Geological map of the project area and area of influence at a scale of 1:10,000.

Submit a map of the area displaying all characteristics described. Include geological profiles and cuts, as well as stratigraphic columns.

D.2 Physical Environment

D.2.1 Geology and Soils

5.1.2 Topography and slope conditions and geomorphology

5.1.3 Seismicity and stability characteristics

5.1.3.1 Indicate the general seismic and tectonic features on the proposed routes
- Seismic sources close to the route
- Seismic history
- Maximum expected magnitudes and intensities
- Period of seismic repetition
- Outcome of threats based on peak acceleration for the site
- Periods of vibration of the site
- Micro zoning in terms of the geological map

5.1.3.2 Volcanic activity (must be provided by all the projects that are located within a radius of 30 km from an active volcanic emission center)
- Indicate the general volcanic features of the area near the site
- Historical eruptions
- Period of recurrence
- Type of eruptions
- Affected areas and high risk areas

5.1.3.3 Describe project areas susceptible to soil liquefaction; planned, active, and abandoned mines; karst terrain; and areas of potential ground failure,

such as subsidence, slumping, and landsliding

5.2 Soil Resources

The EIA shall describe baseline soil resources, and make use of maps, tables and accompanying narrative text to describe the soils in the transmission corridor, along access routes and at the sites of any facilities (such as substations and construction camps).

5.2.1 Types, capacity and uses
5.2.2 Fertility and potential uses of the land for agriculture
5.2.3 Stability and permeability
5.2.4 Erosion and sedimentation potential
5.2.5 Quantity and quality available for revegetating and restoring the disturbed area at time of closure

D.2.1 Geology and Soils

5.3 Water Resources

5.3.1 Surface water
5.3.1.1 Names and locations on maps of all permanent and intermittent streams, rivers, wetlands, lakes and reservoirs within the area of influence
5.3.1.2 Delineation of watersheds and water drainage pattern in the area of influence using cadastral/aerial/remote sensing satellite imageries (map)
- Runoff characteristics of watersheds

5.3.2 Groundwater
5.3.2.1 Identify aquifers within excavation depth in the project area, including the depth of the aquifer, current and projected use, water quality, and known of suspected contamination problems
5.3.2.2 Identify the location of known public and private groundwater supply wells or springs within 150 feet of proposed construction areas.
5.3.2.3 Inventories of consumptive and non-consumptive

D.2.2 Water Resources

5.4 Air and Climate

Baseline information for air resources shall be collected for at least one year or as required by the regulatory agency and shall include at a minimum the following:

5.4.1 Climate and meteorology
5.4.1.1 Source of data (meteorological station(s) from which climatological data have been obtained)
5.4.1.2 Temperature variations
5.4.1.3 Relative humidity
5.4.1.4 Solar radiation and evaporation rates
5.4.1.5 Rainfall (total precipitation, rainfall intensity and duration by month)
5.4.1.6 Wind rose (Wind direction and speed, 24 hourly data)
5.4.1.7 Statistical analysis of the data

D.2.3 Air and Climate

5.5 Noise and Vibration

Present a description of the noise and vibration levels for receptors near where noise generating activities of the project may occur. The EIA shall include:

5.5.1 Location of monitoring stations
5.5.2 Daytime and night time noise levels (measured in decibels)
5.5.3 Inventory of existing noise sources

D.2.4 Noise and Vibration

5.6 Aesthetic and Visual Resources

5.6.1 Photos presenting baseline panoramic views of the facility site from potential receptors
5.6.2 Viewsheds or other aesthetic or landscape resources
5.6.3 Existing sources of light contamination

D.2.5 Aesthetic Resources

Biological Environment

The EIA shall provide detailed information on the location and condition of ecosystems along the proposed routes of the transmission line in the form of narrative, maps and tables, including the following:

D.3 Biological Environment

5.7 Vegetation/Flora

5.7.1 Vegetative mapping of terrestrial and wetland habitats
5.7.2 Species and structure (abundance, density, status, plant communities, presence of invasive species, etc.)

