

Initial Environmental and Social Examination Report

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Proposed Loan and Administration of Loans Da Nhim - Ham Thuan - Da Mi Hydro Power Joint Stock Company Floating Solar Energy Project (Viet Nam)

Prepared by ERM for Asian Development bank (ADB) and Da Nhim - Ham Thuan - Da Mi Hydro Power Joint Stock Company

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ABBREVIATIONS

ADB	–	Asian Development Bank
CHA	–	Critical Habitat Assessment
CDP	–	Community Development Plan
DHD	–	Da Nhim – Ham Thuan - Da Mi Hydropower Joint Stock Company
EVN	–	Electricity Vietnam
ESDD	–	Environmental and Social Due Diligence
ESMP	–	Environmental and Social Management Plan
IESE	–	Initial Environmental and Social Examination
IUCN	–	International Union for Conservation of Nature
NBSAP	–	National Biodiversity Strategy and Action Plan
NESAP	–	National Environment Strategy and Action Plan
NP-SNDD	–	National Program for Sub-National Democratic Development
OSH	–	Occupational Safety and Health
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

ha	–	Hectare
km	–	Kilometre
m	–	Meter
MW	–	Megawatt
kv	-	Kilovolt

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GLOSSARY

Affected Household (AH)	<ul style="list-style-type: none"> It includes all people displaced by the land acquisition for all components of the Project and affected by construction and operation activities of the Project.
Cut-off Date for Eligibility	<ul style="list-style-type: none"> In Vietnam, the completion date of Inventory of Losses (IOL) and Detailed Measurement Survey (DMS) is defined as Cut-off Date and people who occupy the land within the Project land boundary after this date will not be eligible for compensation or assistance.
Detailed Measurement Survey	<ul style="list-style-type: none"> With the aid of the approved detailed engineering design, this activity involves the finalization and/or validation of the results of the IOL, severity of impacts, and list of AHs conducted during the project's feasibility studies. The final cost of compensation and assistance for the Project will be determined following completion of the DMS.
Displaced Person (DP)	<ul style="list-style-type: none"> In the context of involuntary resettlement of this Project, displaced persons are those who are economically displaced (through loss of land, assets, access to assets, income sources, or means of livelihoods) as a result of involuntary acquisition of land, or involuntary restrictions on land use or access to the resource. Further, this refers to any person or people, who satisfy the condition of "Cut-off Date for Eligibility".
Ethnic Minority	<p>Vietnam has voted in favour of UN Declaration on Rights of Indigenous Peoples and is yet to ratify International Labour Organisation (ILO) Convention 169. In general, the term Indigenous Peoples is not used in Vietnam. In the context of Vietnam, they are referred to as 'ethnic minorities' (dân tộc thiểu số) and these two terms are often used interchangeably.</p> <p>Decree 05/2011/ND-CP on Ethnic Minority Work dated 14th January 2011 by the Government provided official definitions of ethnic related terms. Ethnic minority group means an ethnic group with a population smaller than that of the ethnic majority group within the territory of the Socialist Republic of Vietnam. Ethnic majority group means an ethnic group with a population accounting for over 50% of the country's total population according to national population survey. Ethnic minority area means an area in which different ethnic minority groups live together, forming a stable community in the territory of the Socialist Republic of Vietnam.</p> <p>According to the Survey of Social Economic Situation of 53 ethnic minority groups conducted by the General Statistics Office in 2015, there were 30,945 ethnic minority areas, among which urban areas occupied 11% and rural areas 89%. There were 54 officially recognized ethnic groups in Vietnam, of which Kinh was considered as ethnic majority group making up 85.4% of the total population in 2015 (91.71m people). The remaining 14.6% of the population (or 13.39m people) comprised of 53 ethnic minority groups. In ethnic minority areas, the ratio between male:female was 50.3:49.7. The majority of ethnic minority groups lived in rural areas (89.6%), much higher than that of the total population (66.1%).</p>
Ethnic minority area and poverty classification	<ul style="list-style-type: none"> Classification of poverty level of ethnic minority areas was initially conducted through Programme 135. The Programme started in 1998 with three phases. Programme phase 3 covers period 2011-2020. Target beneficiaries are the most impoverished and disadvantaged ethnic minorities and mountainous communes and villages, defined through specific criteria that include population size, remoteness, poverty rate, existing basic infrastructure, education and health indicators (enrolment rate, child and maternal mortality rates, etc.). Based on these criteria, local governments conducted assessments and categorized communes into the below categories and identified if hamlets with exceptional difficulties within these communes. <ul style="list-style-type: none"> Zone 3: area with exceptionally difficult living conditions; Zone 2: area with more stabilized living conditions but difficulties still existing; and Zone 1: the remained ethnic minority areas (with better living conditions).
Indigenous People	<ul style="list-style-type: none"> A generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees: (i) self-identification as members of a distinct indigenous cultural group and recognition of this identity by others; (ii) collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories; (iii) customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture;

and (iv) a distinct language, often different from the official language of the country or region. In considering these characteristics, national legislation, customary law, and any international conventions to which the country is a party will be taken into account.

Inventory of Losses	<ul style="list-style-type: none"> This is the process whereby all fixed assets (i.e., lands used for residence, agriculture; dwelling units; stalls and shops; secondary structure, such as fences, wells; trees with commercial value; etc.) and sources of income and livelihood inside the project footprint are recorded. Assets are identified, measured, their owners recorded, the exact location pinpointed, and replacement cost calculated. Additionally, the severity of impact to the affected assets and the severity of impact to the livelihood and productive capacity of AHs will be determined.
Involuntary Resettlement	<ul style="list-style-type: none"> Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or means of livelihood) as a result of project-related land acquisition¹ or restriction of access to natural resources. For this Project, only economic displacement is occurred. Resettlement is considered involuntary when affected individuals or communities do not have the right to refuse land acquisition that results in displacement. This occurs in Viet Nam for this Project as lawful expropriation or restrictions on land use based on eminent domain.
National Property Line	<ul style="list-style-type: none"> Norms for multidimensional poverty: <ol style="list-style-type: none"> Income <ul style="list-style-type: none"> Poverty level: VND 700,000/person/month and VND 900,000/person/month in rural and urban areas, respectively; Near-poverty level: VND 1,000,000/person/month and VND 1,300,000/person/month in rural and urban areas, respectively. Norms on deprivation of access to basic social services <ul style="list-style-type: none"> Basic social services (5 services): health; education; housing; clean water and sanitation; and information; Indicators measuring the level of deprivation of access to basic social services (10 indicators): access to medical services; health insurance; education level of adults; school attendance of children; housing quality; average housing area per capita; residential water sources; hygienic latrines and toilets; telecom services; and assets to serve information access.
Safety Corridor of Transmission Line	<ul style="list-style-type: none"> The safety corridor of an overhead power transmission line means the space along the line and is delimited as follows: <ul style="list-style-type: none"> The length of the corridor is calculated from the position at which the line stretches from the protection boundary of a station to the position at which the line runs through the protection boundary of the next station; The width of the corridor is delimited by two vertical planes on both sides of the line, running in parallel with the line and with a distance from the outmost wire to each side when the wire is in the static state; The height of the corridor is calculated from the bottom of the post base to the highest point of the work plus a vertical safety distance.
Significant Resettlement Effect	<ul style="list-style-type: none"> For this project, losing 10% or more of their total productive assets (income generating) is considered significant resettlement effect.
Vulnerable Group	<ul style="list-style-type: none"> These are distinct groups of people who might suffer disproportionately or face the risk of being further marginalized by the effects of resettlement. These include: (i) female headed households with dependents, (ii) disabled household heads, (iii) households falling under the generally national indicators for poverty, (iv) elderly households who are landless and with no visible means of support, (v) landless households and (vi) Indigenous People or ethnic minorities. The risk of being further marginalized or being suffered disproportionately will occur if those people have their primary structure affected or be severely affected by the project.

A. Executive Summary

1. Da Nhim – Ham Thuan - Da Mi Hydropower Joint Stock Company (DHD - the Project Sponsor/Project Company) maintains and operates three hydropower plants in Southern and Central Vietnam. Shareholder of the Project Company is Power Generation Corporation 1 (GENCO 1) which is a one-member limited liability company and owned by Electricity of Vietnam (EVN). The older 160MW Da Nhim hydropower station was built in 1961 and began operating in 1964. Almost thirty years later, the 475MW Ham Thuan-Da Mi hydropower complex was developed to address the increasing power demand in Southern Vietnam. The latter was constructed in 1997, and began operating in 2001.

2. DHD plans to install a 47.5 MW floating solar photovoltaic power plant on the reservoir of its Da Mi hydro power plant in Binh Thuan province, Vietnam. The floating solar PV plant and ancillary facilities will have a total footprint of 51.55 ha which includes 5.8 ha to be acquired for the transmission lines. While there is no physical displacement, land acquisition for the transmission line and the access road will result in the economic displacement of 42 households. Construction and installation of the Project's ancillary facilities is expected to last for a year and the Project lifecycle is expected for 20 years. The Project Sponsor has requested financial assistance for the Project from the Asian Development Bank (ADB).

3. A regulatory Environmental Impact Assessment (EIA) for the Project was prepared and approved by the local authorities in 2017 (provided in **Annex A**). However, given the requirements of ADB for environmental and social management are more stringent than those of Vietnamese regulations and in order to identify the gaps in environmental and social performance of the Project against ADB Safeguard Policy Statement (SPS) requirements, in March 2018, Mott Macdonald (MM) was appointed by ADB to conduct an Environmental and Social Due Diligence (ESDD-provided in **Annex B**) for the existing Project.

4. A number of gaps/findings have been identified in the ESDD report on the environmental and social performance of the Project against ADB SPS. As a result, Corrective Action Plan (CAP) was prepared which identified appropriate measures to address these gaps. The Initial Environmental Social Examination (IESE) has been designed based on the results of the ESDD and undertaken in order to identify significant impacts and propose measures for mitigation and management of the identified significant impacts to allow the environmental and social performance of the Project to be in compliance with the ADB's Safeguard Policy Statement (SPS 2009), and other applicable standards and regulations as described in Section B of the report.

5. ERM was engaged to support DHD with development of some management plans including a Stakeholder Engagement Plan, Environmental and Social Management Plan, Livelihood Restoration Plan, Community Development Plan and additional baseline and impact assessment such as Biodiversity baseline collection and impact assessment in accordance with the ADB requirements.

6. The nature of solar power plants typically have site-specific 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 floats, Photovoltaic (PV) panels, inverters, transformers, access road and transmission lines). These activities are likely to generate air and noise emissions, impacts on aquatic habitats 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. a year) and the proposed mitigation measures. Key mitigation measures include the use of dust suppression techniques, traffic management, and use of personal protective equipment, fencing of the Project site, and continued engagement with stakeholders. The operation phase will involve ongoing maintenance

of the PV panels, including regular washing of the panels 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.

7. 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. The Project 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.

8. A screening has been conducted for the Project based on its potential environmental and social impacts against the requirements of ADB Safeguard Categorization for Environment, Involuntary Resettlement, and Indigenous Peoples. The result shows that, the Project is classified as Category B on Environment and Involuntary Resettlement due to a few significant impacts have been identified in terms of Environment and Involuntary Resettlement, and classified as Category C on Indigenous Peoples. Refer to Sections D and Section J for further information on categorization and impact assessment for the Project.

B. Policy, Legal, and Administrative Framework

9. This section discusses ADB's requirements, national and local legal framework that guided the assessment of the Project's potential impacts. It also identifies other international requirements relevant to the Project.

ADB Safeguard Requirements

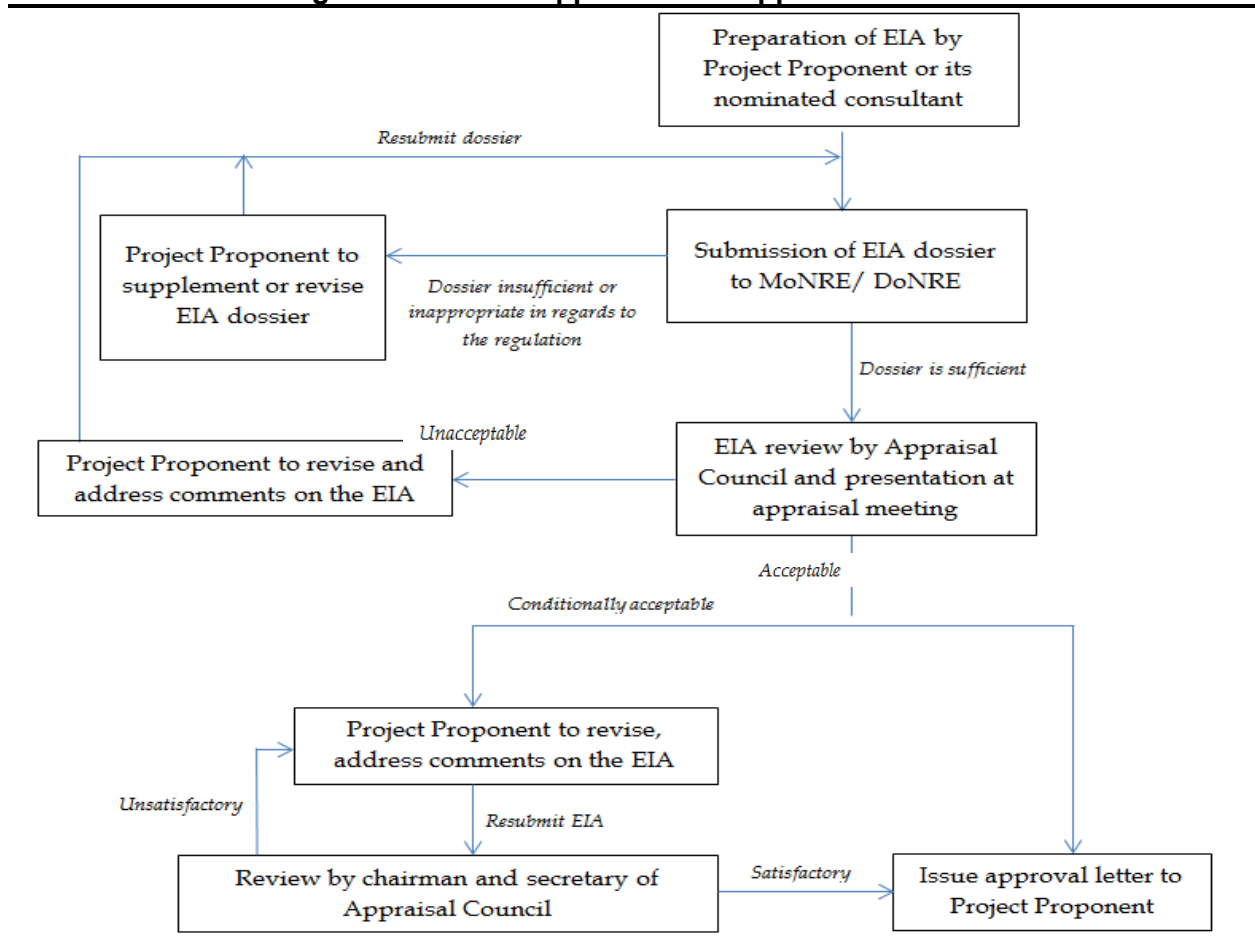
10. The ADB Safeguard Policy Statement (ADB SPS) (2009) requires all ADB financed projects to undergo an assessment. The purpose is to identify potential environmental and social impacts and avoid, or when avoidance is not possible, minimise and mitigate adverse Project impacts.

National Regulations on Environmental Impact Assessment

11. The Law on Environmental Protection No.55/2014/QH13 (LEP 2014) is the main of environmental legislation currently in force. The law assigns national responsibility for environmental strategy, drafting regulations and standards and monitoring to the Ministry of Natural Resources and Environment (MONRE), and the Vietnam Environment Protection Agency (VEPA). Responsibility for implementation of environmental policy at the local level is assigned to the provincial assemblies through the Department of Natural Resources and Environment (DONRE).

12. According to Decree No. 18/2015/ND-CP dated 14th February 2015, issued by the Government on environmental protection planning, strategic environmental assessment, environmental impact assessment (EIA) and environment protection plans and Circular No.27/2015/TT-BTNMT, issued by MONRE on 29th May, 2015 on strategic environmental assessment, environmental impact assessment and environmental protection plans, the Project must undertake an Environmental Impact Assessment (EIA) report that meets the requirements of the Laws, Decrees, Circulars and Decisions. The process of EIA approval is presented in **Figure 1**.

Figure 1 EIA Appraisal and Approval Process



Source: ERM, 2018.

13. Upon receiving the dossier, the appraisal authority is required to respond to the Project Proponent within five working days regarding whether the submitted dossier is complete. Once the dossier is determined to be complete, an appraisal council will be established to appraise the EIA report. The time limit for appraising and approving an EIA report is 45-60 working days (not including the time for addressing the comments and additional requests of the appraisal council) after receiving a complete and valid dossier as regulated in Decree No. 18/2015/ND-CP.

14. The appraisal council will call for an appraisal meeting, in which the Project Proponent is required to present the EIA in front of the council and address the questions and comments of the council. At the end of the appraisal meeting, the appraisal council will verbally announce whether the EIA is unacceptable, acceptable or conditionally acceptable.

15. If the EIA is deemed unacceptable, the EIA needs to be revised and go through the appraisal process again. In the case that the EIA is conditionally acceptable, the appraisal council will provide comments and additional requirements on the EIA within three days after the appraisal meeting. The Project Proponent will then revise the EIA accordingly before resubmitting to the appraisal authority. The revised EIA will not go through the appraisal process again, but will be reviewed by the chairman and secretary of the appraisal council only. The time for addressing the comments and additional requests of the appraisal council can take up to 12 months as common practice.

16. Within 15 working days after the appraisal council considers that the EIA report (or the revised EIA report, in the case of resubmitting) is complete and acceptable, an approval letter will be issued to the Project Proponent.

17. These regulations refer to the official Vietnamese standards which are abbreviated as TCVNs (Tieu Chuan Viet Nam). Over the last years, many of these standards have been updated to become QCVNs (Quy Chuan Viet Nam), but this is largely a change in name only with some additional parameters and changes in value calculation.

18. The national standards generally prescribe maximum permissible levels of pollutants, such as for emissions or waste streams. Some standards prescribe the permitted environmental quality of water or soil for example.

19. The following Vietnamese National Technical Regulations are applicable for this project:

- QCVN 05:2013/BTNMT National Technical Regulation on Ambient Air Quality;
- QCVN 06:2009/BTNMT National Technical Regulation on Hazardous Substances in Ambient Air;
- QCVN 04:2009/BYT National Technical Regulation on Domestic Water Quality;
- QCVN 19:2009/BTNMT Vietnamese National Technical Regulation on Industrial Emission of Inorganic Substances and Dusts;
- QCVN 40:2011/BTNMT National Technical Regulation on Industrial Wastewater;
- QCVN 14:2008/BTNMT National Technical Regulation on Domestic Wastewater Discharge;
- QCVN 03-MT:2015/BTNMT Vietnamese National Technical Regulation on The Allowable Limits of Heavy Metals in The Soil (mg/kg dry soil);
- QCVN 08-MT:2015/BTNMT National Technical Regulation on Surface Water Quality;
- QCVN 09-MT:2015/BTNMT National Technical Regulation on Groundwater Quality;
- QCVN 07:2009/BTNMT National Technical Regulation on Hazardous Waste Thresholds;
- QCVN 26:2010/BTNMT Vietnamese National Technical Regulation on Noise;
- QCVN 24:2016/BYT Vietnamese National Technical Regulation on Noise- Permissible Exposure Levels of Noise in the Workplaces;
- QCVN 27:2010/BTNMT Vietnamese National Technical Regulation on Vibration;
- QCVN 27:2016/BYT National Technical Regulation on Vibration - Permissible Levels of Vibration in the Workplace;
- QCVN 22:2016/BYT National Technical Regulation on Lighting - Permissible Levels of Lighting in the Workplace;
- QCVN 26:2016/BYT National Technical Regulation on Microclimate - Permissible Value of Microclimate in the Workplace;
- QCVN 25:2016/BYT National Technical Regulation on Industrial Frequency Electromagnetic Fields - Permissible Exposure Level of Industrial Frequency Electromagnetic Fields in the Workplace;

- TCVN 6705:2009 Normal solid wastes – Classification; and
- TCVN 6707:2009 Hazardous wastes – Warning signs.

National Regulations on Electricity

- Law on Electricity No. 28/2004/QH11 approved by the National Assembly of the Socialist Republic of Vietnam at its 6th session on December 3rd, 2004.

National Regulations on Biodiversity Conservation and Forest Protection

20. Biodiversity conservation in Vietnam is primarily regulated by the following laws:

- Law on Forest Protection and Development No. 29/2004/QH11 (Forest Law 2004);
- Law on Biodiversity No. 20/2008/QH12 (Biodiversity Law 2008);
- Law on Land No. 45/2013/QH13 (Land Law 2013); and
- Law on Water resources No. 17/2012/QH13 (Water Resource Law, 2012).

National Regulations on Land Acquisition, Compensation, Support and Resettlement (CSR)

21. The CSR Process and Policies in Vietnam are currently regulated by the Land Law 2013 and its relevant by-law regulations; these are:

- Land Law 2013;
- Decree No. 47/2014/ND-CP dated 15 May 2014 of the Government on regulating CSR Policies when land is acquired by the government;
- Decree No. 43/2014/ND-CP dated 15 May 2014 of the Government detailing a number of articles of the Land Law 2013;
- Decree No. 44/2014/ND-CP dated 15 May 2014 of the Government prescribing Land Prices;
- Circular No. 30/2014/TT-BTNMT dated 2 June 2014 of MoNRE regulating documents on land allocation, land lease, land use change and land acquisition; and
- Circular No. 37/2014/TT-BTNMT dated 30 June 2014 of MoNRE detailing CSR policies when land is acquired by the government.

National Regulations on Grievance Mechanism

22. The Law on Grievances 2011 and Law on Administrative Procedures 2015 provide regulations/requirements/procedures for issues regarding grievances and/or lawsuits against administrative decisions or the administrative act, respectively.

23. In particular, when a stakeholder has grounds that an administrative decision or administrative act is unlawful or directly infringes upon its rights and lawful interests, that stakeholder may make a first-time complaint against the individual who has issued such an administrative decision or the agency that manages the person who has enacted such

administrative act, or institute an administrative lawsuit at court in accordance with the Law on Administrative Procedures 2015.

24. In cases where the grievant disagrees with the first-time grievance resolution decision, or the grievance remains unsettled although the prescribed time for resolution has lapsed, he/she may make a second-time grievance with the direct superior of the competent persons responsible to settle the first-time grievance or initiate an administrative lawsuit at court in accordance with the Law on Administrative Procedures 2015.

25. In cases where the grievant disagrees with the second-time grievance resolution decision or the grievance remains unsettled though the prescribed time for resolution has lapsed, he/she has right to institute an administrative lawsuit at court in accordance with the Law on Administrative Procedures 2015.

Provincial Regulations

Compensation, Support and Resettlement (CSR) Policies

26. The applicable CSR policies for projects developed in Binh Thuan Province are currently guided in details by Decision No. 08/2015/QĐ-UBND issued by the People Committee (PC) of Binh Thuan Province on 02 March 2015.

27. Decision No. 05/2018/QĐ-UBND¹ was released on 25 January 2018 by the PC of Binh Thuan to amend and supplement a number of articles to Decision No. 08/2015/QĐ-UBND on CSR Policies in Binh Thuan Province.

Electricity Development Plan

28. Decision No.974/QĐ-BCT on approving the adjustment and supplement of the electricity development plan in Binh Thuan Province between 2011 and 2015, with a vision to 2020, promulgated by the Ministry of Industry and Trade (MoIT) on 22 March, 2017.

29. Da Mi Floating Solar Power Project is established to meet the electricity demand in Binh Thuan Province, according to the Decision No.974/QĐ-BCT.

Other international standards

30. World Bank Group's environmental and social standards, guidance notes and guidelines of relevance to the Project include the following:

- World Bank Group's General EHS Guidelines (2007);
- World Bank Group's Environmental, Health and Safety Guidelines for Electric Power Transmission and Distribution (2007); and
- The IFC's Utility-Scale Solar Photovoltaic Power Plants: A Project Developer's Guide (2015).

C. Project Description

31. The Project involves construction and operation of a 47.5 MW floating solar photovoltaic (PV) power plant which shall be installed at Da Mi Reservoir currently managed by Binh Thuan Province People's Committee. The Project is located at three communes including La Ngau Commune (Tanh Linh District), La Da Commune and Da Mi Commune (Ham Thuan Bac District),

¹<https://thuvienphapluat.vn/van-ban/Bat-dong-san/Quyiet-dinh-05-2018-QĐ-UBND-sua-doi-08-2015-QĐ-UBND-boi-thuong-ho-tro-tai-dinh-cu-Binh-Thuan-375156.aspx>

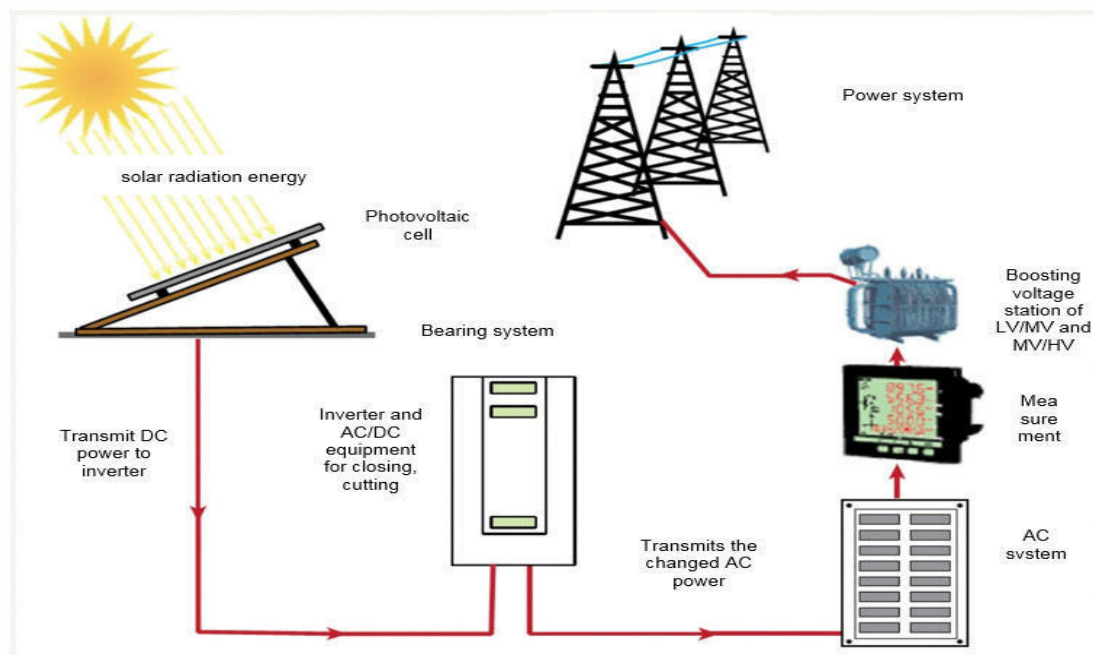
Binh Thuan Province and developed by Da Nhim-Ham Thuan-Da Mi Hydropower Joint Stock Company (DHD) (the “Sponsor”). It is noted that the EIA for Da Mi Floating Solar Power Project was approved by Binh Thuan Province on 15 September 2017. At present, the Project is seeking international finance, it is required to comply with applicable standards which are presented in Section B above.

32. According to the Decision No. 2960/QĐ-UBND dated 13th October 2017 by the People’s Committee of Binh Thuan Province on Investment Principle Approval for the Project, the Project is requested to contact DoNRE of Binh Thuan Province to obtain the permit for surface water area lease but at the time of writing this IESE report, DHD has not obtained such permit as required.

