Initial Environmental and Social Examination Report

October 2016

CAM: Cambodia Solar Power Project

Prepared by Sunseap International and SchneiTec Co. Ltd for the Asian Development Bank.

Table of Content

CURRENCY EQUIVALENTS
(as of 26 October 2016)

Currency unit	–	Riel (KHR)
KHR 1.00	=	$0.00024
$1.00	=	KHR 4,095.67

ABBREVIATIONS

ADB	–	Asian Development Bank
EDC	–	Electricité du Cambodge
D&D	–	Decentralization and De-concentration
IESE	–	Initial Environmental and Social Examination
ILO	–	International Labor Organization
IUCN	–	International Union for Conservation of Nature
MARPOL	–	Marine Pollution
NBSAP	–	National Biodiversity Strategy and Action Plan
NCDD	–	National Committee for Sub-National Democratic Development
NESAP	–	National Environment Strategy and Action Plan
NP-SNDD	–	National Program for Sub-National Democratic Development
OSH	–	Occupational Safety and Health
ROW	–	Right of Way
SEZ	–	Special Economic Zone
SPS	–	Safeguard Policy Statement
UNFCCC	–	United Nations Framework Convention on Climate Change
USD	–	United States Dollar
WBG	–	World Bank Group

WEIGHTS AND MEASURES

C	–	Celsius
ha	–	Hectare
km	–	Kilometre
m	–	Metre
MW	–	Megawatt

A. Executive Summary

1. The Project entails construction and operation of the first utility-scale solar power project in Cambodia with capacity of 10 MWac. The Project is located near Bavet City, Svay Rieng Province, near the border with Vietnam. The Project went through an international competitive bidding process, and a consortium comprised of Sunseap International, a leading solar development firm from Singapore, and SchneiTec Co. Ltd., a local solar developer, (together, the "Sponsors") has won the bid. The Consortium will enter into a Power Purchase Agreement with Electricité du Cambodge (EDC), the state-owned utility of Cambodia, and is expected to be complete by the first quarter of 2017. The Sponsors have requested financial assistance for the Project from the Asian Development Bank (ADB).

2. The purpose of this Initial Environmental and Social Examination (IESE) is to support the Sponsors' application for finance from the Asian Development Bank (ADB). The IESE has been undertaken in order to allow the Sponsor's project to be designed and implemented in compliance with the ADB's Safeguard Policy Statement (SPS 2009), Public Communications Policy (2011), Social Protection Strategy (2001), Gender and Development Policy (1998), and the World Bank Group's (WBG) Environmental, Health and Safety Guidelines covering General EHS matters, Workers' Accommodation and Electric Power Transmission and Distribution.

3. The nature of solar power plants means that they typically result in minimal adverse impacts on the environment and surrounding communities. The construction phase will involve site preparation (e.g. grading and levelling) and installation and commissioning of infrastructure (including the PV modules and a transmission line). These activities are likely to generate air and noise emissions and present occupational and community health and safety risks. However, these impacts are not expected to be significant, given the short duration of the construction phase (i.e. three months) and the proposed mitigation measures. This includes the use of dust suppression techniques, traffic management, use of personal protective equipment, fencing of the Project site, and continued engagement with stakeholders. A pond is being installed on site to capture run-off and minimize the potential for soil erosion and/ or flooding to occur on surrounding properties. The operation phase will involve ongoing maintenance of the PV modules, including regular washing of the modules to remove dust and other debris. No chemicals will be used in this process. Personnel will continue to be required to use appropriate personal protective equipment. The proposed mitigation measures will minimize the potential for any potential impacts.

4. The Project is expected to generate a range of positive impacts including local employment opportunities, as well as training and development opportunities for local community members and local authorities, in particular the EDC. The Sponsors have engaged with stakeholders throughout the design of the Project, and are committed to continuing this engagement. This will help facilitate access to the range of employment opportunities that will be created.

B. Policy, Legal, and Administrative Framework

5. This section discusses the ADB's requirements and national and local legal framework that guided assessment of the potential Project impacts. It also identifies relevant international environmental agreements to which Cambodia is a party.

ADB Safeguard Standards

6. The ADB's SPS (2009) requires all ADB financed projects to undergo an assessment. The purpose is to identify potential environmental and social impacts and avoid, or when avoidance is not possible, minimize and mitigate adverse project impacts.

7. In line with SPS Requirement 1 (environment), the Project has been evaluated using the Rapid Environmental Assessment Checklist (Appendix A). The adverse environmental impacts associated with the Project are considered site-specific and reversible. Therefore, the Project has been classified as a Category B for environment.

8. Under the SPS Requirement 2 (involuntary resettlement) and Requirement 3 (indigenous peoples), the Project was classified as Category C. Although the Project involves land acquisition, the process was completed through a voluntary process (as described in Section C). No indigenous peoples were identified as being impacted by the Project.

Environmental Protection in Cambodia

9. Cambodia's current Constitution, which was confirmed in 1993 by the Royal Government of Cambodia, identifies environmental issues that are to be considered during project development and implementation. Specifically, Article 59 of the Constitution states that: ***The state shall protect the environment and balance the abundant natural resources and establish a precise plan of management of land, water, air, win, geology, ecological systems, mines, energy, petrol and gas, rock and sand, gems forests and forestry, products, wildlife, fish and aquatic resources.*** The Ministry of Environment was established to implement this provision.

10. The Law on Environmental Protection and Natural Resource Management (NS/RKM/1296/36), which was issued in 1996, is the primary law governing environmental management in Cambodia. The law requires the Government to prepare national and regional environmental plans, which are expected to cover a wide range of issues, including environmental assessment, pollution prevention and control, public participation and project disclosure.

11. As required by the Law on Environmental Protection and Natural Resource Management, a National Environment Strategy and Action Plan (NESAP) is being developed. The NESAP will identify priority policy tools and financing options for sustainable natural resource management and environmental protection. It will guide government ministries, private sector, civil society, and development organizations to mainstream environmental considerations in policies, plans, and investments. The final draft NESAP is expected to be produced in late-2016 and will require endorsement by the National Council for Sustainable Development and then approval by the Council of Ministers.

12. Following the issuance of the Law on Environmental Protection and Natural Resource Management, the Ministry of Environment passed regulations (also referred to as sub-decrees) to provide further protection for the environment, including:

- Sub-decree No.27 on water pollution control, issued on 6 April 1999;
- Sub-decree No.36 solid waste management, issued on 27 April 1999;
- Sub-decree No.42 on air pollution and noise disturbance, issued on 10 July 2000;
- Sub-decree No.72 on environmental impact assessment process, issued on 11 August 1999; and
- Law on the management and exploitation of mines resources, adopted on 13 July 2001.

For consideration of other applicable environmental standards and criteria, such as ambient air quality, vibration, noise, contaminated soil, and workplace and community safety the protocols of the Environment, Health and Safety Guidelines of the World Bank (2007) apply.

13. A range of national environmental policy documents also exist within Cambodia such as the National Environmental Action Plan (1998-2002) and the National Biodiversity Strategy and Action Plan (NBSAP) of 2002.

14. **Law on Nature Reserves.** The Royal Decree on Protected Natural Areas was issued in November 1993. The regulation provides protection for the environment, land, forests, wetlands and coastal zones. The regulation covers 23 natural protected areas in Cambodia, representing 18% of the total land area of the country or 2.2 million hectares. The Ministry of Environment is responsible for implementing this law.

15. In 2008, Cambodia introduced the Protected Area Law No. NS/RKM/0208/007 which defines the National Parks (IUCN Category II), Wildlife Sanctuaries (IUCN Category IV), Protected Landscapes (IUCN Category V), Multiple-Use Areas (IUCN Category VIII), and Ramsar sites which includes two sites in IUCN Categories IV and VIII. The 2008 Protected Areas Law defines the framework of management, conservation and development of protected areas and aims to ***ensure the management, conservation of biodiversity, and sustainable use of natural resources in protected areas***. The law reinforces the Ministry of Environment's responsibility to administer and manage protected areas.

16. **Law on Historical Monuments.** All national monuments in Cambodia are protected by the Law on the Protection of Cultural and National Heritage, which was promulgated in 1996. This is supplemented by the "Decision on the Definition of 3 Zones to Protect Temple Surrounding Areas in All Provinces and Municipalities Except Angkor Wat" (1996). The law protects a range of cultural heritage sites, including small temples and ancient structures in Cambodia.

Labor Management in Cambodia

17. The Labor Law was issued in March 1997 to govern relations between employers and workers. It governs all employment contracts to be performed within the territory of the Kingdom of Cambodia.

18. Law on social security schemes were issued in 2002. This law seeks to set-up a social security scheme. It includes references to: i) a pension scheme, which provides old age benefits, invalidity benefit and survivors' benefit; and ii) an occupational risk scheme, which is in charge of providing employment injury and occupational disease benefit.

19. **Occupational Health and Safety.** The First Occupational Safety and Health (OSH) Master Plan (2009-2013) was developed by the Ministry of Labor and Vocational Training with technical support from the International Labor Organization (ILO). It contains the following priority areas: strengthening national OSH systems; improving safety and health inspections and compliance; promoting OSH activities by employers' and workers' organizations; implementing special programs for hazardous occupations; extending OSH protection to small enterprises, and informal and rural workplaces; and promoting collaborative actions with hazardous child labor and human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS) projects and activities.

Land Management in Cambodia

20. Under the Cambodian Constitution all Khmer legal entities and citizens of Khmer nationality have the right to own land, so long as it is not in conflict with public interests. However, foreigners are not allowed to own land in Cambodia, although they may own above ground floor units in co-owned buildings located more than 30km from the Cambodian border.

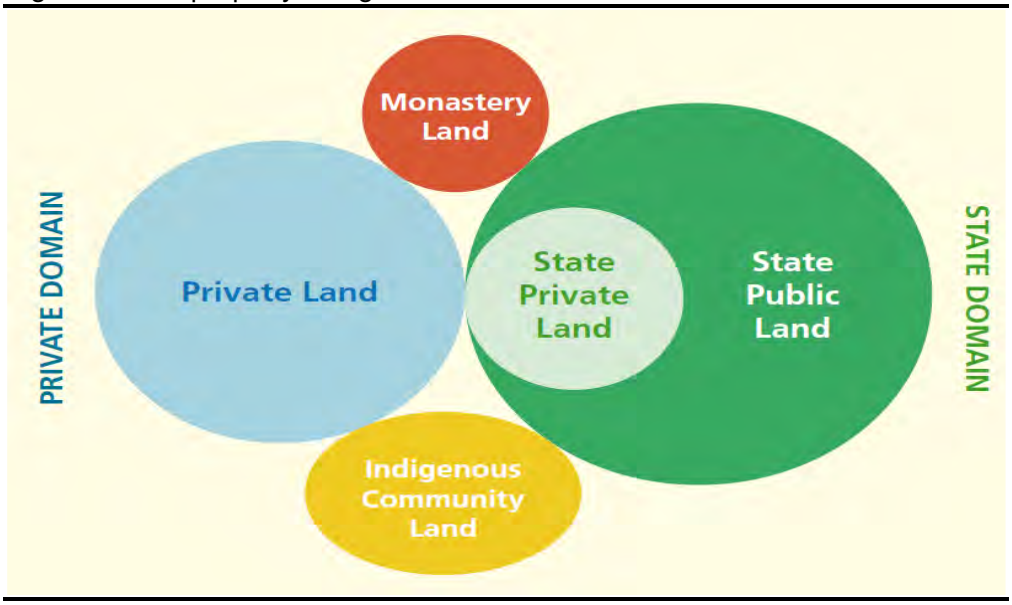
21. According to the Land Law promulgated in August 2001, there are five categories of land: private land; state public land[1]; state private land[2]; common property and indigenous land

[1] State public land: State land with a public interest

[2] State private land: all state land is not state public land and in the term for all state land that can be legally privatised.

(Figure 1) with three forms of landownership: private ownership, state ownership and collective ownership by indigenous communities. State land, including state public and state private, accounts for around 75-80% of Cambodia's total land area. Privatization of this land cannot occur where a public interest is held, such as roads, mountains, military bases, public service (e.g. school, public hospital land or an administrative post) and natural origin (e.g. forest, water bodies, river beds).

Figure 1 Land property categories under the 2001 Land Law

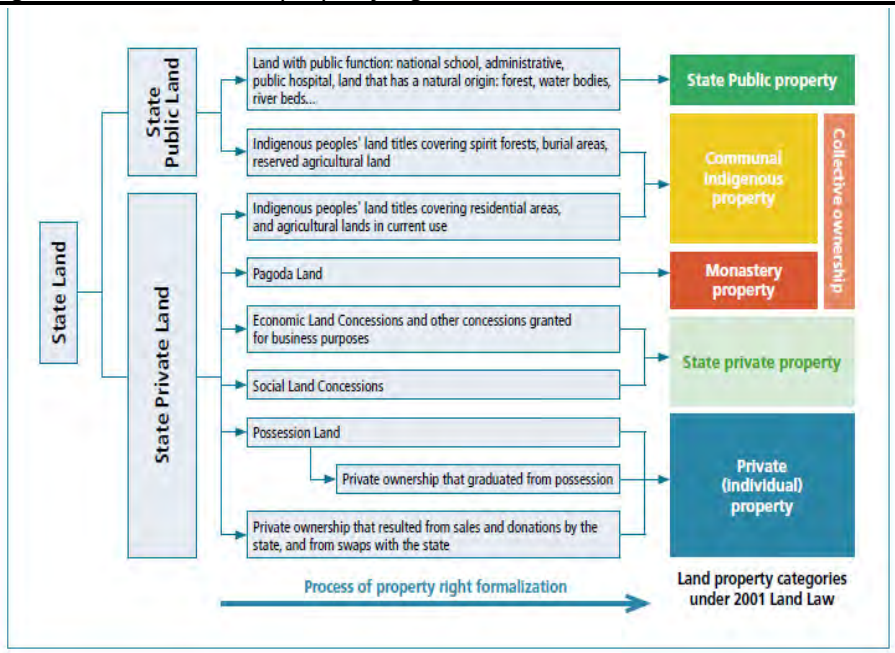


Source: The fragmentation of land tenure system in Cambodia: peasants and the formalisation of land right, 2015.[3]

22. The Land Law promulgates private ownership rights for residential and agricultural land. With indigenous communities, they have a right to collective ownership of their land and to assert and enforce their interests against third parties. The Land Law allows indigenous communities to manage their community land according to their traditional customs.

[3] https://orbi.ulg.ac.be/bitstream/2268/183306/1/DIEPART_2015_Fragmentation-Land-Tenure-Systems-Cambodia.pdf

Figure 2 Processes of property rights formalization under the Land Law 2001



Source: The fragmentation of land tenure system in Cambodia: peasants and the formalisation of land right, 2015.[4]

23. Figure 2 summarizes the implementation of the Land Law, including the processes involved in formalizing property rights. A key feature of these processes is the difference between state private and state public land and the formalization of private or collective property rights.

