Initial Environmental Examination

September 2018

VIE: Second Health Human Resource Development Project (SHHRDP)

Ho Chi Minh City University of Medicine and Pharmacy - Phase 1

Prepared by Ministry of Health for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 1 September 2018)

Currency unit	–	Dong (VND)
VND1.00	=	$0.00004
$1.00	=	VND23,290

ABBREVIATIONS

ADB	Asian Development Bank
ADB SPS 2009	Safeguard Policy Statement (2009)
BOMICEN	Technology Centre for Bomb and Mine Disposal
CEMP	Contractor Environmental Management Plan
CHPMU	Central Health Project Management Unit
CoPC	Commune People's Committee
CPMU	Central Project Management Unit
CSC	Construction Supervision Consultant
DoNRE	Department of Natural Resources and Environment
DPC	District People's Committee
DPH	Department of Public Health
EA	Executing Agency
EHS	Environment, Health and Safety
EMP	Environmental Management Plan
ESO	Environmental Safeguard Officer
ERP	Emergency Response Plan
ERT	Emergency Response Team
EERT	External Emergency Response Team
GOV	Government of Vietnam
GRM	Grievance Redress Mechanism
HCMC	Ho Chi Minh City
HCMCUMP	Ho Chi Minh City University of Medicine and Pharmacy
HMU	Hanoi Medical University
IA	Implementing Agency
IEE	Initial Environmental Examination
IFC EHS General Guidelines	International Finance Corporation Environmental, Health, and Safety General Guidelines
IFC EHS Guidelines for HCF	International Finance Corporation Environmental, Health and Safety Guidelines for Health Care Facilities
IFC EHS Guidelines for THD	International Finance Corporation Environmental, Health and Safety Guidelines for Tourism and Hospitality Development
MOC	Ministry of Construction
MOH	Ministry of Health
MoNRE	Ministry of Natural Resources and Environment
MPI	Ministry of Planning and Investment
ODA	Official Development Assistance
PAI	Project Area of Influence
PCR	Physical Cultural Resources

PIB	Project Implementation Booklet
PMU	Project Management Unit
PPC	Provincial People's Committee
PPE	Personal Protective Equipment
PPTA	Project Preparatory Technical Assistance
SHHRDP	Second Health Human Resource Development Project
TOR	Terms of Reference
TSN	Tan Son Nhat
USD	United States Dollar
VND	Vietnamese Dong

NOTES

(i) The fiscal year of the Government of Viet Nam ends on 31 December.
(ii) In this report, "$" refers to US dollars.

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EXECUTIVE SUMMARY

1. The proposed Second Health Human Resources Development Project (SHHRDP), funded by the Asian Development Bank (ADB), which approved a Project Preparatory Technical Assistance (PPTA) in December 2015, will assist the Government of the Socialist Republic of Vietnam (GOV) to achieve universal health coverage and progress towards meeting the health-related sustainable development goals to:

(i) Increase the number of graduates from medical, nursing, and other health sciences to meet the country's health workforce needs and address supply constraints to achieve universal health coverage,

(ii) Diversification into the size of the medical training programs in general and intensive training to meet the country's epidemiological and demographic changes,

(iii) ensure the quality of future medical services through training of staff and graduates under internationally recognized programs,

(iv) strengthening research and development capacity in the field of technical and medical technology, and technology transfer.

2. The Ministry of Health (MOH) has issued a plan for developing human resources for health, which highlights the significant shortfall in the number of physicians, nurses, pharmacists, technical specialists and other specialized health specialists and goals and requirements for human development by 2020. Consequently, in January 2016 it has requested the incorporation of a new campus (or "second campus") for Hanoi Medical University (HMU) and Ho Chi Minh City University of Medicine and Pharmacy (HCMCUMP) in Ha Nam and Dong Nai provinces, respectively. Currently operating at capacity, existing HMU and HCMCUMP's classrooms, laboratories, and skill labs are unable to accommodate increased student numbers while maintaining teaching quality. A lack of adjacent land and restrictions on the development of educational campuses in central city locations prevent HMU and HCMCUMP from expanding in their current locations.

3. The investment for these campuses will be realized in phases, and SHHRDP will provide a financing of $80 million for **Phase 1 development of HMU and HCMCUMP, which is the only works supported by SHHRDP**[1]. Phase 1 development of HCMCUMP ("**HCMCUMP Phase 1**" or "**the Project**") encompasses the facilities required for teaching the undergraduates and graduates students to be developed on 10 hectares (ha) of land – expected to receive the first students in 2025. This development will occur inside 120 ha for the future development of a complete campus which will include a hospital, teaching laboratories and other facilities, designated along the text as **Main Project** of HCMCUMP University.

4. This Main Project will consist of HCMCUMP Phase 1 development (the main features are the educational buildings, student housings and infrastructural facilities for the campus), Phase 2 (the main features will be the university hospital, the enlargement of the educational program and the dormitory and sports center facilities) and Phase 3 (the main features will be start-up companies, bio incubators and the extension of the university hospital up to its full

[1] This report is for HCMCUMP Phase 1 only, while separate Initial Environmental Examination (IEE) report is prepared for HMU Phase 1.

capacity) that will be developed inside the zoning plan in Long Tan commune and Phuoc Thien commune, Nhơn Trach District, Dong Nai Province, currently proposed by Dong Nai PPC for a 320 ha development which includes some other universities, hereby referred as **University Village**. HCMCUMP Phase 1 is for about 6,050 students (and 200 staff), going up to 15,870 students (and 500 staff) in Phase 2.[2]

5. The University Village will be part of 41,078 ha of the **Nhơn Trach New Urban Master Plan** toward 2035 and vision to 2050, approved by the GOV in 2016, which aims at establishing a modern urban area, industrial parks, commercial and cultural centers, public parks, recreation and other services for 26,000 – 28,000 inhabitants (in 2025).

6. The Ministry of Health (MOH) is the executing agency and will have overall responsibility in Project coordination and implementation. The Project will be implemented through MOH's Central Heath Project Management Unit (CHPMU). The expected Project duration for HCMCUMP Phase 1 is 6 years from 2019 to 2024 including 3 years and 4 months of construction period which starts in July 2021.[3]

7. The SHHRDP is classified as Category B for environment under the ADB Safeguard Policy Statement (2009) (ADB SPS 2009) therefore only requiring an Initial Environmental Examination (IEE).

8. In the framework of IEE preparation, a comprehensive environmental and ecological baseline assessment was conducted in the framework of the IEE. From the results of ecological field survey, sampling, laboratory analysis and collected data and information, it may indicate that at present air quality, expressed by concentrations of dust (TSP), NO_2, SO_2, CO and noise, is well within the Vietnam National Technical Regulations (QCVNs) for Ambient Air Quality and Noise; creek/canals water is slightly polluted by organic matters, (BOD exceeds the Permissible Limits in QCVN for Surface Water); ground water quality is good; land is not contaminated by heavy metals and pesticides, although various kinds of pesticides were used at the site. At present, before land clearance, agriculture with paddy fields is the dominant ecosystem; no mangrove forest and protected sites are present within the wider area of influence, but mangrove vegetation species are growing at the banks of the creeks in the project area. Various birds, e.g. *Egretta garzetta, Hirundo rustic, a Halcyon chloris, Dicrurus paradiseus, Passer montanus etc.,* some amphibian (*Mabuya longicaudata, Xenochrophis piscator, Enhydris jagori, Bufo melanostictus* etc.) and fish *(Periophthalmus schlosseri, Anabas testudineus, Clarias macrocephalus, Fluta alba, Mystus gulio Trichogaster microlepis* etc.) species are found in the project area but no vegetation and wild animal species belong to the IUCN List and Vietnam Red Book.

9. Literature review, experiences from other similar construction projects and the field assessment for collection of primary and secondary data for this IEE show that the potential

[2] The number of students and staff for Phase 3 is unknown at this stage.

[3] The timeframe of the construction of Phase 2 and Phase 3 is unknown at this stage. The land required for the subsequent phases will be acquired by the IA/EA once they obtain the budget for the development of each phase. Phase 1 can operate without Phase 2 and Phase 3 therefore is a stand-alone development.

environmental impacts of HCMCUMP Phase 1 will occur during all three phases: pre-construction, construction and operation.

10. Main negative impacts during pre-construction phase would be caused by land acquisition, changing in livelihoods of people; land clearance leading to loss in natural ecological values and changes in landscape. During construction, the main impacts are an increased air pollution by dust, increased noise and vibration pollution by construction machines, canal water pollution and damage of paddy fields surrounded by run-off (storm) water in the rainy seasons; water and land pollution by disposal of organic spoils from earthworks, solid waste and wastewater; land erosion and increased risks of injuries and casualties of workers and residents by trucks transporting materials and spoils for the Project. loss of aquaculture would occur by disposal of construction wastes and run-off water.

11. During operation the main impacts expected are increased air and noise pollution and traffic accidents by increased volume of vehicles; environmental pollution by great amount of solid wastes and wastewater created by 6,050 students and 200 employees, and health risks in case of lack of safety management. Impacts of climate change on the project, including anticipated increase of atmospheric temperature, change in rainfall regime in all project phases are expected as minor, but they must be considered in campus design, construction and management.

12. Although many of the impacts are temporary, moderate or minor, land acquisition and changes in landscape will be permanent and major. In general, all impacts may be minimized and turn into negligible after application of proper mitigation measures.

13. HCMCUMP Phase 1 will result in the acquisition of mainly agriculture land and small area of residential land. There will be 25 households affected by permanent acquisition of 96,212 m^2 agricultural land and 747 m^2 residential land. There are 08 AHs with 33 affected people that will be severely affected due to loss of 10% and more of their total productive land holding on which they are directly cultivating. These 08 households also include two households (05 people) whose main house will be affected and thus will be physically displaced. A Resettlement Plan was prepared for the HCMCUMP Phase 1. The plan is commensurate with the expected impacts and in compliance with the ADB SPS 2009. The RP will be updated and cleared by ADB and the provincial government based on the final site boundaries. No physical or economic displacement will take place in connection with the project until (a) compensation and other entitlements have been provided to affected people in accordance with the updated RP; and (b) a comprehensive income and livelihood restoration program has been established in accordance with the updated RP.

14. Most of the environmental impacts from the implementation of HCMCUMP Phase 1 are considered as moderate during construction and operation, since many of them are temporary and local. The benefits of HCMCUMP Phase 1 and the Main Project in general are great.

15. The Environmental Management Plan (EMP) provides a comprehensive overview on the identified mitigation and management measures to avoid, minimize, mitigate and compensate for anticipated adverse environmental impacts, implementation of monitoring and reporting, responsibilities and regulations applicable to the Project.

I. Introduction

1. The purpose of this report is to incorporate any environmental concerns regarding the Second Health Human Resources Sector Development Project (SHHRDP), with focus on Ho Chi Minh City University of Medicine and Pharmacy (HCMCUMP) Phase 1, which primarily consists of the construction of one new campus for the enlargement of the capacity of existing HCMCUMP.

2. Literature review on existing studies and field environmental assessments were performed on site in order to predict and evaluate possible impacts and prescribe mitigation measures for the planning actions, construction works and operation of the new medical center.

3. SHHRDP will provide a financing of $80 million for Phase 1 development of HMU and HCMCUMP. Phase 1 development of HCMCUMP ("**HCMCUMP Phase 1**" or "**the Project**") encompasses the facilities required for teaching the undergraduates and graduates students to be developed on 10 hectares (ha) of land – expected to receive the first students in 2025. This development will occur inside 120 ha for the future development of a complete campus which will include a hospital, teaching laboratories and other facilities, designated along the text as **Main Project** of HCMCUMP.

4. This Main Project will consist of HCMCUMP Phase 1 development (the main features are the educational buildings, student housings and infrastructural facilities for the campus), Phase 2 (the main features will be the university hospital, the enlargement of the educational program and the dormitory and sports center facilities) and Phase 3 (the main features will be start-up companies, bio incubators and the extension of the university hospital up to its full capacity) that will be developed inside the zoning plan in Long Tan commune and Phuoc Thien commune, Nhơn Trach District, Dong Nai Province, currently proposed by Dong Nai PPC for a 320 ha development which includes some other universities, hereby referred as **University Village**. HCMCUMP Phase 1 is for about 6,050 students (and 200 staff), going up to 15,870 students (and 500 staff) in Phase 2.[4]

5. The University Village will be part of 41,078 ha of the **Nhơn Trach New Urban Master Plan** toward 2035 and vision to 2050, approved by the GOV in 2016, which aims at establishing a modern urban area, industrial parks, commercial and cultural centers, public parks, recreation and other services for 26,000 – 28,000 inhabitants (in 2025). Nhơn Trach District covering 410.83 km^2 with a population of 453,372 inhabitants (2015) is a new and large urban and industrial center of the Southern Focal Economic Region of Viet Nam, including provinces of Dong Nai, Baria – Vungtau, Binh Duong, Binh Phuoc, Tay Ninh, Tien Giang and Ho Chi Minh City. In this district, besides Nhơn Trach New Urban Master Plan, 9 industrial parks have been planned, 5 of which with over 100 industrial production facilities are under operation. In the district, a University Village with 320 ha has been planned.

6. The Ministry of Health (MOH) is the executing agency and will have overall responsibility in Project coordination and implementation. The Project will be implemented through MOH's

[4] The number of students and staff for Phase 3 is unknown at this stage.

Central Heath Project Management Unit (CHPMU). The expected Project duration for HCMCUMP Phase 1 is 6 years from 2019 to 2024 including 3 years and 4 months of construction period which starts in July 2021.[5]

7. Investment in infrastructure development at the university is fundamental since it cannot accommodate the increasing number of students. The investment in this Project is in line with policies of the Government on fundamental and comprehensive reform of education following Resolution No. 22/NQ-TW dated 10 April 2013 on international integration and Directive No. 15/CT-TTg dated 7 July 2015 on continuing the implementation of the Politburo's Resolution No. 22/NQ-TW on international integration. The Project is in accordance with the Prime Minister's Decision No. 37/2013/QD-TTg dated 26 June 2013 on adjusting the planning of the network of universities and colleges in the period 2006-2020 with priority given to the construction of internationally recognized universities/colleges. The Project will help HCMCUMP to meet criteria for a research-oriented university in accordance with Decision 73/2015/NĐ-CP dated 8 September 2015. On 3 May 2018 an official letter was issued for the acceptance of SHHRDP, according to which Mr. Pham Binh Minh agrees to propose the Project as per the Ministry of Planning and Investment (MPI) letter No. 2808/BKHDT-KTDN, with full collaboration of MOH, the two Universities involved and other relevant entities.

8. Being the overall objective of SHHRDP to assist the Government of Vietnam (GOV) to reach the target of universal health coverage and progress towards meeting sustainable development goals through an increase in the supply of qualified workforce in health sectors to appropriately respond to changes in Vietnam's epidemiological and demographic profile, this Project makes a significant contribution to the general health state of the country by:

a) Increasing the number of medical graduates to meet the demand in health workforce in the country and address existing constraints to reach the target of universal health coverage;
b) Diversifying the scope of the training programs and majors to accommodate the demographic and epidemiological changes that the country is experiencing;
c) Ensuring the future quality of health services by training students in accordance with international standards;
d) Strengthening Research and Development (R&D) capacity in medical engineering and technology, and technology transfer.

9. The specific objective of SHHRDP will be to help develop HMU and HCMCUMP to become a university of health sciences to meet international standards, by assisting the construction of the universities' second campus. These campuses will improve the quality of health education and training in these Universities and strengthen the accreditation for medical training in these two cities.

10. For HCMCUMP, the number of students is specified according to the Master plan for the development of HCMCUMP to 2020 with a vision towards 2030, approved in Decision No.

[5] The timeframe of the construction of Phase 2 and Phase 3 is unknown at this stage. The land required for the subsequent phases will be acquired by the IA/EA once they obtain the budget for the development of each phase. Phase 1 can operate without Phase 2 and Phase 3 therefore is a stand-alone development.

2670/QĐ-BYT and calculation of the student population size. Accordingly, and considering the scope of implementation of this Program, the construction of training facilities will be for about 6,050 students (and 200 staff) on Phase 1.

11. Health students are identified as direct beneficiaries of HCMCUMP Phase 1, since the new facilities have new and modern spaces to study and practice, adapted to international standard training programs.

12. Lecturers will also be able to develop competencies from the adaptation to the new training programs, developed according to international standards. New staff will be recruited to work at the new campuses, which will also be identified as direct beneficiaries from the Project (higher employment rates in the areas) and most importantly, the medical services in both cities (and therefore the country in general) will be served with hospitals with medical services of world-standard quality.

13. Hospitals with medical services of world-standard quality improves population health of Dong Nai and nearby provinces and reduce the overload of hospitals in Ho Chi Minh City.

14. Indirect beneficiaries will be the students in other institutions related to health who will also have the chance to enjoy new training programs and new training facilities with the required accreditation for medical training and other medical related service providers who will have more demand for quality products.

II. Policy and Legal Requirements

15. This Project is implemented in accordance with the provisions of the Government's Decree No. 16/2016/NĐ-CP dated 16 March 2016 for the use of Official Development Assistance (ODA) resources of the Government.

A. LEGAL FRAMEWORK FOR ENVIRONMENTAL ASSESSMENT IN VIETNAM

16. Vietnam is part of several relevant International Conventions on Environmental Management that may be relevant to mention for the Project which are the 1987 Convention on the Protection of the World's Natural and Cultural Heritages, the Montreal Protocol on Substances that Deplete the Ozone Layer, the 1992 United Nations Statement on Environment and Development, the 1994 Vienna Convention for the Protection of the Ozone Layer, the 1994 Convention on Biological Diversity (CBD), the 1994 Cartagena Protocol on Biosafety, 1994 United Nations Framework Convention on Climate Change (UNFCCC), the 1995 Basel Convention on the Control of Transboundary Movements of Harmful Substances and the 2009 Stockholm Convention on Persistent Organic Pollutants (POPs).

17. On a legal basis, the environmental assessment of a Project in Vietnam is carried out in accordance with Law No. 55/2014/QH13 on Environmental Protection (2014) passed by the National Assembly of the Socialist Republic of Vietnam on 23 June 2014.; Decree No. 18/2015/NĐ-CP (para.17); MoNRE Circular No. 27/2015/TT-BTNMT dated 29 May 2015, detailing a number of articles of the Decree No. 18/2015/NĐ-CP.

18. Article 19 of Law No. 55/2014/QH13 regulates:

a) Project owners falling into the categories defined in Clause 1, Article 18 of this Law shall themselves or hire consultancy organizations to conduct environmental impact assessment and bear responsibility before law for the results of the impact assessment. environment.
b) The environmental impact assessment must be carried out in the project preparation stage.
c) The results of the environmental impact assessment shall be expressed in the form of an environmental impact assessment report.
d) Expenses for making and evaluating environmental impact assessment reports belonging to the project's investment capital sources shall be borne by the project owners.

19. The implementation of an EIA Project in Vietnam follows, in general, certain steps until approval. This process starts with:

(i) study on the contents of reports on Project descriptions and basic designs as well as relevant technical documents;
(ii) collection of data on the natural environmental conditions (geology, topography, soils, climate, hydrology, environmental quality, ecology) and socio-economy at the project affected areas;
(iii) field surveys on the present physical, biological and social conditions, sampling and analysis of environmental components at the Project area;
(iv) identification of the sources of impacts, objects, scales affected; forecast and evaluate the project potential impacts on the environment;
(v) proposal of measures to minimize the adverse impacts, prevent and respond to environmental incidents of the Project, included proposal of environmental protection facilities; (vi) proposal of project management and monitoring programs;
(vi) EIA report preparation following the MoNRE Guideline;
(vii) conducting consultation with local authorities via letters and meetings and with CcPCs, related organizations and project affected people through public consultation meetings;
(viii) supplement and finalization of EIA reports;
(ix) submit EIA Report together with Project FS report or Investment Report to the state management agency for environmental protection for appraisal and approval (MoNRE or DoNREs, depending on the Governmental Guideline for Project Classification in EIA, EPP in Decree No. 18/2015/NĐ-CP (para.17));
(x) Checking the project area in terms of the present environmental conditions and potential project impacts by EIA Appraisal Council set up by MoNRE or DoNRE;
(xi) Meeting of EIA Appraisal Council for reviewing EIA report;
(xii) Revise EIA report following the comments and requirements of the EIA Appraisal Council;
(xiii) Re-submission to the EIA Appraisal Council for consideration and proposal to Minister of MoNRE or PPC Chairman for approval of the EIA Report of the Project.

20. The following Vietnam legal documents are as the major documents on environmental protection and impact assessment for this Project (from oldest to newest issuing date and from Laws, Decrees, Decisions to Circulars):

a. <u>Environmental Protection</u>

- Law on Protection of People's Health, No. 21-LCT/HDNN8 passed by the National Assembly of Socialist Republic of Vietnam on June 30, 1989.

- Law on Standards and Technical Regulations, No. 68/2006/QH11 adopted by the National Assembly of the Socialist Republic of Vietnam on 29 June 2006.
- Law on Biological Diversity, No. 20/2008/QH12 passed by the National Assembly of the Socialist Republic of Vietnam on November 13, 2008.
- Law on Water Resources, No. 17/2012/QH13 passed by the National Assembly of Socialist Republic of Vietnam on 21 June 2012.
- Construction Law, No. 50/2014/QH13 approved by the National Assembly of Socialist Republic of Vietnam on June 18, 2014
- Law No. 55/2014/QH13 (para.17).
- Decree No. 127/2007/NĐ-CP dated August 1, 2007, detailing the implementation of a number of articles of the Law on Standards and Technical Regulations.
- Decree No. 117/2009/NĐ-CP dated December 31, 2009 of the Government on the sanctioning of administrative violations in the field of environmental protection.
- Decree 18/2015/NĐ-CP (para.17).
- Decree No. 19/2015/NĐ-CP detailing the implementation of a number of articles of the Law on Environmental Protection.
- Decree 38/2015/NĐ-CP dated 24 April 2015 by the Government on waste and waste management.
- Decree No. 59/2007/NĐ-CP dated 09/4/2007 on solid waste management;
- Decree No. 59/2015/NĐ-CP dated 18/6/2015 of the Government on management of construction investment projects.
- Decree No. 155/2016/NĐ-CP on sanctioning administrative violations in the field of environmental protection
- Decision No. 256/2003/QD-TTg dated 02/Dec./2003 of the Government, approving the national environmental protection strategy till 2010 and orientations towards 2020
- Decision No. 455/QĐ-TTg dated 22/Mar./2016 of the Prime Minister approving the adjustment of the master plan for new urban development of Nhơn Trach, Dong Nai Province to 2030, vision to 2050.
- Circular No. 36/2015/TT-BTNMT of the Ministry of Natural Resources and Environment dated 30 June 2015 on hazardous waste management.
- Circular No. 27/2015/TT-BTNMT (para.17).

b. <u>Land Use:</u>

- Land Law, No. 45/2013/QH13 passed by the National Assembly of the Socialist Republic of Vietnam on 29/11/2013;
- Decree No. 43/2014/NĐ-CP dated 15/05/2014 of the Government on the implementation of the Land Law;
- Decree No. 01/2017/NĐ-CP dated 06/1/2017 of the Government providing for amendments and supplements to a number of decrees detailing the implementation of the Land Law;
- Circular No. 01/2017/TT-BTNMT dated 09/02/2017 regulating the land use for the construction of cultural and medical facilities and land for the construction of educational and training establishments, physical training and sports facilities and cultural works belonging to the community.
- Circular No. 33/2017/TT-BTNMT dated 29/9/2017 detailing the Government's Decree No.

01/2017/NĐ-CP dated 06/01/2017 amending and supplementing a number of decrees detailing the implementation of the Land Law and amending and supplementing a number of articles of the circulars guiding the implementation of the Land Law.

c. Health and Safety

- Law on Occupational Safety and Hygiene, No.84/2015/QH13 passed by the National Assembly of the Socialist Republic of Vietnam on 25/July/2015;
- Decree No. 39/2016/NĐ-CP of the Government detailing the implementation of a number of articles of the Law on Occupational Safety and Hygiene;
- Decision No. 2670/QD-BYT dated 27/07/2009 of Ministry of Health approving the master plan for development of Ho Chi Minh City University of Medicine and Pharmacy to 2020 with a vision to 2030;
- Joint Circular No. 01/2011/TTLT-BLDTBXH-BYT of Ministry of Health Guiding the organization of implementation of labor safety and hygiene in labor establishments;
- Circular 19/2011/TT - BYT of Ministry of Health on Guideline on management of occupational health, occupational health and occupational diseases
- Decision 2992/QD-BYT dated 17/07/2015 of Ministry of Health approving the Health Human Resources Development Plan in the national health care system for the period 2015-2020

d. National Technical Regulations:

- National technical regulation on surface water quality (QCVN 08/2015/BTNMT).
- National technical regulation on groundwater quality (QCVN 09/2015/BTNMT).
- National technical regulation on permissible limits of heavy metals in soil (QCVN 03: 2008/BTNMT)
- National technical regulation on domestic wastewater (QCVN 14/2008/BTNMT).
- National technical regulation on ambient air quality (QCVN 05/2013/BTNMT).
- National technical regulation on industrial emissions of dust and inorganic substances (QCVN 19/2009/BTNMT).
- National technical regulation on industrial emission for some organic substances (QCVN 20/2009/BTNMT).
- National technical regulation on sediment quality (QCVN43/2012/BTNMT).
- National technical regulation on noise (QCVN 26/2009/BTNMT).
- National technical regulation on vibration (QCVN 27/2009/BTNMT).
- National technical regulation on industrial wastewater (QCVN 40/2011/BTNMT).
- National microclimate technical regulation (QCVN 26: 2016/BYT)
- Decision No. 3733/2002/QD-BYT - Decision on promulgation of 21 occupational hygiene standards, 5 principles and 7 indicators on occupational hygiene

B. ADB SAFEGUARD POLICY

21. ADB requires the consideration of environmental issues in all aspects of its operations, and the requirements for environmental assessment are described in the ADB SPS 2009. It emphasizes environmental and social sustainability in progress of economic growth and poverty reduction in Asia and the Pacific, with the following aims:

- Avoid adverse impacts of Projects on the environment and affected people, where possible;
- Minimize/mitigate and/or compensate for adverse impacts on environment and affected people when avoidance is not possible;
- Help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

22. The ADB SPS 2009 also requires, during the design, construction and operation of a project that the borrower follows environmental standards consistent with good international practices as reflected in internationally recognized standards such as the International Finance Corporation Environmental, Health and Safety Guidelines (IFC EHS Guidelines). The IFC EHS Guidelines contain discharge effluent, air emissions, and other numerical guidelines and performance indicators as well as prevention and control approaches that are normally acceptable to ADB and are generally considered to be achievable at reasonable costs by existing technology. When host country regulations differ from these levels and measures, the borrower/client is to achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client is required to provide justification for any proposed alternatives.

23. The IFC EHS Guidelines include the International Finance Corporation Environmental, Health and Safety General Guidelines (IFC EHS General Guidelines)[6] covering environment, occupational health and safety, and community and health and safety) and Sector Guidelines. Applicable sector Guidelines utilized in the IEE include the International Finance Corporation Environmental, Health and Safety Guidelines for Health Care Facilities (IFC EHS Guidelines for HCF)[7] and the International Finance Corporation Environmental, Health and Safety Guidelines for Tourism and Hospitality Development (IFC EHS Guidelines for THD)[8].

24. The nature of the environmental assessment required for a Project depends on the significance of its environmental impacts, which are related to the type and location of the Project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures. Projects are screened for their anticipated environmental impacts and allocated to one of the following four categories (A, B, C, FI) from which HCMCUMP Phase 1 was classified as a Category B Project.

25. An EMP which addresses the potential impacts and risks identified by the environmental assessment has been prepared and the level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the Project's impact and risks. For this Project details of the EMP can be found inside Chapter IX.

26. ADB will post different safeguard documents on its website so affected people, other stakeholders, and the general public can provide meaningful inputs into the Project design and

[6] https://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES

[7] https://www.ifc.org/wps/wcm/connect/bc554d80488658b6b6e6f66a6515bb18/Final%2B-%2BHealth%2BCare%2BFacilities.pdf?MOD=AJPERES&id=1323161961169

[8] https://www.ifc.org/wps/wcm/connect/e9f48800488559c0840cd66a6515bb18/Final%2B-%2BTourism%2Band%2BHospitality%2BDevelopment.pdf?MOD=AJPERES&id=1323162543953

implementation, which in this case should be the IEE final document and the environmental monitoring reports submitted by CHPMU during implementation.

C. ENVIRONMENTAL LEGAL PROCEDURES

27. The following law and decree require EIA (Vietnamese EIA) for the Main Project (or HMU Phase 1) to be approved by MoNRE before the civil works of the Project starts:

a) Environmental Law 55/2014/QH13: Article 23. Authority to verify the report on environmental impact assessment: MoNRE shall arrange to verify the report on environmental impact assessment in respect of the following Projects: a) Projects subject to the decision on investment intentions made by the National Assembly, Government and the Prime Minister;
b) Decree No. 18/2015/NĐ-CP (para.17): Article 14. Assessment and approval for EIA reports: 1. The competence of the EIA report assessment authorities: a) The Ministry of Natural Resources and Environment shall assess and approve the EIA reports on Projects prescribed in Appendix III of this Decree: Appendix III: 1. Projects under competence to decide of the National Assembly, the Government and the Prime Minister.

28. The budget for the preparation of the Vietnamese EIA will be allocated by the GOV only after the Project's Pre-Feasibility Study[9] is approved. CHPMU will, as soon as the pre-Feasibility Study is approved, engage a licensed national consulting firm for the site-specific environmental assessment and preparation of the Vietnamese EIA which will be submitted to MoNRE, and expected to be approved 2-3 months after submission.

29. The Main Project is subject to Circular No. 01/2017/TT-BTNMT[10] in which Article 6 restricts land use for universities between 5 and 24ha, but due to the specific nature of the Project (entailing latter on the construction of health care facilities, and with the agreement of the MOH on the land use plan)[11], although the Main Project area is more than 24ha, it is approved and the CHPMU is required to coordinate closely with MoNRE as well as Dong Nai PPC, in preparation of the Project.

III. Project Description

[9] The pre-Feasibility Study which covers the Main Projects of both HMU and HCMCUMP was submitted to the Prime Minister for approval in October 2018. The Feasibility Study of HMU and HCMCUMP Phase 1 is under preparation and planned to be approved by MOH in October 2018.

[10] https://thuvienphapluat.vn/van-ban/Bat-dong-san/Thong-tu-01-2017-TT-BTNMT-Dinh-muc-su-dung-dat-xay-dung-co-so-van-hoa-y-te-giao-duc-340568.aspx

[11] CHPMU met senior staff of MoNRE in April 2018 and confirmed that the Circular No. 1/2017/TT-BTNMT will not impact on (pre-) feasibility study approval.