33. In general, the Project uses Photovoltaic (PV) panel technology installed in Da Mi reservoir and a central inverter to convert the Direct Current (DC) into Alternating Current (AC) through transformers to upgrade voltage to the level of 0.4/22kV and 22/110kV, then connect to the national power system.

34. The floating solar power plant in Da Mi reservoir in Binh Thuan Province will generate electricity directly to the national grid with a large capacity. PV solar technology and direct grid connection will be only used without storage.

Figure 2. The Diagram of Solar Photovoltaic Technology



Source: EIA, 2017.

36-35. The Project’s key components include photovoltaic module, inverters, transformer stations and transmission line. National highway No.55 is the main road to access to the Project site, which connects Ba Ria Vung Tau, Binh Thuan and Lam Dong province with the total length of 229 km.

37-36. Photovoltaic module is a component that directly converts solar radiation into DC electricity through a photovoltaic effect with a completely clean process and does not require moving components such as ordinary rotary power. Each photovoltaic panel consists of several photovoltaic cells connected to each other. Photovoltaic panels are connected to string and parallel to the array to achieve the requirements of the DC output power.

Table 1. Specification of PV Panels

Specification	Value
Electrical characteristics	
Type	Single or multi-crystal silicon
Rated capacity P_{mpp}	>330 Wp
Rated voltage U_{mpp}	37.8V
Nominal current I_{mpp}	8.74A
Off-load voltage U_{oc}	46.9V
Short-circuit current I_{sc}	9.15A
Conversion efficiency	17%
Range of operating temperature	-40°C ÷ 85°C
The maximum voltage of system (IEC standard)	1500 V DC
Rated current of fuse	15A
Measurement uncertainty of capacity	0-3%
Temperature characteristics	
NOCT	45±2°C
Temperature coefficient P_{max}	-0.40%/°C
Temperature coefficient V_{oc}	-0.30%/°C
Temperature coefficient I_{sc}	0.06%/°C
Physical characteristics	
The type of photovoltaic cells	c-Si 156x156 mm
The number of cells	72(6x12)
Size	1956 x 992 x 40 mm
Weight	26.5 kg
The thickness level of glass cover	4.0 mm, heat resistant
Bracket	Aluminum alloy
Wire box	IP67 Standard
Connecting wire	MC4, 0.9 -1.1 m of length

Source: EIA, 2017.

38-37. Inverter. It is a power electronic device that converts DC current into AC current suitably for connecting to the national grid.

Table 2. Specification of Inverters

Specification	Value
Input (DC)	
Voltage range, MPPT (25°C)	850-1425V

Specification	Value
Maximum voltage of system (V_{oc})	1500V
Maximum input current	3000A
Maximum short circuit current	4300A
Number of inputs	24
Output (AC)	
Rated power (25°C/50°C)	2500kVA/2250kVA
Rated output voltage	440-660V
Rated frequency	50Hz
Maximum current	2624A
The range of power factor adjustment	0.8
Maximum transfer efficiency (AC/DC)	98.6%

Source: Feasibility study, 2017.

39-38. Supporting frame system: The function of system is to fix photovoltaic panels stably. The system can be designed with a fixed angle or sun-tracking system.

40-39. Transformer station (0.4/22kV): The purpose of this is to raise the output voltage from the inverter to a higher voltage level that is suitable for connection to the power system. To connect with the national grid, substations will be set up, which will include protection, measurement and control equipment.

Table 3. Transformer Specification

Parameters	Value
Input voltage	0.6kV
Output voltage	22kV
Capacity	2500kVA
Input current	2410A
Output current	66A
Wire rope	Yn/Do

Source: Feasibility study, 2017

41-40. Solar PV installation technology. Due to the unstable background with the effect of waves, wind, currents, difficult transmission links, the fixed array of PV panels will be applied. With the fixed array installation technology, it is simple to install in different types of terrains and the spaces between PV panels is relatively small. Furthermore, its investment cost and does not occupy a large of land area. Since they have no moving parts, the fixed system are resilient and need little maintenances.

42-41. Project capacity. The total capacity of Project is 47.5MW with the performance ratio (PR) is 81.43%.

43-42. The technical methods of Project construction. Main construction components include floating PV panel system, floating bridge, anchoring, inverter substations, transformer, and transmission line.

Table 4. The Capacity of Da Mi Floating Solar Power Project

No	Categories	Quality	Total capacity
1	Solar power plant	1	47.5 MW
2	PV module panel 72 cell - 330Wp	143,940	47.5 MW
3	Inverter station A		
4	Inverter 2.500 kW	7	17.5 MW
5	Booster transformer 0,6/22kV - 2.500kVA	7	17.5 MVA
6	Inverter station B		
7	Inverter 2.500 kW	10	25 MW
8	Booster transformer 0,6/22kV - 2.500kVA	10	25 MVA
9	Substation 22/110kV	1	63MVA
10	Boosting voltage transformer 22/110kV - 63MVA	1	63 MVA
11	Output electricity (at first year)	-	69.990MWh

Source: EIA, 2017.

45.43. Project location of PV modules. In the Project layout is set up as follows:

- Zone A, B and F are PV modules, which connect to inverter station A. The total area of floating PV panel installation and Inverter Station A is about 18.7 ha and 0.25 ha, respectively.
- Zone C, D and E are PV modules, which connect to inverter station B. The total area of floating PV panel installation and Inverter Station B is about 26.2 ha and 0.1 ha, respectively.

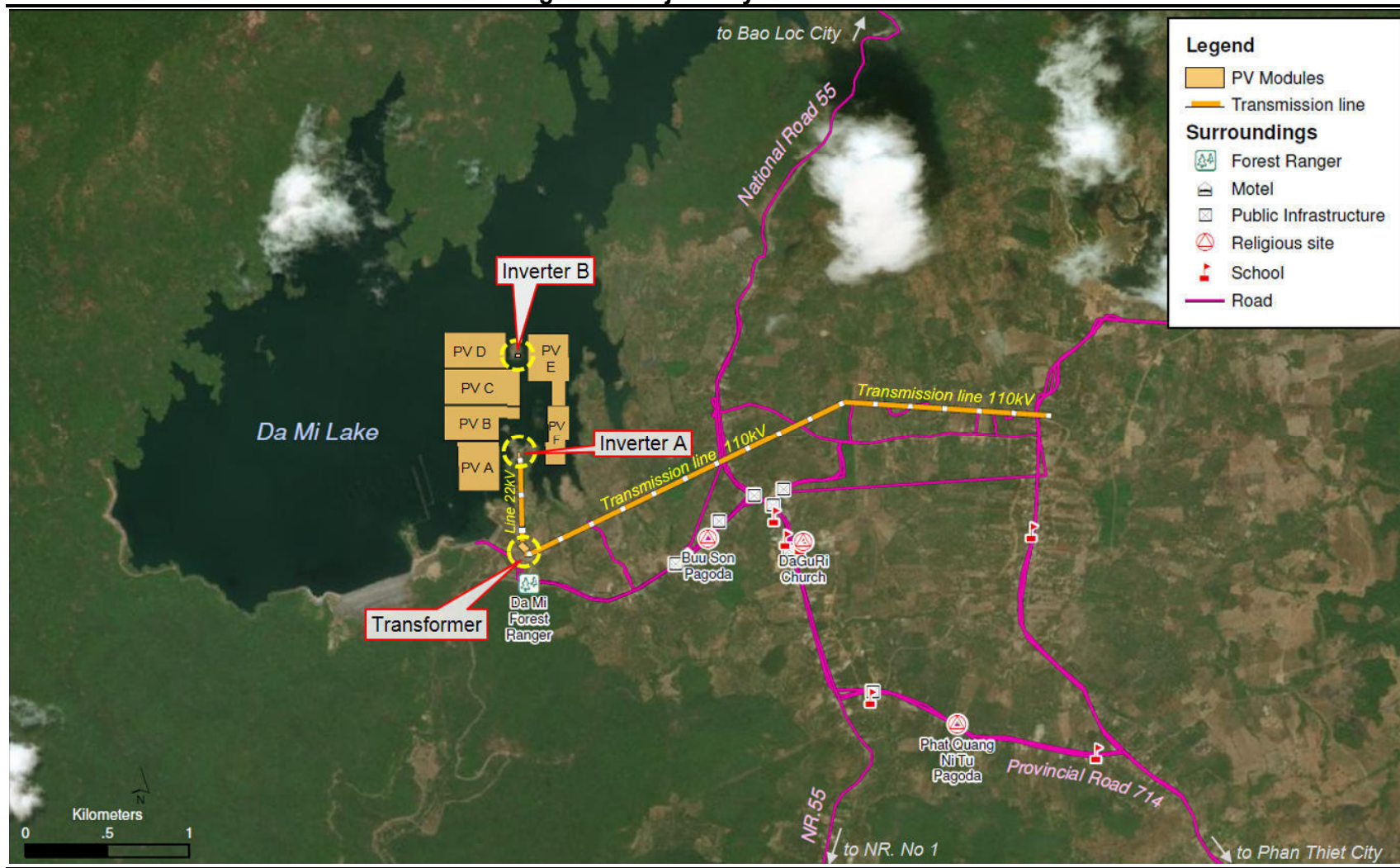
46.44. Project's 110kV substation. The 110kV substation area is 0.5 ha, which is expected to be constructed at the shore of Da Mi reservoir in La Ngau Commune. It should be noted that it is 100m from the reservoir safety corridor, so it is in compliance with safety corridor requirements.

Figure 3. The Overview of Da Mi Floating Solar Power Project location



Source: ERM based on Google Map, 2018.

Figure 4. Project Layout



Source: ERM based on Google Map, 2018.

Figure 5. The Location of PV Module on the Surface of the Da Mi Hydropower Reservoir



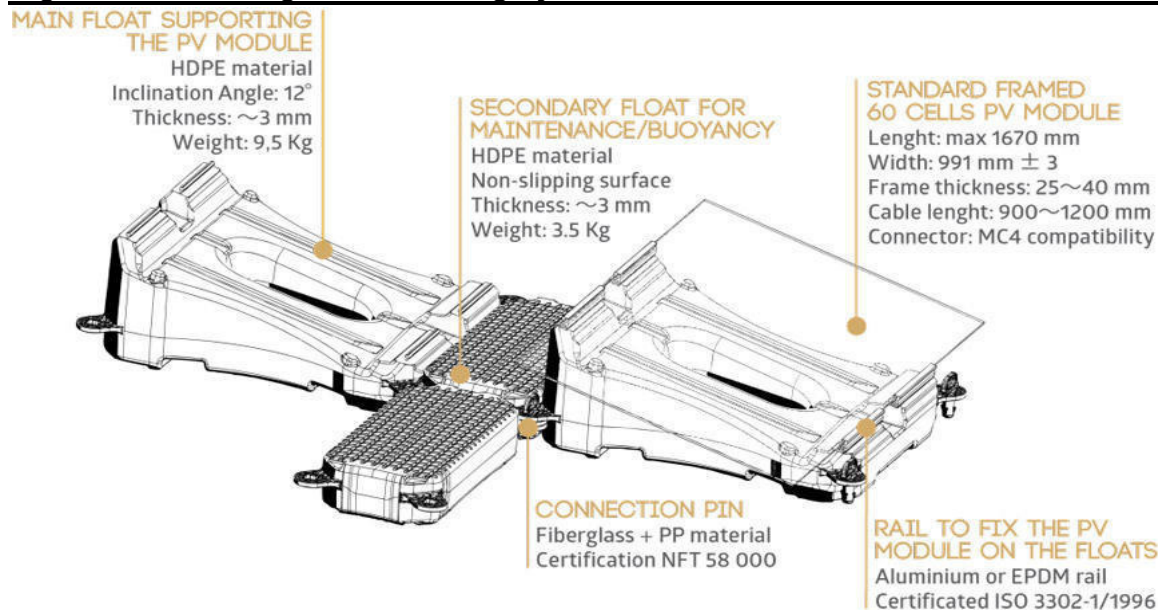
Source: ERM based on Google Map, 2018.

47.45. Transmission line. The Project includes two transmission lines 22kV and 110kV, of which, the 22kV transmission line runs through from three stations including Inverter A, Inverter B and the transformer station with the length of 1.2km. The 110kV transmission line (3.3 km) is connected from the transformer station to the Ham Thuan – Duc Linh Station.

48.46. Floating system. The floating system is blow-moulded floats which are made with HDPE (High Density Polyethylene) plastic. The floating system is popular and currently used in several power projects with large capacity in the world. The advantages of the floating system is a simple structure which is easily assembled and installed without many accessories. The main components of this system include the following and as illustrated in Figure 6:

- The main float supporting the PV module
- The secondary float for maintenance and buoyancy.

Figure 6. A Diagram of Floating System



Source: Feasibility study, 2017.

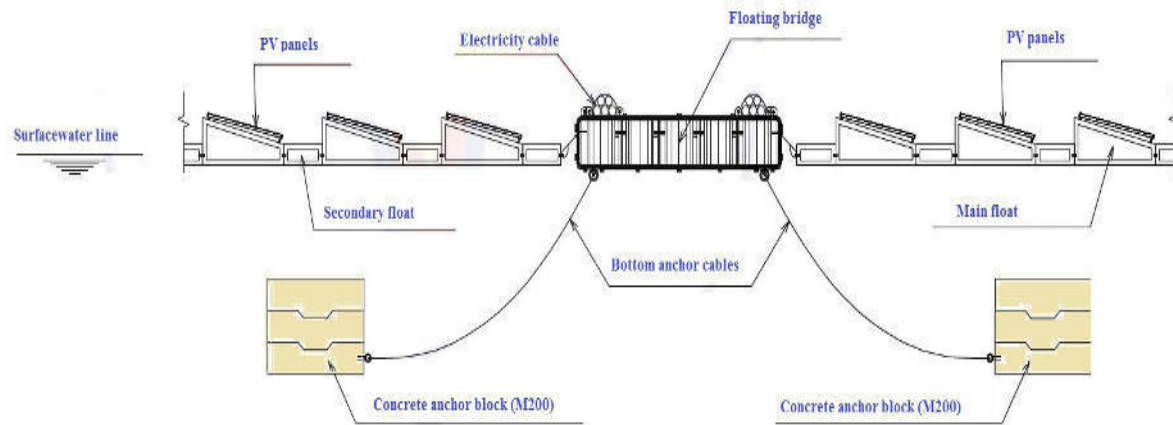
49.47. The mounting system. It will be designed to keep equipment stable due to the impact of weather conditions (such as wind and water flow). In addition, the system is used to connect PV module panels and other parts of the solar floating system. The material of mounting system is often stainless steel or aluminium and steel with an optimum design to load the total weight of solar system.

50.48. Anchoring system. The system includes two types: bottom anchoring and shore anchoring.

- Bottom anchoring system:** Each PV module is be designed with surrounding floating bridge and connected to the bottom anchoring system. The system will be anchored to reinforced concrete blocks through a range of cables. Each bottom anchoring system is comprised of three reinforced concrete blocks with dimensions of 2.5 x 2.5 x 0.6m. The concrete blocks are anchored at the bottom of Da Mi Reservoir. Distance between anchoring line (anchoring point) will be 10m - 15m in compliance

with the dimension of each PV module. The whole bottom anchoring system will be secured to keep PV module in place during the Project operation.

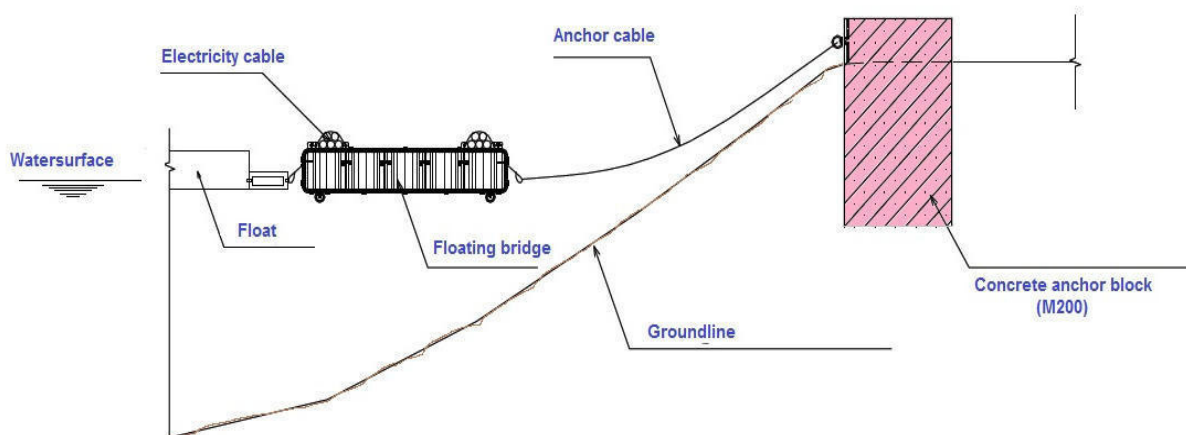
Figure 7. A Diagram of Bottom Anchoring System



Source: Feasibility study, 2017

e/b) **Shore anchoring system:** The PV module located near the shoreline will be anchored to the shore through a shore anchoring system. Similar to bottom anchoring system, the shore anchoring system includes reinforced concrete blocks.

Figure 8. A Diagram of Shore Anchoring System



Source: Feasibility study, 2017

51-49. The PV panel system. After floating and anchoring systems have been completely installed, the PV panels will be transported by barges and then fixed to the floating system.

52-50. Float manufacturing workshop. During ERM's site visit in June 2018, DHD advised that a floating manufacturing workshop will be constructed near the planned transformer area within the Project site. At present, DHD have not yet manufactured floats as they are testing the site and waiting for permissions from local authorities. It should be noted that this section only describes technical manufacturing process and analysis impact

assessments of the float manufacturing workshop based on brief description provided to ERM.

53-51. Machines used to produce floating modules include an agitator, a blow moulding, cutting machine, a crusher, cooling tower and an air compressor. The duration of process is planned for 306 days within the construction phase. Figure 9. describes a float manufacturing process as follows:

54-52. Mixing: The raw materials used for manufacturing the floats includes HDPE pellets, pigment and Anti-UV additives. The HDPE pellets will be imported and transported to the Project site. The raw materials will poured into a container in accordance with a required proportions then they will be stirred by an agitator.

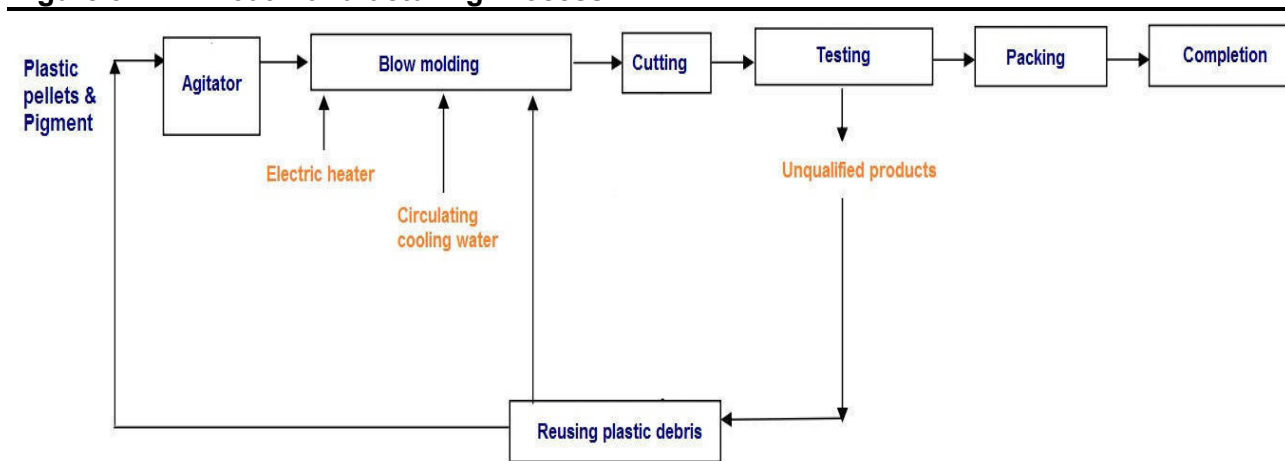
55-53. Blow Moulding: A molten tube will be formed (referred as the parison or preform) comprised of thermoplastic material (polymer or resin), which is placed within a mould cavity and inflated with compressed air, to take the shape of the cavity. The tube will be allowed to cool prior to removing from the mould². Cooling water stored in a cooling tower will be re-circulated during the process.

56-54. Cutting: A small amount of plastic pieces will be generated during the cutting process.

57-55. Testing: This step is to check and identify unqualified products. Qualified products will be placed in the warehouse located within the float manufacturing workshop. The layout of warehouse is provided in **Annex C**.

58-56. Reusing plastic debris: In the process, unqualified products³ will be utilised and ground into irregular particles with a size of $\Phi 2-3\text{mm}$.

Figure 9. Float Manufacturing Process



Source: DHD, 2018

D. Safeguard Categorisation for the Project

60-57. Environment. ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project

² <https://www.milacron.com/mblog/2018/02/28/what-is-blow-molding/>

³ Unqualified product include broken or out of shape or pierced floats, etc.

is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:

- Category A. A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- Category B. A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
- Category C. A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- Category FI. A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

From the impact assessment section below, the Project has site specific and few irreversible impacts which can be mitigated and managed via actions plan. As such the environmental impact of the Project is categorized as B.

61-58. Involuntary Resettlement. The involuntary resettlement impacts of an ADB-supported project are considered significant if 200 or more persons will be physically displaced from home or lose 10% or more of their productive or income-generating assets. Projects are classified into the following four categories:

- Category A. A proposed project is likely to have significant involuntary resettlement impacts. A resettlement plan, which includes assessment of social impacts, is required.
- Category B. A proposed project includes involuntary resettlement impacts that are not deemed significant. A resettlement plan, which includes assessment of social impacts, is required.
- Category C. A proposed project has no involuntary resettlement impacts. No further action is required.
- Category FI. A proposed project involves the investment of ADB funds to or through a financial intermediary. The financial intermediary must apply and maintain an environmental and social management system, unless all of the financial intermediary's business activities are unlikely to generate involuntary impacts.

62-59. The resettlement of the Project is government led and involuntary process with a number of gaps against ADB safeguard requirement 2 (See baseline section for details of key gaps). In consideration of no physical displacement and the small number of economically displaced households (42), the categorisation for involuntary resettlement of the Project is identified as B.

63-60. Indigenous People. The impacts of an ADB-supported project on indigenous peoples is determined by assessing the magnitude of impact in terms of customary rights of use and access to land and natural resources; socioeconomic status; cultural and communal integrity; health, education, livelihood, and social security status; and the recognition of indigenous knowledge; and the level of vulnerability of the affected Indigenous Peoples community. Projects are classified into the following four categories:

- Category A. A proposed project is likely to have significant impacts on indigenous peoples. An indigenous peoples plan (IPP), including assessment of social impacts, is required.
- Category B. A proposed project is likely to have limited impacts on indigenous peoples. An IPP, including assessment of social impacts, is required.
- Category C. A proposed project is not expected to have impacts on indigenous peoples. No further action is required.
- Category FI. A proposed project involves the investment of ADB funds to or through a financial intermediary. The financial intermediary must apply and maintain an environmental and social management system, unless all of the financial intermediary's business activities unlikely to have impacts on indigenous peoples.

64-61. The social impact assessment conducted by ERM in June-August 2018 has, in consultation with ethnic minority communities (EM) in project areas, identified the project-affected EM and identify potential impacts of the proposed project on them.

65-62. Under social impact assessment section (Section H), the Project is not expected to have impacts on ethnic minority peoples, i.e. Category C.

E. Land Requirements

66-63. This section describes the land requirements for the Project in total area and process for land acquisition of Vietnam.

67-64. The Project requires approximately 51.55ha of area for development of its components including floating solar project plant, inverter stations, and substation and transmission line areas. Details about the land requirements for these components are indicated as below.

Table 5. Project Land Description

No	Items	Size	Description	Geographical conditions	Land use status	Location
1	Floating Solar Project Plant	44.9ha	It is located in the surface water of Da Mi Hydropower Reservoir	Surface water	Surface water	La Ngau Commune, Thanh Linh District (The Commune approved the land use for DHD)
2	Inverter station A and B	0.35ha	It is set up at shore of Hydropower Reservoir	Topographic is relatively flat	Land of perennial trees.	La Ngau Commune, Thanh Linh District (The land of inverter station B was granted land use right for DHD)
3	Substation	0.5ha	It is set up at shore of Hydropower Reservoir	Topographic is relatively flat	Land of perennial trees	La Ngau Commune, Thanh Linh District (The Commune approved the

No	Items	Size	Description	Geographical conditions	Land use status	Location
						land use for DHD)
4	110kV Transmission Line	Length: 3,331m Total area: 5.1452ha. Of which: 1,487.42m ² (Permanent land acquisition) 49,965m ² (Safety corridor land)	Start from substation, then connect to 110kV line of Ham Thuan - Duc Linh. The line route shall pass through local land of perennial trees	Topographic is relatively flat	Land of perennial trees	La Ngau Commune (Tanh Linh District), Da Mi Commune and La Da Commune (Ham Thuan Bac District)
5	22kV transmission line	0,55ha	Start from inverter station A to 110kV substation. Two thirds of line shall across through the local residents' land of perennial trees and one third of line (170m) belongs to DHD's land use.	Topographic is relatively flat	Land of perennial trees	La Ngau Commune (Tanh Linh District)

Source: EIA, 2017.

68-65. From the report of the Project sponsors, a total of 42 land users were identified as having land within the Project's component areas. **Annex D** provides a list of these displaced land users. As reported in the Stakeholder Engagement Plan (SEP) (**Annex E**) of the Project, during the baseline survey for informing the IESE of the Project, ERM has engaged with 41 out of 44 households. Those not engaged were either not available or no longer living in the Project area, or duplicated in the list (see the SEP for further information). The engagement was undertaken during a three-day period from 19 to 21 June 2018 and also included meetings/discussion with local authorities and key informants of the areas such as village heads, Womens' Union, Farmers' Union, etc. From the survey, it is understood that all affected households are eligible for compensation and/or an assistance package depending on their loss.

69-66. At the time of the survey, it was observed that the land acquisition and CSR process of the Project was at the stage of the finalization of the CSR plans and these plans were under disclosure. According to the Land Law 2013 which is applicable to the Project, after 20 days from publishing, if no grievance/ disagreement received, the CSR plans would be submitted to District PC for approval and implementation. The District PC, who is the organization in charge of the CSR process, confirmed the CSR process for the Project was progressing in compliance with the Vietnamese regulations. However, it is noted that there are some key gaps between the Vietnamese regulations on CSR process and the SPS Safeguard Requirement 2-Involuntary Resettlement. These include:

- Cash compensation will be provided to the displaced households at the price decided by the Government via a land price survey for the project area before the commence of the CSR process (rather than full replacement cost);

- Persons who lost the land they occupy in its entirety or in part who have neither formal legal rights nor recognized or recognizable claims to such land before the cut-off date will receive compensation for the investment on land and assistance rather than full compensation;
- All compensation and assistance will be paid in cash and no in-kind assistance such as credit facilities, training, and employment opportunities is provided by the Government or required to be provided by the project itself; and
- No monitoring is required during and after the CSR process to assess the effectiveness of the process and close gaps if any.

F. Project schedule

[70-67.](#) The Project consists of three main phases which are described in detail as below.

Table 6. Overview of the Project

Stage of the Project	Action	Schedule
Preparation	Land acquisition and compensation	This will be conducted after the provincial People's Committee issued a decision on land acquisition
	Site clearance	Approximately 1 month
Construction	Excavate the foundation of station and install cables	Around 12 months
	Fabrication and installation equipment	
	Build embankment for foundation protection	
	Installation of PV module array, inverter station, floating bridge system and anchoring system.	
	Completion, acceptance, handover	
Operation	Electricity Produce	20 years

Source: EIA, 2017.