International Conventions

24. Besides national legislation, a number of international conventions, treaties and protocols related to environmental management and protection have been signed and ratified by the Royal Government of Cambodia. These include:

- United Nations Framework Convention on Climate Change (UNFCC), 1992, entered into force on 21 March 1994 (Cambodia ratified on 18 December 1995)
- Kyoto Protocol 1997, entered into force on 16 February 2005 (Cambodia accessed on 22 August 2002)
- Vienna Convention for the Protection of the Ozone Layer, entered into force on 22 September 1988 (Cambodia accessed on 27 June 2001)
- Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, entered into force on 1 January 1989 (Cambodia accessed on 27 June 2001)
- The International Convention for the Prevention of Marine Pollution from Ships, 1973 as modified by the Protocol of 1978 relating thereto "MARPOL 73/78", fully entered into force on 2 October 1983 (Cambodia ratified on 1994)

[4] The fragmentation of land tenure system in Cambodia: peasants and the formalisation of land right, https://orbi.ulg.ac.be/bitstream/2268/183306/1/DIEPART_2015_Fragmentation-Land-Tenure-Systems-Cambodia.pdf

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, entered into force on 5 May 1992 (Cambodia accessed on 02 March 2001)
- United Nations Convention to Combat Desertification, entered into force on 26 December 1996 (Cambodia ratified on 18 August 1997).
- Convention on International Trade in Endangered Species of Wild Fauna and Flora, entered into force on 01 July 1975 (Cambodia ratified on 04 July 1997).

C. Description of the Project

25. The Project involves construction and operation of the first utility-scale solar power project in Cambodia with capacity of 10 MWac. The Project will be developed by a consortium comprised of Sunseap International, a leading solar development firm from Singapore, and SchneiTec Co. Ltd., a local solar developer, (together, the "Sponsors").

26. The Sponsors entered into a Power Purchase Agreement (PPA) with Electricité du Cambodge (EDC), the state-owned utility of Cambodia, at the end of August 2016. The PPA will currently be in place for 20 years – i.e. the life of the Project. At the conclusion of the 20 year period, an economic assessment will be conducted to determine whether the life of the Project will be extended. At this stage, it is anticipated that the Project will be extended for a further 20 years via a new PPA.

27. The Project is located between Thlok (east) and Bat Sloek (west), in the Chrak Mtes commune, in Bavet District, Svay Rieng Province (Figure 3), near the border of Vietnam. The Project site is 162 kilometers from the capital Phnom Penh by road, and within five kilometers of the border with Vietnam and 88 kilometers from Ho Chi Minh City by road. The site is largely surrounded by land used to cultivate rice crops. The closest residential property is located 700 metres to the east in Thlok village. The closest natural protected area is Trapeang Lpeou Wildlife Sanctuary which is located in Takeo province (around 122 km from the southwest of the Project site). The Project site and the surrounding area are managed as part of the Bavet District.

28. Construction will involve preparation of the site, including land clearing, levelling and backfilling. The site is approximately 207,316 m^2 in size, of which approximately 170,000 m^2 is required for the PV modules. Once the site has been prepared, a range of infrastructure will be installed, including the PV modules (approximately 39,000 polycrystalline photovoltaic modules), and an on-site office and security house. In addition, a water pump (to extract minor volumes of groundwater for washing), and infrastructure for the inverters (e.g. switchgears, battery and PIX) will be installed. No temporary worker's resting area will be installed during the construction phase as most of the workforce will be from the local area. The proposed site layout is detailed in Figure 4.

29. A pond will be established on site and the adjacent water canals will be expanded to help manage run-off. Canals, which are used by the surrounding properties for irrigation, are located along the north and east boundaries of the Project site. The soil that is excavated to create the pond will be used to level the Project site. The size and dimensions of the pond are based on local rainfall data, site topography and groundwater levels, and climate change expectations (i.e. potential increases in rainfall). Water storage capacity of the pond onsite is 160,000 m^3. The total rainfall within the Project site is estimated to be 9,300 m^3 per month, which is based on monthly rainfall data. A hydrology survey is being conducted by a local third party engaged by the Project Sponsor. The hydrology survey report is expected to be available in the coming month. Based on the results of the hydrology survey, groundwater management

measures will be reviewed to ensure that they continue to be sufficient to manage the predicted impacts.

30. The Project site's access road (i.e. the road that connects the Project with the commune road and Highway 1) will be upgraded, as it is currently a muddy track. The road is approximately 1 km in length.

31. In addition, an above ground 22 kV transmission line will be installed to connect the Project to the Chrak Mtes substation, which is located approximately 5.5 km to the southwest of the Project site. The transmission line will be located in the right-of-way (ROW) adjacent to National Highway 1, and will involve installing ground footings. This will include installation of approximately 110 poles – i.e. one pole every 50 meters. As the transmission line will be located within the ROW, no new land will be acquired. No physical or economic displacement is expected as part of the installation. The transmission line will be installed by the EDC. A separate IEE will be prepared and approval from the EDC will be obtained once the final route and the location of the poles has been determined.

32. Construction is expected to take a total of three months. Clearing has already commenced (further information is provided in Section F below). Piping and fencing is being installed, and is expected to be completed by September. Construction activities will be paused during the peak of the rainy season (from mid-September until mid-October) to minimize impacts associated with the Project (e.g. erosion, flooding). The operation phase is expected to commence in February 2017.

33. Commissioning of the Project will be undertaken in two phases – the solar farm and the transmission line/ grid. This is largely due to the fact that the Sponsors are responsible for the solar farm, while the transmission line will be installed in the EDC. Commissioning will be guided by testing procedures specific to the technology being used.

34. Operation will involve ongoing maintenance of the PV modules. The modules will be regularly washed to remove dust and other debris. This will be done using minor volumes of water; no chemicals will be required. The wastewater will be left to seep into the soil within the Project boundary. Maintenance will be guided by an established set of guidelines, which will include monitoring parameters (i.e. system performance ratio, string level performance). This will help ensure optimum performance of the system.

35. Bavet District is linked to Phnom Penh by National Highway 1. The PV modules will be transported from Schneider's facilities[5] in four countries (i.e. Spain, France, India and Indonesia) to Phnom Penh. The National Highway No.1 will be the main route used to transport the modules and other equipment from Phnom Penh to the Project site.

36. The Project will employ approximately 100 people during construction and 6 people during the operation phase. Most of the required employees will be sourced from the communities surrounding the Project site. The Sponsors' contractor has committed to training local community members to fill the positions that will exist during the operation phase.

37. There is potential for the Project to be expanded. The intention is to help meet the energy demands created by the rapidly expanding local tourism and manufacturing industries. Any potential impacts (associated with expansion) will be assessed prior to expansion occurring.

38. The Sponsors have lodged the required environmental approvals documentation with the Cambodian Ministry of Environment. The documentation is currently being progressed through the approvals system.

[5] Schneider is the Project EPC that will supply the PV modules and other equipment/ machines.

Figure 3 Solar Farm Project Location

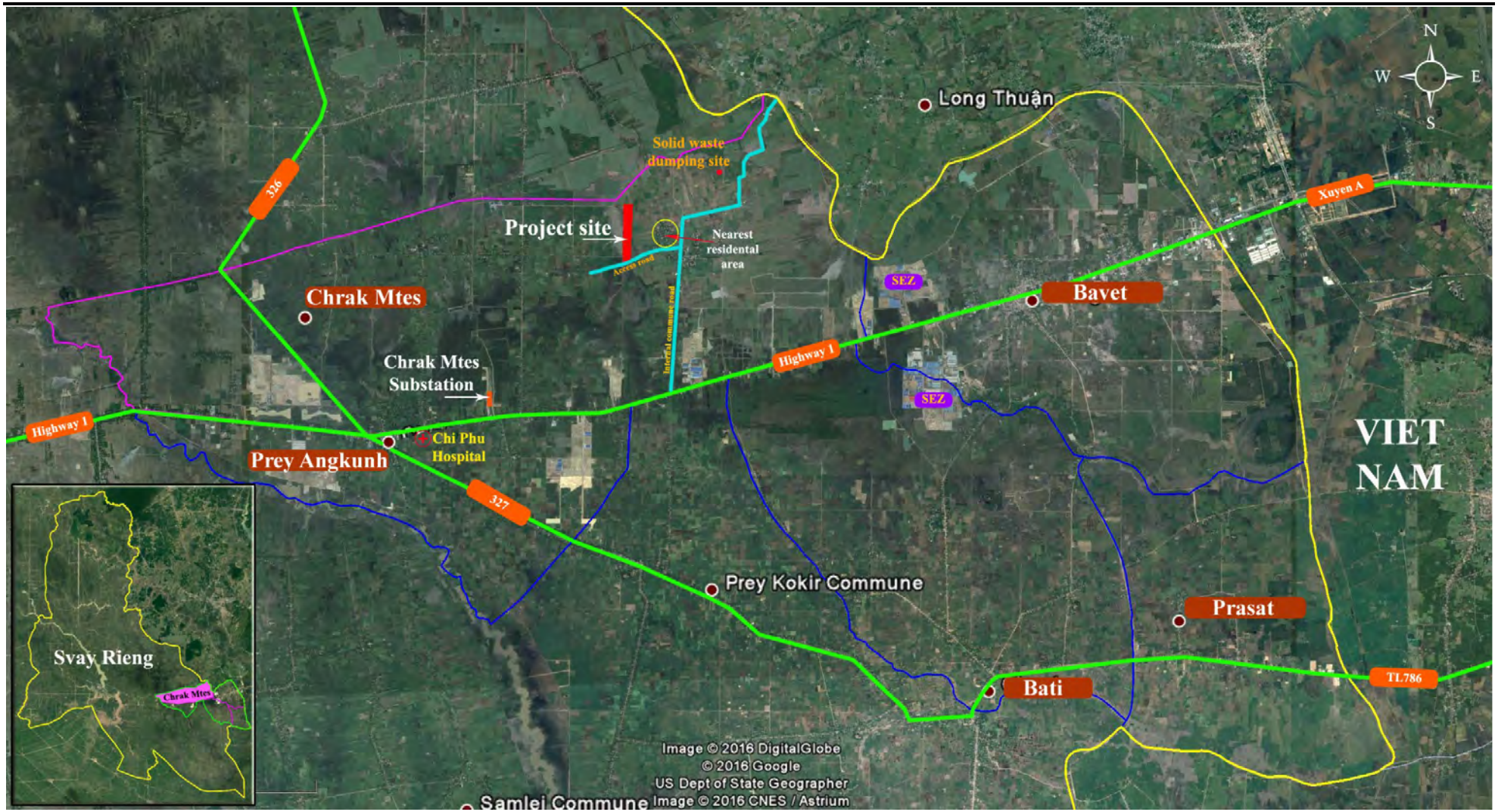
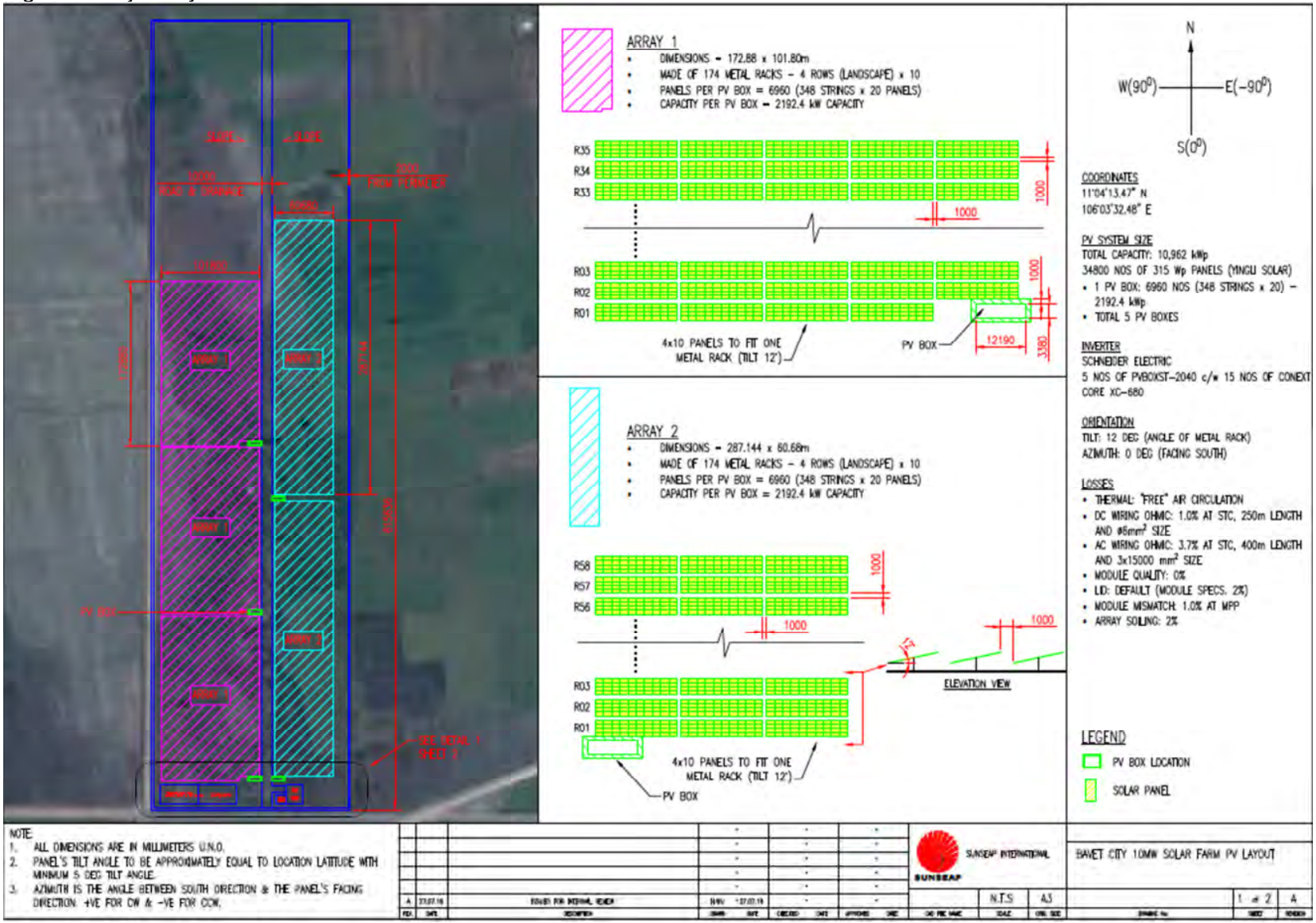


Figure 4 Project layout



D. Land Requirements

39. This section describes the process followed to acquire the land needed to develop the Project, including engagement with landholders. The Project requires 23 ha of land.