D.3.1 Flora

5.8 Aquatic and Terrestrial Wildlife/Fauna

5.8.1 Fish and Aquatic Resources

5.8.1.1 Identification of fish, mussel, macroinvertebrate and other aquatic species

- Spatial and temporal distribution
- Species life stage composition
- Standing crop
- Age and growth data
- Spawning run timing
- Extent and location of spawning, rearing, feeding and wintering habitat

5.8.2 Wildlife Resources

5.8.2.1 Species (including status, i.e., endemic, migratory, exotic, endangered, threatened, keystone, etc.), life history, and seasonal use

5.8.2.2 Breeding areas

5.8.2.3 Mating and brooding areas

5.8.2.4 Migratory corridors (if applicable)

5.8.2.5 Important wildlife use areas (roosts, clay licks, etc.)

D.3.2 Fauna

5.9 Ecosystems: Terrestrial, Wetlands, Aquatic, Marine

Much if not all that will be needed to address the environmental setting for terrestrial, wetlands, aquatic and/or marine ecosystems will have been covered in Sections 5.7 and 5.8. This section is not intended to duplicate that information; rather, it should integrate the information to ensure that the structure and function of each ecosystem is adequately presented.

D.3.3 Ecosystems

5.10 Endangered or Threatened Species and Habitats

Sections 5.7 and 5.8 should identify all species in the project area. This section should highlight all endangered and threatened species and critical habitat that potentially occur in the vicinity of the project.

5.11 Protected Areas

Identify on maps the specific locations and boundaries of relevant national parks, sanctuaries, reserves, etc., as well as any areas proposed for protection. Provide a brief narrative description of each area.

D.3.4 Endangered or Threatened Species and Habitats

Social-Economic-Cultural Environment

5.12 Socio-Economic Conditions

Identify nearby human settlements including the following information for each settlement:

D.3.5 Protected Areas

5.12.1 Population (size, gender and age distribution)

5.12.2 Cultural characteristics (religion, ethnic composition, languages spoken, etc.)

5.12.3 Economic activities (employers, employment and incomes)

5.12.4 Tax base

5.12.5 Crime rates

5.12.6 Literacy rates

5.12.7 Community organizations

5.12.8 Public Health and Safety

5.12.8.1 Diseases in the project area (including the sources of data and the methodology used to collect and analyze the data)

5.12.8.2 Level of emergency services and access to clinics, doctors and hospitals

5.12.8.3 Existing practice for assessment of occupational health

5.12.8.4 Existing electromagnetic fields

5.12.9 Skills, services and goods availability in the communities

D.4 Social-Economic-Cultural Environment

D.4.1 Socio-Economic Conditions

5.13 Infrastructure

For each human settlement identified in subsection 5.12, describe the infrastructure in or serving the settlement, including the following information:

5.13.1 Transportation infrastructure

5.13.1.1 Roads

This section of the EIA addresses baseline conditions of transportation and traffic patterns on existing roads. The EIA shall provide information on following:

- Location and condition of all existing roads
  - Surface materials

D.4.2 Infrastructure

- Erosion and sediment control
- Maintenance programs (what, when and whom)

- Description of anticipated third-party improvements (government or entity other than the proponent)
- Traffic patterns and densities on roads within affected project vicinity
- Safety levels and current circulation issues, and capacity

5.13.1.2 Airports or airstrips, and their capacity and trends in use
5.13.1.3 Other transportation infrastructure as applicable such as rail, pipelines, harbors etc.

5.13.2 Public health infrastructure
5.13.2.1 Drinking water supplies and treatment
5.13.2.2 Wastewater treatment and management
5.13.2.3 Solid and hazardous waste management and treatment

5.13.3 Communications Infrastructure
5.13.3.1 Types of communications systems
5.13.3.2 Types of transmission (wired or wireless)
5.13.3.3 Locations of transmission lines (if applicable)
5.13.3.4 Locations of microwave towers and/or antennae (if applicable)

5.13.4 Energy Infrastructure
5.13.4.1 Types of energy
5.13.4.2 Sources including location and description of generating facilities in the area of influence
5.13.4.3 Transmission lines and/or pipelines
5.13.4.4 Fuel storage facilities

5.14 Cultural, Archeological, Ceremonial and Historic Resources

Identify all cultural, archaeological, ceremonial and historic resources within the area of influence, including the following information:

D.4.3 Cultural, Archeological, Ceremonial and Historic Resources

5.14.1 Data and maps relating to archeological, cultural, ceremonial, and historic sites in the direct vicinity of the project
5.14.2 Information on indigenous people or other traditional cultures, if any

5.15 Land Use

Actual and potential showing location, size and proximity within and surrounding the project area, including land use maps, and to extent possible, integrated into one map.