G. Description of the Environment (Baseline Data)

[71-68.](#) This section describes relevant natural conditions and physical environment within the Project area. It also looks at current and proposed development activities within the Project's area of influence.

[72-69.](#) **Geography and Topography.** According to the structural geomorphology, the floating solar in the Da Mi reservoir is divided into two main types of terrain as follows:

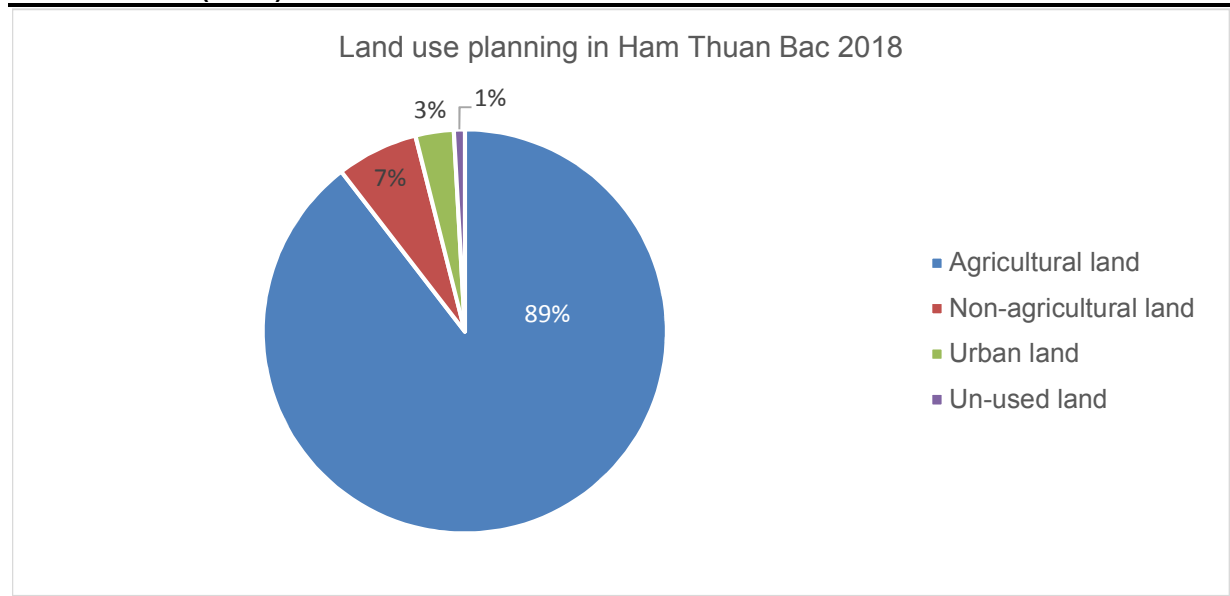
[73-70.](#) *Denuded terrain:* Most of the Project plant, the transformer station 22 / 110kV and 110kV transmission line areas are weathered products of granite including clay and macadam. It is the formations of long hills and mountain chains in the shape of saddle and the terrain is relatively flat with the slope level from 10 to 15 degree.

[74-71.](#) *Accumulated terrain:* The terrain only occupies a small area of the Project plant, Da Mi lakeside, and ravines. They mainly accreted in the form of mudflats along streams, under sloping hills with a narrow width from a few meters to more than ten meters. The surface of

mudflats is slightly rippled with a low-slope level and inclined toward Da Mi reservoir. The geologic composition of this terrain consists of sandy silt.

75.72. Land Use. According to land use planning in Ham Thuan Bac District in 2018, the total area of Ham Thuan Bac District is over 134,451 ha which consists of agricultural land⁴, non-agricultural land, urban land and un-used land. The proportion of each land use is illustrated in Figure 10. This shows that agricultural land and forest land accounted for the highest proportion of total land use (89%). In contrast, non-agricultural land, urban land and unused land are relatively small (total of 11%).

Figure 10. The Proportion of Land Use Planning in Ham Thuan Bac District (2018)

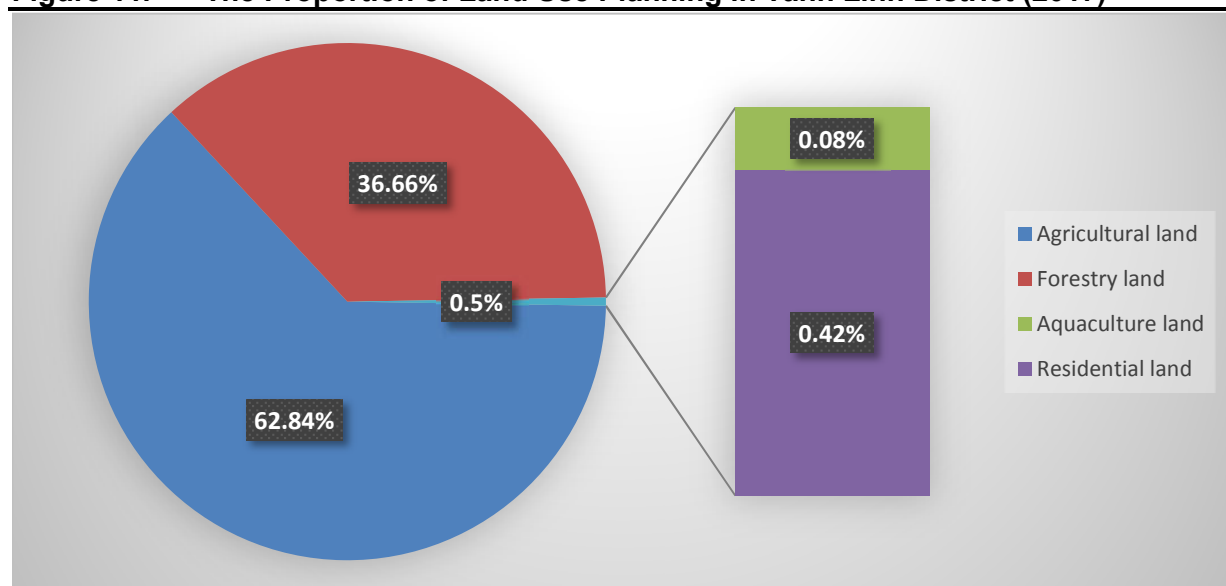


Source: Binh Thuan People's Committee, 2018⁵.

⁴ In the total agricultural land, the area of cultivation land, forestland, aquaculture land and others are 48.74%, 50.9% and 0.36% respectively

⁵ Source: <https://thuvienphapluat.vn/van-ban/Bat-dong-san/Quy-yeu-dinh-768-QD-UBND-2018-phe-duyet-Khoach-su-dung-dat-Ham-Thuan-Bac-Binh-Thuan-379411.aspx>

Figure 11. The Proportion of Land Use Planning in Tanh Linh District (2017)



Source: The Statistical Yearbook of Tanh Linh District, 2017.

76-73. The Tanh Linh District, is 119,860 ha in area, of which, agricultural land occupied the largest proportion of total land (62.84%), followed by forestry land (36.66%). Land used for aquaculture and residential purposes, respectively only accounted for 0.5% of total land.

77-74. Meteorology. In general, the Project is located in the tropical monsoon climate zone with hot and humid conditions. The rainy season occurs from May to October while the dry season is from November to April. Given that the Project is contiguous to the Lam Dong highland where a high rainfall level is measured from 3700 to 4000 mm/year, the Project location has heavy rainfall and humidity.

78-75. Temperature, humidity, sunlight and storms. The air temperature is relatively low and stable. The annual average temperature ranges from 21.5 to 22.5°C and the difference between the hottest month and the coldest month is only 2-3°C. The annual average humidity is 70-85%. The total sunny hours are more than 2300 hours per year. Storms rarely occur in this area with the frequency of 4-5 years/time in the period of October to December. The average, highest, lowest temperature during the period 1978-2016 are as follows:

Table 7 Air Temperature Features at Bao Loc Meteorological Station

Features	Months												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
TAverage (°C)	20,2	21,1	22,2	23,1	23,3	22,7	22,2	22,0	22,2	21,9	21,2	20,2	21,9
Tmax (°C)	31,8	33,8	33,6	32,2	32,3	33,4	30,8	30,9	31,3	31,0	31,0	30,6	33,8
Tmin (°C)	8,8	8,8	11,2	15,2	15,9	16,2	16,8	16,8	16,6	13,5	10,8	9,8	8,8

Source: Hydro-meteorological station in South Middle Vietnam (1978-2016).

79-76. Wind direction. The dominant wind direction is described as follows:

- From May to October (rainy season): W, SW (West, Southwest)⁶

- From November to April (dry season): NE (North East)

80-77. Wind speed. Due to the influence of geographical and topographical characteristics mentioned above, the wind speed is varies across regions in Binh Thuan Province. The northeastern area of the Province (Tuy Phong and Bac Binh districts) has the highest wind speed (over 3 m/s) whereas the wind speed decreases from east to west. The west area of the Province where is contiguous with Bao Loc Highland has the smallest average wind speed.

Table 8. Average Monthly and Annual Wind Speed Recorded in Bao Loc Meteorological Station

Features	Monthly and annual average wind speed (m/s)												
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
Average wind speed	1.6	1.6	1.5	1.3	1.3	1.6	1.9	2.2	1.4	1.3	1.6	1.9	1.6

Source: Hydro-meteorological station in South Middle Vietnam (1978-2016).

81-78. Rainfall. Rainfall in the year is mainly concentrated in the rainy season with the level of 80-90%. The number of rainy days in the rainy season is 20-25 days, and 160 - 180 days in the whole year. In the dry season, rainfall is not significant. Since the Project area is located in the North West of Binh Thuan Province where presents the highest rainfall with the rainfall level from 2300 to 2600mm.

Table 9. Monthly and Annual Rainfall in years in La Ngau and Bao Loc Stations (mm)

Months Stations	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
La Ngau	8	5	28	75	237	307	420	483	382	243	95	23	2306
Bao Loc	64	53	115	192	241	297	397	475	402	333	171	81	2832

Source: Hydrological and meteorological station in South Middle Vietnam from 1978-2016

82-79. Thunderstorms. There are many thunderstorms occurring in Binh Thuan Province, and the average number of days with thunderstorms is 100-120 days per year. Beginning in April, there are several seasonal storms. June, July, and August are the peak months of the thunderstorm. Thunderstorms usually occurred in a short-time but its intensity was relatively high. Sometimes thunderstorms were intense and caused tornados and thunders.

Table 10 Average Number of Thunderstorm Days

Months District	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
North Ham Thuan District	0.1	0.5	1.1	8.4	18.1	13.9	15.5	14.2	15.1	14.6	4.3	2.2	108

Source: Hydrological and meteorological station in South Middle Vietnam from 1978-2016.

83-80. Storm. According to the meteorological data in Binh Thuan province, ten storms were recorded during 39 years between 1977 and 2015. It is recorded that stormy season in the Province starts from October to December.

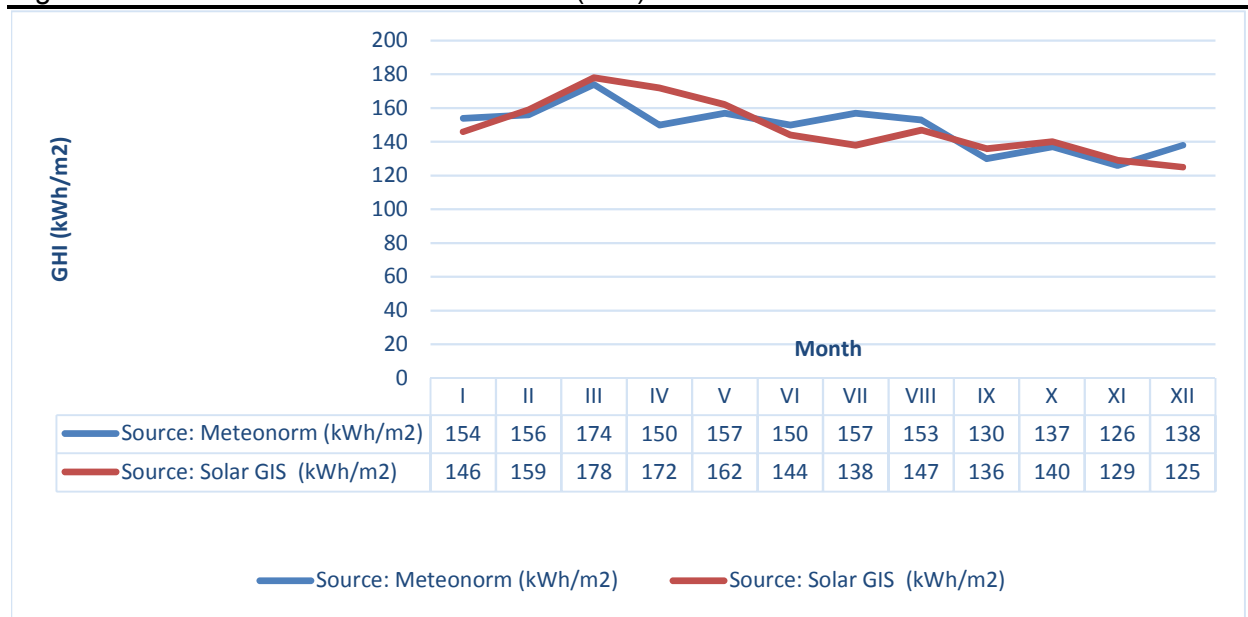
84-81. Drought. From January to April, hot weather continuously occurs in the whole province, so it leads to water shortage and drought in some areas. As the result, it damages

http://www.binhthuan.gov.vn/wps/portal/binhthuan/chinhquyen/gioithieu/!ut/p/c4/04_SB8K8xLLM9MSSzPy8xBz9CP0os3gfDxcLQ2MDQ09_Xy9XA0f3ED8nswB3Y7MqU_2CbEdFAP38ZWcl/?WCM_GLOBAL_CONTEXT=/wps/wcm/connect/bt_vi/bt_noi_dung/gioi_thieu/gioi_thieu_chung/7f9abd0041003b058bf1af5446f9df92

agricultural and fruit-growing lands in some districts, especially Ham Thuan Bac and Tanh Linh districts.

85-82. Potential radiation. Solar radiation is the input for all solar energy generation system. To calculate potential radiation, Direct Normal Insolation (DNI)⁷ and Diffusion Horizontal Insolation⁸ (DHI) are two key components together, which are referred to total or Global Horizontal Irradiance⁹ (GHI). Figure 12 presents the statistics of GHI level in the Project area from different data resources. All the results show that the GHI value at the area was high, and the total average intensity of GHI is 1777-1782 kWh/m².year (approximately 5.0 kWh/m².day).

Figure 12 Global Horizontal Irradiance (GHI)



Source: EIA, 2017.

86-83. Hydrological conditions. The transmission line and transformer stations are located on a sloping hillside area hence not expected to be affected by flooding.

87-84. The Da Mi reservoir (connecting to La Nga River), experiences a flood season beginning in July and ending in November. According to the hydrological monitoring data at La Nga River, most of the major floods occur in August, September and October when West - South monsoon and storms in the East Sea are the most active.

88-85. The hydrological conditions of the Project area were evaluated based on the hydrological parameters of Da Mi reservoir. The normal raising water level in Da Mi Reservoir is 325m with the dead water level of 323m. It is noted that Da Mi reservoir has 684.04 ha of a water surface with the average depth of 60m. Its main function is to supply water to the Da Mi Hydropower Plant.

89-86. To assess the quality of air, surface water and soil of the Project area, DHD coordinated a subcontractor (*Phuong Nam Environmental Analysis and Measurement Center*) to conduct an environmental survey in April 2017. The survey locations are shown in Figure 13 below and the results are described in detail below.

⁷ Direct Normal Insolation: the radiation comes directly from the sun, with minimal attenuation by the Earth's atmosphere or obstacles.

⁸ Diffusion Horizontal Insolation: the solar radiation is scattered, absorbed, and reflected within the atmosphere, mostly by clouds, but also by particulate matter and gas molecules.

⁹ The calculation of Global Horizontal Insolation (GHI) = DNI x Cos (θ) + DHI

90-87. Air quality and Noise. Air quality and noise baseline survey was conducted in April 2017. Monitoring parameters include total suspended particles (TSP), sulfur dioxide (SO₂), Nitrogen Oxides (NO_x), Carbon Monoxide (CO) and Lead (Pb) at three locations, described in Table 11 and Figure 13.

Table 11. Description of the Air Sampling Location

Sampling	Air Survey Location	Coordinates (VN2000)
KK1	At proposed transformer station area (it is about 150m from the water surface of Da Mi Reservoir).	X = 1243537; Y = 428528
KK2	At the area between the 110kV transmission line and National Highway No. 55	X = 1243861; Y = 429622
KK3	At the end point of the 110kV transmission line (the line will be connected with exiting Ham Thuan - Duc Linh 110kV transmission line).	X = 1243759; Y = 431624.

Source: EIA, 2017.

Table 12. Ambient Air Sampling Baseline

No.	Parameters	Unit	Method	Results			National standards	IFC EHS Guideline Standard ¹⁰
				KK1	KK2	KK3		
1	Noise	dBA	TCVN 7878-2:2010	50.5	56.3	51.7	70**	70/55 (day) 70/45 (night)
2	Total suspended Particles (TSP)	mg/m ³	TCVN 5067:1995	0.02	0.08	0.04	0.3*	N/A
3	Sulfur Dioxide (SO ₂)	mg/m ³	TCVN 5971:1995	0.02	0.01	0.03	0.35*	0.5
4	Nitrogen Dioxide (NO _x)	mg/m ³	HD77-PPDN-NO _x	0.05	0.03	0.03	0.2*	0.2
5	Carbon Monoxide (CO)	mg/m ³	HD24-LM-CO	ND	ND	ND	30*	N/A
6	Lead (Pb)	mg/m ³	TCVN 5067:1995	ND	ND	ND	N/A*	N/A

Source: EIA, 2017.

Note: ND: Not detected

(**): QCVN 26:2010/BTNMT: National Technical Regulation on Noise

(*): QCVN 05:2013/BTNMT: National Technical Regulation on Ambient Air Quality

Methods of air sampling:

- TCVN 7878-2:2010: Acoustic – Description, measurement and assessment of environmental noise.
- TCVN 5067:1995: Air quality - Weighing method for determination of dust content
- TCVN 5971:1995: Ambient air - Determination of the mass concentration of sulphur dioxide tetrachloromercurate (TCM) pararosaniline method.
- HD77-PPDN-NO_x: Method of NO_x sampling collection in ambient air environment.
- HD24-LM-CO: Method of CO sampling collection ambient air environment.

¹⁰ IFC EHS General regulated that the noise limit for industrial area is 70 dbA (both daytime and nighttime); and for residential are is 55 dBA during daytime and 45dBA during nighttime .

91-88. The results show that all the air parameters were lower than the National technical regulation on ambient air quality (QCVN 05:2013/BTNMT) and noise standard (QCVN 26:2010/BTNMT). In addition to compliance with the National technical regulations, the results complied with IFC EHS Guideline Standard on ambient air quality.

92-89. **Surface water quality.** Surface water quality was surveyed at three locations in Da Mi Reservoir (see Figure 13) through following parameters: pH, Dissolved oxygen (DO), Total suspended solids (TSS), Chemical oxygen demand (COD), Biochemical oxygen demand (BOD₅), Coliform, Nitrate, Nitrite, Ammonite, Copper (Cu), Iron (Fe), Nickel (Ni), Zinc (Zn), Lead (Pb), Chromium (Cr) and Phosphate.

Table 13. Description of the Surface Water Sampling

Sampling	Surface Water Survey Location	Coordinates (VN2000)
NM1	At the location of solar cell installation on Dam Mi reservoir.	X = 1243613; Y = 428504
NM2	At the location between the solar cell system and the sturgeon farm (It is noted that sturgeon farm is managed by Tam Long – Da Mi Joint Stock Company).	X = 1243382; Y = 428188;
NM3	At the location of the Investor's sturgeon farm	X = 1243048; Y = 427226;

Source: EIA, 2017.

Table 14. Surface Water Quality in Da Mi Reservoir

No.	Parameters	Unit	Applicable standard ¹¹ (National standard - QCVN 08:2015/BTNMT on surface water quality)	Monitoring duration						
				April 2017 (EIA)	Q1-2017	Q2-2017	Q3-2017	Q4-2017	Q1-2018	Q2-2018
1	pH	-	5.5-9	7.1	6.8	6.6	6.8	6.8	6.75	6.66
2	DO	mg/l	> 4	5.3	6.2	5.9	6.4	6.2	6.66	6.52
3	TSS	mg/l	50	15.0	15.5	11.3	14	14.4	10	12
4	COD	mg/l	30	14.5	14.4	12.7	17	16	18.6	14.3
5	BOD ₅	mg/l	15	8.4	7.3	7.7	9	11	9.8	7.36
6	Coliform	MNP/100 ml	7500	700	2400	1300	2200	1600	3800	3500
7	Nitrate (NO ₃ -)	mg/l	10	1.8	0.65	0.42	0.61	0.58	0.66	0.58
8	Nitrite (NO ₂ -)	mg/l	0.05	ND	0.01	0.01	0.01	0.01	0.01	0.01
9	Ammonium (NH ₄ ⁺)	mg/l	0.9	ND	0.12	0.09	0.12	0.15	0.1	0.12
10	Copper (Cu)	mg/l	0.5	<0.04	0.03	ND	ND	ND	ND	ND
11	Total Iron (Fe)	mg/l	1.5	0.1	0.41	0.29	0.31	0.32	0.38	0.30
13	Zinc (Zn)	mg/l	1.5	0.1	0.02	ND	ND	ND	ND	ND

¹¹ IFC EHS Guideline does not provide standard on the surface water quality.

No.	Parameters	Unit	Applicable standard ¹¹ (National standard - QCVN 08:2015/BTNMT on surface water quality)	Monitoring duration						
				April 2017 (EIA)	Q1-2017	Q2-2017	Q3-2017	Q4-2017	Q1-2018	Q2-2018
14	Lead (Pb)	mg/l	0.05	ND	0.002	ND	ND	ND	ND	ND
17	E.coli	MPN/100 ml	100	NC	37	27	23	15	12	10
18	Aluminum (Al)	mg/l	Not given	NC	0.05	0.12	0.062	0.073	0.058	0.058
19	Chloride (Cl-)	mg/l	350	NC	24.8	26.2	25.1	24.6	32.8	28.2
20	Fluoride (F-)	mg/l	1.5	NC	0.29	0.18	0.2	0.18	0.25	0.346
21	Lipid	mg/l	1	NC	0.3	ND	ND	ND	ND	ND
12	Nickel (Ni)	mg/l	0.1	ND	NC	NC	NC	NC	NC	NC
15	Total of Chromium (Cr)	mg/l	0.04	ND	NC	NC	NC	NC	NC	NC
16	Phosphate	MPN/100 ml	0.3	ND	NC	NC	NC	NC	NC	NC

Source: EIA (2017) and surface water monitoring at Da Mi Reservoir (2017-2018)

Note:

ND: Not detected

NC: not collected

Method of surface water sampling:

- TCVM 6492:2011: Determination of pH in surface water.
- TCVN 7325:2004: Determination of dissolved oxygen - Electrochemical probe method.
- TCVN 6625:2000: Determination suspended solids by filtration through glass-fibred filters.
- SMEWW 5220C:2012: Determination of chemical oxygen demand (COD).
- TCVN 6001-1:2008: Determination of biochemical oxygen demand after n days (BOD_n).
- TCVN 6187-2:2009: Detection and enumeration of Escherichia coli and coliform bacteria.
- SMEWW 4500-NO₃-E:2012:
- TCVN 6178:1996: Determination of nitrite- Molecular absorption spectrometric method
- EPA Method 350.2: Determination of Ammonia.
- SMEWW 3111.B:2012: Determination of Cooper, Iron, Nickel and Lead.
- SMEWW 2012-3500-Zn.B: Determination of Zinc.
- SMEWW 3500-Cr.N:2012: Determination of Total of Chromium
- TCVN 6202:2008: Determination of phosphorus – Ammonium molybdate spectrometric method.

94-90. Based on the results of surface water analysis during the period of 2017 - 2018, the surface water quality at the site was compliant with the National technical regulation on surface water quality (Column B1- QCVN 08 -MT: 2015/BTNMT). In particular, the values of DO were higher than the standard (4.0 mg/l), so the surface water quality in the area was relatively good.

95-91. Soil quality. A survey was conducted at three different locations as presented in Table 15 and Figure 13 in order to assess the soil quality in the Project. Monitoring parameters include Arsenic (As), Cadmium (Cd), Copper (Cu), Lead (Pb) and Zinc (Zn).

Table 15. Description of the Soil Sampling

Sampling	Surface Water Survey Location	Coordinates (VN2000)
MD1	At the construction site of the 110kV transformer substation.	X = 1243310; Y = 428164.
MD2	At the G1 point of the 110kV connection line.	X = 1244173; Y = 430272.
MD3	At the end point of 110kV connection line, which connects to 110kV transmission line and exiting Ham Thuan - Duc Linh 110kV transmission line.	X = 1244120; Y = 431587.

Source: EIA, 2017.

Table 16. Soil Quality Monitoring

No.	Parameters	Unit	Methods	Results			Applicable standard ¹² (National standard QCVN 03:2015/BTNMT on soil quality)
				MD1	MD2	MD3	
1	Arsenic (As)	mg/kg	EPA Method 3050B SMEWW 3114B:2012	3.05	1.18	1.83	25
2	Cadmium (Cd)	mg/kg	EPA Method 3050B SMEWW 3111B:2012	0.85	0.12	0.51	10
3	Copper (Cu)	mg/kg	EPA Method 3050B SMEWW 3111B:2012	45.3	58.2	76.9	300
4	Lead (Pb)	mg/kg	EPA Method 3050B SMEWW 3111B:2012	16.6	9.2	11.3	200
5	Zinc (Zn)	mg/kg	EPA Method 3050B SMEWW 3111B:2012	104.4	90.6	59.3	300

Source: EIA, 2017.

Note: The method of soil sampling: EPA Method 3050B SMEWW 3114B:2012: Determination of As, Cd, Cu, Pb and Zn in soil.

97-92. The analysis results show that all the soil quality parameters at the surveyed sites were compliant with the National technical regulation on the allowable limits of heavy metals in the soils (QCVN 03-MT: 2015/BTNMT).

98-93. Electric field intensity. An electric field intensity survey was undertaken at the connection point between the 110kV transmission line and the existing 110kV Ham Thuan - Duc Linh transmission line. Geographical coordinate of the location is Longitude (X) = 1244079; Latitude (Y) = 431532, as depicted in Figure 13.

Table 17. The Result of Electric Field Intensity Survey

No.	Parameters	Unit	Methods	Result	Applicable standard (Word Bank IFC Standard on electric power transmission and distribution)
1	Industrial Frequency	kV/m	Immediate meter HI3604	1.164	≤5

¹² IFC EHS Guideline does not provide standard on soil quality

No.	Parameters	Unit	Methods	Result	Applicable standard (Word Bank IFC Standard on electric power transmission and distribution)
	Electromagnetic Field ¹³				
2	Electric field intensity ¹⁴	kV/m	Immediate meter HI3604	0.877	

Source: EIA, 2017.