40. A total of 27 landowners were identified as owning land within the Project site. Annex A provides a map of the properties and details of the land owners. The Sponsor engaged with landholders between May 2016 and July 2016 to facilitate the acquisition process through a representative appointed by the Sponsors[6]. During the negotiation process, it was determined that not all landholders were in possession of titles, which meant that the Project Sponsors worked with landholders and the village leadership to determine property boundaries (in particular the property size).

41. The Sponsors collaborated with village chiefs and the local authority to organize a series of meetings with the 27 identified landowners to discuss the acquisition process. During these meetings, key Project information was discussed to landowners, including details of the construction process, operation timeframes, and employment requirements. Annex B provides photos from the meetings.

42. The landowner meetings also served as a forum to negotiate the land purchase price. Initially landowners proposed a price of USD 20,000/ ha (equivalent USD 2.0/m^2). Following a review of the market, the Sponsors counter offered a price of USD 1.55/m^2, which was the agreed price paid for the land.

43. Agreements are now in place with each of the 27 landowners. Payments in full have been made to all 27 landowners via a representative appointed by the Project Sponsors. Annex C provides a summary of the payments made to landowners. The total land acquisition payment is $341,565.75.

44. To verify the land acquisition process, all landowners were invited to attend a meeting on 24 August 2016 at the Thlok Village Chief's home, facilitated by an independent third party[7]. In total, 19 of 27 landowners attended the two-hour meeting; the landowners in attendance were the individuals (as of August) waiting on their final payment. During the meeting, landowners were asked about their understanding of the Project and the process involved in acquiring/ selling their land. Based on feedback received during the meeting, landowners confirmed that they voluntarily sold their land, and in general, seemed happy with the land price paid. A list of meeting attendees is provided in Annex B.

E. Description of the Environment (Baseline Data)

45. This section describes relevant physical, biological, and socioeconomic conditions within the Project area. It also looks at current and proposed development activities within the Project's area of influence.

[6] A representative appointed by the Sponsors was engaged to support the Project during the negotiation process with landowners. His role was to lead the engagement with landholders and relevant authorities. This included verifying existing land ownership status with authorities, negotiating the price paid to landowners, and overseeing the transfer of land.

[7] A site visit was conducted on 24 and 25 August. The focus was on collecting data to inform the assessment presented in this report. This included the collection of environmental and socioeconomic baseline data from secondary sources (provided by local government authorities) and primary data obtained through meetings with local landowners, village leaders and local government authorities. In addition, the site visit provided an opportunity to meet with landholders to review their understanding of the Project and the land acquisition process.

1. Physical and Biological

46. **Geography.** Svay Rieng is located in the southeastern part of Cambodia sharing borders with Kampong Cham to the north, Prey Veng to the west and an international border with Vietnam from east to south. The total area of the province is approximately 2,966 km^2. Svay Rieng is classified as a rural province that is composed of eight (8) districts and subdivided into 80 communes. The eight districts are Chanthrea, Kampong Rou, Romdoul, Romeas Haek, Svay Chrom, Svay Rieng, Svay Theab and Bavet. The Project is located in Bavet District.

47. Bavet District is composed of five (5) communes and subdivided into thirty-five (35) villages. Bavet District shares a border with Svay Theab to the north, Chanthrea and Kampong Rou to the south, Svay Thea and Kampong Rou to the west and an international border with Vietnam to the east. The five communes are Bavet, Prey Angkunh, Prasat, Bati and Chrak Mtes. The Project is located in Chrak Mts commune.

48. Bavet District serves as an international land border crossing to Vietnam's Moc Bai. Given the close proximity to Vietnam and the long history of cross border migration and trade, the Vietnamese language is widely understood within Bavet City, but not in the Project area (i.e. Chrak Mtes commune).

49. The geology of Bavet District is dominated by young alluvium soils made up of sediment deposits from rivers and streams. These are mainly finer sediments, thus a high concentration of silt and clay is found in the ground. Alluvial deposits, such as these, normally result in fertile land.

50. **Topography.** Cambodia's topography is divided into three (3) distinct topographic regions: central plains, flat coastal areas, and mountain ranges with high plateaus. The central plains form 75% of the country. The Project site lies in the central plains and is characterized by flat, low lying land, ranging up to 10 m above sea level. The area is used mostly as lowland paddy fields.

51. **Land Use.** The total area of Bavet District is 20,669 hectares which consists of residential land (20.8%), agricultural land (75.2%), and forest and unused (future residential) land (each accounting for 2% of the total area) (Table 1). Development of Bavet District is guided by a land use plan.

Table 1 Land Use in Bavet City

Land Use	Existing	
	Area (ha)	%
Residential	4,310	20.8
Agriculture	15,539	75.2
Forest	404	2.0
Unused (future residential)	416	2.0
Total	20,669	100

Source: Socio-economic data of Bavet District, 2016

52. According to the Bavet District three-year investment program (2016-2018), in some areas of Bavet District there is a shortage of land for farming and housing, which has resulted in an increasing number of illegal settlers encroaching on local right of ways, natural ponds, streams, canals and forest. However, there are also reports that a number of rice fields are available for sale and may be awaiting development for industrial purposes.

53. **Climate, Rainfall and Flooding.** Svay Rieng Province is considered to have a tropical monsoon climate. This is influenced by a number of factors, including its location in the Inter-Tropical Convergence Zone.

54. Svay Rieng Province experiences two distinct seasons: (i) the dry season, which extends from November to April, and is associated with the northeast monsoon, which results in drier and cooler air; and (ii) the rainy season, which extends from May to October when the southwest monsoon conditions are drawn inland. The temperature is lowest in January/December and highest in April, with an average of 22.1 - 35.1^{o}C

55. The total average rainfall in the Svay Rieng Province is 1,576.9 mm and the annual average rainfall is 130.9 mm. Peak rainfall often occurs in September and October (Table 2).

Table 2 Monthly Rainfall in Svay Rieng Province, 2009 – 2015 (mm)

Month / Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total	Average
2009	0	26.3	116.7	147.8	288.3	159.4	159.4	185.5	285.7	170.4	0	0	1,539.5	128
2010	20.7	0	11.5	98.4	126.6	239	299	284.9	209.1	449.7	241.3	0	1,980.2	165
2011	0.0	0.7	62.7	51.3	114.3	106.1	201	214.9	206.1	418.1	69.2	44	1,488.4	124
2012	29.9	0.8	18.4	82.0	220.0	144.9	73.4	164.3	499.1	399.5	98.3	0	1,730.6	144
2013	0.4	0	73.3	73.3	75.1	201.2	145.9	256.3	285.3	243.3	142	4.5	1,500.6	122
2014	0	2	0.8	256.7	118.5	132.7	297.9	84.5	182.8	153.5	150.6	49.8	1,429.8	119.1
2015	6	15.2	0	33.7	46.7	126.3	205	172	309.4	270.8	126.8	58.7	1,370.6	114.2
Average	8.1	6.4	40.5	106.2	141.3	158.5	197.4	194.6	282.5	300.7	118.3	22.4	1,576.9	130.9

Source: Provincial Department of Water Resources and Management, Svay Rieng Province, 2015

56. Most of Cambodia experiences an average wind velocity of less than 3 m/s. Maximum wind speeds can reach in excess of 20 m/s during the rainy season while during the dry season the maximum wind velocities are lower.

57. Typically flooding in the Project area is not caused by the river or tidal scheme, instead being caused by heavy periods of rain. As a number of local people indicated during a recent site visit (conducted on 24 August 2016), flooding typically occurs during the peak of the rainy season (September and October), often following two to three days of continuous rain. Stakeholders attributed this to the depth of the irrigation canals – as they are considered too shallow (0.5 m depth) and narrow (2 m width) to accommodate the large amounts of rain water received.

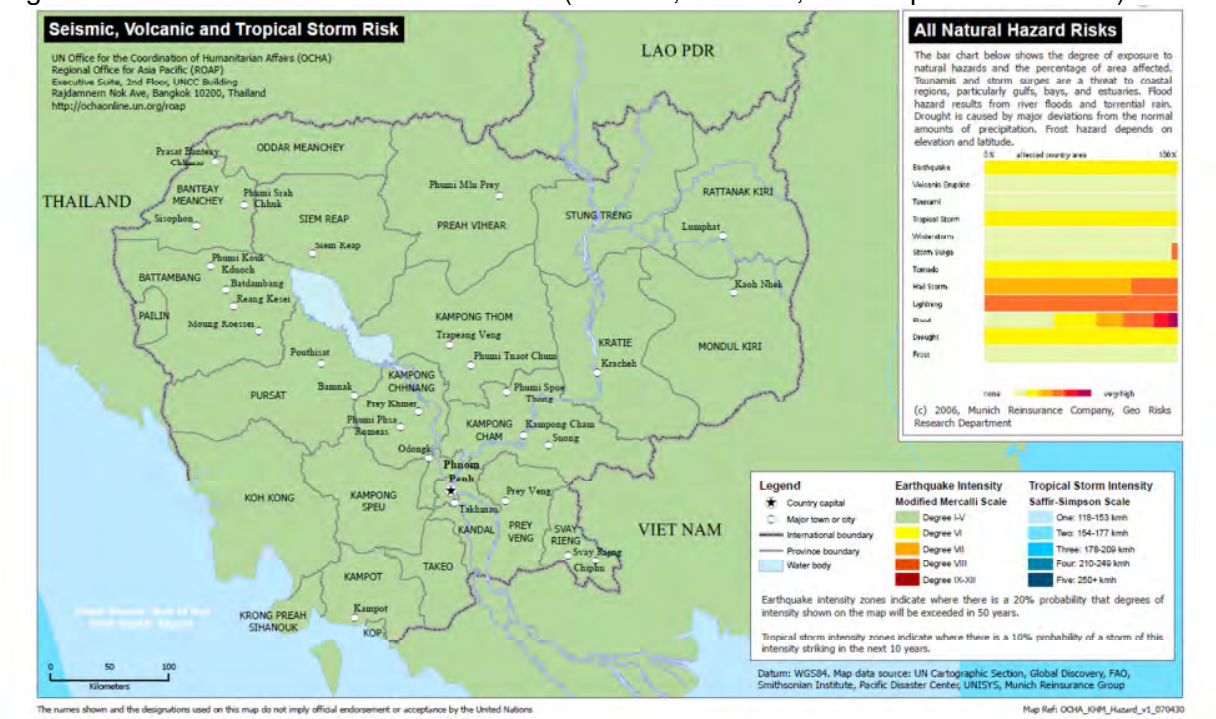
58. In October 2013, the Svay Rieng Province was severely affected by flooding. A total of 3,808 households (or 17,517 people or 3.6% of the population in the Province) were impacted, which included the displacement of 253 households. Annex D provides further details on the flooding that occurred in October 2013. Reportedly, the Project site was also affected during this flood event in 2013.

59. According to the Climate Resilience for Provincial Road Improvement Project (funded by ADB[8]), warming will likely occur throughout Cambodia. It is anticipated that there will be an increase in temperature between 0.35 and 2 degrees Celsius by 2050 and between 1 and 5 degrees Celsius by 2100. Regarding rainfall, it is expected that overall there will be a net decrease in total rainfall during the wet season, but the wet season will start earlier. It is also anticipated that there will be an increase in the amount of rain that falls during extreme events. The decrease in the total yearly rainfall that is projected for some locations in Cambodia, including Svay Rieng province, is a result of a decrease in the total number of rainy days not a reduction in intensity of rain. For Svay Rieng, it is anticipated that there will be a decrease of approximately 136mm of rain across the wet season. This amount is less than the interannual variability that is found in Svay Rieng Province.

[8] http://www.spcrcambodia.org/en/admin/uploads/investment%20project/cpr/Vulnerability%20Report%20v5.pdf

60. **Seismic.** Figure 5 shows the risk of a seismic events occurring in Cambodia. All of Cambodia is categorized as V and below on the Modified Mercalli Scale. There are no records of a significant disaster being caused by an earthquake in Cambodia[9].

Figure 5 Natural Hazard Risks of Cambodia (Seismic, Volcanic, and Tropical Storm Risk)



Source: Country Report Cambodia, March 2015. See http://open_jicareport.jica.go.jp/pdf/1000023400.pdf

61. **Water Resources.** Overall, the hydrology of Svay Rieng Province is moderated by low slopes, which increases storage, retards runoff, and attenuates discharges. Floods appear to be synchronized with the flood heights, which rise and fall on both sides of existing roads.

62. There is a canal system located in the Project area, which is used to irrigate local rice crops. During the recent site visit stakeholder meetings were conducted with district and commune officials (on 24 August 2016) who indicated that the irrigation canals are to be dredged every 5 years. However, the government's budget has been insufficient to maintain the canals and as a result the canals have fallen into disrepair. Annex E provides photos of the irrigation canal system in the Project area.

63. Local officials also indicated that the Tapov stream, which is approximately 6.5 km in length and 3 to 100m in width, is the main waterway in the Bavet District. It flows from the National Highway No.1 to the Vietnam border. The Chrak Mtes stream is the primary waterway in the Chrak Mtes commune - and flows along internal commune roads from Chrak Mtes commune to Vietnam.

64. A groundwater quality survey of Svay Rieng by Resource Development International[10] identified the presence of arsenic above Cambodian Drinking Water Quality Standard in 2% of collected well samples. Manganese, often found in association with arsenic, was also present in 31% of samples. See Table 3 for an illustration of groundwater quality in Svay Rieng province.