A. PROJECT RATIONALE, OVERVIEW

30. The project will assist the Government of Viet Nam achieve universal health coverage and the health-related sustainable development goals through increased supply of a skilled health workforce.[12]

31. **Development context.** Economic growth has averaged more than 6.5% per year from 1991 to 2017, and gross domestic product per capita reached $2,389 in 2017. Gross domestic product accelerated from 6.2% in 2016 to 6.8% in 2017, and is estimated at 7.1% in 2018, driven by export expansion, rising domestic consumption, and strengthening of agriculture. Viet Nam's sustained economic growth has bolstered the country's progress in reducing poverty, which fell from 49% in 1993 to 2.8% in 2014.[13] Despite this, Gini coefficient has increased from 32.6 to 34.8; while poverty incidence varies significantly across regions with ethnic minorities, who account for 14.5% of the population, making up more than half of the poor.[14] Inclusive growth and population health are intricately linked, as evidenced by differences in key health indicators by location. For example, in the impoverished Central Highlands, infant mortality rate was 24.8/1,000 live births in 2015, while the affluent South East region recorded infant mortality rate of 8.6/1,000 live births. Similar variations also are found on reproductive health and maternal mortality outcomes.[15] Inequitable access to quality and affordable healthcare services results in disparities in health outcomes.[16]

32. Inclusive growth is further threatened by high out-of-pocket health expenditure, in particular, the growing financial burden associated with the treatment of non-communicable disease (NCD).[17] In 2015, the proportion of total disease burden attributable to NCD reached 73%, partly due to Viet Nam's aging population.[18] Those aged over 60 years now account for 10% of the population and is forecast to reach 20% by 2038. Catastrophic health expenditure, which affected 2.3% of households in 2014 (footnote 4), is more likely to occur among households with NCD patients.[19]

33. **Insufficient health professional graduates to meet health needs.** Viet Nam's health professional education and training institutions (HPETI) graduate approximately 2,550 general doctors, 1,160 nurses, and 1,020 pharmacists annually (footnote 10). These numbers are

[12] Universal health coverage means that all people have access to the health services they need (prevention, promotion, treatment, rehabilitation, and palliative care) without the risk of financial hardship when paying for them.
[13] Poverty rate is assessed as the percentage of population living on less than $1.90 per day, 2011 PPP.
[14] ADB. 2016. *Country Partnership Strategy: Viet Nam, 2016–2020—Fostering More Inclusive and Environmentally Sustainable Growth*. Manila.
[15] Ministry of Health (MOH). 2017. *Joint Annual Health Review 2016*. Ha Noi.
[16] MOH. 2016. Joint Annual Health Review 2015. *Strengthening Primary Health Care at the Grassroots Towards Universal Health Coverage.* Ha Noi.
[17] A non-communicable disease is a medical condition or disease that is not caused by an infectious agent.
[18] Institute for Health Metrics and Evaluation (accessed in 26 April 2018).
[19] Health expenditure is considered catastrophic if a household's financial contributions to health equal or exceed 40% of non-food expenditures. H. Bach and B. Tran. 2012. *Assessing the household financial burden associated with the chronic non-communicable diseases in a rural district of Viet Nam*.

insufficient to meet the country's health workforce targets. While demand for admission to HPETIs is strong, universities are unable to accommodate an increase in enrolments due to inadequate infrastructure. This is most evident at HMU and HCMCUMP, Viet Nam's leading HPETIs. In 2017, only 7–8% of total applicants for undergraduate medicine at each university could be offered places.[20] Currently operating at capacity, HMU and HCMCUMP's classrooms, laboratories, and skill labs are unable to accommodate increased student numbers while maintaining teaching quality. A lack of adjacent land and restrictions on the development of educational campuses in central city locations prevent HMU and HCMCUMP from expanding in their current locations.[21]

34. **Government's plan and strategy.** The National Action Plan for the Implementation of the 2030 Sustainable Development Agenda confirms the government's commitment to ensure an adequate supply of skilled health workforce towards achieving universal health coverage.[22] Health human resources (HHR) development is a government's priority.[23] The MOH will develop HMU and HCMCUMP as health science universities, capable of increasing graduate numbers across disciplines in line with the country's evolving health needs and disease burden.[24] In parallel with medical education reforms, the government maintains its commitment to redress the imbalance in HHR distribution, prioritizing the LHC level. The MOH has undertaken reforms to address deficiencies in LHC workforce quantity and quality, and to rapidly increase the number of graduates and improve training quality.[25] Various MOH programs, including the deployment of graduate doctors to difficult areas and granting preferential access to HPETIs for students from disadvantaged regions, have contributed to increasing health workforce in LHC facilities.[26]

35. The medium-term development plans of HMU and HCMCUMP detail the increase in student intake required to meet health workforce needs.[27] To enable this expansion, MOH has requested assistance to build new campuses for HMU and HCMCUMP. MOH has prepared master plans for each new campus and proposed phased implementation. Phase one

[20] HCMCUMP received 22,000 applications for the 1,600 available first year medicine places (source: HCMCUMP Department of Training). HMU received approximately 13,000 applications for 1,000 available places (source: HMU).

[21] Decision No. 5209/QD-UBND dated 22 October 2014 of the Peoples Committee of HCMC directing the development of university facilities in locations outside of HCMC.

[22] Decision 622/QĐ-TTg dated 10 May 2017 on the *National Action Plan for the Implementation of the 2030 Sustainable Development Agenda.*

[23] Resolution No. 20-NQ/TW dated 25 October 2017 on the *Resolution of the Sixth Plenary Session of the 12th Party Central Committee on the protection, care and improvement of people's health in the new situation.*

[24] MOH. 816/QĐ-BYT dated 16 March 2012 on the plan for development of health human resources for the period 2012–2020. Viet Nam.

[25] Decision 2348/QD-TTg dated 5 December 2016 approved the *Master Plan on Building and Developing of LHC Network in the New Situation.*

[26] In 2017, the proportion of CHS nationwide served by a medical doctor reached 88.0% from 78.5% in 2014.

[27] Decision No. 3680/QD-BYT dated 02 October 2009 on approval the Overall plan for development of HMU until 2020 and with a vision to 2030; and Decision No. 2670/QD-BYT dated 27 July 2009 on approval the Overall plan for development of HCMCUMP until 2020 and with a vision to 2030.

encompasses the construction of undergraduate teaching, administrative, and service infrastructure. Each university will recruit and train additional academic staff to ensure undergraduate teaching is put into operation by phase one civil works completion. Subsequent phases incorporate the development of graduate and post-graduate training facilities, research centers, teaching hospitals, and centers for medical technology development.

36. The overall Project covers both HMU and HCMCUMP and includes 3 outputs, as defined below.

37. **Output 1: Undergraduate education facilities in new HMU and HCMCUMP campuses operationalized.** The project will support phase one of the HMU and HCMCUMP campus master plans, operationalizing undergraduate teaching at each new campus. Output 1 will prepare, for each campus (i) DED of phase one infrastructure, incorporating gender specific, universal design features, and complying with international emission and urban climate change resilience standards; (ii) site preparation and construction of phase one facilities; and (iii) supply of classroom, laboratory, and clinical teaching equipment. At project completion, HMU and HCMCUMP's combined annual intake of undergraduate students will increase by 2,200 (over 50% female), contributing 1,863 additional health professionals to the workforce annually by 2032.

38. **Output 2: Competency of graduates to respond to community health needs strengthened**. The project will implement an innovative model of academe-LHC facility engagement to facilitate 'bottom-up' reforms to health professional training programs and provide students with experience of systems-based practice in disadvantaged settings (footnote 18). Output 2 will (i) conduct community-based diagnostic assessments of the health needs of women and men and the determinants of health inequality; (ii) update curriculum for four key degree programs, with a focus on competencies for work in LHC;[28] (iii) rotate seven hundred students under a pilot model of practice placements at CHS servicing poor and vulnerable populations; (iv) equip 35 CHS in pilot sites;[29] and (v) strengthen capacity of female and male faculty members to apply modern teaching approaches.

39. **Output 3: Quality of health workforce in disadvantaged communities enhanced.** The project will pilot the delivery of distance CME to existing health workforce in remote areas using mobile technologies. Output 3 will (i) equip health facilities in four remote districts to support the CME pilot; (ii) develop 40 CME modules covering primary health care topics including modules specific to the health needs of women;[30] (iii) pilot the distance delivery of CME for health workforce in four districts and evaluate the efficacy of the approach; and (iv) apply evidence from the pilot to inform replication by HPETIs and registered CME providers.

[28] HMU will review curriculum for the undergraduate medical program. HCMCUMP will review curriculum for the undergraduate public health, traditional medicine and pharmacy degree programs.

[29] The pilot model serves to strengthen health service delivery to poor and vulnerable populations while providing students with experience of systems-based practice in disadvantaged settings.

[30] For example, sexual and reproductive health and rights, including maternal health, family planning, STIs and HIV/AIDS, and gender-based violence.

40. **Coverage of the IEE.** This IEE covers the HCMCUMP Phase 1 component only. The HMU component is covered in an IEE under separate cover. SHHRDP is classified as a Category B Project according to ADB SPS 2009 environmental categories as activities under Output 1 have the potential to cause negative environmental impacts. The other two outputs are expected to have minimal to no impact to the environment thus not discussed in this IEE. This IEE was prepared for the HCMCUMP Phase 1 component accounting for pre-construction, construction and operational phases, using the information available from previous studies, further collection of information (especially considering the history of the development on-site, natural conditions and biological data) and site visits.

B. PROJECT LOCATION

41. The Main Project is located in the area assigned for the University Village in Long Tan and Phuoc Thien communes, Nhơn Trach District, Dong Nai Province. Nhơn Trach District is planning the construction of a new urban area, including housing, commercial and cultural centers, a university village, ecotourism destinations, an industrial park according to the needs of the population living in the vicinity of the area. The area of Nhơn Trach New Urban Master Plan is one of the economic, cultural, scientific and technical centers of Dong Nai province; supporting the education, training, health, trade and other services for Ho Chi Minh City Region.

42. HCMCUMP Phase 1 has a need for permanent land use. HCMCUMP Phase 1, with area of 10 ha allocated for teaching facilities and other buildings of the campus, will be developed inside these 320 ha of the University Village, as indicated in Figure 1 and Figure 2. Access to the University Village will be ensured by the Provincial Government. An Access road to the area will be built before the campus is completed. It is not included in the Project scope and does not classify as an associated facility. Nhơn Trach DPC shall do the land compensation and HCMCUMP must pay compensation costs.

43. The site is at about 3 km from Long Thanh – Dau Giay (LT-DG) Expressway, 8 km from Nhơn Trach DPC Office, 20 km from the future Long Thanh International Airport, 20 km from HCM City Center, 16 km from Saigon High-tech Park and 27 km from Tan Son Nhat Airport; 25 km from Bien Hoa City. Dong Nai Port is at 16 km, Cat Lai Port is at 12 km and Phu My port is about 24 km away (Figure 3).

44. Urban zone 3-1, which includes the University Village, is located in the North of Nhơn Trach District, adjacent to Long Thanh – Dau Giay (LT-DG) expressway and belongs to Long Tan, Phu Hoi and Phuoc Thien communes. The terrain is flat and low-lying, divided by dense creeks (natural canals) with elevation of <1m. This area includes mostly paddy fields and some Nypa palms along creek system. This area has currently no access roads.

45. The Project area is shown as a reference on the figures below, and has the following borders:

- North boundary: Nuoc Trong river; LT-DG expressway, Long Thanh District
- South boundary: Dong Mon river;
- East boundary: future residential area; Road 319
- West Boundary: future ecotourism area.

46. The Project location is considered as suitable according to environmental safeguards.

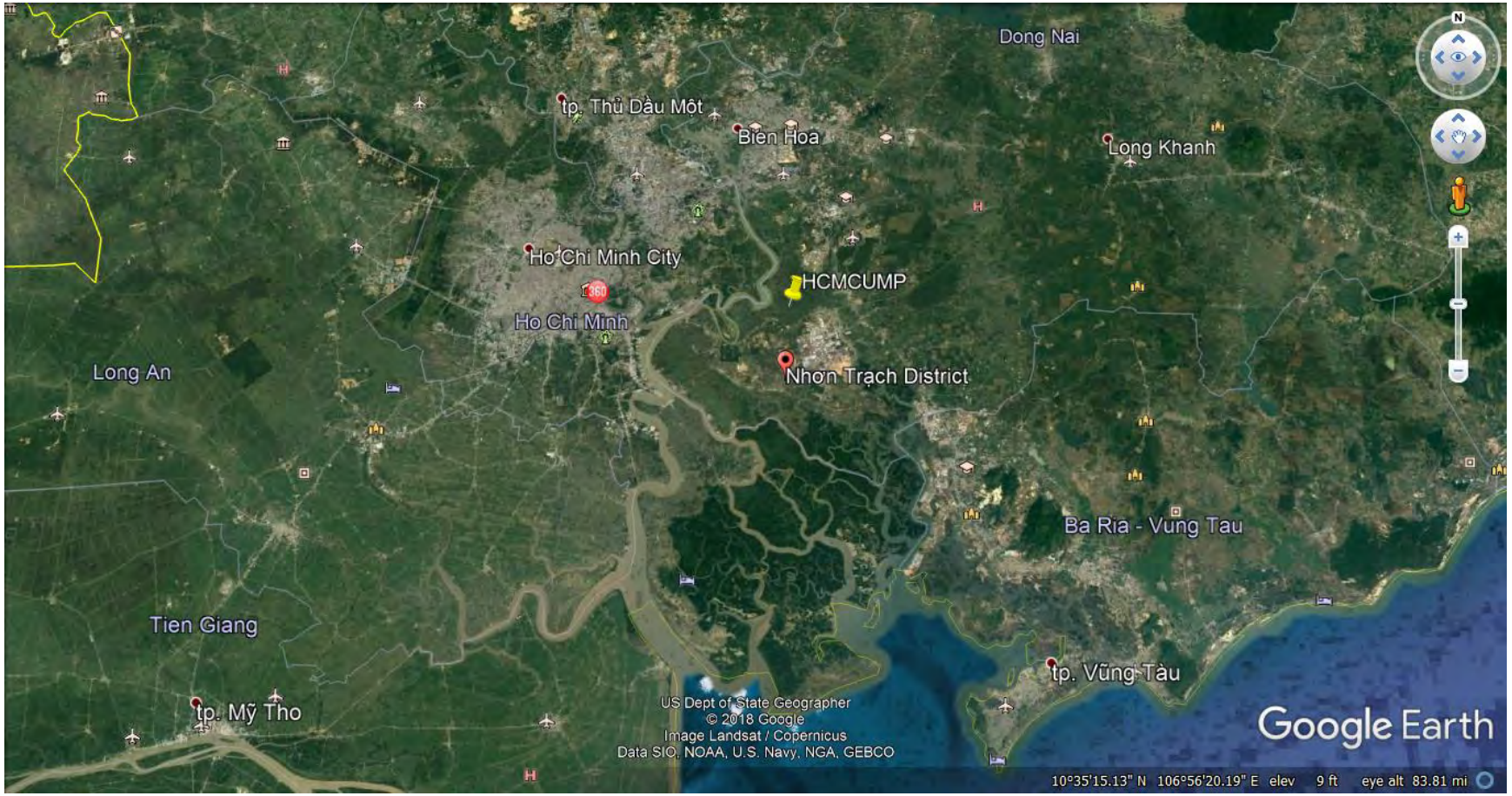


Figure 1: Location of the Project in Ho Chi Minh City Region

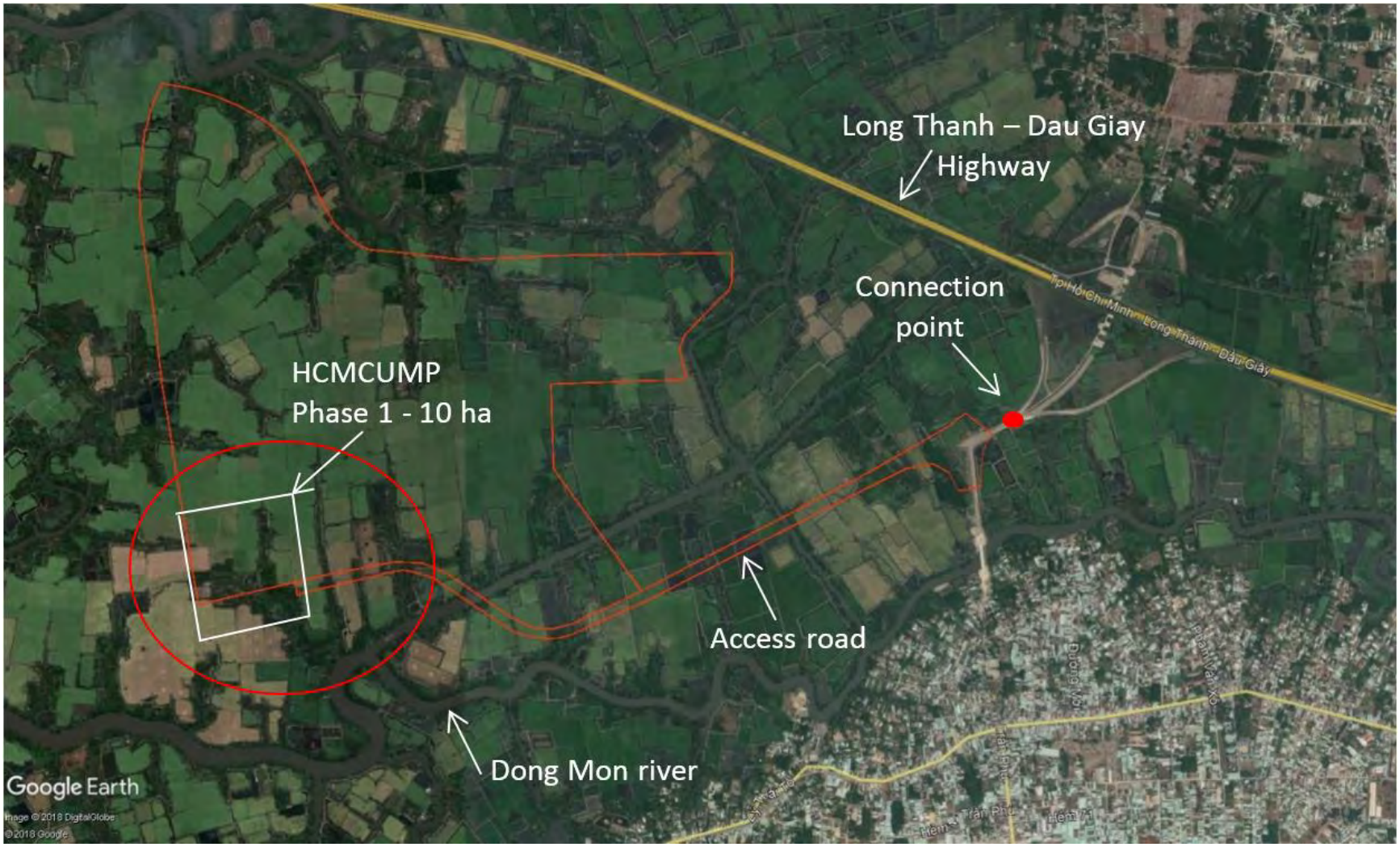


Figure 2: Area of influence of the Project

Figure 3: Distance from the Project site to the main centers

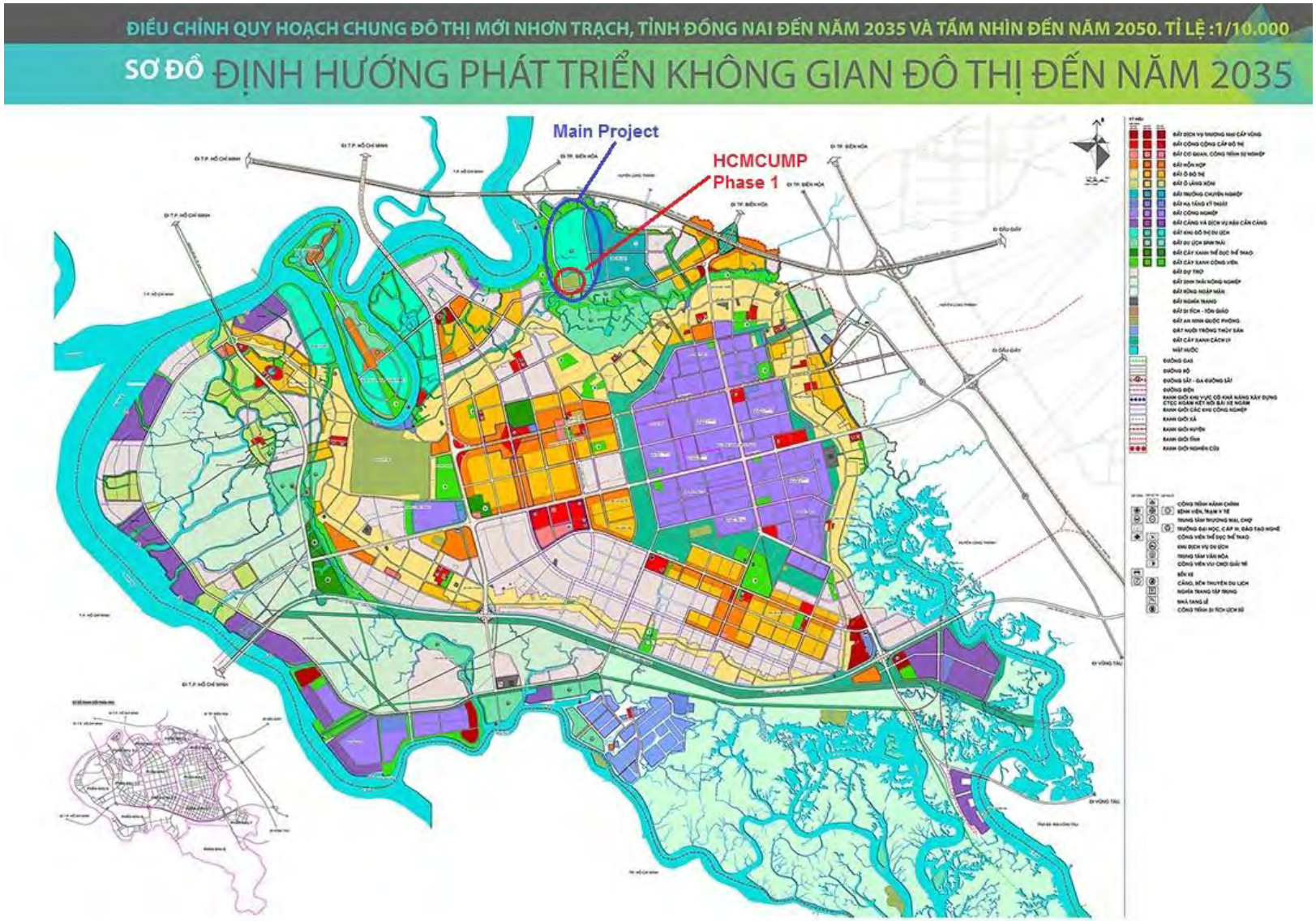


Figure 4: Nhơn Trach New Urban Master Plan

Figure 5: The important public facilities around proposed site for new campus of HCMCUMP

C. PROJECT AREA OF INFLUENCE

47. The area of direct influence of HCMCUMP Phase 1 includes approximately the Project area (10 ha) and a buffer zone, as shown in Figure 6. Some impacts may also occur further away from this area of direct influence (e.g., the impact of increased traffic during construction and operation on local roads, the pressure of incoming workers and students of basic urban services (water supply, wastewater, solid waste), and possible impacts on surrounding physical cultural resources (PCR)[31] and settlements.

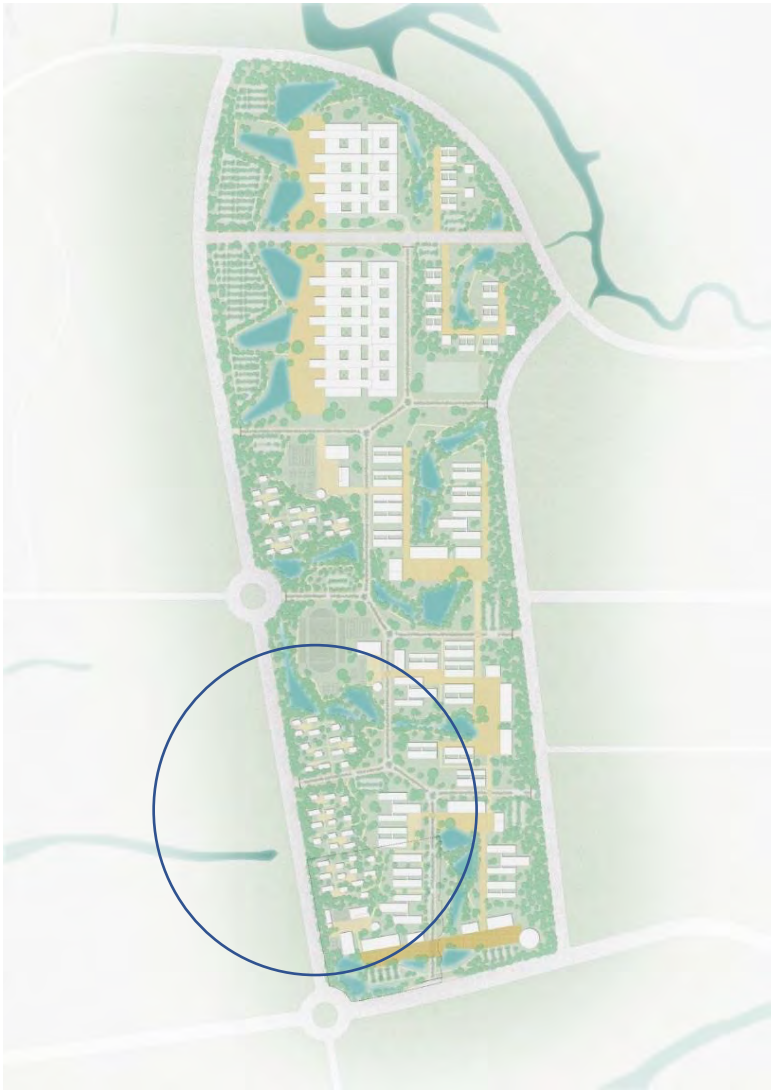


Figure 6: Area of influence of the Project

[31] Physical Cultural Resources are movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings and may be above or below ground or under water. Their cultural interest may be at the local, provincial, national, or international level. (ADB SPS 2009).

D. CONTENT OF THE PROJECT

48. The project will finance Phase 1 on the 2nd campus of HCMCUMP. Phase 1 is located within the zones of Dormitory and Staff Service Apartment Area; and Administration, Library, Auditoria, Lecture Area of the General Master Plan of the HCMCUMP Campus (Figure 7).

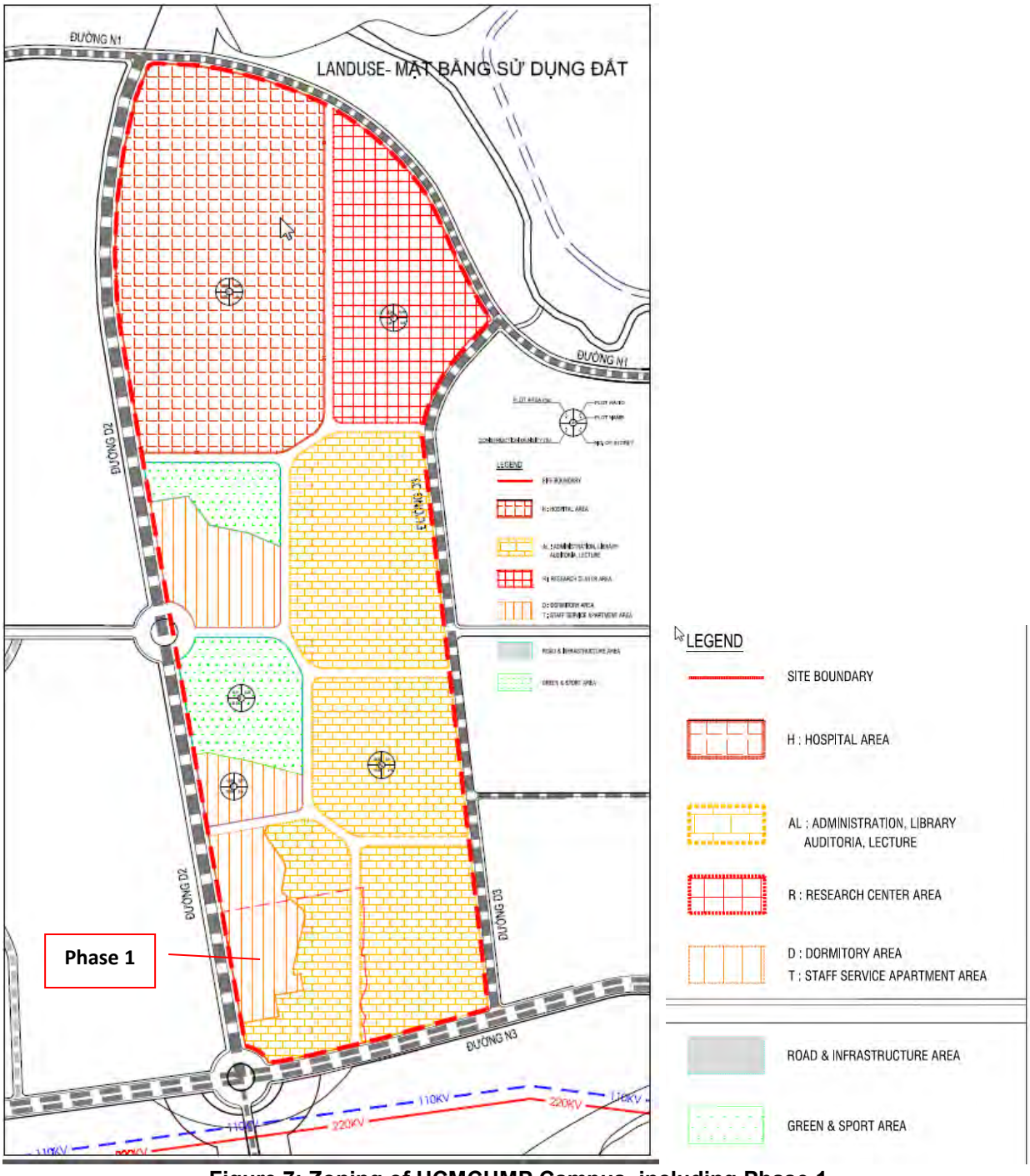


Figure 7: Zoning of HCMCUMP Campus, including Phase 1

49. Phase 1 will include construction of 16 buildings, including 1 main administrative building, 1 auditoria building, 1 canteen, 1 medical center, 6 lecture/laboratory buildings, 4 dormitory buildings, 1 staff residence and 1 sports administration building. Additional facilities include outdoor sports areas, recreational green space (30% of the total area will be green space), a car parking area, and internal roads (2km). The access roads south and west of phase 1 development will be constructed by the provincial government and are not included in the scope of this project. Key facilities to be supported under the project are presented in Figure 8 and Figure 9, listed in Table 1, and discussed in more details below.