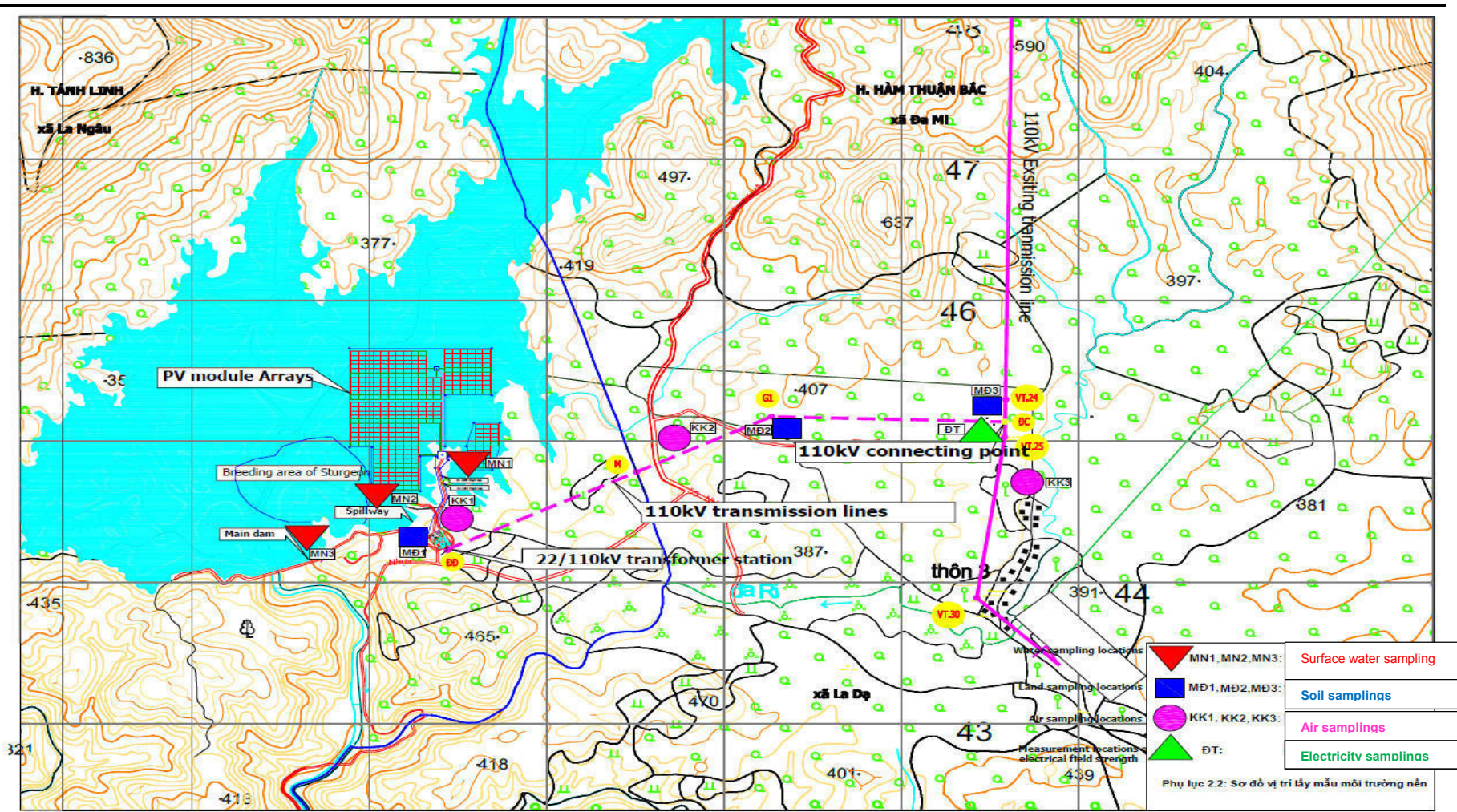
[99-94.](#) The allowable limit of electric field intensity regulated in both World Bank IFC Standard and national standard¹⁵ is the same with the value of 5kV/m. Based on the result in Table 17, the electric field intensity at the sampling site was compliant with the allowance limit.

¹³ **Industrial frequency electromagnetic field:** An electromagnetic wave with frequencies from 50Hz to 60Hz generated by electrostatic induction and electromagnetic generation from power sources, power transmission lines and electrical appliances.

¹⁴ **Electric field intensity:** is the strength of an electric field at any point. It is equal to the electric force per unit charge experienced by a test charge placed at that point. The unit of measurement is volts per meter or newton per coulomb.

¹⁵ Decree No. 14/2014/ND-CP- Detailing the implementation of the Electricity Law regarding electricity safety

Figure 13. Environmental Sampling Locations



Source: EIA, 2017.

H. Biodiversity baseline

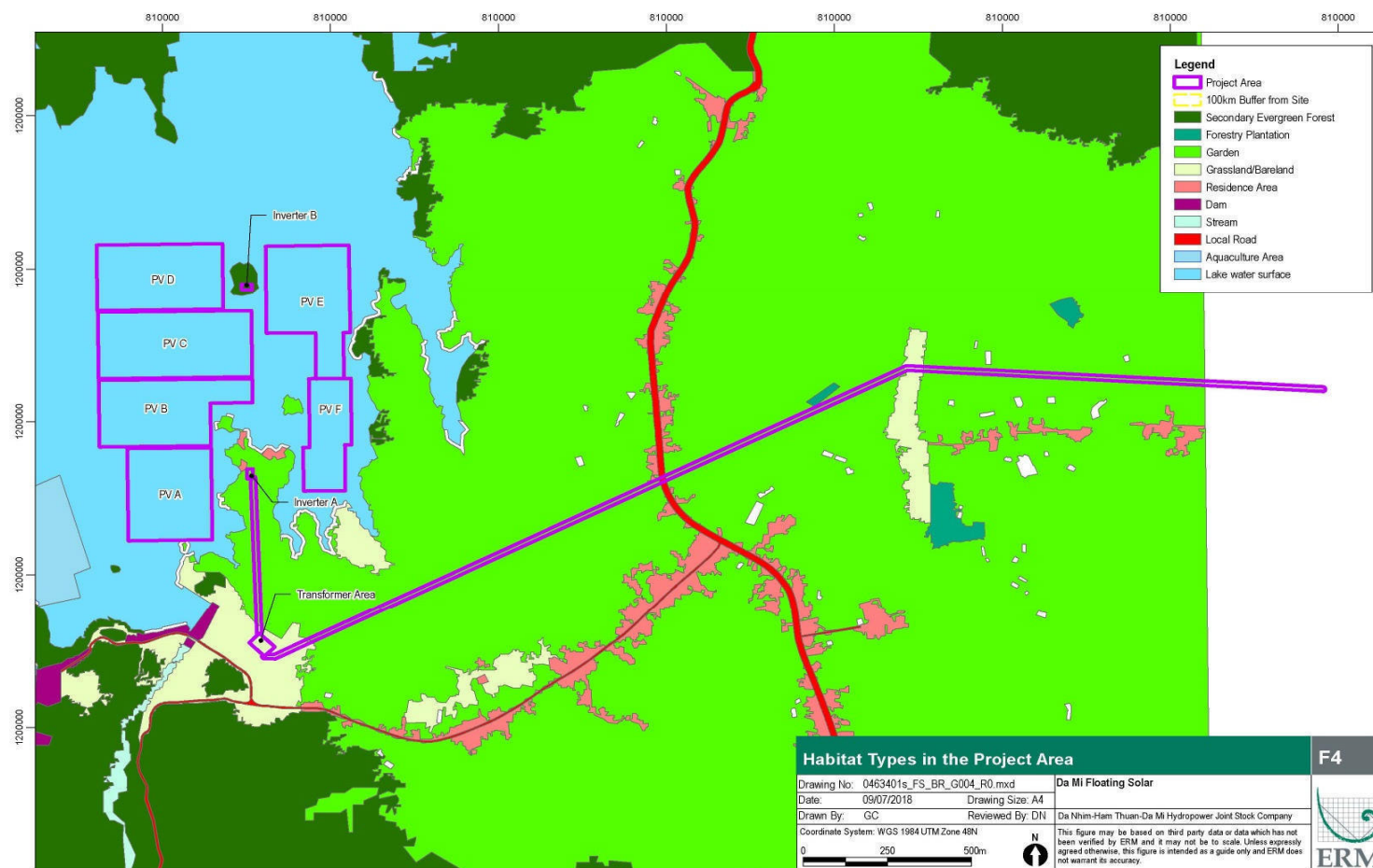
~~100-95.~~ A biodiversity baseline study was launched within the Project area from 1 June 2018 to 3 June 2018, including habitat mapping, aquatic surveys, terrestrial surveys and identification of ecosystem services. The surveys were conducted by a subcontractor under fulltime supervision of ERM staff in order to determine the location of any priority biodiversity values within the Project area that may be affected by the installation of the Project.

~~101-96.~~ **Habitat mapping.** The survey identified ten habitat types within Project area. Description is given in **Table 18** and **Figure 14** as below.

Table 18 Habitat Type Descriptions within the Project Area

No.	Habitat Type	Description
1	Disturbed secondary evergreen forest	Disturbed secondary evergreen forest were identified within forested areas surrounding Da Mi reservoir. These forests surrounded the riparian area of the reservoir and on some small islands.
2	Forestry plantation	Plantation species were identified within the watershed of Da Mi reservoir and the species included <i>Acacia auriculiformis</i> (Keo bông vàng) and hybrid <i>Acacia</i> .
3	Gardens/agriculture	Gardens and agriculture were identified nearby human settlements and were the dominant habitats in the Project Area. The gardens and agriculture areas are used for planting cashew nuts, mangoes, coffees, rubber and jackfruit. The dominant grass species growing beneath the planted trees was <i>Ageratum conyzoides</i> (Cứt lợn).
4	Grassland/Bareland	Grassland and bare land were identified within the watershed of Da Mi reservoir. The area consisted of grasses, shrubs and some trees; the coverage of grasses was over 90% of area.
5	Residential area	Residential areas were identified within the watershed of Da Mi reservoir and consisted of farm houses and some villages.
6	Ponds	Ponds were identified scattered within the gardens and agricultural areas. These ponds were utilized for watering plantation trees.
7	Aquaculture area	Aquaculture is practiced on a portion of Da Mi reservoir for the production of fish.
8	Submerged and aquatic grasses in riparian	These were habitats of submerged and aquatic grasses in flooded zones between maximum water levels and minimum water levels in the Da Mi reservoir at the depth of under 1.0m and around 10m far from max-water level in the riparian.
9	Stream	This was a waterway of a previous existing stream, which has low water volume when the dam is closed. Some shrubs and grasses exist on the cliff.
10	Lake surface	The Da Mi reservoir provides habitat for aquatic communities.

Figure 14 Habitats within the Project Area



Source: ERM, 2018.

402-97. From the background assessment and results of the field baseline surveys, ERM has identified a number of Critical Habitat candidate species that require screening against the criterion by IFC PS6. These species are shown in below table. Further details of the study are presented in the standalone Critical Habitat Assessment Report (**Annex F**). The report concludes that there are no impacts to Natural Habitat were identified and Critical Habitat values were not identified within the Project Area

Table 19 Critical Habitat Candidate Species

Taxonomic group	Species	Common name	IUCN Red List Category	Source	Critical Habitat Triggers
Amphibians	<i>Kalophrynus cryptophonus</i>		EN	IBAT	CR or EN species
Amphibians	<i>Rhacophorus helenae</i>		EN	IBAT	CR or EN species
Birds	<i>Emberiza aureola</i>	Yellow-breasted Bunting	CR	IBAT	CR or EN species
Birds	<i>Gracula robusta</i>	Nias Hill Myna	CR	IBAT	CR or EN species
Birds	<i>Gracula venerata</i>	Tenggara Hill Myna	EN	IBAT	CR or EN species
Birds	<i>Gyps bengalensis</i>	White-rumped Vulture	CR	IBAT	CR or EN species
Birds	<i>Rheinardia ocellata</i>	Crested argus	NT	WWF	Endemic
Birds	<i>Pavo muticus</i>	Green Peafowl	EN	IBAT	CR or EN species
Birds	<i>Sarcogyps calvus</i>	Red-headed Vulture	CR	IBAT	CR or EN species
Birds	<i>Sterna acuticauda</i>	Black-bellied Tern	EN	IBAT	CR or EN species
Birds	<i>Arborophila davidi</i>	Orange-necked Partridge	NT	EBA	Endemic
Birds	<i>Polyplectron germaini</i>	Germain's Peacock-pheasant	NT	EBA Trigger species	Endemic
Birds	<i>Lophura edwardsi</i>	Edwards's pheasant	CR	WWF	Endemic/ CR or EN species
Birds	<i>Garrulax yersini</i>	Collared laughingthrush	EN	WWF	Endemic/ CR or EN species
Birds	<i>Garrulax ngoclinhensis</i>	Golden-winged laughingthrush	VU	WWF	Endemic
Birds	<i>Jabouilleia danjoui</i>	Short-tailed scimitar-babbler	NT	WWF	Endemic
Birds	<i>Mixornis kelleyi</i>	Grey-faced Tit-babbler	LC	EBA Trigger species	Endemic
Birds	<i>Actinodura sodangorum</i>	Black-crowned barwing	NT	WWF	Endemic
Birds	<i>Crocias langbianis</i>	Grey-crowned crocias	EN	WWF	Endemic/ CR or EN species
Birds	<i>Carduelis monguilloti</i>	Vietnamese greenfinch	LC	WWF	Endemic
Fishes	<i>Catlocarpio siamensis</i>	Giant Carp	CR	IBAT	CR or EN species
Fishes	<i>Pangasianodon hypophthalmus</i>	Striped Catfish	EN	IBAT	CR or EN species
Fishes	<i>Scleropages formosus</i>	Golden Dragon Fish	EN	IBAT	CR or EN species

Taxonomic group	Species	Common name	IUCN Red List Category	Source	Critical Habitat Triggers
Mammals	<i>Chrotogale owstoni</i>	Owston's Civet	EN	IBAT	CR or EN species
Mammals	<i>Rattus hoxaensis</i>		NA	WWF	Endemic
Mammals	<i>Rattus osgoodi</i>		LC	WWF	Endemic
Mammals	<i>Maxomys moi</i>		LC	WWF	Endemic
Mammals	<i>Dendrogale murina</i>		LC	WWF	Endemic
Mammals	<i>Hylobates gabriellae</i>	Yellow-cheeked gibbon	EN	WWF	Endemic/ CR or EN species
Mammals	<i>Manis javanica</i>	Sunda Pangolin	CR	IBAT	CR or EN species
Mammals	<i>Muntiacus vuquangensis</i>	Large-antlered Muntjac	CR	IBAT	CR or EN species
Mammals	<i>Nomascus gabriellae</i>	Red-cheeked Gibbon	EN	IBAT	CR or EN species
Mammals	<i>Pygathrix nigripes</i>	Black-shanked Douc Langur	EN	EBA Trigger species	Endemic/ CR or EN species
Mammals	<i>Pygathrix nemaeus</i>	Red-shanked douc	EN	WWF	Endemic/ CR or EN species
Mammals	<i>Trachypithecus germaini</i>	Indochinese Lutung	EN	IBAT	CR or EN species
Mammals	<i>Viverra megaspila</i>	Large-spotted Civet	EN	IBAT	CR or EN species
Mammals	<i>Capricornis sumatraensis</i>	Serow	VU	EBA Trigger species	Endemic
Mammals	<i>Nycticebus pygmaeus</i>	Pygmy Slow Loris	VU	EBA Trigger species	Endemic
Plants	<i>Magnolia cattienensis</i>		EN	IBAT	CR or EN species
Reptiles	<i>Crocodylus siamensis</i>	Siamese Crocodile	CR	IBAT	CR or EN species

103-98. Aquatic organisms. Fourteen sites at Da Mi reservoir and one reference site upstream of the Project area were sampled. Organisms, including aquatic phytoplankton, zooplankton and macroinvertebrates were recorded, counted, analysed and identified. A total of 36 species belonging to 5 phyla of phytoplankton were recorded at 15 sampling sites in the Project area. The phylum Chlorophyta recorded the highest number of species (13 species) comprising 36.1% of total, followed by *Cyanobacteria* and *Chrysophyta* (8 species), *Euglenophyta* (5 species) and Dinophyta (2 species).

104-99. Zooplankton. A total of 20 species and 4 larval forms of zooplankton were recorded at the 15 sampling sites in the Project Area. The phylum *Arthropoda* recorded the highest number of species (11 species), followed by *Rotifera* (8 species) and other 4 larval forms.

105-100. Macroinvertebrates. A total of 27 species of littoral and benthic macroinvertebrates were recorded at the 15 sampling sites in the Project Area. The phylum *Arthropoda* recorded the highest number of species (17 species), followed by *Mollusca* (9 species) and *Annelida* (1 species). Species characteristic of swift-flowing streams at Reference site included many aquatic insect species. Additionally, the Channeled apple snail (*Pomacea canaliculata*) was identified as an invasive alien species.

~~106-101.~~ All species recorded were freshwater plankton and macroinvertebrates, revealing that all sites were located at a freshwater area. Most sampling sites revealed medium biodiversity levels¹⁶ of phytoplankton, zooplankton and macroinvertebrates communities, except the Reference site with a relative high diversity level.

~~107-102.~~ **Fisheries Resources.** A total of 28 fish species were recorded in the Project Area. Fish species with high economic value observed in the Project Area include Nile tilapia (*Oreochromis niloticus*), Marble goby (*Oxyeleotris marmorata*), Java barb (*Barbonymus gonionotus*), Forest snakehead (*Channa lucius*) and Striped snakehead (*Channa striata*). The sturgeon fish was also recorded for commercial aquaculture the Da Mi Reservoir, where the breeding sturgeon was imported from Russia to be cultured in the area.

~~108-103.~~ **Vegetation.** No aquatic vascular plants were recorded in areas with great depth, but some terrestrial and semi-aquatic species surrounding the lakeside were recorded. Thirteen (13) plant species were recorded within the PV modules area, and eleven (11) of which were terrestrial and semi-aquatic species. Almost all of the species were common species in Vietnam.

~~109-104.~~ Within the terrestrial lakeside area surrounding the PVs area, 66 species belonging to 26 families were recorded. No species of conservation significance were recorded in the PVs area, according to the Vietnam Red Databook (2007) and the IUCN Redlist of Threatened Species. However, there are several invasive species occurred within the PVs area including: *Mimosa pigra* (Mai dương) are abundant on lakeside, *Ageratum conyzoides* (Cứt lợn) are abundant on gardens, and *Chromolaena odorata* (Cỏ hôi) are common on gardens and lakeside.

~~110-105.~~ There were 14 species belonging to 6 families recorded in Inverter A's area, and 39 species belonging to 22 families recorded in Inverter B's island. At the transformer area located on grassland/bare-land, 15 species belonging to seven families were recorded. No species of conservation significance, according to the Vietnam Red Databook (2007) and the IUCN Redlist of Threatened Species, were recorded in these area.

~~111-106.~~ There were 97 species belonging to 43 families recorded along the transmission line with buffer 15m. *Aquilaria crassna* Pierre ex Lecomte (Dó bầu), a species listed as Endangered ('EN') by Vietnam Red Databook (2007) and Critically Endangered ('CR') by the IUCN Redlist of Threatened Species, was located in coffee garden along the 110 kV transmission line. However, this species is relatively common in planting forests in Vietnam, especially in the North and Central region. Hence, there is no need to remove or replant this species.

~~112-107.~~ **Avifauna.** There were 26 bird species belonging to 17 families recorded in the Project Area. The highest diversity of birds was observed in the Secondary Evergreen Forest habitat (20 species), followed by the Gardens habitat (18 species), Plantation Forests (13 species), Lake Corridors (13 species) and Residential Area (8 species). The birds observed were common and widely distributed in both Highland Vietnam and elsewhere in Vietnam. The avifauna was dominated by resident species because the survey period did not coincide with the migratory season.

~~113-108.~~ The avifauna recorded in the Project area and along the transmission line route was relatively diverse in species composition. *Psittacula roseata* and *Psittacula alexandri* are two recorded species listed as Near Threatened conservation level ('NT') according to the IUCN Redlist of Threatened Species. No important habitat such as breeding habitat was identified within the project area for these species. It should be noted that according to information of Important Bird Area, this area is not known as a location for migratory birds within Vietnam.

¹⁶ Details of assessment are discussed in the Annex F

114-109. Herpetofauna. There were 15 herpetofauna species belonging to 10 families recorded within Project Area by direct observation (11 species) and interviews with locals (4 species). One species of Tokay gecko (*Gekko gecko*) is listed as Vulnerable (VU) in the Vietnam Red Databook (2007), and ranked as Least Concerned ('LC') by IUCN Redlist of Threatened Species. The remaining species are widely common in Vietnam.

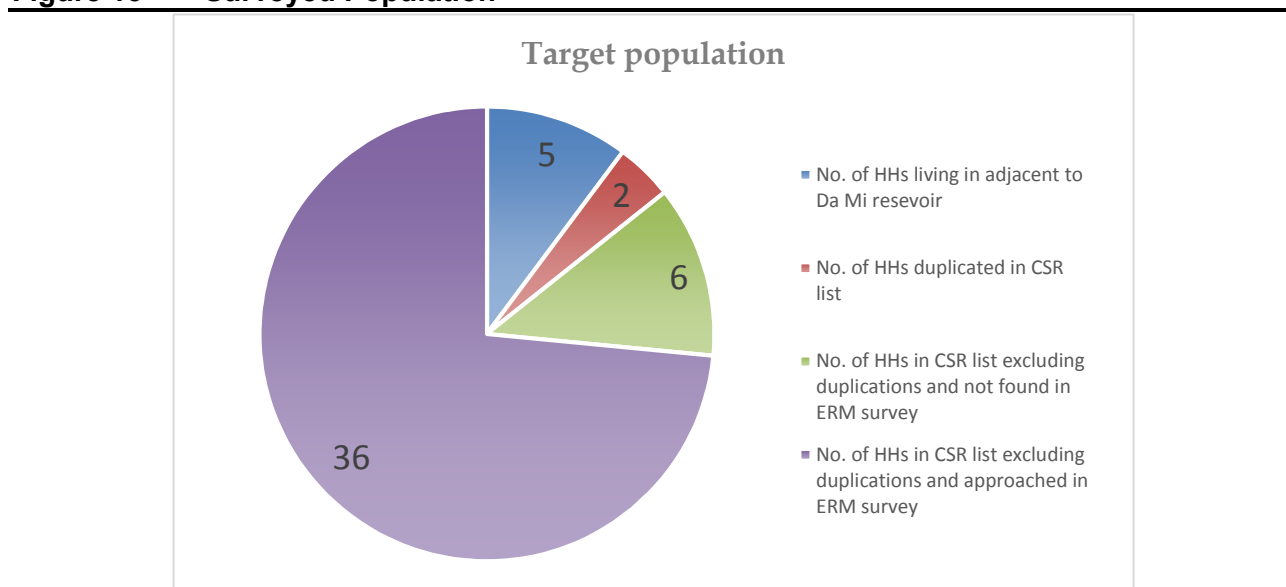
115-110. Mammals. A total of eight mammal species belonging to five families were recorded in the Project Area by direct observation (6 species) and interviews with locals (2 species). Evening surveys recorded only rat and bat species with no signs of other animals. The most abundant species were the Rice-field rat (*Rattus argentiventer*) and Lesser asiatic yellow bat (*Scotophilus kuhlii*). Generally, the density of the mammal species was low as they are relatively sensitive and tend to avoid areas with high human activities. No mammal species observed in the Project Area are of conservation significance according to the Vietnam Red Databook (2007) and IUCN Redlist of Threatened Species.

I. Socio-economic baseline

116-111. Six PV modules of the Project will be established on surface of Da Mi reservoir in La Ngau commune, Tanh Linh District, Binh Thuan province. The reservoir is about 2km from National Highway No.55 to the west, approximately 50km from Bao Loc City to the south, and about 76km from Phan Thiet City to the northwest. In addition to PV modules, the Project consists of 3.3km of associated transmission line going along three communes including La Ngau Commune of Tanh Linh District, La Da and Da Mi Communes of Ham Thuan Bac District (herein after referred to as “three communes”).

117-112. A social survey was conducted by ERM in June 2018 with key informants (local authorities of 2 districts and 3 communes), 20 community leaders through focus group discussion and 41 households through in-depth interviews (excluding 8 households not available during site visit). See details in Section K. During this survey, ERM has collected data from local authority and primary data from engagement with households and key stakeholders and use them as data source for the following analysis.

Figure 15 Surveyed Population



Source: ERM, 2018

Figure 16 Household Visit by ERM Team



Source: ERM, 2018

118-113. Communities affected by project components are summarized in the Table below.

Table 20 Communities within the Vicinity of the Project Affected Areas

District/ Commune	Tanh Linh/ La Ngau*	Ham Thuan Bac/ Da Mi	Ham Thuan Bac/ La Da
Project Component			
Directly affected hamlets	Da Mi	Daguri	Hamlet No. 3 and No. 4
Floating system	X		
Inverter station	X		
110kV substation	X		
600m 22kV transmission line	X		
3.3km 110kV transmission line	X	x	x

(*) Not including 8 households that ERM could not approach during the site visit; Including 5 households living close to the reservoir and not in the HH list provided by DHD.

Source: ERM, 2018.

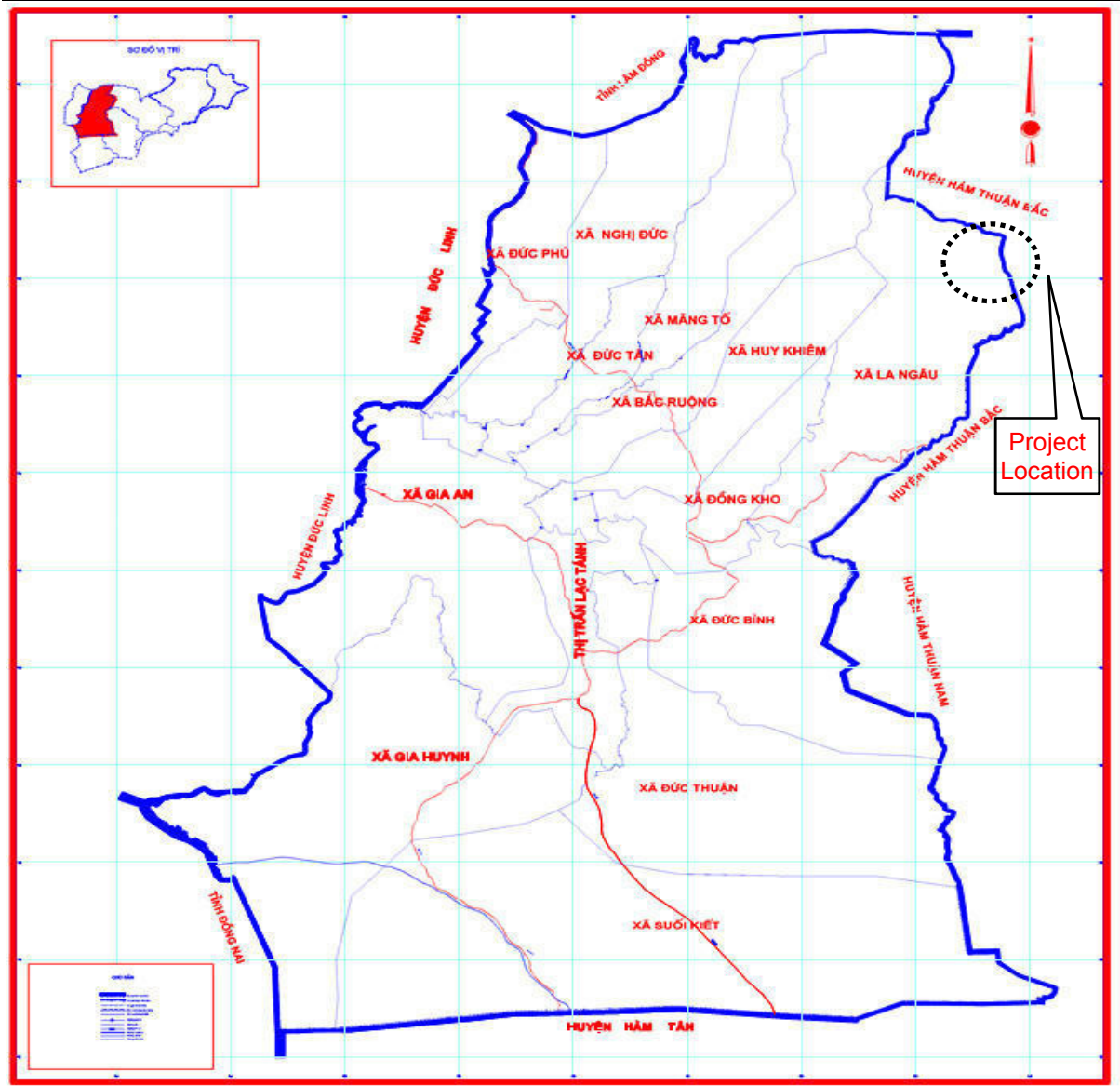
119-114. **Administration and Governance.** Three project affected communes belong to Tanh Linh and Ham Thuan Bac District of Binh Thuan province, a southern coastal province of Vietnam central region.

