

Initial Environmental Examination

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CAM: Urban Water Supply Project – Stung Treng Subproject

Prepared by Ministry of Industry and Handicraft for the Asian Development Bank.

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ABBREVIATIONS

ADB	Asian Development Bank
CAP	Corrective Action Plan
CC	Construction Contractor
CEMO	Contractor Environmental Management Officer
DDR	Due Diligence Report
DEIA	Department of EIA
DPWS	Department of Potable Water Supply
DSC	Design and Supervision Consultant
ES	Environmental Specialist
GMS	Greater Mekong Subregion
IEE	Initial Environmental Examination
MIH	Ministry of Industry and Handicraft
MOE	Ministry of Environment
MOH	Ministry of Health
MPWT	Ministry of Public Works and Transport
PDOE	Provincial Department of Environment
PWW	Provincial Water Works
PSMO	PMU Environmental Management Officer
PMO	Project Management Office
PMU	Project Management Unit
PPTA	Project Preparation Technical Assistance
REA	Rapid Environmental Assessment (Checklist)
SPS	Safeguard Policy Statement (2009)
UWSP	Urban Water Supply Project
UXO	Unexploded Ordinance
WTP	Water Treatment Plant

Units

cm	centimeter
km	kilometer
L	liter
m	meter
m ³ /day	cubic meters per day
masl	meters above seal level
MCM	million cubic meters
mg/L	milligrams per liter
ROW	right of way
Φ	diameter

Summary IEE

Introduction

1. This report presents the findings of the Initial Environmental Examination (IEE) for the proposed Stung Treng Water Supply Subproject. The Subproject is part of the Urban Water Supply Project (the Project) financed by the Asian Development Bank (ADB), which provides improvements in infrastructure for nine provincial towns. The province of Stung Treng is located in Northeast of Cambodia. It borders Laos to the North, Rattanakiri to the East, and Kratie to the South.
2. The UWSP Project is classified as Category B, thus subprojects require an initial environmental examination (IEE) to determine whether significant environmental impacts are likely. Also, Appendix I of the ADB SPS (2009) requires that, "when the project involves existing activities or facilities, . . . environmental audits [will be performed] to determine the existence of any areas where the project may cause or is causing environmental risks or impacts." The REA checklist includes a section in which the existing facilities have been audited to identify the presence of environmental risks or impacts.
3. Overall management of the environment in Cambodia lies with the Ministry of Environment (MOE). EIA policy has been extended through the Sub-decree on Environmental Impact Assessment Process passed by the Council of Ministers on 11 Aug 1999. Under the sub-decree an Initial Environmental Impact Assessment (IEIA) report is required from a project owner. All IEIAs and related documents are reviewed and approved by the Department of EIA in the MOE. A timeline for submittal and approval of the IEE during implementation is provided in the report.
4. The Department of Potable Water Supply (DPWS) under the Ministry of Industry and Handicraft (MIH) is responsible production and distribution of safe water throughout the country. Water Supply Authorities (WSAs) are active in the two municipalities (Phnom Penh and Siem Reap) while Provincial Water Works (PWWs) oversee water supply systems in provincial and district urban centers.

Description of the Project

5. The existing water works has been in use for many years and no longer produces adequate quantities or quality of potable water. Its size and configuration are outdated for the needs of the community. Many outlying areas are not tied into the distribution system, and service remains poor throughout the area. The subproject aims to rehabilitate in entirety the Stung Treng system in order to meet the projected 2030 demand.
6. The water supply system is to be replaced in entirety to remedy these problems. Improvements include replacement of the existing treatment plant and pump station; a raw water transmission main to the proposed Water Treatment Plant (WTP) facility; tie-in to the existing distribution system with transmission main; replacement of broken/leaking cast iron distribution piping in urban locations; and addition of new piping to increase size of service areas. A total of 8,000 new connections are anticipated, to be subsidized under the loan.

Description of the Environment

Physical Resources

7. Stung Treng Province is an agricultural province of hills, mountains and riverside terraces. Monthly rainfall and temperature are summarized in the report. There are no predictions available on the effects of climate change on local rainfall or groundwater availability.
8. The local geology consists of a flood plain with a natural levee adjacent to the Sekong River and shallow depressions behind it that hold swamps or wetlands. Dark grey fine sand is found to a depth of 9 m, underlain by Mesozoic shale and sandstone. There are no natural hazards such as steep slopes and unstable soils within the confines of the plant property or along distribution line routes that would affect the project.
9. The town sits above the normal water elevation of the Mekong and Sekong about 20 m and is high along the river. Internal drainage is hindered by lack of clear outlets, and local flooding occurs during heavy rains. Drainage is cut off with fill in some loca-

tions. Internal relief is seldom less than 5 m. The Mekong's flood discharge may reach a magnitude of 60,000 m³/s, while low flow values are on the order 2,000 m³/s, giving a ratio between peak and base-flow of about 30:1.

Ecological Resources

10. Aquatic ecosystems along the Mekong in Stung Treng Province have been documented extensively by the Mekong Wetland Biodiversity Program. The Ramsar Wetlands along the Mekong provides a rich habitat for fish. There is no extensive natural forest located close to the project area; however Stung Treng Province is characterized by extensive forest cover. Numerous mammal species in the past could be found in Stung Treng Province, though none are currently found in the project area. The population of Mekong river dolphin, a subspecies of the Irrawaddy dolphin, has declined to less than 100 and has brought them to the brink of extinction. The nearest protected area is the Stung Treng Ramsar Site upstream along the Mekong, a wetlands of international importance and so designated under the Mekong Wetlands Biodiversity Programme.

Economic Development

11. Land use in the project area includes residential space, commercial and institutional space, agricultural fields, grazing land and sparse, degraded forest land. Land use is undergoing rapid change in the vicinity of Stung Treng, especially along the highway. The types of industry with some contribution to the provincial economy include the wood products industry, handicrafts, agro-industry and animal husbandry, and mining for iron ore, copper, gold and other metallic minerals.

Social and Cultural Resources

12. The majority of people of Stung Treng Province are farmers and fishers. The province's poverty rate of 47% is somewhat higher than the national average of 32%. Data revealed through the project socioeconomic survey showed that 61.5% of surveyed households were poor for reasons of poor health, lack of food and land, joblessness and lack of access to credit.

Potential Environmental Impacts and Mitigation Measures

13. The IEE presents a summary of the potential impacts for each phase of the project and each impact is then analyzed and necessary mitigation measures are proposed to reduce the overall magnitude of impact. Findings regarding preconstruction impacts have been incorporated into the planning under the PPTA.

Location Planning and Design

14. The raw water demand will be met by extraction of raw water from the Mekong River. Water quality varies seasonally, with total suspended solids (TSS) increasing through the wet season while conductivity decreases. Both ammonia and total phosphorous may also decrease from the effects of dilution; however their response is less clear as increased runoff from agricultural and urban areas contribute nonpoint source pollutants that cause a reverse effect. The proposed conventional treatment approach is flexible enough to accommodate a range of turbidities as well as to remove pollutants that would cause the water to be unusable as a drinking source. Still, activities should be restricted within a distance of 100 m of the proposed intake, in particular excreta disposal from home or public latrines and septic tank systems.

15. About 0.2 ha of land in Preah Bat Commune is the site for the treatment plant. The land has been purchased by the Provincial Waterworks for the proposed use. The raw water pipeline and distribution piping will be installed in roadways. Some small amount of space for land-side appurtenances related to pumping may be necessary; however no land acquisition is anticipated under the subproject.

16. Unexploded ordinance (UXO) and mines are reported to be potentially present in some areas of the project. The Government will undertake any necessary UXO investigations and clearance and provide certification that the proposed water treatment plant area and roads within the expanded coverage area within the City of Stung Treng are free of UXO and mine hazards prior to commencement of the work. Alternatively, various independent mine clearance groups in Cambodia such as the Cambodia Mine Action

Committee (CMAC) and Halo Trust can provide certification based on surveys and prior information to determine the presence of UXO and mines in a project area, as well as demining if necessary.

Construction

17. Construction of the intake and pump station is unlikely to cause any impact, since it is a floating pontoon arrangement that simply needs to be launched upon the River and moored permanently to the bank. Construction of the water treatment plant may cause some localized impacts, which are addressed in the IEE

18. The typical construction effort will involve a crew of perhaps 30 workers and duration of around nine months. The crew is made up of domestic laborers, though likely not local. Housing will likely be at a site provided by the contractor. Impacts and related mitigation measures are related to the workforce and the workplace. The replacement and extension of water distribution pipe takes place along linear alignments along roadways (for extensions), and city streets (where replacement of existing pipe is proposed). Potential impacts stem from the presence of workers carrying out their jobs and temporarily residing at the site and working along roadways. Noise and air emissions may extend beyond the site boundaries and cause a nuisance for adjacent land uses. Movement of materials to and off the site can affect traffic and conditions on roadways. Workers may be exposed to health and safety risks as a result of the work. None of these impacts is significant, and a high standard of project implementation by the contractor can minimize the effect. A comprehensive list of potential impacts and proposed mitigation measures are proposed to protect community health and safety; meet the needs of the work force, provide for worker camps, and ensure worker health and safety; protect air and water and mitigate noise impacts; and protect soils and dispose of excess materials as necessary. Construction impacts are mitigated by a set of environmental specifications to be included in procurement documents, which will be binding on the contractor. Specific procedures should be applied throughout pipe laying with particular emphasis on work conducted in congested areas. The contractor should conduct pipe laying in a manner that has minimum impact on the health, safety and convenience of businesses, residences and users of the street area; specific guidelines are provided in the IEE to accomplish this goal. All roadway surfaces should be repaired as construction progresses; bid packages should contain a unit bid price for roadway repair, and for repair of any other facility, structure or surface that is likely to be damaged in quantity during construction. Finally, commissioning requires that newly constructed or repaired water mains, tanks and reservoirs be disinfected through chlorination. Installation contracts should include a bid item for disinfection of installed piping.

Operations

19. Impacts during operations concern environmental or public health. Poorly operated treatment plants pass pathogens; failure to chlorinate allows pathogens to survive in distribution systems; broken pipes and low pressure allow cross-contamination from sewers and soil organisms. Modern, well-operated water treatment plants deliver a product water consistently free of coliform organisms and other pathogens, no matter how polluted the raw water may have been. Further, effective coagulation and sedimentation reduces turbidity to improve the effectiveness of chlorination. Regardless of the effectiveness of the treatment process, continuous chlorination at the head of the delivery system is necessary for delivery of safe water free of bacterial contamination, viruses and other pathogens. Broken lines and low pressure provide means for entry of pathogens into distribution systems. Maintaining chlorine residual in the system is one way to guard against cross-contamination, as is sustaining adequate pressure in the system. Capacity building is recommended during implementation in the safe handling of chlorine effective during the operations period.

Indirect, Cumulative and Induced Impacts

20. One type of cumulative impact stems from the effect of water supply systems on urban growth. Urbanization is accompanied by congestion with concomitant effects on air pollution and overall quality of life. New areas being served in Stung Treng are already settled, so the aggravation of uncontrolled development does not occur.

21. An indirect impact of water supply expansion has to do with the disposal of increased quantities of wastewater from households and industrial/commercial users. Generally speaking, improved water supply should be accompanied by improvements in sanitation and drainage that mitigate the effect of increased discharges. Data obtained through the socioeconomic survey for the coverage area shows 90% of households equipped with pour flush toilets—a high percentage, indicating lack of sanitation should not be a constraining factor in advancing water supply coverage.

22. Increased flows enter drainage systems. Impacts occur if drainage increases pollution load to receiving waters. In general, drainage systems suffer from a lack of investment in infrastructure, limited cooperation between government departments, clogging with solid waste and infilling/blockage by property owners. The situation at Stung Treng is that most septic tank supernatants will percolate into the sandy soil and that which flows overland will receive some ‘treatment’ in the shallow wetlands that course through the town. The cumulative effect of discharges from many small urban drains on receiving water quality can be severe over the long term, and available solutions are inadequate to deal with the greater problem.

Resilience to Climate Change Impacts

23. The quantities of water supplied “at source” and the extent of water supply distribution to a recipient population provides the base case for comparison with future conditions under which the subproject is implemented and climate change effects take place. The subproject either improves, or is neutral with respect to, climate change resilience. A further issue concerns the exacerbation of health impacts due to climate change in the absence of effective sanitation and drainage in urban and peri-urban communities. Finally, whether subproject infrastructure is vulnerable to weather conditions brought about by climate change may be considered.

24. As of December 2012, downscaling of the general circulation models (GCMs) to determine regional climate conditions under global climate change had not been accomplished for Cambodia. Thus predictions related to the effects of climate change on hydrometeorological parameters in Cambodia are uncertain and generally qualitative. The subproject improves climate change resilience by increasing the supply of water at-source; and by extending the reach of the distribution system to areas within the community that lack piped water supply. To the extent that the community is lacking in piped water supply either from shortage of source quantities or due to inadequate distribution, the recipient populations are benefited.

25. The complete rehabilitation of the Stung Treng Water Supply System will result in benefits for the entire community in respect to the ordinary needs for obtaining clean drinking water as well as in respect to improved resilience to climate change impacts. Currently the community is vulnerable to failure of the piped water supply either from shortage of source quantities, old and failing conditions of the equipment and piping, poor water quality as produced by the existing treatment system, and inadequate distribution. Relocation of the intake for the system supply to the Mekong from the Sekong increases the availability of raw water, and its quality, many-fold. Further, the subproject is expected to affect some of some 46,000 beneficially due both to increase in at-source supply and distribution system extensions. The subproject has a beneficial impact on the community to alleviate drought brought on by climate change, and improves the resilience of the community in the face of drought.

26. Drainage conditions are worsened under climate change scenarios, whether stagnant and still water bodies during periods of drought that breed mosquitoes and harbor high numbers of enteric disease bacteria, or flooding conditions where drainage systems are overwhelmed and polluted water enters human living spaces.

Existing Facilities Audit

27. Appendix I of the ADB SPS (2009) requires that, “when the project involves existing activities or facilities, relevant external experts will perform environmental audits to determine the existence of any areas where the project may cause or is causing environmental risks or impacts.” Rapid environmental assessment was conducted at the fa-

cility to identify the presence of waste, spent, out-of-spec and discarded water treatment chemicals, oils, cleaning fluids and solvents, as well as contaminated soils that have or have the potential for causing environmental impacts or risks. Waste materials that pose a hazard to human health or the environment have not been identified at the facility, nor are there any other environmental hazards connected with the facility. There is no need to prepare a corrective action plan for purposes of reducing environmental impact and risk.

Environmental Management Plan

28. Impacts are presented in a tabular form along with summaries of the required mitigation measures, institutional responsibilities for assuring the mitigation action is carried out and costs, which are in all cases included in previously identified budgets for design, construction and operation of the systems.

Institutional Arrangements

29. The Department of Potable Water Supply (DPWS) at central level under Ministry of Industry and Handicraft (MIH) is the executing agency and will establish the Project management Unit (PMU) to execute the Project. The PMU will assign responsibility for environmental aspects to a particular individual as staff PMU Safeguard Management Officer (PSMO) who is engaged full time with implementation of the project to oversee work related to monitoring. The Provincial Water Works (PWW) is the operator of the Stung Treng water supply system and implementation agency for the subproject. PWW will establish a Project Implementation Unit (PIU) to undertake construction of the Subproject in Stung Treng Province.

30. The PMU will engage Contractors for specific works, based on the subcontract packages considered most suitable for execution. Legal clauses regarding mitigation measures are required to be included in construction contract bidding documents and become part of contract agreements; a typical set of specifications are provided in Appendix 2. For the main construction contracts, the Contractor will be required to appoint a staff Construction Environmental Management Officer (CEMO) responsible for supervising implementation of mitigation measures during the execution of the contract. The contractor will be required to prepare a Construction Management Plan (CMP) to ensure construction, demolition and excavation that take place at building sites do not adversely affect health, safety, amenity, traffic or the environment in the surrounding area.

31. The PMU will be assisted by the Environmental Specialists (ES), consultants who are part of the Design and Supervision Consultant (DSC) and support all the subprojects undertaken through the loan. The ES will update and finalize the IEE, submit the plans on behalf of MIH to the Ministry of Environment, incorporate legal clauses regarding mitigation measures into construction contract bidding documents, and assist the PSMO in monitoring the implementation of those measures during the progress of construction. The ES also will provide training to PMU and PIU staff.

32. The ES will revise and update the IEE based on final designs, and the document will be translated into Khmer prior to submittal to MOE DEIA, which will engage in the review process the provincial PDOE where the subproject takes place. Once DEIA approves the EMP for the subproject, implementation can proceed with construction mitigation measures mostly in the hands of the contractor, and the ES, PDOE, PIU and PSMO working together to perform monitoring and reporting. It will be the job of the PIU supported by the ES to compile quarterly reports, which then are compiled into semi-annual safeguard monitoring reports by the PMU and DSC, supported by the ES. The PSMO and PMU Project Director will be responsible for submittal of reporting to ADB.

33. A table summarizing monitoring requirements is provided in the IEE. The PIU and ES are responsible for the bulk of the monitoring being undertaken during the design and construction periods. During operations, the Provincial Water Works is responsible. During the detailed design, repeated samples of well water from any newly developed, test, or surrogate wells should be analyzed for standard parameters: temperature, color, turbidity, pH, total dissolved solids and conductivity. Data should **used** to determine acceptability of the raw water source and be incorporated into the treatment system design.

Recommended protocols for monitoring raw water quality used in production operations (the raw water source) and finished water quality are already in place by DPWS in which a number of parameters are monitored.

Public Consultation and Information Disclosure

34. The Provincial Water Works (PWW) is a key stakeholder that holds the interests of the community to be its primary mission. The subproject concept and design are driven by PWW perceived needs for rehabilitation of system elements within the constraints of the available budget. Furthermore the IEE has been reviewed by DPWS and concurrence has been reached on the contents of the EMP.