[9] http://open_jicareport.jica.go.jp/pdf/1000023400.pdf
[10] http://rdic.org/groundwater-summary-data/

Table 3 Svay Rieng Groundwater Quality Summary

Parameter	Unit	Samples	Mean	Max	Min	CDWQS	# exceeding CDWQS	% exceeding CDWQS
Health-impacting								
Arsenic	µg/l	1947	5.45	200	0	50	43	2.21
Fluoride	mg/l	1947	0.14	1.99	0	1.5	3	0.15
Nitrate	mg/l as NO_3	1947	0.85	176.2	0	50	1	0.05
Manganese	mg/l	1947	0.40	9.97	0	0.4[11]	598	30.71
Aesthetic-impacting								
Iron	mg/l	1947	1.69	106	0	0.3	1411	72.47
Manganese	mg/l	1947	0.40	9.97	0	0.1	1407	72.27
Turbidity	NTU	1947	14.10	787	0.16	5	907	46.58
Chloride	mg/l	1947	28.12	2665.23	0.13	250	46	2.36
pH		1947	6.02	8.58	2.65	6.5-8.5	1449	74.42
Hardness	mg/l $CaCO_3$	1947	59.60	1116	11	300	27	1.39
Sulfate	mg/l	1947	8.23	347.52	0	NA	NA	NA
Phosphate	mg/l	1947	0.15	9.71	0	NA	NA	NA
Conductivity	uS/cm	1947	306.50	7570	17	1500	50	2.57
TDS	mg/l	1947	205.33	5072	12	800	69	3.54
Salinity	ppt	1947	0.15	4.2	0	NA	NA	NA

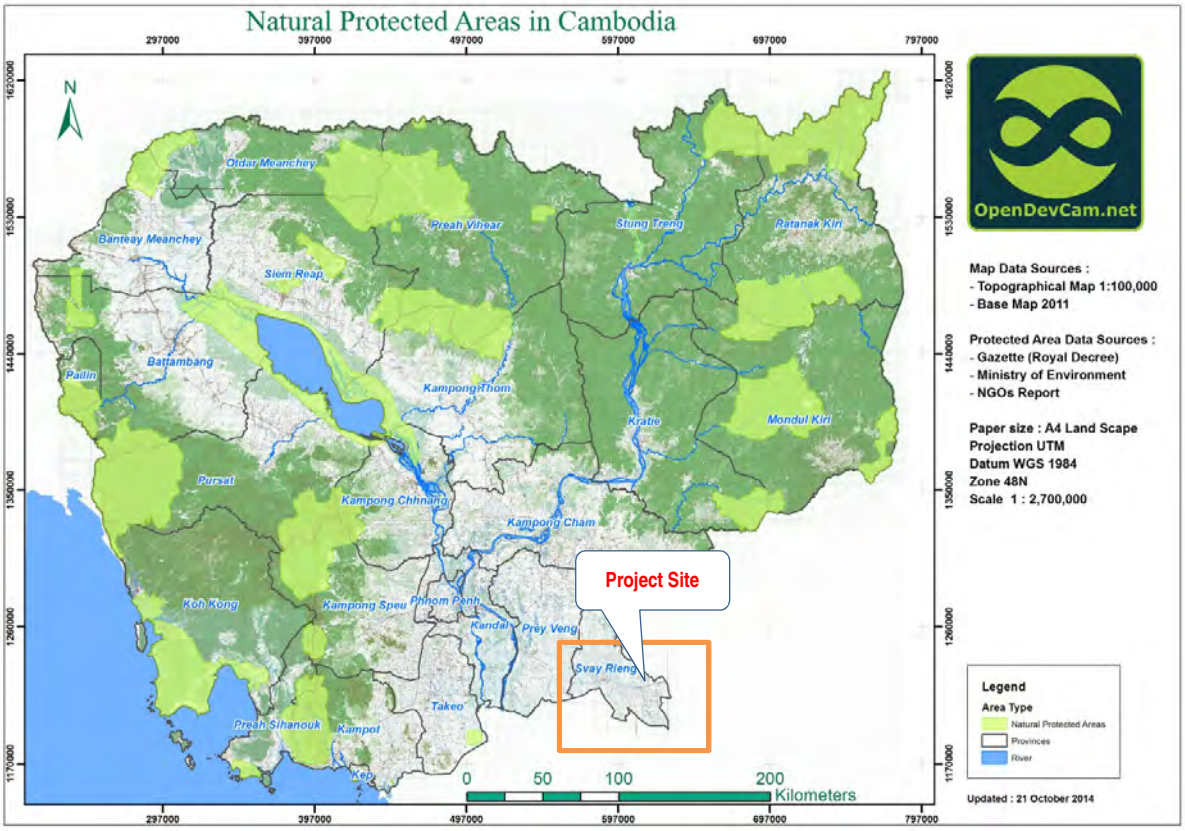
Note: CDWQS: Cambodian Drinking Water Quality Standard
Source: http://rdic.org/groundwater-summary-data/

65. **Air quality.** Air quality and noise data were not available for Bavet District. As observed during the recent site visit, air quality is typical of rural areas in Cambodia. There are no industrial activities in Chrak Mtes commune that contribute to air quality changes or noise that will disrupt the normal balance in the daily lives of local people. The main sources of air pollutants are dust from unpaved roads, burning of agricultural wastes, vehicle emissions and contamination from the solid waste dumping site located near the Project site (See Paragraph 67). Based on this, the air quality condition of the Project area is considered to generally be good.

66. **Biological Resources.** The terrestrial biodiversity in the Project area is limited. Within Svay Rieng Province there are scattered trees and agricultural land. There are no protected areas or forested areas located, which was confirmed by local stakeholders during the recent visit. Figure 6 shows the on the natural protected areas in Cambodia.

[11] Manganese health standard of 0.4 mg/l from WHO

Figure 6 Natural Protected Area in Project Site



Source: Open Development, 2016. See http://www.opendevelopmentcambodia.net/download/maps/natural_protected_areas.jpg (viewed 05 September 2016).

67. **Solid waste management.** Local stakeholders indicated during the recent site visit that there are no solid waste collection services in Thlok village; with solid waste from households being burned or thrown away into pits. Solid waste in Bavet City is collected by a private company and transported to a dumping site located near Thlok village (around 2 km northeast of the Project site). This dumping site stores domestic and industrial solid waste. Local stakeholders indicated, during the recent site visit, that Thlok village members are concerned about air pollution and potential water contamination associated with the site. (Annex E contains photos of the dump site.) There is no hazardous waste collection, transportation and disposal service in Bavet District.

2. Socioeconomic

68. **Administration and Governance.** The Royal Government of Cambodia ***(RGC)*** has delegated many of its powers to sub-national authorities[12]; this is referred to as ***Decentralization and De-concentration (D&D).*** National Committee for Sub-National Democratic Development (NCDD) was established to assist the Royal Government to implement the terms of the Organic Law and to formulate, oversee and coordinate implementation of a national D&D Program**.** The NCDD is now fully operational, and is working with all levels of government, including central

[12] Sub-National authorities include provincial, district/municipality/Khan, and commune/Sangkat levels.

and line ministries and councils at sub-national administration levels to achieve the National Program for Sub-National Democratic Development (NP-SNDD).

69. Chrak Mtes commune, where the Project is located, was integrated into Bavet District in December 2008, when the former city commune expanded to become a district (or municipality as urban districts are called in Cambodia). Formerly it had been a part of neighboring Svay Teab District. Bavet District is led by a governor, currently Mr. Seng Seyla, and a number of deputy governors who are appointed by the Ministry of Interior. Chrak Mtes commune is governed by a directly elected commune council, which is led by a commune chief. The commune council is typically responsible for maintaining security and public order, managing public services, and contributing to the economic and social development in each commune. The current commune chief is Mr. Hout Samai.

70. **Demographics.** As reported by the Chrak Mtes commune chief during the recent site visit, everyone residing in the commune is Buddhist, and follows Khmer traditions, cultures and customs. The Chrak Mtes Commune comprises 23% of Bavet's total population. There is a higher proportion of women in the Project area (compared to elsewhere in Cambodia), which may be attributed to the presence of garment manufacturing plants in the area which typically employ mostly women.

Table 4 Demographic Data Statistics for Project Area

	Province 2014 Svay Rieng	**District 2016 Bavet**	**Commune 2016 Chrak Mtes**
Number of Population	611,511	49,665	11,449
Number of Males Population	296,502	22,153	5,592
Number of Females Population	315,009	27,512	5,857
Sex Ratio (male over female)	94.12	80.52	95.47
Number of Households	138,411	11,912	2,884
Average Household Size	4.41	4.16	4.80
Population Density (KM)	206.17	240.28	217.22
Area (HA)	296,600	20,669	5,260

71. **Economy, Employment and Land Use.** The Project area economy has changed in the last decade, spurred on by a more efficient road connection to Phnom Penh, enhanced border trade with Vietnam and the establishment of the Manhattan Special Economic Zone (SEZ) and the Tai Seng-Bavet SEZ (locally known as the Bavet SEZ)[13]. Both SEZs are located along National Highway 1 and around 5 km from the Project site. As of January 2014, the Tai-Seng SEZ contained 17 manufacturing plants employing 8,095 local workers and the Manhattan SEZ contained 22 plants employing 17,487 local workers.[14]

72. According to the socioeconomic data for Chrak Mtes commune and Bavet District, people in the Project area are currently employed in both agriculture (seasonal) and industrial roles (in the SEZs). Table 5 provides further details.

[13] In 2016, SEZs in Bavet District have been the subject of negative reports in the national media. The key issues raised by the media include: unfair wages, , road accidents involving workers being transported to work, and accusations of untreated wastewater being released into local canals.

[14] See http://www.moc.gov.kh/Portals/0/Docs/TradeInfo/sez/SEZ_SVR_2014_01_The_Company%e2%80%99s_Proiles_Updated.pdf (viewed 17 August 2016).

Table 5 Economically Active Population (aged 18-60)

	2015	
	Number (people)	**Ratio (%)**
Chrak Mtes Commune, 2014	5,405	47.2
Bavet District 2015	17,860	40
Svay Rieng Province[15], 2014	325,750	53.3

Source: Socio-economic data 2015 books of Bavet District and Svay Rieng Province

73. According to the Economic Census (2011[16]), there were 1,568 businesses - i.e. light industrial, trading, services - in Bavet District employing 17,139 people. At the time, the total number of employed people in Bavet District was more than double that of those employed in businesses in the provincial capital Svay Rieng. Of the people engaged by businesses in Bavet District, 62% were women (10,642).

74. **Housing.** As observed during the recent site visit, most people who reside near the Project area own their home. Most of these homes have wood panel walls with metal roofs. Annex E provides photos of houses in Chrak Mtes commune.

Table 6 Dwelling Status of Household in Svay Rieng Urban, Rural, District & Commune Areas

	Owner Occupied	**Rented**	**Rent Free**	**Other**	**Total**
Urban	3,215	183	142	22	3,562
Rural	108,709	511	1,679	297	111,196
Total of above	111,924	694	1,821	319	114,758
Chrak Mtes Commune	1,913	140	26	6	2,085
Bavet District	7,058	250	176	27	7,511

Source: Cambodia General Population Census 2008

75. Most households located near the Project site are connected to the Bavet District grid. For example in Thlok village, it is estimated that only 5 or 6 of the 422 households in the village are not yet connected to the grid. However, it appears that there is insufficient supply to meet demand during peak times. In terms of price, the electricity unit price is determined by the government, and stakeholders. Findings from the recent site visit indicated that price of electrcity was affordable.

Table 7 Main Source of Light in Bavet District and Svay Rieng Households

	City Power	**Battery**	**Solar panel**	**Bio-gas**	**Total**
Thlok Village	416	6	-	-	422
Bavet District	6,364	1,736	283	17	8,400
Svay Rieng Province	32,829	68,147	7,785	1,361	110,122

Source: Socio-economic data 2015 books of Bavet District and Svay Rieng Province

76. Groundwater is currently the primary source of water in Bavet District. The ratio of households using groundwater in Bavet District is 90%. At the Project site, local people access groundwater through wells (20-32m) to meet their domestic needs. Groundwater is reportedly of good quality and of sufficient quantity, as indicated by local community members during the recent site visit. A piped water supply system is not available in the Project area.

[15] The Inter-Censal Population Survey 2013 reported 364,680 economically active people in Svay Rieng in that year, comprising 170,111 males and 194,569 females.

[16] Economic Census of Cambodia , 2011, http://www.stat.go.jp/info/meetings/cambodia/pdf/ec_pr07.pdf

Table 8 Source of Drinking Water in Thlok Village, Bavet District and Svay Rieng Province

	Piped Water	Groundwater	Rain Water	Total
Thlok village, 2015	-	422	-	422
Bavet District, 2015	999	8,970	-	9,969
Svay Rieng Province, 2014	4,156	132,511	263	136,930

Note: One household may be use more than one source of drinking water.
Source: Socio-economic data 2015 books of Bavet District and Svay Rieng Province

77. As of 2015, most people in the Project area had installed toilets in their houses. The percentage of households using toilets (i.e. septic tank, connected sewage) in Thlok village is approximately 88%. Table 9 provides details on toilet types in Thlok Village, Bavet District and Svay Rieng Province.

Table 9 Number of Households Have Toilet in Thlok Village, Bavet District and Svay Rieng Province

	Septic Tank and Connected sewerage	Pit latrine and others	Not available
Thlok village	370	10	42
Bavet District	6,701	607	1,092
Svay Rieng Province	63,860	12,852	33,410

Source: Socio-economic data 2015 books of Bavet District and Svay Rieng Province

78. **Education and Training.** There are five primary schools and one high school in Chrak Mtes commune. One of the five primary schools in Chrak Mtes commune is located in Thlok village. In general, the illiteracy rate in the Chrak Mtes commune is lower than in Bavet District and Svay Rieng Province (Table 10), which means that there is a higher rate of literacy in the commune than the surrounding area.

Table 10 Illiteracy Population and Rate in Chrak Mtes Commune, Bavet District and Svay Rieng Province

	Illiteracy population (people)		Illiteracy rate (%)	
	18 - 45 years old	6 – 18 years old	18 - 45 years old	6 – 18 years old
Chrak Mtes Commune (N=11,449)	0	47	0	0.41
Bavet Disrtrict (N=49,665)	237	318	0.48	0.64
Svay Rieng Province (N=611,511)	13,029	8,237	2.13	1.35

Source: Socio-economic data 2015 books of Bavet District and Svay Rieng Province

79. **Community Health and Wellbeing.** There are no healthcare centers in the Chrak Mtes commune. When local people in Chrak Mtes commune get sick, they travel to the Chi Phu hospital located in the populated area of Prey Anhkunh commune along the National Highway No. 1 in Bavet City (approximately 8km away from the Project site). However, the medical services in Chi Phu are limited. A committee has been organized by the Bavet District to help manage the Chi Phu hospital. A benefit of this is to eliminate the presence/ use of fake medicines and illegal private health services.

80. **Gender, Poverty and Vulnerability.** Bavet District has been taking steps to increase the representation of women in decision making positions – e.g. in local companies and factories. Key activities have included improving access to education and health care for women and girls and organizing gender mainstreaming education.

81. Regarding vulnerability, according to recent socioeconomic data there are 195 persons in Bavet District classified as vulnerable (Table 11). None of the landowners (who have sold their properties to the Project Sponsors) were identified as being vulnerable or members of a vulnerable household, based on feedback received during the recent site visit. However, there are vulnerable households in Thlok village, as reported by the Thlok village chief during the recent site visit, there are approximately 30 poor households (of the total 422 households) in the Thlok village.

Table 11 Vulnerability in Bavet District

Socioeconomic data for Bavet District	**2013**	**2014**	**2015**
Total vulnerable group/person	***200***	***197***	***195***
Orphan	5	5	3
Disabled aged 18 up can earn for living	78	72	85
Disabled aged 18 up cannot earn for living	32	62	53
Disabled aged lower 18 years olds	49	37	33
Elderly with family	19	15	17
Uncertain family	17	6	4

Source: Socio-economic data 2015 books of Bavet District

82. **Cultural Heritage.** According to local stakeholders (during the recent site visit), there are no cultural heritage, archaeological or places of worship in the area surrounding the Project site. There is one pagoda in Thlok village which is located approximately 1.5 km from the Project Site.