- Binh Thuan consists of ten administrative units: Phan Thiet city, Lagi town, districts of Tuy Phong, Bac Binh, Ham Thuan Bac, Ham Thuan Nam, Ham Tan, Tanh Linh, Duc Linh and island district of Phu Quy. Tanh Linh and Ham Thuan Bac are two rural districts located in

the northwest of Binh Thuan province. They share borders with Duc Linh district in the west, Bac Binh district in the east and Lam Dong province in the north. Their southern border meets districts of Ham Thuan Nam and Ham Tan together with Phan Thiet city.

- Tanh Linh District has 1 town (Lac Tanh) and 13 communes. La Ngau commune locates in North East of Tanh Linh district and border with Ham Thuan Bac District to the North East, Duc Binh Commune to the South, and Dong Kho, Huy Khiem and Bac Ruong to the West.

Figure 17 Administrative Map of Tanh Linh District



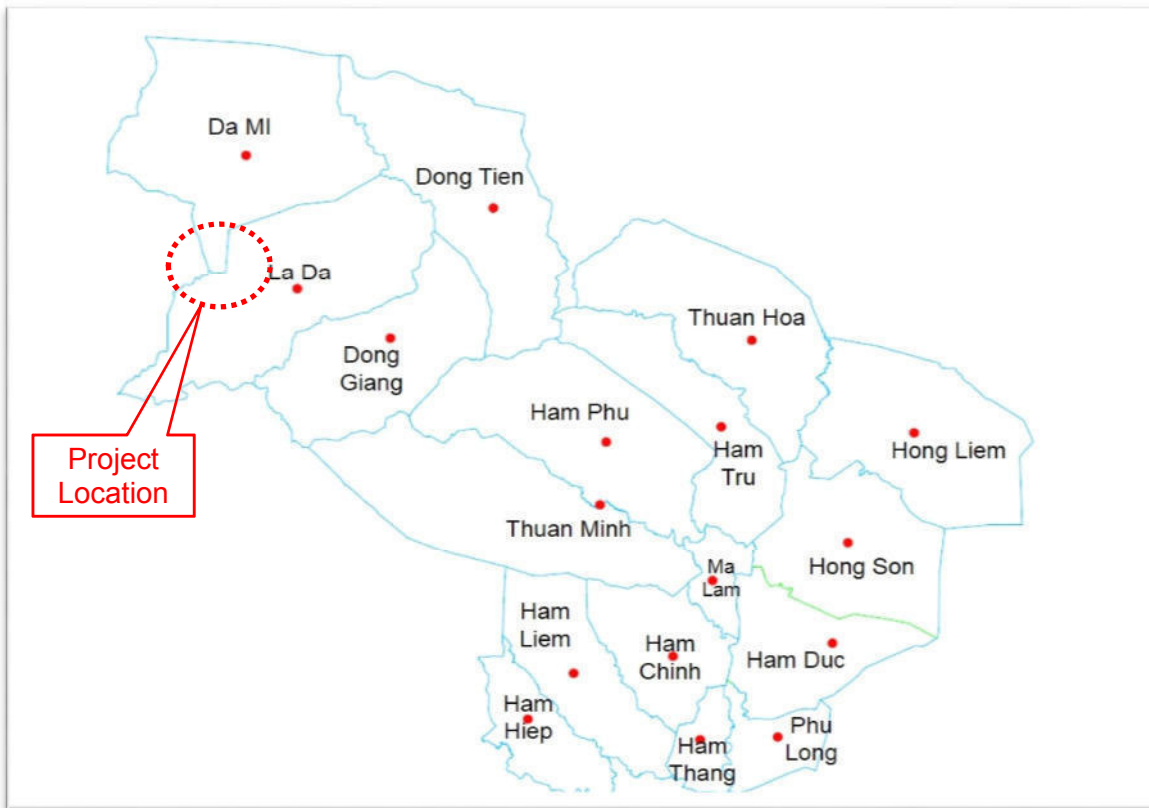
Source: Tanh Linh People's Committee

- Ham Thuan Bac District has two towns (Ma Lam and Phu Long) and 15 communes. According to administration plan up to 2020, Phu Long town, Ham Hiep commune and Ham Thang Commune will belong to Phan Thiet City. According to administration plan up to 2030, Ham Thuan Bac District will develop Da Mi commune into Da Mi tourism town and Ham Duc commune into industrial and service town. Altogether there will be three

towns (Ma Lam, Da Mi and Ham Duc) and 11 communes according to this plan. In 2001-2002, La Da Commune was divided into La Da Commune and Da Mi Commune.

- La Da Commune locates the North West of Ham Thuan Bac District and borders with Da Mi commune to the North, Dong Tien and Dong Giang commune to the East, My Thanh Commune of Ham Thuan Nam District to the South and La Ngau commune of Tanh Linh District to the West
- Da Mi Commune locates in the North of Ham Thuan Bac District and borders with Lam Dong Province to the North, Dong Tien Commune to the East, La Da Commune to the South and Tanh Linh District to the West

Figure 18 Administrative Map of Ham Thuan Bac District



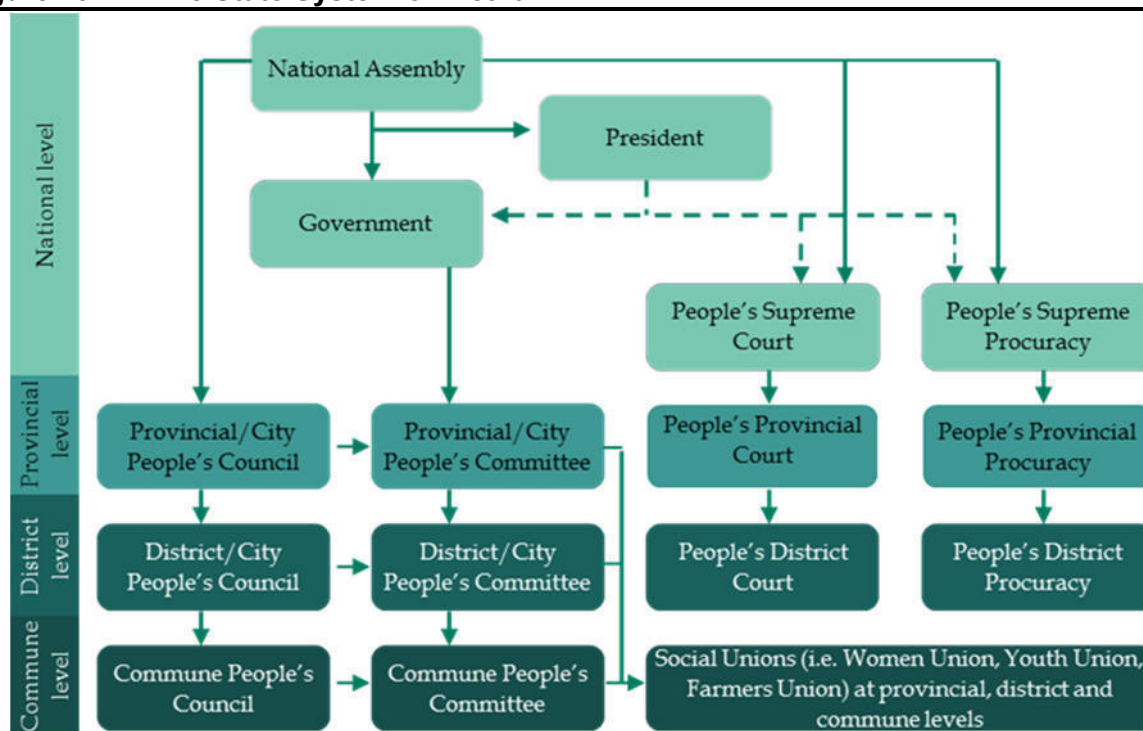
Source: Ham Thuan Bac Statistics Office

120-115. Administrative System - The state system of governance of Vietnam has four levels: national, provincial, district and commune as illustrated in Figure 19. The organization of the institutional governance from provincial/city level to commune level consists of:

- The People's Council at provincial, district and commune levels; a body of state power at the local level, representing the rights of the people and is elected by the local people; and
- The People's Committee at provincial, district and commune levels; the executive body of the People's Councils and State administrative agencies at the local level. The People's Committee at the provincial/city and district level includes departments for different fields

such as agriculture and rural development, natural resources and environment, and transport etc.

Figure 19 The State System of Vietnam



Source: ERM, 2018

The number of staff for each body may vary from commune to commune depending on the size and area of the commune.

[121-116.](#) **Land Tenure.** In Vietnam, the government owns the land but provides land use rights to the people. The period given for a land use right varies depending on the land use type. For residential use, the period is unlimited if the land user has the certificate. As regulated in *Decree 43/2014/ND-CP Detailing a number of articles of the land law*, the period of agriculture land use for individuals/ households is 50 years counted from the date individuals/ households receive agriculture land from the Government¹⁷. *Decree No.43/2014/ND-CP* also promulgated that households and individuals who have been using land on which there are houses and other construction works before July 1, 2004 and have no land use right related documents are eligible to apply for certificates of land use rights following the instruction of Article 20 of the Decree.

[122-117.](#) Land in Vietnam is managed by the Directorate of Land Administration at national level under the Ministry of Natural Resources and Environment. At Provincial and District level, there are:

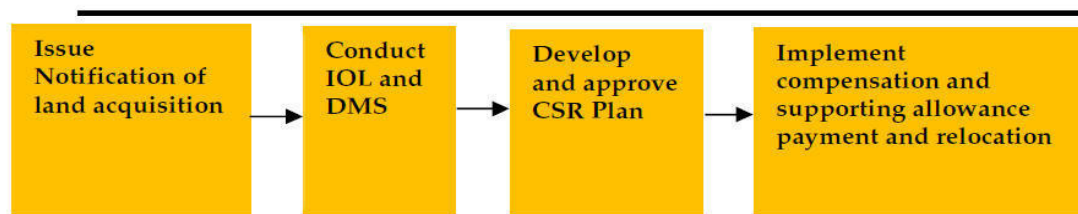
- Department of Natural Resource and Environment – acting as Land Administration Agency
- Land Registration Office - registering land and other land-attached assets; compiling, managing, updating and uniformly revising cadastral dossier and land databases; making

land statistics and inventory; providing land information to organizations and individuals at their request under regulations;

- Land Fund Development Organization - creating, developing, managing and exploiting land funds; organizing the payment of compensations, provision of support, and resettlement; receiving land use rights transferred by organizations, households and individuals; organizing the auction of land use rights and providing other services.

423-118. Standard land acquisition, compensation and resettlement process according to Land Law 2013 is presented in the following Figure 20. At the time of the survey (19-22 June 2018), the local authority together with DHD had completed the IOL and DMS of Ham Thuan Bac district. The CSR plans of Ham Thuan Bac were approved and published on 7 June 2018. If no grievance/ disagreement was received within 20 days of publishing, the CSR plans would be submitted to District People's Committee for approval. Following the approval of the CSR plans, the authority will implement the compensation and support payment based on the approved plan.

Figure 20 Standard Land Acquisition, Compensation and Resettlement Process



Note: IOL (Inventory of Loss)
DMS (Detailed Measurement Survey)
CSR Plan (Compensation, Support and Resettlement Plan)

Source: ERM, 2018.

425-119. Demographic Profiles of affected Districts and Communes. Tanh Linh and Ham Thuan Bac district have three geographical terrains: plain, semi-mountain and mountain. Ham Thuan Bac district is the second largest district in Binh Thuan province (1,344km²) and Tanh Linh district is ranked as the third one (1,198km²)¹⁸. However, despite of large area, they conversely are among the districts with lowest population density of province, with Tanh Linh is listed as the second lowest density's district (88 person/km²), and Ham Thuan Bac is the fifth lowest one (130 person/km²). Two districts contribute to 23% of the province total population.

426-120. According the socio-economic data obtained during ERM's socio-economic survey in 2018, the population, number of households, average household size and ratios of gender for each affected commune are presented in the below table. The three communes have low population density with the range from 27 to 31 person/km², far lower than the district's average level of Tanh Linh and Ham Thuan Bac District, which are 88 and 130 person/km² respectively.

¹⁸ Source: Binh Thuan Statistical Yearbook 2016

Table 21 Population, Number of households and Average Household Size of three communes

Commune	Area (km ²)	Population	Density (person/km ²)	No. of Household	Average Household size	Gender (%)	
						Male	Female
La Ngau Commune	95.02	2877	27	625	N/A	50.06	49.94
La Da Commune	112.13	4730	26.9	946	5	50	50
Da Mi Commune	148.38	4306	31.1	N/A	N/A	50	50

Source: Statistical Book of Communes and Districts, 2016

127-121. There were 184 persons of 41 surveyed households. The average household size was 4.5 persons per household. Among 184 persons, 96 persons (or 52%) are male, 85 persons (or 46%) are female and 3 persons (or 2%) are not available for data collection.

Table 22 Gender and Age group Statistics at Three Communes

Commune of residence	Number of persons	Gender			Age group				
		Male	Female	n/a	<18	18-30	31-60	>60	n/a
Da Mi	69	40	28	1	24	12	25	8	
La Da	32	15	17	0	12	5	14	1	
La Ngau	83	41	40	2	24	14	37	4	4
Total	184	96	85	3	60	31	76	13	4

Source: ERM, 2018.

The majority of the people in the surveyed households are between 31 and 60 years old (i.e. within the working age), accounting for about 41% of the total sample. Nearly 33% are below 18 years old, and about 17% of people are from 18 to 30 years old. The other 7% are elderly people over 60 years old and 2% not available for data collection.

128-122. Ethnicity (See definitions in the Glossary). In Tanh Linh District, there are a total 15,075 ethnic people of 3,211 households making account for 14.6% of district population¹⁹. Twelve ethnic groups of Cham, Ra-glai, Cho-ro, K'ho, Dao, Hrê, Hoa, Khmer, Muong, Nung, Tay, Thai living together with Kinh people in 13 hamlet of six communes and one town. It should be noted that groups of Muong, Nung, Tay and Thai people has been migrant since 1995. In La Ngau commune, K'Ho people make up 66.7% of total commune population.

129-123. Ham Thuan Bac District has ethnic minorities of K'Ho, Cham, Raglai concentrating in the mountainous communes such as La Da, Dong Giang, and Dong Tien. In La Da commune, 96% of population is K'Ho people. The remaining includes other groups such as Kinh, Ede, Hoa, etc.

130-124. In the census survey conducted by ERM, Kinh people is majority group within the Project area. There are several households of Muong people, and three households of K'Ho people.

¹⁹ <http://tanhlinh.binhthuan.gov.vn>

Table 23 Ethnic Groups by Household

Commune of residence	Ethnic group by household			
	Kinh	K'Ho	Muong	Unknown
Da Mi	13		1	2
La Da	3	3	1	
La Ngau	18			
Unknown (the affected households that ERM could not meet and interview during the social survey)				8
Total	34	3	2	10

Source: ERM, 2018.

The Districts have implemented the following policies in supporting ethnic minority community in socio-economic development:

- Programme 135 (phase 3) under Decision 1722/QĐ-TTg approving the National Target Program for Sustainable Poverty Reduction during 2016 – 2020. Ham Thuan Bac District has 3 communes entitled to Programme 135⁽²⁰⁾, including Dong Giang, Dong Tien and La Da Commune. La Ngau commune in Tanh Linh district is also entitled to Programme 135.
- Decision 2085/QĐ-TTg dated 31/06/2016 by the Prime Minister on Approval the Special policy to support socio-economic development in ethnic minority and mountainous areas in the period of 2017-2020 and Circular 02/2017/TT-UBND dated May 22, 2017 of the Committee for Ethnic Minority Affairs.
- Resolution No.4 by Provincial PC issued in 2001 regarding full development for ethnic minority areas through provision of not more than 1.5ha of land to each household ⁽²¹⁾.
- Decision No. 05/2016/QĐ-UBND, dated 01 February 2016, by Provincial PC regarding advance and transportation cost support for breeds and materials to support agriculture production of ethnic minority households in highland communes and communes with ethnic minority groups in Binh Thuan Province.
- Students of ethnic groups receive educational support according to Decision No. 05/2013/QĐ-UBND dated 24 January 2013 by Binh Thuan Province PC.
- Besides, Ham Thuan Bac District also provides cleared forest land to ethnic groups in Dong Giang and La Da between 2013-2020. As of now, La Da has received 95 ha and Dong Giang 77.5ha. Budget for supporting ethnic minorities is mostly from New Rural Development Programme, about 1b VND per year.

132-125. Religion. In Tanh Linh and Ham Thuan Bac Districts, there are seven main religions including Buddhism, Catholic, Protestant, Caodaism, Brahmin, Hoa Hao, Baha'i. According to ERM's social survey, among 49 households in three communes, the Catholic followers make up 28.6% of commune population, followed by Buddhist with 12.2% and other religions with 8.2%. The percentage of non-religious people is 28.6%.

²⁰ <https://thuvienphapluat.vn/van-ban/Dau-tu/Quyet-dinh-900-QĐ-TTg-2017-phe-duyet-danh-sach-xa-vao-dien-dau-tu-cua-Chuong-trinh-135-352515.aspx>

(21) Cannot find this resolution.

Table 24 Religions by Household

Commune of residence	Religion by household					
	Hindu	Buddhism	Catholic	Others	No Religion	Unknown
Da Mi	1	3	6	1	4	1
La Da			3		3	1
La Ngau		3	5	2	7	1
Unknown						8
Total	1	6	14	3	14	11

Source: ERM, 2018.

134-126. Road network. The three communes are linked with Central Highlands by National Road No.55 from Vung Tau connecting La Gi and Bao Loc, Lam Dong Province. Provincial Road No.714 connects three communes with the provincial center of Phan Thiet city. All roads to centers of districts, communes and other important economic areas have been upgraded, enlarged, and extended, ensuring favorable conditions for production and commodity transport.

- Da Mi - National Highway No.55 is the main concrete road running through the whole Da Mi Commune (20 km) whereas inter-commune roads have not yet covered with concrete and its length is 15 km.
- La Da - Main road (DT.714) is asphalted and in good condition. Households live along the main roads.
- La Ngau - One national road (No. 55) goes through the commune.

135-127. Railway. The North – South Railway crosses a section of 190 km through the province, including 34km through Ham Thuan Bac District. The main station of the province is Binh Thuan station, located at Ham Thuan Nam District, approximately 78km southeast of three communes and around 10 km northwest of Phan Thiet City. There are three small stations of Song Dinh, Suoi Kiet, Gia Huynh located in Tanh Linh District, and two stations of Long Thanh and Ma Lam located in Ham Thuan Bac District. The nearest station from the Project Site is Ma Lam station which is 52km away to the southeast.

136-128. Ports & Airport. Phan Thiet port with capacity 2,000 ton-vessels is 70km away from three communes. The nearest commercial airport is located in Lien Khuong, Duc Trong District, Lam Dong province (125km).

137-129. Water Supply. In Ham Thuan Bac District, tap water is not enough for communes in Northern areas of the District. There is one water plant in Ham Tri commune and three water stations in Hong Liem, Hong Son, Phu Lap commune. There is one project with Italian donor to build water stations in Thuan Hoa and Ham Lien commune up to 2020 and a project to build water plant for Dong Giang and La Da commune with project host being the Department of Agriculture and Rural Development. In Tanh Linh District, tap water only covers 8/76 villages. Some areas lack of water in dry season, e.g. Suoi Kiet area. The District currently has 1 water plant in Loc Tanh commune and eight water station and plans to build water station in Ta Bao Commune.

138-130. It should be noted that there is no water supply system in three communes of La Ngau, La Da and Da Mi. Groundwater is currently the primary source of domestic purpose in three communes. According to the social survey conducted by ERM in June 2018, the ratio of households using groundwater for drinking is 50.8%. The percentage of households using river

water for drinking is 15.3%, and the remaining households use other sources for, such as buying water bottles. At the Project site, local people access groundwater through wells (10-20m) however in some specific area such as the area near project's future substation, it is necessary to drill up to 100m to reach the groundwater level. Groundwater is reportedly of sufficient quantity but not really good quality, as indicated by local community members during the recent site visit.

139-131. Irrigation. The river of La Nga goes across three communes. There are some major lakes such as Ham Thuan reservoir (Da Mi commune), Da Mi reservoir (La Ngau commune), Da Gu Ri (La Da commune) together with a number of adjacent streams are main water sources for irrigation.

140-132. Ham Thuan Bac District is confident of its irrigation system. There are more than 103 irrigation units and hydro dams in the district: Ham Thuan Da Mi hydro dam, Dan Sach hydro dam, Suối Đá lake, Sông Kháng lake, Sa Lôn dyke, Sông Quao irrigation system, Châu Tá channel, etc. with coverage capacity of 30,000 ha. Thanh Linh District reported that the irrigation system in the district basically meets production needs with two main irrigation systems (South and North systems). Both districts plan to upgrade the existing system only, not building new one.

141-133. La Ngau Commune reported that there was one irrigation system in Villages 2 and 3 which could provide irrigation for the area of 60ha. La Da Commune reported that the irrigation system in the commune was not satisfactory. Households mainly utilize existing streams/ lakes with limited capacity, only covering about 40ha. There are three main lakes in the commune including Da Tri-An lake (26ha), Da Lanh lake (5ha) and Da Gu-Ri lake (36ha).

142-134. Electricity Supply. Binh Thuan Province uses the national grid power. The main power source for Phan Thiet City is from the central transformer station of 50 MVA capacity which will be increased to 80-100 MVA. There are 3 main power sources, including:

- From Da Nhim Hydropower Plant through the transmission line of 110 kV;
- From Ham Thuan – Da Mi Hydropower Plant through the transmission line of 110 kV;
- Diesel power plant of 3,800 KW.

Some hydropower plants have been operated: Ham Thuan – Da Mi Plant having a capacity of 475 MW is located in the north-west, Dai Ninh Plant (300 MW), Bac Binh Hydropower Plant (33 MW), etc. In accordance with a Government decision, there will be two major electrothermal – coal plants built in Binh Thuan, i.e. Son My (3,900 MW) and Vinh Tan (5,668 MW).

Binh Thuan is the site of several renewable energy projects including wind and solar and will be important for Vietnam's diversification of power instead of hydro-power. Binh Thuan has significant potential for wind power generation, estimated at 3,000 MW. The projects comprise Binh Thuan wind power project at stage 1 (30 MW), Phu Quy wind power plant (6 MW). The large wind energy project is expected to help boost regional socio-economic development and pave the way for further exploitation of renewable energy sources. Binh Thuan province is also considered to be a nation with high solar potential. Solar energy intensity on the average could reach 5 kWh/m² due to the absence of cloud and drizzle. In terms of price, the electricity unit price is determined by the government, Vietnam Electricity (EVN) and stakeholders.

143-135. Most affected households in three communes are connected to the Ham Thuan-Duc Linh national grid. It is estimated that only 4 or 5 of the survey households (about 10% of the surveyed population) are not yet connected to the grid and they buy energy from a small private supplier. Some surveyed households reported that there is insufficient supply to meet demand during peak times.

144-136. Waste Management. According to the Socio-economic report in 2016 of Binh Thuan Province, 75% of domestic waste is collected and treated. In Ham Thuan Bac District, there is a 10ha waste collection point in Ham Tri commune which is about 38km away from the Project site. Main method used is burying. The waste collection point was reported to meet the needs of the district. There is no plan to build waste treatment plant up to 2020. In Tanh Linh district, there are two solid waste treatment projects including Lac Tanh Plant currently in operation which is approximately 64km from the Project Site and Ba Phat Plant (approximately 60km from the Project Site) has been approved by the Ministry of Natural Resource and Environment but specific timeframe for their operation commence has not been confirmed.

145-137. In three communes of La Ngau, La Da and Da Mi, there is an absent of trash collection and solid waste treatment system.

146-138. Land Tenure. Land measurement in Da Mi Commune started in 2009 and land title issuance started in 2013 and is still going on. This explains for the fact that a certain amount of households in Da Mi Commune do not have LURC. Among surveyed households, 34 were reported to have residential land. However, only 16 households (47%) have land use right certificates (LURCs) for their residential land. The remains do not have the land use rights yet, in particular six households living near Da Mi reservoir using the land for free since their moving to settle down there.

147-139. Among surveyed households, household land type are mostly agriculture and garden land. In fact, 41 surveyed households have agricultural land, among which 24 (59%) have LURCs.

Table 25 Land Use by Location in 2017

Area of land use in 2017 (ha)	Agriculture land	% of Total	Forest land	% of Total	Aquaculture land	% of Total	Land with specific use	% of Total	Residential land	% of Total
Tanh Linh District	111,629	62.8%	65,136	36.7%	142	0.08%	-	0.0%	746	0.4%
Ham Thuan Bac District	61,332	47.1%	63,652	48.9%	60	0.05%	3,551	2.7%	1,530	1.2%
La Ngau Commune	8,107	52.2%	7,407	47.7%	0	0	0	0.0%	10	0.1%
La Da Commune	4,275	34.5%	8,029	64.9%	0	0	48	0.4%	27	0.2%
Da Mi Commune	3,542	25.7%	8,662	62.8%	0	0	1,565	11.3%	25	0.2%

Source: Statistical Yearbook of Ham Thuan Bac and Tanh Linh Districts 2016.

148-140. Housing. Most surveyed households who reside near the Project area own their home. Most of these houses are semi-permanent houses with metal roofs. There are two households next to the lake living in stilt houses.

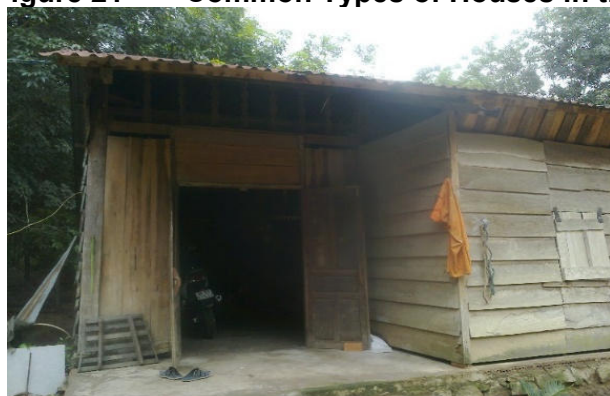
Table 26 House Types by Household

Commune	Non-permanent house	Semi-permanent house	Permanent house	Unknown
Da Mi Commune	1	13	1	1
La Da Commune	1	4	1	1
La Ngau Commune	9	6	2	1
Unknown				8

TOTAL	11	23	4	11
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Source: ERM, 2018.

Figure 21 Common Types of Houses in the Affected Area.