35. Consultation: During field work on environmental and social components, people were told about the subproject in their area, and asked about conditions regarding water supply, sanitation and drainage. The social component combined focus group discussions with socioeconomic survey work, and conducted random sampling surveys that focused on local experience and perceptions of thematic issues like sanitation practice and water supply quantity and quality. A meeting was held in Stung Treng, combining resettlement and environmental components of project activity. Initial discussions were held with the DPWS director and staff to understand the proposed system components and operational constraints. Following that, a meeting was held on the grounds of the water treatment plant. About 37 persons attended the meeting representing commune leaders and ordinary citizens. A general description of the project was prepared in Khmer language, using visual means to provide some detail about the project proposal. A hand-out in Khmer was provided and used in the presentation. Responses were recorded on specially prepared forms, noting the name, age, sex and occupation of the respondent, and the nature of the response. These are provided in Appendix 3. Responses were positive, in favor of the project. Concerns centered on the extent to which the project would serve new areas within the community. There was general all-round support and enthusiasm for the project.

36. Disclosure: MIH shall provide the relevant environmental information for this subproject, including information from the IEE to affected people in a timely manner, in an accessible place, and in a form and language(s) understandable to them by providing a copy of the IEE in Khmer language at the PWW office for review by interested parties. In addition, ADB will post on its website the subproject IEE, updates prepared during the project implementation period, and environmental monitoring reports prepared during the implementation period.

37. Grievance Redress: Grievances related to both environmental and resettlement issues are addressed through the Grievance Redress Mechanism (GRM). In order to ensure that complaints from all affected persons (APs) on any aspect of environment, land acquisition, compensation and resettlement are addressed in a timely and satisfactory manner, and that all possible avenues are available to APs to air their grievances, a well defined grievance redress mechanism will be established. All APs can send any questions to the implementing agency about their rights in relation with redress of environmental problems and entitlements. APs are not required to pay any fee in order to file a complaint at any level. The GRM is explained in detail in the IEE and in the public information booklet distributed to all APs.

Findings, Recommendations and Conclusions

Findings

38. The Initial Environmental Examination for this Category B subproject provides a review of the proposed infrastructure and its interactions with the surrounding environment, and analyzes potential impacts. The review and analysis shows that these are unlikely to occur. Because water supply is an important infrastructure improvement that runs concurrently with – and are essential for – economic development, the main impact is expected to be beneficial. Furthermore, good engineering practice in the design, installation and operations of water supply systems mitigate substantially the environmental impacts noted herein.

39. There are ways in which the environmental performance of the project can be improved, and the IEE provides recommendations in regard to these opportunities. The majority of negative impacts that have been identified are associated with construction and installation of the proposed works. These are short term and localized, hence are impacts of minor significance that are minimized by application of safeguards that are common in the construction industry. Environmental criteria for construction are recommended to mitigate construction impacts, and are included as a separate appendix.

40. Negative environmental impacts occurring during the operation of the project are few. These are mainly concerned with maintaining water supply systems so that safe water, free of pathogens, can be delivered. Monitoring treated water quality and chlorine residual in the distribution lines is necessary for assuring safe supply, and is already a routine activity by government water supply agencies.

41. Public consultation has been conducted to make clear to the directly affected communities the potential social and environmental impacts as identified by the environmental and social reviews. No significant issues were raised during the public consultation that have not been addressed in the IEE. A proposal has been described for continuing the process of public consultation during construction that includes mechanisms for disclosure and for redress of grievances that arise during the construction phase.

Recommendations

42. Environmental safeguards involve mitigation of construction impacts by means of environmental requirements placed on the construction contractor, and operations and maintenance of the completed system to guarantee high quality of potable water. Sanitation and drainage have been addressed in terms of indirect and cumulative impacts.

43. Mitigation measures to be undertaken during construction cover hiring of workers, provision of facilities for worker housing and sustenance, site work and pipe laying, temporary suspension of water supply and pipeline commissioning. Recommendations are aimed at maintaining access to residences and businesses, reducing dust, noise pollution and congestion at the site and along roadways and haul routes, provision of alternative services for water supply when the system needs to be shut down, disinfecting completed distribution mains prior to commissioning, provisions for worker housing, sanitation and waste management, and worker safety and health.

44. Mitigation measures for implementation during operations include chlorination of water supplies, periodic testing to assure good bacteriological quality, and maintenance of system pressures to prevent cross-contamination in distribution systems.

Conclusions

45. The environmental impacts of the proposed improvements in water supply infrastructure for Stung Treng have been assessed by the Initial Environmental Examination reported in this document, conducted according to ADB guidelines. Issues related to involuntary resettlement were assessed by a parallel process of resettlement planning and determined to be insignificant, in that no involuntary land acquisition will occur within the scope of the subproject.

46. The overall conclusion of both processes is that providing the mitigation, compensation and enhancement measures are implemented in full, there should be no significant negative environmental impact as a result of location, planning, design, construction and operation of the project. There are benefits stemming from recommended mitigation and enhancement measures, and major improvements in quality of life and individual and public health once the project is in operation.

47. Further work on the IEE will be required prior to implementation to update the mitigation proposals and identify any associated costs, to be performed by the Environmental Specialist working with the Design Supervision Consultant.

I. INTRODUCTION

A. Purpose of the Report

1. This report presents the findings of the Initial Environmental Examination (IEE) for the proposed Stung Treng Water Supply Subproject. The Subproject is part of the Urban Water Supply Project (the Project)¹ financed by the Asian Development Bank (ADB), which provides improvements in infrastructure for four provincial towns in Cambodia under the Cambodia Water Supply and Sanitation Sector Strategy. The ADB's sector strategy for Cambodia, currently being formalized, seeks alignment with the Government's action plan to facilitate public-private partnerships, strengthen management of publicly owned water supply facilities and integrate urban water supply and urban environmental management;² and supports Cambodia's millennium development goal for 80% of urban access to improved water supply by 2015.³

2. Stung Treng is one of the four towns targeted under the Project. The province of Stung Treng is located in the Northeast of Cambodia. It borders Laos to the North, Ratanakiri to the East, Kratie to the South and Preah Vihear to the West. The town of Stung Treng has 17 villages in four sangkats (districts), with a population of 24,507 in 5,543 households.

B. Institutional and Regulatory Framework

3. The Project is classified under ADB rules as a Category B project. According to the ADB Safeguard Policy Statement (2009), such projects are judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for category A projects. An initial environmental examination (IEE) is required for subprojects to determine whether or not significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report. A Rapid Environmental Assessment Checklist for the subproject is found in Appendix 1.

4. Appendix I of the ADB SPS (2009) requires that, "when the project involves existing activities or facilities, relevant external experts will perform environmental audits to determine the existence of any areas where the project may cause or is causing environmental risks or impacts." The rapid environmental assessment checklist (Appendix 1) includes a section in which the existing facilities have been audited to identify the presence of waste, spent, out-of-spec and discarded water treatment chemicals, oils, cleaning fluids and solvents, as well as contaminated soils that have or have the potential for causing environmental impacts or risks.

5. Overall management of the environment in Cambodia lies with the Ministry of Environment (MOE), which was created in 1993 with a wide set of responsibilities. At provincial and city levels, there are corresponding Provincial/City Environment Departments. Local departments have the responsibility of enforcing environmental legislation coming under the competence of the MOE.

¹ ADB, 2013; "Project Data Sheet"; Project Number 41403-013; Urban Water Supply and Sanitation Project; at . <http://www.adb.org/projects/41403-013/main>.

² Cambodia: Water Supply and Sanitation Sector Assessment, Strategy, and Road Map; ADB Manila, 2012.

³ Overview of the Urban Water Supply Sector in the Kingdom of Cambodia, Sub -Technical Working Group for Urban Water Supply, Department of Potable Water Supply, Ministry of Industry, Mines and Energy, January 2012.

6. The hierarchy of legislation in Cambodia includes the Constitution, laws issued by the National Assembly, decrees/sub-decrees/implementing regulations issued by the Council of Ministers, implementing legislation (prakas) issued by ministries and decree laws, which are legal instruments issued prior to the 1992 Constitution. Article 59 of the Cambodian Constitution provides for the protection of the environment. In November 1996, the Cambodian National Assembly passed the Law on Environmental Protection and Natural Resource Management (the framework law). The objectives of this law are to protect environmental quality through the prevention, reduction and control of pollution, to establish an Environmental Impact Assessment (EIA) system, to ensure sustainable use of natural resources, to encourage public participation and to suppress acts which are harmful to the environment. The law calls for EIAs to be conducted for every private or public project, to be reviewed by the Ministry of Environment before submission to the Government for a final decision. All proposed as well as existing activities are to be covered under this requirement.

7. Other articles of the law prescribe sustainable use of natural resources, and anticipate the establishment of natural resource protected areas by decrees. Another article provides that the MOE shall collaborate with other ministries to develop an environmental inventory which details the sources, types and quantities of wastes, toxic substances and noise disturbances which may exist in Cambodia.

8. EIA policy has been extended through the Sub-decree on Environmental Impact Assessment Process passed by the Council of Ministers on 11 Aug 1999. Under the sub-decree an Initial Environmental Impact Assessment (IEIA) report is required from a project owner either private, joint-venture or public sector.⁴ A Project Owner must apply to the MOE for reviewing the IEIA report or to the Provincial/Urban Environmental Office (PEO) if the investment value is less than \$2,000,000 and environmental impacts are not considered severe. In the case of a project that causes serious impact, the Project Owner must prepare a full EIA report and apply to the MOE for review. In practice, all IEIAs and related documents are reviewed and approved by the Department of EIA in the MOE. Declaration No. 49 *Guideline for EIA Reports* was issued in June 2000, and Declaration No. 745 *Determination of Service Charge for Environmental Impact Assessment Report Review and Follow-up and Monitoring of Project Implementation* was issued in October, 2000. For the present project, RGC/Client approval for Environment Clearance from the Ministry of Environment involves revision of the IEE during the design phase, coincident with detailed design preparation, and translation of the IEE into Khmer. The IEE is submitted to the Department of EIA within MOE, which has a period of 30 days to review and respond with comments, or approve, the IEE.

9. The Department of Potable Water Supply (DPWS) under the Ministry of Industry and Handicraft (MIH) is responsible for controlling and managing the production and utilization of safe water throughout the country; collecting information and preparing inventories of potential surface and groundwater supply; developing policies, rules and regulations to manage urban water supply; operating laboratories for control of water quality in line with National Drinking Water Standards; and issuing licenses for operation of water supply facilities in accordance with ministerial guidelines and principles. Water Supply Authorities (WSAs) are active in the two municipalities (Phnom Penh and Sihanoukville) while Provincial Water Works (PWWs) oversee water supply systems in provincial and district urban centers.

C. Extent of IEE Study

10. The IEE was prepared as part of the ADB project preparation technical assistance (PPTA) TA 8125-CAM, with two months of international and three months of national consultant input. Data sources include government agencies, professional and academic reference materials, government publications and project background sources provided

⁴ The IEIA report is similar in scope and effort to an Initial Environmental Examination (IEE).

by the project management office (PMO). Field observations were conducted at the sites of proposed construction.

II. DESCRIPTION OF THE PROJECT

A. Scope

11. The existing water works has been in use for many years and no longer produces adequate quantities or quality of potable water. Its size and configuration are outdated for the needs of the community. Many outlying areas are not tied into the distribution system, and service remains poor throughout the area. The subproject aims to rehabilitate in entirety the Stung Treng system in order to meet the projected 2030 demand.

B. Interventions

12. The water supply system is to be replaced in entirety to remedy these problems. Improvements include replacement of the existing treatment plant and pump station; a raw water transmission main to the proposed Water Treatment Plant (WTP) facility; tie-in to the existing distribution system with transmission main; replacement of broken/leaking cast iron distribution piping in urban locations; and addition of new piping to increase size of service areas. The various components are itemized in the following list:

Onsite Civil, Mechanical and Electrical

- A. New Mekong intake, raw water pump station with a 300 m³/hr (4,800 m³/day) raw water intake and pump station on the Mekong River and 1.4km transmission main 1.4 km 400 mm Φ ductile iron
- B. New WTP of 7,950m³/day capacity with elevated storage tank and underground storage basin
- C. Rehabilitate existing 500m³ elevated storage tank in old WTP and build new underground clear water storage basin

Distribution System Improvements

- A. New distribution system for Stung Treng, Srah Ruessei & Preah Bat commune
- B. New distribution system for Sammakki commune across the Sekong River bridge
- C. New distribution system for Ou Rey and Thalaborivat communes across new Mekong bridge with pump station and elevated storage tank.

13. The total network length is 354 km: 7.7 km of 400 mm OD line; 41.9 km of 315 mm; 9.1 km of 200 mm; 43.3 km of 160 mm; 24.3 km of 110 mm; 68.7 km of 90 mm; and 159 km of 63 mm. Roughly 70%, 15%, and 15% are distributed among the main town, Sammakki Commune, and Thalaborivat Commune, respectively.

C. Location

14. The general layout of the project is shown in Figure 1. The inlet and pump station are located along the Mekong River, with a raw water main to the proposed water treatment plant, shown in Figure 2, located at coordinates N 16° 41' 30" X 107° 08' 30". Treated water transmission mains connect the treatment plant to the distribution network, which will be replaced in most areas. The distribution system will be extended to the important communes of Sammakki along the north bank of the Sekong and to Ou Rey and Thalaborivat communes across the Mekong, soon to be accessed by the new Mekong Bridge. Transmission mains will be suspended from the undersides of bridges for servicing these areas.

D. Capacity and Performance

15. The system capacity is based on a 2012 population of 37,973 persons for areas to be served by water supply, and annual population growth rate of 1.17%, and 120 lpcd consumption. The design year is 2030 for structures, pumps and appurtenances.

Growth in commercial and institutional use is included in the projection. Additional allowance for production losses, unaccounted for water and a 1.2 peaking factor brings the design capacity to 7,950 m³/day. A total of 8,000 new connections are anticipated, to be subsidized under the loan. Treatment performance is based on a full chemical conventional treatment process comprised of:

- Floating pontoon intake
- Pre-Sedimentation (one unit) with loading rate: 20 m³/m²/day
- Coagulation/Flocculation (30 minutes retention)
- Sedimentation (2 units) with load rate : 20 m³/m²/day
- Rapid sand filtration (2 units): 5 m³/m²/hour
- Disinfection (calcium hypochlorite)
- sludge dried for land disposal, backwash (water + air blower) to river

16. Finished water quality will meet drinking water standards. The distribution piping line size and storage tank elevation is designed to maintain pressure in the system at one atmosphere (33 ft, 10 m, or 14 PSI).

17. Non-process facilities and equipment included in the proposal include gabion riverbank protection at the intake pump, a plant office, power connection and electrical works, boundary fences, drainage and parking area, administrative office and workshop.

18. Underflow discharge from the sedimentation tank and filter backwash will be treated in a sludge drying basin before being returned to the River. Solids will be disposed of separately. There are no other process waste streams.

E. Sanitation

19. Various ministries have overlapping responsibilities related to sewerage and sewage/wastewater treatment in urban sanitation, but in general urban sanitation remains the responsibility of the Ministry of Public Works and Transportation (MPWT). The implications with respect to environmental issues of the approach to sanitation are taken up in Sec. IV.E on indirect and cumulative impact.