83. In line with Buddhist tradition when people die their bodies are typically cremated and put in a stupa at a Pagoda or stored at a family member's home. Given this tradition, there are no local burial sites, as everyone in the local area is said to be Buddhist.

F. Anticipated Environmental and Social Impacts and Mitigation Measures

84. This section presents the environmental and social impacts predicted to occur as a result of the Project. This includes potential positive and negative direct and indirect impacts as well as cumulative impacts to the physical, biological, socioeconomic, and cultural resources located within the Project's area of influence. The Project's area of influence includes the Project site, the transmission line that will be constructed between the Project site and Chrak Mtes substation, the road network that will be used to assess the Project, and the nearby communities that may be impacted by the Project.

85. This section also includes mitigation measures. Where adverse impacts are predicted to occur, measures have been designed to mitigate these impacts. The aim is to avoid, reduce, mitigate, or compensate the predicted adverse environmental and social impacts.

1. Impacts during Construction

86. **Land clearing.** As previously noted, the Project Site has already been cleared. Prior to clearing, the land was used to cultivate rice. For this reason, only a limited amount of vegetation (i.e. small patches of grass) was required to be removed during the clearing process. During a recent site visit (conducted in August 2016), site clearing was not identified as an issue of concern by stakeholders. Further details are provided in Annex F.

87. **Land use.** The Project Site will occupy only 0.15% of the agriculture land in Bavet City. Moreover, as stated above, a number of rice fields are available for sale for industrial development. Therefore, the impact from the Project on local land uses (e.g. a potential reduction in land available for agricultural production) in Bavet City is not considered to be significant.

88. **Water and soil management.** During the construction period a number of civil works will be required, including land clearing, backfilling, leveling and grading. This will modify the landscape and change on-site drainage patterns. The result will likely be an increase in run-off to nearby properties, which may result in an increase in soil erosion and flooding. Soil erosion and flooding are of particular concern during periods of heavy rain (i.e. September and October).

89. To minimize the potential impacts, a pond (80m width x 200m length x 10m depth) will be established on-site, which has been designed to accommodate run-off from the site and minimize impacts on the surrounding properties (such as potential flooding or erosion). The size and dimensions of the pond are based on local rainfall data and site topography. The topography of the site has been modified to direct run-off to the pond. In addition, construction works will be put on hold between mid-September and mid-October to avoid the heavy rains**.**

90. **Traffic management.** Materials, goods and workers will be transported to and from the Project site via Highway 1 and local access roads (including a local commune road). Highway 1 is used by local communities to access Bavet City and the nearby SEZs (i.e. Manhattan and Tai Seng-Bavet SEZs); this includes trucks that transport garment workers to and from their factories in the SEZs daily. Highway 1 becomes congested during peak periods (e.g. at the start and end of the work day around 8 AM and 5 PM daily). There are safety concerns along the local stretches of Highway 1 given the high level of use, the poor condition of the road, the high number of untrained drivers, and the lack of road safety awareness amongst local people[17]. Whereas the local communal road that will be utilized is of sufficient quality to meet the needs of the Project, the local access road will be upgraded with filling of laterite on the road surface to meet the requirements of the Project.

91. There is potential for the Project to further exacerbate the current congestion experienced along Highway 1 and contribute to degradation of the communal road (that will be utilized). However, due to the short duration of the construction phase, it is not anticipated that these impacts will be significant.

92. **Environmental emissions.** Air quality can be affected by construction activities. Land clearing and traffic movements along unsealed roads can generate dust (or particulate matter), while the exhaust gases generated from vehicle movements (such as CO) can result in pollution. Construction activities will also generate a range of noise – e.g. from traffic, pile driving.

93. However, given the short duration of the construction period (i.e. 3 months) and the temporary nature of the construction activities, the impacts associated with air and noise emissions are not expected to be significant. Mitigation measures, such as dust suppression and minimization of traffic movements, will be specified in the construction contracts.

94. **Waste management.** Construction will generate a range of solid waste. Disposal of this waste could add to issues (e.g. air pollution, potential contamination) that already exist at the local solid waste storage facility, which is located adjacent to Thlok village.

[17] Source: https://www.cambodiadaily.com/news/drunk-driver-causes-factory-truck-crash-74-hospitalized-2-113125/

95. Instead of using the local facility (located adjacent to Thlok village), the Project has contracted a local company based in Bavet District to collect and dispose of the solid waste generated by the Project. Materials deemed to be recyclable (e.g. PV panel cardboard) will be sold to a local recycling company. These measures will eliminate any potential impact on local communities or the nearby environment.

96. Prior to disposal, the solid waste, generated by the Project, will be stored on a leak-proof plastic covers. This will eliminate the potential for contamination of surface or ground water to occur.

97. In terms of liquid waste, septic tanks will be installed to collect and treat domestic wastewater before being discharged to the local drainage system. Given the short duration of the construction phase, the impacts associated with domestic wastewater are not expected to be significant. The Project will not require the use of hazardous materials during construction or operation. The Project will engage an oil supplier who will supply new oil for maintenance activities and collect/ transport used oil for disposal.

98. **Occupational health and safety.** Construction activities can cause harm and present risks to the welfare of workers. A construction health and safety policy will be prepared and implemented by the contractor. As part of this policy, wearing Personal Protective Equipment (PPE), such as hard hats, safety gloves, earing protection, and safety boots, will be required. The policy will also include appropriate measures to manage sun and heat exposure, such as taking regular breaks and drinking plenty of water.

99. **Community health and safety.** There are a number of potential community health and safety risks associated with construction of the Project. This includes an increased risk of accidents and injuries associated with the transport of materials, goods and workers to and from the Project site (due to an increase in the amount of traffic on local roads and the safety concerns associated with Highway 1), and the unauthorized entry of community members into the Project area.

100. A fence is being established around the Project site and 24 hour security will be provided by locally employed individuals to minimize any potential unauthorized entry. Signage will be erected at site outlining the potential health and safety risks to the community. Engagement will occur with local stakeholders to ensure that they are aware of the potential health and safety risks associated with the Project.

101. An emergency response and preparedness procedure will be developed. The procedure will include a communication system for engaging with regional and local emergency response and healthcare authorities. The procedure will be developed in consultation with potentially affected stakeholders and local authorities.

102. **Employment.** The construction phase will generate a range of employment opportunities, including in a number of low-skilled construction roles. It is anticipated that 100 people will be employed during the three-month construction phase. It is expected that most of the workers will come from the local area (i.e. nearby villages and towns), and only a small number skilled workers (less than 10) will be brought in to support construction of the Project. These workers will be accommodated in a hotel in Bavet City. There will be no accommodation on site; therefore, social impacts related to migrant employees will likely not occur.

103. **Land acquisition.** Land required for the Project site has been voluntarily acquired at market value as described in Section D. The Project has made all payments for the land acquired and no adverse impacts are expected to occur as a result of the land acquisition process.

104. For the transmission line, the existing ROW will be utilized. As mentioned above, informal settlement on local ROWs has occurred in some areas of Bavet District. This means that temporary and/ or permanent displacement may occur. To mitigate any potential impacts, a land acquisition framework will be developed modelled on the December 2014 EDC compensation schedule used in the Australian Government and ADB funded project 45303-001[18]. The framework will include an engagement process to identify, assess and mitigate potential displacement related impacts along the ROW prior to construction.

105. **Climate change.** The construction phase is short-term (three months) so impacts from climate change on the construction phase of the Project are not considered to be significant (particularly given the changes likely to be experienced as a result of climate change will not occur immediately).

2. Impacts during Operation

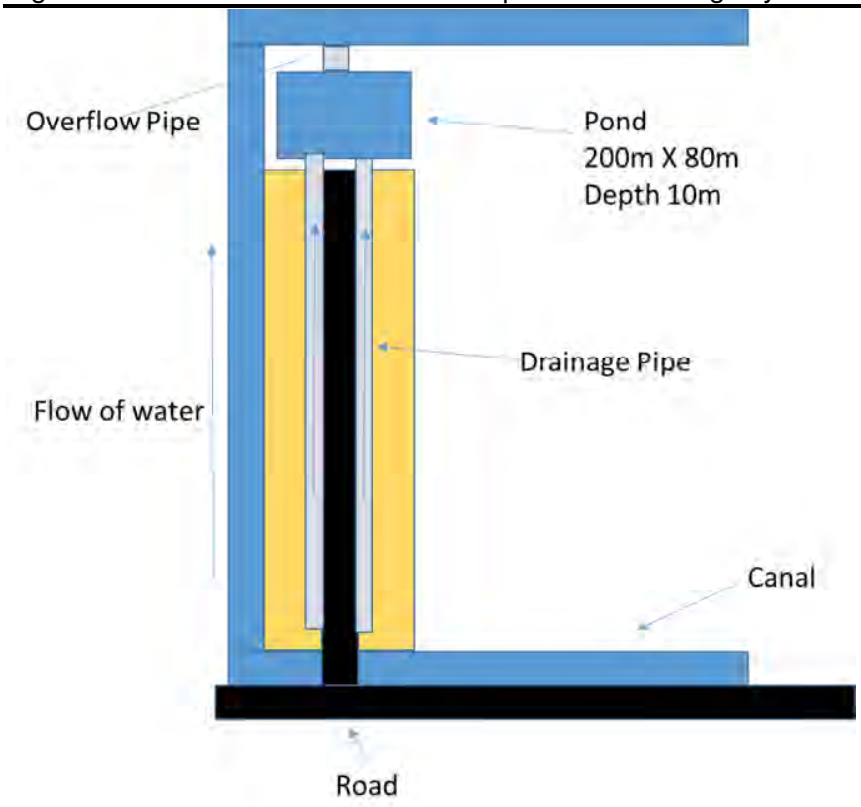
106. **Water and soil management.** Modifying the landscape (e.g. land clearing, backfilling, deepening the immediately adjacent canals) will affect on-site drainage patterns. This may result in an increase in run-off onto nearby properties, which can lead to soil erosion and increased flooding, particularly during periods of heavy rain.

107. To minimize the potential impacts, a pond (80m width x 200m length x 10m depth) will be established on-site, which has been designed to accommodate run-off from the site and minimize impacts on the surrounding properties (such as potential flooding or erosion) (Figure 7). The topography of the site has been modified to direct run-off to the pond. In the unlikely event that the pond overflows, water will be directed (via an overflow pipe) to the irrigation canal behind the pond. The canal will be expanded to accommodate any potential run-off.

108. The size and dimensions of the pond are based on local rainfall data and site topography. Water storage capacity of the pond onsite is 160,000 m^3. Based on rainfall data, the total rainfall within the solar farm area is estimated to be 9,300 m^3 per month. Hence, the pond capacity is considered adequate to manage potential impacts to nearby properties as well as the Project infrastructure.

[18] Grant 0336-CAM: Rural Energy Project https://www.adb.org/projects/45303-001/main

Figure 7 Schematic of the onsite water pond and drainage system



109. The PV modules will require ongoing maintenance throughout operation. This will involve regular washing of modules to remove dust and other debris. This will be done using a minor volume of groundwater; and no chemicals will be required. The resulting wastewater will be left to seep into the soil within the Project boundary. The lack of chemical use will eliminate any potential for contamination of local surface and ground water.

110. **Environmental emissions.** Air and noise emissions are not expected to occur during operation. The reduction of CO_2 emissions per 1kWh of solar power is approximately 0.7 kg of CO_2[19]. It has been estimated that 10,220 tons/year of CO_2 will be reduced by the Project.

111. The PV modules will use a high-transmission, low-iron glass. This type of glass transmits more light, producing less glare and reflectance than normal glass. Given the glass used, and the angle of the modules, glare is not expected to be an issue.

112. **Waste management.** In terms of liquid waste, septic tanks will be installed to collect and treat domestic wastewater before discharging to the local drainage system. The number of employees working onsite during the operation phase is limited, which means that the wastewater volumes will be minimal. For this reason, the potential impacts are not expected to be significant. The Project will not require the use of hazardous materials during construction or operation.

113. In terms of solid waste, the key source of waste will be the PV panels (if broken). The aluminum frames from broken PV panels will be separated and sold to a local recycling

[19] Source: http://www.solarmango.com/in/tools/solar-carbon-emission-reduction.

company. Broken glass (from the PV panels) will be properly wrapped and sealed for disposal by a local company. The PV modules do not contain hazardous materials**.**

114. **Occupational health and safety.** Operations, including ongoing maintenance of the PV modules, presents a range of hazards to the welfare of workers. A construction health and safety policy will be prepared and implemented by the contractor. As part of this policy, wearing PPE, such as hard hats, safety gloves, earing protection, and safety boots, will be required when onsite undertaking maintenance works, and appropriate measures to manage sun and heat exposure will be implemented.

115. **Community health and safety.** The key community health and safety risk associated with the operation phase is the unauthorized entry of community members into the Project area. The Project site will be fenced to help minimize unauthorized entry. Relevant signage will also be posted at on the Project site – outlining the key health and safety risks to the community. There will be minimal traffic generated by the Project during operation, for this reason, safety risks associated with traffic are not expected to be a significant issue.

116. An emergency response and preparedness procedure will be developed. The procedure will include a communication system for engaging with regional and local emergency and healthcare authorities. The procedure will be developed in consultation with potentially affected stakeholders and local authorities.

117. **Employment.** It is anticipated that six (6) people will be employed during the operation phase. These individuals will be responsible for ongoing maintenance at the Project site. It is expected that these workers will be recruited from the local area. There will be no employee accommodation onsite; therefore, social impacts often associated with the use of migrant employees will not occur.

118. **Social impacts.** In addition to generating employment opportunities, the Project Sponsors have committed to generating a range of community benefits. The Project Sponsors intend to support eco-tourism in Cambodia by providing the opportunity for interested visitors to tour the Project site. The Sponsors also plan to open the Project site to local schools and universities to visit and learn about the environmental benefits of sustainable, clean energy sources (such as solar power).

119. The Project Sponsors also intend to install a water purification system, which will provide clean water to nearby villages. The focus will be on providing water to those who sold their land to the Project Sponsors as part of the Project. The purification system is intended to be powered by the Project and located within the Project site.

120. In addition, the Sponsor has committed to educating representatives from the EDC, and other relevant government departments. The training will have a value of up to USD 30,000 per year for a 20 year period. The training delivered will be agreed by the Project Sponsors and EDC on an ongoing basis.

121. **Transmission line.** The impacts associated with the construction and operation of the transmission line (such as environmental emissions and occupational and community health and safety) are captured in the assessment above. However, the final route for the transmission line (and the location of the poles) has yet to be determined; once the route has been confirmed the potential impacts will be reviewed and, where required, additional management measures will be established. The potential impacts and associated management measures will be captured in a separate IEE, once the final route and the location of the poles has been determined.