D.4.4 Land Use

5.15.1 Population centers, including information and locations of
5.15.1.1 Schools
5.15.1.2 Cemeteries
5.15.1.3 Churches
5.15.1.4 Other public buildings
5.15.1.5 Housing (including housing density)
5.15.1.6 Commercial areas
5.15.2 Agricultural lands
5.15.3 Forested lands
5.15.4 Protected areas (including but not limited to)
5.15.4.1 National parks
5.15.4.2 Wildlife refuges
5.15.5 Wetlands and Mangroves
5.15.6 Other environmentally sensitive areas
5.15.7 Tourism and recreation areas
5.15.7.1 Recreation facilities
5.15.7.2 Eco-cultural-tourist locations
5.15.8 Culturally sensitive areas
5.15.9 Flood plains and water bodies
5.15.10 Coastal zones
5.15.11 Other land uses as appropriate

6 Assessment of Impacts

The EIA shall provide information on potential impacts (direct, indirect and cumulative) and the magnitude and frequency of potential impacts on physical, biological, social-economic-cultural resources resulting from construction, operation and closure of the proposed project and alternatives. The assessment shall use standardized predictive methods, such as models, to determine the specific range of impacts on environmental and socio-economic resources. The EIA shall identify which impacts are significant and the criteria used to make this judgment. Critical data input from project description and environmental setting analysis projecting the conditions in the environmental setting in the absence of the proposed project shall be used as the baseline upon which potential impacts are forecast. The EIA shall also identify sources of data used in the analysis and the uncertainties associated with the outputs of each method used.

E. Potential Impacts

F. Assessing Impacts: Predictive Tools and Considerations

Appendix F. Asian Development Bank Rapid Environmental Assessment Checklists

Physical Impacts

6.1 Geologic Resources and Hazards

Potential impacts to geologic resources and potential effects on facility shall be described including but not limited to the following:

E.2 Physical Environment
Tables E-1 and E-2

6.1.1 Geologic hazards and potential effects on facility
6.1.2 Impacts on mineral resources (current/future mining)
6.1.3 Changes in topography and drainage patterns
6.1.4 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.1 Geology and Soils

F.3 Soils and Geology Impact Assessment Tools

6.2 Soil Resources

Potential impacts to soil resources shall be described including but not limited to the following:

6.2.1 Soil quality
- 6.2.1.1 Contamination (accidental spills of fuel, oil or other hazardous substances)
- 6.2.1.2 Impacts on use

6.2.2 Erosion, slope alteration, vegetation removal and drainage patterns
- 6.2.2.1 Models for soil erosion should be included using methods like USLE, defining the areas with high erosion potential
- 6.2.2.2 Sediment accumulation and transport
- 6.2.2.3 Sediment and hazardous waste removal and disposal

6.2.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.1 Geology and Soils

F.3 Soils and Geology Impact Assessment Tools

Appendix D: Erosion and Sedimentation

6.3 Water Resources

Potential impacts to surface water and groundwater resources shall be described including but not limited to the following:

E.2.2 Water Resources

6.3.1 Geomorphology
- 6.3.1.1 Location of all stream or wetland crossings by right-of-ways and access roads.
- 6.3.1.2 Modification/diversion in the existing drainage pattern
- 6.3.1.3 Downstream scouring and upstream head cutting
- 6.3.1.4 Bank erosion (surface water discharges, stream crossings and dredging)
- 6.3.1.5 Potential for increased flash flooding

6.3.2 Quality
- 6.3.2.1 Runoff, erosion and sedimentation from roads, right of ways, disturbed areas and stream crossings
  - Sources
  - Receiving waters
  - Concentrations
    - Physical parameters
    - Chemical parameters
    - Biological parameters
- 6.3.2.2 Description of impact from wastewater discharges (if applicable)
- 6.3.2.3 Chemical contamination from herbicides used for right-of-way maintenance
- 6.3.2.4 Spills and accidents
  - Chemical, hazardous waste and fuel spills

6.3.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.4 Air and Climate

Potential impacts to air resources shall be described including but not limited to the following:

6.4.1 Impacts on ambient air quality
- 6.4.1.1 Sources (e.g., windblown dust and mobile equipment emissions)
- 6.4.1.2 Concentrations
- 6.4.1.3 Receptors (e.g., communities, schools, water bodies, ecosystems)