Figure 1: Stung Treng Water Supply System Improvements

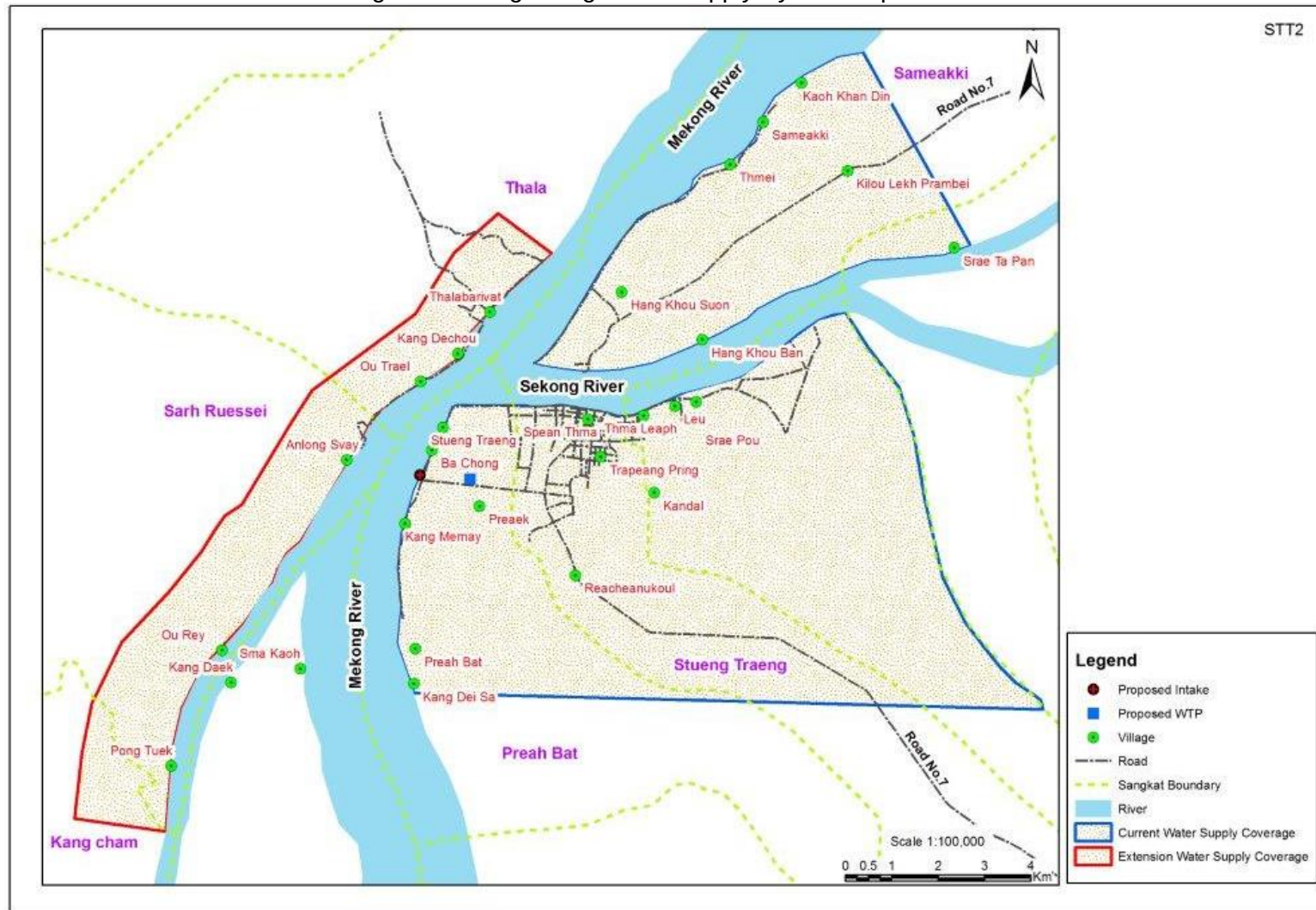
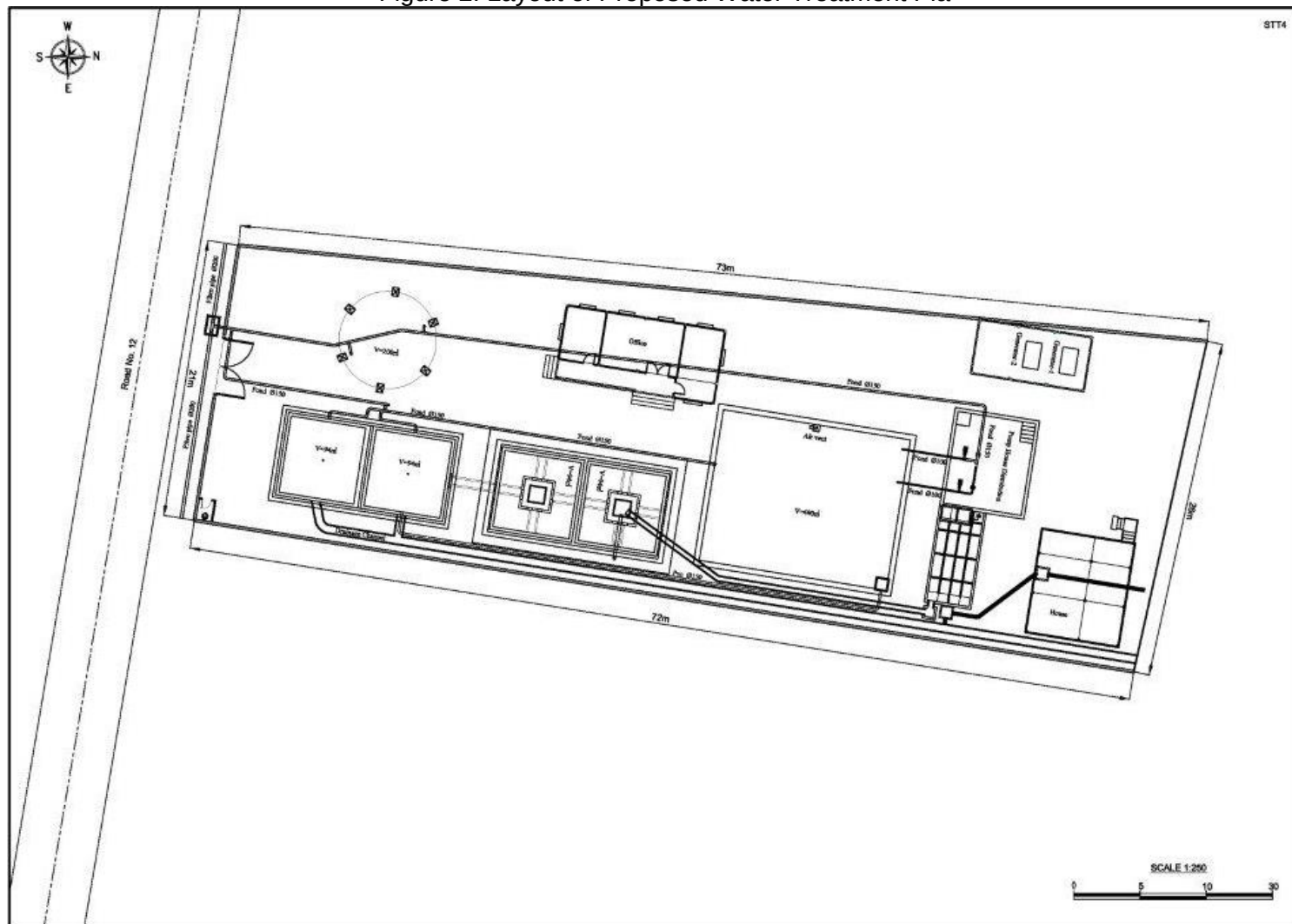


Figure 2: Layout of Proposed Water Treatment Pla

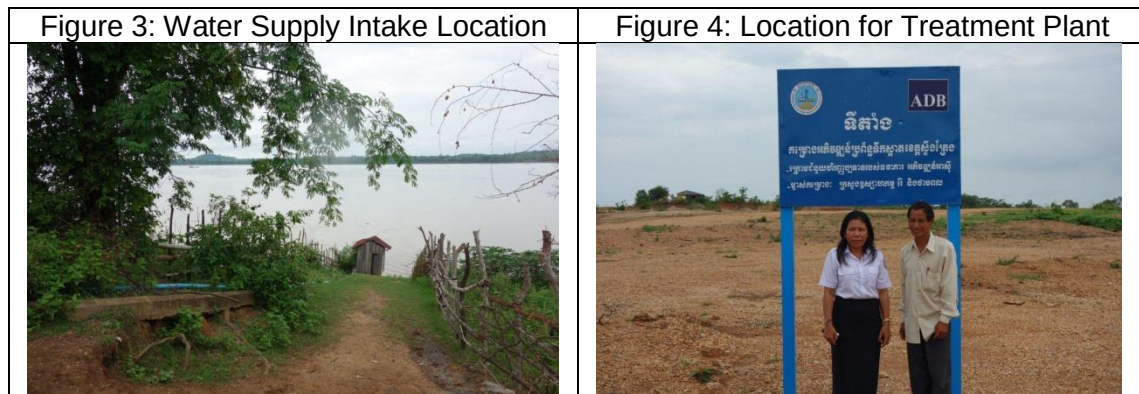


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III. DESCRIPTION OF THE ENVIRONMENT

A. Physical Resources

20. Photographs of the water supply intake point and the proposed area for the treatment plant are shown in Figures 3 and 4, respectively.



1. Climate and Air Quality

21. Stung Treng is located along the Mekong River at 13° 31' 40" N X 105° 57' E at an elevation of around 50-60 masl. The climate is humid and tropical but with some variation over the period of a year. Monthly average rainfall and temperature are summarized in Figure 3. These values reflect the average of 22 years of data (1990-2011) recorded at the Stung Treng Province weather station (see Figure 5). There are no predictions available on the effects of climate change on local rainfall or Mekong river flows.

2. Soils, Geology and Seismology

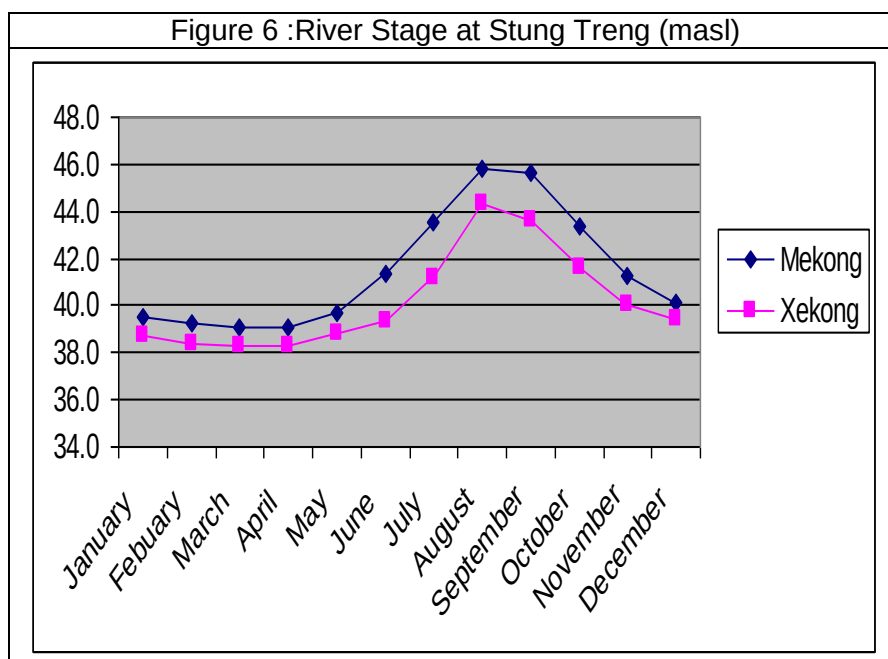
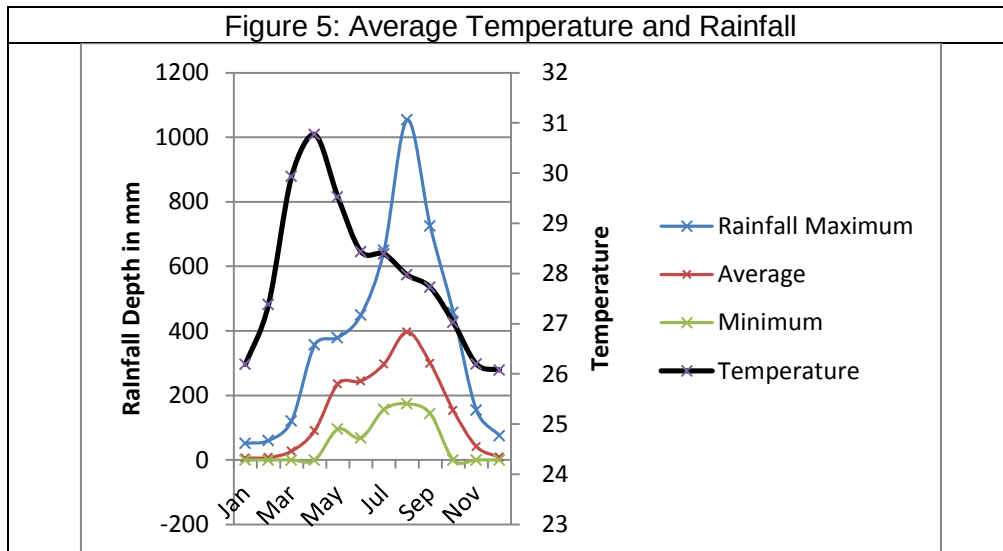
22. The local geology consists of a flood plain with a natural levee adjacent to the Sekong River and shallow depressions behind it that hold swamps or wetlands. Dark grey fine sand is found to a depth of 9 m, underlain by Mesozoic shale and sandstone. This bedrock is exposed along the river and forms the many islets of the Stung Treng Ramsar Wetlands and the Siphandon further north. Soils are classified as Brown Alluvial and Alluvial Lithosoils.

3. Topography and Drainage

23. The town sits above the normal water elevation of the Mekong and Sekong about 20 m and is high along the river. Internal drainage is hindered by lack of clear outlets, and local flooding occurs during heavy rains. Drainage is cut off with fill in some locations. Internal relief is seldom less than 5 m. There are no natural hazards such as steep slopes and unstable soils within the confines of the plant property or along distribution line routes that would affect success of the project.

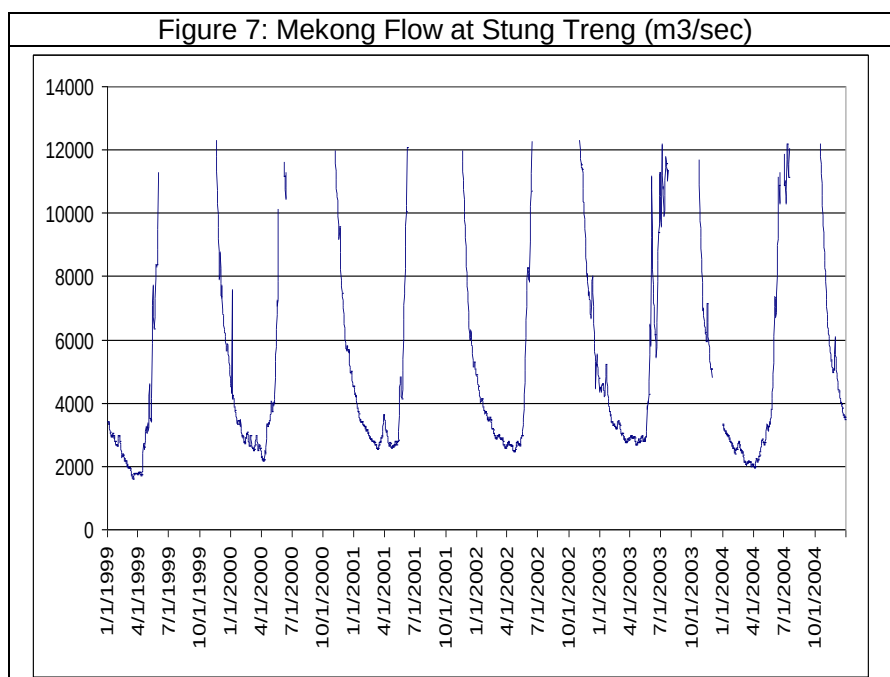
1. Surface Water

24. The Mekong River joins with the Sekong at Stung Treng and according to annual hydrographs for the two rivers is likely to constrain the flow of the Sekong at its mouth (Figure 6). The maximum average flood stage of the Mekong at Stung Treng is 44.3 m, and occurs in August (five out of nine years, with the balance in September and once in October). The maximum height reached over the last nine years is 48.8 masl on 20 August 2001. The Yali Dam and other hydropower developments on the Sesan and Sekong Rivers will affect flow and water quality.

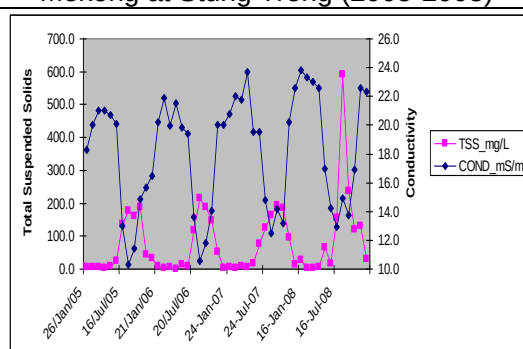


25. The Mekong's flood discharge may reach a magnitude of $60,000 \text{ m}^3/\text{s}$, while low flow values are on the order $2,000 \text{ m}^3/\text{s}$, giving a ratio between peak and base-flow of about 30:1. Daily flows over the years 1999 – 2004 provided by the Ministry of Water Resources (MWR) are shown in Figure 7, but the data are not continuous – maximum stage readings are not recorded.

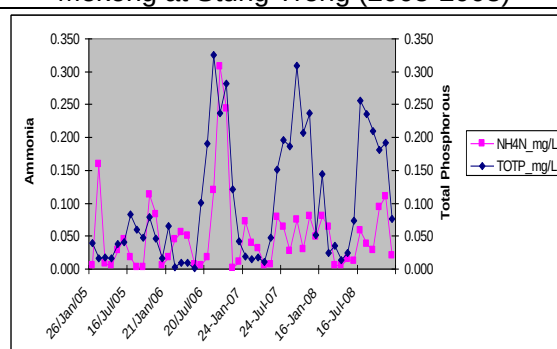
26. Monthly water quality data for the Mekong at Stung Treng over the years 2005-2008 were provided by MWR. Conductivity declines due to dilution with fresh water, and suspended solids increases due to sediment loss, with increase in flow, hence are inversely related (correl coef = -0.66) (Figure 8). Ammonia and total phosphorous (Figure 9) are directly correlated (0.48), with average values of 0.05 and 0.10 mg/L, respectively. COD is low (average of 2.5 mg/L) and dissolved oxygen is near saturation (average of 7.6 mg/L). Table 1 provides average values for all parameters monitored by MWR.



**Figure 8: TSS and Conductivity:
Mekong at Stung Treng (2005-2008)**



**Figure 9: Ammonia and Phosphorus:
Mekong at Stung Treng (2005-2008)**



**Table 1: Averages of Monthly Water Quality
Values at Stung Treng (2005-2008)**

<i>Parameter</i>	<i>Average</i>	<i>Parameter</i>	<i>Average</i>
TEMP °C	28.66	Cl meq/L	0.22
pH	7.27	SO ₄ meq/L	0.27
TSS mg/L	79.68	NO ₃ -2 mg/L	0.16
COND mS/m	18.08	NH ₄ -N mg/L	0.05
Ca meq/L	1.02	TOT-N mg/L	0.45
Mg meq/L	0.36	TOT-P mg/L	0.10
Na meq/L	0.35	DO mg/L	7.64
K meq/L	0.04	COD mg/L	2.52
ALK meq/L	1.28		

2. Groundwater

27. Little information is available concerning large scale groundwater use in the area of Stung Treng, though it constitutes a common source of homestead water supply throughout the province, with shallow wells to a depth of 7—12 m. The arsenic risk map prepared under the National Drinking Water Quality Assessment for Cambodia in 2001 shows the Province as very low risk for arsenic contamination.

B. Ecological Resources

1. Aquatic Biology and Fisheries

28. Aquatic ecosystems along the Mekong in Stung Treng Province have been documented extensively by the Mekong Wetland Biodiversity Program. The Ramsar Wetlands along the Mekong provides a rich habitat for fish, and much of the indigenous population of Cham and Khmer depend heavily on fishing as a central part of their livelihoods.

2. Forests and Wildlife

29. There is no extensive natural forest located close to the project area; however Stung Treng Province is characterized by extensive forest cover. These include forests on the seasonally flooded sandy and rocky islands on the Mekong's river bed; riverine or gallery forest along the Mekong's river banks and the larger islands; deciduous dipterocarp forests somewhat away from the river and semi-evergreen forest. The forests on the seasonally flooded sandy/rocky islands of the Mekong's main channel is rare anywhere in the world and although it occurs in the Mekong as far south as Kratie it is best developed in Stung Treng Province. Dominant trees are species of *Barringtonia*, *Eugenia*, *Acacia*, *Ficus* and *Anogeissus rivularis*. The riverine or gallery forests occur in patches along both banks of the River and on its larger islands. They vary greatly in structure and diversity; the trees can grow to 30 m in height on seasonally flooded alluvial soils and grade into semi-evergreen forests.