122. **Climate change.** The impacts of climate change on the Project during operation will include: i) an increase in rainfall intensity during rainy days which may increase the amount of run-off generated by the project, and ii) an increase in temperature may impact the amount of energy generated by the solar panel. As identified above, a pond is being established and the adjacent canals are being expended to mitigate issues associated with an increase in run-off. The solar panels will be designed to improve passive airflow beneath mounted structures to keep the modules cooler and manage the loss in efficiency due to temperature rise. These measures are considered to be sufficient to enable the Project to adapt to the anticipated changes in climate.

3. Decommissioning

123. At decommissioning the PV modules will be removed, and recycled. The PV modules do not contain any hazardous materials. Given the modules will be recycled, the impacts from decommissioning are not expected to be significant.

124. The PPA with EDC is expected to be in place for 20 years. At the conclusion of the 20 year period, an economic assessment will be conducted to determine whether the life of the Project will be extended. At this stage, it is anticipated that the Project will be extended for a further 20 years via a new PPA. Given the potentially lengthy duration of operation, the potential impacts associated with decommissioning were not assessed. The potential impacts will be assessed closer to the date of decommissioning so that the existing local context can be taken into consideration.

G. Analysis of Alternatives

125. There is a growing demand for power in Bavet City, which is being driven by the tourism and manufacturing industries. Given the demand, and the Project's ability to help meet the demand, a 'no project alternative' was not considered.

126. The Sponsors identified the land required for the Project during preparation of its tender for EDC. As part of the tendering process, the Sponsors compared a number of potential sites located in close proximity to the Chrak Mtes substation. A key factor in the Sponsors' selection of the current site was existing land uses; the site was largely unused due to reoccurring flooding caused by the site's low elevation. The site is being leveled and a pond is being established to mitigate any impacts on the Project associated with flooding..

127. The Sponsors choose the "High-transmission low-iron" glass technology in their solar modules, and narrows down the accepted range of glass surface roughness. This type of glass transmits more light, producing less glare and reflectance than normal glass. This high-transmission glass meets the military's reflectance requirement, where this value has to be less than 10%. Modules are produced using antireflection coated solar glass have a reflectance value below 4% when with up to 60°angle of incidence.

H. Information Disclosure, Consultation, and Participation

128. This section summarizes the public consultation process that has been undertaken by the Project Sponsor, including concerns raised by stakeholders.

129. The Sponsor has engaged with local stakeholders, including landholders, local village leaders and local authorities, to understand their issues and concerns. This has involved a range of small group meetings to disclose information about the Project, including details of the construction process and the infrastructure that will be installed, information about potential employment opportunities, and information about how the power generated will be used. Photos from some of these meetings are provided in Annex B.

130. A key issue that has consistently been raised by stakeholders is employment. There is an expectation that local communities will be employed by the Project. In response to this, the Sponsor has amended its workforce planning, and will seek to maximize local employment opportunities during construction and operation. It is anticipated that less than 10 of the 100 people employed during construction will be from outside the local area. During operation, it is anticipated that the 6 people employed will be from the local area. This will be facilitated by training provided to local people by the Sponsor's contractor. The Sponsor will work with the local village leaders to ensure that local community members have access to the available job positions.

131. Local stakeholders also anticipate that the Project will bring new development opportunities to the area, and generate ancillary benefits such as road improvements and a reliable, and potentially cheaper, supply of electricity.

132. Landowners expressed concerns about receiving their final payment from the land acquisition process. 10 of the 19 landowners who attended the meeting held during the recent site visit had used the payment received to put a deposit on a new piece of land. However, there was concern that if the final payment from the Sponsors was delayed that they would lose their deposits. Since the stakeholder engagement meeting when these issues were raised, the Sponsors have completed the land acquisition process and all payments have been made in full. See Annex B for more details on the stakeholder's concerns and suggestions identified during the meeting on 24 August 2016.

133. Engagement will continue throughout construction and operation of the Project. This will involve engaging with local village leaders and local authorities to disseminate information about the Project. This will include information regarding the Project schedule, in particular timing of noisy activities and periods when larger volumes of traffic are expected (e.g. when the PV modules are transported to site). In addition, information will be provided on the potential community health and safety risks associated with the Project to help minimize the likelihood of the risks occurring. This IESE report will be disclosed on the ADB website and the results of the assessment will be made available to local stakeholders by the Project Sponsors.

I. Grievance Redress Mechanism

134. A grievance redress mechanism has been devised to provide an avenue for stakeholders to raise grievances with the Sponsors. This section describes the grievance redress framework (both informal and formal channels), setting out the timeframe and mechanisms for resolving complaints.

135. During construction and operation, there will be several options available to stakeholders to lodge grievances. This will include a drop-box, which will be located at the Project site, a telephone number, and postal address to which stakeholders can send letters. In addition, stakeholders will be able to lodge grievances directly with the Project site manager. The drop-box (or grievance box) has already been installed and is regularly checked by the Sponsors and is checked monthly by a member of the commune committee.

136. It is anticipated that stakeholders may also relay grievances to village leaders, local authorities or workers involved in the Project. If this occurs, these individuals will be asked to communicate the grievance to the Project site manager, so that the grievance can be readily investigated and resolved.

137. Once a grievance has been received, the Project site manager will contact the complainant to acknowledge the grievance and collect any additional information required to understand the issue or concern. Steps will then be taken to resolve the grievance – the specific

steps will be dependent on the grievance. All grievances will be investigated in a timely manner, including those lodged anonymously. If a grievance cannot be readily resolved, it will be escalated to the Sponsors.

138. A record of all grievances will be maintained by Project site manager. This will include: (a) date of the grievance, (b) details of the complainant (name and contact details), (c) description of the grievance, (d) actions taken/ resolution, and (e) any required following.

J. Environmental and Social Management Plan (ESMP)

139. This section outlines the ESMP. The ESMP has been designed to mitigate the predicted adverse impacts and enhance the potential benefits associated with construction and operation of the Project, and introduces good practice standards to be adopted across the Project.

140. The ESMP includes monitoring and reporting procedures to track performance over time. It also includes implementation arrangements to ensure that roles and responsibilities for implementation of the mitigation and management measures are clearly defined.

141. **Mitigation Measures.** The proposed construction and operation phase mitigation measures are summarize in Table 12. This includes timing and responsibility for implementation of the measures.

Table 12 Mitigation Measures

Predicted impact issue	Mitigation Measure(s)	Cost	Schedule	Responsibility
Construction				
Water management (soil erosion and flooding)	Establish a pond on-site and monitor drainage patterns. Establish a grievance mechanism to understand potential impacts.	Part of construction cost	Throughout construction	Site Manager Contractors
Traffic management (congestion and accidents)	Ensure workers observe speed limits. When in built up areas, ensure workers maintain a max speed of 30 kph when passing through built up areas. Implement good practice fatigue management. Designate a worker to direct traffic at the entrance/ exit of the Project site. Minimize the transport of heavy equipment to site during peak traffic periods. Notify local stakeholders of construction schedule, including transport routes that will be utilized.	Part of construction cost	Throughout construction	Site Manager Contractors
Environmental emissions (noise and dust	Utilize dust suppression techniques to minimize dust generation, particularly during dry and windy conditions along	Part of construction cost	Throughout construction	Site Manager Contractors

Predicted impact issue	Mitigation Measure(s)	Cost	Schedule	Responsibility
emissions)	road ways and at site. Cover trucks responsible for hauling construction materials. Conduct regular maintenance of vehicles used (to prevent incomplete combustion and excessive noise). Undertake construction activities only during the day to minimize noise related disruption. Notify local stakeholders of the construction schedule, including prior to particularly noisy activities (e.g. pile driving).			
Waste management (contamination)	Practice waste segregation. Where possible, recycle waste. Where recycling is not possible, dispose of waste in an approved landfill through engaging a competent waste collection service.	Part of construction cost	Throughout construction	Site Manager Contractors
Occupational health and safety (accidents and injuries)	Prepare and implement a health and safety management policy to manage occupational and community health and safety issues. Ensure all workers are aware of the requirements set out in the health and safety management policy through appropriate site inductions and training. Require workers to wear appropriate personal protection equipment (PPE), such as hard hats, safety boots, gloves, and hearing protection. Manage exposure to sun and heat by requiring workers to take regularly breaks in shaded areas and wearing hats and long-sleeves, and providing ready access to drinking water. Provide onsite first-aid facilities for workers. Develop and implement an emergency	Part of construction cost	Before and during construction	Site Manager Contractors

Predicted impact issue	Mitigation Measure(s)	Cost	Schedule	Responsibility
	response and preparedness procedure. The procedure will be developed in consultation with potentially affected stakeholders and local authorities.			
Community health and safety (accidents and injuries)	Prepare and implement a health and safety management policy to manage occupational and community health and safety issues. Fence the Project site and ensure that all visitors sign-in and out. Provide 24 hour security at site. Engage local stakeholders so that they are aware of the construction and operation schedule and potential risks. Include signage at the Project site that identifies potential risks. Develop and implement an emergency response and preparedness procedure. The procedure will be developed in consultation with potentially affected stakeholders and local authorities.	Part of construction cost	Before and during construction	Site Manager Contractors
Employment	Develop a procedure to ensure priority employment of former land owner and local women (i.e. if equally qualified with another candidate they will receive preferential treatment). Comply with core labor standards and national labor laws. Establish a transparent approach for identifying, selecting and employing workers. Maintain monthly records detailing: number of employees employed from the local area, number of men and women employed, and payments made (i.e. receipts).	Part of construction cost	Before and during construction	Site Manager Contractors
Land acquisition	Develop and implement a land acquisition framework for the transmission line. Engage with the affected households and seek out an acceptable solution for the transmission line.	Part of construction cost	Before and during construction	Site Manager

Predicted impact issue	Mitigation Measure(s)	Cost	Schedule	Responsibility
Operation				
Water management (soil erosion and flooding)	Establish a pond on-site and monitor drainage patterns. Establish a grievance mechanism to understand potential impacts	Part of construction cost and operation cost	During construction and throughout operation	Site Manager
Waste management (contamination)	Practice waste segregation. Where possible, recycle waste. Where recycling is not possible, dispose of waste in an approved landfill.	Part of operation cost	Throughout operation	Site Manager
Occupational health and safety (accidents and injuries)	Prepare and implement a health and safety management policy to manage occupational and community health and safety issues. Ensure all workers are aware of the requirements set out in the health and safety management policy through appropriate site inductions and training. Require workers to wear appropriate PPE, such as hard hats, safety boots, gloves, and hearing protection. Provide onsite first-aid facilities for workers.	Part of operation cost	Throughout operation	Site Manager
Community health and safety (accidents and injuries)	Prepare and implement a health and safety management policy to manage occupational and community health and safety issues. Fence the Project site and ensure that all visitors sign in and out. Engage local stakeholders so that they are aware of the construction and operation schedule and potential risks. Include signage at the Project site that identifies potential risks.	Part of operation cost	Throughout operation	Site Manager
Employment	Develop a procedure to prioritize employment of former local land owners and local women (i.e. if equally qualified with another candidate they will receive preferential treatment). Comply with core labor standards and	Part of operation cost	Throughout operation	Site Manager

Predicted impact issue	Mitigation Measure(s)	Cost	Schedule	Responsibility
	national labor laws. Establish a transparent approach for identifying, selecting and employing workers. Train local community members to fill the operation role. Maintain employment records detailing: number of employees employed from the local area, number of men and women employed, and payments made (i.e. receipts).			
Climate change	Establish a pond on-site and monitor drainage patterns. Design modules to improve passive airflow beneath mounted structures.	Part of construction cost and operation cost	During construction and throughout operation	Site Manager

142. **Monitoring Plan.** Table 13 provides a monitoring plan. The parameters and methods have been selected to help monitor the predicted impacts as well as implementation of the proposed management measures. All monitoring data will be stored on site (such as site inspection and observation notes).

143. The data generated through the monitoring plan will be used to evaluate the effectiveness of the management measures in mitigating the predicted impacts on an on-going basis during construction and annually during operation. Based on the monitoring results and the evaluation process, any issues of concern will be investigated and where required corrective actions will be implemented. Any required changes or modifications to the management measures will be reflected in the ESMP.

144. The results of the monitoring and evaluation process will be reported to the ADB at the conclusion of construction and annually throughout the operation phase. This will include the results of the monitoring activities, details of any impacts that occurred as well as changes or modifications made to the ESMP.

Table 13 Monitoring Plan

Impact Issue	Parameter	Location	Method of Monitoring	Frequency
Construction				
Water (soil erosion and flooding)	Soil erosion and flooding	Project site and immediately surrounding land	Site inspection and observation	Weekly monitoring throughout construction
Water (soil erosion and flooding)	Grievances relating to erosion and flooding	NA	Grievance mechanism	Monthly monitoring throughout

Impact Issue	Parameter	Location	Method of Monitoring	Frequency
				construction
Traffic (congestion)	Grievances related to congestion	NA	Grievance mechanism	Monthly monitoring throughout construction
Traffic (accidents)	Accidents/ injuries (due to Project traffic)	Commune road and Highway 1	Record of accident	Monthly monitoring throughout construction
Emissions (dust)	Dust	Project site, access road and commune road	Site inspection and observation	Weekly monitoring throughout construction
Emissions (noise)	Noise	Project site, access road and commune road	Site inspection and observation	Weekly monitoring throughout construction
Waste (management)	Volume of solid waste generated	Project site	Site inspection and observation	Weekly monitoring throughout construction
Waste (management)	Appropriate disposal of solid waste	Project site	Receipts from recycling or landfill	Monthly throughout construction
Occupational health and safety (accidents and injuries)	Unsafe behaviors or practices	Project site	Site inspection and observation of health and safety practices	Monthly monitoring throughout construction
Occupational health and safety (accidents and injuries)	Health and safety incidents	Project site	Site records detailing incidents	Monthly monitoring throughout construction
Occupational health and safety (accidents and injuries)	Percentage of staff receiving site inductions	Project site	Induction records maintained on site	Monthly monitoring throughout construction
Community health and safety (accidents and injuries)	Grievances relating to health and safety	NA	Grievance mechanism	Monthly monitoring throughout construction
Community health and safety (accidents and injuries)	Community health and safety incidents	NA	Site records detailing incidents	Monthly monitoring throughout construction
Employment	Positions created, positions filled by locals, wages paid	NA	Employment strategy	Monthly monitoring throughout construction