6.4.2 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.3 Air Resources

F.6 Air Resources Impact Assessment Tools

Table F-3

6.5 Noise and Vibration

Potential impacts from noise shall be described including but not limited to the following:

6.5.1 Potential noise levels at different representative sites in the project area and in communities near the project area

6.5.2 Potential vibration due to blasting and movement of heavy equipment, and related damage to materials and structures

6.5.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.4 Noise and Vibration

F.7 Noise Impact Assessment Tools

6.6 Aesthetic and Visual Resources

Potential impacts to Aesthetic Resources, including light pollution, shall be described including but not limited to the following:

6.6.1 Impacts on visual resources and landscapes

6.6.2 Increases in light contamination

6.6.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.2.5 Aesthetic Resources

F.8 Aesthetic and Visual Resources Impact Assessment Tools

Table F-4

Biologic Impacts

Potential impacts to biological resources shall be described including but not limited to the following:

E.3 Biological Environment

6.7 Vegetation/Flora and Associated Ecosystems

Describe and quantify alterations in vegetative cover due to:

6.7.1 Deforestation or wetlands destruction

6.7.2 Other vegetative type conversions
- 6.7.2.1 Direct vegetative removal for roads, rights of way and substation locations
- 6.7.2.2 Indirect (e.g., poisoning by dust and air contaminants)

6.7.3 Wildfires

6.7.4 Increased road access in remote areas leading to destruction of existing vegetative cover (land use changes)

6.7.5 Spread of noxious or invasive species

6.7.6 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.3.1 Flora, Fauna and Ecosystems

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

6.8 Aquatic and Terrestrial Wildlife/Fauna and Associated Ecosystems

Describe and quantify alterations in aquatic and terrestrial wildlife populations due to:

6.8.1 Fish and Aquatic Resources
- 6.8.1.1 Loss in habitat (e.g., spawning, rearing, juvenile, or adult habitats) from changes in water quality (sedimentation and other parameters)
- 6.8.1.2 Disturbance of aquatic resources during construction, operations, or maintenance activities, including equipment noise, erosion and sedimentation, vehicular movements, or blasting

6.8.2 Wildlife Resources
- 6.8.2.1 Loss of habitat, migratory routes/corridors, and breeding areas due to

E.3.1 Flora, Fauna and Ecosystems

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

Table F-5

changes in vegetative cover/wetlands loss
- 6.8.2.2 Disturbance of habitat, migratory routes/corridors and breeding areas due to project construction, operation, and maintenance, recreational use, and human settlement associated with the project (e.g., noise, vibration, illumination, vehicular movement)
- 6.8.2.3 Loss or contamination of drinking water for wildlife species
- 6.8.2.4 Poisoning (e.g., air emissions, direct contact with toxic waster/substances)
- 6.8.2.5 Animals attracted to garbage and food waste at construction camps or onsite facilities
- 6.8.2.6 Electrocution of large birds
- 6.8.2.7 Increased hunting

6.8.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.9 Endangered or Threatened Species or Habitats

Describe and quantify impacts to endangered or threatened species or habitats

6.9.1 Biodiversity

6.9.2 Individual species (with special emphasis on endemic, rare, threatened and endangered species)

6.9.3 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

6.10 Protected Areas

Social-Economic-Cultural Impacts

The EIA shall assess potential positive and negative impacts to social-economic-cultural resources including but not limited to the following:

6.11 Socio-Economic Conditions

6.11.1 Increased individual incomes
- 6.11.1.1 Direct employment at the project
- 6.11.1.2 Indirect employment generated by project activities
- 6.11.1.3 Increased purchases from local businesses
- 6.11.1.4 Other economic activities stimulated in the community as a result of the project

6.11.2 Employment opportunities for local residents

6.11.3 Increased tax base

6.11.4 Displacement and relocation of current settlements, residents or community resources

6.11.5 Displacement or disruption of people's livelihoods (e.g., fishing, hunting, grazing, farming, forestry and tourism)

6.11.6 Public finance requirements – will more infrastructure need to be built and maintained to meet the demands of increased population in the areas of public education and public service (water, sanitation, roads, emergency services, etc.)