30. The Central Indochina Dry Forest ecosystem covers more area in mainland Southeast Asia than any other forest type, and remains extensive in coverage along the broad valley of the Mekong and its tributaries in central and southern Laos and has a widespread distribution in the arid plains of northern, eastern, and south-central Cambodia. Associated with this forest type are "an outstanding assemblage of threatened large vertebrates that characterize the mammal fauna of the Indo-Pacific region." However habitat loss and hunting have exacted a heavy toll on these species, especially in settled areas along the Mekong River. Some remaining pockets of wildlife may be found in the general vicinity of Stung Treng; however the project area is not likely to harbor any wildlife of significance.

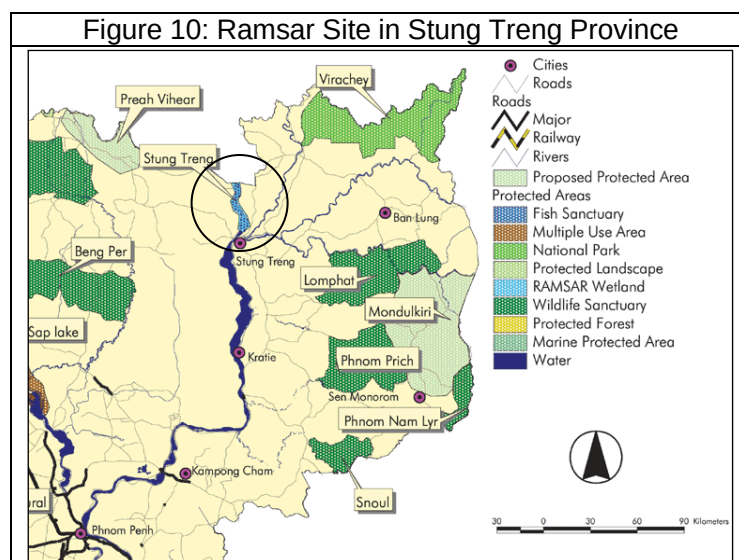
3. Rare or Endangered Species

31. Terrestrial wildlife species are more prevalent in Stung Treng than further south along the river. Numerous mammal species in the past could be found in Stung Treng Province. None are currently found in the project area.

32. Irrawaddy dolphins are commonly seen on the Mekong over a 190 km stretch including Stung Treng and are threatened with extinction from dam-building on the Mekong. The population of Mekong river dolphin, a subspecies of the Irrawaddy dolphin, has declined to less than 100 and has brought them to the brink of extinction.

4. Protected Areas

33. The nearest protected area is the Stung Treng Ramsar Site upstream along the Mekong (Figure 10), a wetlands of international importance and so designated under the Mekong Wetlands Biodiversity Programme (Lopez 2007).



C. Economic Development

1. Land Use

34. Land use in the project area includes residential space, commercial and institutional space, agricultural fields, grazing land and sparse, degraded forest land. Land use is undergoing rapid change in the vicinity of Stung Treng, especially along the highway. Infilling is a form of change with effects on the biological environment.

2. Agriculture, Industry and Tourism

35. The types of industry with some contribution to the provincial economy include the wood products industry, handicrafts, agro-industry and animal husbandry, and mining for iron ore, copper, gold and other metallic minerals. Statistics available from the World Food Program⁵ regarding employment show higher proportions of the population engaged in agriculture, and fewer in industry and services, in comparison with the national average (Table 2). Poor road infrastructure and lack of access to markets lower farm-gate prices (Table 3).

Table 2: Employment and Labor Force Indicators

Indicator	Stung Treng	National
Literacy Rate > 15 years % total population	53	67
Literacy Rate > 15 years % females	47	60
% of the labor force in the primary sector incl. Agriculture	70	60
% of the labor force in the secondary sector/ Industry	6	13
% of the labor force in the tertiary sector/ Services	18	25
% of the labor force economically active <=10 days/ mth	27	29

Table 3: Market Access Indicators

Indicator	Stung Treng	National
Average time (minutes) from village to the nearest market	242	45
Average farm gate price of paddy in Riel	437	521
Distance (Km) to nearest year-round road	32.4	3.8
Average time (minutes) from village to nearest year-road	167	18

36. Tourism is opening up through the region with the Mekong Discovery Trails project and other bilaterally and multilaterally supported projects. Projects emphasize eco-tourism from Kracheh up the Mekong to Steung Treng and beyond to the Lao – Cambo-

⁵ <http://www.foodsecurityatlas.org/khm/country/provincial-Profile/Stung-Treng>

dia border. Tourism activities include dolphin viewing at Kampi, Sambour and other locations, and includes the vast wetlands created by distributaries of the Mekong north of Stung Treng. No data are available on the volume of tourism revenues for the area.

3. Infrastructure, Transport and Power Supply

37. Stung Treng is connected to Kracheh via National Rd. 13 and to Rattanakiri and the border with Lao PDR to the north.

38. Power generation and distribution is provided by the Provincial Department of Industry, Mines and Energy, providing 200 kVA power. Electric power comes from a local generating facility.

D. Social and Cultural Resources

1. Population and Communities

39. The people of Stung Treng Province are farmers and fishers, with 70% of the population engaged in agriculture. The province's poverty rate of 47% is somewhat higher than the national average of 32% (Table 4). Data revealed through the project socioeconomic survey showed that 61.5% of surveyed households were poor for reasons of poor health, lack of food and land, joblessness and lack of access to credit.

Table 4: Indicators of Consumption Poverty

Consumption Poverty Indicator	Stung Treng	National
Per capita consumption in riel	2303	3247
Consumption poverty line in riel	1833	1836
% of households below the poverty line	47	32
The poverty line value as a percentage of total consumption	80	49
World Food Program, http://www.foodsecurityatlas.org/khm/country/provincial-Profile/Stung-Treng		

2. Health Facilities and Conditions

40. Health centers are found at Stung Treng and Sarh Ruessei. There is also a referral hospital at Stung Treng. Most references give the province a low rating in health indicators, with 62% of women suffering from anemia, 94% of births occurring outside of a health clinic and 87% without a health professional in attendance. Statistics on illnesses reported at the Stung Treng Health Center between 2006 and 2008 show the highest incidence among respiratory infections (38%), with water related diseases constituting 6%. Malaria and dengue, at 1,010 cases, made up 6% of reported illnesses. Schistosomiasis is also prevalent in Stung Treng. Data provided by WFP⁶ among school children in villages bordering the Mekong showed 27% inflicted with chronic diarrhea, 20% with worms in the stool, 43% with abdominal pains and 28% with bloody stools.

3. Sites of Historical, Archaeological and Paleontological Significance

41. During the 19th century, the area making up Stung Treng Province was part of the ancient Champasak kingdom and ceded back to Cambodia in 1904 during the French occupation. Intensive guerilla activity took place in the province during the French period and during the Vietnam-American conflict.

42. Petrified forests are found in Siem Pang. Other physical remains of historical, archaeological and paleontological significance are not noted in available references.

IV. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

43. This section reviews potential environmental impacts in relation to location, planning and design; construction; and operations. Most of the findings regarding precon-

⁶ <http://www.foodsecurityatlas.org/khm/country/provincial-Profile/Stung-Treng>

struction impacts have been incorporated into the planning under the PPTA. A summary of the potential impacts is presented for each phase of the project. Each potential impact is then analyzed and necessary mitigation measures are proposed to reduce the overall magnitude of impact.

A. Location, Planning and Design

44. The raw water demand will be met by extraction of raw water from the Mekong River. As described in Sec. 1, water quality varies seasonally, with total suspended solids (TSS) increasing through the wet season while conductivity decreases. It is unlikely, therefore, that the raw water intake will have any potential negative impacts on the aquatic ecosystem, since a floating pontoon-type design will be adopted and the quantity of water abstracted from the river will be relatively small compared to the river flow. Both ammonia and total phosphorous may also decrease from the effects of dilution; however their response is less clear as increased runoff from agricultural and urban areas contribute nonpoint source pollutants that cause a reverse effect. The proposed conventional treatment approach is flexible enough to accommodate a range of turbidities as well as to remove pollutants that would cause the water to be unusable as a drinking source. The US Environmental Protection Agency considers convention treatment appropriate for raw water sources containing coliforms up to 20,000/100 ml, no restriction or upper limit on turbidity (solids content of raw water) and up to 75 CU (color units). Removal of color will also accomplish removal of dissolved constituents that contribute nutrients (NH₃, P). Activities should be restricted within a distance of 100 m of the intake, in particular excreta disposal from home or public latrines and septic tank systems.

45. About 2 ha of land in Preah Bat Commune is the site for the treatment plant. The land has been purchased by the Provincial Waterworks for the proposed use. The raw water pipeline and distribution piping will be installed in roadways. Some small amount of space for land-side appurtenances related to pumping may be necessary; however no land acquisition is anticipated under the subproject.

46. Treatment of effluents composed of sedimentation tank underflow streams and filter backwash flows is also a design and environmental issue. These flows generally contain around 1% solids that originate from the suspended solids in the raw water, combined with alum and lime. A sludge drying bed will be installed on the site to improve handling of sludge and reduce quantities of return flow. The underflow can be directly discharged to the river without significant impact. Solids need to be removed regularly and disposed of in a controlled landfill.

47. Unexploded ordinance (UXO) and mines are reported to be potentially present in some areas of the project. The Government will undertake any necessary UXO investigations and clearance and provide certification that the proposed water treatment plant area and roads within the expanded coverage area within the City of Stung Treng are free of UXO and mine hazards prior to commencement of the work. Alternatively, various independent mine clearance groups in Cambodia such as the Cambodia Mine Action Committee (CMAC) and Halo Trust can provide certification based on surveys and prior information to determine the presence of UXO and mines in a project area, as well as demining if necessary.

48. None of the facilities proposed under the project are subject to damage or failure due to natural disasters such as floods and earthquakes, a factor that was taken into consideration during the design of the project.

B. Construction

1. Raw Water Intake, Pumps and Treatment Plant

49. Construction of the intake and pump station is unlikely to cause any impact, since it is a simple floating pontoon arrangement that simply needs to be launched upon the Riv-

er and moored permanently to the bank. It is unlikely, therefore, that the raw water intake will have any potential negative impacts on the aquatic ecosystem. Construction of the water treatment plant may cause some localized impacts, which are addressed in the following paragraphs.

50. The typical construction effort will involve a crew of perhaps 30 workers and duration of around nine months. The crew is made up of domestic laborers, though likely not local. Housing will likely be at a site provided by the contractor. Impacts and related mitigation measures are related to the workforce and the workplace.

51. To accommodate the needs of the workforce, the contractor should provide suitable housing, adequate supplies of potable water, and toilet and bathing facilities within the housing area. Onsite facilities for preparing food need to be provided, or food service contracted. The contractor should provide means for disposing of wastewater from toilets, baths and food preparation areas either through a septic tank and soakaway, or holding tank with removal by vacuum truck. Solid waste should be collected at waste bins and disposed of properly offsite. The labor camp should be located at a distance from the community, preferably at the construction site. The public should be barred from the site and children of workers should not be allowed within the work area.

52. The Contractor should have a basic safety and health plan in place for workers, in which workers are required to wear personal protective gear suitable to the type of work being performed and a worker is suitably trained (or experienced) in the work he/she is assigned to do. Emergency care should be available on call. The Contractor should maintain a record of accidents, which should be reviewed on occasion with the supervising engineer.

53. The workplace should be kept orderly to reduce accidents. Deep excavations in unstable soils need to be shored, and below grade construction brought to grade quickly, then excavations closed. Surface soils should be temporarily graded-to-drain and protected as necessary to reduce erosion and sediment runoff. Silt fences may be required in locations where there are nearby bodies of water that could be affected by sediment.

54. Noise and dust emissions should be controlled at the workplace to the extent practicable, depending on the presence of nearby homes or institutional buildings. Dust emissions can be controlled using water sprays. Operation of high decibel emitting equipment should be limited to daylight hours, as with receipt of materials and supplies shipments.

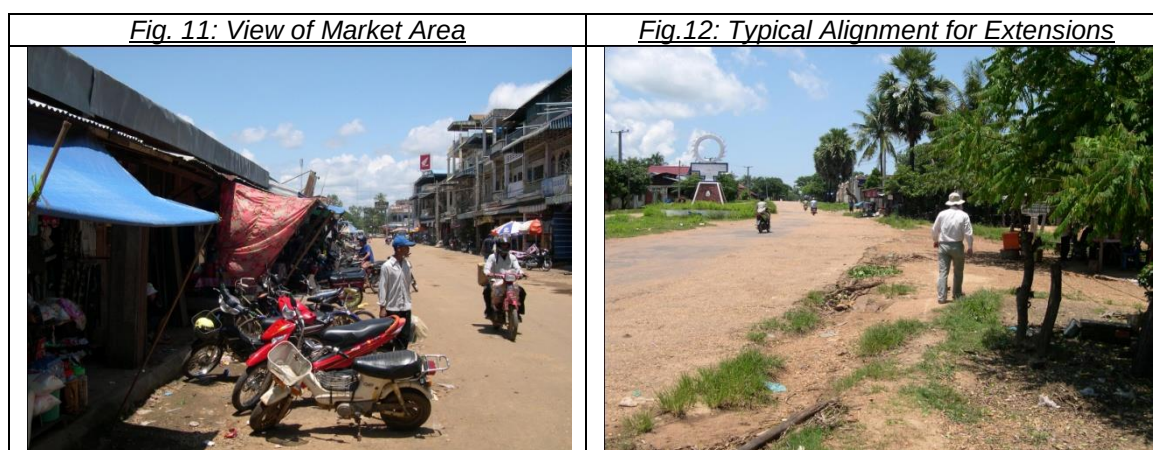
2. Replacement and Installation of Distribution Piping

55. The placement of water transmission and distribution pipe takes place along linear alignments most typically the shoulders of roadways, along city streets (generally outside the curb line or pavement edge) and along other linear features such as irrigation canals or railway easements. In limited instances the installation will cut across or intersect the street or road alignment.

56. Ductile iron and HDPE distribution piping will be installed to replace existing pipe materials and extend the transmission and distribution network. Much of the pipe to be replaced is located in existing roadways; in such cases, the old pipe will be abandoned in place and new pipe installed about one meter outside the property line in the shoulders of roadways. Some alignments have homes and shops along the roadway; other alignments are away from areas where there are homes. The potential for environmental impact is found primarily in those areas where there are homes and businesses, but the impact is of temporary duration and limited extent. Special precautions need to be taken in more built up areas, for instance near the market (Figure 11) where water lines will be replaced. The area is congested during the day; construction work may be conducted during nighttime and cause less disruption to the community. Most roadways where pipe

will be installed are relatively open and clear of obstruction (Figure 12). The following procedures should be applied throughout pipe laying with particular emphasis where the work is conducted in congested areas.

57. Facilities to accommodate the needs of the workforce have been described previously and are generally applicable; however the labor camp needs to be located away from work locations and workers transported to the work site on a daily basis. Temporary lodging for workers should not be set up along the alignments where piping is being installed. The labor camp should be set up at a selected and approved location for the duration of the contract, at a location that does not interfere with or cause a nuisance for the local community.



58. The contractor should conduct pipe laying in a manner that has minimum impact on the health, safety and convenience of businesses, residences and users of the street area. This includes the following:

1. Minimize the period of time that a segment of excavation is kept open by not allowing trenching to outpace pipe-laying by more than a day or so. Trenches should be back-filled and ground leveled after installation of piping.
2. Place only bedding and pipe materials at the location that will be used within the next few days work, well out of the line of traffic. Clean up and remove from the site any excess spoil, wood used for shoring and construction materials upon completion of the segment. Compact soil in trench and clean surrounding pavement areas to reduce blowing dust.
3. Provide temporary bridging across the trench at entries to residences and businesses. Otherwise, provide tape barriers to reduce the possibility of an accident.
4. Once work is complete on a segment, pavement surfaces and masonry works (curbs, abutments, stairs, drains, drives, etc.) should be repaired and returned to original condition.

59. The construction approach should minimize the time that any one segment is under construction or roadway/walkway left un-repaired to reduce the construction impact, done by limiting the length of open trench to 100 m or less.

60. The contractor should minimize use of heavy equipment in congested areas, conduct activities during daylight hours and apply water to suppress dust as needed. In heavily trafficked areas such as tourist sites and markets, the contractor should increase the work force to complete construction quickly, reduce dust by removal of excess earth, and avoid obstructing the paths of travel for pedestrians and vehicles.

61. The contractor should minimize downtime of existing water supply, limit shutdowns to less than four hours and notify the public in advance to store water as necessary.
62. The contractor should use tarpaulins to cover truck beds hauling sand, dirt or fill, avoid overfilling trucks and causing spillage along roadways, plan haul routes to avoid congested areas and narrow roads, and schedule transportation to avoid peak traffic periods.
63. The contractor should avoid trenching where damage might occur to buildings, and provide shoring and backfill with sand/cement admixture to prevent caving.
64. The public should be barred from construction areas, and excavations should be barricaded and marked. Workers should not be allowed to enter trenches deeper than waist height unless they are properly shored. Given that excavations will not be deep, pipe diameters relatively small, and that excavated materials will be used as backfill, the quantity of spoil will be minimal.
65. Movable sanitary facilities should be provided at the work site and kept clean, free of odors and usable. No materials should be stored onsite for longer than a day before their use. Excess materials should be removed after a segment is complete. Any excess earth should be used for backfilling trenches or as fill offsite at locations agreed upon by the property owner.
66. All roadway surfaces should be repaired as construction progresses; bid packages should contain a unit bid price for roadway repair, and for repair of any other facility, structure or surface that is likely to be damaged in quantity during construction.
67. There is a potential for archaeological relics to be found in the project area and some may be unearthed during trenching. Secs. 37-39 of the Law on the Protection of Cultural Heritage (1996) specifies a chance find procedure to be in place in the event that "cultural property such as monuments, ruins, ancient objects, remains of inhabited sites, ancient burial sites, engravings or any property likely to be of interest" is discovered. The law goes on to state that "the owner of the site is obliged to call a halt to the construction work at that location and immediately make a declaration to the local police, who shall transmit the information to the Governor of the province or a delegated representative. The Governor or representative shall take measures necessary to ensure the protection of the objects and the site." Such chance finds should not be disturbed until an assessment has been made by a government approved Archeologist.
68. The subproject could face unreasonable delay by encountering repeated work stoppages and the following procedure is intended to conform to the intent of the law while avoiding repeated stoppages:
- A. During the period of detailed design, the PIU should request that a government approved Archeologist make a visit to the area to assess the potential for significant archeological finds within the pipe alignments and at depths that piping will be installed.
 - B. The pipe alignments will be walked at systematic intervals, and subsurface investigation techniques, such as shovel probing, will be used to explore areas of poor visibility. If necessary, test pits may be dug to resolve surface evidence.
 - C. If the Archaeologist completes a survey and determines that no archaeological sites are present within the area of project impact, a management recommendation of "no archaeological sites present" would be appropriate. In addition, the Archaeologist would normally make a recommendation that no further archaeological investigations are needed. A recommendation of "no eligible archaeological sites present" can also be made if it can be demonstrated that artifacts or

sites are not eligible due to loss of physical integrity or insufficient scientific data content.