A wooden house of K'ho community in La Da commune



Traditional stilt houses of K'Ho community in La Da Commune



A bamboo house of K'Ho community in La Da Commune



Charity house and well system donated by development programmes in La Da Commune



Stilt house of a household* living next to Da Mi reservoir. During the flood spilling season of Ham Thuan hydropower plant, the water from Da Mi reservoir may reach the house floor within 10-15 days.

(*) These five households were recognised poor from the interview with them during the survey. It is noted that these households are not displaced by the land acquisition but will be affected during the Project construction and operation in particular with noise, influx and restriction of access to the reservoir.

Note: According to the definition of the Ministry of Construction on permanent and semi-permanent houses, there are three criteria to categorise permanent house and semi-permanent house. In particular, permanent house is a house meets all three criteria, and semi-permanent house is a



Cemented house, common among Kinh group

house meets two criteria. The criteria include: (1) Pillar made of materials: concrete, brick/stone, iron/steel/ durable wood; (2) Roof made of materials: concrete, tile (cement, terracotta); (3) Wall made of materials: concrete, brick / stone, wood/metal. Based on the answer of the interviewees we will classify their houses as permanent, semi-permanent and non-permanent houses.

Source: ERM, 2018

149-141. All the surveyed households have basic house assets including motorbikes and cabinets. The majority of them had separate toilets, beds, and motorbikes. Notably, the percentage of surveyed households owning TVs and mobile phones is high (100%). Other high-grade assets such as computers and fridges owned by approximately 25% and 71% of surveyed households, respectively.

150-142. Schools and Education. Ham Thuan Bac District has 42 primary schools; 17 junior high schools and 3 high schools. Tanh Linh District has 30 primary schools, 17 junior high schools and 2 high schools. The below table shows the number of schools in each grade level in three communes in 2016.

Table 27 School Statistic in Three Communes

City/ Commune	Kindergarten	Primary school	Junior High School	Total
Grade		1-5	6-9	
La Ngau Commune	1	1	1	3
La Da Commune	1	3	1	4
Da Mi Commune	4	2	1	7

Source: Statistical Yearbook of Ham Thuan Bac and Tanh Linh Districts 2016

151-143. According the census survey of ERM in 2018, 25.8% of this population have finished primary school, 31.5% of members of surveyed households has finished secondary school and 15.8% of population have finished high school. The detailed education level of surveyed households is presented in the below table.

Table 28 Education Level of Surveyed Households (Unit: person)

Educational attainment	Gender					
	Male		Female		Total	
	Number	%	Number	%	Number	%
No info	2	2.0%	2	2.3%	4	2.2%
Illiterate	4	4.1%	6	7.0%	10	5.4%
Under primary level	4	4.1%	3	3.5%	7	3.8%
Primary level	28	28.6%	22	25.6%	50	27.2%
Secondary level	31	31.6%	27	31.4%	58	31.5%
High school level	18	18.4%	11	12.8%	29	15.8%
University/College ²²	5	5.1%	7	8.1%	12	6.5%
Postgraduate	0	0%	0	0%	0	0
Others	6	6.1%	8	9.3%	14	7.6%
Total	98	100%	86	100%	184	100%

Source: ERM, 2018.

²² Trade school or vocational college is a type of educational institution of post-secondary education designed to provide vocational education, or technical skills required to perform the tasks of a particular and specific job.

[152-144.](#) **Health Condition and Services.** Table 29 below presents health facilities and resources in the Province and Districts. Health services in Binh Thuan area are provided at two levels: medical station and hospital levels. In 2016, Ham Thuan Bac and Tanh Linh District both have District hospital. It is noted that the under-one-year-old vaccination rate of La Ngau Commune was 100% and that of La Da and Da Mi Commune in 2016 were 95.7% and 96.8%, respectively.

Table 29 Health Services in Binh Thuan Province, Ham Thuan Bac and Tanh Linh District in 2016

	Binh Thuan Province	Ham Thuan Bac District	Tanh Linh District
Total health care establishments, included:	143	18	15
Hospital	16	1	1
Regional polyclinic	10	2	1
Medical stations	117	15	13
Clinic of enterprise	0		
Other health care facilities	0		
Total personnel, including:			
Medical staff	3,439	353	342
Pharmaceutical staff	640	38	39
Number of beds	3,838	265	125

Source: Statistical Yearbook of Ham Thuan Bac and Tanh Linh Districts.

[153-145.](#) Results from census survey presented that in the last 12 months, among surveyed households, the most common illness was flu/cold with 59 cases. Hypertension ranked next with 16 cases. The below table showed the number of people having common illness in Project Area in the last 12 months.

Table 30 Statistics on Illness Cases among Surveyed Households in the Last 12 months

Commune	Number of illness cases among surveyed households in the last 12 months											
	Substance abuse	Liver	Neurological	Flu/cold	Osteoporosis	Hypertension	Diabetes	Rubella	Diarrhea	Dengue	Heart	Others
Da Mi	2	1	0	30	3	5	1	1	3	1	3	12
La Da	1	0	0	16	0	3	0	1	2	2	0	4
La Ngau	0	1	1	13	2	8	0	4	6	0	4	10
Total	3	2	1	59	5	16	1	6	11	3	7	26

Source: ERM, 2018.

[154-146.](#) **Vulnerability.** Vulnerable households are those having at least one of the following characteristics: Female-headed households; Households with elderly bread-winner (out of working age); Households with members with disabilities or injured war veterans; Orphans; and Poor/near poor households with small land holdings. The below table shows the number of vulnerable households in the survey.

Table 31 Vulnerable Households' Statistics

Commune	Not vulnerable HH	Vulnerable HH	Vulnerable cases				
			HH head with disability	Ethnic minority	Female headed	With poor/ near poor certificate	Elderly head
Đa Mi	14	3		1			3
La Dạ	3	4		4	1	2	1
La Ngâu	12	5	1		1	3	3
Total	29	12	1	5	2	5	7

Source: ERM, 2018.

155-147. Cultural Heritage. According to site visit and local stakeholders consultation, the nearest religious site to the Project components are Buu Son Pagoda which is about 500m away from the transmission line, and the Da Gu Ri Church which is about 700m away from the transmission line (See map in Section “Project Description”)

Figure 22 Daguri Church (Left) and Buu Son Pagoda (Right)

Source: ERM, 2018.

156-148. Livelihoods and Economic Development. In Ham Thuan Bac District, main livelihoods is agriculture with common commodities being dragon fruit (more than 9,000 ha, equaling one third of the total amount of 30,000 ha of Binh Thuan province) and rice (9,000 ha). Other commodities are coffee, rubber and fruit trees. Average size of dragon fruit farm in the district is one ha. With the average price of VND 15,000/kg of dragon fruit, farmers can make VND 300-400 million per ha. The District does not plan to increase the total area of dragon fruit but increase farm productivity through technology application. There are some successful examples, e.g. chilly and rock melon farms in Da Mi Commune, vegetable green house in Phu Long Commune, Nong Trang Viet farm in Hong Son commune, etc. In La Da and Dong Giang, the plan is to improve cashew nut breed quality. Rubber has been grown in the area for the last ten years. There are two output methods: 1) selling sap to middlemen if farmers manage their own investment; 2) selling sap to the Center of Mountainous Services if farmers have advance from the Center through contract farming. Regarding husbandry, the Province has grass area planning and the district follows this policy. There are some swine farms such as those in Hong Liem, Ham Duc and Thuan Hoa and high-yield cow farm in Ham Phu Commune. The policy encourages industrial farming but traditional practice is still dominant. Trading, Services and Aquaculture occupy small portion. Industry is growing with one industrial zone (Phan Thiet-Ham Liem) and three industrial clusters (Ma Lam, Ham Duc, Phu Long). Workers earn about VND 3.5 million/month. Workers are mostly Kinh group. The District also has a tourist site called Nine-

storey-waterfall. The construction and site clearance are going on. Manual workers working for dragon fruit farm in harvesting season can make between 500-1m dong per day.

~~157-149.~~ In Tanh Linh District, agriculture occupies approximately 70%. Main commodities are rice (11,000 ha), corn and rubber (23,000 ha). The District plans to change three rice crops a year to two rice crops and 1 non-rice crops per year or one rice crop and two non-rice crops per year. On average, one household has 5,000 m² of land. There is no green houses in the District. In La Ngau, main livelihood is husbandry using traditional practice (cow, goat) and planting corn and beans. The District has four industrial clusters currently calling for investment.

~~158-150.~~ In Da Mi Commune, cultivation is the main livelihood. In particular, durian, mango, jackfruit, banana and avocado are popular fruit trees that are widely grown in the whole Commune. In addition to the fruit trees, coffee and cashew trees are common commercial perennial crops. In recent years, the Commune has no significant changes in livelihood in general. Cultivation remains their main livelihood activity and coffee is the Commune's livelihood development strategy. However, in the last 2-3 years, the number of durian trees in the Commune has gradually increased to satisfy high demands from Chinese traders. Durian trees occupied 20% agricultural land in the Commune, and the remaining land is mainly used for growing coffee and cashew trees. Apart from cultivation, there are some employees working for a local sturgeon company. Also, local people also find other employment opportunities in other areas.

~~159-151.~~ In La Da Commune, the most common livelihood of local people is perennial trees/plants such as Cashew (540ha), rubber trees (504ha) and fruit trees. Cashew trees used to be the most popular in previous years, however the price is decreasing rapidly and local people tend to change to fruit trees such as mango, durian, jackfruit and cassava. Second most-common livelihood is rice cultivation, and rice paddies mainly located near three main lakes (Da Ri-An, Da Lang, Da Gu-Ri, altogether 67ha). In recent years, local farmers tend to change cultivated practices from upland rice cultivation to wet rice cultivation. Rice cultivation in La Da is not effective due to poor technique. There is also vegetable crops based livelihood along La Nga river however it is not wide-spreading. Rice and vegetable cultivation are mostly for self-consumption rather than for commercial use. There is also fishing activity on these three lakes. Some households also live on forest resources such as mushroom collection and cultivation on forest land. Husbandry is of small scale and for self-consumption (swine, cow, and poultry). There is no processing service nor handicraft workshop in the Commune. One investor asked for 30ha of land to build a factory but the Commune turned down the request due to the lack of land. In the future, the Commune plans to:

- increase areas of cashew nut, improve cashew nut breeding quality (hybrid, high yield), increase wet-rice productivity (Currently productivity is low with only 420kgs per ha)
- increase areas for fruit trees (durian, jackfruit, mango, avocado) and café (Currently, there are 4 ha of durian and 139 ha of café)
- encourage local swine/ black swine raising and cow raising. There are many projects supporting cow breeds. However traditional practice in cow raising is still popular and hard to change. In sunny season, people leave their cows free. The cows can destroy crops and sometimes the cows get lost but households do not know until rainy season when they take the cows home. The Commune is piloting grass growing and industry cow raising model in Hamlet 3 and Hamlet 4. Hamlet 1 and Hamlet 2 still follow traditional practice.

~~160-152.~~ In La Ngau commune, agriculture occupies over 80%. Main commodities are cashew, corn, coffee, pepper and fruit. Next common livelihood activity is husbandry (cow, goat farming).

[161-153.](#) Main occupation of surveyed households is cultivation with 33.3% of the surveyed population. The number of students/pupils make up 31%, followed by workers with 6.9%. The detail of occupation is shown at the below table. It should be noted that there are five households in La Ngau commune conducting fishing on Da Mi reservoir as their main income resource.

Table 32 Income Occupation by Person

Commune of residence	Occupation by person									Total
	Cultivation	Fishing	Service/ Business	Government officer	Worker/ staff	Seasonal employment	Students	Stay at home	Others	
Da Mi	27	1	5	2	3	0	24	8	1	71
La Da	16	0	0	0	1	4	9	2	0	32
La Ngau	17	6	4	2	8	6	22	6	4	75
Total	60	7	9	4	12	10	55	16	5	123

Source: ERM, 2018.

Figure 23 Livelihood Activities



Source: ERM, 2018

[162-154.](#) The challenge for livelihood development were reported to be technology, price fluctuation and weather (drought and heavy rains). There was also the lack of monitoring and enforcement tools. For example, the policy is to maintain areas for rice and dragon fruit. However, when farmers quit on rice and grow more dragon fruit, they do not have to pay fine but simply sign monitoring reports.

[163-155.](#) **Social Network.** In all project affected areas, mass organization were reported to be active but there were no business groups. The site visit by ERM recorded a number of local NGOs and development projects:

- In both Ham Thuan Bac and Thanh Linh District, Thien Chi Organization (a local NGO) is active. They invest in seven main areas, including livelihoods (farming & husbandry), health education, gender equity, microcredit, supporting vulnerable households, environment protection, education and job creation.
- In La Ngau commune, Thien Chi Organisation provides cash based support (VND 2-3 million/household) for chicken farming and technology support for vegetable farming and fruit farming.
- In the period of 2006-2009, Da Mi Commune received support from NGOs in building cultural houses in villages, schools and wells. Besides the NGOs, Community-Based Rural Infrastructure Project (CBRIP) was implemented in the Commune. Through a pilot program, JICA is investing in grafted coffee trees in the local area. In particular, they supported VND 8 million for each household joining in the coffee tree development program.
- In La Da commune, there are three relative proactive mass organizations including Youth Union, Women Union, and Veteran Association. World Vision and Norad are two NGOs having activities in La Da commune. Support from World Vision is expected to end within the upcoming four years. Norad supports forest protection and local livelihood and this is their second year working in La Da, in Hamlet 1, 2 and 3.

J. Impact assessment methodology.

[164-156.](#) The section will map the proposed impacts from the projects to the environment and socio-economic. Once it is completed, each impact shall be described in relevant characteristics.

Table 33 Impact Characterisation Terminology

Characteristic	Definition	Designations
Type	A description about the impact to the Project (cause and effect).	Direct, Indirect, Induced
Extent	The “reach” of the impact	Local, Regional, International
Duration	The time over which a resource / receptor is affected.	Temporary, Short-term, Long-term, Permanent
Scale	The size of the impact	No fixed designations; intended to be a numerical value or a qualitative description of “intensity”
Frequency	A measure of the constancy or periodicity of the impact.	No fixed designations; intended to be a numerical value or a qualitative description.

Source: ERM, 2018.

Table 34 Impact type definitions

Designations	Definition
Direct	Direct impacts between the Project and a resource/receptor.
Indirect	Impacts that follow on from the above direct interactions.
Induced	Impacts from other activities.

Source: ERM, 2018.

- Once an impact’s characteristics are defined, a ‘magnitude’ shall be assigned to each impact. It is typically a function of some combination (depending on the resource/receptor in question) of the impact characteristics mentioned in table above.

- Magnitude describes the intensity of the change predicted to occur in the resource/receptor due to the impact. In the case of a positive impact, no magnitude designation is required to be assigned. The universal magnitude designations are: Positive, Negligible, Small, Medium and Large.
- As in the case of magnitude, the sensitivity/vulnerability/importance designates themselves from level low to high, are universally consistent, but the definitions for these designations vary on a resource/receptor basis. Once all of them have been characterised, the significance can be assigned for each impact.

Figure 24 Impact Significant Matrix

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Source: ERM, 2018.

K. Anticipated Environmental and Social Impacts and Mitigation Measures

165-157. 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 plant site and substation, the access road that will be used to assess the Project, and the nearby communities that may be impacted by the Project.

166-158. 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.

167-159. Main activities of the construction phase include transportation, site preparation, and construction of solar power plant, inverter stations, transformer station, transmission lines, access road, plastering, and the installation of float system, PV panels, insulators, accessories, machines and equipment for the stations.

168-160. Main activities of the operation phase include electricity generation and maintenance activities.

❖ Impacts during Construction

169-161. Land acquisition and clearance. The land acquisition and CSR process of the Project is a government-led process and is being implemented in line with the national requirements (see Section Land Requirements above). As reported by the Project Company and local authorities at district level, there was none of physical displacement case involved in the land acquisition of the Project. All 42 households were identified as economically displaced due to loss of their farm land including three households will lose their agriculture land permanently for access roads and power poles, 25 households will lose their agriculture land temporarily for transmission lines (during its construction), and 14 households will lose their agriculture land both permanently and temporarily for these components of the Project. There are a number of gaps between Vietnamese regulations on land acquisition and CSR process and ADB requirements for Involuntary Resettlement, the CSR process will not achieve the full replacement cost, in-kind assistance via livelihood restoration programmes instead of assistance in cash, additional assistance for vulnerable groups including ethnic minority peoples. However, in order to assess the significance of the displacement impact, it is necessary to take into account of (1) percentage of land loss, (2) vulnerability²³ of the displaced households which is showed in the table below. It is noted that given five households living adjacent to the reservoir will not lose their land for the Project but their impacts are identified as restriction of access to the fishing area and moorage area on the reservoir which will be discussed in the next paragraph.

Table 28 Percentage of Land Loss

Nature of land loss	% of land loss			
	<10%	>=10%	No information (*)	Total
both permanent and temporary	6	3	5	14
permanent	2	0	1	3
temporary	17	8	0	25
Total	25	11	6	42

Note: (*) ERM could not meet these six households for the interview as explained in baseline section above. No information for the % of land loss but in the displacement list provided by DHD nature of land loss of each household is noted.

Source: ERM, 2018

Table 29 Percentage of Land Loss in Consideration of Vulnerability

% land loss	No-vulnerable household	Vulnerable household	Vulnerable Case				
			Disable headed household	Poor and Near Poor household	Female headed household	Elderly headed household	Ethnic minority
<10%	19	6	0	2	1	4	2
>=10%	7	4	1	2	0	2	1
Total	26	10	1	4	1	6	3

Note: ERM could not meet six households for the interview as explained in baseline section above and therefore, information on vulnerability of these households are not available to presented in this table.

Vulnerable case: all cases fallen into the vulnerable categorisation for this project including repetition cases of one household. For example, one person could be an elderly female head of a poor household.

Vulnerable household: is counted on household only meaning that excluding duplicate cases as example above.

²³ as defined in the baseline section above

170-162. Significant displacement effect is defined for this project as losing 10% or more of their total productive assets (income generating), vulnerability status of the displaced households is considered as a cumulative factor for the displacement significance. As indicated in Table 29, there will be four households who are vulnerable and will lose their land from and more than 10%, and thus impact from agriculture land loss on these households are assessed major. There is another group including six vulnerable households but their agriculture land loss will be less than 10% and those are not vulnerable and will lose from and more than 10% (seven households); therefore, the impact on their livelihood after the land acquisition is likely moderate. Such impact on the remaining households (19 households), who do not fall into any cohort of vulnerability or have less than 10% agriculture land losing in the Project land acquisition, is considered minor. The specific post-displacement impacts of these households include change of land use and land value, crop height restriction (for those lose land for transmission line) and effect on their income and livelihood as discussed in detailed in the following paragraphs. Specific impact assessment for ethnic minority group is also discussed in a separate paragraph as below.

171-163. *Change of land use and land value.* This impact will take place after the land acquisition. The Project will occupy 7.4 ha agriculture land of 42 households in the three affected communes for construction of access road and transmission line including power poles, and thus change this area from agriculture land to industrial land. Given the land under the transmission line is required to comply with safety corridor requirements, only compatible activities are allowed and maturity height of crop shall not exceed 4m. Because of this restriction, the value of the land in terms of land purchase will be depreciated.

172-164. *Crop height restriction.* Apart from the permanent land acquisition as mentioned above for access road and power pole construction, the remaining area along the transmission line can still be used for agricultural purposes after construction phase with the height restriction of crops within 4m. Therefore, some households will need to change their crop type to meet this safety requirements. Changing crop types may require households to acquire new skills and a risk of unknown productivity of new crop type if they have never tried that type of crop before.

173-165. It is also noted the Project is in process of development of Livelihood Restoration Plan (LRP) (**Annex G**) and Community Development Plan (CDP) (**Annex H**) and these are considered as measures to mitigate and manage this impact.

174-166. **Impacts on ethnic minority communities during land acquisition and construction phase.** According to the Decision 582/QĐ-TTg issued on 28 April 2017, hamlets 1, 2 and 3 of La Da Commune of Ham Thuan Bac District and hamlets 1 and 2 of La Ngau Commune of Tanh Linh District are identified as ethnic minority region with exceptionally difficult living conditions (Region III). From the interview with both the Project persons and local authorities, it is understood that the Project will occupy the land in hamlet 4 of La Da Commune (part of transmission line) and Da Mi hamlet of La Ngau Commune (floating solar area, substation, access road and part of transmission line) only. Therefore, the displacement impact of the Project will not be occurred in the identified Region III hamlets of these two affected communes. In terms of other impacts during construction and operation, given the National road 55 which is the main road connected with the access road of the Project is going through the hamlets 1 and 2 of La Ngau Commune, traffic safety, noise and dust of transportation could be an issue for the health and safety of the communities of these hamlets but assessed as minor since the demand for transportation for the Project is limited both for construction and operation as reported in the local EIA. Supporting affected community is one of the responsibilities that the Project Company has committed with ADB and thus a CDP is being developed to fulfil this commitment.

175-167. It is noted that in 1997-2001 when DHD constructed the Ham Thuan-Da Mi Hydropower Plant, a whole ethnic minority community had been relocated to another place for

resettlement purpose. The current ethnic minority community residing in the Project area is confirmed by the local authority as not the community displaced by the construction of the Hydropower Plant.

176-168. Impacts on ethnic minority households during land acquisition and construction phase. There are three households involved in the economical displacement during the land acquisition for and construction of the transmission line. Of which, two households will lose less than 10% in particular with 3.8% and 0.6%, and another one will lose more than 10% of their agriculture land (26.7%). (1) The household with 0.6% land loss is classified as poor household based on the national poverty line (refer to Glossary section) and her land will be occupied temporarily during the construction of the transmission line. From the interview, she reported that her agriculture land is used by her children for cashew farming and she is living based on the support from her children. In this case, given the height of a mature cashew could vary from 7-14m, this household may require to change their farming crop, and therefore, the impact from the land acquisition and construction on this household is assessed moderate. (2) The second household with 3.8% of land loss own 3ha agriculture land and not categorized on any vulnerable groups; as such they may receive the impact in an insignificant manner and can still keep doing farming on the remaining land without any restriction. (3) The impact on the last household is likely major since this household will lose 26.7% (0.08ha) of their agriculture land which is 0.3ha in total both temporarily and permanently and at the time of the survey they are reportedly near poor household. To mitigate such impact, the Project is required to have a plan to support the development of ethnic minority households within the affected communities with special care of affected cases. Given these affected ethnic minority households are a part of larger affected communities, the Project Company can develop a boarder CDP with separate components for affected ethnic minority households.

177-169. Access Restriction, Lose of Moorage Area and Disturbance on Fishing Activities. Installation of floating PV modules, and anchoring may restrict access to fishing grounds within the Da Mi reservoir. In particular, during the survey there were five households who live adjacent to the Da Mi lake where the PV modules will be installed reported that fishing is their main livelihood and another household who live along the transmission line also responded that they sometimes go fishing at Da Mi lake for domestic consumption. It is recognized that during the installation and with the presence of the modules the nearest access to the lake from their houses will be restricted but these households still can reach the lake from the other side which may take longer way. The lake is also identified via the interview with these five lakeside households as an area for mooring their boats and as the results of the installation of the floating solar modules these fishermen who use this mooring area may need to moor their fishing boats in other places that are farther from their houses. In addition to the access restriction for both fishing and moorage areas, these five households are identified as fence-line households who live next to the project components and will be the receptors of the construction impact including the installation of the PV modules. Considering fishing is their main income and vulnerability of these affected households, significance of this impact can be classified into: (1) major for two lakeside households who are poor households (one has poverty book and another one was observed and reported by themselves as poor without poverty book since they did not own a residential book to be recognised in the government procedure as a poor household), (2) moderate for any disturbance will be considered significant to their livelihood. Although, as reported by DHD, this lake is under the management of the Sponsor from the date the Ham Thuan-Da Mi Hydropower Plant was constructed (construction: 1997-2001), and these households came and settled here illegally after that time, the Sponsor should have some actions to mitigate the impact of the construction of the Project on the livelihoods of these households and such actions should be discussed in the LRP.

~~178-170.~~ In concern of the health and safety of these five households, it is suggested that the Project Sponsor to consider having a communication and negotiation with these five households to persuade them to move outside the project footprint. Accessibility of these households to the reservoir and connection between the new location and surrounding areas should be take into account in the communication between these households and the Project personnel.

~~179-171.~~ To avoid other people illegally moving to settle nearby the lake, the Project Company should (1) set up a cut-off date which is defined as the date immediate after the completion of IOL and DMS and people who occupy the land within the Project land boundary after this date will not be eligible for compensation or assistance; (2) appoint their persons to guard the area to remind people to not access the area for illegal activities including fishing and settlement.

~~180-172.~~ **Community health and safety.** There are a number of potential community health and safety risks associated with construction of the Project. This includes influx-related community health and safety and other community health and safety excluding influx issues. These impacts are discussed as below.

~~181-173.~~ *Influx-related community health and safety.* Key components of the Project including floating solar area, substation, transmission line and float manufacturing workshop are located in Da Mi, La Da and La Ngau communes, of which all the key components will be built in La Ngau and part of the 110kV transmission line will go through La Da and Da Mi communes. It is noted that the Project components will not be all constructed simultaneously but some components may be built back to back. For example, the float module manufacturing construction is required to complete first and then the solar installation will be followed. During the one-year construction of these components, it is expected that, at the peak time, approximately 40 workers will be employed by the Project and its contractors of which 75% will be sourced from local labour market and the rest will be skilled workers from other areas. These workers will be accommodated in a camp within the site boundary. With the small proportion of migrant worker compared to the total population of the Project footprint area (Da Mi, La Da and La Ngau) and short time presence of them in town the impacts from migrant worker influx including pressure on local infrastructure and service, increase of commodity and good price, conflict/tension between migrant and local people, increased risk of infectious diseases including sexual transmitted infection and general disturbance (alcohol and drug abuse) is assessed minor.

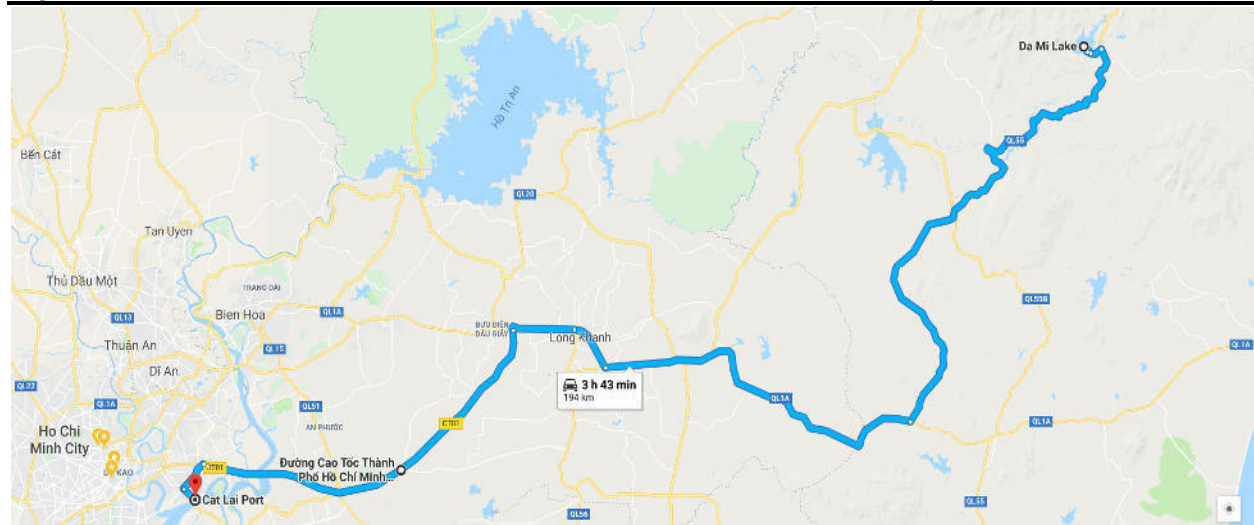
~~182-174.~~ *Other community health and safety.* The local community may be exposed to health and safety risks resulting from construction activities of the Project components including noise, dust, traffic safety and drowning potential due to curiosity of the floating solar. Noise and dust impact can be referred to the following sections regarding environmental impact assessment. Community health and safety impact from traffic is also discussed below.