6.11.7 Reduction in quality of life for residents from visual and noise impacts

6.11.8 Change in crime rates (drugs, alcohol, prostitution, etc.)

6.11.9 Change in population (temporary or permanent)

6.11.10 Change in character of community

6.11.11 Change in religious, ethnic or cultural makeup of community

6.11.12 Potential hazard to the public from facility components resulting from accidents or natural catastrophes and how these events will affect reliability

6.11.13 Hazards, environmental impact and service interruptions which could reasonably ensure from failure of proposed facilities

6.11.14 Impacts on public health
- 6.11.14.1 Creation of new electromagnetic fields near residences, including their strength and extent
- 6.11.14.2 Potential for induced or conducted currents along the transmission right-of-way from electric and magnetic fields

E.3.2 Endangered or Threatened Species and Habitats and Protected Areas

F.9 Flora, Fauna, Ecosystems and Protected Areas Impact Assessment Tools

E.4 Social-Economic-Cultural Environment

E.4.1 Socio-Economic Conditions

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.11.14.3 Water-related vector diseases (malaria, dengue, etc.)
6.11.14.4 Health impacts of pesticide and fertilizer use
6.11.15 Impacts on worker health and safety
6.11.15.1 Identification of hazardous jobs and number of workers exposed with duration of exposure
6.11.15.2 Occupational diseases due to exposure to dust and other project related activities such as handling of explosives, solvents, petroleum products, etc.
6.11.15.3 Identification of physical risks and safety aspects
6.11.16 Potential for fires
6.11.17 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.4.2 Infrastructure

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.12 Infrastructure

6.12.1 Transportation infrastructure

This section of the EIA addresses impacts of transportation and traffic patterns on existing roads. The impacts of new and existing roads on water quality, biological resources and land use should be addressed in those respective sections. The EIA shall assess potential impacts to transportation systems including but not limited to the following:

6.12.1.1 Potential changes to traffic patterns, densities, and traffic safety issues in area affected by project

- A determination of vehicular traffic density in the project area (before, during, and after the proposed activities)
- Potential for traffic accidents
- Congestion
- Noise

6.12.1.2 Potential impacts to previously inaccessible areas from improvement of roads
6.12.2 Public health infrastructure
6.12.2.1 Increased need for public health infrastructure
6.12.2.2 Alterations to public health infrastructure
6.12.3 Communications infrastructure
6.12.3.1 Increased need for communications infrastructure
6.12.3.2 Alterations to communications infrastructure
6.12.4 Energy infrastructure
6.12.4.1 Increased need for energy infrastructure
6.12.4.2 Alterations to energy infrastructure
6.12.5 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.4.3 Cultural, Archeological, Ceremonial and Historic Resources

F.10 Socio-Economic-Cultural Impact Assessment Tools

6.13 Cultural, Archeological, Ceremonial and Historic and Resources

6.13.1 Destruction during construction
6.13.2 Damage and alteration
6.13.3 Removal from historic location
6.13.4 Introduction of visual or audible elements that diminish integrity
6.13.5 Neglect that causes deterioration
6.13.6 Loss of medicinal plants
6.13.7 Loss of access to traditional use areas
6.13.8 Impacts to previously inaccessible resources from development/improvement of roads
6.13.9 Overall assessment of significance of direct, indirect and cumulative impacts for all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

E.4.4 Land Use

F.10 Socio-Economic-

6.14 Land Use

6.14.1 Changes in land use by both area and location
6.14.2 Overall assessment of significance of direct, indirect and cumulative impacts for

all phases of the proposed project based upon analysis of magnitude, frequency, scope and duration in context

7 Mitigation and Monitoring Measures

This section of the EIA must include measures designed to mitigate potential adverse impacts to physical, biological and social-economic-cultural resources from construction, operation and closure of the proposed project and alternatives. These shall include measures to avoid and prevent, and if needed, to reduce or minimize adverse impacts. The project proponent must include measures considered to be "best practices" in the design of all alternatives.

Here and/or in the Environmental Management Plan section, proposed mitigation shall be described in auditable terms and at a level of detail sufficient to demonstrate its effectiveness in addressing the concern or performance criterion, including its anticipated level of effectiveness and/or measurable performance, and design specifications.