- D. Work can proceed once alignments receive the recommendation; in the event artifacts are unearthed, the Archeologist will be requested to visit the site to recover any artifacts present in already excavated materials and to record evidence that may be visible below ground.
- E. The contractor does not need to interrupt work progress; excavated materials containing slight archeological evidence may be used for refilling trenches; the contractor and its employees are enjoined to prevent any pilfering of artifacts from excavated earth or side walls of trenches upon penalty of law.

3. Disinfection of Installed Water Pipe

69. Newly constructed or repaired water mains, tanks and reservoirs contain pollutants that accumulate during construction. These units can be disinfected through chlorination. Initial chlorine concentrations are made high enough (about 50 mg/L) to overcome the chlorine demand of contaminants. Chlorination is repeated until residual chlorine is one mg/L, after which the structure is flushed out before being placed into use. Installation contracts should include a bid item for disinfection of installed piping.

C. Operations

70. Impacts during operations concern environmental or public health. Poorly operated treatment plants pass pathogens; failure to chlorinate allows pathogens to survive in distribution systems; broken pipes and low pressure allow cross-contamination from sewers and soil organisms.

71. Modern, well-operated water treatment plants deliver a product water consistently free of coliform organisms and other pathogens, no matter how polluted the raw water may have been. Data show that flocculation, settling and sand filtration coupled with chlorination can produce an effluent containing one coliform organism per 100 ml (the historical standard for these plants) when influent contains as many as 6,000 coliform/100 ml.

72. Effective coagulation and sedimentation reduces turbidity to improve the effectiveness of filtration. Effective removal of bacteria by filtration relies on influent turbidity in the range of 7-14 NTU, after which sand filtration is capable of high removal efficiency. Regardless of the effectiveness of the treatment process, continuous chlorination at the head of the delivery system is necessary for delivery of safe water free of bacterial contamination, viruses and other pathogens. Chlorine residuals of 0.2 – 1 mg/L after 15 to 30 min of contact will generally produce a decontamination factor of 1000 (99.9% destruction). A 15 min residual of 0.5 mg/L appears to be a safe average.

73. Broken lines and low pressure provide means for entry of pathogens into distribution systems. The mechanics of this phenomenon are difficult to trace; however most modern systems guard against low pressure, when cross-contamination is potentially more likely in systems with high rates of unaccounted for water (e.g. systems with broken and leaky mains). Maintaining chlorine residual in the system is one way to guard against cross-contamination, as is sustaining adequate pressure in the system. A planned technical assistance aims to provide capacity building for PWW staff in all aspects of operations and maintenance, which will ensure that high quality drinking water is provided through provincial systems.

74. Capacity building in the occupational and public safety aspects of operational use of chlorine will need to be included in the Loan. Of particular concern is the provision/procurement of adequate safety equipment at the site, to include eye wash stands refitted under the project and correct use of personal protective gear. Training must include emergency procedures for response in the event of leaks and spills, and means for conducting regular training of staff under normal operations, as well as simulated drills.

75. A sludge drying bed is being installed at the treatment plant works for dewatering filter backwash generated during operations. The small amount of materials derived from the drying operation can be safely landfilled at facilities operated by the municipality.

D. Sanitation

76. There is no physical intervention or actual investment related to sanitation on the Project; therefore there is no direct environmental impact that can be associated with any physical works. The absence of sanitation interventions to offset or mitigate the impact of increased household, commercial and (potentially) industrial waste flows is a form of indirect or cumulative impact that is taken up in the next section.

E. Indirect, Cumulative and Induced Impacts

77. Water supply is an essential component of human welfare, and is essential for urban growth, both in terms of population density and the spread, or extension, of settlements into new areas. Growth in many towns in Cambodia has been constrained by limitations on water supply; even where actual numbers and area coverage are not factors, human health impacts stemming from inadequate household supply may occur.

78. Indirect, cumulative and induced impacts stemming from development of water supply systems have to do with the effects of urban growth. Most generally, urbanization is accompanied by congestion with concomitant effects on air pollution and overall quality of life. More specifically, the introduction of water supply into an area can cause rapid changes in land value, and the conversion of peri-urban or rural land into areas ripe for development. If land ownership is not clearly established ahead of time, the potential for land grabbing and displacement of households exists. In short, in the absence of land use controls, expansion of water supply systems aggravate uncontrolled development and consequent impacts on environment. New areas being served in Stung Treng are already settled, so the aggravation of uncontrolled development does not occur.

79. The most clearly linked indirect impact of water supply expansion has to do with the disposal of increased quantities of wastewater from households and industrial/commercial users. Generally speaking, improved water supply should be accompanied by improvements in sanitation and drainage that mitigate the effect of increased discharges. Onsite sanitation is the norm throughout Southeast Asia, and many areas receiving water supply improvements also require improved onsite sanitation facilities, for homes not already equipped. As of 2011, approximately 87% of urban Cambodians have improved toilets.⁷ Data obtained through the socioeconomic survey for the coverage area shows 54.7% of households equipped with pour flush toilets. Though a relatively poor percentage, lack of sanitation should not be a constraining factor in advancing water supply coverage.

80. Functioning of septic systems can be a problem. Depending on local soil conditions, supernatants from septic systems installed for homes or commercial establishments may not percolate into the soil, and are routed to surface drains. Industrial and commercial wastewater discharges need more than simple removal from the living environment, requiring sufficient regulatory presence to insure that industries, hotels and markets install and consistently operate treatment systems. Improved drainage in areas newly served by water supply helps to alleviate some of the impact, but because these flows often concentrate partially treated effluents, the effect on a receiving stream can be injurious.

81. Impacts occur if drainage increases pollution load to receiving waters. In general, drainage systems suffer from a lack of investment in infrastructure, limited cooperation between government departments, clogging with solid waste and infilling/blockage by property owners. Drains receive urban run-off, solid waste and septic tank overflow, and

⁷ NIS at http://www.nis.gov.kh/download.php?file=nis/CSES/Data/CSES_Housing.xls

contain high BOD, a measure of oxygen demand. These impacts may be alleviated by routing flows through constructed wetlands upstream (often along the boundaries) of receiving streams prior to final discharge. Access/use of suitable low-lying state-owned land should be secured for temporary use, requiring engagement of the Provincial Department of Land Management (DLM) and the custodial authority over the state-owned land.⁸ The hydraulic features of the system should be based on an estimate of seasonal flows and biological features (plant types and density) incorporated. A maintenance budget needs to be allocated that will assure that the facility gets the minimum of attention required to function.

82. The cumulative effect of discharges from many small urban drains on receiving water quality can be severe over the long term, and available solutions are inadequate to deal with the greater problem. Water quality is likely to be degraded in any open water bodies in the project area due to drainage discharges originating from increased water supply.

F. Resilience to Climate Change Impacts

1. Framework

83. The quantities of water supplied “at source” and the extent of water supply distribution to a recipient population provides the base case for comparison with future conditions under which the subproject is implemented and climate change effects take place. The subproject either improves, or is neutral with respect to, climate change resilience. A further issue concerns the exacerbation of health impacts due to climate change in the absence of effective sanitation and drainage in urban and peri-urban communities. Finally, whether subproject infrastructure is vulnerable to weather conditions brought about by climate change may be considered.

2. Predicted Regional Climate Conditions due to Climate Change

84. As of December 2012⁹, downscaling of the general circulation models (GCMs) to determine regional climate conditions under global climate change had not been accomplished for Cambodia. Thus predictions related to the effects of climate change on hydrometeorological parameters in Cambodia are uncertain and generally qualitative. Extreme events at different times of the year, different years, and variable frequencies of both flooding and drought are anticipated, with main impacts on agriculture and public infrastructure, but the extent and seasonality of flooding or drought in any particular area are unknown. Long range effects on water supply, including Mekong River flows, are not known, but are insignificant given the total volume of flow and amount to be extracted.

3. Prioritization of Urban Water Supply under Climate Resilience Regimes

85. According to Cambodia’s National Adaptation Programme of Action (NAPA), water availability and accessibility, and water quality, are two of 14 ranking criteria to be applied to non-health projects aimed at improving resilience. Among agriculture and water resource projects, only one – “Safer Water Supply for Rural Communities” – deals specifically with water supply, and received a ranking in importance of 10 out of 14 points. Among coastal zone projects, one addresses water supply for communities located in coastal provinces (“Community and Household Water Supply in Coastal Provinces”),

⁸ The Fisheries Administration, for instance, is the custodial authority over seasonally submerged state-owned land in Cambodia.

⁹ This is reported under “POLICY BRIEF 4: Improving Hydro-Meteorological Information and Downscaling of Climate Predictions for Better Climate Change Adaptation Planning in Cambodia”, prepared by Hatfield Consultants for The Royal Government of Cambodia (RGC) through the Climate Change Department of the Ministry of Environment (CCD-MoE) under the project entitled “Preparation of a Strategic Pilot Program for Climate Resilience (PPCR) Project” – Phase I (November 2010 to January 2013).

which received a ranking of 12 out of 14 points. No projects identified through the NAPA participatory process are aimed at improving resilience of urban water supplies.

4. Subproject Interactions with Climate Change

86. The complete rehabilitation of the Stung Treng Water Supply System will result in benefits for the entire community in respect to the ordinary needs for obtaining clean drinking water as well as in respect to improved resilience to climate change impacts. Currently the community is vulnerable to failure of the piped water supply either from shortage of source quantities, old and failing conditions of the equipment and piping, poor water quality as produced by the existing treatment system, and inadequate distribution. Relocation of the intake for the system supply to the Mekong from the Sekong increases the availability of raw water, and its quality, many-fold. Outlying communes that currently do not have piped supply, and typically rely on water from shallow wells subject to depletion in the dry season, will be served under the new system improvements. The subproject also introduces more energy efficient operations through better pump selection, improvement of water treatment system efficiency, and an improved distribution system.

87. The recipient populations are benefited by the system improvements. Drought conditions brought on by climate change exacerbate problems related to water shortages among communities not served by centralized supply. In other words, inadequate or paucity of supply is made worse when long periods of drought exhaust storage in tanks, ponds and streams and replenishment comes infrequently and too late. Drought conditions are made worse as a result of climate change, either from the length of drought periods or from lack of intermittent rains of quantity or duration to relieve drought conditions. There is both an increase in the numbers of people to be served in Stung Treng and the existing service area will receive greatly improved service. The subproject is expected to affect some of some 46,000 beneficially due both to increase in at-source supply and distribution system extensions. The subproject has a beneficial impact on the community to alleviate drought brought on by climate change, and improves the resilience of the community in the face of drought.

88. Drainage conditions are worsened under climate change scenarios, whether stagnant and still water bodies during periods of drought that breed mosquitoes and harbor high numbers of enteric disease bacteria, or flooding conditions where drainage systems are overwhelmed and polluted water enters human living spaces. Well-built and durable sanitation and drainage appurtenances, drainage easements, clear, open flow channels, and downstream extensive systems for pollution abatement such as constructed wetlands provide the means to offset impacts from climate change and make communities more resilient. No other aspects of the subproject appear affected by climate change.

G. Existing Facilities Audit

89. Appendix I of the ADB SPS (2009) requires that, "when the project involves existing activities or facilities, relevant external experts will perform environmental audits to determine the existence of any areas where the project may cause or is causing environmental risks or impacts." The rapid environmental assessment checklist (Appendix 1) includes a section in which the existing facilities have been audited to identify the presence of waste, spent, out-of-spec and discarded water treatment chemicals, oils, cleaning fluids and solvents, as well as contaminated soils that have or have the potential for causing environmental impacts or risks. Waste materials that pose a hazard to human health or the environment have not been identified at the facility. The director of the water supply agency confirms the absence of any such materials within the water supply system buildings or on property under the control of the water supply agency. There is no need to prepare a corrective action plan to dispose of materials of this nature or remediate soils or structures for purposes of reducing environmental impact and risk.

H. Summary

90. Potential impacts have been identified as follows: there are no significant impacts arising from the planning phase. Project preparation should assure adequate funds for repair of road surfaces, driveways and other roadside features following installation of water transmission/distribution piping. These elements of work should be included as payment items in the bid price for construction contracts. Impacts during construction are mitigated through application of environmental guidelines that limit the extent of dust and air emissions, water quality impacts, and the degree to which access, egress and passage are afforded to the public and adjacent landholders during construction. Safety features for workers are described in the IEE. Impacts during operation are mitigated by maintaining the water treatment system and assuring a chlorine residual in the system.

91. Indirect, cumulative and induced impacts have been found to be insignificant with the exception of increased sanitation and drainage flows, which are mitigated through a follow-up sector loan. The project enhances climate change resilience among the communities served. An existing facilities audit did not reveal the existence of any areas where the project may cause or is causing environmental risks or impacts, hence there is no need for preparation of a corrective action plan.

V. ENVIRONMENTAL MANAGEMENT PLAN

A. Review of Impacts

92. Table 5 summarizes the impacts in the approximate order that they have been discussed in the previous section. The table also summarizes the required mitigation measures, institutional responsibilities for assuring the mitigation action is carried out and costs, which are in all cases included in previously identified budgets for design, construction and operation of the systems.

B. Institutional Arrangements

93. The Department of Potable Water Supply (DPWS) at central level under Ministry of Industry and Handicraft (MIH) is the executing agency and will establish the Project management Unit (PMU) to execute the Project. The PMU will assign responsibility for environmental aspects to a particular individual as staff PMU Safeguard Management Officer (PSMO) who is engaged full time with implementation of the project to oversee work related to monitoring.¹⁰ The Provincial Water Works (PWW) is the operator of the Stung Treng water supply system and implementation agency for the subproject. PWW will establish a Project Implementation Unit (PIU) to undertake construction of the Subproject in Stung Treng Province.

94. The PMU will engage Contractors for specific works, based on the subcontract packages considered most suitable for execution. Legal clauses regarding mitigation measures are required to be included in construction contract bidding documents and become part of contract agreements; a typical set of specifications are provided in Appendix 1. For the main construction contracts, the Contractor will be required to appoint a staff Construction Environmental Management Officer (CEMO) responsible for supervising implementation of mitigation measures during the execution of the contract. The contractor will be required to prepare a Construction Management Plan (CMP) to ensure construction, demolition and excavation that take place at building sites do not adversely affect health, safety, amenity, traffic or the environment in the surrounding area. The CEMO working with the Contractor's Site Manager is responsible for preparing this plan prior to the start of construction and receiving approval for the plan from the PMU before the start of construction. The CEMO will serve as a point of contact that is accountable for environmental aspects of the construction work. For smaller construction contracts or

¹⁰ While the PSMO is engaged fulltime with subproject execution, duties related to environmental management may constitute only a portion of his/her responsibilities.

subcontracts, the (sub-) contractor will still be held accountable for implementation of mitigation measures through a system of quality assurance supervised by the PMU¹¹.

95. The PMU has direct responsibility for monitoring the implementation of the mitigation measures. The PSMO will be assisted in tasks by the Environmental Specialists (ES), consultants¹² who are part of the Design and Supervision Consultant (DSC) and support all the subprojects undertaken through the loan. Work will commence with updating and finalizing the IEE and their respective environmental mitigation measures and monitoring plans, submitting the plans on behalf of MIH to the Ministry of Environment, incorporating legal clauses regarding mitigation measures into construction contract bidding documents, assisting the PSMO in monitoring the implementation of those measures during the progress of construction, and preparing the environmental sections of semi-annual reports to be provided to ADB. The ES also will provide training to PMU and PIU staff, focusing on ADB safeguard policies and procedures, and use of verification checklists for monitoring environmental safeguards during construction. Table 6 describes the functions of various agencies engaged in the project, and a diagram illustrating the institutional arrangement is provided in Figure 13.

96. A timeline for updating the IEE as well as for inclusion of the EMP and special conditions in contract and/or bidding documents is as follows:

- Project design proceeds over a period of 5 months (anticipated)
- Monitoring of water quality over first two months
- Concurrently, IEE is updated with new design data
- By end of month 2, expected that issues related to design are resolved
- IEE undergoes translation (2 weeks)
- IEE submitted to DOE by mid-month 3 of design period
- DOE has 30 days to review/approve IEE
- IEE approved by mid-month 4 of design period
- ADB review runs concurrently with DOE review
- Final approval from ADB and the Government obtained before detailed design finalized in time for inclusion in procurement package

97. The Ministry of Environment (MOE) and the provincial Departments of Environment (PDOEs) play a role in submittal, review, and approval of the IEE, and monitoring and reporting. This work takes place during the implementation phase. The ES will revise and update the IEE based on final designs, and the document should be translated into Khmer prior to submittal to MOE DEIA, which will engage in the review process the provincial PDOE where the subproject takes place. The PIU will also need to seek approval from the Ministry of Public Works and Transport Bridge Division for suspension of transmission piping to serve areas across the Mekong and Sesan Rivers. Only after the DEIA approves the EMP for the subproject can a contract be signed between the IA and the contractor for the works. Following that, implementation can proceed with construction mitigation measures mostly in the hands of the contractor, and the ES, PDOE, PIU and PSMO working together to perform monitoring and reporting. It will be the job of the PIU supported by the ES to compile quarterly reports, which then are compiled into semi-annual safeguard monitoring reports by the PMU and DSC, supported by the ES. A sample environmental monitoring reporting form is shown in Appendix 4. The PSMO and PMU Project Director will be responsible for submittal of reporting to ADB.