~~183-175.~~ The existence of the floating solar modules on the lake may attract the people from local area and/or other place (tourists) who want to visit the Project area and access to the lake to observe the floating solar. Such actions could lead to the increase of drowning and other safety (due to construction activities of other components nearby) potential to the visitors and disturbance to the daily activities of local community who live near the Project area. As discussed above the Project will allocate their personnel to stay at the site and install a camera system for security observation during the construction and operation phases. These expenses have been planned in the budget of the Project. It is also understood that the Project has placed a warning sign for all visitors that this is the restricted area and deep lake which could be dangerous for unauthorized persons and keep reminding visitors to stay far from the construction area and the lake.

184-176. Traffic management. Construction materials and workers will be transported to and from the Project site via the National Road 55 and local access roads (including a local commune road). National Road 55 is used by local communities to travel to surrounding areas and as observed on site there were two other industry projects (Ham Thuan Hydropower and Sturgeon Farm) located nearby the Project and also use this Road for their daily transportation. Given the local population density was low and the transportation of these two industries during the baseline survey were observed not frequently the main roads (Nation Road 55 and communal roads) may be busier during the short period of construction of the Project but the potential of traffic congestion is not highly likely. Number of transportation trip during construction of the Project is unknown; however, the Project will manufacture the floating modules at the site and this will limit the transportation during the construction phase.

185-177. Impact on traffic road. In the construction phase, material construction (including land, stone, gravel, cement, and reinforced concrete) will be purchased at local suppliers and processed at the site while PV panels and transformer equipment will be imported at Cat Lai Port, then transported to the Project site. It is noted that they are not heavy equipment, so it does not have significant impacts on the local road quality.

Figure 25 The Road Connection between Cat Lai Port and the Project Site



Source: Google Map, 2018.

186-178. In general, asphalt roads directly connected to the Project area are relatively good. Traffic density is quite sparse which is convenient for transporting materials and equipment. However, it will increase the density of heavy vehicles joining traffic and lead to risks of traffic accidents for local people using the roads.

Figure 26 Current status of roads in the Project area



Source: ERM, 2018

(Note: Left photo: An inter-commune road connecting Da Mi and La Ngau communes; Right photo: National Highway No.55).

187-179. The mentioned impacts can be reduced through avoiding mobilizing in peak hours. The Project would have in place a traffic safety training for its employees and contractors' workers, especially the drivers, and if possible such program can be expanded for local communities to raise their awareness and practice of traffic safety. Consideration of maintenance and improvement of the communal roads which are used by the Project is also suggested as part of the CDP.

188-180. Impact on waterway traffic. According to the survey, the reservoir area does not have water navigation activities and shall not be affected by transporting PV panels, floats.

189-181. Workers Health and Safety. Due to the living conditions and sanitation in the construction phase, workers will be at risk of diseases such as diarrhoea, dengue fever, malaria, etc. For common diseases, as reported by the local authorities the local clinics and medical staff can support for common diseases detection and treatment. Besides, workers receive periodic health check-up programs and have a medicine cabinet, so this effect is minor. Additionally, other health and safe risks should be taken into account by the Project during the construction include drowning during the installation of the floating solar modules, falling when working at height for transmission line and electrocution etc. These risks could be major if the workers are not trained for health and safety and equipped with Personal Protection Equipment (PPE). As such, the Project is required to provide health and safety briefing in induction training, appropriate PPE to relevant workers and how to use the PPE. During the construction period, supervision from both the management of contractor and the Project should continuously observe and remind the workers with safety requirements.

190-182. Economic and Employment. As mentioned above, the construction phase will generate a range of employment opportunities for local people including direct employment in the Project, indirect supply chain employment and Project induced employment such as restaurants, hotels, shops including in a number of low-skilled construction roles. It is anticipated that 40 people will be employed during the one-year construction phase at the peak time, of which a large proportion of the construction workers will come from the local area (i.e. the three affected

communes and other nearby communes) for unskilled jobs, and only a small number skilled workers will be brought in to support construction of the Project.

191-183. Indirect employment includes those employees of companies providing goods and services for the Project, and their suppliers or subcontractors. Indirect employment through the construction supply chain will be quite limited in the affected areas due to the virtually non-existent service sectors in the area, and due to the small-scale of the Project in supply demand. Induced employment is also expected to be limited in these areas due to limited availability of goods and services.

192-184. These positive impacts will be short term in nature within the construction period. It is noted that the Project can enhance these positive impacts via its management programs such as LRP and CDP as discussed in Environmental and Social Management Plan Section.

193-185. **Non-hazardous solid waste.** During the construction phase, non-hazardous solid waste generate mainly from activities including site clearance and preparation, land excavation. Notably, the project does not cause major excavation works, thus the solid waste will be minimal. According to the regulatory EIA, the total volume of excavated soil is 728 m³ and in which, 397 m³ (around 55%) of excavated soil will be backfilling at some Project's component areas. The unused excavated soil will be disposed of to the designed areas. In the stage, the Project has not yet defined the designed areas, therefore it should be mentioned in the Waste Management Plan.

194-186. The estimated amount of soil generated the excavation and backfilling process is provided in the table below.

Table 35 The Amount of Soil Generated from Excavation and Backfilling Process

No.	Tasks	Volume of soil generation	
		m ³	tons
1	Excavation	728	1,135.7
2	Backfilling process	397	619.3

Source: EIA, 2017.

195-187. In the construction phase, the workforce is expected to peak at 40 people. Normally, the average domestic waste volume generated each worker is estimated about 0.3-0.4kg/persons, so the total amount of solid waste of the workers will be 12-16kg/day. The majority of domestic solid waste is biodegradable, which will be separated, collected and transported daily to a competent waste treatment facility. If construction waste is iron or steel material, it will be reused or sold to other users. Therefore, impact from the domestic waste is expected to be minor. No dredging activities will be carried out during the Project development phases; thus there is no concern related to the impact of dredged sludge.

196-188. HDPE is main raw material used in the workshop for producing floats. Waste will be fully utilized through reusing small plastic pieces and unqualified products released from crushing, cutting and testing process. Moreover, the process only occurs in a short term (306 days) so its impact is considered minor.

197-189. **Hazardous solid waste.** It includes oily waste, oily cleaning mops and grease generated from machinery maintenance. This amount of hazardous solid waste generated during the construction process of the project depends on the number of construction machines and transportation, the amount of lubricant discharged from the motor vehicle; lubrication and machinery maintenance plans. However, as mentioned above, maintenance activities will be mainly carried out in nearby garages, impacts from hazardous solid waste are considered minor.

~~198-190.~~ **Industrial wastewater.** Construction wastewater will be mainly generating from the concrete mixing process which will only occur in 12 months. Volume of construction wastewater is not much. Therefore, the industrial wastewater cause minor impacts on the environment.

~~199-191.~~ **Oily wastewater** is released from repairing and maintaining motorcycles and construction vehicles. It contains a high level of suspended solids and grease which can lead to surface water pollution if it is not treated. However, the motorcycles and construction vehicles will be maintained in the garages in the local area, so its impact from oily wastewater is minor

~~200-192.~~ **Float manufacturing process** will generate cooling water from the blow moulding step. However, the cooling water will be recirculated to reduce impacts on the surrounding surface water bodies. Therefore, impact from industrial wastewater is minor.

~~201-193.~~ **Domestic wastewater.** As mentioned in the regulatory EIA (2017), the total average amount of domestic wastewater generated from workers' daily activities is around 4.8 m³/day in construction. This figure is calculated based on the maximum number of workers (40 people in construction phase) and the volume of water supply is from 80 to 180 liters/ person/day, according to IFC Worker Camp Guideline. Given that construction workers stay at the camp, the domestic wastewater discharge is collected into a septic tank. Thus, the impact of domestic wastewater is minor.

~~202-194.~~ **Rainwater runoff.** As informed by the People Committee's Da Mi Commune, there is no drainage system constructed at the Commune; instead of that, the rainwater runoff flows naturally and smoothly through ravines, lakes, streams and river system. Therefore, it will not cause water stagnation at the area. According to the regulatory EIA, the highest amount of rainwater runoff is estimated 16.83 m³/day, so the amount of rainwater runoff generated during the construction phase is relatively small. In addition, clearing, levelling, excavation and backfilling activities are only undertaken in a short period of 12 months and only in the dry season. Moreover, construction waste will be collected and transported to a suitable place for treatment in order to avoid mixing the waste into rainwater runoff. Additionally, construction activities will occur over a limited time within the Project site; therefore the impact of rainwater runoff is minor.

~~203-195.~~ **Surface water.** During the construction period a number of civil works will be required, including land clearing, backfilling, levelling 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 rain season (i.e. May and October).

~~204-196.~~ During anchoring floating systems to the bottom of Da Mi Reservoir, it will affect sediment and muddy layers in the reservoir. To reduce the impact, the construction contractor has to comply with the anchoring process requirements. In particular, the position of anchors at the ground is determined accurately and then the anchors will be slowly put down to the bottom by cranes so that the impact force of collision between the anchor system and the lakebed is reduced. Therefore the amount of sludge dispersed is small within a short penetration distance.

~~205-197.~~ The installed PV panels will reduce water evaporation, reduce solar energy absorption, decrease water temperature, and increase the dissolved oxygen concentration in water. It should be noted that the PV panel system area (44.9ha) occupies only about 6.56% of Da Mi Reservoir area (total 684.94ha), therefore the impact of PV panel on the surface of Da Mi Reserve is consider minor.

~~206-198.~~ **Groundwater.** During site preparation, ground water resources may be impacted from spills and leaks of hazardous substances such as fuel and oil as a result of improper storage

and handling of these substance. The likelihood and severity is however low if implementation of a construction management plan is carried out. Thus, the impacts on groundwater is minor.

207-199. Air emission. In overall, air quality can be affected by construction activities, especially excavation, backfilling, the operation of construction machines and transportation. In particular, site preparation, land clearing, road construction, excavation for substations and transmission line construction, loading and unloading construction materials (cement, sand, macadam, etc.) and traffic movements along unsealed roads can generate dust and exhaust gases generated from vehicle operation (such as CO, SO_x, NO_x and hydrocarbons) can result in pollution. Given the short duration of the construction period (only 12 months) and the temporary nature of the construction activities, the impacts associated with air emissions are not expected to be significant.

208-200. Noise. Noise generating from the Project's construction activities mainly is from construction machines, transportation vehicles and specific machines used for float manufacturing process. See Table 36 below for illustration on the noise levels from construction machines. In general, noise levels exceed the World Bank IFC EHS Guideline on applicable noise standard which is reproduced in Table 37.

Table 36 Noise Levels Generated from Construction Machines

No.	Equipment	Potential noise level (dBA) ²⁴
A	Construction machines	
1	Bulldozer	93
2	Compaction machine	72-74
3	Bucket excavator	72-84
4	5-15 tons truck	82-94
5	Monitoring vehicle	70-82
B	Machines used in float manufacturing process	
1	Agitator	80
2	Blow molding	85
3	Cutting	80
4	Crusher	85
5	Cooling tower	85
6	Air compressor	80
1	Agitator	80
2	Blow molding	85

Source: EIA, 2017.

Table 37 Applicable standards on Noise in the Residential Areas.

Receptor	IFC Noise standard (dBA)		Vietnamese QCVN 26:2010/BTNMT (dBA)		Applicable standard (dBA)	
	Daytime	Night time	Daytime	Night time	Daytime	Night time
Residential; institutional; educational	55	45	70	55	55	45

Source: World Bank Group General EHS Guideline, 2012

209-201. During ERM's site inspection, there are five households living adjacent the Da Mi reservoir, which are identified to be the nearest residential areas to the project site. Within the distance of 15m, the construction noise will affect to the residential area. The noise levels from most construction works associated with major developments do not represent a constant or long-term emission that would be experienced by the community on daily basis throughout the project construction schedule. Construction noise levels will only be experienced for limited period time when works are occurring at select locations; they will not be experienced for full daytime, evening

²⁴ Notes: The noise level is monitored at the position which is 1.5m from noise generation sources

or night time periods. Any impacts associated with these works will be temporary and do not represent a permanent impact on the community and surrounding environment.

210-202. The Project will implement noise mitigation measures to reduce the impact on the nearest residence areas to comply with the National technical regulations (QCVN 26:2010/BTNMT on Noise) and the World Bank Group General EHS Guideline on Noise. In addition, impacts of noise from the float manufacturing activities will occur in short-term and day-time, thus impacts is considered minor.

211-203. Soil. Site clearing and site preparation activities (vegetation clearing, road and drainage construction) will result in loss of vegetation cover (grass and shrubs) and topsoil which could lead to soil erosion. Accidental oil spill could result in soil contamination and the generation of waste material can also lead to soil degradation. However, site clearance will occur in short term, impact on soil quality is considered minor.

212-204. Occupational health and safety. Construction activities can cause harm and present risks to the welfare of workers. During the construction phase, an occupational health and safety policy will be prepared and implemented by the EPC contractor. As part of this policy, wearing PPE, such as hard hats, safety gloves, hearing protection devices, and safety boots, will be required when onsite undertaking maintenance works, and appropriate measures to manage sun and heat exposure will be implemented. In addition, all contractors perform their field work under the supervision of consultant agencies regulations to comply with occupational health and safety requirements. Therefore, the impacts on occupational health and safety are minor.

213-205. During the installation of the float PV system, the PV panels will be set up on the reservoir and employees may face with the risk of falling into water. Therefore, lifejacket and buoyancy aid shall be provided and readily available for emergency rescue for all workers when they work over or near water. Therefore, the risk of drowning is minor during the construction process.

214-206. Fire explosion and electric shock. In the construction phase, there are several reasons causing fire exploration, such as electric shock, loose electricity wires or lighting strike. These incidents may occur during the construction phase at the transformer station and transmission line. To minimize these unplanned events, all workers and operators will be required to complete the training courses on safety measures.

❖ Impacts during Operation

215-207. Impact on livelihood and daily activities of local community. It is assumed that mitigation measures for impacts on local livelihoods proposed above for construction phase will have been commenced before the Project's operation phase. A LRP, including support on any livelihood adversity, will be developed and implemented from construction phase.

216-208. In operations phase, the Project will be implementing the recommended measures for mitigation and management of negative environmental impacts on farming activities potentially occur in construction. Thus, such impacts will be controlled and not significant in operation. The presence of the floating solar modules on the Da Mi reservoir may cause a visual impact and access restriction for local people especially fishermen.

217-209. All of the aforementioned impacts will be in long term of 20-year operation. However, with the mitigation and management measures in place and the adaption of local people with the Project activities during construction phase, these impacts are assessed medium-low.

218-210. 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 facilities (i.e. transformer, inverters) will be fenced with security to help

minimize unauthorized entry. Similar to construction phase, the security of the Project will be available at the site during the operation phase for Project security and community health and safety through their observation and cautionary communication with any concerned stakeholders. Relevant signage will also be posted at on the Project site – outlining the key health and safety risks to the community as recommended above. 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.

219-211. 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.

220-212. **Workers Health and Safety.** Similar to the impact discussed in construction phase above, risk of diseases for operation workers is expected negligible.

221-213. *Impact of electromagnetic field on workers and local people.* Based on result of electromagnetic field survey at transformer and transmission line of the Project, the result is shown as follows.

Table 38 The Estimated Electromagnetic Field Level the Transformer and Connection Line Positions

No.	110kV Transformer Station	The maximum level of electromagnetic field (kV/m)	Allowed limit (kV/m)		
			Decree No. 14/2014/NĐ-CP		Decision No. 3733/2002/QĐ-BYT
			Indoor	Outdoor	
1	Station yard	4.31	1	5	25
2	Under 110kV transmission lines	0.57	1	5	25
3	Inside operation office	0.68	1	5	25

Source: EIA, 2017.

222-214. The maximum level of electromagnetic field at surveyed locations complied with allowable limit regulated in Decree No. 14/2014/ND-CP on stipulating in detail the implementation of electricity law regarding to electricity safety and Decision No.3733/2002/QĐ-BYT on promulgating 21 labor hygiene standards, 05 principles and 07 hygiene measurements. Therefore, it is not anticipated that the effect of electromagnetic field on workers and community health will be significant.

223-215. Workers undertaking the cleaning of the solar panels could accidentally fall into the water. As such, only workers who have gone through training on the work, health and safety and equipped with life vests can conduct this type of work. It is required that more than one people should be assigned for conducting this activity and during the conduction, observation of supervisor is also required. Work should be avoided during excessively hot or sunny periods to reduce heat stress and dizziness for the workers. To ensure these requirements can be achieve, a procedure for solar panel cleaning process should be developed and communicated with the workers at the time of induction training.

224-216. **Economic and Employment.** During the operation phase of the Project, the local economy will be positively impacted by an increase in taxation revenue, and demand for materials and services; however such demand will be low. During operation, about five employees will be employed by the Project. All employees will be skilled workers and unskilled positions including security guard, cleaning and cooking will be maintained from construction phase and thus job opportunities for local people will be minimal. Some induced opportunities such as restaurant and guesthouse may continue after the demobilization of construction workers since the tourism of

the area reportedly slightly grew in recent years. As the LRP is expected to be in implementation during the operation period, affected people may obtain some benefits from the plan including professional training (semi-skills training such as driving, welding and employ in other projects) and local agriculture promotion (adapting with new crop type, receiving seeds and/or seedling to continue their farming).

225-217. Non-hazardous waste. Similar to construction phase, domestic solid waste will be collected and transported to a waste treatment facility. Damaged and replaced floats will be collected and stored in the non-hazardous waste storage area in the Project site and regularly transferred to the competent waste recycling contractor.

226-218. Hazardous waste. The operating life of the PV panels is about 20 years and in operation phase, does not cause pollution. However, with damaged and replaced PV panels, the Project Sponsor will temporarily store in the hazardous waste storage area in Ham Thuan Hydropower plant. The Project Sponsor will contract with licensed waste treatment agencies to collect and treat the panels as well as hazardous solid waste in compliance with national regulations. The estimated replacement ratio of the PV panels is 0.05% for whole 20 year Project lifecycle; thus the operation of the floating solar farm will produce negligible solid waste.

227-219. Industrial wastewater. There is an oil well constructed at the transformer station. The storage capacity of oil well will be larger than the amount of oil contained in the transformer. When any incident occurs at the transformer station, so oil leaks will be minimized. Therefore oily wastewater caused in the operation phase is manageable and limited, so its impact is not significant.

228-220. Domestic waste water. The estimated amount of domestic wastewater generated from workers' activities in operation phase is around 0.9 m³/day. The maximum number of workers in this phase is around five people. Similar to construction phase, all domestic wastewater will be collected into a septic tank for treatment, so it does not cause significant impact to environment.

229-221. Surface water. Water using for PV modules cleaning will be supplied from water in the Da Mi reservoir. Waste water from the cleaning activities will be discharge directly to the Da Mi reservoir because it is not hazardous to the water environment. Accidental leakage of transformer oil can occur during transmission line and substation operation. However, substation transformers will be located within secure and impervious areas with a storage capacity of 100% spare oil. The potential impact on surface water during the operation phase is negligible.

230-222. Impacts on Da Mi reservoir. During the operation phase, the floating solar power system will be regularly checked and maintained. During operations the PV panels will already be installed and so will not cause any incidents related to dropping battery panels or wires into the reservoir or affect the water environment at the area.

231-223. The Da Mi reservoir contains a sturgeon farm which is managed by Tam Long – Da Mi Joint Stock Company. However, the floating PV panel system is 500m far from the sturgeon farming, so it will not significantly affect the sturgeon activities in the reservoir.

232-224. Ground water. The Project will not use groundwater for any Project'-related activities.

233-225. Air emission. Air emissions and noise are not expected to occur during operation. The floating solar power project does not use fossil fuel to generate electricity in operation phase.

234-226. Oil Spill. At transformer station, oil might leak or spill into the environment. If there are no collection measures, the oil spills from the transformer will result in pollution of the local environment, especially soil and water environment. This might cause negative impacts to the habitat of species, the ecosystem and people living in the Project area. However, the transformer

station has been designed with an oil collection system and an oil trap. Therefore the penetration of oil spill will be minimised. Oil spill response measures are also expected to be put in place, so the impact is not significant.

235-227. Lightning strike. A lighting strike can cause damage among power distribution components and possibly cause explosion of transformer and transmission line. To ensure the safety of the electricity grid, the transformer station is equipped with lightning protection system through lightning rods (3m). The floating solar power construction is designed with lightning protection according to national standards so it is not likely to occur lightning strike. Otherwise, it is possible that electricity equipment is damaged by weather conditions. Therefore, it is necessary to have regular inspections right after floods or heavy rain.

236-228. Storm or flooding. The float system is positioned by the anchor systems at Da Mi Reservoir, so storm and flood do not affect the PV panel system.

237-229. Climate change. The Project will be engineered and designed to integrate into its environmental surroundings and operate safely and reliably over the lifetime of the Project. Solar PV panels have an operating lifetime of 25 and more years and PV systems are vulnerable to flood, wind and extreme temperatures. The float system shall be designed and installed to the current standards related to potential water column level increase, and the risk is expected to be minimal based on the low increase in water column level in Da Mi reservoir.

238-230. The comparison of the GHGs emission caused by solar power plant with the GHGs emission that would have been caused by fossil fuel burned to make the same amount of electricity has been made. Thus, the purpose of the project activity is to generate power from zero emissions Solar PV based power project and thereby reduce the emissions associated with the grid. The project activity will export the electricity to the Vietnam Electricity through the national electricity transmission line. The electricity generated by the plant will be monitored through energy meters at project site. The technology of electricity generation from Solar PV Plant is environment friendly as it does not use any fossil fuel. It thereby reduces the greenhouse gas emissions associated with fossil fuel based electricity generation system. The availability and reliability of solar power depend largely on current and future climate conditions, which may vary in the context of climate change.

239-231. Biodiversity. During the operation phase, impacts on biodiversity include i) loss of terrestrial habitat, ii) changes to aquatic habitat functionality; iii) barrier creation, degradation of habitat, fragmentation and edge effects, iv) mortality by vehicle strike, hunting, fishing and poaching, v) mortality by Avifauna Infrastructure Strike with Transmission Line; and vi) ecosystem services. Most of the impacts are considered to be negligible. Detailed impact assessment on biodiversity is presented in the Critical Habitat Assessment Report (**Annex F**).

240-232. Visual impacts. The Project, after completion of its development, would consist of built structures, landscaped to give a pleasing outlook. The potential impacts could be visual and reflection. However, as the project site and the surrounding areas provide no significant aesthetic value, the sights of a large area covered with solar PV panels will have no visual impact. With the old design of solar PV arrays, reflected sunlight may cause problems if the system is close to a road and is facing in a direction which the reflected sunlight may cause problems. This problem will not occur in this Project as its surface of solar PV panels is designed to absorb sunlight and minimize sunlight reflections. The panels which are being used have a negligible silicon inhalation and from that the workers are used to wear masks during working hours in the project area. The panels have more efficiency to absorb heat and there is very low chances of reflection.

❖ Decommissioning

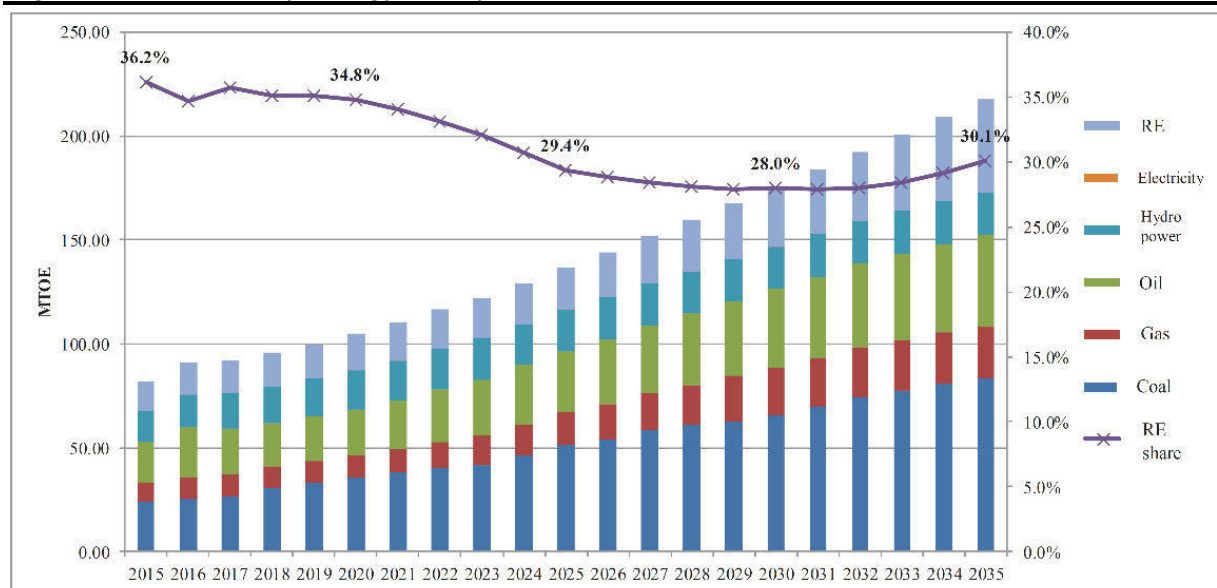
[241-233.](#) At decommissioning the PV modules will be removed, and recycled. The PV modules do not contain any hazardous materials.

[242-234.](#) The Project life is 25 years. Depending on the financial efficiency of the Project, at the conclusion of the 25 year period, an economic assessment will be conducted to determine whether the life of the Project will be extended. 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.

L. Analysis of Alternatives

[243-235.](#) Vietnam has large reserves of primary energy resources, such as coal, oil, natural gas, and water for hydropower generation. It also has a high potential for renewable energy resources, such as biomass, solar, and wind. In 2015, the share of total national primary energy by fuel type was coal (35%), crude oil and petroleum products (28%), gas (14%), and hydropower generation (7%). Vietnam's power demand has grown and will continue to grow rapidly, reflecting the country's economic development. As estimated, the non-commercial biomass energy has gradually been replaced by other commercial energy sources. The shift to fossil energy has been a key reason for the increase in greenhouse gas (GHG) emissions. In the past decade, Vietnam has had the highest GHG emissions in the ASEAN region. The total GHG emissions and GHG emissions per capita have increased nearly 3 times in a 10 year period, while the carbon intensity per GDP increased by 48%. Figure 27 shows the predicted power generation make-up of Vietnam by fuel type to 2035. While this shows a heavy reliance on coal fired power generation, it also shows the growth in supply by renewables such as hydropower to remain relatively stable over that period.

Figure 27 Primary energy supply in the proposed scenario



Source: Vietnam Energy Outlook Report, 2017

[244-236.](#) The revised National Power Development Plan in the period 2011-2020 with the vision to 2030 and the Renewable Energy (RE) Development Strategy together set relatively concrete directions for the development of the power sector in the coming years. Regarding the primary energy mix per fuel type, coal still covers the major part but tends to be stable in the following years with a proportion of 37.3% in 2025 and 38.4% in 2035. This is a result of applying

low carbon policies to promote RE development. Hydro power experiences a significant reduction while gasoline and oil products cover over 20-22% and natural gas accounts for about 11-13% of the total primary energy.

[245-237.](#) Installation of the floating PV panels in Da Mi Reservoir saves precious land for agricultural, tourism and other land-incentive activities and turn unexploited and non-revenue generating water surface into commercial solar power plants. In addition, installation of the floating PV panels also considers to reduce land acquisition impacts on local people.