The monitoring plan must include monitoring throughout the life of the project for each potential mitigation to confirm the effectiveness of the measure and support contingency plans to provide assurance that the project, at the site preparation, construction, operation, expansion, and closure stages will meet applicable environmental requirements/standards by law, and fall within the limits of impacts deemed acceptable upon approval of the EIA. Some important items to address in the mitigation plan and associated monitoring plans include, but are not limited to the following:

Physical Impacts

7.1 Geologic Resources and Hazards

7.1.1 Pre-excavation, onsite geological inspection and geotechnical study protocols to determine slope stability and landslide risks
7.1.2 Slopes built and maintained to avoid landslides and favor revegetation and soils formation
7.1.3 Slope stabilization by constructing retaining walls, using vegetation, geotextile membranes, or other mechanical methods
7.1.4 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)
7.1.5 Use of signage to mark areas where slopes are not stable as a preventive measure in the event of a landslide
7.1.6 Mitigation measures unique to specific alternatives

7.2 Soil Resources

7.2.1 Topsoil management measures including specifically future use for agriculture
7.2.2 Erosion and sediment temporary and permanent control measures including when each will be installed or implemented, how often it will be checked and the process for and timing of removal of temporary measures
7.2.3 Spoil and disposal measures
7.2.4 Best management practices to minimize soil disturbance
7.2.5 Decommissioning/Rehabilitation Plan-if needed (summary of relevant measures with full document in Annex)
7.2.6 Mitigation measures unique to specific alternatives

7.3 Water Resources

7.3.1 Water Quality Management Plan (summary of relevant measures with full document in Annex)
  7.3.1.1 Sewage and domestic wastewater at construction camps
  7.3.1.2 Nonpoint sources – runoff, erosion and sediment control prevention measures
7.3.2 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)
7.3.3 Solid Waste Management Plan (summary of relevant measures with full document in Annex)
7.3.4 Hazardous Waste Management Plan (summary of relevant measures with full document in Annex)
7.3.5 Transport system construction and maintenance to avoid erosion and sedimentation including:
  7.3.5.1 Elevation or rerouting
  7.3.5.2 Design for proper run-off control and catchment

Cultural Impact Assessment Tools

G. Mitigation and Monitoring Measures

G.3 Monitoring and Oversight

G.5 Auditable and Enforceable Commitment Language

G.5.3 Transmission Line Example

Tables G-1 and G-2

G.2.1 Seismic Events Associated with Geothermal Developments

Tables G-1 and G-2

Tables G-1, G-2 and G-4

G.2.2 Process and Wastewater Discharges

7.3.5.3 Provision of culverts to allow flow that might otherwise be impeded by roadways or other rights of way
7.3.5.4 Appropriate traffic control
7.3.6 Off-road vehicle use restrictions
7.3.7 Waste minimization practices
7.3.8 Mitigation measures unique to specific alternatives

7.4 Air and Climate

7.4.1 Dust control measures
7.4.2 Emissions control measures
7.4.2.1 Emissions reduction equipment
7.4.2.2 Maintenance and inspection of equipment and vehicles using combustion engines to reduce emissions
7.4.3 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)
7.4.4 Hazardous Materials Management Plan (summary of relevant measures with full document in Annex)
7.4.5 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

G.2.3 Air Emissions from Fossil Fuel- and Biomass-Fired Plants

7.5 Noise and Vibration

7.5.1 Noise control measures
7.5.1.1 Noise reduction technologies
7.5.1.2 Rerouting of traffic and other infrastructure related activities to minimize impacts of noise and vibration and pollutants, relocation of cultural or historical resources, physical protection.
7.5.1.3 Time of day limitations on blasting and movement of heavy equipment when in close proximity to houses not being operated during evening hours
7.5.2 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)
7.5.3 Mitigation measures unique to specific alternatives

Tables G-1, G-2 and G-5

G.2.4 Noise

7.6 Aesthetic and Visual Resources

7.6.1 Relocation of facilities to another site
7.6.2 Redesign of placement of facilities on site
7.6.3 Redesign height and location of structures blocking view or light
7.6.4 Use of underground lines
7.6.5 Lighting minimization
7.6.6 Visual/Landscape Management Plan (summary of relevant measures with full document in Annex)
7.6.7 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

Biological Impacts

7.7 Vegetation/Flora and Associated Ecosystems

7.7.1 Right-of-way Vegetative Maintenance Plan (summary of relevant measures with full document in Annex)
7.7.2 Control of noxious and invasive weeds
7.7.3 Restoration/Rehabilitation Plan for disturbed areas (summary of relevant measures with full document in Annex)
7.7.4 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