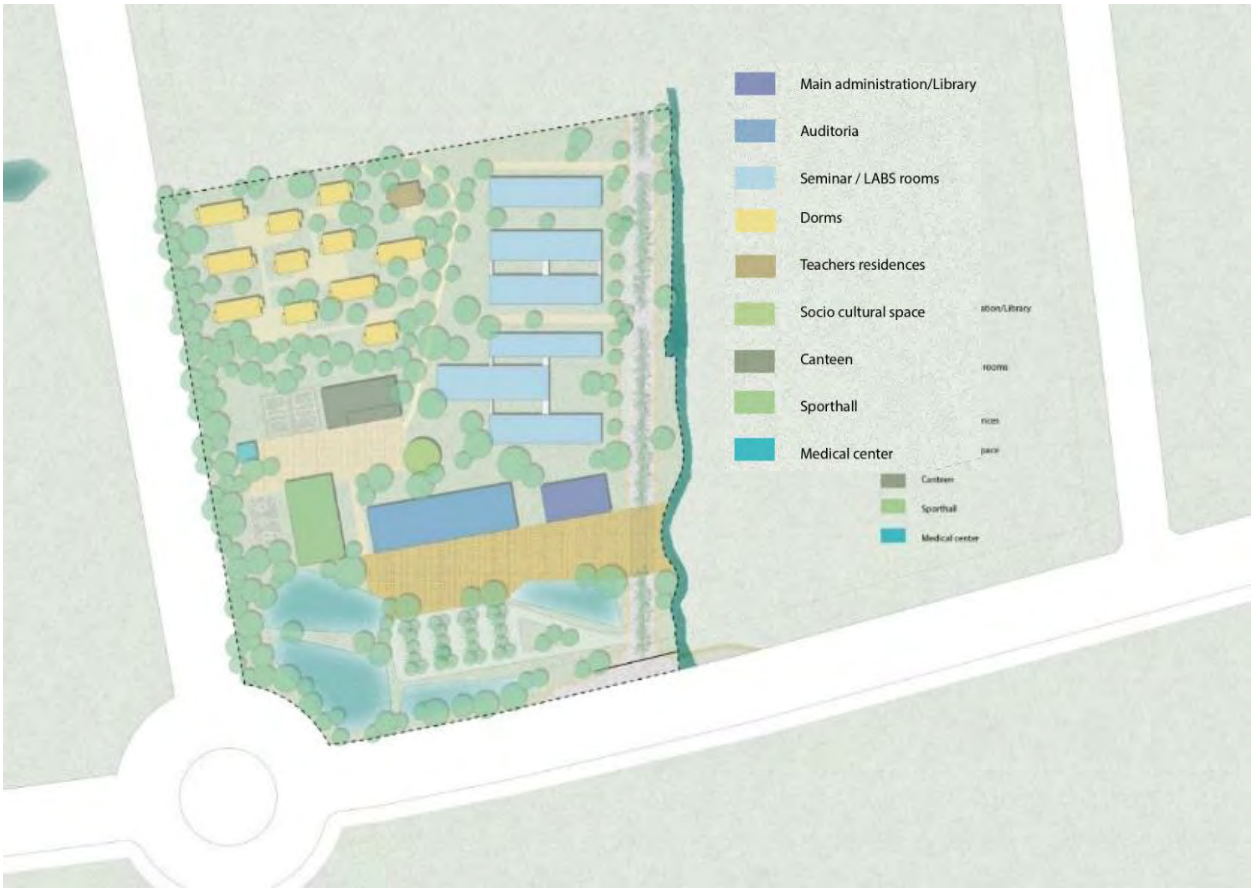


Figure 8: HCMCUMP Phase 1 Development

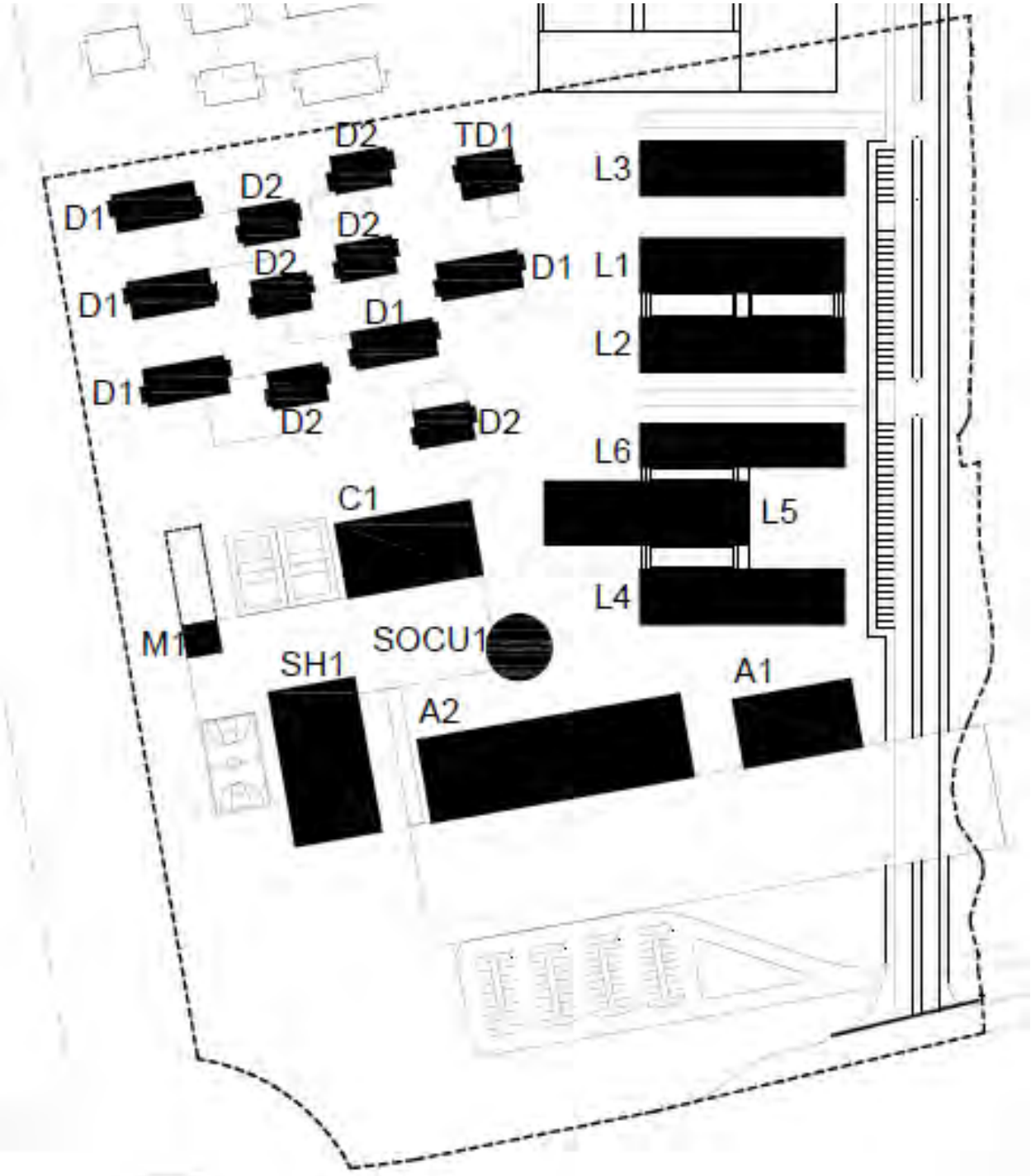


Figure 9: Key facilities (including code) to be financed under HCMCUMP Phase 1 (Note that only 4 dormitories will be built under Phase 1)

Table 1: HCMCUMP Phase 1 Facilities

NO.	Function	Code	Storey	Planning						
				Footprint T1 (m^2)	Floor area F2 (m^2)	Floor area F3 (m^2)	Floor area F4 (m^2)	Floor area F5 (m^2)	Floor area F6 (m^2)	GFA (m^2)
				(1)	(2)	(3)	(4)	(5)	(6)	(1)+(2)+(3)+ (4)+(5)+(6)
I	ADMINISTRATION BUILDING, AUDITORIA & LIBRARY	A		3,108	1,677	864	864	597	-	7,110
	Auditoria	A2	2	2,520	1,117	-	-	-	-	3,637
	Main Administration building +library	A1	5	588	560	864	864	597	-	3,473
II	EDUCATION	L		7,576	7,576	7,576	-	-	-	22,728
	Seminar/Lab rooms	L1-2	3	2,556	2,556	2,556	-	-	-	7,668
	Seminar/Lab rooms	L3	3	1,242	1,242	1,242	-	-	-	3,726
	Seminar/Lab rooms	L4-5-6	3	3,778	3,778	3,778	-	-	-	11,334
III	DORMITORY			1,851	1,885	1,885	1,885	1,290	1,290	10,086
	Student Dormitories	D1	6	422	430	430	430	430	430	2,572
	Student Dormitories	D1	6	422	430	430	430	430	430	2,572
	Student Dormitories	D1	6	422	430	430	430	430	430	2,572
	Student Dormitories	D2	4	281	291	291	291		-	1,154
	Staff Residence	DT	4	304	304	304	304		-	1,216
IV	SPORT			1,467	241	-	-	-	-	1,708
	Sports Hall	SH1	1	1,467	241	-	-	-	-	1,708
V	MEDICAL CENTRE			133	133	133	-	-	-	399
	Medical Centre	M1	3	133	133	133	-	-	-	399
V	SOCIAL CULTURE			415	-	-	-	-	-	415
	Social culture	SOCU1	1	415	-	-	-	-	-	415
VII	CANTEEN			1,154	1,154	-	-	-	-	2,308
	Canteen	C1	2	1,154	1,154	0	-	-	-	2,308
TOTAL GFA										44,754

50. **Main administrative building (A1).** This building is the main building of the first phase. It hosts a generous entrance lobby at ground floor level including students secretariat, a space for meeting on the first floor and four levels dedicated to the general administration of the whole campus. The building is shaped in the lower part with some diagonal cuts in order to establish a dialogue with the form of the auditorium buildings; at the same time, it allows a better connection with the surroundings. In the upper part the building gets a square footprint that sticks out form the rest of the auditorium buildings, showing its presence as a landmark. The ground floor is conceived as an open lobby that can host some exhibition space and other activities with a direct connection with the first floor through a generous void. The first floor hosts different meeting spaces, with a big board room facing the educative square. From the 3rd until the 5th levels the administrative center is organized around a central atrium. The office space is divided in landscape office and close office space with some shared facilities as coffee corners, printer rooms and others. The total GFA of the building is 3,473 m^2.

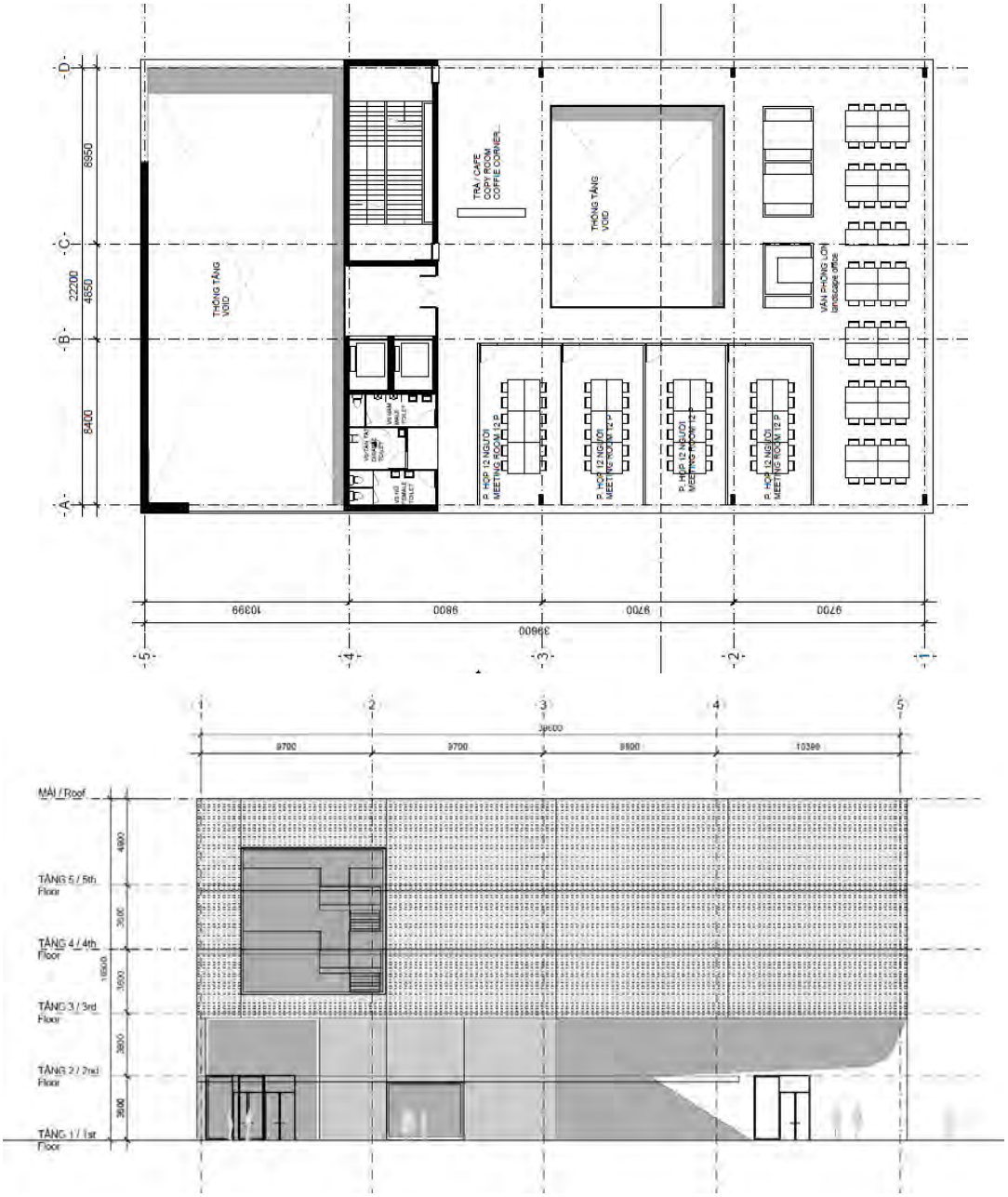


Figure 10: Main administrative building

51. **Auditoria (A2).** This 2-storey building hosts four auditoria, including two big auditoria for 600 students and 2 smaller ones for a capacity of 250 students. On ground floor level entrances provide gathering space for the students before and after the lessons. This enlarged circulation space is mainly glazed and gives a good relation to the surrounding public space. Internally the auditoria are connected from the 1st floor and from the 2nd floor. The façade is perforated to filter in the light and give additional architectural expression to it. The roof of the building is green, whereas it is very visible from the surrounding higher buildings. The total GFA of the building is 3.637m^2.

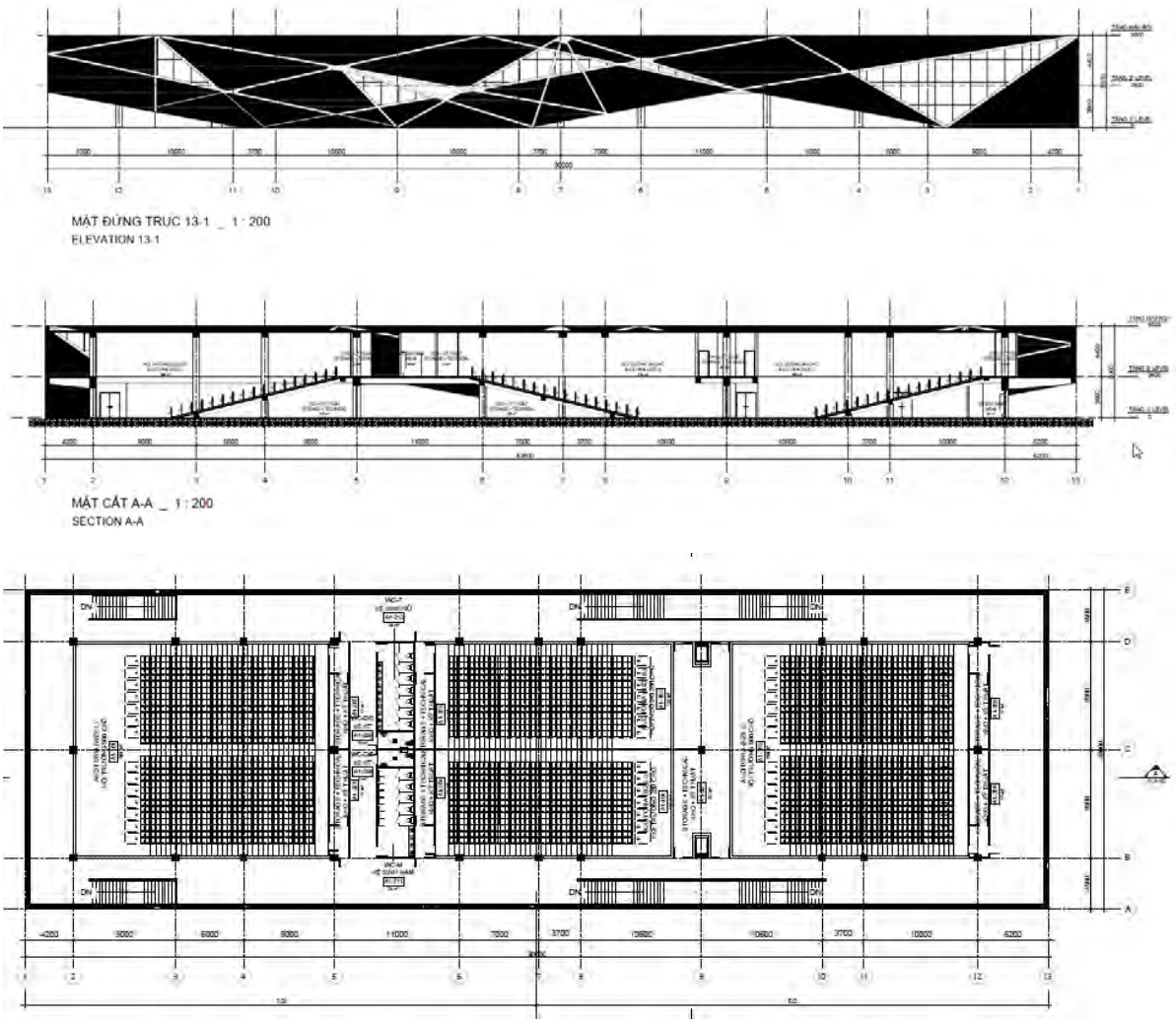


Figure 11: Auditoria building

53. **Canteen (C1).** The canteen is a large low rise two-storey building with dining tables provided on both floors. Adjacent to the inner spaces is an outside space for eating outside under a covered canopy. The canteen is oriented on one side towards a nice green area, nearby a parking space and to the sport facilities to the other side. Catering facilities with storage room and sanitary facilities are foreseen. The total GFA of the building is 2,308 m^2.

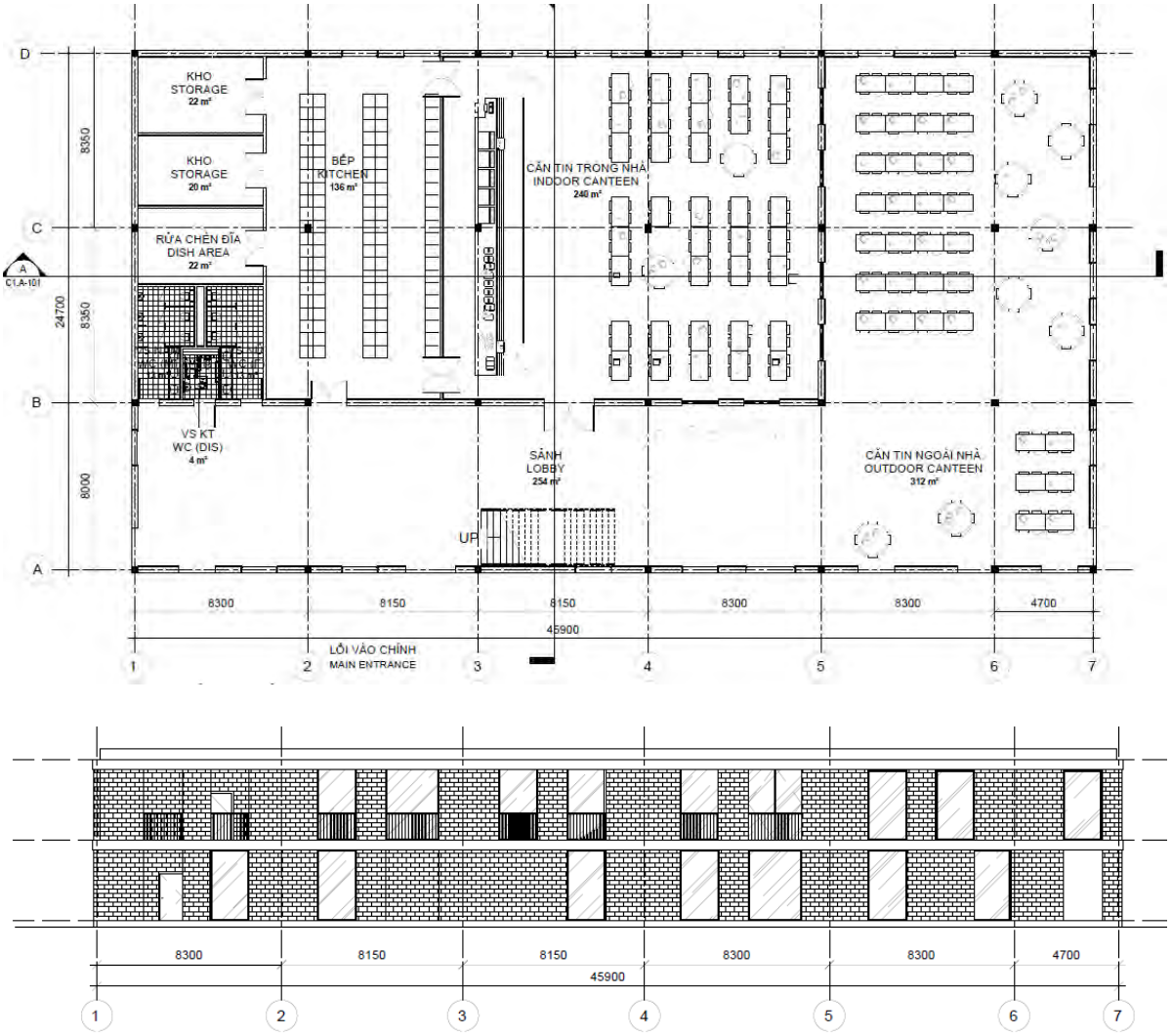


Figure 12: Canteen building

55. **Sport hall (SH1).** The sports hall contains two sports fields, a basketball field and an mini-football field. A central storage room is foreseen between both. Changing rooms for girls and boys, a supervisor room, a back office and sanitary is provided. The total GFA of the building is 1,708m^2.

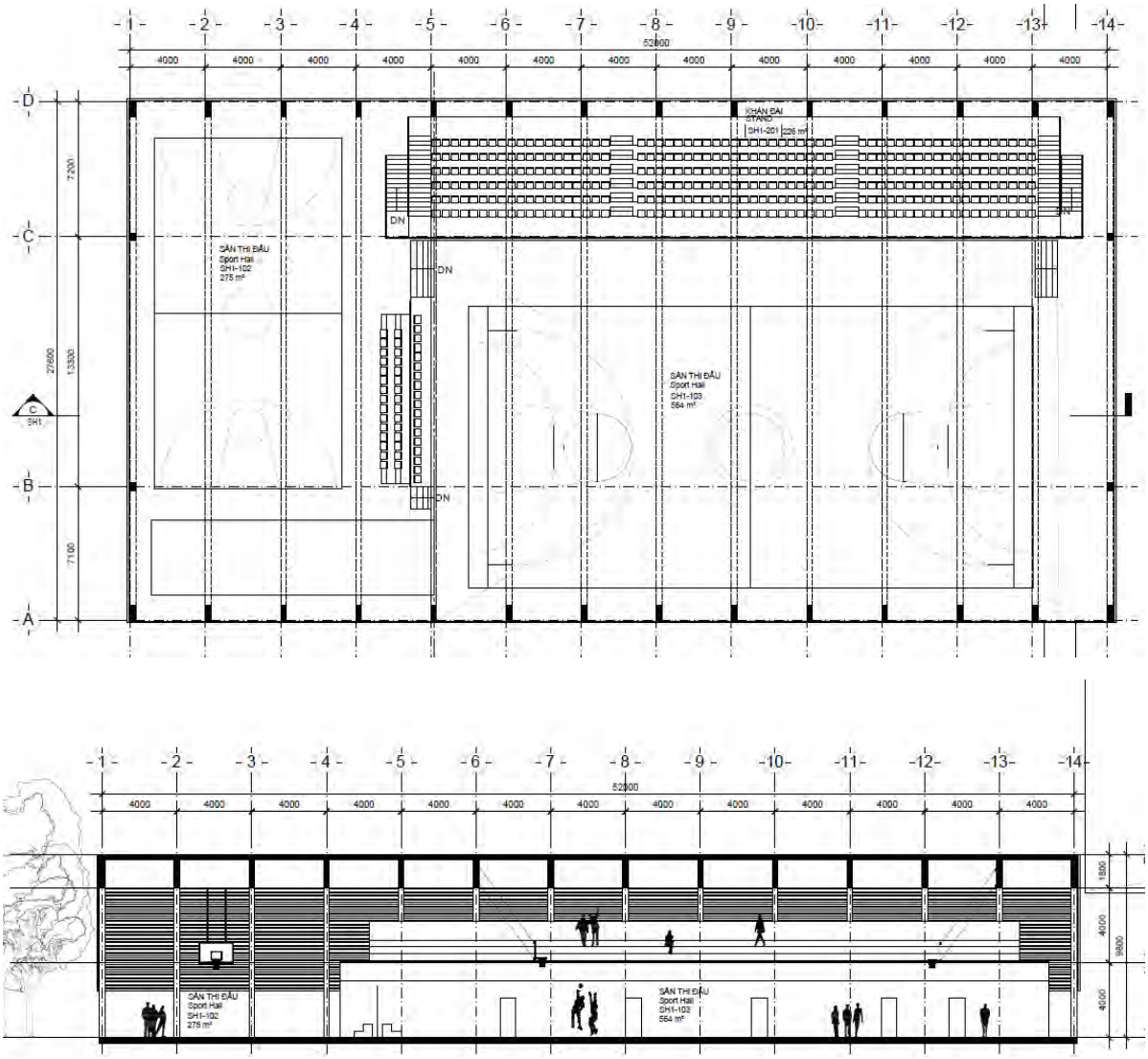


Figure 13: Sports Hall

56. **Socio-cultural room (SOC1).** This small building is designed for hosting cultural activities. In the first phase, only one portion on the ground floor will be built and in the next phase it will grow in height and footprint. The space in the first phase is divided into a big room that can be divided in two by a flexible wall. An exterior covered space is provided including toilets. The total GFA of the building is 415m^2.

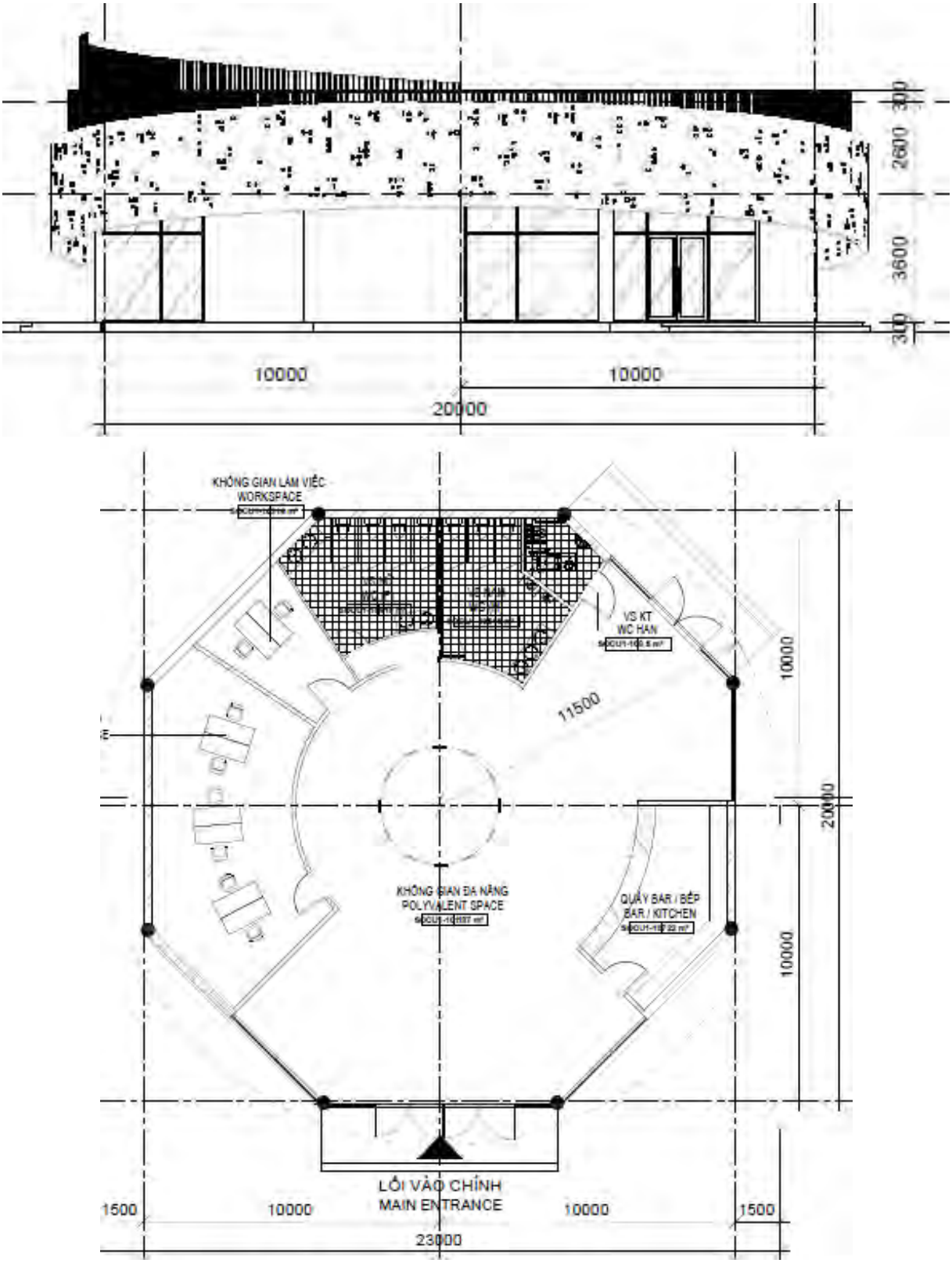


Figure 14: Socio-cultural room

57. **Medical Centre (M1).** This is a small building hosting basic medical services for the campus. It is designed as a modular building that can be extended in future phases. In the first phase only two modules will be realized with a footprint of 133 m^2. A reception and a staff room are located on the ground floor. In the first and second level the medical rooms are located, being accessible by two exterior corridors. One corridor is dedicated for the public while the other is more private for private communications for doctors and nurses. The façade is designed with bamboo sticks making a very clear prism. The total GFA of the building is 399m^2.

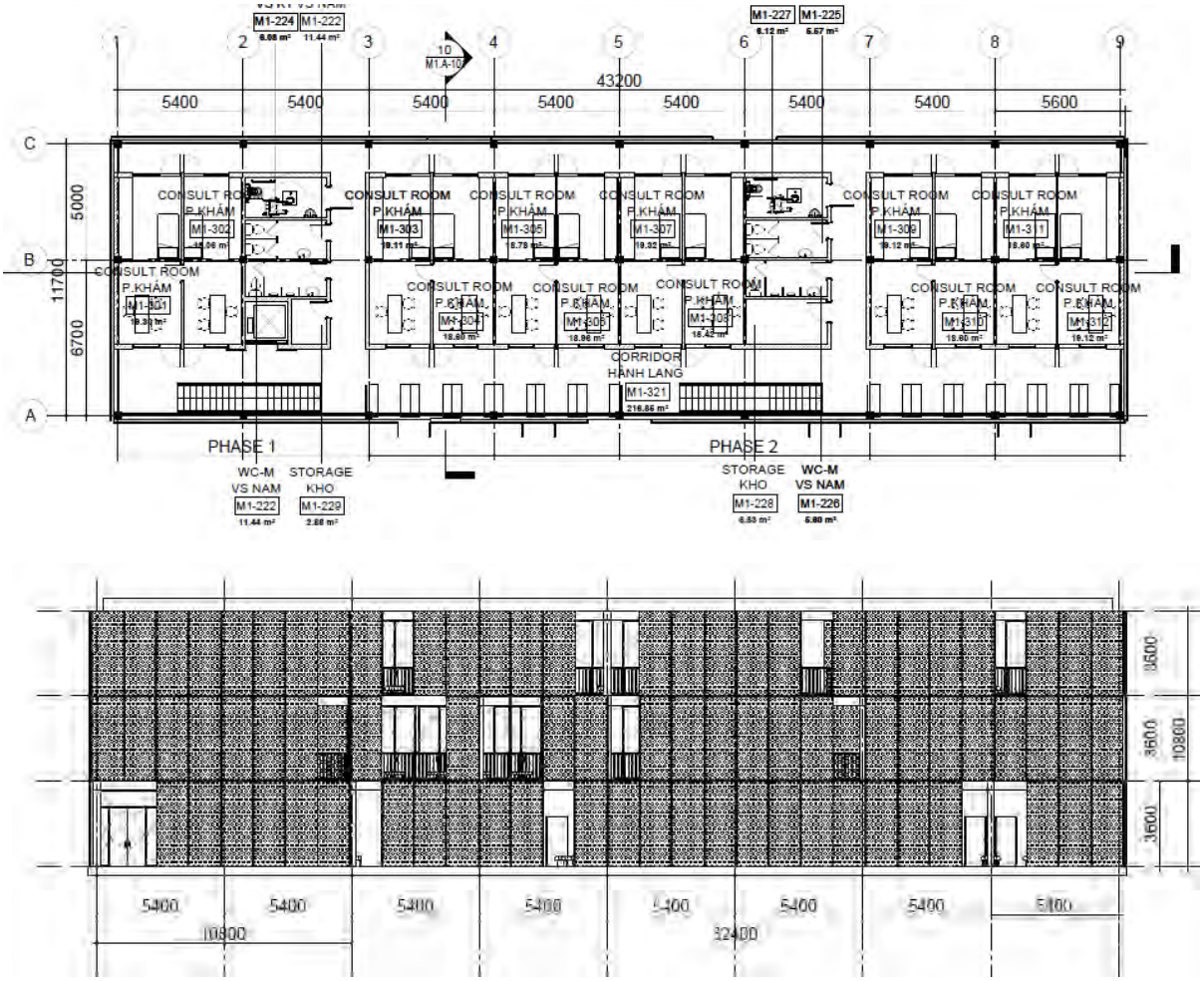


Figure 15: Medical Center

58. **Lecture/Laboratory Buildings (L1, L2, L4, L5, L6).** The project will finance 5 lecture/laboratory buildings. These are described in more details below. A typical layout is presented in **Error! Reference source not found.** (typical lecture floor) and **Error! Reference source not found.** (typical laboratory/practice floor).

a. ***L1: Anatomy/dissection/seminar rooms.*** This Building has 3 levels with the front office, the larger seminar room and the oxford laboratory on the ground floor. Dissection rooms and skill labs on the other floors. The circulation is exterior and covered connecting all the different rooms, and L2. The sanitary cell is accessible from the hallways. Without separating them strictly architecturally, four zones can be outlined. As well as an administrative zone, there is a zone for anatomical and morphological skills on the one hand and one for communications and manual skills on the other. The self-study zone is located centrally. The total GFA the building is 3,834 m²

b. ***L2: Microbiology / microscopy.*** L2 is connected to L1 (see above). The building hosts rooms for microscopy and microbiology. On the ground floor they share the office spaces and a seminar room as well as the sanitary and storage areas. Each floor also contains a large seminar room. The practical microbiology laboratory area is used for practical training and lectures prior to practice sessions. It can be used to provide practical training for up to 48 students. The practical microscopy facilities consist of two rooms, i.e. the microscope room and a storage room. The total GFA of the building is 3,834 m².

c. ***L4: Nursing / Skill Labs.*** This building contains nursing training and some seminar rooms for theoretical teachings. A skill lab, easier accessible for all students are located on the ground floor. Before some lab sessions, students are taught collectively. Each floor also contains a large seminar room. The total GFA of the building is 4,707 m².

d. ***L5: Physics/chemistry/pharmacy/traditional medicine.*** The building has 3 levels, with offices and seminar rooms on the ground level and labs on the 2nd and 3rd level. Each floor also contains a large seminar room. As the practical training for physics and chemistry are similar, training facilities are located in the same building. The building will comprise 3 laboratories for 3 different sizes of groups. Training laboratories will cover: qualitative analysis; quantitative analysis; pharmacology; bromatology; instrumental analysis; microbiology; practical chemistry; chemistry; pharmaceutical chemistry; toxicology. Each practice facility consists of a main laboratory, plus one or more smaller rooms for instruments, balances and/or PCs, if required. The total GFA the building is 3,984m².

e. ***L6: Physiology/biochemistry/pharmacology.*** The building will host 2 biochemistry labs on the ground floor, a physiology training lab on the 2nd floor, and a pharmacology lab on the 3rd floor. Each floor also contains a large seminar room. All labs are connected by a covered exterior circulation that can be used as a balcony. The entrance faces the more private “garden” area. The total GFA of the building is 2,643 m².