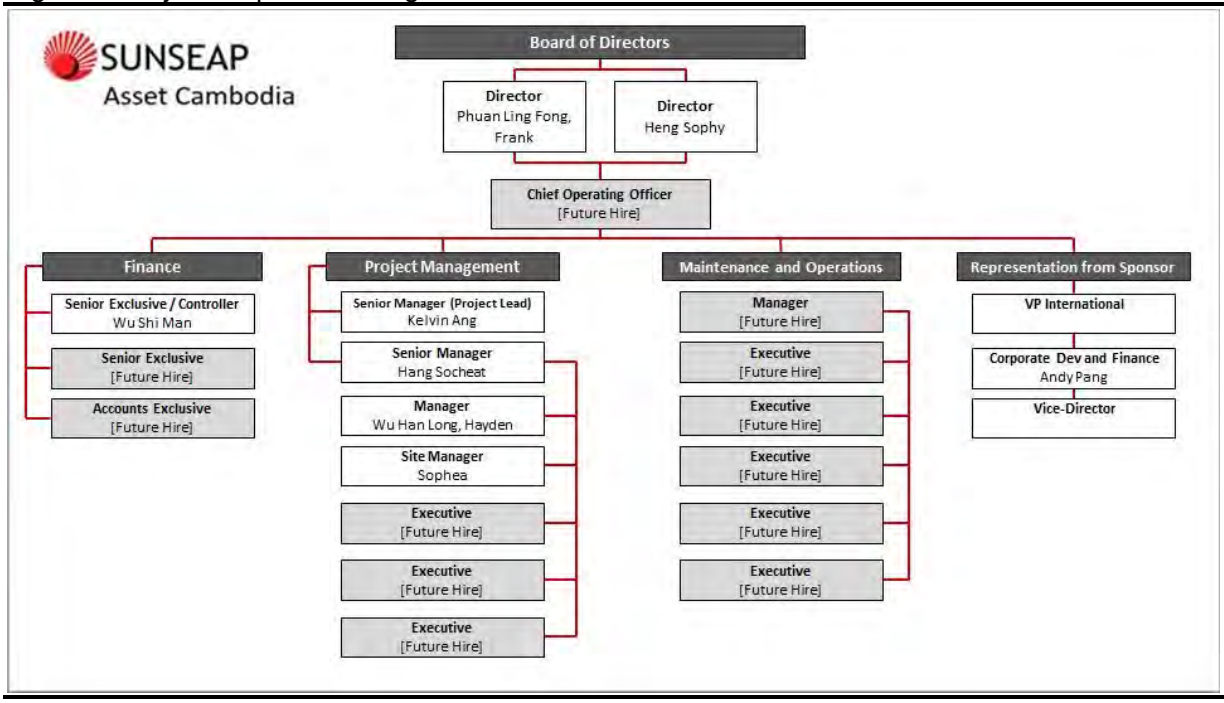
Impact Issue	Parameter	Location	Method of Monitoring	Frequency
Employment	Priority filled positions for former land sellers and local women.	NA	Employment strategy	Monthly monitoring throughout construction
Operation				
Water (soil erosion and flooding)	Soil erosion and flooding	Project site and immediately surrounding land	Site inspection and observation	During the rainy season throughout operation
Water (soil erosion and flooding)	Grievances relating to erosion and flooding	NA	Grievance mechanism	Monthly throughout operation
Water	Volume of water used for cleaning	Project site	Flow meters	Monthly throughout operation
Traffic (congestion)	Congestion	NA	Grievance mechanism	Monthly monitoring throughout operation
Traffic (accidents)	Accidents/ injuries (due to Project traffic)	Commune road and Highway 1	Record of accident	Monthly monitoring throughout operation
Waste (management)	Volume of solid waste generated	Project site	Site inspection and observation	Bi-annually throughout operation
Waste (management)	Appropriate disposal of solid waste	Project site	Receipts from recycling or landfill	Bi-annually throughout operation
Occupational health and safety (accidents and injuries)	Unsafe behaviors or practices	Project site	Site inspection and observation of health and safety practices	Bi-annually throughout operation
Occupational health and safety (accidents and injuries)	Health and safety incidents	Project site	Site records detailing incidents	Bi-annually throughout operation
Occupational health and safety (accidents and injuries)	Percentage of staff receiving site inductions	Project site	Induction records maintained on site	Bi-annually throughout operation
Community health and safety (accidents and injuries)	Grievances relating to health and safety	NA	Grievance mechanism	Monthly monitoring throughout operation
Community health and safety (accidents and	Community health and safety incidents	NA	Site records detailing incidents	Bi-annually throughout operation

Impact Issue	Parameter	Location	Method of Monitoring	Frequency
injuries)				
Employment	Positions created, positions filled by locals, wages paid	NA	Employment strategy	Bi-annually throughout operation
Employment	Priority filled positions for former land sellers and local women.	NA	Employment strategy	Bi-annually throughout operation
Climate change	Temperature changes	PV modules	Temperature readings	Bi-annually throughout operation

K. Institutional Arrangements and Responsibilities

The Project Sponsors head office is located in Phnom Penh, where the Project Management team will be based. The Project Management team will oversee and be responsible for implementation of the ESMP. Day-to-day implementation will be led by the Sponsors' contractor during construction, and the Maintenance and Operations Manager during the operation phase (Figure 8).

Figure 8 Project's Sponsors' Organization Structure



L. Conclusion and Recommendation

145. The nature of solar power plants means that they typically result in minimal adverse impacts on the environment and surrounding communities. The construction phase will involve site preparation (e.g. grading and levelling) and installation and commissioning of infrastructure

(including the PV modules and a transmission line). These activities are likely to generate air and noise emissions and present occupational and community health and safety risks. However, these impacts are not expected to be significant, given the short duration of the construction phase (i.e. three months) and the proposed mitigation measures. In terms of mitigation this includes the use of dust suppression techniques, traffic management, use of personal protective equipment, fencing of the Project site, and continued engagement with stakeholders. A pond is being installed on site to capture run-off and minimize the potential for soil erosion and/ or flooding to occur on surrounding properties. The operation phase will involve ongoing maintenance of the PV modules, including regular washing of the modules to remove dust and other debris. No chemicals will be used in this process. Personnel will continue to be required to use appropriate personal protective equipment. The proposed mitigation measures will minimize the potential for any potential impacts.

146. The Project is expected to generate a range of positive impacts including local employment opportunities, as well as training and development opportunities for local community members and local authorities, in particular the EDC. The Project has engaged with stakeholders throughout the design of the Project, and is committed to continuing this engagement. This will help facilitate access to the range of employment opportunities that will be created.

Annex A
Map of the Properties and Information Details of Landowners

Onwer and Land size

1. sok chheng (16201 m2)
2. kun sapan (3103 m2)
3. lorng lat (5614 m2)
4. Soun sarat / soun touch (1701 m2)
5. soun pari (4709 m2)
6. net sopeak (8406 m2)
7. sek san (7336 m2)
8. nat yan and som eourn (637 m2)
9. soun sarun (9868 m2)
10. ngun suy (4417 m2)
11. soun saron (1529 m2)
12. Mao Vireak (3925 m2)
13. soun kreun (13025 m2)
14. soun kreun (8458 m2)
15. pot kmaov (2221 m2)
16. pot vireak (836m2)
17. soun kreun (7007 m2)
18. pot kmaov (8756 m2)
19. hing sakin (3583 m2)
20. kong savern (387 m2)
21. soun kreun (1460 m2)
22. prom heoung (6773 m2)
23. klang cheng (3525 m2)
24. kim samean (4766 m2)
25. prom teour (7629 m2)
26. kim pov (1388 m2)
27. kim samean (17000 m2)
28. kim saken (4073 m2)
29. keav pung (17512 m2)
30. cheak ratana (2903 m2)
31. chan chea (10408 m2)
32. Im sara (25033 m2)
33. prom sarit (2308 m2)
34. chan chea (1868 m2)

No.	Landowner name	Sex	Age	Land plot No.1	Land plot No.2	Land plot No.3	Land plot No.4	Total
1	Prum Toeur	F	74	7,629	0	0	0	7,629
2	Im Sara	M	49	25,033	0	0	0	25,033
3	Khuon Saphan	M	40	3,103	0	0	0	3,103
4	Kung Savern	M	36	387	0	0	0	387
5	Sok Chheng	M	64	16,201	0	0	0	16,201
6	Soun Sarun	M	37	9,868	1,529	0	0	11,397
7	So Kroeun	M	59	7,007	8,458	1,460	13,025	29,950
8	Prom Sarith	M	46	2,308	0	0	0	2,308
9	Suon Phary	M	29	4,709	0	0	0	4,709
10	Put Kmao	M	76	2,221	8,756	0	0	10,977
11	Koem Samean	M	49	4,766	17,000	0	0	21,766
12	Khiev Phoung	M	76	17,512	0	0	0	17,512
13	Put Vireak	M	28	836	0	0	0	836
14	Kem Peou	F	27	1,388	0	0	0	1,388
15	Chiek Ratana	M	29	2,903	0	0	0	2,903
16	Nguon Suy	M	32	4,417	0	0	0	4,417
17	Thoem Sakhen	F	33	4,073	0	0	0	4,073
18	Khlang Chheng	F	61	3,525	0	0	0	3,525
19	Chan Chea	M	51	10,408	1,868	0	0	12,276
20	Net Yan	M	57	2,637	0	0	0	2,637
21	Soun Saratt	M	28	1,701	0	0	0	1,701
22	Mao Vireak	M	28	3,925	0	0	0	3,925
23	Prum Oeun	F	53	6,773	0	0	0	6,773
24	Hing Sakin	F	69	3,583	0	0	0	3,583
25	Net Sopheak	M	32	8,406	0	0	0	8,406
26	Lang Lath	F	55	5,614	0	0	0	5,614
27	Sek Sann	M	35	7,336	0	0	0	7,336
	Total			**168,269**	**37,611**	**1,460**	**13,025**	**220,365**

Annex B

Minutes of Meeting on Land purchasing negotiation and agreement

The meeting was held on **15th July 2016 at 10:00am** between the land holders, the representative from Sunseap Energy (Cambodia) Co.,Ltd. and the middle-man under the witness of the village chief, the Bavet city deputy chief and the officer from Land management office.

The company explained the purpose of land usage and contribution of the project to the village after the plant is completed such as employment and tourist attraction.

The land holders showed their intention to sell their land to the company. The land prices were various depended on the location of their land. The middle-man offered to all land holders with their agreed price and they offered to the company at a fix price (**1.55USD/m2**).

Both the company and land holders finally agreed on the buy/sale agreement and made the finger print on the agreement between the land holders and the company representative for official ownership transferring procedure.

The meeting ended up friendly at 12:00am.

A meeting was held on 24 August 2016 to review the land acquisition process. The list of participants is provided below.

No	Name	Sex	Position
1	Kong Run	M	Thlok Vil. chief
2	Sok Chheng	M	Bat Sloek Vil chief
3	Nguon Bouy	M	Villager
4	Suon Sarun	M	Villager
5	Khiev Roeun	M	Villager
6	Khiev Phann	F	Villager
7	Khleang Chheng	F	Villager
8	So Kroeun	M	Villager
9	Put Kmao	M	Villager
10	Hing Sakin	F	Villager
11	Prum Oeung	F	Villager
12	Long Lat	F	Villager
13	Suon Phary	M	Villager
14	Net Yan	M	Villager
15	Net Sopheak	M	Villager
16	Khiev Phuong	M	Villager
17	Sek Sann	M	Villager
18	Kim Samean	M	Villager
19	Chan Sorinda	M	Villager
20	Nhim Pao	M	Villager
21	In Sokvichea	M	Villager
22	Hout Samai	M	Commune chief
23	Ung Sa	M	Deputy governor
24	Yim Kimyan	M	Commune councilor
25	Ian Bryson	M	ADB Representative
26	Tram Le	F	ERM Vietnam
27	Kelvin Ang	M	Sunseap
28	Hayden	M	Sunseap
29	Sopheak	M	Sunseap
30	Morakath	F	ERM's sub-consultant
31	Roath	M	ERM's sub-consultant

Concerns and suggestions raised by stakeholders during the meeting on 24 August 2016 are summarised below.

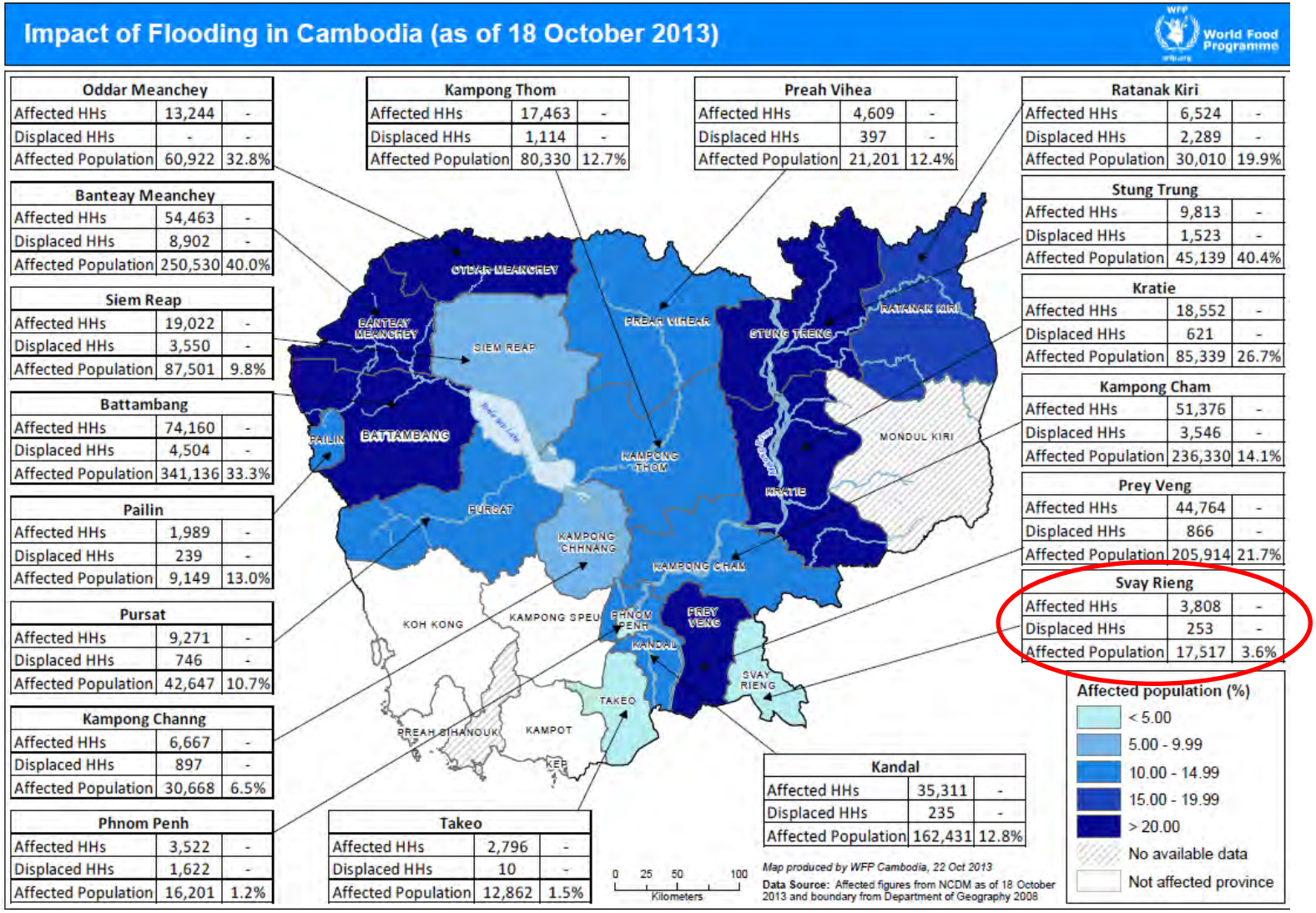
No.	Concerns and suggestion	Response from the Project Sponsor
1	All landowners in attendance raised concerns about the final payment for their land - given most of them already made a deposit on a new lot.	The Project Sponsor will give the final payment to landowners once the land title is obtained.
2	Some landowners in attendance expressed their concerns about flooding at the Project site and	The Project Sponsor will improve the irrigation system surrounding the

	surrounding area. The concern was that flooding would increase if the Project backfills the site so that it is one meter higher than the surrounding area.	Project site, i.e. making the irrigation system deeper and wider to ensure rain water will run off in the canal system and not onto surrounding properties. Moreover, there will be a pond installed onsite to capture run-off generated at the site, and minimize impacts on the surrounding properties.
3	Some landowners in attendance suggested that the Project Sponsors improve the commune road.	The Project Sponsor responded that they will only be able to upgrade the access road (i.e. the road that connects the Project with the commune road and Highway 1), as it is currently a muddy track. The road is approximately 1 km in length.
4	Some landowners in attendance suggested that the Project Sponsors recruit them/ their children to work for the Project during the construction phase.	The Project Sponsor will give priority to local recruitment, especially for former landowners during the construction phase.