¹¹ Subcontractors hired by the general contractor, or minor contracts undertaken at the site are required to be managed under the provisions of the main contract and in conformance with the CMP.

¹² Both international and national ES will be engaged. It is recommended that the international ES be engaged for four months over the project duration, and the national ES be engaged fulltime, to provide support to the PSMOs for this and other subprojects.

Table 5: Potential Environmental Impacts and Mitigation Measures

Project Activity	Potential Negative Impact	Proposed Mitigation Measure	Institutional Responsibility	Cost Estimates
Design and Preconstruction				
Detailed Design and Preparation of Bid Documents	Hazardous road conditions, dust during/after construction.	Include unit cost for road repair as a bid item in the construction contract for water line installation.	DE, PMU	Design Office
Detailed Design and Preparation of Bid Documents	Fecal and other types of contamination contaminates water at the intake of the water supply	Restrict activities within 100 m of the intake, in particular excreta disposal from home or public latrines and septic tank systems.	PMU WSC	No cost
All aspects of site preparation ahead of construction	Personnel and public injury from UXO and mines	The Government will certify that the proposed water treatment plant area and roads within the expanded coverage area within the City of Stung Treng are free of mines and UXO. Alternatively the Government may elect to arrange for this to be done by an experienced independent UXO clearance specialist organization.	DE, PMU	Included in the government counterpart funds
Construction				
Provision of worker facilities	Inconvenience to communities due to presence of workers	Provide suitable housing, adequate supplies of potable water, and toilet and bathing facilities within the housing area. Onsite facilities for preparing food need to be provided, or food service contracted.	Contractor	Part of contract cost
Provision of worker facilities	Solid waste and sanitary discharges from worker camps.	Provide means for disposing of wastewater from toilets, baths and food preparation areas either through a septic tank and soakaway, or holding tank with removal by vacuum truck. Solid waste should be collected at waste bins and disposed of properly offsite.	Contractor	Part of contract cost
Site access	Accident or injury to public.	The public should be barred from the site and children of workers should not be allowed within the work area.	Contractor	Part of contract cost
Labor hiring	Unsafe working conditions and injury.	Basic safety and health plan in place for workers; personal protective gear; suitable training or experience in the work; emergency care available on call; contractor to maintain a record of accidents.	Contractor	Part of contract cost
Site work	Accidents, injury.	Workplace should be kept orderly to reduce accidents. Deep excavations in unstable soils need to be shored, and below grade construction brought to grade quickly, then excavations closed.	Contractor	Part of contract cost
Site work	Sediment runoff	Surface soils should be graded-to-drain and protected to reduce erosion and sediment runoff. Silt fences may be required in locations where there are nearby bodies of water that could be affected by sediment.	Contractor	Part of contract cost
Site work	Air pollution and noise.	Restrict use of heavy equipment and material receipts to daylight hours. Apply water to suppress dust where needed.	Contractor	Part of contract cost
Pipe laying.	Sediment runoff	Exercise caution to prevent erosion losses, close excavations rapidly and stabilize soils once the pipeline is in place.	Contractor	Part of contract cost
Pipe laying.	Damage to private property.	Compensate property damage under the Resettlement and Compensation Plan. Return land to the original condition on completion.	PMU	Part of Resettlement Plan cost
Pipe laying.	Congestion and blockage of access to homes, buildings, shops and roadways	Complete work on a segment according to a progressive sequence of activity. Provide access by bridging trenches.	Contractor	Part of contract cost

Project Activity	Potential Negative Impact	Proposed Mitigation Measure	Institutional Responsibility	Cost Estimates
Pipe laying.	Dust hazard and impediment to traffic flow.	Store bedding materials outside trafficked areas. Cover materials and/or suppress dust with water. Excess spoil from excavations will be minimal, but should be removed from site and either reused or disposed of appropriately with other construction wastes.	Contractor	Part of contract cost
Pipe laying.	Damage to buildings, walls and existing buried piping.	Avoid trenching in locations where damage might occur. If needed, provide shoring to assure no subsidence occurs.	Contractor	Part of contract cost
Pipe laying.	Accident and injury.	Excavations should be barricaded and marked. Workers should not be allowed to enter deep trenches unless they are properly shored.	Contractor	Part of contract cost
Pipe laying.	Traffic congestion and high dust levels.	Use tarpaulins to cover truck beds or avoid overfilling and spillage along roadways, plan routes to avoid congested areas and narrow roads, and schedule transportation to avoid peak traffic periods.	Contractor	Part of contract cost
Pipe laying.	Inconvenience to public	Plan construction to avoid repeated excavation in roads and easements	Contractor	Part of contract cost
Pipe laying.	Inconvenience to public	Provide movable sanitary facilities at the work site and maintain clean, free of odors and usable.	Contractor	Part of contract cost
Pipe laying/suspension of water supply service	Inconvenience and health risk.	Plan work to minimize duration of shutdown. Limit shutdown to less than four hours. Notify public in advance and advise to store water as necessary.	Contractor	Part of contract cost
Pipe laying.	Disturbance at schools, hospitals, tourism sites by noise, dust and impeded access	Increase work force to complete construction quickly in affected areas. Minimize dust / avoid obstruction of pedestrians and vehicles	Contractor	Part of contract cost
Pipe laying.	Land acquisition outside of public R.O.W.	Purchase land as described in Resettlement Framework	PMU	Part of resettlement and land acquisition cost
Pipeline commissioning.	Negative health impact.	Disinfect water mains, tanks and reservoirs by chlorination. Include a bid item for disinfection in piping installation contracts.		Part of contract cost
Operations				
Water system operations	Property damage, water quality impact	Operate and maintain facilities to treat filter backwash and sedimentation tank underflow. Remove solids and dispose of according to approved means.	DPWS/PWW	Part of operations cost
Water system operations	Negative health impact.	Chlorinate water supplies.	DPWS/PWW	Part of operations cost
Water system operations	Accident/Injury to workers	Provide capacity building for emergency response to chlorine gas leaks and spills; assure sufficient PPE and onsite emergency response equipment is included in the loan	DPWS/PWW, DE	Part of loan implementation
Water system operations	Negative health impact.	Detect and repair leaks and maintain sufficient pressure to prevent cross-contamination.	DPWS/PWW	Part of operations cost

Table 6: Roles and Responsibilities

Agency	Role
MIH—DPWS Project Management Unit (PMU)	Supervision and guidance; assist to appoint staff of PMU including Project Safeguard Management Officer (PSMO); recruit competent environmental specialists (ES) as part of the DSC to assist design team and PMU; submit IEE to Ministry of Environment (MOE) for approval; consolidate and submit semi-annual reports to ADB, ensure EMPs are satisfied in the design and construction of the subproject.
Provincial Water Works (PWW) PIU (Strung Treng)	Assist the ES to monitor mitigation measures and implement grievance mechanism, prepare and conduct public consultations, monitor subproject activities and prepare quarterly environmental reporting at the subproject level.
MPWT Bridge Division	Approval for suspension of piping from bridge structures across Mekong and Sesan Rivers
Design and Supervision Consultant (DSC) National Environmental Specialist (ES)	Assist the PMU to review, update and submit IEE for approval by MOE; incorporate EMP requirements into design, specifications and construction contract; co-ordinate with other government agencies regarding environmental issues; organize and implement public consultation and grievance redress mechanism; monitor activities of design engineer and construction contractors to assure mitigation measures are implemented; incorporate environmental reporting into semi-annual progress reports.
Construction contractors	Implement environmental requirements related to construction; incorporate environmental costs into bid estimate; prepare a Construction Management Plan (CMP); appoint the Construction Environmental Management Officer (CEMO); assure all environmental requirements are followed.
MOE DEIA and PDOE	Review IEE and provide comment and approval; PDOE assists in monitoring implementation of mitigation measures
DPWS/MIH Lab	Implement water quality monitoring of raw and treated water supplies during operations

C. Environmental Monitoring Plan

98. Environmental monitoring extends during the implementation of the loan and engages the previously identified groups. Table 7 identifies the monitoring to be undertaken in respect to the mitigation measures previously identified. The PIU and ES are responsible for the bulk of the monitoring being undertaken during the design and construction periods. During operations, the Provincial Water Works is responsible.

Figure 13: Organization for Environmental Management on Stung Treng Project

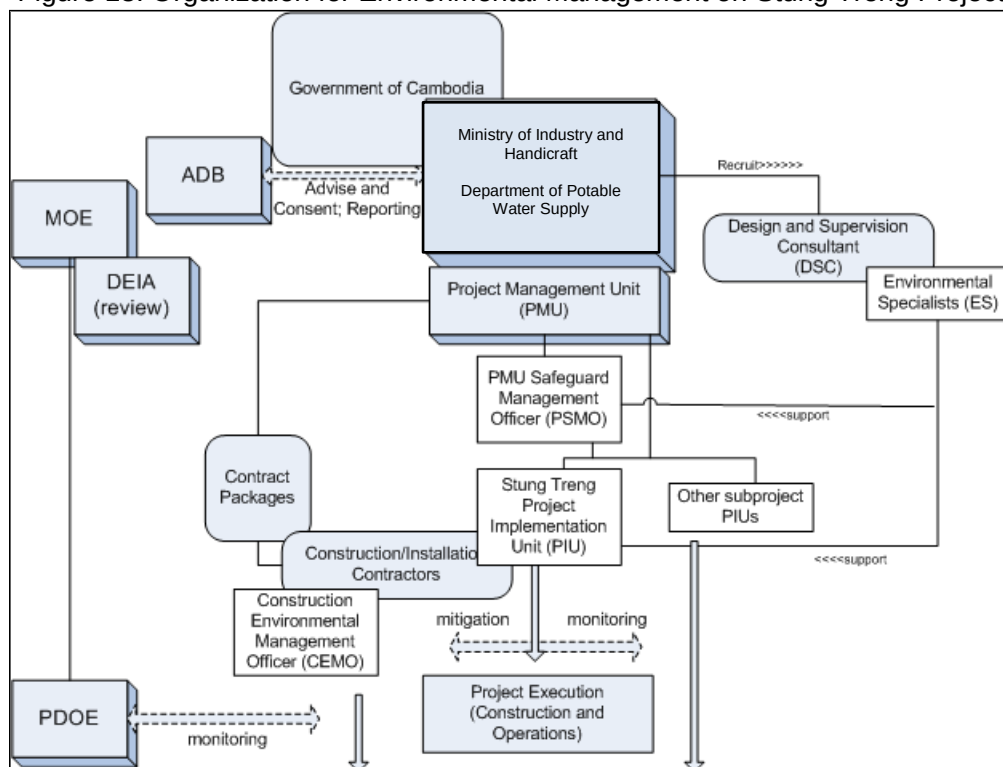


Table 7: Environmental Monitoring Plan

Mitigation Measure	Parameters to be Monitored	Location	Measurements	Monitoring Frequency	Responsibility for Monitoring	Cost to Monitor
Design and Preconstruction						
Include unit cost for road repair as a bid item in the construction contract for water line installation and for drainage pipe installation.	Components of Contract bid	Design Office; PMU	Review of Detailed Design Proposals.	At time of preparation	PSMO, ES, PDOE	No extra cost.
Contractor will obtain services of independent qualified agency to certify the proposed water treatment plant area and roads within the expanded coverage area within the City of Stung Treng are free of mines and UXO	Components of Contract bid	Design Office; PMU	Review of contractor bid documents and certification	Prior to site occupancy	PSMO, ES, PDOE	No extra cost.
Construction						
Provide suitable housing, adequate supplies of potable water, and toilet and bathing facilities within the housing area. Onsite facilities for preparing food need to be provided, or food service contracted.	Field Conditions	Labor Camps	Visual inspection	At start of contract; quarterly	PSMO, ES, PDOE	No extra cost.
Provide means for disposing of wastewater from toilets, baths and food preparation areas either through a septic tank and soakaway, or holding tank with removal by vacuum truck. Solid waste should be collected at waste bins and disposed of properly offsite.	Field Conditions	Labor Camps	Visual inspection	At start of contract; quarterly	PSMO, ES, PDOE	No extra cost.
The public should be barred from the site as well as from worker housing areas.		Site locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Basic safety and health plan in place for workers; personal protective gear; suitable training or experience in the work; emergency care available on call; contractor to maintain a record of accidents.	Worker Provisions	Contractor's field office	Review of records	At beginning and end of contract	PSMO, ES, PDOE	No extra cost.
Workplace should be kept orderly to reduce accidents. Deep excavations in unstable soils need to be shored, and below grade construction brought to grade quickly, then excavations closed.	Field Conditions	Site locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Surface soils should be graded-to-drain and protected to reduce erosion and sediment runoff. Silt fences may be required in locations where there are nearby bodies of water that could be affected by sediment.	Field Conditions	Site locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Restrict use of heavy equipment and material receipts to daylight hours. Apply water to suppress dust where needed.	Field Conditions	Site locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Exercise caution to prevent erosion losses, close excavations rapidly and stabilize soils once the pipeline is in place.	Field Conditions	Site locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Compensate property damage under the Resettlement and Compensation Plan. Return land to the original condition on completion.	Terms of Compensation Plan	Pipe laying locations	Review of compensation claims and awards	Monthly	PSMO, ES, PDOE	No extra cost.
Complete work on a segment according to a progressive sequence of activity. Provide access by bridging trenches.	Field Conditions	Pipe laying locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Store bedding materials outside trafficked areas. Cover materials and/or suppress dust with water. Remove excess.	Field Conditions	Pipe laying locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.

Mitigation Measure	Parameters to be Monitored	Location	Measurements	Monitoring Frequency	Responsibility for Monitoring	Cost to Monitor
Avoid trenching in locations where damage might occur. If needed, provide shoring to assure no subsidence occurs.	Field Conditions	Pipe laying locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Excavations should be barricaded and marked. Workers should not be allowed to enter trenches greater than waste deep unless they are properly shored.	Field Conditions	Pipe laying locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Use tarpaulins to cover truck beds or avoid overfilling and spillage along roadways, plan routes to avoid congested areas and narrow roads, and schedule transportation to avoid peak traffic periods.	Field Conditions	Roadways and haul routes	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Plan construction to avoid repeated excavation in roads and easements	Field Conditions	Pipe laying locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Provide movable sanitary facilities at the work site and maintain the site clean, free of odors and usable.	Field Conditions	Pipe laying locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Plan work to minimize duration of shutdown. Limit shutdown to less than four hours. Notify public in advance and advise to store water as necessary.	Community acceptance	Community	Visual inspection	Whenever shutdowns are needed	PSMO, ES, PDOE	No extra cost.
Increase work force to complete construction quickly in affected areas. Minimize dust / avoid obstruction of pedestrians and vehicles	Field Conditions	Pipe laying locations	Visual inspection	Weekly	PSMO, ES, PDOE	No extra cost.
Purchase land as described in Resettlement Framework	Terms of Compensation plan	PMU office	Review of compensation claims and awards	Monthly	PSMO, ES, PDOE	No extra cost.
Disinfect water mains, tanks and reservoirs by chlorination. Include a bid item for disinfection in piping installation contracts.	Terms of contract documents	PMU office	Review of bid documents and contractor performance	Draft contract stage; during performance	PSMO, ES, PDOE	No extra cost.
OPERATIONS						
Operate and maintain facilities to treat filter backwash and sedimentation tank underflow. Remove solids and dispose of according to approved means.	Effluent TSS	Water Treatment Plant	TSS in effluent	Quarterly	DPWS/PWW	\$200/yr
Chlorinate water supplies.	Chlorine residual	Treatment plant	Chlorine residual	Weekly	DPWS/PWW	\$600/yr
Detect and repair leaks and maintain sufficient pressure to prevent cross-contamination.	System Pressure	Distribution system	System pressure	Weekly	DPWS/PWW	None

D. Water Quality Monitoring

1. Types, Frequency and Timing

99. Immediately upon mobilizing the project during the detailed design and implementation, repeated samples of raw water should be analyzed for standard parameters: temperature, color, turbidity, pH, total dissolved solids and conductivity. At least 10 sets of data should be used to determine variability of the raw water source and be incorporated into the treatment system design.

100. Concerns about surface water quality impacts during construction will be met by observing site conditions. In any case, these are minor impacts, and no direct water quality monitoring of surface water is needed.

101. Recommended protocols for monitoring raw water quality used in production operations (the raw water source) and finished water quality are already in place by DPWS in which a number of parameters are monitored (Table 8). Treated water quality should be within the limits set by the DPWS/MIH. It is important to consistently monitor raw and finished water quality, produce consistent data outputs, and analyze data for the purpose of maintaining and improving operations.

102. Other operations monitoring may be required. For instance, some operators measure select parameters downstream of the sedimentation tank in order to track performance of flocculation and settling in response to adjustments in chemical addition rate. Sampling and analysis may be performed at greater or lesser frequencies than specified herein to adjust performance. Actual parameters may differ depending on the source of supply (ground or surface water). The monitoring proposed herein is part of the operating unit's protocols, and is supported by MIH's Water Quality Lab, hence there is no additional cost associated with the proposal.