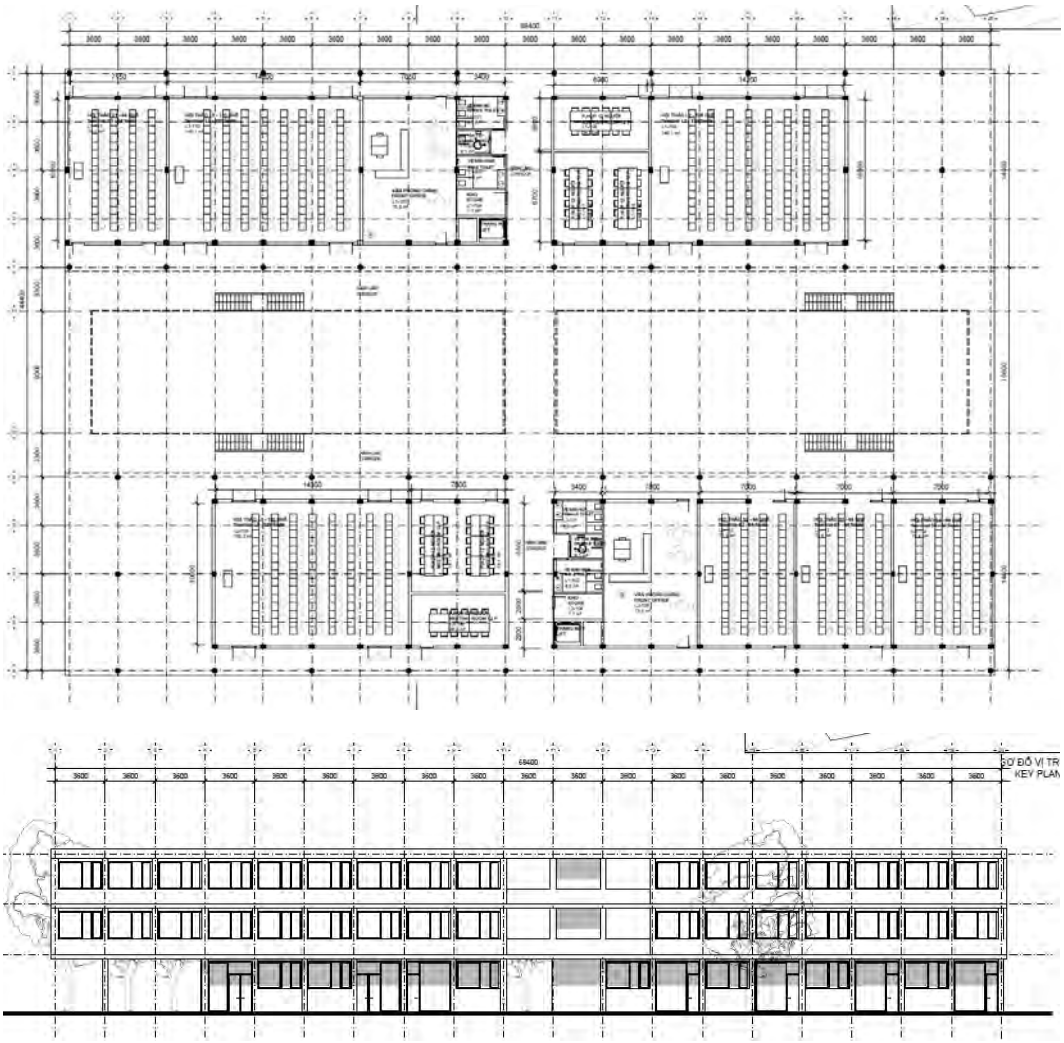


Figure 16: Lecture/Laboratory Building, Typical lecture floor

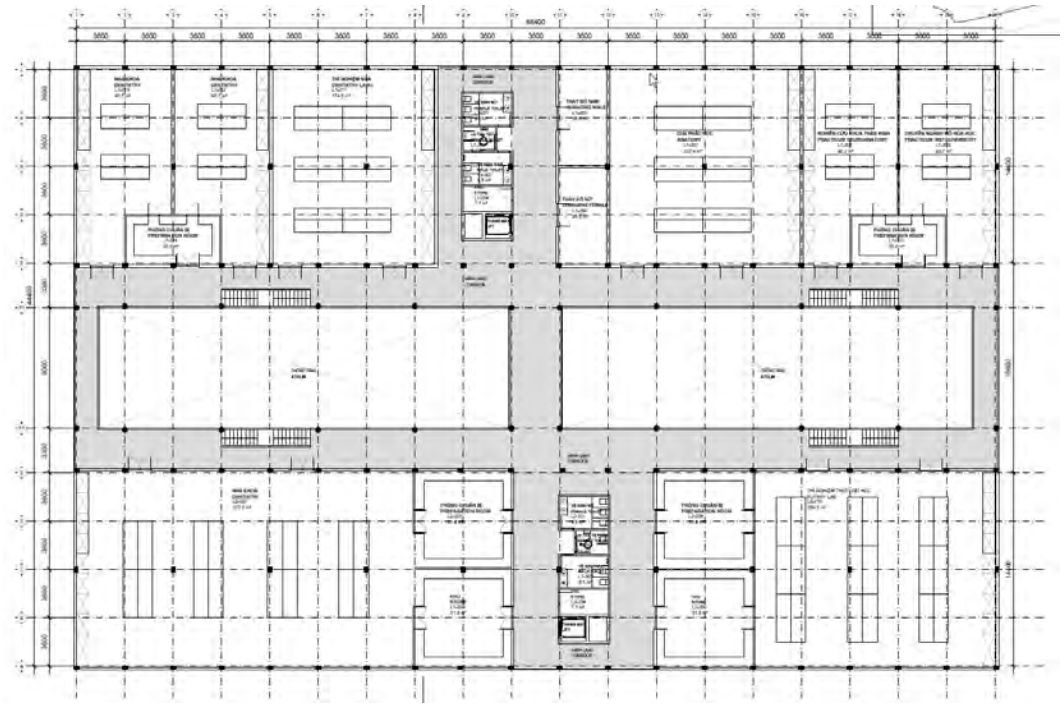


Figure 17: Lecture/Laboratory Building, Typical laboratory/practice floor

59. **Dormitories (D1, D2).** This set of buildings provides dormitory rooms for 3 students each. Each room has his own sanitary equipment with shower and toilets. On the ground floor level, a communal leisure area is provided for the students to gather together. The size of the rooms is 4.45 x 6.30 = 28m^2. The different types of buildings have different sizes and heights. The total GFA of the D1 building is 2.572m^2, D2 is 1,154 m^2. Under Phase 1, four dormitory buildings will be built, including 3 type D1, and 1 type D2.

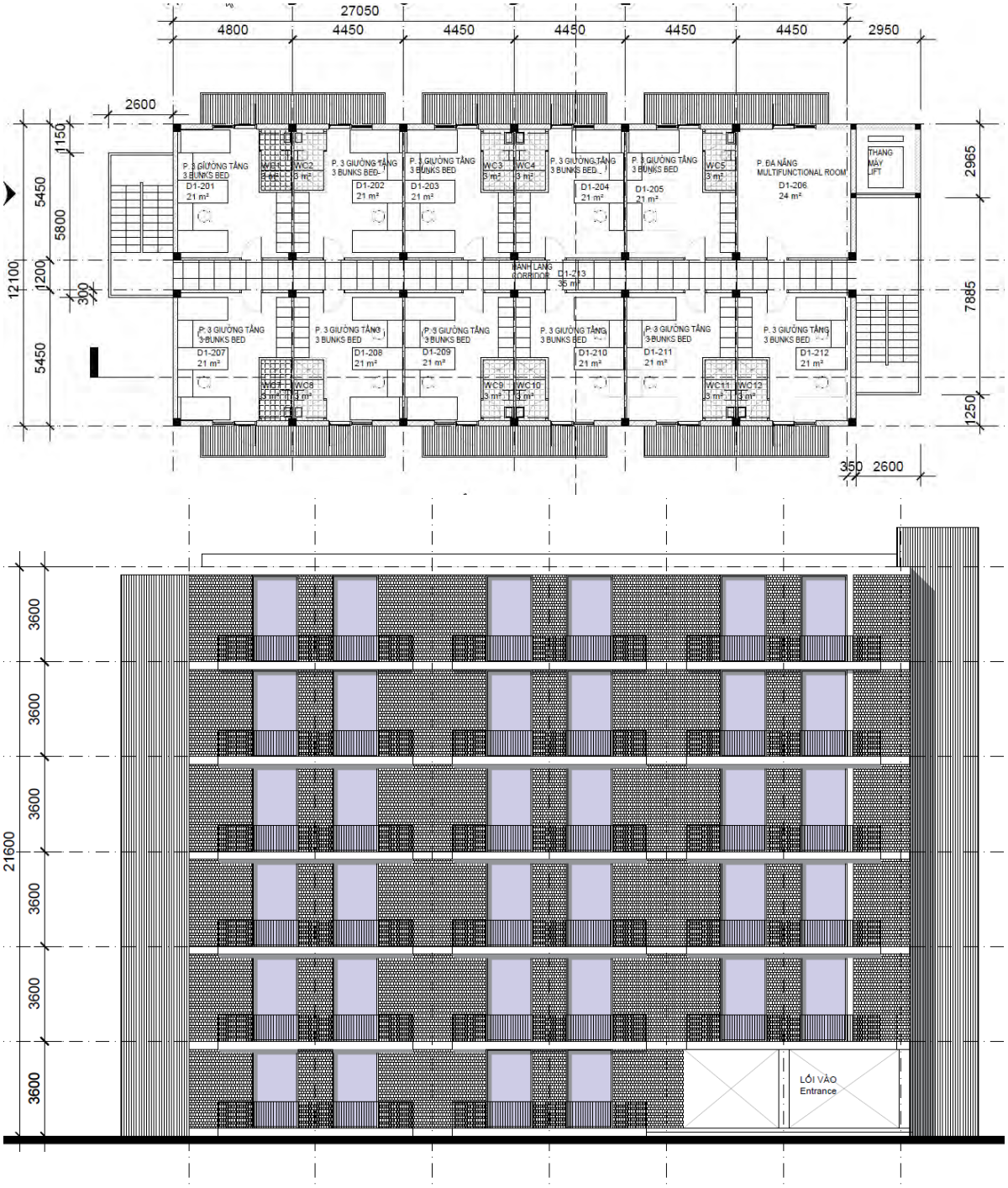


Figure 18: Typical Dormitory Building

61. **Staff residences building (DT).** A 4 stores building with 4 units per floor, and one ground floor level 3 units and a communal space. The rooms have a small kitchenette and a bath room and have double beds. The total amount of rooms for staff is 15. The total GFA of the building is 1.216m^2.

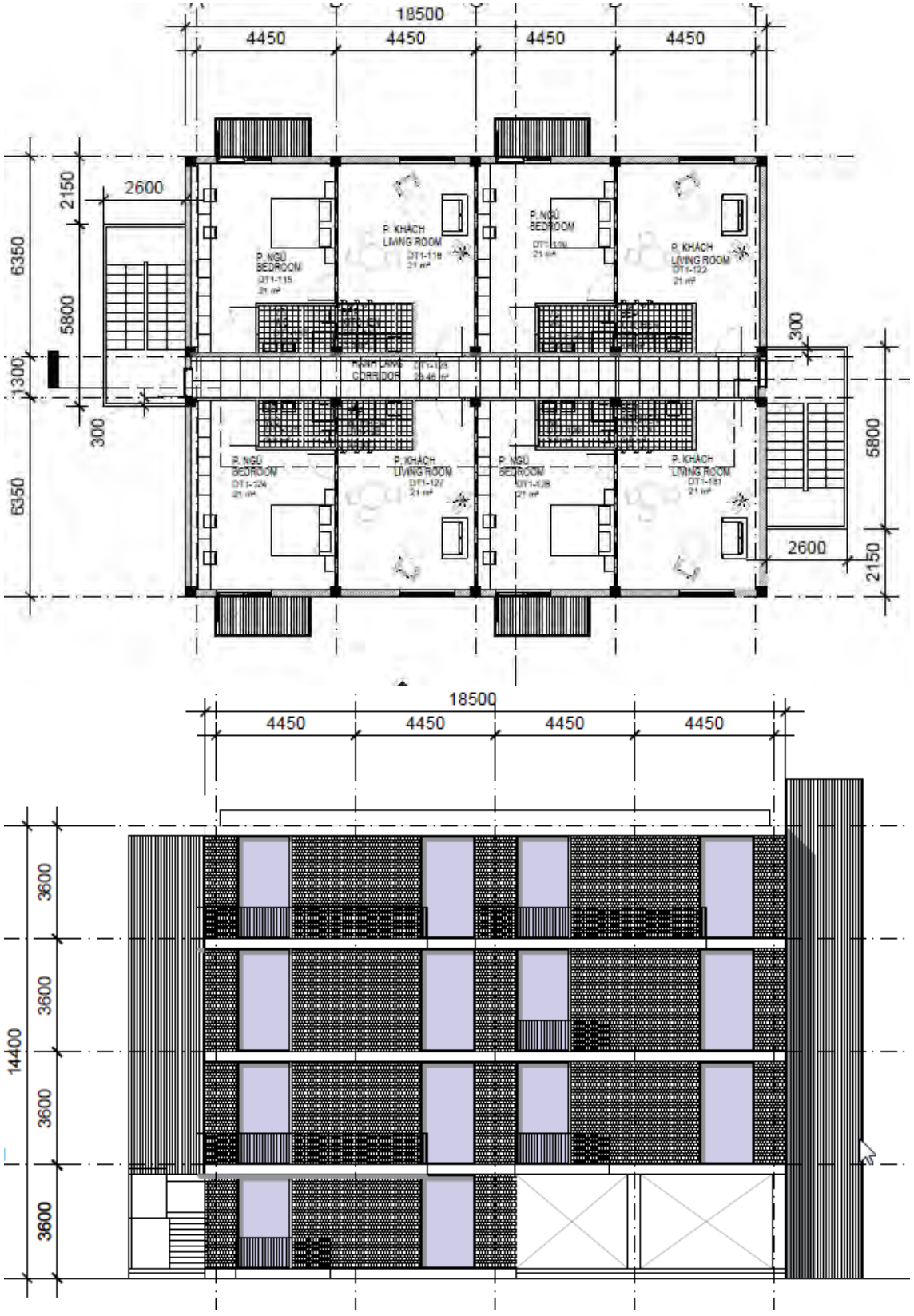


Figure 19: Staff Residences

62. **Power supply.** The report on "Adjustment of general planning for building Nhơn Trach new urban center up to 2030 with a vision to 2050"[32] indicates that power will be supplied from the national electricity grid through underground power supply works to transformer substations to be incorporated inside HCMCUMP Phase 1, and there will be electricity supply from backup generators in case this provision fails.

63. Power supply works for Nhơn Trach New Urban Master Plan includes:

- Long Thanh 220/110 KV station (2x250MVA);
- Nhơn Trach 220kV station (2x250MVA) (new)
- Nhơn Trach IP 220kV station (2x250MVA) (new);
- Nhơn Trach Thermal Power Center of 1,200MW;
- Combined gas turbine power plant of 1,500MW (new).

64. Energy-saving solutions are applied in combination with the smart use of natural lighting. Natural lighting is promoted in the design of the buildings. Detailed power supply equipment will be defined during the Technical Design Stage after the Feasibility Study.

65. **Water supply.** At present, there is no piped water supply system at the project area. Water required for construction and operation of the campus will be supplied through the municipal water supply system, which will be extended to the project area when the road is being constructed. Materials used will comply with latest standards (i.e. HDPE pipes). Source of water supply will be from Nhơn Trach Water Plant in Tan Bien - Bien Hoa using surface water of Dong Nai River. Phase 1 of the plant has the capacity of 100,000 m^3/day. Treated water will be brought to the pressure station in Nhơn Trach District with a capacity of 70,000m^3/day for Nhơn Trach New Urban Master Plan area. By 2020, Nhơn Trach water plant will increase its capacity to 200,000m^3/day. The demand for water in the operation phase is calculated based on the expected number of students at 6,050 people and employees at 200 people. According to the Water Drainage Plan of Nhơn Trach District to 2020 (Decision N2957 of Dong Nai PPC, 29 Octber 2009), at 2020 the daily average water consumption will be 150L/person/day. Phase 1 provides accommodation for 681 (666 students and 15 staff). Assuming that only 10% of students and staff will permanently live on the Campus, and that 90% will commute daily to the Campus using only 30% of water supply norm, the demand for water in the Campus is calculated at 353 m^3/day (Table 2).

66. **Wastewater collection and treatment.** Given the discharge of domestic wastewater accounts for 80% of supplied water, the daily domestic wastewater generated will be about 282 m^3/day (Table 2).

Table 2: Water consumption, wastewater generation in Phase 1

	People	**Water use**		**Wastewater generation**	
	[pax]	[L/d/person]	[L/d]	[L/d]	[m^3/d]
commuting students/staff	5,569	45	250,605	200,484	200.484
resident students/teachers	681	150	102,150	81,720	81.720
Total	6,250	-	352,755	282,204	282.204

67. Appropriate capacity for wastewater collection and treatment will be installed within the campus under HCMCUMP Phase 1. Domestic wastewater will be collected by 3 pipes of system (1 grey water pipe, 1 soil pipe and 1 vent pipe), discharged to septic tank to re-treat, and discharged to central sewage treatment plant (STP) within the site before discharged to

[32] "Adjustment of general planning for building Nhơn Trach new urban center up to 2030 with a vision to 2050" was approved by the Prime Minister in Decision No. 455/QĐ-TTg dated 22 March 2016.

external drain. Medical wastewater (from anatomy/dissection/Lab) will be collected separately and re-treated before discharged to the central STP. Trade waste drainage system (grease wastewater for all kitchen and food preparation areas, including location of traps clear of air intakes to the building) will be collected and re-treated by grease interceptor and discharged to the central STP.

68. The technical process flow chart of the central STP is indicated in Figure 20, while the location of the wastewater treatment plant is shown in Figure 21. The quality of wastewater after treatment at STP will meet class A as per QCVN 14:2008/BTNMT and will be discharged into a closed ditch system (H10 centrifugal concrete pipes), then released into external drainage channels, meeting the requirements of environmental protection. Wastewater treatment will be detailed during the Detailed Engineering Design (DED) Stage, and after the Feasibility Study.

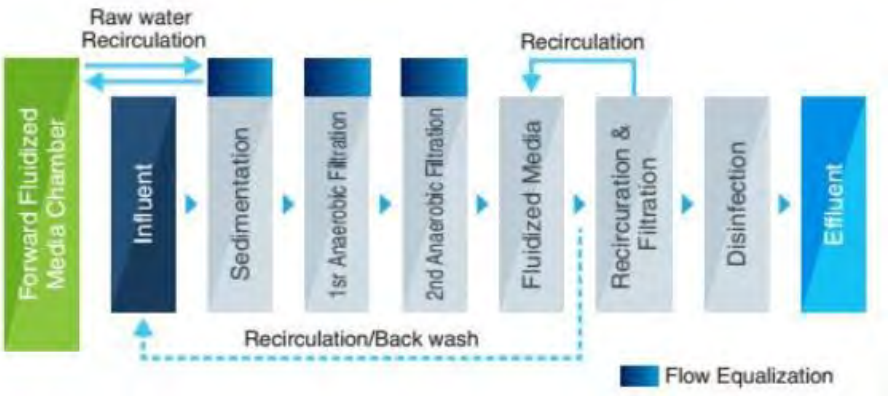


Figure 20: Technical Process Flow Chart of the Central Sewage Treatment Plant (STP)

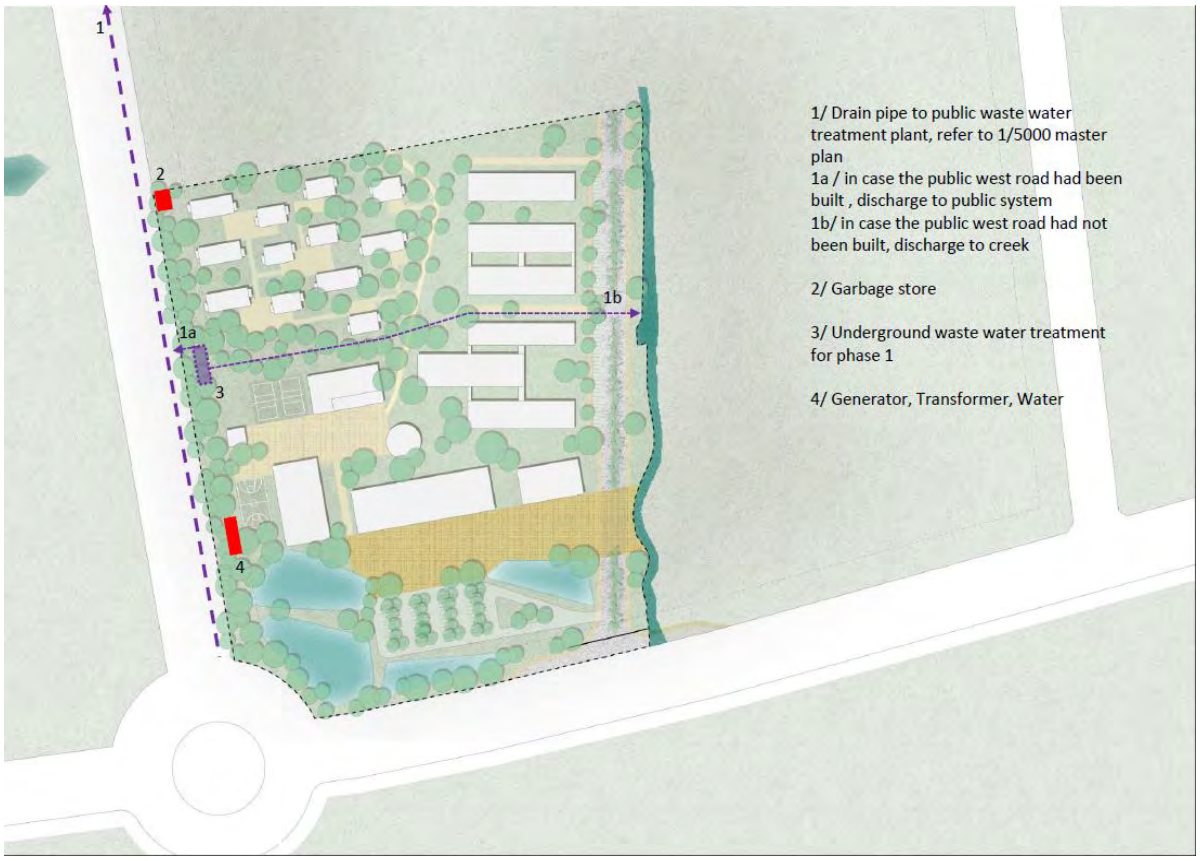


Figure 21: Location of Wastewater Treatment Plant and Waste Storage Area within the Project Site

69. **Construction equipment and material supply.** Equipment and material for construction works including basic construction material for reinforced concrete works, elevators, air conditioners, telecommunications, generators, water pumps, fire protection, outdoor power and water supply and waste water treatment will be required. Basic construction materials can be sourced from licensed quarries in the area. The nearest licensed quarry is indicated in the map below. Teaching and training equipment will meet high technical requirements in line with the function and scope of investment. The project will require establishment of one construction camp, which will be established within the boundary of the Project site.

Figure 22: Quarry close to HCMCUMP Phase 1 development

E. PROJECT IMPLEMENTATION SCHEDULE

70. The expected Project duration is 6 years from 2019 to 2024 including 3 years and 4 months of construction period (para.6). Detailed Engineering Design (DED) will be prepared in 2020, and construction works are expected to begin in August 2021. Construction works are expected to be completed by December 2024. The implementation schedule of the Project is presented in Figure 23.

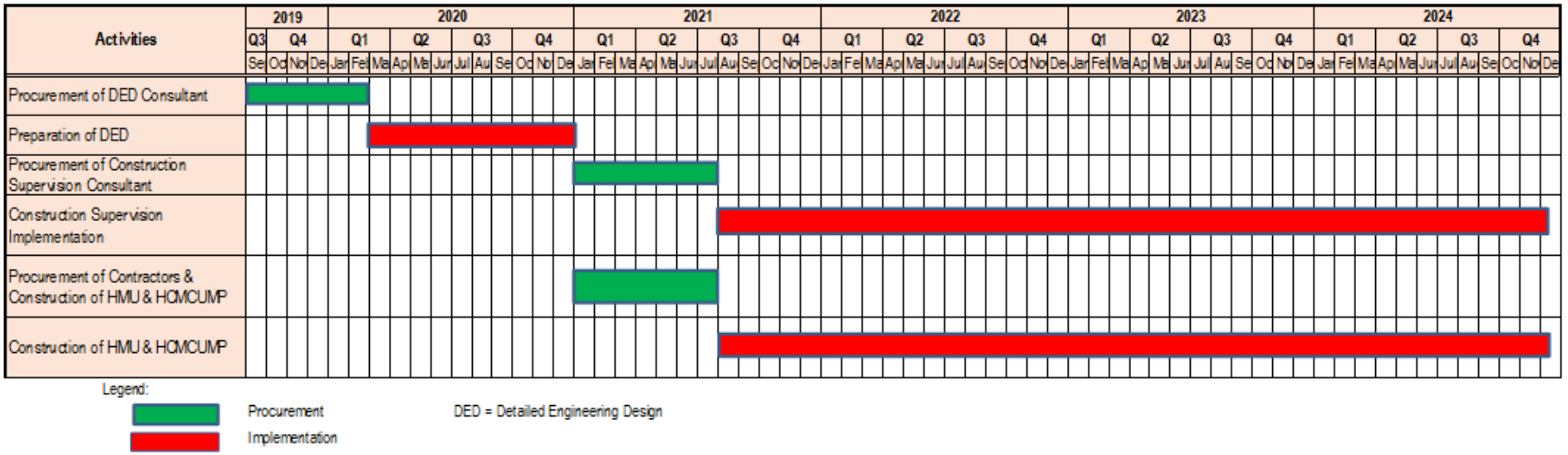


Figure 23: Civil works implementation plan

IV. Description of the Environment

A. ABIOTIC SITE DESCRIPTION

1. Topography and Geology

71. The estuarine region of the Dong Nai – Saigon River is a flat area composed of plains with a system of river branches, estuaries and watercourses. The topography of the project district is relatively low and flat, with the main slope decreasing from the North (Long Tan, Phuoc Thien communes: average height of 1.0 m above sea level - ASL) to the Southeast (Vinh An commune: average height is 0.2 – 0.4m ASL).

72. In the project communes, the area of agricultural land is relatively large with large parts consisting of alluvial soils with potential presence of acid sulfate soil at deep level; top soil of the upper part is organic matter with relatively large amount of poor gravel clay. In general, the topography and soils of the project area are suitable for growing rice, fruit trees, vegetable crops; but because soft soil is dominant in the project area (literature shows that the lowland area along Dong Mon River has a soft soil base with a compressive strength of <0.5 kg/cm^2), soft soil must be considered in design and construction of heavy facilities as urban and transport infrastructures.

2. Hydrology

73. The HCMCUMP Phase 1 area is surrounded by Vam Kinh, Dong Mon and Nuoc Trong Rivers, and some other creeks (natural canals) which are tributaries of Dong Nai River, but there are no man-made irrigation canals present (Figure 24). Dong Nai River is the second largest river in the Southern Vietnam and the third in the country, with a length of 220 km.

Figure 24: Location of rivers nearby the Project area (in red color square)

74. The main source of water in Nhơn Trach District is Dong Nai River and its tributaries. Dong Nai River has abundant water, because the river basin is located in the South-West monsoon winds and is influenced by the North-East monsoon, so the rainfall can be up to 2,300mm/year. The rainy season lasts 6-7 months in the year from April to October. The annual flow of water on the Dong Nai River is about 22 billion m^3. The average flow of the

Dong Nai River is 40.6 l/s-km^2, which is larger than the average flow of rivers across the country.

75. Dong Nai River has a simple flow regime, and there are usually two peaks during the rainy season. In the hydrological year there is only one flood season and one successive dry season. Also due to the regulating effect of nature, the intensity of flood in Dong Nai River is not high: flood water volume is about 68% of the total water volume of the year.

76. The flooding time of the Dong Nai River begins late as compared to the rainy season. Some places have flood seasons occurring in the months of July-October, usually floods occur later than the rainy season by about 2-4 months, flood peak usually occurs in 8-9 months and this is also the months of most concentrated rain. According to Dong Nai's history, Dong Nai River has few floods and most of them are small ones. The thermal flow of Dong Nai River system is quite high, with an average of 37,907,106 kcal/s. The average annual water temperature of Dong Nai River is 27.5 ^oC.

77. The Project area is about 2.0 km away from the main stream of Dong Nai River. Dong Mon is a larger river connecting the creeks in the project commune to the main stream of Dong Nai River. Flow of the creeks in the project area is influenced by the tide of Dong Nai River. At high tide, water flows from Dong Nai River to Dong Mon River and the creeks. When the tide is low, the water flows in opposite direction, i.e. from the natural watercourses to Dong Mon River and back to Dong Nai River. The highest tide level of Dong Nai River at the project commune is 1.58 m, and the lowest is - 2.48 m.

78. In recent years, the water quality of Dong Nai River declined dramatically. According to the report of the Office of Dong Nai River Commission, river water exceeds the standards up to four times for TSS, NH_3, and COD. The river water in the surrounding cities and industrial zones only meets the levels of water quality for irrigation purposes and waterway transport (column B, QCVN 8-MT: 2015/BTNMT).

3. Climate

79. Because TSN Station - HCM City is the nearest National Meteorological Station to the Project Site, data on meteorology of this Station may be used in this IEE and other documents of the Project. From the continuous 5 years (2012 - 2016) data (Table 3, Table 4, Table 5, Table 6, Table 7, Table 8) the main characteristics of climate at the region are summarized below.

a) Rain Regime

80. Characteristics of rainfall (monthly average) from 2012 to 2016 is shown in Table 3.

Table 3: Rainfall at Tan Son Nhat (TSN) Meteorological Station in 2012 to 2016

Year	Month / Feature	1	2	3	4	5	6	7	8	9	10	11	12	Total Annual
2012	Total (mm)	18.0	68.7	36.4	144.4	72.2	270.6	200.4	113.4	407.9	434.4	91.1	25.4	1,882.9
	Max (mm)	16.6	46.7	23.8	73.0	15.9	83.4	33.8	45.9	60.3	88.5	35.8	14.7	88.5
	In day	17	17	21	1	6	1	3	23	1	1	2	27	
	No. of raining days	4	3	4	12	16	23	22	16	28	18	12	4	162
2013	Total (mm)	38.1	0.1	10.1	18.3	196.8	173.3	175.8	260.7	411.2	407.4	257.4	31.3	1,980.5
	Max (mm)	35.4	0.1	7.8	7.0	37.5	37.9	26.8	46.2	64.7	68.1	71.5	25.5	71.5
	In day	9	14	24	11	23	29	29	6	10	11	24	20	
	No. of raining	4	1	4	12	22	18	22	23	21	23	12	5	167

Year	Month / Feature	1	2	3	4	5	6	7	8	9	10	11	12	Total Annual
	days													
2014	Total (mm)	2.5	22.1	0.0	111.5	179.7	258.0	234.2	353.4	342.1	306.5	182.2	50.0	2,042.2
	Max (mm)	2.5	22.1	0.0	49.5	64.5	54.3	66.3	67.2	59.7	49.7	44.3	24.7	67.2
	In day	13	21	-	7	2	1	5	15	25	23	3	8	
	No. of raining days	1	1	0	9	14	19	24	20	19	20	12	7	146
2015	Total (mm)	1.6	0.0	10.2	104.4	104.9	143.1	246.4	126.9	504.4	339.3	174.8	4.6	1,760.6
	Max (mm)	1.3	0.0	8.3	44.4	37.9	25.7	85.3	56.0	119.3	148.3	78.4	4.0	148.3
	In day	5	-	26	13	15	21	30	15	15	23	2	22	
	No. of raining days	2	0	2	4	11	17	23	16	20	17	16	2	130
2016	Total (mm)	29.3	0.0	0.0	0.0	162.1	195.9	191.4	427.1	500.4	491.7	181.2	128.6	2,307.7
	Max (mm)	25.2	0.0	0.0	0.0	69.3	37.7	42.0	150.0	171.0	68.9	43.0	54.0	171.0
	In day	3	-	-	27	30	20	14	26	26	3	30	9	
	No. of raining days	2	0	0	0	12	23	18	24	21	25	12	12	149

Source: MoNRE, 2017

81. According to Table 3, the Project site is located in the area with high average rainfall. The average annual rainfall in TSN is 1,926mm. Rainy season (from May to November) has a total rainfall of 1,820mm (accounting for 94% of annual rainfall). The highest rainfall (>280mm/month) is from June to October. Dry season (from December to April of the following year) has a total rainfall of 106mm (accounting to 6% of annual rainfall). February has the smallest rainfall (4mm). The maximum level of rainfall in one day at TSN is shown in Table 4.