7.8 Aquatic and Terrestrial Wildlife/Fauna and Associated Ecosystems

7.8.1 Fish and Aquatic Resources
7.8.1.1 Scheduling construction to avoid critical or important fish life history periods (e.g., spawning)
7.8.1.2 Blasting Plan, if applicable (summary of relevant measures with full document in Annex)
7.8.1.3 Mitigation measures unique to specific alternatives
7.8.2 Wildlife Resources
7.8.2.1 Controls on hunting within the project area

Tables G-1 and G-2

7.8.2.2 Modify facility and activity locations and timing to avoid critical ecosystems, migratory routes and breeding areas
7.8.2.3 Scheduling construction to avoid critical or important wildlife history periods (e.g., breeding, nesting)
7.8.2.4 Transmission line design to minimize or avoid electrocution of raptors and other large birds
7.8.2.5 Blasting plan, if applicable (summary of relevant measures with full document in Annex)
7.8.2.6 Mitigation measures unique to specific alternatives

Social-Economic-Cultural Impacts

7.9 Socio-Economic Conditions

7.9.1 Selection of an alternate route for the project, and if not possible then adhering to requirements of an internationally recognized Resettlement Action Plan (RAP)
7.9.2 Rehabilitation Program for people displaced by the project (summary of relevant measures with full document in Annex)
7.9.3 Training local residents for employment in the project
7.9.4 Development of a "Code of Conduct" (with associated training program) for workers to show respect to the local populations and their culture and social rules
7.9.5 Measures proposed to protect public from failure of proposed facilities
7.9.6 Design and operational measures to avoid or reduce risk
7.9.7 Measures to exclude public from hazardous areas
7.9.8 Development of an Occupational Health, Industrial Safety and Accidents Prevention Program with appropriate accident prevention program, reporting and periodic review (summary of relevant measures with full document in Annex) including provision of routine training and testing, and proper safety equipment such as hearing protection, hardhats, steel-toed shoes, safety railings, fall arrestors, sensors for notification on reaching of warning and action limits for exposure to hazardous gases and liquids or impending catastrophic failures.
7.9.9 Spill Prevention and Containment Plan (summary of relevant measures with full document in Annex)
7.9.10 Hazardous Materials Management Plan (summary of relevant measures with full document in Annex)
7.9.11 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

7.10 Infrastructure

7.10.1 Transportation infrastructure
This section of the EIA addresses mitigation measures for transportation and traffic patterns on existing roads. Mitigation of impacts of new and existing roads on water quality and biological resources and land use should be addressed in those respective sections.
7.10.1.1 Transportation Plan (summary of relevant measures with full document in Annex)
- Placement of traffic signals
- Establishing, posting and enforcing speed limits for the vehicles that transport material
- Training employees, contractors and subcontractors on measures to reduce or avoid potential accidents
- Hiring and training security personnel devoted exclusively to preventing accidents in the access road and controlling the speed of the vehicles transporting project material

7.10.2 Public health infrastructure
7.10.3 Communications infrastructure
7.10.4 Energy Infrastructure
7.10.5 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

7.11 Cultural, Archeological, Ceremonial and Historic and Resources

7.11.1 Modify facility and activity locations to avoid significant archeological, cultural, ceremonial and historic sites

7.11.2 If avoidance is not possible, conduct appropriate resource recovery operations before disturbing the sites
7.11.3 Clearly delineate boundaries and post signs identifying existing archeological, cultural and historic sites on roadsides and within the project area boundaries so that they are easily recognized by the machinery operators and other workers
7.11.4 Development of a training program so that staff recognize and respect culturally and archeological sensitive areas
7.11.5 Development protocols for use during construction and operation stages for identifying and responding to archeological, cultural, ceremonial and historic sites not identified during the preliminary surveys
7.11.5.1 In the event that such a site is found, they will stop activities at the site and report to the government relocation of cultural or historical resources, for their physical protection.
7.11.6 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

7.12 Land Use

7.12.1 Criteria and method for calculating compensation for loss of land and crops
7.12.2 Compensation to farmers and ranchers for crop or forage losses and restore lost agricultural lands at the end of the project.
7.12.3 Compensation to property owners for relocation of their homes in the event the relocation is unavoidable.
7.12.4 Mitigation measures unique to specific alternatives

Tables G-1 and G-2

8 Environmental Management Plan

The EIA shall include an Environmental Management Plan to prevent, mitigate and monitor each impact identified in the EIA. Plans will describe actions to be taken in sufficient detail to provide a basis for subsequent auditing of compliance with commitments made in the EIA process including who is responsible, how and when it will be implemented, what will be done and what results will be achieved, why it is being done, and how to know whether it is effective in addressing the underlying concerns. The Environmental Management Plan shall have the following elements:

H. Environmental Management Plan

Table H-1

8.1 Overview of Environmental Management Plan Organization and Policy

8.1.1 Describe the project management and how environmental management and organization relates to overall project responsibility. Describe the personnel and performance accountability system for design, operation, maintenance and closure for implementation of mitigation and monitoring measures
8.1.2 Describe the environmental policy that will govern the Project throughout its implementation, including at least the objectives, scope, commitment to continuous improvement, control and environmental monitoring and good relationship with neighboring populations and countries, as well as the commitment to internal controls such as compliance and environmental monitoring and routine audits
8.1.3 Identify the persons responsible for the implementation of mitigation measures, in each phase

8.2 Project-wide Mitigation Plan including an implementation schedule. It has two elements:

8.2.1 Environmental resource mitigation (such as air, water)
8.2.2 Socio-economic-cultural mitigation (relocation, etc.)

G. Mitigation and Monitoring Measures

8.3 Project-Wide Monitoring Plan (usually specific to monitoring of surface and ground water)

8.3.1 Short-term and long-term monitoring of resource condition, including but not limited to:
8.3.1.1 Slope stability
8.3.1.2 Water Quality Monitoring Program
- Where, how and when monitoring shall be conducted
- Parameters to be monitored
- Monitoring frequencies
- Sampling and analytical protocols to be used

8.3.1.3 Air Quality Monitoring Program
- Where, how and when monitoring shall be conducted

G.3 Monitoring and Oversight

- The Parameters to be monitored
- The monitoring frequencies
- The sampling and analytical protocols to be used

8.3.1.4 Noise and Vibration

8.3.1.5 Cultural, ceremonial archeological and historic resources in the vicinity of the mine

8.3.2 Short-term and long-term monitoring to ensure that the mitigation measures are functioning as predicted and that rehabilitation is working

8.4 Management of Other On- or Off-Site Environmental Pollution Control and Infrastructure

This section should address management of critical elements of pollution control and infrastructure that are not otherwise included in the mitigation plan because they were considered an essential part of the proposed project.

Table H-1

8.5 Contingency Plans

Contingency plans shall be prepared and described to address a) failure to meet specific performance criteria established by law or necessary for the project to meet its commitments in the EIA and b) respond to natural and other risks previously identified and mitigated in the EIA in the event reasonable and feasible mitigation measures to address the risks are inadequate.

8.5.1 Performance-related Contingency Plans, indicating the steps that will be taken should monitoring indicate that:

8.5.1.1 Environmental standards are not being met

8.5.1.2 Impacts are greater than predicted

8.5.1.3 The mitigation measures and/or rehabilitation are not performing as predicted

8.5.2 Natural Disaster Risk Response Plan (assumes that risk identification and risk reduction have been addressed in other parts of the EIA)

8.5.3 Other Risks Response Plans (assumes that risk identification and risk reduction have been addressed in other parts of the EIA)

8.5.4 Contingency plans for maintaining service or reducing downtime in the event of accidents or natural catastrophes that disrupt facility operation

9 Signed Commitment Statement

The EIA shall contain a legally binding signed letter of commitment to meeting the terms of the EIA. The statement must be signed by the authorized representative of the proponent company with assurance that all financial surety measures as required by the regulatory agency have been met.

10 Annexes

These shall be numbered and duly referenced in the text.

B.2 Public Participation

10.1 Public Consultation

10.1.1 Public consultation plan

10.1.2 A summary of public outreach activities including: audience, number of persons, organizations involved, concerns raised, responses to comments

10.1.3 Summary of response to comments

10.1.4 Actual copies of written comments

10.2 Technical Supporting Documents

10.2.1 Include maps, plans, charts and figures in the sequence mentioned in the EIA document

10.2.2 Zoning maps with resources and results of impacts

10.2.3 Special Studies if relevant but not readily accessible

10.2.4 Detailed materials on predictive tools/models and assumptions used for the assessment but too detailed for the body of the EIA

10.1. References

Submit a list of all references, (books, articles, technical reports and other information sources) cited in the various chapters of the EIA study with full biographic references, and the following conventional procedures cited in the literature: author, year, title, source, number of pages, and city of publication or issuance.