Table 8: Drinking Water Quality Parameters and Frequency

<u>Parameter</u>	<u>Raw Water</u>	<u>Treated</u>	<u>Notes</u>
<u>Essential Items (Analyze Daily)</u>	✓		
-Color	✓	✓	
-Turbidity	✓	✓	
-pH	✓	✓	
-TDS	✓	✓	Or conductivity
-Residual Chlorine		✓	Multiple locations in pipeline
<u>Important Items (Analyze every 3 months)</u>			
-Taste		✓	
-Odor		✓	
-Mn	✓	✓	
-Zn	✓	✓	
-SO ₄	✓	✓	
-Cu	✓	✓	
-H ₂ S	✓	✓	
-Hardness	✓	✓	
-Al	✓	✓	
-Cl ⁻	✓	✓	
-Fe	✓	✓	
-NH ₃ -N	✓	✓	
-E. Coli	✓	✓	
-Total Coliform	✓	✓	
<u>Other possible analyses</u>			
-Alkalinity	✓	✓	Some ops measure daily
-Organic carbon content	✓	✓	Permanganate test (COD)

2. Sampling Locations

103. The location of raw water quality sampling is at or near the intake point. Treated water quality monitoring takes place at the end of the treatment plant. Monitoring chlorine residual is done at various locations in the distribution system.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Project Stakeholders

104. The primary stakeholders are the citizens of Stung Treng who will benefit from improved water supply. Among this group, outlying communities that have previously not been connected to community water supply see the greatest change in their circumstance, whereas others may experience improved service, including higher quality water.

105. The Provincial Water Works (PWW) is a key stakeholder that holds the interests of the community to be its primary mission. The subproject concept and design are driven by PWW perceived needs for rehabilitation of system elements within the constraints of the available budget, and the PPTA team consulted regularly with the PWW to achieve good alignment of the subproject elements and current system needs. Furthermore the IEE has been reviewed by DPWS and concurrence has been reached on the contents of the EMP.

B. General Awareness of Project

106. During field work on environmental and social components, people were told about the subproject in their area, and asked about conditions regarding water supply, sanitation and drainage. Individual informants provided valuable information on current access to water supply, their daily routines in obtaining water, seasonal conditions that affect availability, and requirements for household use. As part of the field work, individuals were informed about the proposed project and their responses noted. The social component combined focus group discussions with socioeconomic survey work, and conducted random sampling surveys; while the resettlement work included Inventory of Losses (IOL) surveys; environmental field work, conducted by two staffs at any given time, focused on local experience and perceptions of thematic issues like sanitation practice, water supply quantity and quality, and flooding.

C. Formal Public Consultation regarding Environmental and Social Issues

1. Meetings

107. A meeting was held in Stung Treng, combining resettlement and environmental components of project activity. Initial discussions were held with the DPWS director and staff to understand the proposed system components and operational constraints. Following that, a meeting was held at a temple a short distance from the center of the Town. About 37 persons attended the meeting representing key provincial agencies, commune leaders and ordinary citizens. The team obtained the support of the Department of Potable Water Supply in organizing the meeting and soliciting attendance from Sangkat leaders and other representative members of the community. The meeting was publicized in advance by word of mouth through commune/village and government leaders.

2. Information Dissemination

108. A general description of the project was prepared in Khmer language, using visual means to provide some detail about the project proposal. Hand drawn/lettered poster boards – and large scale prints of drawings – were used in the presentation. Environmental and social impacts identified by the project team were reviewed, as described in the IEE. Attendance lists were completed at the meeting and are included in Appendix 2.

3. Information Solicitation

109. The public in attendance was informed about the general purpose of the meeting: to ascertain the public's views on the project, suggestions for improvement, and concerns about environmental and social impact. Questions and comments were solicited, and ample time provided for attendees to react and respond. Responses were recorded on specially prepared forms, noting the name, age, sex and occupation of the respondent, and the nature of the response. These are provided in Appendix 2.

4. Respondent Issues

110. Responses were positive, in favor of the project. People expressed concern about flooding, which is a local problem at Stung Treng, and wanted to know which areas of the community would benefit from the project. Some raised the issue of levels of compensation for property damage, especially when private property was built in public right-of-way. No other specific issue of environmental concern was raised during the consultation. There was general all-round support and enthusiasm for the project.

5. Further Public Consultation

111. Further consultation should be held at the outset of procurement for the construction of civil works under the project. This is in order to notify the community that work will commence on the project, to review environmental issues of concern, and to inform the public of the grievance redress mechanism established under the project.

D. Disclosure

112. Details of the subproject were disclosed through a process of public consultation described above. Further to that, MIH shall provide the relevant environmental information for this subproject, including information from the IEE to affected people in a timely manner, in an accessible place, and in a form and language(s) understandable to them by providing a copy of the IEE in Khmer language at the PWW office for review by interested parties. In addition, ADB will post on its website the subproject IEE, updates prepared during the project implementation period, and environmental monitoring reports prepared during the implementation period.

VII. GRIEVANCE REDRESS MECHANISM

113. Grievances related to both environmental and resettlement issues are addressed through the Grievance Redress Mechanism (GRM). In order to ensure that complaints from all affected persons (APs) on any aspect of environment, land acquisition, compensation and resettlement are addressed in a timely and satisfactory manner, and that all possible avenues are available to APs to air their grievances, a well defined grievance redress mechanism will be established. All APs can send any questions to the implementing agency about their rights in relation with redress of environmental problems and entitlement under the resettlement plan. APs are not required to pay any fee in order to file a complaint at any level. The GRM has been explained in the public information booklet distributed to all APs, and is explained here in relation to complaints related to environmental impacts.

114. Stage 1 - Complaints from APs on any aspect of environmental impacts or the resettlement program shall first be lodged verbally or in written form to the commune leader. The commune leader along with the members of the provincial resettlement subcommittee working group (PRSC-WG) will meet to decide on a course of action within 15 days from the day it is lodged.

115. Stage 2 - If no understanding or amicable solution can be reached, or if no response from the commune chief is received by the AP within 15 days of registering the complaint, he/she can appeal directly to the PRSG-WG. APs will be heard in person by the vice chairman of the PRSC-WG and APs will be invited to produce documents which

support his/her claim. The complaint must be settled within 60 days of registering the original complaint. The PRSC-WG will provide a decision within 30 days of the registering of the appeal.

116. Stage 3 - If the AP is not satisfied with the decision of the PRSC-WG, or in the absence of any response, the AP can appeal to the Interministerial Resettlement Committee-Resettlement Department (IRC-RD). The IRC-RD has 30 days to provide a resolution of the problem from the day it is lodged.

117. Stage 4 - If the AP is still not satisfied with the decision of the IRC-RD on appeal, or in absence of any response from the IRC-RD within the stipulated time, the AP, as a last resort, may submit his/her case to court of law, whose judgment is final. APs may also ask for resolution from ADB's responsible project officer consistent with the provision of the ADB's accountability mechanism. They can file their complaint through the ADB resident mission in Phnom Penh for transmittal to the ADB headquarters in Manila.

118. At each stage the governing official is responsible for recording the minutes of meetings, maintaining files on all complaints, and for distributing copies of all decisions to the PMU and lower level bodies, including commune/village officials and affected parties and households.

VIII. FINDINGS AND RECOMMENDATION

A. Findings

119. The Initial Environmental Examination for this subproject provides a review of the proposed infrastructure and its interactions with the surrounding environment, and analyzes potential impacts due to design, construction and operations, with the objective of determining the timing, scale and intensity of impacts. The review and analysis shows that significant negative impacts are unlikely to occur. Because water supply is an important infrastructure improvement that runs concurrently with – and are essential for – economic development, the main impact is expected to be beneficial. Furthermore, good engineering practice in the design, installation and operations of water supply systems mitigate substantially the environmental impacts noted herein.

120. There are ways in which the environmental performance of the project can be improved, and the IEE provides recommendations in regard to these opportunities. The majority of negative impacts that have been identified are associated with construction and installation of the proposed works. These are short term and localized, hence are impacts of minor significance that are minimized by application of safeguards that are common in the construction industry. Environmental criteria for construction are recommended to mitigate construction impacts, and are included as a separate appendix.

121. Negative environmental impacts occurring during the operation of the project are few. These are mainly concerned with maintaining water supply systems so that safe water, free of pathogens, can be delivered. Recommendations are made regarding chlorination and prevention of cross-contamination in the distribution system, to be carried out by the Department of Potable Water Supply. Monitoring treated water quality and chlorine residual in the distribution lines are necessary means for assuring safe supply, and are already routine activities by government water supply agencies.

122. Public consultation has been conducted to make clear to the directly affected communities the potential social and environmental impacts as identified by the environmental and social reviews. A Public consultation was held in Stung Treng to review the subproject. The public consultation is documented in the subproject IEE. No significant issues were raised during the public consultation that have not been addressed in the IEE, nor were there issues that pose a significant constraint on implementation of the proposed subproject. A proposal has been described for continuing the process of public

consultation during construction that includes mechanisms for disclosure and for redress of grievances that arise during the construction phase.

B. Recommendation

123. Environmental safeguards involve enhancing performance of the water treatment system, mitigation of construction impacts by means of environmental requirements placed on the construction contractor, and operations and maintenance of the completed system to guarantee high quality of potable water. Sanitation and drainage have been addressed in terms of indirect and cumulative impacts.

124. Mitigation measures to be undertaken during construction cover hiring of workers, provision of facilities for worker housing and sustenance, site work and pipe laying, temporary suspension of water supply and pipeline commissioning. Recommendations are aimed at maintaining access to residences and businesses, reducing dust, noise pollution and congestion at the site and along roadways and haul routes, provision of alternative services for water supply when the system needs to be shut down, disinfecting completed distribution mains prior to commissioning, provisions for worker housing, sanitation and waste management, and worker safety and health.

125. Mitigation measures for implementation during operations include chlorination of water supplies, periodic testing to assure good bacteriological quality, and maintenance of system pressures to prevent cross-contamination in distribution systems.

IX. CONCLUSIONS

126. The environmental impacts of the proposed improvements in water supply infrastructure for Stung Treng have been assessed by the Initial Environmental Examination reported in this document, conducted according to ADB guidelines. Issues related to involuntary resettlement were assessed by a parallel process of resettlement planning and will be compensated by measures set out in detail in the Resettlement Framework for the project.

127. The overall conclusion of both processes is that providing the mitigation, compensation and enhancement measures are implemented in full, there should be no significant negative environmental impact as a result of location, planning, design, construction and operation of the project. There are benefits stemming from recommended mitigation and enhancement measures, and major improvements in quality of life and individual and public health once the project is in operation.

128. Further work on the IEE will be required prior to implementation to update the mitigation proposals and identify any associated costs, to be performed by the Environmental Specialist working with the Design Supervision Consultant. There is no additional environmental assessment work required at this stage to comply with ADB policy or national law.

Appendix 1: Rapid Environmental Assessment (REA) Checklist

Country/Project Title:	Cambodia Urban Water Supply Project (Stung Treng)
Sector Division:	Urban Development and Water

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area...			
▪ Densely populated?		✓	
▪ Heavy with development activities?		✓	
▪ Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site		✓	
• Protected Area		✓	
• Wetland	✓		Adjacent bodies of water not affected by the subproject.
• Mangrove		✓	
• Estuarine		✓	
• Buffer zone of protected area		✓	
• Special area for protecting biodiversity		✓	
• Bay		✓	
• Unexploded Ordinance (UXO)	✓		UXO and mines are reported to be potentially present in some areas of the project. The Government will undertake any necessary UXO investigations and clearance and provide certification that the proposed water treatment plant area and roads within the expanded coverage area within the City of Stung Treng are free of UXO and mine hazards prior to commencement of the work. Alternatively, various independent mine clearance groups in Cambodia such as the Cambodia Mine Action Committee (CMAC) and Halo Trust can provide certification based on surveys and prior information to determine the presence of UXO and mines in a project area, as well as demining if necessary.
B. Potential Environmental Impacts Will the Project cause...			

Screening Questions	Yes	No	Remarks
▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?		✓	
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		✓	
▪ hazard of land subsidence caused by excessive ground water pumping?		✓	
▪ social conflicts arising from displacement of communities ?		✓	
▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		✓	
▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?	✓		Water is treated for removal of standard pollutants
▪ delivery of unsafe water to distribution system?		✓	
▪ inadequate protection of intake works or wells, leading to pollution of water supply?		✓	
▪ over pumping of ground water, leading to salinization and ground subsidence?		✓	
▪ excessive algal growth in storage reservoir?		✓	
▪ increase in production of sewage beyond capabilities of community facilities?		✓	
▪ inadequate disposal of sludge from water treatment plants?		✓	
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		✓	
▪ impairments associated with transmission lines and access roads?		✓	
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		✓	
▪ health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?	✓		Capacity building plan for handling chlorine; prior experience of workers (existing system has chlorine gas delivery system)
▪ dislocation or involuntary resettlement of people?		✓	
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		✓	
▪ noise and dust from construction activities?	✓		Moderate effects; mitigated through standard means
▪ increased road traffic due to interference of construction activities?		✓	
▪ continuing soil erosion/silt runoff from construction operations?	✓		Moderate effects; mitigated through standard means

Screening Questions	Yes	No	Remarks
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		✓	
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		✓	
▪ accidental leakage of chlorine gas?	✓		Capacity building in safe handling of chlorine gas provided under the project
▪ excessive abstraction of water affecting downstream water users?		✓	
▪ competing uses of water?		✓	
▪ increased sewage flow due to increased water supply		✓	
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant		✓	
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	
▪ social conflicts if workers from other regions or countries are hired?		✓	
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		✓	
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		✓	

Preliminary Climate Risk Screening Screening Questions		Score	Remarks ¹³
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	Design to consider sustainable river levels
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Medium

¹³ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

Appendix 2: Environmental Specifications for Contract Tender Documents

General

1. The contractor will post a public notice regarding the nature, extent and cost of the project at the start of the construction zone; and post notices announcing the grievance redress mechanism in local government offices and in strategic places of the subproject's area of influence.

Worker Provisions

2. GOC criteria for minimum age, wage and living provisions, benefits, hours of work, overtime arrangements and overtime compensation, and leave for illness, maternity, vacation or holiday should be met for all workers. The Contractor will conform to national law in relation to hiring and employment; and will comply with the principle of equal opportunity, fair treatment, and nondiscrimination with respect to the employment relationship; except that hiring of project-affected persons, residents of project-affected administrative units and disadvantaged groups is encouraged.
3. The contractor shall implement a safety and accident prevention program involving provision, training and use of safety equipment; minimum skills qualifications for operators and drivers; and record keeping related to accidents.
4. The Contractor will provide Personal Protective Equipment (PPE) to workers that offer adequate protection to the worker without incurring unnecessary inconvenience in its use¹⁴. Proper maintenance of PPE, including cleaning when dirty and replacement when damaged or worn out; and proper use of PPE should be part of training programs, as appropriate.
5. The contractor will maintain first aid kits onsite along with instructions for use, and personnel trained in basic first aid emergency response measures; and emergency care should be available on call.
6. Laborers and others resident at the site will be provided with lodging in a camp setting, potable water supply, food service facilities, adequate means for maintaining personal hygiene and solid/liquid waste disposal, and onsite facilities for preparing food, or food service contracted.
7. The contractor will provide means for disposing of wastewater from toilets, baths and food preparation areas either through a septic tank and soakaway, or holding tank with removal by vacuum truck. Solid waste should be collected at waste bins and disposed of properly offsite.
8. The public should be barred from the site as well as from worker housing areas.
9. HIV/AIDS awareness should be incorporated into the contractor's policy and outreach toward workers.

¹⁴ Depending on the application PPE may include safety glasses with or without side-shields, and protective shades; plastic helmets with top and side impact protection; hearing protectors (ear plugs or ear muffs); safety shoes and boots for protection against moving & falling objects, liquids and chemicals; gloves made of rubber or synthetic materials; facemasks with appropriate filters for dust removal and air purification; single or multi-gas personal monitors; portable or supplied air; on-site rescue equipment, and insulating clothing, body suits and aprons of appropriate materials.

Use of Land for Construction Purposes

10. The contractor will obtain approval from landowners for temporary use of land for labor camps and construction yards. Local authorities will be consulted on locations, which will in no case be close to sensitive receptors such as hospitals, schools and residential communities.
11. The contractor will not encroach upon vacant land or cause damage to adjacent properties. The Contractor will execute a plan for preventing firewood gathering in the project area and prohibit among workers possession of instruments or poisonous substances for killing or capturing fish or wildlife.
12. The Government will provided certification that the proposed water treatment plant area and roads within the expanded coverage area within the City of Stung Treng are free of UXO and mine hazards prior to commencement of the work. Alternatively, various independent mine clearance groups in Cambodia such as the Cambodia Mine Action Committee (CMAC) and Halo Trust provide surveys to determine the presence of unexploded ordinance (UXO) and mines in a project area, as well as demining if necessary.
13. Cutting trees is prohibited except inside the construction zone. Trees to be removed must be specified in the Project plans and specifications.
14. No fuel, oil, or parts cleaning fluids shall be spilled, wasted or disposed of at the project site. Secondary containment (earth or concrete berm) at least equal to the capacity of the fuel storage tank shall be provided at fueling stations.
15. After completion of occupancy, all affected areas within the general project boundary shall be graded to their original elevation that allows positive drainage. Machinery, equipment, structures, contaminated earth, plant matter and waste or unused materials shall be removed and disposed of properly.

Conduct of Work

16. The workplace should be kept orderly to reduce accidents. Deep excavations in unstable soils need to be shored, and below grade construction brought to grade quickly, then excavations closed. The contractor will:
 - a. Restrict use of heavy equipment and material receipts to daylight hours. Apply water to suppress dust where needed.
 - b. Exercise caution to prevent erosion losses, close excavations rapidly and stabilize soils once the pipeline is in place.
 - c. Compensate property damage under the Resettlement and Compensation Plan. Return land to the original condition on completion.
 - d. Complete work on a segment according to a progressive sequence of activity. Provide access by bridging trenches.
 - e. Store bedding materials outside trafficked areas. Cover materials and/or suppress dust with water. Remove excess.
 - f. Avoid stockpiling materials, equipment and supplies at the site.