Table 4: The maximum daily rainfall (mm)

Features	**Month**												Year
	1	2	3	4	5	6	7	8	9	10	11	12	
Average (mm)	69	38	103	89	155	137	150	177	179	135	131	77	179

Source: MoNRE, 2017

b) Sun Regime

82. At TSN Station, the average number of sunshine hours for many years is 2,645 hours. March has the sunniest hours (300 hours, an average of 9.7 hours/day). September has the least hours of sunshine (173 hours, an average of 5.8 hours per day). The record in 2017 is shown in Table 5).

Table 5: Total of yearly and monthly average sunny hours

Feature	Month												Year
	1	2	3	4	5	6	7	8	9	10	11	12	
Average	245	246	272	239	195	171	180	172	162	182	200	223	2,489

Source: MoNRE, 2017

c) Air Humidity

83. At TSN Station, the average annual humidity ranged between 63-75% (Table 6). Relative humidity in the rainy season (May - November) is higher than humidity in the dry months (December - April). On some days of March and April, the lowest relative humidity is only about 30-40%, combined with high temperatures, causing very dry, hot and unpleasant weather and affecting human health.

Table 6: Features of relative humidity of month, year at TSN station from 2012 –2016

Month / Year/Features		1	2	3	4	5	6	7	8	9	10	11	12	Year
2012	Ave.	68	70	68	74	74	78	78	75	82	76	74	67	73
	Min	34	40	40	39	52	50	48	49	53	51	45	39	34
	date	24	16	3	26	9	4	1	13	16	7	20	28	-
2013	Ave	68	60	68	69	75	79	80	80	82	81	76	72	74
	Min	32	28	35	34	41	51	53	49	46	48	40	44	28
	date	16	18	4	14	6	26	11	20	1	24	3	2	-
2014	Ave.	65	68	66	71	72	79	80	79	80	80	76	72	74
	Min	33	33	33	42	42	49	50	46	48	49	43	44	33
	Date	22	28	12	18	13	5	11	10	18	14	14	26	-
2015	Ave.	70	68	67	69	70	74	76	75	77	76	72	67	72
	Min	38	35	34	35	39	44	45	48	47	38	39	33	33
	Date	16	2	25	8	18	8	26	19	7	31	20	27	-
2016	Ave.	65	62	67	67	70	78	76	79	76	83	77	78	73
	Min	36	32	33	36	44	44	47	49	47	54	40	48	32
	Date	1	20	25	20	14	30	5	31	24	28	14	17	-

Source: MoNRE, 2017

d) Atmospheric Temperature

84. Average monthly air temperature from 2012 to 2016 is shown in Table 7.

Table 7: Average monthly air temperature from 2012 to 2016

Month / Year/ Features		1	2	3	4	5	6	7	8	9	10	11	12	Year
2012	Ave.	27.6	28.2	29.5	29.3	29.3	28.8	28.3	29.1	27.5	28.2	28.8	29.1	28.6
	Max	35.0	35.0	36.5	36.0	37.0	35.5	35.5	35.8	35.0	35.5	35.5	34.5	37.0
	Date	29	17	12	30	8	8	4	9	5	27	23	2	
	Min	20.7	22.5	22.6	22.9	23.5	23.5	23.2	23.2	23.5	23.5	22.8	20.2	20.2
	Date	17	6	30	19	30	16	13	23	23	30	12	12	
2013	Ave.	27.3	29.1	29.3	30.4	29.8	29.0	28.1	28.3	27.6	27.8	28.1	26.6	28.5
	Max	34.5	37.5	36.5	39.0	37.9	36.7	36.5	35.8	35.8	34.8	35.0	33.6	39.0
	Date	13	16	25	6	14	11	11	19	2	24	12	13	
	Min	21.5	23.9	24.1	25.5	25.0	23.9	23.4	23.9	23.9	23.8	24.0	20.0	20.0
	Date	17	13	6	23	15	1	29	12	7	9	25	29	
2014	Ave.	26.0	26.9	29.1	30.2	30.5	28.7	28.0	28.4	28.3	28.1	28.8	27.9	28.4
	Max	34.3	35.1	37.9	37.8	37.4	37.0	35.6	36.0	35.0	35.0	35.4	35.3	37.9
	Date	11	28	16	25	13	8	3	10	18	1	16	26	
	Min	19.5	22.3	24.0	23.9	25.5	23.6	23.8	24.4	23.8	24.0	23.6	23.0	19.5
	Date	23	1	1	7	3	29	22	15	2	24	3	31	
2015	Ave.	26.5	26.8	29.0	29.9	30.7	29.2	29.0	29.0	28.7	28.7	29.1	28.6	28.8
	Max	33.8	34.8	37.5	37.6	38.0	37.1	36.3	36.0	37.0	36.1	36.0	35.2	38.0
	Date	10	27	25	21	21	11	24	19	7	30	18	2	
	Min	19.7	21.1	24.9	24.0	26.0	23.9	23.4	24.5	23.0	23.2	24.2	22.2	19.7
	Date	15	10	11	13	30	14	10	2	8	23	2	18	
2016	Ave.	28.7	28.3	28.8	30.8	30.9	28.9	28.7	28.7	28.4	27.7	28.7	27.4	28.8
	Max	36.2	36.2	37.0	38.5	38.2	37.9	36.6	36.0	36.0	34.4	35.7	34.6	38.5
	Date	20	24	25	20	13	10	14	23	1	27	14	22	
	Min	21.8	18.9	22.6	26.0	24.4	24.5	24.0	23.8	23.2	23.6	24.0	23.0	18.9
	Date	26	8	1	2	30	27	31	11	27	7	1	28	

Source: MoNRE, 2017

85. At TSN station: multi-year average annual temperature is 27.40C, April has the highest average temperature (29.200C), January and December have the lowest average temperature (26.00C). The daily average temperature amplitude is 8.60C. Number of days

with average temperature from 26.0-28.0 ^{o}C varies from 195-215 days per year. The highest absolute temperature is 39.0^{0}C (April) and the absolute lowest is 17.5^{0}C (January and December), maintaining for a short time of day.

e) Evaporation

86. The evaporation at TSN Station is presented in Table 8.

Table 8: Monthly evaporation at TSN Station from 2012 - 2016

Month / Factors / features		1	2	3	4	5	6	7	8	9	10	11	12	Annual
2012	Total	128.1	127.2	156.0	122.7	100.2	94.4	89.4	112.4	65.4	89.3	112.2	141.9	111.6
	Max	5.9	6.1	7.5	5.8	4.8	4.8	4.6	5.5	3.7	4.8	6.0	6.4	7.5
	date	9	29	3	9	2	13	26	13	3	18	29	17	
	Min	2.7	2.2	3.1	2.0	1.7	1.3	1.6	2.1	0.5	0.9	1.5	2.9	0.5
	date	6	17	21	1	7	9	1	24	28	1	15	7	
2013	Total	116.3	153.1	136.1	126.8	97.1	85.9	82.0	84.8	72.2	73.0	90.4	92.7	100.9
	Max	5.6	7.5	5.6	5.9	4.1	4.6	4.5	4.7	4.0	3.4	4.9	4.7	7.5
	date	18	4	1	14	6	27	14	21	2	29	3	1	
	Min	1.8	3.8	3.0	2.0	1.7	0.8	1.4	0.8	0.8	1.1	1.0	1.4	0.8
	date	7	7	25	23	10	17	22	12	14	3	7	20	
2014	Total	122.3	118.2	159.7	120.0	108.9	72.8	77.3	81.3	72.6	75.6	107.1	110.0	102.2
	Max	5.7	6.0	7.2	5.4	5.5	4.1	4.9	4.4	3.4	3.8	5.5	4.8	7.2
	date	22	27	16	24	6	9	11	10	3	18	18	17	
	Min	2.3	2.9	3.8	1.5	2.0	1.2	1.0	1.6	1.8	1.4	1.6	2.4	1.0
	date	2	2	2	30	25	30	31	20	5	2	4	8	
2015	Total	111.2	122.8	161.3	142.0	140.4	95.5	90.9	95.1	82.0	89.5	108.1	142.1	115.1
	Max	4.6	5.1	7.3	6.5	5.9	4.4	4.1	4.1	4.4	5.1	5.2	6.7	7.3
	date	2	5	25	9	14	8	24	4	7	31	20	24	
	Min	2.4	3.4	4.0	3.0	2.9	1.3	1.3	1.4	0.8	1.3	1.8	2.2	0.8
	date	5	25	4	13	31	21	19	25	16	15	5	21	
2016	Total	146.9	148.3	156.0	158.2	131.2	86.6	92.3	86.6	77.1	64.2	105.6	79.7	111.1
	Max	6.1	6.6	7.1	7.2	5.8	4.6	4.4	3.9	3.9	4.0	5.4	4.2	7.2
	date	21	19	30	20	2	10	9	15	3	27	14	29	
	Min	3.5	3.9	3.7	4.4	2.1	1.1	1.5	1.6	1.2	0.9	1.0	0.5	0.5
	date	3	13	10	11	18	24	28	2	12	8	6	13	

Source: MoNRE, 2017

87. The table above shows that in the dry season (December - April), especially in the months of February to April have a rate of very high evaporation.

f) Wind Regime

88. In the year there are two seasons: the Northeast monsoon prevails from November to April and the southwest monsoon prevails from May to October. Northeast winds account for 60-65% of occurrences during the dry season month (February to April), the highest monthly average winds of 3.6 m/s (March). The maximum instantaneous wind speed is 26 m/s (April 1976).

89. Southwest monsoons, with the main components being the west and southwest winds, account for 70-75% of their occurrences during the rainy season (July to September). The highest monthly average winds are 3.8 m/s (August). The maximum instantaneous wind speed is 29 m/s (July 1977). The strong southwest monsoon is the main cause of heavy rainfall and increased waterlogging in the project districts.

g) Abnormal Climate Phenomenon

90. A Storm is a tropical cyclone with the strongest winds of level 8 or higher. Storms rarely occur in Dong Nai Province, but in recent years, typhoons have formed in the East Sea, showing signs of increasing and severely affecting coastal areas of the Dong Nai River.

91. A Tornado is a whirlwind of high velocity formed in a narrow space and dissipated in a short time, often causing damage to property and even the grass of the people during heavy rain and wind in the area. In 2016, four tornados occurred in Dong Nai and Ho Chi Minh City.

92. The above information on climate may help the Project in prevention of natural disasters during construction and operation of the New Campus.

B. ENVIRONMENTAL QUALITY

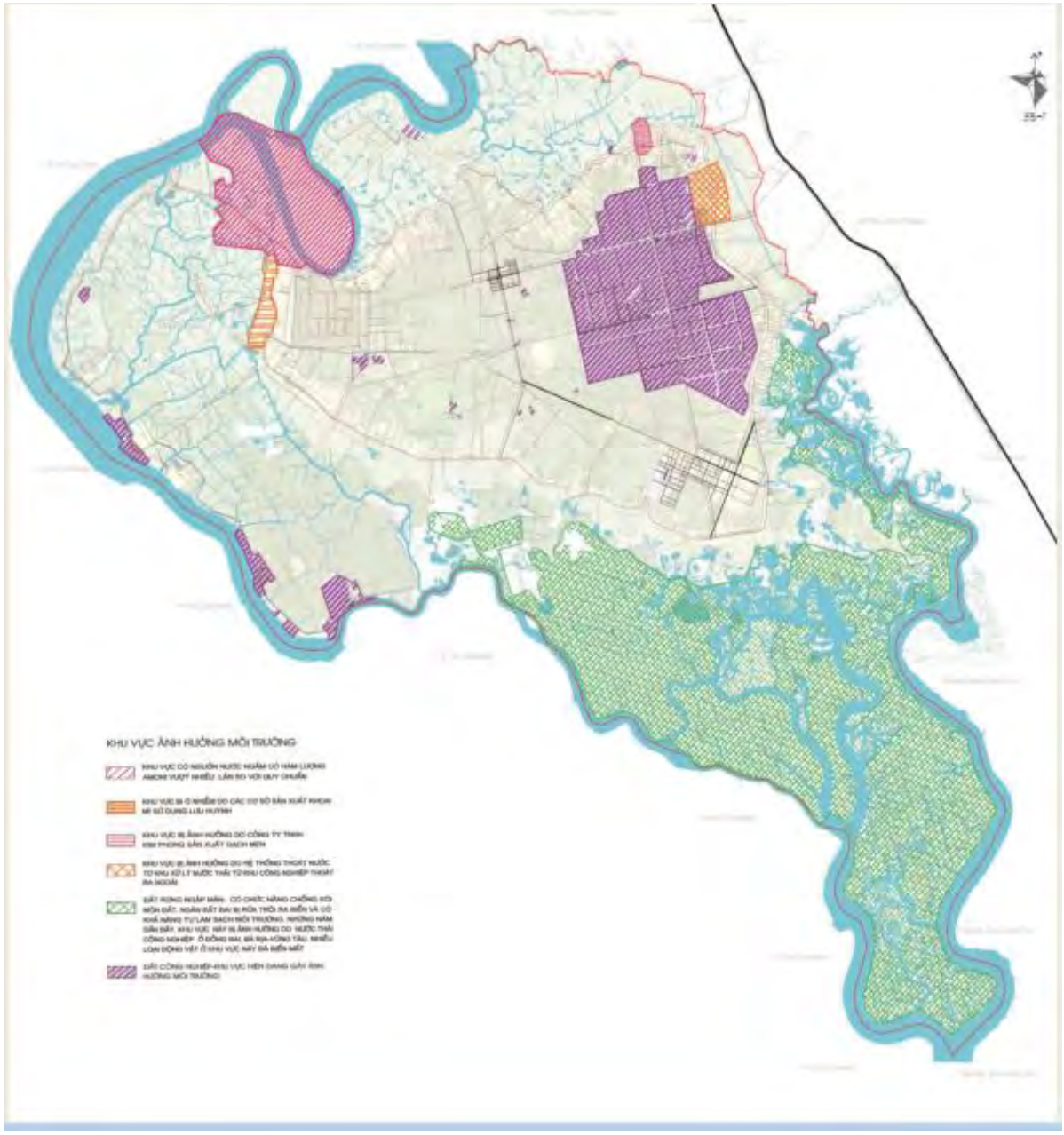
93. Nhơn Trach District has a new industrial and urban center. At present, 9 industrial parks with hundreds of factories are operating in this district. Therefore, environmental quality of the district is affected by many pollution sources.

94. Figure 25 set up by Dong Nai DoNRE shows the areas currently affected by existing pollution sources. From this figure it can be concluded that at present environmental quality at the Project area is not evidently affected by pollution sources.

95. In order to assess the quality of ambient air, water and soil, in the last week August 2018, the Institute for Tropical Technology and Environmental Protection (ITE) has conducted sampling, measurement and analysis of the samples collected as indicated in Figure 26. Each sample location is also described under its corresponding section.

96. The results of these samplings showed that the air has no signs of pollution (i.e. no degraded airshed), surface water quality is within the quality standard for rivers, streams and lakes (QCVN 08-MT: 2015/BTNMT (column B1). The groundwater parameters are also within the permitted limits of QCVN 09-MT: 2015/BTNMT (except for Fe and Mn, which are slightly above standard). The soil quality is within the standard for agricultural land according to QCVN 03-MT: 2015/BTNMT. By micro detection of all persistent organic pesticides by Gas Chromatography - Mass Spectroscopy, no pesticide contamination in the soil was found (detailed results of the baseline monitoring at the project site are given in **Appendix 6**, **Appendix 7**, **Appendix 8**, **Appendix 9**, and **Appendix 10**).

97. Main results of environmental analysis and evaluations on the present environmental quality at the project communes are presented and discussed below.



LEGEND

- Areas with ammonium concentration in groundwater many times higher than technical regulation
- Areas being polluted by tapioca processing factories using sulfur
- Areas being affected by a company manufacturing enameled tiles.
- Areas being affected by effluent from IPs.
- Mangrove forests being affected by industrial wastewater
- Industry lands- causing environmental pollution

Figure 25: Areas affected by pollution sources in Nhơn Trach District

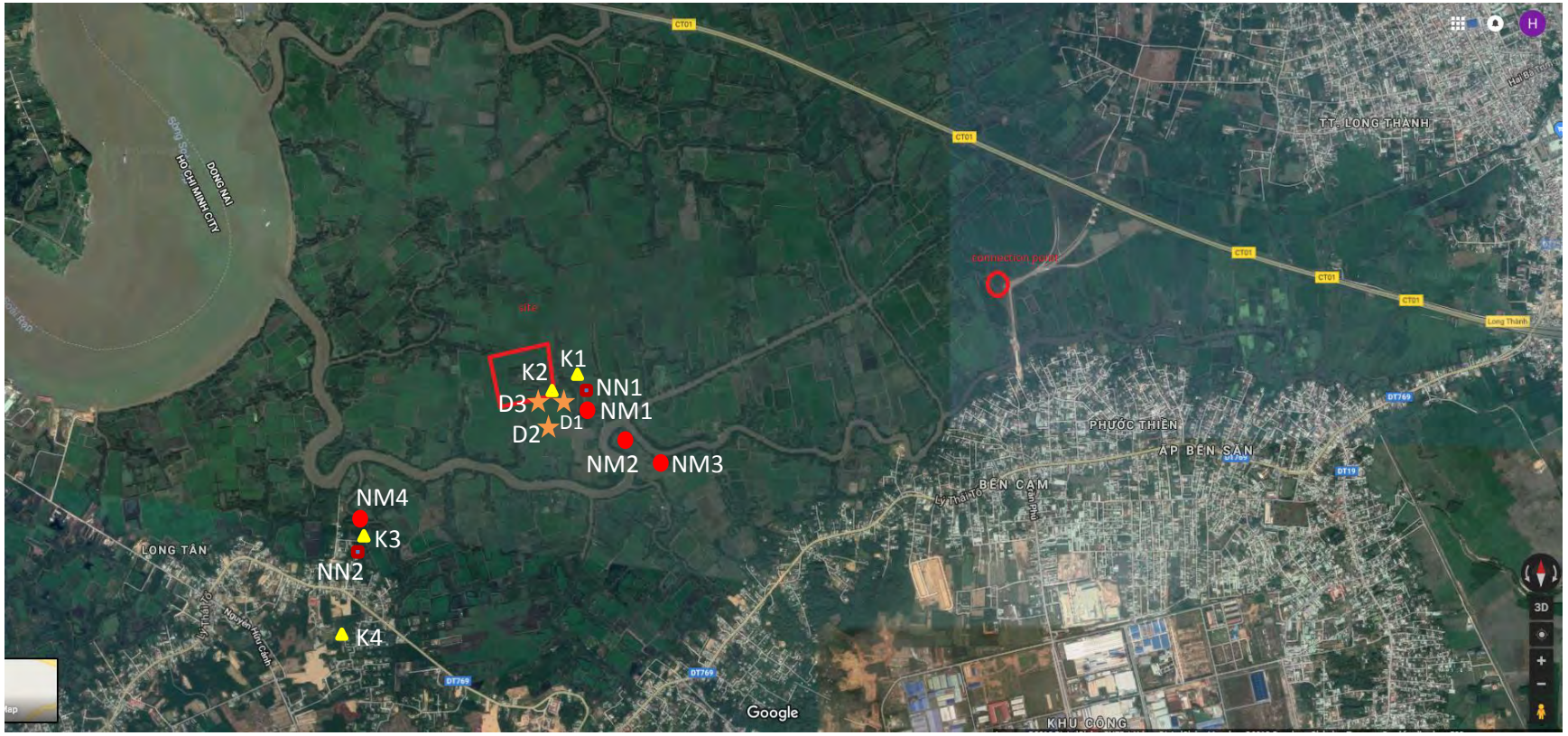


Figure 26: Location of environmental monitoring sites, August 2018

LEGEND:

- ● Surface water sampling locations
- ▲ Ambient air sampling locations
- ○ Groundwater sampling locations
- ★ Soil sampling locations

1. Air Quality, Noise and Dust

98. Micro climate parameters such as temperature and humidity were determined in the field by rapid measurement, air sampling by absorption method in accordance with Vietnamese standards. The analysis methods applied followed Circular 28/2011/TT-BTNMT, establishing the technical sampling processes for air and noise sampling.

99. The sampling campaign for evaluation of the air quality in the University Village area before construction and operation, entailed the collection of 8 samples of air, each sampling site was measured once, on 29 August 2018, from 9h00 to 12h30. The samples were collected near residential areas, pagodas, roads and around the project area (Table 9), which may be directly and indirectly affected by the project activities, thus reflecting the nature of the environmental background of the area.

Table 9: Location of air samples

No.	Sample	Location	Coordinates	
			WGS84	VN2000
1	K1	At the end of the creek inside project area	N=10°45'56" E=106°53'40"	X=1188912 Y = 0623657
2	K2	In paddy field inside project area	N=10°45'50" E=106°53'43"	X=1190495 Y = 0624890
3	K3	At the boat wharf in Long Hieu hamlet, Long Tan commune	N=10°45'22" E=106°52'50"	X=1190083 Y = 0623220
4	K4	In front of Long Huong Pagoda on Ly Thai To street, Long Tan commune	N=10°44'59" E=106°52'47"	X=1189064 Y = 0623340

Table 10: Results for ambient air quality analysis

Indicator	Unit	Results				QCVN 05:2013/BTNMT/ QCVN 26:2010/BTNMT	IFC EHS General Guidelines
		K1	K2	K3	K4		
Temp	0C	29	30	31	32	-	
Humidity	%	77	72	67	60	-	
Wind speed	m/s	0.8-1.8	1.1-2.4	0.6-1.1	1,0-2,1	-	
Noise	DBA	46,3	45,8	50,7	68,5	70	55
Total dust	µg/m^3	79	84	127	235	300	20 (1yr) 50 (24hr)
CO	µg/m^3	2000	2100	2700	3600	30,000	
SO2	µg/m^3	58	51	61	72	350	125 (24hr) 500 (1hr)
NO2	µg/m^3	47	48	52	60	200	40 (1yr) 200 (1hr)
Pb	µg/m^3	ND (LOD=0,1)	ND (LOD=0,1)	0,5	0,9	1,5	

Source: Institute for Tropical Technology and Environmental Protection

Note: QCVN 05: 2013/BTNMT - Air quality - National technical standards on ambient air quality (1h; 24h for Pb)
QCVN 26:2010/BTNMT – National Technical Regulation on noise (from 6h-21h, normal location)
IFC EHS General Guidelines – Noise level (1hr) at residential; institutional; educational receptor (Table 1.7.1), WHO Ambient Air Quality Guidelines (Table 1.1.1)

100. The results show that total dust concentration ranges between 79-84 µg/m^3 inside the project area and a bit higher in residential area and the road (127 and 235 µg/m^3); CO concentrations range from 2,000-3,600 µg/m^3. SO_2 concentrations range from 51-72 µg/m^3. NO_2 concentrations range from 47-60 µg/m^3. All are within the limits of QCVN 05: 2013/BTNMT (Air

quality - National technical standards on ambient air quality). Noise levels range from 45.8 to 68.5 dBA, which is within the limits of QCVN 26:2010/BTNMT (National Technical Regulation on Noise), but slightly exceeds the IFC standard in the existing residential area. Therefore, the quality of the air environment in the project area and surrounding area is still good; the airshed does not qualify as degraded. However, concentrations of pollutants in existing residential area is higher than those of project site area.

2. Water Quality

101. Surface water and groundwater samples were collected inside and in the vicinity of the project area. Surface water was collected according to the method TCVN 5996:1995 (ISO 5667-6:1990) and the groundwater was collected according to TCVN 6000:1995 (ISO 5667-11:1992). Both types of samples were stored according to the instructions for storage and handling of samples TCVN 5993:1995 (ISO 5667-3:1985).

102. In order to assess the water quality of the project area, the survey team collected 4 samples of surface water and 2 samples of groundwater (well water) inside and in the vicinity of the project area on 29 August 2018, from 9h00 - 12h30, as indicated in Table 11 below.

Table 11: Location of water sampling sites

No.	Sample	Location	Coordinates	
			WGS84	VN2000
Surface water samples				
1	NM1	At the end of the creek inside project area	N=10°45'56" E=106°53'40"	X=1188912 Y = 0623657
2	NM2	Surface water point between project site and Vam Kinh confluence	N = 10°45'42" E = 106°53'45"	X = 1188647 Y = 0623702
3	NM3	Surface water point at confluence of Vam Kinh river and Dong Mon river	N = 10°45'35" E = 106°53'51"	X = 1187320 Y = 0625719
4	NM4	At the boat wharf in Long Hieu hamlet, Long Tan commune	N = 10°45'23" E = 106°52'50"	X = 1190427 Y = 0624906
Groundwater samples				
1	NN1	At the well of Mr. Bui Thanh Hiep, Long Hieu hamlet, Long Tan commune	N=10°45'50" E=106°53'43"	X=1190495 Y = 0624890
2	NN2	At the well of Mr. Vu Van Tac, Long Hieu hamlet, Long Tan commune	N = 10°45'16" E = 106°52'51"	X = 1189010 Y = 0623495

Table 12: Results of surface water quality analysis

Parameter	Unit	NM1	NM2	NM3	NM4	QCVN 08-MT:2015/BTNMT (Column B1)
pH	-	6.4	6.3	6.6	6.7	5.5-9
SS	mg/L	34	39	35	48	50
EC	µS/cm	108	106	96	54	-
Salinity	%	0.01	0	0	0	-
Turbidity	NTU	25	25	21	31	-
N – NO_2	mg/L	0.011	0.014	0.011	0.012	0.05
N – NO_3	mg/L	0.92	0.95	0.99	1.02	10
N – NH_4	mg/L	0.280	0.376	0.175	0.091	0.9
P – PO_4	mg/L	0.074	0.098	0.063	0.074	0.3
Total phosphorus	mg/L	ND LOD=0.10	0.10	ND LOD=0.10	ND LOD=0.10	-

Parameter	Unit	NM1	NM2	NM3	NM4	QCVN 08-MT:2015/BTNMT (Column B1)
BOD5	mgO2/L	9	13	10	9	15
COD	mgO2/L	15	29	44	29	30
Total Fe	mg/L	0.350	0.453	0.388	0.301	1.5
Cd	mg/L	ND LOD=0.001	ND LOD=0.001	ND LOD=0.001	ND LOD=0.001	0.01
Total Cr	mg/L	ND LOD=0.0015	ND LOD=0.0015	ND LOD=0.0015	ND LOD=0.0015	0.5
As	mg/L	ND LOD=0.00007	ND LOD=0.00007	ND LOD=0.00007	ND LOD=0.00007	0.05
Hg	mg/L	ND LOD=0.0002	ND LOD=0.0002	ND LOD=0.0002	ND LOD=0.0002	0.001
Oil & grease	mg/L	1.27	1.12	1.24	0.98	1
Coliforms	MPN/100mL	15,000	2100	2800	7,500	7,500
DO	mg/L	6.3	5.8	5.9	6.0	≥4

Source: Institute for Tropical Technology and Environmental Protection
ND: Non-detectable.

Table 13: Results of ground water quality analysis

Parameter	Unit	Result		QCVN 09-MT: 2015/BTNMT
		NN1	NN2	
pH	-	6.4	6.5	5.5-8.5
SS	mg/L	17	4	-
EC	μS/cm	782	10	-
Salinity	%	0.04	0	-
Turbidity	NTU	14	2.4	-
N – NO_2	mg/L	0.014	<0.010	1
N – NO_3	mg/L	0.88	0.84	15
N – NH_4	mg/L	0.122	ND LOD=0.026	1
P – PO_4	mg/L	ND LOD=0.003	ND LOD=0.003	-
Total phosphorus	mg/L	ND LOD=0.10	ND LOD=0.10	-
BOD5	mgO2/L	4	1	4
Total Fe	mg/L	0.265	0.015	5
Mn	mg/L	0.090	0.002	0.5
Cd	mg/L	ND LOD=0.001	ND LOD=0.001	0.005
Total Cr	mg/L	ND LOD=0.0015	ND LOD=0.0015	0.05
As	mg/L	ND LOD=0.00007	ND LOD=0.00007	0.05
Hg	mg/L	ND LOD=0.0002	ND LOD=0.0002	0.001
Oil & grease	mg/L	0.62	0.64	-
E.Coli	MPN/100mL	4	9	Non-detected

Source: Institute for Tropical Technology and Environmental Protection)
ND: Non-detectable.

103. The sampling locations were selected to allow for the assessment of any direct or indirect impact from the project on the Vam Kinh River and Dong Mon river which will receive stormwater runoff and treated wastewater effluent. Vam Kinh River and Dong Mon river are likely directly and indirectly affected during the construction phase of the project. The surface water sampling locations will serve as a basis for comparing and assessing impacts of the project in the construction and operation stages, with the application of appropriate waste water treatment measures before discharge into the environment.

104. From the analysis results of the surface water sampling campaign against the National Standards of Surface Water Quality of Vietnam (column B1 for irrigation purposes and B2 for other uses), it is possible to confirm that almost all parameters in the 4 samples are within the limits of QCVN 08 MT: 2015/BTNMT (Column B1), except for Oil & grease and Coliforms. This

may be explained by the fact that there are only few populated areas or industrial zones in the vicinity.

105. Groundwater samples (30 m deep) were analyzed and compared against National technical Standards of Underground Water Quality of Vietnam QCVN 09-MT:2015/BTNMT. It may be concluded that all parameters are below the admissible standards, except for E.Coli.

3. Soil Quality

106. Soil samples were collected inside and in the vicinity of the project area according to the Soil Sampling Guidelines TCVN 7538-2:2005. In order to assess the soil quality of the area, three samples were collected in rice land on 29 August 2018, as indicated in Table 15 below.

Table 14: Location of soil sampling sites

Sample	Location	Coordinates	
		WGS84	VN2000
D1	At the end of the creek inside project area	N=10°45'56" E=106°53'40"	X=1188912 Y = 0623657
D2	In paddy field inside project area	N=10°45'56" E=106°53'20"	X=1188712 Y = 0622657
D3	In paddy field inside project area	N=10°45'50" E=106°53'43"	X=1190495 Y = 0624890

Table 15: results of soil analysis

Indicator	Unit	Results			QCVN 03-MT: 2015/BTNMT (agricultural land)
		D1	D2	D3	
Cu	mg/kg dry soil	8.90	57.5	51.0	100
Pb	mg/kg dry soil	13.0	58.1	42.1	70
Zn	mg/kg dry soil	35.9	66.4	69.1	200
Cd	mg/kg dry soil	KPH	KPH	KPH	1.5
Total Cr	mg/kg dry soil	28.9	72.3	48.3	150
As	mg/kg dry soil	7.87	57.9	31.4	15

Source: Institute for Tropical Technology and Environmental Protection

107. According to the regulation QCVN 03- MT: 2015/BTNMT-KTQG for the permissible limits of heavy metals in the soil, the results indicate that all samples are below the permissible limits, except for Arsenic (Table 15). High arsenic levels are evident at some sites at the project communes.

108. Micro detection of all persistent organic pesticides by Gas Chromatography - Mass Spectroscopy implemented by EUROFINS – Sacky Haidang, a JV France – Vietnam Laboratory in September 5, 2018 indicates that no a pesticide contamination is found in 2 soils samples taken from rice field at the project area. Sheets of results of lab analysis are given in **APPENDIX 9**.

C. BIOLOGICAL ENVIRONMENT (Ecology)

1. Survey Methodology

109. To set up baseline data on the present biological environment, in August 2018 a Team of the Ecological Study of Institute for Environmental Science and Development (VESDEC) has

conducted ecological field survey at the project and surrounded area. Total study area was about 15.0 ha which is wider than the project area (10.0 ha).

a) Vegetation Survey

110. Surveys were undertaken to identify the common and dominant plant species in each vegetation class found within the Study Area, as well as to identify the presence of any protected or rare plant species. Representative areas of identified vegetation class within the Study Area were surveyed on foot. All plant species encountered were identified and their relative abundance recorded in five nominal scales, namely: Rare, Occasional, Common, Abundant and Dominant. The location of plant species of conservation interest and community of invasive species were also recorded.

Table 16: Species relative abundance assessment (Classification Criteria)

Key	Relative Abundance
-	Absence
R	Rare
O	Occasional
C	Common
A	Abundant
D	Dominant

111. Vegetation class/land use identified within the Study Area were mapped based on aerial photos (Google Earth) and updated during the field surveys to identify and delineate the distribution of different vegetation classes found within the Study Area. Color photographs were taken of all vegetation class surveyed; determine the location of invasive species (according to the Global Invasive Species Database and Vietnam national listings) and possible presence of species of conservation significance (according to Vietnam Red Book 2007 and IUCN Red List ver 3.2) within the Project Area.

b) Fauna Surveys

112. ***Avifauna*:** Bird communities in each habitat type recorded within the study area were surveyed on foot. Baseline surveys of bird populations were undertaken within each habitat type using visual observation method. Observations were made using 8x binoculars and photographic records were taken where possible.

113. ***Herpetofauna.*** Herpetofauna surveys were conducted through direct observation and searching in potential hiding places such as among leaf litter, inside holes, and under logs within the survey area.

c) Mammal survey

114. The mammal surveys were conducted covering each habitat type through active searching. As most of mammals in the area occur at low densities, indicators of presence such as signs, tracks, fecal remains were searched for and recorded.