M. Environmental and Social Management Plan (ESMP)

[246-238.](#) 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.

[247-239.](#) 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.

[248-240.](#) **Mitigation Measures.** The proposed construction and operation phase mitigation measures are summarize in Table 39. This includes timing and responsibility for implementation of the measures. A more detailed ESMP is presented in **Annex I**.

Table 39 Mitigation Measures

Predicted impact issues	Mitigation Measure(s)	Cost	Schedule	Responsibility
Preparation				
Land acquisition impacts Access restriction and fishing disturbance	<p>Conducted a target survey to identify those land-losing households who lost more than 10% of their land, in vulnerable situation and would have faced high livelihood impacts. Development of a livelihood programme for these households based on engagement with them is under progress.</p> <p>List ethnic minority households in the vulnerable group to provide special support and monitoring during the implementation of SEP, LRP and CDP.</p> <p>Having a communication and persuasion with the five household living near Da Mi lake for them to understand that they may be the receptor for the potential health and safety impacts from the Project activities, and relocation will be a good mitigation measure for them.</p> <p>Upgrade the activities under social and environmental fund to be a CDP. This CDP shall include a number of programmes for local development with details of beneficiary community's eligibility, roles and responsibilities for implementation, monitoring and reporting, and timeframe of implementation. It is noted that separate programme for affected ethnic minority households should be designed in the CDP. A CDP is under development by ERM for the Project.</p> <p>Implement a SEP including assigning Community Liaison Officer to ensure effective project information disclosure and communication with the project affected people, including develop and disclose a Grievance Procedure to receive and address concerns raised by the Project affected people. This SEP is also being developed for the Project.</p> <p>Implement a grievance procedure for the Project through which the local people, especially who are affected by the land acquisition and/or construction activities of the Project can lodge their concerns and complaints. The grievance procedure should be easily accessible to local communities.</p> <p>Develop and implement a monitoring programme of the SEP, grievance mechanism, LRP and CDP implementation to continuously evaluate the effectiveness of the activities. Comply with specific monitoring and reporting mechanism designed in each plan.</p>	Part of preparation cost	As soon as possible	<p>Project sponsor</p> <p>Binh Thuan DoNRE</p> <p>District People's Committee: Tanh Linh and Ham Thuan Bac</p> <p>Commune People's Committee: La Ngau, La Da, and Da Mi</p>

Predicted impact issues	Mitigation Measure(s)	Cost	Schedule	Responsibility
	<p>Report to ADB about the effectiveness of the implementation of these plans every six months during the construction and annually during the operation.</p> <p>Set up a cut-off date which is defined as the date immediate after the completion of IOL and DMS and people who occupy the land within the Project boundary after this date will not be eligible for compensation or assistance;</p> <p>Appoint Project personnel to guard the area to remind people to not access the area for illegal activities including fishing and settlement and warn them with health and safety risks.</p>			
Impacts of clearance activities	<p>Do not use defoliants and herbicides to clear trees.</p> <p>In case of discovery of culture relics, stop the construction work and report to the authority.</p>	-	During land clearance process	
Construction				
Air quality management	<p>Within the construction site, vehicles are required to follow the speeds of up to 10 km/h.</p> <p>Implement extra control measures, either excavation stopped if excessive dust generated or water applied in case of extremely dry weathers.</p> <p>Cover and secure the transportation trucks with loose materials.</p> <p>Maintain construction vehicles and equipment as per manufacturer's recommendation and industrial practices.</p>	Part of construction cost	Through construction period	<p>Project sponsor</p> <p>Construction Contractor</p>
Noise and vibration management	<p>Optimise scheduling of vehicles and construction equipment to reduce noise</p> <p>Vehicles to adhere to posted speed limit</p> <p>Monitor noise levels on site.</p> <p>Prepare and implement a vehicle and machine maintenance program.</p> <p>Ensure that construction machinery are kept in good condition to reduce noise generation</p>	Part of construction cost	Through construction period	<p>Project sponsor</p> <p>Construction Contractor</p>

Predicted impact issues	Mitigation Measure(s)	Cost	Schedule	Responsibility
	<p>Ensure that all generators and heavy-duty equipment are insulated or placed in enclosures to minimize ambient noise levels</p> <p>Plan the noisy construction works on during daytime (06:00 – 18:00).</p> <p>Minimize construction works generating noise at the night-time.</p> <p>Limit the hours of operation for specific pieces of equipment or operations through the nearest residential community.</p> <p>Re-locate noise sources to less sensitive areas to take advantage of distance and shielding.</p> <p>Site permanent facilities away from community areas if possible</p> <p><u>To reduce the level of noise and vibration caused by float manufacturing process:</u></p> <p>Ensure the production workshop be constructed with walls, windows and doors for sound insulation</p> <p>Use dashpots for production equipment and machines</p> <p>Enhance daily checking and maintenance of equipment, machinery to minimize noise sources</p> <p>Minimize the operation of the float manufacturing workshop during the night-time.</p>			
Water management	<p>Utilize mobile sanitary facilities that are tailored for construction site (e.g. equipped with effluent collection tank)</p> <p>Wash and maintain construction equipment and vehicles at nearby garages where oil and effluent are collected</p> <p>Establish rainwater drainage system for the transformer area</p> <p>Construct in consecutive form and clean immediately after completion</p> <p>Follow the anchor technique</p> <p>Paint anchors with waterproof layers or make anchors of stainless steel</p>	Part of construction cost	Throughout construction	<p>Project sponsor</p> <p>Construction Contractor</p>

Predicted impact issues	Mitigation Measure(s)	Cost	Schedule	Responsibility
Waste management	<p>Develop and implement a Waste management plan</p> <p>Request workforce to leave litter in proper places and arrange waste bins in construction site</p> <p>Use excavation stones and soil for levelling</p> <p>Return unused construction materials to manufacturers or reuse and sell scraps</p> <p>Maintain construction equipment and vehicles at garages where oil and effluent are collected</p> <p>Collect and store oily rags and waste oil in proper containment (one 100 liters waste oil drum and two 60 liters oily-drag drum)</p> <p>Contract licensed waste vendor for collection, transfer and treatment of hazardous waste</p> <p>Register with DoNRE as a hazardous waste generator.</p> <p>Classify hazardous waste in accordance to Circular 36/2015/TT-BTNMT on Hazardous waste management.</p> <p>Engage a licensed waste disposal company to collect and handle all hazardous waste in accordance with the applicable regulation.</p> <p>Store hazardous waste generated by the Project in temporary storages prior to transport and treatment/disposal. The temporary storage area for hazardous waste will be constructed as per the guidelines of the relevant regulation.</p> <p><u>Waste generated from the floating manufacturing workshop:</u></p> <p>Provide screens (diameter <2mm) at all drainage systems in the float manufacturing workshop to ensure small plastic pieces will be prevented from entering the surface water bodies.</p> <p>Implement a comprehensive house keeping program to ensure all small plastic pieces are collected and handled appropriately.</p>	Part of construction cost	Throughout construction	

Predicted impact issues	Mitigation Measure(s)	Cost	Schedule	Responsibility
	<p>Provide secondary containments and spill kits at all oil storage areas</p> <p>Develop and implement an oil spill response procedure.</p>			
Occupational health and safety	<p>Establish HSE board before starting construction phase. This board will control safety aspects for the Project including training and raising safety awareness for workers, inspecting safety, and identifying safety issues.</p> <p>Develop and implement an Occupational Health and Safety Procedure</p> <p>Arrange regular health check-up for worker</p> <p>Ensure first aid boxes are available in worker's camp to minimise medical risk.</p> <p>Each EPC contractor will need to fit the training and safety plan according to the potential risks associated with each EPC contractor activities.</p> <p>Arrange worker's accommodation in hygienic areas and do housekeeping on a regular basis.</p> <p>Provide necessary supplies for workers such as mats and nets.</p> <p>Raise worker's awareness on good hygiene and housekeeping practice.</p> <p>Register temporary residence for worker at commune level authorities.</p> <p>Cooperate with local authorities to manage workers.</p> <p>Follow legal requirement on electricity safety.</p> <p>Compliance with the safety electric distance to carry out any electrical works.</p> <p>Follow safety procedures during installation machines other equipment, connecting lines.</p>	Part of construction cost	Throughout construction	<p>The Project sponsor</p> <p>Construction Contractor</p>

Predicted impact issues	Mitigation Measure(s)	Cost	Schedule	Responsibility
	<p>Ensure safety on the construction site including safety when working at height and on surface water by developing a procedure for these types of job and provide appropriate PPE.</p> <p>Establish onsite health clinic and referral system.</p> <p>Develop and implement an Emergency Response Plan.</p>			
Community health and safety and general disturbance due to construction activities	<p>Implement the measures proposed for mitigation and management of environmental impacts to reduce the environmental disturbance to daily life including livelihood of the local people.</p> <p>Design the time for transportation in consideration of avoiding peak hours and night time.</p> <p>Provide traffic safety training to local people and this can be part of the CDP.</p> <p>Collaborate with local authority to communicate with local communities in advance of commencing the construction activities.</p> <p>Allocate Project personnel to in charge of security in the construction area and restrict unauthorised people to access to this area, especially the lake where the solar panels will be installed.</p> <p>Disclose the ESMP of construction to the affected communities before such construction activities commence.</p> <p>These two above actions should be listed and implemented under the Stakeholder Engagement Plan for construction.</p>	Part of construction cost	Prior to and during construction	Site Manager of the Project Sponsor and Construction Contractor
Worker and local community relation	<p>Issue a Work Site Regulation and a Worker's Code of Conduct, both to be approved by the Project Company, in order to reduce the potential for cultural related conflicts among the migrant and local workforce and the local population.</p> <p>Establish a liaison forum or committee to promote good relations between the workers and the communities.</p>	Part of construction cost	Prior to and during construction	Site Manager of the Project Sponsor and Construction Contractor

Predicted impact issues	Mitigation Measure(s)	Cost	Schedule	Responsibility
Operation				
Water management	<p>Manage domestic wastewater by using septic tanks with an option to connect to public sewer line.</p> <p>Monitor water quality of Da Mi reservoir regularly.</p>	Part of operation cost	During operation	Project Sponsor
Waste management	<p>Arrange waste bins in the plant</p> <p>Collect and store hazardous waste (e.g. PV panels) in hazardous waste storage and transfer to the certified hazardous waste contractors for transportation and disposal</p> <p>Prepare and submit annual hazardous waste management report to the authority</p> <p>Store oily waste from transformer in proper area</p> <p>Ensure waste collection, storage and treatment in accordance with Decree No. 38/2015/ND-CP and Circular No. 36/2015/TT-BTNMT.</p> <p>Engage a licensed waste disposal company to collect and handle the non-hazardous solid waste in accordance with the applicable laws and regulations.</p> <p>Provide adequate containers across the Project site to collect non-hazardous waste prior to transport to temporary storage areas.</p>	Part of operation cost	Throughout operation	
Occupational health and safety	<p>Develop and implement occupational health and safety procedures for activities related to the Project's activities (e.g. working over water, working with electricity, etc.)</p> <p>Allocate HSE in charge persons during operation phase.</p> <p>Ensure safety when working related electric jobs.</p> <p>Prevent fire and deal with firefighting quickly and approximately via fire-fighting and prevention procedure.</p> <p>Follow operation procedures strictly.</p> <p>Provide PPE to those required for example solar panel cleaning.</p>	Part of operation cost	Throughout operation	The Project sponsor

Predicted impact issues	Mitigation Measure(s)	Cost	Schedule	Responsibility
	<p>Regularly check the quality of the PPE.</p> <p>Minimize exposure to electromagnetic fields by arranging shift plan and PPE to the workers. When working at high electromagnetic levels, must comply permissible limits of industrial electromagnetic and inspect working place.</p>			
Community health and safety	<p>Implement the measures proposed for mitigation and management of environmental impacts to reduce the environmental disturbance to daily life including livelihood of the local people.</p> <p>Prohibit any works carried out in electrical safety corridor should the use of equipment that potentially violates the safety electric distance determined by discharge voltage if possible; otherwise agreement with authority managing the power grids shall be made.</p> <p>Allocate Project personnel to in charge of security in the Project area and restrict unauthorised people to access to this area, especially the lake where the solar panels will be installed.</p> <p>The ESMP of operation should be disclosed to the affected communities before such operation activities commence. ESMP can posted at the Commune People's Committee where the Project will be built.</p> <p>Develop and implement work related procedure in consideration of community health and safety if related.</p> <p>Install and regularly inspect lightening protection systems.</p> <p>A LRP and a CDP will be in implementation with a major focus on livelihood and skill development and promote the health and safety of local people.</p> <p>Local procurement should be promoted during operation of the Project. In particular, the Project should use local foods/products and local supply to enhance benefits to the local communities.</p>	Part of operation cost	Throughout operation	Project Sponsor

~~249-241.~~ **Monitoring Plan.** It 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).

~~250-242.~~ 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.

~~251-243.~~ The results of the monitoring and evaluation process will be reported to the ADB every six months during the construction phase 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 40 Monitoring Plan

Impact Issue	Parameter	Location	Method of Monitoring	Frequency
Preparation				
Land acquisition	Grievances/complaints	Project site and line transition area	Checking grievance log book and stakeholder engagement records	Monthly
Construction				
Discovery of culture relics	Sign or notice for a site protected for its historical and cultural	Project site	Observation Consult with authority	On-going
Emissions (dust)	Dust, CO ₂ , NO _x , SO ₂	Project site, access road and commune road	Sampling collection and analysis	Quarterly monitoring throughout construction
Emissions (noise)	Noise level (dB)	Project site, nearest residential areas	Sampling collection	Quarterly monitoring throughout construction
Water management	Parameters required in the QCVN 08-MT:2015/BTMT	Da Mi Reservoir	Sampling collection and analysis	Quarterly monitoring throughout construction
Wastewater	Parameters required in the 14:2008/BTNMT and the World Bank General EHS Guideline on Wastewater	Project site	Sampling collection and analysis	Quarterly monitoring throughout construction
Waste (solid waste and hazardous waste)	Volume of waste generated, storage and transfer to the treatment vendors.	Project site	Site inspection and record keeping	Weekly monitoring throughout construction
Erosion, subsidence	Erosion, subsidence in digging holds and foundation	Project site	Observation	Monthly 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)	Unsafe behaviours or practices	Project site	Site inspection and observation of health and safety practices	Monthly monitoring throughout construction
Community health and safety (accidents and injuries)	Grievances relating to health and safety	Project site	Grievance mechanism	Monthly monitoring throughout construction
Community health and safety (accidents and injuries)	Community health and safety incidents	Project site	Records detailing incidents	Monthly monitoring throughout construction
Operation				
Electromagnetic	Electromagnetic	Station bar	Measurement	Bi-annually or when received request's authorizes

Impact Issue	Parameter	Location	Method of Monitoring	Frequency
		Fence area Equipped installation house Line transmission (the connected location where connects with Dam Thuan _ Duc Linh line transition) and the location of transmission line with National Highway 51		
Waste (solid waste and hazardous waste)	Volume of waste generated, storage and transfer to the treatment vendors.	Project site	Site inspection and record keeping	Quarterly monitoring throughout operation
Water quality of Da Mi reservoir	Parameters required in the QCVN 08-MT:2015/BTMT	Da Mi Reservoir	Sampling collection and analysis	Bi-annually or when received request's authorizes
Water demand	Volume of water used for PV panel cleaning	Project site	Flow meters	Monthly throughout operation
Occupational health and safety (accidents and injuries)	Health and safety incidents	Project site	Site records detailing incidents	Bi-annually throughout operation
Community health and safety (accidents and injuries)	Grievances relating to health and safety	Project site	Grievance mechanism	Monthly monitoring throughout operation
Community health and safety (accidents and injuries)	Community health and safety incidents/accidents	Project site	Site records detailing incidents/accidents	Quarterly throughout operation

N. Information Disclosure, Consultation, and Participation

252-244. This section summarizes the public consultation process that has been undertaken by the Client, including concerns raised by stakeholders.

253-245. In 2017, the Client conducted public consultation for the draft local EIA report of the Project at the People's Committees of affected districts and communes. Subsequently, in June 2018, ERM supported the Client to engage with local authorities at district and commune level to collect secondary baseline data and perceptions of the authorities about the Project. The other primary objective was to survey the households, who are affected by the land acquisition of the Project to collect primary baseline data and their awareness and concerns about the Project. The following sections describe the engagement activities in 2017 and 2018 and summarize all the feedback collected during these activities.

1. Information Disclosure, Consultation, and Participation during EIA process

254-246. As required by the EIA regulations, the Client has conducted the public consultation for the draft local EIA report of the Project at the People's Committees of affected districts and communes. The consultations included meetings with local authorities and consultation with selected households in Da Mi, La Da and La Ngau Communes.

255-247. **Official correspondence with People's Committees of Districts and Communes.** Da Nhim - Ham Thuan - Da Mi Hydropower Joint Stock Company (DHD) sent Official Letter No. 13 / ND-CP to People's Committees of Communes asking for community consultation on EIA report contents of the project. After waiting for the review of relevant documents, DHD has received the written response of the People's Committees to "*Consultation on the content of the EIA report of the project*".

256-248. The People's Committees of the affected communes agreed with the EIA report of Da Mi Floating Solar Power Project. However, it was also proposed that after the Project is approved for investment, the Client should:

- Conduct the conversion of land use purpose in accordance with the law before construction;
- During the construction process, collect and gather domestic wastes and solid wastes at the prescribed places to avoid polluting the surrounding environment;
- Fully implement compensation for land, crops and assets on land satisfactorily for the affected people before conducting the project;
- Periodically inspect the electric safety corridors according to the provisions of law;
- Strictly supervise construction workers and must not leave the construction workers causing security problems and disrupt the order in the locality;
- During the operations period, regularly check and maintain the transmission line in order to identify problems in a timely manner;
- Comply with the Law on Environmental Protection and the provisions of the law on environmental impact assessment.

257-249. **Official correspondence with community representatives directly affected by the project** reports the following concerns and recommendations for the project. More details can be found in the local EIA.

- The Client must strictly complies with the law on environmental protection and the provisions of the law on environmental impact assessment;

- During construction, domestic wastes and solid waste must be collected and packed at the prescribed places to avoid polluting the surrounding environment;
- The Client must complete the compensation of land, crops and assets of the people in the project area;
- The Client must fully implement the compensation of land, crops and assets on land satisfactorily for the affected people before conducting the Project.

2. Information Disclosure, Consultation, and Participation in June 2018

258-250. During 18th-22nd June 2018, representatives of the Project team and ERM had meetings with the PCs of Ham Thuan Bac District, Thanh Linh District, Da Mi Commune, La Ngau Commune and La Da Commune to inform them about the current status of the Project, to collect socio-economic baseline data and to seek their perceptions about the Project and their support for future consultation.

259-251. Following the meetings with local authorities, the Project team and ERM organised consultation with the affected households mainly to collect the updated socio-economic baseline data at household levels, and their opinions and concerns on the development of the Project. The consultations were in the form of household surveys and focus group discussions as discussed below.

260-252. **Key Informant Interviews.** The interviews were organized in the form of formal meetings with local authorities. Qualitative information on socio-economic conditions of the communes including perceptions and concerns about the Project activities was discussed. Feedback from the local authorities was collected and will be considered when identifying and assessing environmental and social gaps. Their feedback including concerns and suggestions primarily revolved around social, economic and cultural issues having emerged from the happening of the Project. Prioritisation of local recruitment and the assurance of land compensation would serve as the pivot in settling any potential entanglement with employment and compensation. Details of key informant's interviews are illustrated in the Stakeholder Engagement Plan.

261-253. **Household surveys.** In order to understand the socio-economic baseline including current livelihoods, income, health profile and the awareness and concerns of the affected communities about the Project, the household surveys were conducted in Da Mi Commune, La Da Commune and La Ngau Commune - the affected community of Ham Thuan Bac and Thanh Linh District. The survey results are used to inform the socio-economic baseline section and to propose livelihood restoration programs for the project. (See details in Section G).

262-254. DHD provided ERM with a list of 44 households who are potentially affected by the transmission line. A household survey was carried out at the houses of the identified households during 19th-22nd June 2018. The interview was conducted based on the availability of the householders and at the end of the survey, ERM interviewed 41 households, including 36 HHs from DHD list and 5 households settling by Da Mi Reservoir (not in the list). Cross referencing with the list of affected households provided by DHD, there were eight cases not engaged by ERM, including:

- 2 duplicated households;
- 1 household not found within the Project area and their location unknown;
- 2 households having migrated to other areas;
- 1 household not available for contact via phone due to invalid mobile number; and

- 2 households not available due to extenuating circumstances.

263-255. **Focus group discussion.** Qualitative methods such as focus group discussion are intended to provide surveyors with means for collecting data that can be used to construct a descriptive account of the phenomena being investigated. This approach is particularly useful because it uncovers participants' subjective attitudes and experiences that are typically inaccessible through other means of data collection. Focus groups also tap into subjective experiences and are an efficient way to collect large amounts of data that describes, compares, or explains a social phenomenon because they allow participants to interact with one another and build on one another's comments, and they allow the facilitators to probe for details.

264-256. Focus group discussions were conducted during June 2018. Group ranged in size of eight participants and lasted for 40 minutes. Focus group discussions were held at the Cultural Village of each commune. The exercise included both community representatives with influence/ power/ good knowledge of the target community and the Project-affected population.

265-257. The list of stakeholders, topics covered in the discussions and concerns and suggestions collected from the key informant interviews and household surveys conducted in 2018 are described in Stakeholder Engagement Plan.

O. Grievance Redress Mechanism

266-258. A grievance redress mechanism has been devised to provide an avenue for stakeholders to raise grievances with the Project. This section describes the grievance redress framework (both informal and formal channels), setting out the timeframe and mechanisms for resolving complaints.

267-259. An effective stakeholder engagement process, which includes proactive provision of access to information on a regular basis and conducting consultations to listen to the stakeholder concerns and feedback, can help to prevent grievances from arising in the first place. However, projects with high potential of environmental and social impacts, or high profile impacts, often result in grievances from project stakeholders. Therefore, a grievance procedure needs to be developed and implemented to ensure that project related grievances can be identified, documented, solved and monitored.

268-260. A grievance procedure should be in place from the beginning of the social and environmental assessment process and should be maintained throughout the project life cycle. As with the broader process of stakeholder engagement, it is important that the Project stays informed and involved in the grievance procedure so that decisive action can be taken when needed to avoid escalation of disputes.

269-261. **Overview.** To allow grievances to be incorporated into project decision-making and to allow key messages to be accurately communicated, all grievances will be recorded in the issues/ grievances register as a means of maintaining transparency throughout any action taken relating to a grievance. Grievances can be submitted to the Project through different channels such as: grievance boxes which can be allocated in the office of the affected commune People's Committee; at the site office of the Project Company; directly via a telephone hotline to the grievance team of the Project; or directly submitted to Community Liaison Officer of the Project.

270-262. The grievance procedure is generally designed for different levels of redress, corresponding to the scale and seriousness of the complaint. Therefore, classification of the complaint is an important step.

271-263. The Project should appropriately recruit and allocate human resources to manage the procedure. A team of Community Liaison Officer should be appointed. Ideally, persons with

social/community management background should be recruited and assigned as a Community Liaison Officer. Ideally this could include members of the local community who have the requisite skill set. Also, the Project should assign resources to set up a Grievance Committee. Members of this Committee typically include senior managers of the Project; and during the construction phase, senior managers of the Contractor shall be involved to discuss and resolve the issues relating to their activities.

272-264. Details of each step in a grievance procedure are illustrated in the Stakeholder Engagement Plan.

273-265. **Step 1: Receive and log grievance**

- The grievance should be received by the Project representative. Ideally a member of a communication or community relations function (e.g. Community Liaison Officer) should be responsible for this.
- The Community Liaison Officer (CLO) logs the grievance using the Grievance Form and ensures that it is captured in a Grievance Log in order to monitor actions taken in resolving the grievance.

274-266. **Step 2: Acknowledge grievance**

- The CLO should communicate, verbally and documented in writing, with the grievant acknowledging receipt of the grievance and providing information on the proposed steps and the anticipated timeframes for resolving the grievance.
- The date of receiving the grievance shall be record in the Grievance Form.

275-267. **Step 3: Classification of grievance and forward to relevant department**

- The CLO should review and classify the grievances based on its nature.
 - Grievances relating to resettlement: will be forwarded to the Land Fund Development Center of Ham Thuan Bac District who is the agency in charge of the implementation of the CSR process for the Project for their resolution. Before forwarding such type of grievance, the CLO should record the nature and root cause of the grievances for the grievance following up and monitoring.
 - Grievances relating to the Project activities: can be classify into two level of its complexity and include: a) Simple grievances: for one-off grievance, and the grievances are considered local (family to small area level) in nature and do not attract attention of media; or b) Complex: for the grievances that are either recurring and/or potentially affect the community (large group to village/commune level) and/or attract attention of media.

276-268. **Step 4: Investigate and resolve grievances relating to the Project activities**

- In the event that the grievances are assessed simple, direct interaction between the CLO and the grievant(s) shall be conducted. Solutions can then be developed and implemented.
- In the event that the grievances are considered as complex, immediate intervention of related parties such as senior managers, construction contractor, and/or village head, local authorities to seek their advice and then propose a resolution which is agreed by the parties in the discussion.
- If the solutions are not accepted by the grievant(s), the CLO should conduct consultation with the grievant(s) to obtain further detailed clarification on the issues and to try and agree

upon a mutual solution. Minutes of consultation session shall be kept in the Grievance Log.

- If a mutual solution cannot be obtained through consultation, third parties could be asked to be involved. The third-party can provide advice or facilitation in a way that is acceptable to all parties.
- In addition, where mediation is desired, academic or other local institutions may be sought out to play an “honest broker” role in mediating between the Project and stakeholder groups.

277-269. **Step 5: Follow up on grievance**

- Grievances relating to resettlement: the CLO should work closely with the LFDC officer to follow up with the resolution process of this type of grievance from the grievance review, resolution to the implementation of the proposed resolution to ensure no grievances will be left unsolved or pending too long.
- For all grievances: The CLO is responsible for seeking the grievant(s) responses/feedback on the implementation of the resolutions. The implemented resolutions shall also be recorded in the Grievance Form and kept in place as required. These activities are considered as follow up actions.

278-270. **Step 6: Documentation and reporting**

- All follow-up actions shall be tracked in the Grievance Log of the Project.
- The CLO is responsible for maintaining all records in the Grievance Log.
- The CLO is responsible for preparing periodical reports to the Manager about the resolution of each grievance processed by the CLO. The report will include the resolution and closure process.

279-271. Templates of all grievance-related documents including Grievance Form, Grievance Log and Investigation Form are provided in the Stakeholder Engagement Plan

P. Institutional Arrangements and Responsibilities

280-272. The Project Sponsors head office is located at No.80 Tran Phu Street, Loc Son Ward, Bao Loc City, Lam Dong Province 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.

281-273. At the time of reporting, it is understood that DHD has not assigned or established separate department to be in charge of management of this Project within its organization. As such it is recommended that DHD to develop relevant department for general management as well as environmental and social management for this Project.

Q. Conclusion and Recommendation

282-274. The construction phase will involve site preparation (e.g. grading and levelling) and installation and commissioning of infrastructure (including the floats, PV panels, inverters, transformers, access road and transmission lines). These activities are likely to generate air and noise emissions, impacts on aquatic habitats and present occupational and community health and safety risks. However, these impacts are site specific and not expected to be significant, and

will only be of short duration (i.e. a year). Mitigating measures include the use of dust suppression techniques, traffic management, and use of personal protective equipment, fencing of the Project site, and continued engagement with stakeholders. The operation phase will have minimal impact from ongoing maintenance of the PV panels, including regular washing of the panels 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.

283-275. 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. 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.