- g. Avoid trenching in locations where damage might occur. If needed, provide shoring to assure no subsidence occurs.
- h. Excavations should be barricaded and marked. Workers should not be allowed to enter trenches greater than waste deep unless they are properly shored.
- i. Use tarpaulins to cover truck beds or avoid overfilling and spillage along roadways, plan routes to avoid congested areas and narrow roads, and schedule transportation to avoid peak traffic periods.
- j. Plan construction to avoid repeated excavation in roads and easements.
- k. Provide movable sanitary facilities at the work site and maintain the site clean, free of odors and usable.
- l. Plan work to minimize duration of shutdown. Limit shutdown to less than four hours. Notify public in advance and advise to store water as necessary.
- m. Increase work force to complete construction quickly in affected areas. Minimize dust / avoid obstruction of pedestrians and vehicles

Sediment Controls

- 17. Areas to be cleared and excavated are limited to areas where construction will take place. Areas will be protected from flowing water including sheet runoff. The contractor will limit sediment loss from exposed surfaces. Existing drainage patterns should be maintained during construction.
- 18. Discharge of wastewater into water bodies is prohibited as is the discharge of wash water from concrete trucks to waterways. . Land clearing activity will be suspended during rains to limit sediment loss.

Community Values

- 19. Vehicles transporting materials for construction will be covered when traveling through community areas or along roadways in use by the public. Vehicles will operate within the legal speed limits in populated areas. The operation of moving equipment in locations accessible to the public will be done in a manner so as to prevent the occurrence of incidents and accidents.
- 20. The Contractor should use available means to prevent accidents by emphasizing safety aspects among drivers; assuring sufficient driving skills and requiring licensing of drivers; adopting limits for trip duration and arranging driver rosters to avoid overtiredness; avoiding dangerous routes and times of day to reduce the risk of accidents; use of speed control devices (governors) on trucks, and remote monitoring of driver actions.
- 21. The contractor is responsible for regular spraying of roadway surfaces in use as haul routes and of sites under construction where these locations are accessed by the public. The contractor will remove excess debris during construction and after completion of the item of work.

22. The contractor will locate batch mix plants at sufficient distance from populated areas, houses, schools and hospitals so as to reduce air pollution and noise.
23. The Contractor will post flagmen at intersections of transit paths for construction vehicles and local traffic, and along traffic lanes where work is in progress. Traffic detours will be clearly marked.
24. The contractor will provide a path for transit of pedestrians and vehicular traffic through the construction area; and barricade open excavations to prevent injury to the public.
25. The contractor will provide temporary access to affected properties and reinstate permanent access on completion of work; minimize the area under construction at any one time and the duration of works at any one location; and minimize impacts on infrastructure, access and services.
26. The contractor will install signs and lighting, where there is nighttime traffic, in the vicinity of works on public roads, and restrict access to the construction site to the public.

Site Conditions and Haul Routes

27. At the start of construction, the contractor will provide a Construction Management Plan for development of the construction zone, worker camps, equipment yards, and haul roads.
28. Haul routes will minimize interference with ongoing activity in the area. Routes shall be approved by the PMU. Haul roads and transport/equipment routes shall be kept within the construction zone, unless authorized by the PMU.
29. Selection of borrow pits, quarry sites and haul routes shall minimize noise and air pollution in the site vicinity, visual impacts in inhabited areas, impacts on land use, air and noise emissions along haul routes, and congestion in populated areas.

Disinfection of Pipes, Tanks and Equipment

30. The Contractor will disinfect water mains, tanks and reservoirs by chlorination and include a bid item for disinfection in piping installation contracts.

Archeological and Cultural Relics

31. The Contractor will develop detailed guidelines for conducting recovery archaeology during construction, obtain prior approval of the procedures to be used, and provide training on the guidelines to relevant members of the construction crew. In the event of a chance find of any archeological relic being unearthed during excavation of the pipeline trenches, the site archaeologist shall conduct a series of actions inclusive of but not limited to:
 - a. Call a halt to the construction work at that location and immediately make a declaration to the local police, who shall transmit the information to the Governor of the province or a delegated representative. The Governor or

representative shall take measures necessary to ensure the protection of the objects and the site.

- b. Temporarily suspend the work, take necessary safeguard measures, and confer with the competent authority to decide on permanent measures to be taken concerning the discovery(ies).
- c. Assure that moveable cultural property found by chance, if removed from burial, is properly secured from theft and remains in the possession of the competent authority.

Appendix 3: Public Consultation at Stung Treng

ADB TA 8125-CAM Cambodia Urban Water Supply Project Environmental and Social Public Consultation Response Form

Province: Steung Treng	District: Steung Treng Town	Commune: Steung Treng
Date: 08/10/09	Time: 8:30 – 10:55 am	Attendance (no.): 37 (12 female)
Statements and Inquiries Provided by Attendees:		
No.1 Name: Ke Song	Sex: Female Age: <u>70</u>	Occupation: villager(TrapeangPring)
Statement or Inquiry: does the project consider on the environmental impacts? Because waste water and pig dung always drains in to her house (during flood).		
Response if any:		
No.2 Name: Sem Savy	Sex: Male Age: <u>44</u>	Occupation: Spean Thmor village
Statement or Inquiry: He raised that the project is very useful for local communities. They also expected that this project can provide safe water and avoid water flood from waste water thus they will avoid or reduce getting sick. (all participants support his idea).		
Response if any:		
No.3 Name: Ok Heng	Sex: Male Age: <u>64</u>	Occupation: villager (Kandal)
Statement or Inquiry: does project able to supply water in the whole Steung Teng town or province?		
Response if any:		
No.4 Name: Kong Kheng	Sex: Male Age: <u>50</u>	Occupation: villager (Bachong)
Statement or Inquiry: Could the water supply from this proposed project able to drink water direct from water pipe?		
Response if any:		
No.5 Name: Duch Chanthy	Sex: Female Age: <u>75</u>	Occupation: villager (Prek village)
Statement or Inquiry: does every one (including poor people) able to access this water supply?		
Response if any:		
No.6 Name: Chan Bourkham	Sex: Male Age: <u>50</u>	Occupation: villager chief (Thmor Leat)
Statement or Inquiry: How about the fee of water supply, does it cheaper or more expensive?		
Response if any:		

No.7 Name: Sou Ham	Sex: Male Age: <u>76</u>	Occupation: villager chief
Statement or Inquiry: after this new water constructed factory, how many hours per day will be able to operate? (for example, only 12 hours per day in the present)		
Response if any:		
No.8 Name: In Kimrong	Sex: Female Age: <u>57</u>	Occupation: villager (Kandal)
Statement or Inquiry: will this proposed project install a new water pipe system?		
Response if any:		
No.9 Name: Soy Heng	Sex: Male Age: <u>52</u>	Occupation: villager chief (Reacheanokol)
Statement or Inquiry: how many household does this proposed project plan to supply for?		
Response if any:		
No.10 Name: Gnem Sophy	Sex: Female Age: <u>51</u>	Occupation: villager (Sre Por)
Statement or Inquiry: Are there any compensate on affected properties?		
Response if any:		

Note:

In October 08, 2009 the environmental consultative meeting was conducted in Steung Treng Town. Thirty-seven (37) participants including villager and villager chief from Steung Treng, Preah Bat and Sreah Reusey communes and also representative from Dep. of Environment and Dep. of Public Works and Transportation attended this consultative meeting. The meeting was going well and very friendly to talk.

Presentation Frames:

Sheet 1:

Construction Impacts:

Construction impacts during

- Construction of facilities
- Hiring of workers
- Transport of construction materials

Impacts affect

- workers
- surrounding community
- environmental resources (air and water)

Safeguards

- Community
- Workers
- Environmental resources (air and water)

Sheet 2:

To protect the community:

- Compensate damage.
- Complete work and repair roads quickly.
- Provide access for homes and shops.
- Minimize dust and obstruction of pedestrians and vehicles.
- Provide sanitary facilities.
- Disinfect completed water mains.

Sheet 3:

To provide for workers health and safety:

- Worker housing, water, toilet and bathing facilities
- Disposal of wastewater and solid waste
- Safety and health plan for workers
- Workplace kept orderly to reduce accidents.

To protect air and water:

- Reduce erosion and sediment runoff.
- Restrict noisy activities to daylight hours.
- Apply water along roadways to suppress dust.

Sheet 4:

OPERATIONS IMPACTS

Operations impacts affect community health and water quality.

- Limit waste from treatment operation.
- Chlorinate water supplies.
- Maintain system pressure to prevent cross-contamination.
- Dispose of septic tank sludge in controlled location

Attendant List:

Attendant List of Environmental Public Consultation

Province: ..Stung Treang...

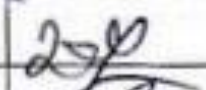
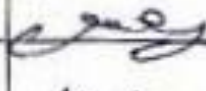
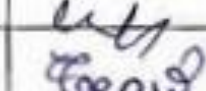
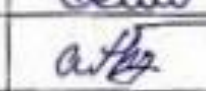
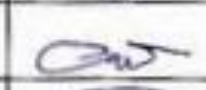
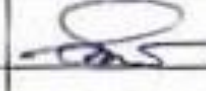
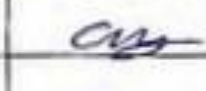
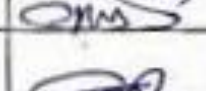
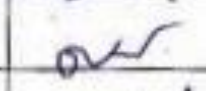
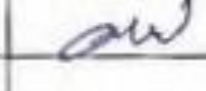
Date: ...June 4, 2013.....

No.	Name	Sex	Age	Village/Office	Signature/thumb
1	វ៉ាន់ ឈុន	♂	63	ស្រុកស្រែចម្ការ	[Signature]
2	ស្រី ឈុន	♀	38	ស្រុកស្រែចម្ការ	[Signature]
3	ស្រី ឈុន	♀	52	ស្រុកស្រែចម្ការ	[Signature]
4	ស្រី ឈុន	♀	31	ស្រុកស្រែចម្ការ	[Signature]
5	ស្រី ឈុន	♀	61	ស្រុកស្រែចម្ការ	[Signature]
6	ស្រី ឈុន	♀	60	ស្រុកស្រែចម្ការ	[Signature]
7	ស្រី ឈុន	♀	52	ស្រុកស្រែចម្ការ	[Signature]
8	ស្រី ឈុន	♀	57	ស្រុកស្រែចម្ការ	[Signature]
9	ស្រី ឈុន	♀	77	ស្រុកស្រែចម្ការ	[Signature]
10	ស្រី ឈុន	♀	63	ស្រុកស្រែចម្ការ	[Signature]
11	ស្រី ឈុន	♀	33	ស្រុកស្រែចម្ការ	[Signature]
12	ស្រី ឈុន	♀	56	ស្រុកស្រែចម្ការ	[Signature]
13	ស្រី ឈុន	♀	60	ស្រុកស្រែចម្ការ	[Signature]
14	ស្រី ឈុន	♀	64	ស្រុកស្រែចម្ការ	[Signature]
15	ស្រី ឈុន	♀	65	ស្រុកស្រែចម្ការ	[Signature]
16	ស្រី ឈុន	♀	59	ស្រុកស្រែចម្ការ	[Signature]
17	ស្រី ឈុន	♀	60	ស្រុកស្រែចម្ការ	[Signature]
18	ស្រី ឈុន	♀	46	ស្រុកស្រែចម្ការ	[Signature]
19	ស្រី ឈុន	♀	47	ស្រុកស្រែចម្ការ	[Signature]
20	ស្រី ឈុន	♀	52	ស្រុកស្រែចម្ការ	[Signature]

Attendant List of Environmental Public Consultation

Province:

Date:

No.	Name	Sex	Age	Village/Office	Signature/thumb
21	ಶ್ರೀಮ. ಭವಾನಿ	ಉ	33	ಅರಸೀಕೆರೆ	
22	ಎಸ್. ಕಾಜಿ	ಉ	38	ಕಾವೇರಿ	
23	ಎಸ್. ವೆಂಕಟೇಶ್	ಉ	40	ಕಾವೇರಿ	
24	ಎ. ಎಸ್. ಶಾಸ್ತ್ರಿ	ಉ	30	ಅರಸೀಕೆರೆ	
25	ಎಸ್. ಎಸ್. ಶಾಸ್ತ್ರಿ	ಉ	20	ಅರಸೀಕೆರೆ	
27	ಶ್ರೀಮ. ಶಾಸ್ತ್ರಿ	ಉ	61	ಹಾಸನಕಲ್ಲು	
28	ಶ್ರೀಮ. ಶಾಸ್ತ್ರಿ	ಉ	23	ಹಾಸನಕಲ್ಲು	
29	ಕಾವೇರಿ ಶಾಸ್ತ್ರಿ	ಉ	57	ಕಾವೇರಿ	
30	ಎಸ್. ಶಾಸ್ತ್ರಿ	ಉ	57	ಕಾವೇರಿ	
31	ಶ್ರೀಮ. ಶಾಸ್ತ್ರಿ	ಉ	48	ಕಾವೇರಿ	
32	ಶ್ರೀಮ. ಶಾಸ್ತ್ರಿ	ಉ	45	ಕಾವೇರಿ	
33	ಶ್ರೀಮ. ಶಾಸ್ತ್ರಿ	ಉ	54	ಕಾವೇರಿ	
34	ಶ್ರೀಮ. ಶಾಸ್ತ್ರಿ	ಉ	56	ಕಾವೇರಿ	
35	ಶ್ರೀಮ. ಶಾಸ್ತ್ರಿ	ಉ	53	ಕಾವೇರಿ	
36	ಶ್ರೀಮ. ಶಾಸ್ತ್ರಿ	ಉ	21	ಕಾವೇರಿ	
37	ಶ್ರೀಮ. ಶಾಸ್ತ್ರಿ	ಉ	18	ಕಾವೇರಿ	
38	ಶ್ರೀಮ. ಶಾಸ್ತ್ರಿ	ಉ	48	ಕಾವೇರಿ	

Photos of Consultation Meeting:



Appendix 4: Sample Environmental Monitoring Reporting Form

TEMPLATE/FORMAT

Safeguard Monitoring Report

Summary:

(to be included as part of the *main Report*)

- **Summary of EMP/RP Implementation**
- **Description of monitoring activities** carried out (e.g. field visits, survey questionnaire, public consultation meetings, focus group discussions, etc)
- **Key issues**, any **corrective actions** already taken, and any **grievances**
- Recommendations

Safeguards Monitoring Report

(to be included in the annex/appendix of the *main Report*)

1. Introduction and Project Overview

Project Number and Title:		
Safeguards Category	Environment	
	Indigenous Peoples	
	Involuntary Resettlement	
Reporting period:		
Last report date:		
Key subproject activities since last report:	This section can include, among others, the following: • Activities of Proponent • Progress of Work (% physical completion) • Changes of Surrounding Environment • Status of Permits / Consents	
Report prepared by:		

2. Environmental Performance Monitoring

a. Summary of Compliance with EMAP Requirements (Environmental Performance)

EMAP Requirements	Compliance Status (Yes, No, Partial)	Comment or Reasons for Non-Compliance	Issues for Further Action
Use environmental impact as main heading and EMAP as listing (see example below)	Use EMoP list as basis for rating/evaluating compliance (see example below)		
Rise of employment opportunities: • Job openings of the project should give priority to local communities. • Recruitment of local laborers should be stipulated in the	• Field inspections and interviews with communities - DONE • Note each complaint case in the field – 3 COMPLAINTS RECEIVED		

contract for construction	Set up grievance centre and report as part of monitoring action plan – NOT DONE		

b. Issues for Further Action

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
List of EMoP measures or activities not completed (last column of previous table)			
New Issues from This Report			

c. Other activities

- Other issues not covered by EMAP/EMoP
- Environmental monitoring as required by GOI (e.g., air quality, water sampling)

3. Involuntary Resettlement Performance Monitoring

a. Summary of Compliance with RP Requirements

RP Requirements	Compliance status Yes/No/Partial	Comment or Reasons for Compliance, Partial Compliance/Non-Compliance	Issues for Further Action ¹⁵
Establishment of personnel in PMU/PIU			
Public consultation and socialization process		Provide information on: - Public consultation, participation activities carried out - Inclusive dates of these activities To be elaborated on in Item 5	

¹⁵ To be elaborated further in table 3.b (Issues for Further Action)

Land area to be acquired is identified and finalised			
Land acquisition completed			
Establishment of Resettlement Site(s)		Please state: • Number of AHs to be relocated as per agreed RP • Number of AHs already relocated • Number of houses built • Status of installation of community facilities to be provided as per agreed RP	
Compensation payments for affected assets is completed		Please state: • Total Number of Eligible AHs and APs (as per agreed RP) • Number of AHs and APs compensated as of this monitoring period • Total Budget allocation as per agreed RP • Total budget disbursed to AHs as of this monitoring period	
Transport assistance for relocating affected households		As above	
Additional assistance to vulnerable affected household		Please state: • Total Number of vulnerable AHs and APs (as per agreed RP) • Agreed forms of assistance as per RP • Number of AHs and APs assisted as of this monitoring period	
Income Restoration Program		Please state progress per income restoration feature/activity and actual period of implementation	
Temporary impacts have been addressed (affected properties restored to at least pre-project conditions)		Please state: • Total Number of AHs affected by temporary impacts as per agreed RP • Actual Number of AHs and total area affected by temporary impacts (if this differs from the projected number, such as in cases of unforeseen project impacts) • Status of restoring affected property	
Capacity building activities			

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b. Issues for Further Action

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
List of RP activities not completed (last column of previous table)			
New Issues from This Report			

4. Occupational, Health and Safety (OHS) Performance Monitoring

a. OHS for worker

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

b. Public Safety

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

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5. Information Disclosure and Socialization including Capability Building

- Field Visits (sites visited, dates, persons met)
- Public Consultations and meetings (Date; time; location; agenda; number of participants disaggregated by sex and ethnic group, not including project staff; Issues raised by participants and how these were addressed by the project team)
- Training (Nature of training, number of participants disaggregated by gender and ethnicity, date, location, etc.)
- Press/Media Releases
- Material development/production (e.g., brochure, leaflet, posters)

6. Grievance Redress Mechanism

Summary:

- Number of new grievances, if any, since last monitoring period: _____
- Number of grievances resolved: _____
- Number of outstanding grievances: _____

Type of Grievance	Details (Date, person, address, contact details, etc.)	Required Action, Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

7. Conclusion

- Important results from the implementation of EMAP/EMoP and RP monitoring
- Recommendations to improve EMAP/EMoP and RP management, implementation, and monitoring

8. Attachments

- Consents / permits

- Monitoring data (water quality, air quality, etc.)
- Photographs
- Maps