2. Finding of the Survey

a) Habitats

115. Five (5) habitats and their area were identified within the study area as shown in Table 17 and Figure 27.

Table 17: Estimated area of the habitats in the Campus Area, August 2018

No.	Habitat	Area (ha)	Percent (%)
1	Rice field	7.87	52.52
2	Garden	2.10	14.02
3	Canal Corridor	1.89	12.61
4	Embankment	1.15	7.64
5	Pond	0.87	5.78
6	Rural Residential area	0.58	3.88
7	Canal	0.53	3.55
	Total	14.99	100.00

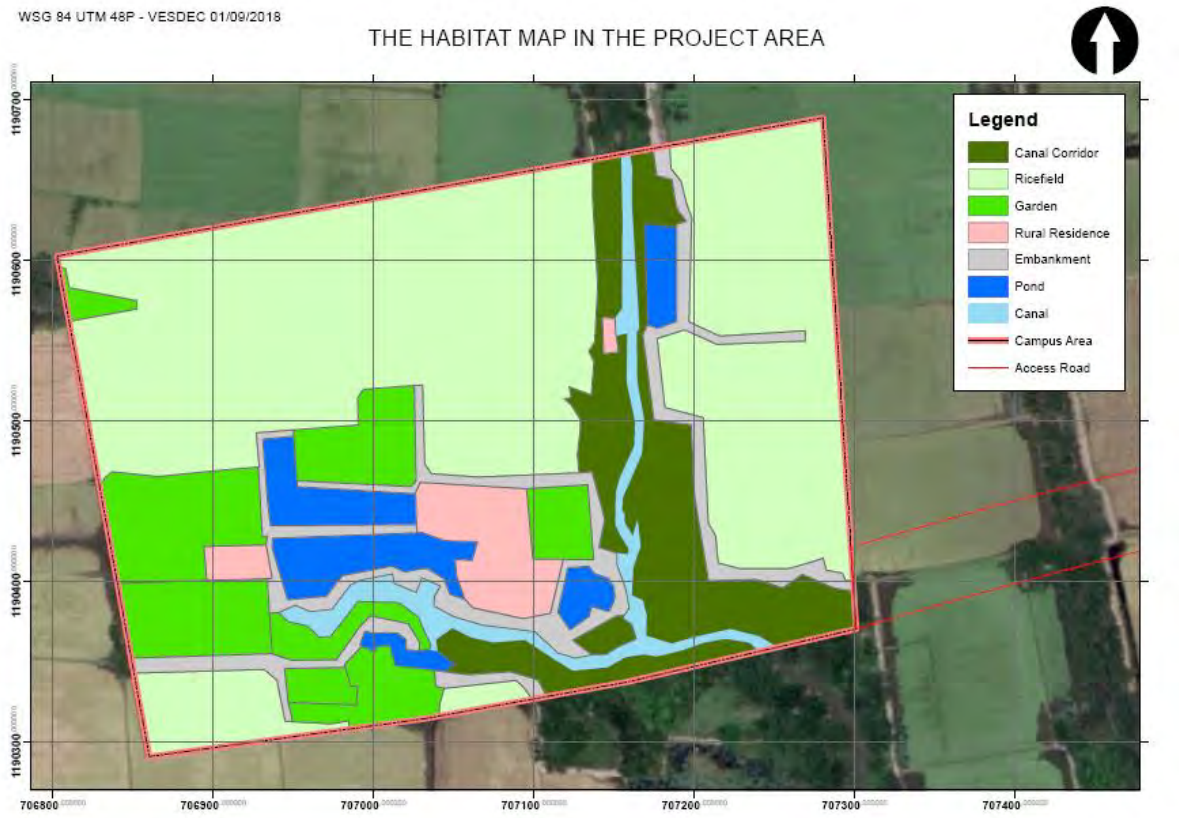


Figure 27: Habitat map in the project area

b) River/Creek corridors

116. The vegetative corridors distributed along the creeks in the project area are un-contiguous fragment sections and are being narrowed by change into agricultural lands. The width of these corridors varies from 5 to 25 m.

117. These vegetative corridors may have some local value as habitat for wildlife, especially birds, and in conservation of biodiversity in an urbanized context. There are many of birds in vegetative corridors at the project area because this area is only 1.7km far from Dong Nai River and 15 km far from Long Thanh Mangrove Protected Forest.

118. These habitats supply natural green-space for urban zone with lowest cost (natural growing). Besides, these natural canals support regulation floods by tide.

Flora: the dominant associations in these canal corridors are Nipa palm (*Nypa fruticans*) and mangrove apple (*Sonneratia caseolaris*) belonging to brackish water ecosystem.

Mangrove apples naturally grow inside, and Nipa palms grow in mud flats outside. Some semi-aquatic plants associated with them include *Aglaodorum griffithii, Hanguana malayana, Acanthus ebracteatus, Gluta velutina.*

Fauna: Although these habitats are narrow, the biodiversity in the area is relatively high, especially birds. The mud flats of river banks are habitats of *Periophthalmus schlosseri* fish, and crab species, and are feeding ground of some birds such as *Egretta garzetta, Ixobrychus sinensis, Mesophoyx intermedia.* Photos of some bird species are shown in **Appendix 3**.

Figure 28: Photos of Riparian/Canal vegetation corridors (left) Rice field (right) at the project area

c) Rice Fields

119. Almost all cultivated areas are rice fields, they are located in low and flat lands. This habitat occupies about 52 % of the area investigated.

Flora: *Echinochloa crus-galli, Cyperus iria, Ludwidgia hyssopifolia.*

Fauna (Birds): *Egretta garzetta, Hirundo rustica.*

Fauna (Herpetofauna): *Hoplobatrachus rugulosus, Kaloula pulchra, Xenochrophis piscator.*

Fish: *Anabas testudineus, Monopterus albus*

d) Gardens

120. Some rice fields were raised to form gardens, almost all gardens are located next to river/canal corridors. These gardens supply fruits and wood.

Flora: planting trees: *Cocos nucifera, Acacia spp, Eucalyptus spp.*

Fauna: *Centropus sinensis, Streptopelia chinensis, Dicrurus paradiseus. Mabuya longicaudata, Trimeresurus albolabris, Bufo melanostictus*

e) Rural Residence/Embankment

121. On garden area, farmers built houses and embankments for prevent from tidal flood and for moving.

Flora: *Annona glabra, Ageratum conyzoides, Chromolaena odorata, Melastoma affine, Commellna difiusa.*

Fauna: same species in the gardens


Figure 29: Photos of Garden and Rural Residence (left) and Pond (right) at the study area

f) Ponds

122. Some ponds were formed by using soil for raise gardens and embankments. They are used for aquaculture.

Flora: *Annona glabra, Ageratum conyzoides, Chromolaena odorata, Melastoma affine, Commellna difiusa.*

Fauna: *Oreochromis niloticus, Monopterus albus, Hoplobatrachus rugulosus.*

3. Evaluation on Ecological Value of Habitats

123. Evaluation on Ecological Value of Habitats is given in Table 18.

Table 18: Ecological Value of Habitats

Value	Habitat Type				
	Corridor	Rice Fields	Garden	Rural Residence /Embankment	Pond
Environment	x	-	x	-	x
Biodiversity Conservation	(x)	-	-	-	-
Endangered Species Protection	-	-	-	-	-

4. Biodiversity

a) Flora

124. In Aug. 2018, 69 different species, belonging to 37 families, were identified at the study area (Table 19).

Table 19: Flora Taxon in the Study Area

Taxon	No. of Families	No. of Species
Polypodiopsida	4	5
Magnoliophyta	0	0
Dicotyledon	26	41
Monocotyledon	7	24
Total	37	70

Table 20: Life Form in the Study Areas

Life Form	Fern	Wood	Shrub	Grass	Liana	Semi-aquatic	Aquatic	Total
Number of Species	5	15	9	29	6	3	3	70
%	7.14	21.43	12.86	41.43	8.57	4.29	4.29	100.00

Table 21: Number and Relative Abundance of Plant Species in Habitats

Abundance	Habitat				
	Canal Corridor	Rice Field	Garden	Rural residence and Embankment	Pond
Dominant	1	1	0	0	0
Abundant	4	0	1	0	1
Common	9	3	6	5	2
Occasional	9	6	13	14	6
Rare	5	3	15	6	2
Total	28	13	35	25	11
% of Study Area	40.00	18.57	50.00	35.71	15.71

b) <u>Fauna</u>

125. Various wild animals were identified in August 2018:

Mammals: Three (3) mammal species in 2 families was recorded in the project area. All of them are very common.

Bird: Seven (7) bird species belonging to 7 families was recorded during the survey in the project area. A list of bird species recorded within each habitat in this area is provided in **Appendix 2**.

126. These recorded birds are common with a wide distribution range in Vietnam. Almost all of them were found in river/canal corridors, some in garden habitats. The most common of them are *Egretta garzetta* and *Hirundo rustica*. There is no any endangered species in Vietnam Red Book (2007) and IUCN Red List (version 3.1).

Herpetological species: Total of 7 herpetological species belonging to 6 families were recorded in the project area by interview with the local people and day and night surveys (**Appendix 2**). Interview information showed that most toad and frog species were very common in paddy fields. No herpetology species is listed in Vietnam Red Book (2007) and IUCN Red List (version 3.1).

Fish: Interview information and field surveys show total of 7 common fishes in 6 families in the project area. No species is listed in Vietnam Red Book (2007) and IUCN Red List (version 3.1).

Table 22: Number of Animal Species by Habitats

Habitat	Mammal	Bird	Herpetological	Fish
Canal corridors	1	5	5	6
Rice fields	1	2	3	3
Gardens	2	5	4	0
Rural residence/embankments	1	2	2	0
Ponds	0	0	2	5
Total	5	14	16	14

127. **Invasive Species.** Three invasive species found in the project area are *Ageratum conyzoides L, Chromolaena odorata King & H.Rob and Eichhornia crassipes (Maret) Solms*.

D. SOCIAL ENVIRONMENT

1. Existing Socio-Economic Features

128. Inside the Project site, there are different types of land. The area is mainly composed of land for annual crops (paddy fields), land for perennial trees, aquaculture land and residential land; some areas with natural vegetation and creeks. The terrain is flat and low-lying, divided by dense creeks with elevation of <1m (Figure 31). The area is surrounded by several tributaries of Dong Nai River and there is no access road. There are no Biosphere Reserves, National Parks, Nature Reserves, or World Nature Reserves inside or nearby the Project area. The nearest protected sites are Long Thanh Mangrove Protected Forest, about 15 km to Southeast and Cangio World Mangrove Biosphere, about 20 km to the South.

129. There are 3 hamlets in Long Tan commune: Long Hieu, Vinh Tuy and Binh Phu. The Project site is located in Long Hieu hamlet of Long Tan commune.

Paddy field at the project area

Temporary house at the project area

Interviewing a farmer in the project area

Creeks in the project area

Figure 30: Existing natural land scape and infrastructures in Project area

130. Approximately 5 km to the east is Phuoc Hung Pagoda, 2 km to Southwest is Long Huong Pagoda and about 4.5 km to the southeast there is Nhơn Trach Industrial Park.

131. Local traffic is depending on Road 769 (Ly Thai To Street), LT-DG expressway, National Road 51, Road 25B (Ton Duc Thang street). All these roads surround the Project area but boat is currently the only means of transportation to the Project area. Roads that will provide access to the University Village are planned for construction by the provincial government, using their own funds, before the construction of HCMCUMP Phase 1 starts in 2021.

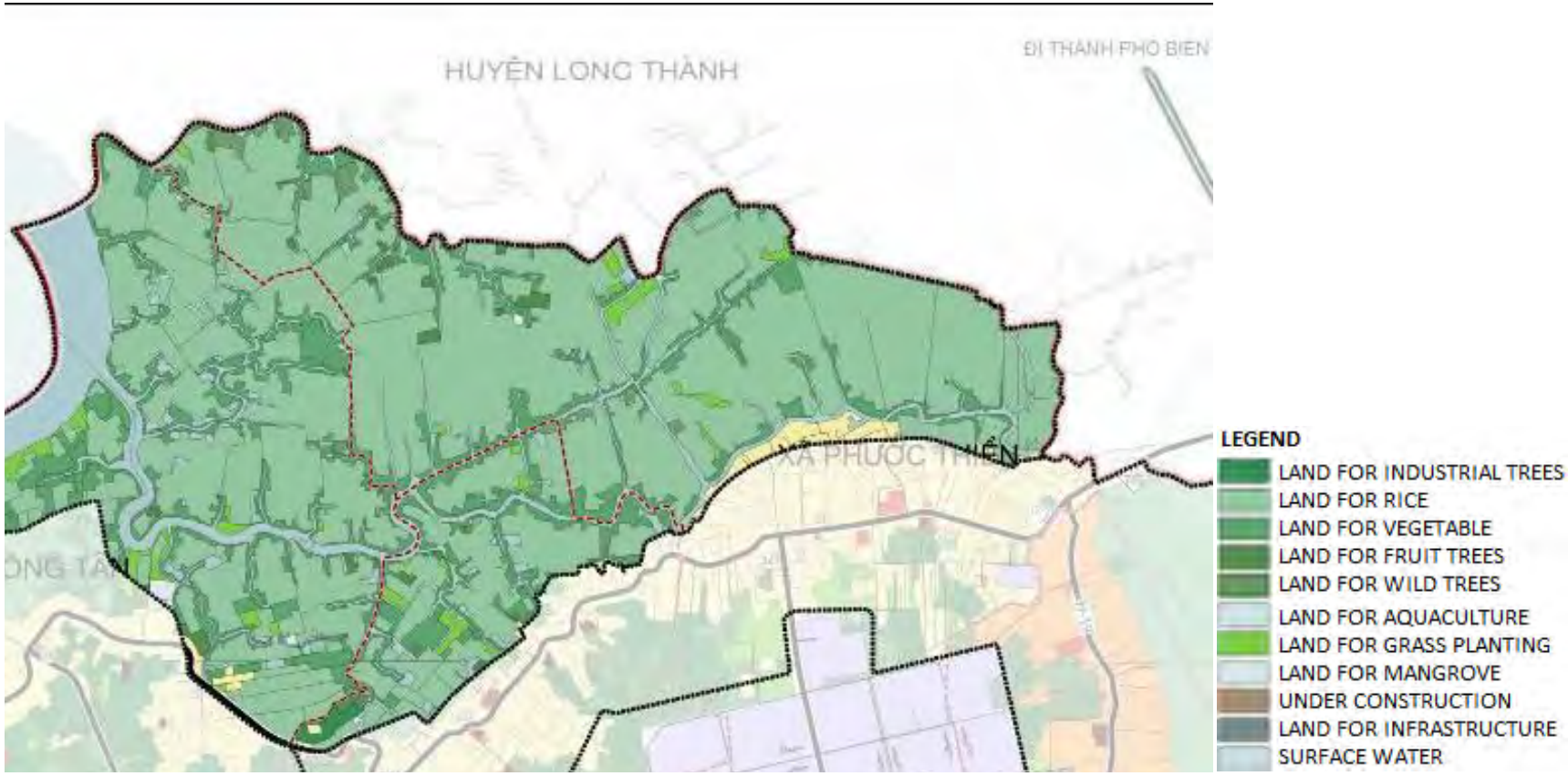


Figure 31: Land use map of Urban Zone 3-1 of Nhơn Trach District, including the Project area

Figure 32: Local traffic around the project site

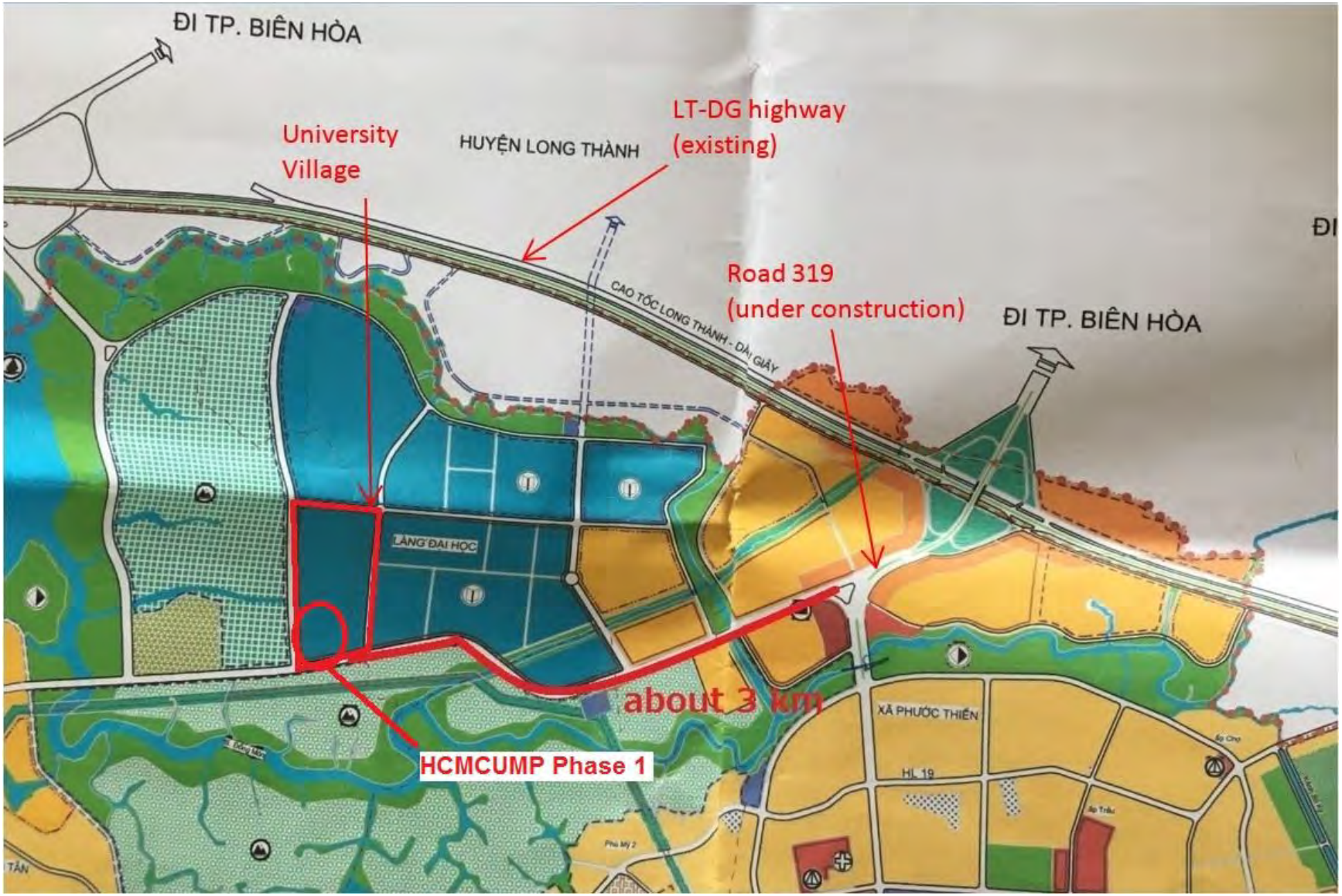


Figure 33: Planned road that will provide access to University Village

132. Several rivers and watercourses surround the Project area (Dong Nai River, Dong Mon river, Nuoc Trong river, Ngon Cung creek, Go Da creek, Dat Set creek and others). This is a very good condition for drainage from the project area.

133. The area does not have a water supply system. All households take water from a 30 m deep communal well and use it for drinking, bathing and cooking.

134. The baseline health profile for Dong Nai Province and Viet Nam are presented in **Appendix 5**. It provides the various determinants of health: socio - demographic profile, employment and education and the health outcomes with health indicators, health services, curative care and health insurance.

2. Socioeconomic Profile of the Project Area

135. In 2016, the population of Dong Nai Province was estimated at 2,963,800 people, with population growth rate of 2.28%. The average urban and rural populations were 1,037,900 people and 1,925,900 people respectively, while the sex ratio was 94.1 males/100 females, in which 1,437,000 were males and 1,526,800 were females[33]. The life expectancy in Dong Nai was 76 years[34]. There are relatively smaller proportion in the older age categories and larger proportion of the population in the less than 25 years of age categories. The total labor force aged 15-year-old and above in Dong Nai was 1,634,700 (55% of the total population) in 2016.

136. Nhơn Trach District has 9 main industrial zones approved by Prime Minister that attract largely Foreign Direct Investment (FDI) and domestic projects to invest and launch business there and create huge jobs for local labors in Dong Nai province as well as in other provinces. Nhơn Trach District has advantage in location when the provincial transport network was and is being developed well including expressway, highway and big port (National Highway 51, Ben Luc – Long Thanh, Long Thanh – Dau Giay, Cat Lai port) as well as internal roads (ring road 3, provincial road 319 to connect local roads with Ben Luc – Long Thanh expressway, etc.). According to a report on socio-economic development of Nhơn Trach DPC in year 2017, the poverty rate in Nhơn Trach District is very low as the number of poor households is only 550 HHs which is 0.89% of the total households. Many poverty reduction programs are being implemented in Nhơn Trach District such as supplying for poor household cows and other material and technical training for planting sugar cane, in-kind support to raise goats, etc. Income per capita in Nhơn Trach District in 2017 is about 48.5 million VND.

137. Long Tan commun has a total area of 3,546.88 ha with 2,796 households and 10,802 inhabitants, and 5,584 or 51.7% of them are female. The average size of household is 3.86 person/family. Most of them are Kinh people. Other ethnic groups include Hoa ethnic group consists of 4 households with 5 members; 3 Khmer people; 1 Nung people; 1 Muong ethnic group with 3 people. Long Tan commune is an agricultural commune and the main income is from planting paddy, lotus and various vegetables. Besides such activities, commercial and service to support agricultural production is developed also and contributed to general income of

[33] General Statistics Office of Viet Nam. 2016. Population and Employment. In: Statistical Yearbook of Vietnam 2016. Hanoi: Statistical Publishing House. pp. 51-151.
[34] Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.

the commune. There are 15 poor households, accounting for 0.55%. Demographic and number of households in Long Tan commune in 2017 are shown in table below.

3. Socio- Economic Profile of the Affected Households

138. 25 households will be affected by the Project. Among them, 12 households were surveyed with a questionnaire and interview. They are living in Phuoc Thien and Phu Hoi communes. As per the result, 03 land-owners are women accounting for 25% while 09 land-owners are men accounting for 75%. Out of 12 household heads, 9 household heads are over 50 years. No head of household is below 30-year-old. It is very difficult for affected heads to change the occupation or find the job in local enterprises in industrial zone surrounding the communes and in Nhơn Trach District.

139. Total members in 12 surveyed households is 50 and the average size of households in project area is 4.25. 44.7% of household's members are student. Farmers and skilled self-employed labor are two main occupations of household's members that generate the income with the percentage of 13.2% and 15.8%. Followings are employees in state organizations and small traders with the rates of 7.9%. Young generations manage to find jobs in the industrial zones in Nhơn Trach District or Ho Chi Minh City and other districts in Dong Nai province, which is not the case for older people and especially for women. Most women in the area are engaged with domestic responsibilities. Apart from the rice cultivation, women do small business in their communes. Details of occupation of household's members are shown in Table 23.

Table 23: Occupation of Household's Members

Occupation	Phu Hoi Commune		Phuoc Thien Commune		Total	
	Number	%	Number	%	Number	%
Farmer	1	6.7%	4	17.4%	5	13.2%
Trader/ Small business	2	13.3%	1	4.3%	3	7.9%
Business owner	0	0.0%	0	0.0%	0	0.0%
Employed (government agencies)	0	0.0%	3	13.0%	3	7.9%
Private sector employee	0	0.0%	0	0.0%	0	0.0%
Skilled self-employed labor	2	13.3%	4	17.4%	6	15.8%
Manual self-employed labor	1	6.7%	0	0.0%	1	2.6%
Driver	0	0.0%	1	4.3%	1	2.6%
Retired/Pensioner	0	0.0%	1	4.3%	1	2.6%
Unemployed; looking for a job	0	0.0%	0	0.0%	0	0.0%
Housewife	0	0.0%	0	0.0%	0	0.0%
Student	8	53.3%	9	39.1%	17	44.7%
Other	1	6.7%	0	0.0%	1	2.6%
Total surveyed households	15	100.0%	23	100.0%	38	100.0%

Source: Socio-Economic Survey – Aug, Sept 2018.

140. **Income and Source of income.** According to the Socio-Economic Survey, the average monthly income of local people in Phu Hoi commune is higher than the one in Phuoc Thien commune. 66.7% of interviewed households has monthly income over 7 million VND while only 16.7% of households has income from 3-5 million and from 5-7 million per month each. With this level of income, no households fall in the threshold of national poverty standard. The average monthly income of female heads is a little bit lower than the one of male heads.

Table 24: Distribution of Affected Households by average monthly income

Commune	Number of surveyed households	Average income (VND/month/household)	Income (1 million VND/HH/month)					
			< 1	1-2	2-3	3-5	5-7	> 7
Phu Hoi	4	14,500,000	0	0	0	0	0	4
Phuoc Thien	8	12,912,500	0	0	0	2	2	4
Total	12	13,706,250	0	0	0	2	2	8
%	100%		0.0%	0.0%	0.0%	16.7%	16.7%	66.7%

Source: Socio-Economic Survey – Aug, Sept 2018

4. Gender Issues – Disparity between Women and Men on Foreseeable Impacts

141. The results of the Socio-Economic Survey showed that there is no big gender issue in the surveyed area. Women are engaged in house works in general. Both men and women are equal in making decision. Women here have voice and are more involved in making decision. Woman also actively participate in livelihood and social activities.

Table 25: Average monthly Income of Households Head by Gender

Commune	Number of surveyed HHs	Average Income/HH/month (VND)		
		Average	HH headed by men	HH headed by women
Phu Hoi	4	6,833,333	7,666,666	6,000,000
Phuoc Thien	8	2,875,000	3,000,000	2,750,000

Source: Socio-Economic Survey – Aug, Sept 2018
HH = household

Table 26: Work divided by gender

Outside works	Both	Male	Female
Farming	6	2	1
Gardening	2	1	1
Work at factory/enterprise	0	0	2
Livestock	1	0	1
Small trading	3	0	1
Work in city far from family	1	0	0
In house works	Both	Male	Female
Take care children	1	0	4
Cleaning house	1	1	10
Cooking	1	2	9
Participating in community activity	Both	Male	Female
1. Participate in community meeting	3	3	6
2. Involvement in making decision	3	3	6
3. Members of social organizations locality	3	4	5

Source: Socio-Economic Survey – Aug, Sept 2018

V. Anticipated Impacts and corresponding Mitigation Measures

A. IDENTIFICATION OF POTENTIAL IMPACTS

1. Rapid Environmental Assessment Checklist

142. This project will create very good impacts to teaching and learning conditions of HMCUMP in particular, and the medical sector of Vietnam in general. However, various adverse impacts to the local natural environment and socio – economy may occur during the project implementation. Anticipated impacts described in this Section are valid for HCMCUMP Phase 1

Development, corresponding to teaching and other auxiliary facilities described under Chapter III.A.

2. Impact Classification System

143. Environmental and social impacts are classified as None or Negligible, Minor, Moderate or Major according to their magnitude and the sensitivity of the receptor, depending on the type, extent, duration, scale and frequency of each impact, as indicated in Table 27. The result is an impact significance table applied to all impacts on the Project site and area of influence, with further description of mitigation measures and foreseeable residual impacts.

Table 27: Impact classification system used for assessment for this Project

		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

144. This classification will allow for the Project to determine the scope and level of efforts devoted to the risks and impacts identification and the mitigation process. The impacts are described for each of the phases of the Project (Pre-Construction, Construction and Operation).

3. Screening of Potential Anticipated Benefit

145. The establishment of the second campus of the University is necessary to build one of the country's leading health universities in the Southern Region of Vietnam and reduce the load on the existing facilities of Ho Chi Minh City. Urban facilities are mainly used for in-depth, post-graduate and in-depth training; these facilities shall serve basic medical training and specialties attached to medical establishments. Schools have the prescribed infrastructure to improve the quality of training to meet the human resources needs of the health sector in order to implement Resolution No. 20/NQ-TW dated 25/10/2017 of the Central Conference.

146. Thus, the benefits from this Project will be mainly the contribution to the renewal of medical human resources training, trainings that meet ethical and professional international requirements, schools with spacious and modern facilities creating great conditions for learning, strengthening of the country' health system in the long run, healthcare in areas outside of big city centers, creation of jobs, renovation of spaces into facilities that promote health (open spaces, seminar rooms, etc.). More specifically, these include:

(i) Increase of the number of graduates with strong expertise in health, nursing, pharmacy and others;
(ii) Diversify the scope of training by introducing new programs and disciplines;
(iii) Ensure the quality of health human resources by generating a class of graduates from regionally accredited training programs;
(iv) Strengthen continuing medical education and the licensing of practitioners, which promotes the quality and management of healthcare resources in the country;
(v) Strengthen the deployment of health graduates, which resolves the understaffing issue in poor and vulnerable areas;

(vi) Compliance with the Socio-Economic Development Plan for 2016-2020 (Resolution No. 142/2016/QH13 dated April 12, 2016) on increasing the number of doctors per 1,000 people;

(vii) Compliance with the health sector development plan for the 2016-2020 period (MOH);

(viii) To build up capacity for education and training institutions and meet the requirements for human health resources nationwide.

4. Summary of Impacts, Cprresponding Mitigation Measures and Benefit of the Project

147. The significance of foreseen project impacts and benefits is summarized in Table 28, with the significance of impacts reside with the implementation of corresponding mitigation measures for negative impacts, which are summarized in Table 31. The explanation of each impact and mitigation measures are described in Chapter B for pre-construction phase, Chapter C for construction phase, and Chapter D for operation phase.

Table 28: List and classification of anticipated impacts, their significance, and residual impacts for HCMCUMP Phase 1 and influence area

	Impact	Significance of Impact	Significance of Residual Impact	Residual Impacts
	Pre-Construction Phase			
0.	General Impact	Moderate	Minor	
1.	Social Impacts due to Land Acquisition and Land Use Change	Major	Moderate	People will have to adapt to alternative livelihoods and grievances may arise with time.
2.	Impacts on life and health of workers during UXO clearance	Minor	Not expected	This activity may still result in unpredictable injuries on life and health of workers in case of an explosion, although it is most unlikely to happen.
	Construction Phase			
3.	Impacts on air quality, noise and vibration due to construction activity	Major	Minor and temporary	There will be some emissions from the transportation of materials and from earth works, which are impossible to fully mitigate, and for which they are considered to create a minor impact.
4.	Impacts on air quality and surface/ground water quality due to construction vehicle/machinery	Moderate	Minor and temporary	There will be some emissions from construction vehicles and machinery, which are impossible to fully mitigate, and for which they are considered to create a minor impact.
5.	Impacts from transportation of construction materials and waste	Major	Minor, risks can be managed, and impacts avoided	There will be some emissions from the transportation of materials, which are impossible to mitigate, and for which they are considered to create a minor impact
6.	Impacts on local hydrology	Major	Minor	If the existing creek/canals is filled by the Project, the impact will be major, however, the impact can be mitigated to minor by constructing a diversion channel.
7.	Impacts from generation of hazardous and non-hazardous waste	Moderate	Minor	-
8.	Impacts from generation of domestic/construction wastewater	Moderate	Minor	-
9.	Impact on local traffic	Minor	Minor, can be mitigated	-
10.	Changes in landscape	Major	Moderate	Permanent loss of vegetation cover, included mangrove trees and habitats for bird, amphibian, repltile species
11.	Impacts of habitat loss due to vegetation clearance	Moderate	Minor, no biodiversity values found on site	This impact occurs mainly in the Land Clearance Phase
12.	Impacts from materials extraction at quarry/borrow site	Minor	Minor, can be mitigated	-
13.	Impacts of storm water; Soil erosion and land slide	Moderate	Minor	-

	Impact	Significance of Impact	Significance of Residual Impact	Residual Impacts
14.	Occupational and community health and safety impacts	Moderate	Minor, can be avoided	-
15.	Impacts on local society and economy due to worker force influx	Moderate	Minor, can be avoided	-
16.	Impacts on physical cultural resources (PCR)	Minor	Negligible	-
	Operation Phase			
17.	Impacts of Traffic Increase	Moderate	Minor	An increase of traffic in the area will be unavoidable.
18.	Impacts of solid/liquid waste including hazardous and non-hazardous wastes	Major	Minor	-
19.	Impacts of wastewater	Major	Minor	-
20.	Impacts of offensive smell	Minor	Minor	-
21.	Impacts from land changes on landscape	Major	Moderate	A change in the landscape of the area from agricultural land into teaching facilities is unavoidable.
22.	Impacts on occupational and comunity health and safety	Minor	Negligible	-
23.	Impacts on local society and economy due to an increase of social crimes/tensions	Minor	Negligible	-
	Positive Impacts			
24.	Job opportunities for local people	Moderate		
25.	Improvement of life quality / health services	Major		
26.	Improvement of educational level	Major		
27.	Improvement of infrastructures	Major		
28.	Increase of local GDP	Moderate		

B. PROJECT IMPACTS DURING PRE-CONSTRUCTION PHASE

1. Conformity of the Project Location to Local Social and Natural Conditions

148. The selected project site is located in Long Tan commune, Nhơn Trach District, Dong Nai province. It is located in the planned University Village of Dong Nai Province, adjacent to Nhơn Trach Town and various industrial parks and the expressway from HCMC to Long Thanh – Dau Giay. As such, the campus, if implemented, will be ideally located in terms of transportation and utility connection. And when finished, it will create a good place for students and employees in university campus to live good quality life, and a motivation that improve living quality of people living around the site.