Annex C - Summary Table of Land Acquisition and Payments

Name	Land area (m	$ 1.55	Total land	Total amount due	First paymentamount	Second payment amoun	Third payment amount	Fourth payment	Total	Outstanding
chan chea (1868 m2)	1,868	$ 2,895.40								
chan chea (10408 m2)	10,408	$ 16,132.40	12,276	$19,027.80	$ 500.00	$ 4,500.00	$14,027.80		$19,027.80	$ -
cheak ratana (2903 m2)	2,903	$ 4,499.65	2,903	$ 4,499.65	$ 1,000.00	$ 1,000.00	$ 2,499.65		$ 4,499.65	$ -
hing sakin (3583 m2)	3,583	$ 5,553.65	3,583	$ 5,553.65	$ 200.00	$ 1,000.00	$ 1,500.00	$ 2,853.65	$ 5,553.65	$ -
Im sara (25033 m2)	25,033	$ 38,801.15	25,033	$38,801.15	$ 1,000.00	$ 37,801.15			$38,801.15	$ -
keav pung (17512 m2)	17,512	$ 27,143.60	17,512	$27,143.60	$ 300.00	$ 1,000.00	$25,843.60		$27,143.60	$ -
kim pov (1388 m2)	1,388	$ 2,151.40	1,388	$ 2,151.40	$ 1,000.00	$ 1,000.00	$ 151.40		$ 2,151.40	$ -
kim saken (4073 m2) [Kung Savern]	4,073	$ 6,313.15	4,073	$ 6,313.15	$ 1,000.00	$ 2,000.00	$ 3,313.15		$ 6,313.15	$ -
kim samean (17000 m2)	17,000	$ 26,350.00								
kim samean (4766 m2)	4,766	$ 7,387.30	21,766	$33,737.30	$ 1,000.00	$ 32,737.30			$33,737.30	$ -
klang cheng (3525 m2)	3,525	$ 5,463.75	3,525	$ 5,463.75	$ 500.00	$ 500.00	$ 2,000.00	$ 2,463.75	$ 5,463.75	$ -
kong savem (387 m2) [Thoem Sakhen]	387	$ 599.85	387	$ 599.85	$ 200.00	$ 399.85			$ 599.85	$ -
kun sapan (3103 m2)	3,103	$ 4,809.65	3,103	$ 4,809.65	$ 1,000.00	$ 3,809.65			$ 4,809.65	$ -
lomg lat (5614 m2)	5,614	$ 8,701.70	5,614	$ 8,701.70	$ 300.00	$ 4,300.00	$ 4,101.70		$ 8,701.70	$ -
Mao Vireak (3925 m2)	3,925	$ 6,083.75	3,925	$ 6,083.75	$ 1,000.00	$ 1,000.00	$ 4,083.75		$ 6,083.75	$ -
nat yan and som eoum (2637 m2)	2,637	$ 4,087.35	2,637	$ 4,087.35	$ 500.00	$ 2,000.00	$ 1,587.35		$ 4,087.35	$ -
net sopeak (8406 m2)	8,406	$ 13,029.30	8,406	$13,029.30	$ 1,000.00	$ 1,000.00	$ 2,000.00	$ 9,029.30	$13,029.30	$ -
ngun suy (4417 m2)	4,417	$ 6,846.35	4,417	$ 6,846.35	$ 200.00	$ 1,000.00	$ 5,646.35		$ 6,846.35	$ -
pot kmaov (2221 m2)	2,221	$ 3,442.55								
pot kmaov (8756 m2)	8,756	$ 13,571.80	10,977	$17,014.35	$ 400.00	$ 4,000.00	$12,614.35		$17,014.35	$ -
pot vireak (836m2)	836	$ 1,295.80	836	$ 1,295.80	$ 1,000.00	$ 295.80			$ 1,295.80	$ -
prom heoung (6773 m2) [Prum Oeun]	6,773	$ 10,498.15	6,773	$10,498.15	$ 300.00	$ 600.00	$ 9,598.15		$10,498.15	$ -
prom sarit (2308 m2)	2,308	$ 3,577.40	2,308	$ 3,577.40	$ 500.00	$ 3,077.40			$ 3,577.40	$ -
prom teour (7629 m2)	7,629	$ 11,824.95	7,629	$11,824.95	$ 1,000.00	$ 10,824.95			$11,824.95	$ -
sek san (7336 m2)	7,336	$ 11,370.80	7,336	$11,370.80	$ 300.00	$ 1,000.00	$10,070.80		$11,370.80	$ -
sok chheng (m2)	16,201	$ 25,111.55	16,201	$25,111.55	$ 300.00	$ 24,811.55			$25,111.55	$ -
soun kreun (13025 m2)	13,025	$ 20,188.75								
soun kreun (7007 m2)	7,007	$ 10,860.85								
soun kreun (8458 m2)	8,458	$ 13,109.90								
soun kreun (1460 m2)	1,460	$ 2,263.00	29,950	$46,422.50	$ 900.00	$ 400.00	$ 1,600.00	$43,522.50	$46,422.50	$ -
soun pari (4709 m2)	4,709	$ 7,298.95	4,709	$ 7,298.95	$ 300.00	$ 100.00	$ 2,000.00	$ 4,898.95	$ 7,298.95	$ -
Soun sarat I soun touch (1701 m2)	1,701	$ 2,636.55	1,701	$ 2,636.55	$ 500.00	$ 2,136.55			$ 2,636.55	$ -
soun saron (1529 m2)	1,529	$ 2,369.95								
soun sarun (9868 m2)	9,868	$ 15,295.40	11,397	$17,665.35	$ 300.00	$ 1,000.00	$16,365.35		$17,665.35	$ -
Total	**220,365**	**$341,565.75**								

Annex D Impact of Flooding in Cambodia in October 2013.



Source: World Food Program, 2013 (See http://reliefweb.int/sites/reliefweb.int/files/resources/WFP_KHM_Impact_of_Flooding_18Oct2013_A4_V01_20131022.pdf) (viewed 05 September 2016).

Annex E – Photolog of Project Site

Picture 1- A typical canal section in the system in the Project area

Picture 2 – Solid waste dumping site located nearby the Project site

Picture 3 – Access road situation to the Project aite

Picture 4 – Meeting with 19 landowners at the Thlok Village Chief's residence on 24 August 2016

Picture 5 – Project site on the day of the site visit

Picture 6 – Cultivated rice paddies surronding the Project site

Picture 7 – The nearest residential area to the Project site

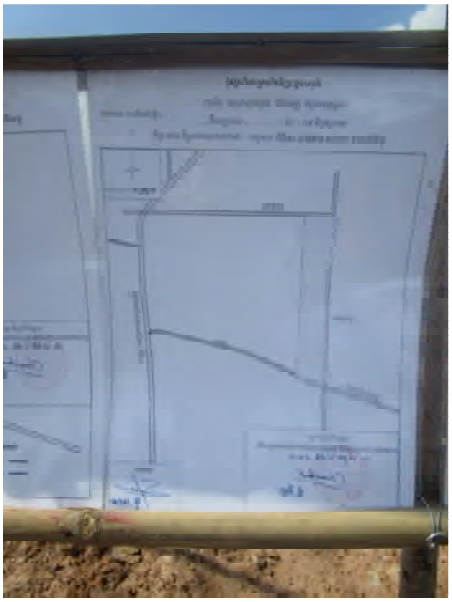
Picture 8 – Chrak Mtes substation being constructed

Picture 9 –Internal Chrak Mtes commune road

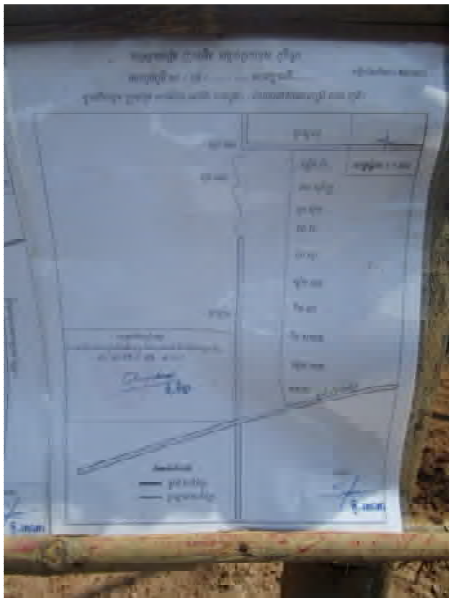
Picture 10 – A typical local house in Chrak Mtes commune

Picture 11 –Meeting with 19 landowners at the Thlok Village Chief's residence on 24 August 2016

Picture 12 –Meeting with 19 landowners at the Thlok Village Chief's residence on 24 August 2016



Picture 13 –Project information posted at the Project site



Picture 14 – Project information posted at the Project site

Annex F - Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES), for endorsement by Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: **Sunseap Solar Power Plant in Cambodia**

Sector Division:

Screening Questions	Yes	No	Remarks
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			The Project site has been cleared. The site is surrounded by agricultural land used to cultivate rice. The Project was previously used to cultivate rice.
▪ Physical cultural heritage site		√	The closest cultural heritage site is 1.5 km away and will not be impacted by the Project.
▪ Located in or near to legally protected area		√	
▪ Located in or near to special habitats for biodiversity (modified or natural habitats)		√	
▪ Wetland		√	
▪ Mangrove		√	
▪ Estuarine		√	
▪ Offshore (marine)		√	
B. Potential Environmental Impacts Will the Project cause…			
▪ large scale land disturbance and land use impacts specially due to diversion of productive lands?		√	

Screening Questions	Yes	No	Remarks
▪ involuntary resettlement of people? (physical displacement and/or economic displacement)		√	Land acquisition occurred and was voluntary. A total of 27 landowners were identified as owning land within the Project site. Agreements are now in place with each of the 27 landowners. For the transmission line, the ROW will be utilized. However, informal settle on local ROWs has occurred in some areas of Bavet District. This means that temporary and/ or permanent displacement may occur.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	No vulnerable households were affected by the land acquisition process. No Indigenous peoples were identified with the Project area.
▪ noise, vibration and dust from construction activities?	√		The construction phase will be in three months. Management measures have been proposed to minimize noise and dust.
▪ an increase in local traffic during construction?	√		There will be an increase in traffic during construction. Traffic management measures will be implemented to minimize any potential impacts.
▪ environmental disturbances such as soil erosion, land contamination, water quality deterioration, air pollution, noise and vibrations during construction phase?	√		Soil erosion may occur but the construction phase will avoid the peak time of the rainy season.
• aesthetic degradation and property value loss due to establishment of plant and ancillary facilities?		√	
▪ changes in flow regimes of the water intake from surface water or underground wells due to abstraction for cooling purposes?	√		There will be changes in flow regimes at the site. Water will be directed to an onsite pond, to minimize soil erosion and flooding to nearby properties. Also, the nearby irrigation canals will be expanded.
▪ pollution of water bodies and aquatic ecosystem from wastewater treatment plant, from cooling towers, and wash-water during operation?		√	
▪ a threat to bird or bat life from colliding with the project facilities and/or being burned by concentrated solar rays?		√	
▪ industrial liquid (dielectric fluids, cleaning agents, and solvents) and solid wastes (lubricating oils, compressor oils, and hydraulic fluids) generated during construction and operations likely to pollute land and water resources?		√	
▪ Soil/water contamination due to use of hazardous materials or disposal of broken or damaged solar cells (photovoltaic technologies contain small amounts of cadmium, selenium and arsenic) during installation, operation and decommissioning?		√	No hazardous materials will be used. The PV modules do not contain hazardous materials.

Screening Questions	Yes	No	Remarks
▪ noise disturbance during operation due to the proximity of settlements or other features?		√	Noise is not expected to be an issue during operation.
▪ visual impacts due to reflection from solar collector arrays resulting in glint or glare?		√	The PV modules will use a high-transmission, low-iron glass. Given the glass used, and the angle of the modules, glare is not expected to be an issue.
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		√	Local workers will be used during construction and operation. However, the workers will be sourced from surrounding villages. Due to the short construction period and limited workforce requirements during operation, influx is not expected to be an issue.
▪ social conflicts between local laborers and those from outside the area?		√	Most of the workforce will be sourced from local villages.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during construction, installation, operation, and decommission?	√		Management measures have been established to minimize potential occupational health and safety hazards.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials and wastes such as explosives, fuel and other chemicals during construction, and operation?		√	
▪ community safety risks due to both accidental and natural causes, 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?	√		The site will be fenced and 24 hour security will be in place to minimize unauthorized access to the site. Signage will be established on site that identifies potential risks.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: Sunseap Solar Power Plant in Cambodia

Sector: Power

Subsector: Renewable Energy

Division/Department:

Screening Questions		Score	Remarks[1]
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	The site has been impacted by flooding in the past. The site has been backfilled, an on-site pond is being established, and the surrounding irrigation canals are being expanded to help manage rainfall and subsequent run-off from the site. The dimensions of the pond have been determined based on historical rainfall data. The pond has capacity should rainfall levels increase in the future. Due to design of the Project, climate related conditions are unlikely to impact the Project.
	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)?	0	
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.

[1] 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.

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

Other Comments:_____
_____