2. Social Impacts due to Land Acquisition and Land Use Change

149. The campus will employ about 10.0 ha of agricultural land, water bodies and sections of irrigation canals. According to the habitat map (Figure 27) and field survey, the Project site consists of 5.25 ha (52.5%) of rice field; 1.42 ha (14.2%) of gardens; 1.26 ha (12.6%) of canal corridors (mostly covered by Nipa palm); 0.35 ha (3.5%) of creek/canals; 0.58 ha (5.8%) of ponds, and a small temporary residential area, which means many farmers will lose their rice and other agricultural and aquaculture products, i.e. their traditional production and income will be affected.

150. 25 households will be affected by permanent acquisition of 96,212 m^2 agricultural land and 747 m^2 of residential land. 8 households with 33 affected people will be severely affected due to loss of 10% and more of their total productive land on which they are directly cultivating. These 8 households also include two households (5 affected people) whose main house will be affected and thus will be physically displaced.

a) Impact on agriculture and aquaculture

151. It is informed from local farmers that at the project area the rice yield is 8 tons/ha/year. As such, the area of about 5.25 ha of rice cultivation land is equivalent to 42 tons of paddy, and with the unit price of 5,000 VND/kg (August 2018), each year the land owners will loss approximately VND 210,000,000 or USD 9,016. This amount of money is not high in comparison with the annual GDP of the project communes but in fact this is the main income of the affected householders.

152. Nipa palms (*Nipa fruticans*), a mangrove tree, is also a source of income of local people. With the price of VND 2,000,000/1,000 leaves (August 2018) and the production of 3,000 leaves/ha/year, an area of 1.26 ha of this tree may provide about VND 7,560,000 or USD 325 for the land owners.

153. According to the public consultation meeting held on 24 September 2018 (para.274), aquaculture is not practiced in the Project area, and farmers do not have any plan to grow fish in the area, therefore no impact on aquaculture is expected as a result of the Project.

Impacts on irrigation system

154. Creeks (natural canals) flowing across the project site are good habitats for aquatic organisms and wetland vegetation. Creeks are also important for water drainage of the Northern part of Nhơn Trach District. Since these creeks are small to medium (about 5 - 15 m in width

and 1.5 – 2.5 m in depth in the rainy season), they are not used for waterway transport, but important for water provision for agriculture areas in many communes. If some sections of the creeks will be filled, even partly, the impact on irrigation could be significant. In case of filling a creek, a large area of rice and vegetables in the communes would not be irrigated. Consequently, agriculture productivity could be significantly reduced. If this situation will be arisen, conflict in water use can be a problem. Impact of creek filling is expected as long-term and major.

b) Impacts on infrastructure, historic, cultural and religious facilities

155. There are no public facilities such as electric poles, optical fiber cables, PCR, or social facilities (cemeteries, schools, hospitals) in the Project area. Therefore, this type of impact is not expected.

c) Indirect Social Impact

156. Social impact associated with resettlement and loss of livelihoods can be considered major depending on the adequacy of resettlement action planning, livelihood restoration planning. Potential impacts include:

(i) Food insecurity (if compensation is done in cash only and affected persons currently harvesting do not have the opportunity for at minimum, small-scale harvesting);

(ii) Loss of informal trade networks, depending on the informal socio-economic location of the village;

(iii) Stress-mediated mental well-being disorders such as anxiety and depression associated with resettlement.

157. **Mitigation Measure.** A Resettlement Plan commensurate with the expected impacts and in compliance with the ADB SPS 2009, including details on the project grievance redress mechanism was prepared. As part of the process of meaningful consultation initiated during project preparation, project information was disclosed to affected persons and cutoff dates for their inclusion in the RP were established during public consultations. Public consultations will continue during project implementation. The resettlement plan will be updated and cleared by ADB and the provincial government based on the final site boundaries. No physical or economic displacement will take place in connection with the project until (a) compensation and other entitlements have been provided to affected people in accordance with the updated resettlement plan; and (b) a comprehensive income and livelihood restoration program has been established in accordance with the updated resettlement plan.

158. To minimize the anticipated social impacts, the following measures are recommended:

- Public consultation and disclosure of information should occur frequently to assure compensation is done fairly and grievances are addressed adequately.
- A resettlement plan should be updated and monitored, in close collaboration with relevant organizations in accordance with the most updated regulations.
- Acquisition of land and livelihood restoration according to Resettlement Plan and its updates.
- Support affected persons by providing available project information accordingly.
- Before construction and clearance of the impacted water ways, assure the surrounding affected rice fields will not have their supply of water affected by applying the designated

engineering solutions defined under the detailed design for the facilities and the HCMCUMP Phase 1 area.

- Announce the scope and duration of the works before commencement, to affected peoples and all relevant authorities.
- Publicly announce the clearance and construction plans.
- Livelihood restoration must be frequently monitored, and any necessary assistance provided to the affected persons.

3. Impacts on life and health of workers during UXO clearance

159. Because the area was a heavy battle field during Vietnamese war (1950's-1970's), UXO (residual explosive materials) may remain in deeper soil layers. Therefore, UXO investigation and removal will be done at all areas of the Project site. However, this activity will not affect the physical and biological environment. Only safety of the workers engaged in investigation and removal, and potential risks to local residents will be a problem. UXO clearance will include surveys and explosive detection, removal, transport and destruction in accordance with the Vietnam regulation and implementation by the Technology Centre for Bomb and Mine Disposal (BOMICEN) or other Military Engineering Unit of Ministry of Defense – an experienced military unit. Therefore, health impact of this activity would be minor.

160. **Mitigation Measures.** The following measures are recommended:

- Engage experienced Military Engineering Unit or accredited contractor (BOMICEN) for safe detection and removal of UXOs.
- Ensure implementation of safety procedures during UXO detection and removal process
- During this process, warning signs will be in place to warn local residents.

C. PROJECT IMPACTS DURING CONSTRUCTION PHASE

1. Impacts and Mitigation Measures

161. The construction activities such as clearance, cutting, and leveling of the land will create various impacts, related with operation of construction machines and workers, waste (including construction and domestic wastes) generation and management, transport of construction materials and wastes, to the natural and social environment. Potential impacts will depend on the construction methods, volume of dredging and leveling; location of access road used for project transport, the number of workers, and number and time of construction machinery operated. Other potential impacts (without mitigation measures) include: changes in landscape, damage to local roads, damage to agriculture land quality because of runoff water and waste disposal, increased traffic, safety of construction workers and local residents, environmental and social impacts associated with the influx of workers, and occupational health and safety risks. The main potential impacts during the ground preparation and construction phase are predicted below.

a) Impacts on air quality, noise and vibration due to construction activity

162. Construction activities can negatively impact on the air quality and cause noise and vibration. Dust pollution may be generated by storage of dredged materials without cover and land erosion, which may cause dispersion of materials in dry days.

163. According to monitoring results from various construction sites, the dust content in the air within 200 m from construction borderlines or within 30m from road used for transport of material or spoils can be higher than the allowable limits guided by Vietnam National Technical Regulation for Ambient Air Quality (QCVN 05/2013/BTNMT). Vibration and noise levels within 200 m from construction borderlines may not exceed the Vietnam Technical Regulations for Vibration and Noise Pollution. However, the nearest residential sites of Long Tan commune is over 2,000m from the construction site. Therefore, these sites are not anticipated to be affected by air, noise and vibration pollution created by the construction activities.

164. Dust, noise and vibration pollution will cause adverse effects on the health of workers. This impact is expected as moderate to major depending on the operation of project construction machines, land surface structure and depending on locations. This is a short-term impact (within the construction stage) and can be mitigated with the measures proposed below.

165. **Mitigation Measure.** To minimize air, noise and vibration pollution the following measures are recommended:

- Ensure that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying the most stringent legislated standards, whether they would be national or current WHO Air Quality Guidelines, or other internationally recognized sources.
- Ensure that emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards.[35]
- Avoid, or when avoidance is not possible always use, whenever applicable and necessary, recommended prevention and control techniques for VOC emissions, particulate matter and ozone depleting substances.
- Use canvas to cover piled materials and avoid erosion and dispersion of materials.
- Selecting equipment with lower sound power levels
- Installing silencers for fans
- Installing suitable mufflers on engine exhausts and compressor components
- Installing acoustic enclosures for equipment casing radiating noise
- Improving the acoustic performance of constructed buildings, apply sound insulation
- Installing vibration isolation for mechanical equipment
- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas
- Re-locating noise sources to less sensitive areas to take advantage of distance
- Siting permanent facilities away from community areas if possible
- Reducing project traffic routing through community areas wherever possible
- Developing a mechanism to record and respond to complaints

[35] As a general rule, this Guideline suggests 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed. (Impacts should be estimated through qualitative or quantitative assessments by the use of baseline air quality assessments and atmospheric dispersion models to assess potential ground level concentrations.

- Minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house, or cyclone)
- Minimizing dust from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content
- Dust suppression techniques should be implemented, such as applying water to minimize dust from vehicle movements
- Managing emissions from mobile sources
- Avoiding open burning of solid waste

b) Impacts on air quality and surface/ground water quality due to construction vehicle/machinery

166. During the land preparation, earthwork with machines such as bulldozers, rollers, excavators, generators, pneumatic hammering machines and trucks, etc. can emit air pollutants such as dust, SO_X, NO_X, CO, VOC and ozone depleting substances. Particularly, dust created by movement of construction machines at earth ground will be the greatest air pollution source. Activities of construction machines cause noise, vibration and pollution of surface/ground water as well.

167. **Mitigation Measure.** To mitigate the impacts, the following measures are proposed:

- Drivers should be instructed on the benefits of driving practices that reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits
- All construction machinery must have licenses of air emission provided by Vietnam Authority
- Implementing a regular vehicle maintenance and repair program
- All construction machinery is fully licensed and fully equipped with communication devices in order to avoid spillages to the soil or surface water.
- Avoiding or minimizing project transportation through community areas
- Use standard-tested construction equipment, (less emissions and toxic gases, dust ...).
- Requiring the contractor to strictly use standard machines and follow the manuals.
- Using noise control devices, such as temporary noise barriers and deflectors for impact activities, and exhaust muffling devices for combustion engines.
- If a concrete mixer is used on site, the dry concrete mixing has to be conducted in a full covered area at least 500 m away from the residential area. Do not place the concrete-mixer or the asphalt-mixer near the boundaries of the construction site.
- The construction machinery will be checked according to the emission standards of Vietnam for CO, hydrocarbons and smoke.
- Maintain a regular inspection and maintenance of all machinery to ensure good technical conditions.
- Foresee that cleaning of machinery or construction vehicles is done in appropriate facilities to impede contamination from any hazardous substances to surface and groundwater.
- Understand the quality, quantity, frequency and sources of liquid effluents in the Project area. This includes knowledge about the locations, routes and integrity of internal drainage systems and discharge points

- Plan and implement the segregation of liquid effluents principally along industrial, utility, sanitary, and run-off (storm) water categories, in order to limit the volume of water requiring specialized treatment. Characteristics of individual streams may also be used for source segregation.

c) Impacts from transportation of construction materials and waste

168. Transportation of construction materials and waste may generate (i) dust by the movement of vehicles on unpaved access and haul roads; and (ii) noise, emissions (gaseous CO and NO2) and vibration from transport vehicles.

169. **Mitigation Measure.** The following measures are recommended:

- Implementation of a traffic and noise/dust/vibration/emissions management plan (as part of the CEMP) that will include a purpose, scope, safe driving policy, roles and responsibilities (including roles for the contractor site EHS Manager, contractor workers, subcontractor workers and drivers); traffic management procedures; worksite requirements; community safety requirements; performance and monitoring; deliverables (site layout and traffic flow patterns and schedule; road safety rules and practices; training registries; vehicle inspection registries; records of road safety campaigns; monthly transportation performance reports; registry for accidents/incidents and major near misses.
- Establish maximum speeds for ALL vehicles associated with the Project and impose strict penalties for non-compliance (zero-tolerance). The transportation vehicles on road must run properly with a specified speed.
- The transporting material vehicles must be covered to avoid dust falling on the road and impeding the circulation process of surrounding vehicles.
- Frequently water, clean and reinforce the road if necessary.
- Increase the awareness of workers by organizing capacity building sessions, in order to avoid or minimize adverse social impacts.
- Coordinate with local authorities the management of residents to ensure security in the province.
- Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries:
- Emphasizing safety aspects among drivers
  - ✓ Improving driving skills and requiring licensing of drivers
  - ✓ Adopting limits for trip duration and arranging driver rosters to avoid overtiredness
  - ✓ Avoiding dangerous routes and times of day to reduce the risk of accidents
  - ✓ Use of speed control devices (governors) on trucks, and remote monitoring of driver actions
- Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

d) Impacts on Local Hydrology

170. The filling of the existing creek/canals at the Project site can be a major impact on hydrology. The proposed Project design (Figure 8) indicates that a part of existing creek/canals will be filled by the Project, however, this impact can be mitigated to minor by the proposed mitigation measure.

171. **Mitigation Measure.** The impact can be mitigated by Avoiding obstruction and filling of existing natural creek/canals. If waterway alteration is unavoidable, design and construct a flow diversion channel (or sluice) to maintain the original flow, connecting to the surrounding waterway. The design of the diversion channel should be approved by DoNRE in advance of the land clearance.

e) Impacts from generation of hazardous and non-hazardous waste

172. The construction of HCMCUMP Phase 1 with various buildings and auxiliary facilities will produce various kinds of solid wastes (vegetation waste – biomass, mud, spoil, construction waste and sanitary waste, etc.) including hazardous waste (oily waste, used batteries, florescent lamps, etc.). These wastes can damage the environment and workers' and people's health as well if not properly managed.

173. During land clearance, vegetation including mangrove tree belts along the creeks, within the Project site will be cut off. This activity will generate an amount of organic waste (leaves, trunk, root of trees, grass etc.). These wastes may cause water pollution by organic matters and obstruct water drainage systems, if disposed into creeks. Assuming biomass at 5.0 kg/m^2 before land clearance, the total biomass at about 10.0 ha at the Project site is estimated at about 500 tons. However, most trees will be collected by local farmers before construction, thus the impact of the discharged waste is expected as minor.

174. During construction, a large volume of spoil will be moved out while large volumes of sand and crushed stone will be moved in for ground preparation. This kind of solid waste contains no hazardous matter and therefore a part of them, except organic muddy spoils, can be collected for reuse. With no data available about the volume of spoil and the volumes of sand and crushed stone, there is no background to estimate the production of construction waste. It is, however, assumed that for every 1,000 ton of construction materials, 5 tons may require disposal, which can pollute not only air, but also soil, water and landscape along the transport route.

175. Experience from many construction projects in Southern Vietnam, a large amount of muddy spoils will be discharged from the land preparation of soft soil area. They should be collected, separated and transported to disposal sites because they can't be reused for ground construction. In case of construction area of 10 ha, the amount of muddy spoils is estimated at several ten thousands of tons, which can be a large source of environmental impacts: pollution of agriculture land and creeks caused by leakage of pollutants by runoff water; dust pollution and road damage by spoil transport; risks to community health and safety caused by management and disposal of these spoils, reduction of receiving capacity of waste disposal sites in Nhơn Trach District. These impacts are expected as moderate to major but short-term and can be mitigated by measures mentioned below.

176. **Mitigation Measure.** To minimize the impacts of wastes, the following measures are recommended:

- Implement waste management plan (as part of CEMP).
- The waste collection from construction works should be done at designated points only. The waste collection points should be prepared for different types of wastes: construction, hazardous, non-hazardous and domestic solid wastes.

- Install trash bins at worker camps and construction sites.
- Make a contract with licensed waste collection/treatment company to make sure they collect and treat wastes following national regulations.
- Clean the collection points every day.
- For unused dredged materials (spoils), contractor must:
  - ✓ Find a site for disposal; design and construct the disposal site complying with guidelines for environmental protection. This disposal site must be approved and permitted by the DPC;
  - ✓ Properly store dredged materials to avoid erosion and leakage of spoils to the surrounding fields.
  - ✓ Properly transport the unused materials to the disposal site avoiding dust emission and leakage of spoils to road.
- For general waste:
  - ✓ Properly collect all types of construction, industrial and domestic solid wastes generated at the construction sites and segregate them into non-hazardous and hazardous; the waste collection from construction sites should be done at designated points only.
  - ✓ For sanitary (domestic) solid waste: the Contractors must install trash bins in worker camps and every construction site; sign contracts with local functional units for collection and transport of trash to dump sites as stipulated.
  - ✓ For construction wastes such as concrete and rubble, iron or steel odds and ends, damaged formwork, etc.: the wastes that can be recycled such as paper, iron and steel, etc. shall be collected separately and recycled.
  - ✓ Hazardous wastes (oily waste, used batteries and fluorescent lamps, etc.), waste bentonite etc. should be safely collected, classified, temporarily stored, transported and treated in compliance with Circular No. 36/2015/TT-BTNMT and other relevant regulations.
- The procedures for transportation of hazardous materials (Hazmats) should include:
  - ✓ Proper labeling of containers, including the identification and quantity of the contents, hazards, and shipper contact information
  - ✓ Providing a shipping document (e.g. shipping manifest) that describes the contents of the load and its associated hazards in addition to the labeling of the containers. The shipping document should establish a chain-of-custody using multiple signed copies to show that the waste was properly shipped, transported and received by the recycling or treatment/disposal facility
  - ✓ Ensuring that the volume, nature, integrity and protection of packaging and containers used for transport are appropriate for the type and quantity of hazardous material and modes of transport involved
  - ✓ Ensuring adequate transport vehicle specifications
  - ✓ Training employees involved in the transportation of hazardous materials regarding proper shipping procedures and emergency procedures
  - ✓ Using labeling and placarding (external signs on transport vehicles), as required.

f) Impacts from generation of domestic/construction wastewater

177. Experience from other construction project: With an area of 10 ha and with a great number of large size facilities to be constructed, in the construction phase, the number of construction workers at the peak construction period would be 200 at minimum. Water demand of construction workers in the site will be significant. It is estimated that water consumption is 100L/capita/day, i.e. the water demand will be 20 m^3/day at minimum. As such, the volume of wastewater will be at most 20 m^3 per day (80% of which will be lead to the drainage of the construction site). With high contents of organic matters (BOD), nutrients (N, P and their salts), bacteria and pathogens, together with other sources such as effluents from industrial zones and residential areas in Nhơn Trach District, the wastewater, if not properly treated, will cause local surface water pollution.

178. Water pollution will be also created by industrial effluents from machine repair and fuel storage sites, and bentonite generation from bore drilling. But this source is small and the impact is minor and temporary, and can be mitigated with standard pollution control measures at the source.

179. Impacts of wastewaters in the construction phase are expected as minor to moderate, temporary, and can be remedied by appropriate measures of collection and treatment.

180. The main source polluting the local creeks, agriculture, aquaculture lands at the project and surrounding areas would be run-off water from construction sites. In the process of construction, storm water overflowing the project area will cover pollutants such as dust, cement dust, sand and grease. Experimental formula for calculating the maximum runoff (according to M.J. Hammer "Water and Wastewater Technology, 2nd Edition, John Willey & Sons, 1986) is:

$$Q = 0.278 \times K \times I \times A$$

(Q = flow of runoff (m^3/s); K: overflow factor; I: Average intensity of rainfall during the period of highest precipitation (mm/h); A: Area of run-off rain (km^2))

181. Thus, if the project area is 10 ha = 100,000 m^2; the highest rainfall is 179 mm/day (Table 4) and K = overflow factor = 0.3-0.5 (average = 0.4) with bare land, not covered with plastic, concrete, grass, the highest rainy day, the flow of runoff over the construction site will be about 0.398 m^3/s or 34,395 m^3/day during peak rainfall.

182. Runoff can be washed off with soil and sand at high levels, leading to obstructed drainage of the surrounding areas. If this amount of water is drained directly into the creeks and surrounding fields in communes of Long Tan and Phuoc Thien (next to Long Tan commune). The creeks and fields can be contaminated by TSS, turbidity, and possibly even toxic pollutants such as grease or heavy metals, and often causes clogging of the local sewerage system. These are environmental issues that often occur at construction sites. This impact is assessed as major but can be mitigated by technical measures at the source.

183. It is necessary to indicate that at the area close to the Dong Nai River at Long Tan Commune, including the Project site, acid sulfate soils (FAO name: Thionic Fluvisols) occur at deep layers. These soils contain iron sulfide minerals (predominantly as the mineral pyrite) or their oxidation products. In an undisturbed state below the water table, acid sulfate soil is benign. However, if the soils are drained, excavated or exposed to air by lowering of the water table, the sulfides react with oxygen to form sulfuric acid. Release of this sulfuric acid from the

soil can in turn release iron, aluminum, and other heavy metals (particularly arsenic) within the soil. Once mobilized in this way, the acid and metals in run-off water can create a variety of adverse impacts: killing vegetation, seeping into and acidifying groundwater and surface water bodies, killing fish and other aquatic organisms, and degrading concrete and steel structures to the point of failure. This phenomenon has been observed at several construction sites in Dong Nai, Ho Chi Minh City and Mekong Delta. If presence of acid sulfate soils is confirmed, this impact is expected as moderate to major depending on levels of economic damage and cost for land and water treatment and can be minimized by application of measures proposed below.

184. **Mitigation Measure.** To minimize water pollution the following measures are recommended:

- Implement wastewater management plan (as part of CEMP).
- The Contractor will be responsible for compliance with the relevant Vietnamese regulations on wastewater discharges into surroundings (QCVN 14/2008/BTNMT for domestic wastewater and QCVN 40/2011/BTNMT for industrial wastewater).
- Construction wastewater will be directed to temporary detention and settling pits which will be installed/constructed by the contractor prior to the construction work at the Project site, located away from surface waters and sized to the needs. The minimum capacity of detention and settling pits shall be calculated following the practical volume of construction wastewater and rain water at each construction site, when the CEMP is prepared.
- Domestic wastewater may include effluents from domestic sewage, food service, and laundry facilities serving site employees. The contractor will;
  - ✓ Install septic tank(s) prior to the Project construction work. The capacity of the septic systems shall be calculated based on the volume of domestic wastewater generated at each construction site, when the CEMP is prepared.
  - ✓ Segregate wastewater streams to ensure compatibility with selected treatment option;
  - ✓ Provide sufficient number of portable/constructed toilets on site for construction workers, which will be connected to the septic systems installed by the contractor.
  - ✓ Segregae and pre-treat oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into sewer systems.
  - ✓ Sign a contract with Urban Environmental Company, who dispose the sludge from sanitary wastewater treatment system to a lisenced solid disposal site in Dong Nai Province.

g) <u>Impacts on local traffic</u>

185. Two route that may be used for transporting construction materials/wastes may be Ho Chi Minh – Long Thanh Expressway connecting with the Project site by the road (to be constructed under the District Masterplan before the Project's construction work starts) and the road connecting with Nhơn Trach Town going across the residential center of Phuoc Thien Commune. Ho Chi Minh – Long Thanh Expressway is wide, but traffic density is high; the road going across Phuoc Thien Commune is narrow and traffic density is high, too. Therefore, the aggregation of trucks for construction may cause traffic jams and accidents and furthermore, the roads may be damaged. However, transport frequency of project trucks may not be high, these impacts are predicted as minor, temporary and can be prevented with sound transport planning and control.

186. **Mitigation Measure.** To minimize the negative impacts on local traffic, the following measures are recommended:

- In order to mitigate the impacts of material transportation for construction sites on traffic to and from the project site, the Contractor shall take measures such as installation of signaling lights and signs on the access route to construction sites. Warning signs shall be available at the places where accidents are likely to occur. The signs shall include warnings of speed limit for every road section.
- Heaping up and unloading construction materials or machines or equipment along roads shall be prohibited.
- Traffic Police shall strictly control traffic safety along the roads in use for transportation of materials. The local road may be damaged due to heavy duty trucks. When the construction is accomplished, the contractor shall repair the road.
- Since the project may contribute to a significant increase in traffic along existing roads, recommended measures include:
  - ✓ Minimizing pedestrian interaction with construction vehicles
  - ✓ Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations where children may be present.
  - ✓ Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaigns)
  - ✓ Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents
  - ✓ Use locally sourced materials, whenever possible, to minimize transport distances.
  - ✓ Locating associated facilities such as worker camps close to project sites and arranging worker bus transport to minimizing external traffic
  - ✓ Employ safe traffic control measures, including road signs and flag persons to warn of dangerous conditions.

h) Changes in landscape

187. Earth works (leveling, dredging, land clearance etc.) and construction works will change the natural landscape of the Project area. This impact is expected as major, long-term and cannot be fully mitigated.

188. **Mitigation Measure.** To minimize the adverse impact of the change in landscape, the following measures will be applied:

- Preserve existing vegetation when feasible;
- Enforce compliance with building codes of the area
- Plan, implement and maintain an appropriate landscaping program for the site that takes into account restoration or creation of native vegetation cover with local fauna and flora.

i) Impacts of Habitat Loss due to Vegetation Clearance

189. The agricultural ecosystems will change to an urban one. There is no rare, endemic and endangered animal or plant species listed in IUCN List or Vietnam Red Book. All vegetation and wild animal species in the Project area are common in the Nhơn Trach District, Long Thanh and other places in the downstream of the Dong Nai River. Therefore, the ecological change caused

by the Project will not have significant negative impacts on biodiversity and are considered acceptable given the benefits of the project.

190. However, in terms of ecological value and response to climate change, the mangrove tree belts with dominance of Nipa palms and other mangrove trees along the creeks play an important role in the creation of natural habitats for aquatic animals, amphibians, reptiles and water bird species; flood control, and localized soil erosion control. Nipa palm belts are also typical landscapes of Southern Vietnam. Therefore, loss of an area of mangrove trees is assessed as moderate and long-term.

191. As mentioned above, during land clearance, vegetation covers, including mangrove tree belts along the creeks within the project area will be cleared. This will not adversely affect the local ecology but will generate waste biomass and also create conditions for increased soil erosion, increased inundation in the flooding season at upstream areas and reduce the capacity of self-purification of the area. However, the area of vegetation cover to be cleared for construction is not large, thus this impact is expected as minor to moderate.

192. **Mitigation Measure.** To well mitigate the impacts, the following measures are recommended:

- During land clearance, maintain the vegetation and trees, especially the area of mangrove, as much as possible to protect the biological environment as well as the landscape;
- Do not cut down any trees or vegetation outside the Project site;
- Cut off trees step by step according to the project implementation progress, and not in one time;
- Catching and hunting of wild animals is prohibited.
- Properly collect biomass waste (leaves, roots, etc.) for reuse. Do not dispose them into creeks.

j) Impacts from materials extraction at quarry/borrow site

193. Extraction of material will be needed as 10ha of land needs to be elevated by 1-2m at least. Materials required for site preparation and leveling include sand, soil, stones which will be supplied by sub-contractors.

194. **Mitigation Measure.** To well mitigate the impacts, contractor is required to procure materials only from DoNRE authorized quarries. If the contractor shall operate the quarry site, required environmental permits shall be secured prior to operation of quarry/borrow areas. Ensure borrow pits are left in a tidy state with stable side slopes and proper drainage in order to avoid creation of water bodies favorable for mosquito breeding.

k) Impacts of Stormwater, Soil erosion and Land Slide

195. Soil erosion is a common issue in ground preparation and construction. With impact of storm water runoff, solid materials from eroded land may pollute the surrounding creeks and agriculture land, causing damage to aquatic ecosystems and planted trees. Water and land pollution may be more serious if soil erosion occurs at actual acid sulfate soil area. Because the area is flat, soil erosion and landslides are expected as minor to moderate risk, temporary and can be minimized with standard construction practices.

196. **Mitigation Measure.** To minimize soil erosion, the following measures are recommended:

- Ensure proper design of the ground so that storm water could be well controlled; erosion and land slide could be minimized.
- Maintain wild vegetation covers along existing waterways (creek/canals) and ground surface as much as possible for erosion control.
- Provide grass cover and other suitable slope stabilization measures on ground slopes and on long term stockpile of spoils.
- Rainwater flowing over the construction site and water from dug holes shall be pumped to a temporary drainage to be constructed by the contractor prior to construction work. The drainage shall be designed to quickly drain rain water such that local water logging does not occur. Deposit tanks shall be arranged on rain water drains for dregs to settle before wastewater is discharged to the existing waterway. The capacity of the deposit tanks shall be calculated when the CEMP is prepared.
- In case acidic water from the Project site flows into the surrounding land causing soil acidification, it will adversely affect the agricultural fields. To mitigate the impact, the contractor will have to treat acidic soil (pH <5.0) with lime or lime powder. The amount of lime shall be calculated based on th pH and volume of the contaminated soil.

I) Occupational and Community Health and Safety impacts

197. During the construction phase, the health and safety of workers can be adversely affected by the following activities. These impacts depend on the organization and management of the contractor's construction and the employee's compliance with labor disciplines.

- Noise pollution due to construction machinery (compressors, crane, etc.): Large noise (noise levels above 85 dBA) can affect the nervous system, causing stressful mood, hearing loss and high blood pressure, and/or heart rate.
- Dust pollution caused by construction activities: High concentrations of dust in the air, especially dust PM2.5, PM10, heavy metal dust, silicon can cause inhibition of lung function, impaired function of the lungs, lung diseases, acute respiratory disease, cancer.
- Health hazards caused by high concentrations of SO_2, CO, NOx, VOC, PAH from construction machinery and fuel, can cause lung disease and other chronic diseases.
- Traffic accidents: can occur during transportation of machinery and equipment.
- Work accidents can occur due to failure to comply with safety regulations, workers who do not use proper helmets, safety shoes, gloves, masks, protective goggles, etc.
- Accidents caused by electric shock, falling from the ground or other causes, etc.
- Infectious diseases caused by infectious media (dengue fever); Illness caused by virus (flu); social diseases (HIV AIDS etc.).

198. The above impacts are expected as moderate but temporary and can be prevented.

199. **Mitigation Measures.** In order to prevent and minimize safety incidents and to protect worker's and community's health, contractors will implement several synchronous measures proposed below:

- Implement an occupation and community health and safety management plan (as part of the CEMP) to be prepared according to Section 2 on Occupational Health and Safety from the IFC EHS General Guidelines, IFC EHS HCF Guidelines and IFC EHS THD Guidelines.
- IFC EHS Guidelines indicate that employers and supervisors are obliged to implement all reasonable precautions to protect the health and safety of workers. This section provides

guidance and examples of reasonable precautions to implement in managing principal risks to occupational health and safety on:

- ✓ General Facility Design and Operation: Integrity of workplace structures, severe weather and facility shutdown, workspace and exit, fire precautions, lavatories and showers, potable water supply, clean eating area, lighting, safe access, first aid, air supply, work environment temperature
- ✓ Communication and Training: OHS training, visitor orientation, new task employee and contractor training, basic OHS training, area signage, labelling of equipment, communicate hazard codes
- ✓ Physical Hazards: rotating and moving equipment, noise, vibration, electrical, eye hazards, welding/Hot work, Industrial vehicle driving and site traffic, working environment temperature, ergonomics, repetitive motion, manual handling, working at heights, illumination
- ✓ Chemical Hazards: air quality, fire and explosions; corrosive, oxidizing and reactive chemicals, asbestos containing materials (ACM)
- ✓ Biological Hazards
- ✓ Radiological Hazards
- ✓ Personal Protective Equipment (PPE)
- ✓ Special Hazards Environments: confined space, lone and isolated workers
- ✓ Monitoring: accidents and diseases monitoring

- More in detail, some guidelines are essential: ensure the living conditions for workers like facilities for resting, clean water, food, accommodation, and others meet international standards for worker accommodations to prevent communicable, food-borne, water-borne and vector-borne illnesses;
- Full (personal protective equipment) PPE in order to avoid the negative effects on health, prevent diseases and not affect the environment of the residential areas;
- When executing works in height, transporting, handling and installing the machinery and equipment, workers should be equipped with all means of PPE such as protective helmets, masks, reflective clothing, lights and flags.
- Workers will be trained on manipulation, testing, commissioning and technical correct and timely response when problems occur;
- Provide a workforce health/emergency services on site
- Especially for community's health and safety;
  - ✓ Restrict access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community.
  - ✓ Remove hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials.
  - ✓ The incidence of road accidents involving project vehicles during construction should be minimized through a combination of education and awareness-raising, and the adoption of procedures.

- ✓ Deploy information, education and behavior change communication to workers on communicable diseases as appropriate (e.g. sexually transmitted infections, including HIV, vector-borne diseases), road traffic safety and driving behavior through communities, and respectful interaction with local populations.

m) Impacts on local society and economy due to work force influx

200. It is anticipated that in peak periods, the construction will require more than 200 workers at the site. As other construction projects in Dong Nai Province, it is expected that most workers will come from other provinces; most of them will live in construction workers camp; most of them have demands for food, drinking, basic service etc. in residential areas in Phuoc Thien and Long Tan communes.

201. Influx of a big number of workers may create positive impacts to the project communes: the spending by workers may contribute to the income increase of some local shop holders around the Project site. However, large worker influx during project construction may cause the following environmental and social impacts:

- Increased burden on social infrastructure and services, such as water and sanitation systems;
- Increased environmental pollution by generation of domestic wastes: about 200 kg/day of solid waste, 20 m^3/day of domestic wastewater, assuming that 1 worker living in workers camp generates 1.0 kg/day of domestic solid waste and 100L/day of domestic wastewater.
- Transmission of communicable diseases between workers and local residents: Even though the hygienic and medical conditions are good in the Project communes, as a result of poor hygiene at workers camp and daily contacts between workers and local residents, transmission of communicable diseases via the environment (such as Dengue fever, diarrhea, dysentery, cholera, or SARC (severe acute respiratory syndrome) or sexual contact (HIV/AIDS, and others) could occur among workers and local residents. This matter may arise when a large number of workers aggregate. Nevertheless, experiences from other large construction projects in Dong Nai Province and Ho Chi Minh City indicate that this impact is minor and avoidable, if location of workers camp is not close to residential sites and health management at worker camps is good.
- Conflicts between construction workers and local residents: In many cases, conflict may arise between workers and local residents due to one of the following causes: difference in habits; difference in income; worker's disrespect of local historic, cultural or traditional relics. However, experience from other large–size construction projects in Dong Nai Province indicates that conflicts between local people and construction workers are minor or may not happen, if the location of worker camps is not close to residential sites and contractor's worker management is good.
- Increase in social evils: Some social evils (for instance, gambling, prostitution, narcotic use, etc.) may increase as a result of workers' aggregation in the Project site that leads to poor social security and discipline. However, experience from other large–size construction projects in Dong Nai Province indicates that this phenomenon is very minor, if location of worker camps is not close to residential sites and contractor's worker management is good.

202. **Mitigation Measures.** In order to avoid conflicts between construction workers and local inhabitants, the following measures shall be taken:

- Employ as many local people as possible for simple jobs (earthwork, material transport, cooking, safeguarding, etc.).
- Use local suppliers of goods and services where possible.
- Frequently educate workers about relationships with local residents and communicable diseases.
- Register the temporary residence of workers with local police
- Closely collaborate with local authority and organization to monitor and control illegal activities related to construction workers
- The contractor will make a list of temporary absences and residence of workers at site and should enforce site rules at all times.

n) Impacts on physical cultural resources (PCRs)

203. Based on surveys undertaken by the consultant and consultations with local authorities, there are no known PCRs within the project boundaries, therefore impacts on PCR is not anticipated.

204. **Mitigation Measure.** However, chance find procedure will be established and activated if any chance finds of PCRs are encountered:

- Relocate according to local standards and traditions, existing scattered graves (if any are found) in the area. Construction activities will be immediately suspended if any PCR are encountered and can only be resumed after assuring these resources are conserved and avoidance of destroying and damaging is assured by providing for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation. Construction activities can resume only after thorough investigation and with the permission of Provincial Department of Culture, Sport and Tourism.
- The project will not remove any physical cultural resources unless the following conditions are met:
  - ✓ No alternatives to removal are available.
  - ✓ The overall benefits of the project substantially outweigh the anticipated cultural heritage loss from removal
- Any removal is conducted in accordance with relevant provisions of national and/or local laws, regulations, and protected area management plans and national obligations under international laws, and employs the best available techniques.

2. Summary of Mitigation Measures in the Construction Phase

205. It is considered the above foreseen adverse impacts are moderate in general since they are medium or major in magnitude but the sensitivity of the receptors (natural as well as social receptors) is considered as not high. It is expected that impacts will be minor if all mitigation measures are properly applied. Most of the impacts will also be temporary, i.e. limited to the construction phase.

206. Measures to mitigate potential impacts are defined in the Environmental Management Plan (EMP) under Chapter IX, in order to meet ADB SPS 2009 and be in line with relevant IFC EHS Guidelines.

207. The IFC EHS General Guidelines indicate conservation opportunities, which are applicable to HCMCUMP Phase 1, for energy efficiency, heat distribution system, energy conversion system efficiency improvements for process cooling, and energy conversion, and also indicate water conservation measures like water monitoring/management techniques, process and cooling/heating water recycling, reuse, and other techniques and sanitary water conservation techniques (for example: storm/rainwater harvesting and use, zero discharge design).

208. More in detail, the IFC EHS Health Care Facility Guidelines (HCF, applicable to the medical laboratories and research facilities of HCMCUMP Phase 1) identify HCF design considerations to ensure the separation of materials and people flows, development of adequate disinfection facilities, adequate space for storage of materials, selection of heating and ventilation systems that prevent airborne infections, design of water systems, provision of hazardous materials and waste storage and handling areas, treatment and exhaust systems for infectious agents and selection of easily cleaned building materials. The IFC EHS Guidelines for THD (applicable to the accommodation and catering facilities of HCMCUMP Phase 1) identify potential EHS issues like increased demand on limited local infrastructure including roads, water supply, and liquid effluent and solid waste disposal capacity, and increased stress on ecologically sensitive areas.

209. Furthermore, all workers will undergo a site induction/orientation that will highlight expectations on minimizing impacts to the physical and social environment. There will be an on-site and off-site code of conduct established that will outline roles, responsibilities and consequences for non-compliance. Prior to construction, the Contractor Environmental Management Plan (CEMP) will have its Impact Mitigation Plan updated based on the EMP of this IEE, to include more detailed information regarding (a) Traffic and noise/dust/vibration/emissions management plan; (b) Waste management plan; (c) Wastewater management plan; (d) Worker accommodation management plan; (e) Occupational and Community Health and safety management plan; and (f) Grievance redress mechanism.

210. As examples of mitigation measures to be implemented, solid waste and domestic wastewater deposition and collection equipment will be available on site and for worker accommodations. The design of the Project should include best practices mentioned in the IFC EHS Guidelines like (i) establishing waste management priorities at the outset of activities based on an understanding of potential EHS risks and impacts and considering waste generation and its consequences, (ii) establishing a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes, (iii) avoiding or minimizing the generation waste materials as far as practicable, (iv) recovering and reusing waste, and (v) where waste cannot be recovered or reused, treating, destroying, and disposing of it in an environmentally sound manner.

211. If any hazardous waste is foreseen to be produced, it will always be segregated from non-hazardous wastes and if its generation cannot be prevented, its management should focus on the prevention of harm to health, safety and the environment following the principles of (i) understanding potential impacts and risks associated with the management of any generated hazardous waste during its complete life cycle, (ii) ensuring that contractors handling, treating and disposing of hazardous waste are reputable and legitimate enterprises, licensed by the

relevant regulatory agencies and following good international industry practice for the waste being handled, and (iii) ensuring compliance with applicable local and international regulations (which may include host country commitments). If any hazardous health care waste is foreseen to be produced in the medical laboratories and research facilities, there should be an health care waste management system adequate for the scale and type of activities which should include the components (i) waste minimization, reuse and recycling (ii) waste segregation strategies, (iii) on-site handling, collection, transport and storage, (iv) transport to external facilities, (v) treatment and disposal options.

212. All transportation vehicles and construction machinery need to meet the most stringent Vietnamese or International standards for noise, vibration and emissions and be regularly maintained to assure compliance. Dust generated during the site preparation phase will be mitigated through watering and all materials will be stored appropriately, following IFC EHS General Guidelines, HCF and THD and according to each material specification for safe storage.

213. Occupational health and safety in line with IFC EHS Guidelines and other regulations are to be followed in order to avoid or minimize risk injuries to workers (usage of Personal Protective Equipment (PPE)), identification of pathways and working areas, clear identification of hazardous materials on site, and others.).

214. Community health and safety risk mitigation will be outlined clearly in the works contracts and at minimum will include: engaging with local villages and communes along transportation corridors with traffic safety awareness campaigns, imposing speed limitations with zero tolerance clauses in the worker codes of conduct for non-compliance, traffic signs on entry and exit points of the construction site, signs inside villages of caution with the transportation machinery and others. Natural vegetation should be cleared only up to the extent necessary.

215. It is considered that after implementation of mitigation measures these impacts will be, in general, minor, since the magnitude will be medium only and the sensitivity of the receptors is considered as low.

D. PROJECT IMPACTS DURING OPERATION PHASE

1. Anticipated Impacts

a) Impacts of Traffic Increase

216. During the operation phase, the air environment in the project area is likely to be better in comparison with that in the construction phase, since there will be no more dust or exhaust emissions from machineries. Nevertheless, emissions from vehicles for students and employees could have some localized impact as a result of traffic increase. The increase in traffic may also increase the traffic accidents in the Project area.

217. **Mitigation Measure.** To well mitigate the impact of increased traffic, the following measures are proposed:

- Promote collective transportation to the area.

- Promote use of active modes of transportation (walking and cycling) inside the campus. Incentivize walking, cycling, and use of public transport by students and staff. (for example. through active transport campaigns, shared cycling schemes, cycling clubs).
- If needed, frequently water any internal roads to reduce dust and keep the roads cleaned.
- Since the project may contribute to a significant increase in traffic in the Project area, in order to mitigate the risk and impacts of traffic accidents;
  - ✓ Increase the awareness of workers and students by organizing capacity building sessions
  - ✓ Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaigns)
  - ✓ Collaborate with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations where children may be present.
  - ✓ Ensure a vehicular speed limit on site.
  - ✓ Employ safe traffic control measures, including road signs and flag persons to warn of dangerous conditions
  - ✓ Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries:
  - ✓ Coordinate with emergency responders to ensure that appropriate first aid is provided in the event of accidents

b) Impacts of solid/liquid waste including hazardous and non-hazardous wastes

218. In the Operation Phase, the main source of solid waste will be domestic waste from people working, studying and living in campus. With 6,050 students and 200 employees for Phase 1, assuming 10% of them will stay full day, 90% of them will stay a half of day in the campus, and the average generation of domestic solid waste of 1.0kg/person/day, the amount of domestic solid waste will be 3,437.5 kg/day.

219. With main components of domestic solid waste such as food odds and ends, nylon bags, scrap paper, used cans and glasses, etc., this kind of waste, if not properly collected and treated, will damage landscape, pollute the environment and threaten residential areas nearby.

220. Domestic waste from service zones and offices usually occupies a large portion of the total waste generated in the whole student living zone. Its main components are also food packaging, food odds and ends, scrap paper and hazardous wastes including fluorescent tubes (Hazardous Waste Code: 16 01 06), used lead batteries (Hazardous Waste Code: 19 06 01), oily wastes etc. If hazardous wastes will be disposed together with domestic waste, its risk to the environment would be high.

221. Medical solid wastes contain various components: Non-hazardous domestic solid wastes; Sharp objects: needle, scalpel, blade, broken glass, razor, syringe; Infectious wastes: gauze, paper towels, stools, medical instruments and bacterial culture in the laboratory; Radiation: unused liquid radiotherapy or laboratory research fluids; Pathological wastes: fluids, tissues, blood, body parts, body fluids and infected animal carcasses; Medicine: Unused vaccines and vaccines have expired; Chemicals: detergents, laboratory solvents, batteries, and

heavy metals from medical devices such as mercury from a broken thermometer; Toxic wastes: highly toxic type of medical waste that causes cancer, teratogenicity, or mutagenic effects.

222. Many of the above types of wastes are hazardous wastes. According to the Environmental Management Department of MOH (28 December 2017) in Vietnam hazardous wastes occupy about 23% of the total medical solid wastes. In case of poor management medical wastes may affect the natural environment and public health. This impact is expected as moderate but can be mitigated.

223. Combining domestic and medical solid waste generated by the above sources it is found that this amount of wastes is large, and its environmental impacts will be moderate, long-term but controllable by taking proper measures in collection, segregation, transport and treatment.

224. **Mitigation Measure.** To properly mitigate the impacts of solid and hazardous wastes in the operation phase, the Campus must conduct the following measures:

- For non-hazardous solid wastes:
  - ✓ Each housing block must install 3 types of solid waste containers with labels: organic, inorganic and reusable;
  - ✓ All domestic wastes must be collected, segregated and hauled to trash collection points by sanitation workers with trash trolleys. Trash collection points will be enclosed with walls and covered with sheets. From the points, trash will be transported by a licensed waste collection/treatment company.
- For hazardous and medical solid wastes:
  - ✓ Segregate hazardous and non-hazardous wastes;
  - ✓ Hazardous and medical wastes should be managed complying with MoNRE and with the Joint Circular 58/2015/TTLT – BYT-BTNMT dated 31 December 2015 of MOH and MoNRE on management of medical wastes.
  - ✓ Arrange a specific storage zone for hazardous waste, equipped with cement-floor, enclosing walls, roof to store trash containers that are coded for every sort of hazardous waste.
  - ✓ Register hazardous waste sources
  - ✓ Hire a functional licensed hazardous waste collection/treatment company.
  - ✓ Medical waste may be burned by a specific incinerator, permitted by provincial DoNRE.
- Minimize hazardous waste generation by implementing stringent waste segregation to prevent the commingling of non-hazardous and hazardous waste to be managed.
- Provide training and incentives to employees in order to meet objectives.

c) Impacts of wastewater

225. The demand for water in the operation phase is calculated based on the expected number of 6,500 students and 200 employees. According to the Water Drainage Plan of Nhơn Trach District to 2020 (Decision N2957 of Dong Nai PPC, 29/ Oct./ 2009), at 2020 the daily average water consumption will be 150L/person/day. Phase 1 provides accommodation for 681 (666 students and 15 staff). Assuming only 10% of students will permanently live on the Campus, and that 90% will commute daily to the Campus using only 30% of water supply norm, the demand for water in the Campus is calculated at 353 m^3/day. Given the discharge of

domestic wastewater accounts for 80% of supplied water, the daily domestic wastewater generated will be about 282 m^3 (**Table 2**).

226. Employing the discharge coefficient of Aceivala (1983), the biological oxygen demand (BOD) load per capita per day is 45 – 54g (50g on average) and the flow rate and BOD load in domestic wastewater in the Campus is estimated as 282 m^3 and 141 kg, respectively. With this BOD load, BOD content in domestic wastewater is 510 mg/L or 10 times higher than the permissible limit guided in Vietnam National Technical Regulation for Domestic Wastewater (QCVN14:2008/ BTNMT; Column B, K=1,0).

227. Therefore, if domestic wastewater will not be treated to meet QCVN14:2010/BTNMT prior to discharge, the receiving environment (the creeks within the Campus) will be polluted. This impact is expected as moderate, long term but easily controllable by the measures proposed below.

228. In addition to domestic wastewater from people living in the Campus, it is necessary to consider the impacts of various sources of wastewater generated from laboratories and technical facilities, which may contain not only organic matters, nutrients, bacteria, pathogens but also mineral oils and other hazardous substances. Amounts are expected to be very small, but inadequate management of these wastewaters could have detrimental impacts on the environment and public health.

229. Runoff water flowing over the site area will be one pollution source. Runoff water in this stage is predicted similarly with the one in the Construction Phase. In the Operation Phase, a major part of the project surface will be covered by concrete or vegetation covers then the contents of pollutants in runoff would be much lower than those in the construction stage.

230. According to WHO statistic data in relation with ground surface covered with concrete, contents of pollutants in runoff are usually as follows: 0.5 – 1.5 mg N/L; 0.004 – 0.03 mg P/L; 10 – 20 mg COD/L and 10 – 20 mg TSS/L. Considering the contents, it is possible to state that runoff water is much cleaner than industrial wastewaters after treatment to meet standards of National Technical Regulation for Industrial Effluents (QCVN 40:2011/BTNMT, Source Class B) and it will therefore be discharged directly to the planned drainage of the site.

231. **Mitigation Measure.** In the operation phase the following measures for wastewater management are recommended

- Wastewater from buildings established under Phase 1 shall be separately collected as wash water and toilet water:
  - ✓ Wash water: including wastewater from lavatory basin, bathrooms, toilet floors and canteens shall be driven to waste stacks in connection boxes, then to manholes of wastewater collection systems (downstream of septic tanks) to be treated in wastewater treatment stations of the Campus.
  - ✓ Toilet water shall be collected in soil stacks (separately from waste stacks). Toilet water shall be discharged to septic tanks of every building before discharge to the wastewater treatment station of the Campus.
- The Project Owner must install adequate capacities for the treatment of wastewater from the whole Campus. A pre-fabricated, compact and closed wastewater treatment plant may be most appropriate given the relatively small volume of wastewater and the proximity to lecture

and dormitory facilities. Such a facility would require approximately 170 to 280 m^2 of land but can be installed underground. The waste water after treatment shall achieve the permissible limits in National Technical Regulation for Domestic Wastewater (QCVN 14: 2008/BTNMT; column B, K = 1.0) and was led into the drainage system of the district (Chapter III-III.D, paras.66, 67, 68).

d) Impacts of offensive smell

232. In the operation stage, smell pollution may be due to one of the main causes as follows:

- Decay of organic matters and nutrients in domestic wastewater;
- Smell from waste storage as a result of the decomposition of organic matters in domestic waste;
- Smell from waste collecting chutes, if not frequently cleaned;
- Smell from public toilets.

233. The impact of offensive smells is local (around the sources) and, therefore, assessed as minor and controllable by the following measures:

- Properly manage domestic wastewater and solid wastes at buildings, offices and other places in the Campus;
- Well clean toilets in buildings, offices and other places in the Campus;
- Carry out odor control at the centralized wastewater treatment stations and at temporary solid waste storage sites.

e) Impacts from land changes on landscape

234. The creation of a Campus with various buildings will greatly change the agricultural habitats into urban habitat. This is expected a major and long-term impact but mitigation is impossible.

235. **Mitigation Measure.** To mitigate the impact, the campus will be planned accordingly to the adaptation to the actual landscape to imprint the least impacts possible.

f) Impacts on Occupational and Community Health and Safety

236. **Fire Risk:** In the operation of the campus, there are many causes of fire, but the main ones include:

- Short circuits in housing areas, cooking carelessness in families, gas leak in family kitchens, etc.;
- Electrical system or transformer station in housing areas being thunderstruck;
- Short circuits in automobiles or motorcycles in housing areas.
- Failure to comply with fire regulations on fueling standby electric generators.
- Carelessness of people living or working in the buildings.

237. Any fire, particularly in high buildings, can lead to severe damages to human beings and assets. Therefore, the Campus Management Board must take proper measures to prevent and respond to fire. Hazardous wastes and hazardous areas are also sources of health impacts.

238. **Earthquake and natural calamities:** The design of the Campus ensures to tolerate with the change of climate the project province is not located in the high risk of natural

disasters. Therefore, impacts of Earthquake and Nhơn Trach District, natural calamities are expected as minor with a low probability.

239. **Power failure:** In the operation stage, a power failure may occur as a result of short circuit, overload, or natural calamity, and a range of operations in the buildings will be stopped, those include elevators, ventilators and pumps. That will severely affect the living of residents in the building as well as services there.

240. **Mitigation measure.** Fire and failure of building safety may cause impacts on community health. However, this impact may not be anticipated because at present there are very few households living closed tho the Campus but number and density of population in the surrounding area is not clear. The following measures are recommended:

- Provision of training on EHS to the staff
- Provision of training on EHS to the staff
- Prepare instruction board or post with practices and guidance on safety risk by fire etc. on public places inside the campus to teachers, students and other staff.
- Training to all new employees to ensure they are apprised of the basic site rules of work and the necessary procedures for an emergency situation (fire, failure of buildings, accidental and natural hazards, others).
- Hazardous areas, installations, materials, safety measures and emergency exits should be marked properly and in accordance to international standards;
- Copies of the hazard coding system should be posted outside the facility at emergency entrance doors;
- Information on the hazardous materials at the facility should be shared proactively.
- Against power failure, providing stand-by electric generators for housing areas; maintain a technical team for examination, maintenance and service of electric generators as well as the power grid so as to ensure immediate response to any incident. Cooperate with Provincial Department of Public Security for training against fire, natural hazards
- Provide visual safety instruction at public places for community
- Provide instruction on first aid to reduce accidental damage.
- Incorporation of siting and safety engineering criteria to prevent failures due to natural risks posed by earthquakes, wind, flooding, landslides and fire. To this end, all project structures should be designed in accordance with engineering and design criteria mandated by site-specific risks, including but not limited to seismic activity, slope stability, wind loading, and other dynamic loads
- Application of locally regulated or internationally recognized building codes to ensure structures are designed and constructed in accordance with sound architectural and engineering practice, including aspects of fire prevention and response
- Engineers and architects responsible for designing and constructing facilities, building, plants and other structures should certify the applicability and appropriateness of the structural criteria employed.
- Depending on the nature of a project, guidance provided in the ICC or comparable codes should be followed, as appropriate, with respect to:
  - ✓ Existing structures
  - ✓ Soils and foundations

- ✓ Site grading
- ✓ Structural design
- ✓ Specific requirements based on intended use and occupancy
- ✓ Accessibility and means of egress
- ✓ Types of construction
- ✓ Roof design and construction
- ✓ Fire-resistant construction
- ✓ Flood-resistant construction

- Project sponsors' architects and professional consulting engineers should demonstrate that affected buildings meet these life and fire safety objectives.
- Life and fire safety systems and equipment should be designed and installed using appropriate prescriptive standards and/or performance based design, and sound engineering practices.
- Life and fire safety design criteria for all existing buildings should incorporate all local building codes and fire department.

g) Impacts on local society and economy due to an increase of social crimes/tensions

241. There will be a higher pressure on the social infrastructures (like public spaces, physical cultural resources, restaurants and other services) and the possible increase of social unrest and dissemination of new diseases. On the other hand, socially speaking, the Project will bring more benefits than negative impacts since there will be more work, the commerce will develop faster and on the long run, the living conditions in the Province will improve.

242. **Mitigation measure.** To mitigate the impact, the following measures are recommended:

- Prioritize local people in training and employment in particular those who were directly affected by the land acquisition.
- Organize and participate in campaigns to promote harmonious lifestyle and to prevent discord between workers and local people.
- Ensure the public, green, recreational and cultural spaces within the campus are accessible to local populations.
- Have adequate public consultation and information disclosure actions that the public opinion can be recorded and heard in a timely manner. Public consultation should be performed during all phases of the Project.
- Create a grievance mechanism to collect, monitor and respond to arisen social and cultural issues during the HCMCUMP Phase 1 operation.
- Capacity building and awareness of environmental sanitation to community in the region and participate in volunteering Labor Days for environmental protection.
- Supervise and educate, inspect the implementation of regulations on hygiene, security and order, prevention of social evils.
- Close collaboration with local authority and organization to monitor and control illegal activities related to workers or students.

- Mitigate any impacts on the existing infrastructure arising from the 6,050 students and 200 staff, like accommodation, restaurants, supermarkets, health facilities, schools for the staff's children and any others:
  - ✓ It is expected private business will rise in the area to accommodate the rising needs
  - ✓ It is expected some of the directly affected people will apply their compensation into their own businesses to suppress the needs of the incoming immigration.

2. Summary of the Predicted Impacts in the Operation Phase and Proposed Mitigation Measures

243. The foreseeable adverse impacts for the Operation Phase are mainly considered as moderate if no proper mitigation measures applied. However, they will be minor and even negligible after mitigation measures are applied. The Project is considered to be beneficial for the surrounding area of influence, the surrounding communes and the country in general.

E. CLIMATE CHANGE IMPLICATION

1. Scenarios of Climate Change in Dong Nai Province

244. According to the MoNRE Scenarios of Climate Change (2016), in Dong Nai Province, in the period 2046-2065, atmospheric temperature is projected to increase by approximately 2^{o}C, rainfall at 13.3 % in comparison with the period 1986 – 2005; sea level in 2060 at the mouth of the Dong Nai River will increase by 28 cm in comparison with that in 2005. The area is not subject to frequent typhoons.

2. Impacts Caused by Increased Flood and Inundation

245. The project area is located near by the Dong Nai River. According to the Map of Flood Area issued by Ministry of Natural Resources and Environment (MoNRE) (2016), the Project area is not located within a high inundation risk area. According to the Climate Change Response Plan of Dong Nai Province (2010), the Project area is not located within an area strongly affected by increased floods and the Project area is not likely to be affected by droughts, storms, and landslides.

246. But given the low and flat land, not far from the Dong Nai River, the area may be partly inundated in case of high tide. Therefore, appropriate design and construction of ground at high elevation is needed to avoid flooding in the high flood season.

3. Impacts by Change in Hydrological Regime and Increased Water Salinity

247. The campus may not have a bridge or construction facility going across the rivers, but it is constructed at the lowland area which may be affected by river tidal regime. Therefore, the project design and construction must consider hydro-meteorological parameters (e.g., river water level, peak river flow, etc.).

248. In the recent years, the Dong Nai River water salinity at this section has increased in the low flow period, affecting water supply for domestic use, therefore, this issue must be considered not only in the design and construction of water supply system for the campus but also in the Operation Phase. However, water for the campus will be supplied from the municipal water supply system of Nhơn Trach District (para. 65) and will not take raw water of Dong Nai River for piped water supply.

4. General Assessment of Climate Change Impacts to the Project

249. From above analysis it may initially assess:

- Impacts of climate change on project location and design are not likely.
- Impacts of climate change would not affect the project outputs.
- The increase of temperature, rainfall and river water salinity will not be high, therefore, it does not strongly affect the maintenance (scheduling and cost) of project outputs.

5. Project's contribution to Climate Change (Greenhouse Gas Emissions)

250. **Total Greenhouse Gas Emissions.** The project will generate greenhouse gas emissions (GHG) during construction and operation of the campus facilities. Based on Table 1, the project will establish 15 buildings with a total floor area of 44,754 m^2.

251. Many studies have attempted to quantify the GHS emissions that the building industry including three main stages of cycle life (Construction, Operation and Demolition) is responsible for. According to the work conducted by (Williams et al. 2012)[36], the amount of embodied GHG emissions represent 1/5 of total life cycle emissions. (Sartori and Hestnes. 2007)[37] conducted a statistic study of 60 buildings with an assumption of 2 years for construction and 50 years for operation, and the ratio of the amount of carbon emissions between construction and operation is 1:4. Consequently, the carbon emissions intensity can be calculated, which is 0.38 tCO2e/m^2 Yr during the construction process and 0.06 tCO2e/m^2 Yr.

252. Moreover, to estimate an emission intensity for the Project, it is necessary to refer to other studies. (Hong et al 2015)[38] and (H. Yan et al 2010)[39] estimated the carbon emission intensity from many international studies for building construction phase of different types of building with the respective structures, construction floor areas. Per these estimates, GHG emission intensity from residential buildings (72-770 $kgCO_{2e}/m^2$) is smaller than that from office or commercial buildings (160-803 $kgCO_{2e}/m^2$), and that from buildings with reinforced concrete structure (160-803 $kgCO_{2e}/m^2$) is larger than that from buildings with concrete and brick structure (257-606 $kgCO_{2e}/m^2$). Assuming that the university is more similar to office and commercial buildings than residential buildings or hotel, and given the nature of works consisting primarily of a mix of concrete and masonry, this IEE uses the range of 257-606 $kgCO_{2e}/m^2$ for construction and 0.06 $tonCO_{2e}/m^2$ for operation to estimate the GHS emissions of the Project. Thus, with total construction floor area of 44,754 m^2 the GHS emission intensity from construction of the Project is in a range of 10,260 tons of CO_{2eq} to 24,193 $tonCO_{2eq}$ during

36 Williams, D., Elghali, L., Wheeler, R., France, C., 2012. Climate change influence on building lifecycle greenhouse gas emissions: Case study of a UK mixed-use development. Energy and Buildings 48, 112–126.

37 Sartori, I., Hestnes, A.G., 2007. Energy use in the life cycle of conventional andlow-energy buildings: a review article. Energy and Buildings 39, 249–257.

38 Hong J.K., *Shen G.Q.P., Feng Y., Lau W.S.T., Chao M. (2015). Greenhouse Gas Emissions during the Construction Phase of a Building: A Case Study in China, Journal of Cleaner Production, Vol 103, 249–259. (SCI, 5YIF=4.167)

39 Yan, H., Shen, Q., Fan, L. C. H., Wang, Y., Zhang, L., 2010. Greenhouse gas emissions in building construction: A case study of One Peking in Hong Kong. Building and Environment 45 (4), 949–955.

3 years and 4 months of construction. GHG emissions during facility operation is anticipated to amount to 2395 tons of CO_{2eq} per year.

253. **GHG emission reduction.** The design of the facilities plays a key role to GHS reduction. Howarth and Hadfield note that "the issues of sustainability are often neglected in design or expected to be someone else's responsibility" (Howarth et Hadfield. 2006)[40], Nielsen added that "the energy performance aspects are often not assessed before the detailed building design has been decided. At this stage of the design process only small changes to the building design are possible and the changes often result in high extra expenses." (Nielsen. 2002)[41] Accordingly, "decisions made during early stages of a building design process would have substantial impact on the performance of the resulting building." (Pollock et al. 2009)[42]. Therefore, according to (Dawood, S., et al 2013)[43] the following key criteria related to energy performance that are advantageous to address within the design process and how consideration of these issues can be further integrated into current working practices:

- Any process adopted must be compatible with the RIBA[44] work stages;
- Building orientation, shape and wall-window ratio have the most significant impact on energy performance;
- Consideration of both passive and active renewable energy technologies is essential;
- Occupant comfort must be included in any energy optimization process of building designs;
- Any process adopted must have the flexibility to ensure that client requirements can be prioritized.

254. During detailed design process and construction: GHS emissions from the construction industries are generally coming from:

- Materials manufacturing (e.g., concrete, wood, steel…) according to (Hong et al. 2015) the GHS emission for construction from building material production accounts for 94% of the total emissions.
- Materials and wastes transport account for 3.64% of GHS emission for construction
- Equipment transportation (0.44%) and off-site office staff activities (1.89%) have a small contribution to total emissions.

255. It is recommended to apply the following strategies to reduce GHG emission during the detailed design and construction including:

- Selecting materials having low emissions factors associated (e.g., recycled materials)
- Selecting material suppliers as close as possible from the construction site

40 Howarth,G.,&Hadfield,M.(2006).A sustainable product design model. Materials and Design, 27, 1128-1133.

41 Nielsen, T. (2002). Optimization of buildings with respect to energy and indoor environment, department of civil engineering. Danmarks Tekniske University

42 Pollock, M., Roderick, T., McEwan, D., & Wheatly, C. (2009). Building simulation as an assisting tool in designing an energy efficient building: a case study. In the IPBSA building simulation conference of simulation experts Glasgow, UK,. July

43 Dawood, S., et al. Designing low carbon buildings: A framework to reduce energy consumption and embed the use of renewables. Sustainable Cities and Society (2013)

44 RIBA, Outline RIBA plan of work (2008).

- Construction waste should be used in recycling instead of landfills or disposal sites.

256. For the operation of the Project, from the building energy consumption percentages, the demanded services of building in terms of ventilation and air-conditioning (VAC) systems account fo more than 60% of total consumption (Mardiana, A. 2012)[45]. Whilst, lighting accounts for approximately 11 to 20% of total building energy demand. Some recommendations to reduce GHS emissions during operation are:

- Adjusting working and learning hours appropriately to seasons to be able to use as much as possible natural sunlight instead of artificial lights.
- Regularly conducting campaigns to raise awareness of students, staffs on saving energy consumption.
- Planting trees and developing green spaces within the campus of the University.

F. INDIRECT, CUMULATIVE OR INDUCED IMPACTS

257. Indirect impacts are adverse and/or beneficial environmental impacts which cannot be immediately traced to a project activity but can be causally linked. Induced impacts are adverse and/or beneficial impacts on areas and communities from unintended but predictable developments caused by a project which may occur later or at a different location. Cumulative impacts are the combination of multiple impacts from existing projects, the proposed project, and anticipated future projects that may result in significant adverse and/or beneficial impacts that would not be expected in case of a stand-alone project.[46]

258. Some indirect or induced impacts in the Operation Phase can be foreseen as follows:
(i) in-migration,
(ii) traffic congestion on roads adjacent to the campus,
(iii) accidents along community roadways owing to increases in transport activity in the project area of influence.

259. Furthermore, some cumulative impacts are expected, considering the development of the consequent phases of campus development, and the development projects in Long Tan and Phuoc Thien Communes:

(i) the effects on ambient conditions such as the incremental contribution of pollutant emissions in the airshed,
(ii) the increase in water pollution for the creeks in the Campus and in Long Tan and Phuoc Thien Communes as well as for the Dong Nai River, receiving drainage from the creeks;
(iii) the reduction of water flow in the watershed due to multiple withdrawals,
(iv) the increases in sediment loads on the watershed of the area or increased erosion,
(v) the pressure on the carrying capacity of the environment, growth of mangrove vegetation and the survival of wild animals in the local ecosystems.

260. The cumulative impact was assessed as part of the SEA conducted for Nhơn Trach New Urban Master Plan which was approved by the Prime Minister in 2016, and will be addressed in the course of the implementation of the Master Plan.

45 Mardiana, A, RiffatSB (2012) Review on heat recovery technologies for building applications. Renewable Sustainable Energy Rev 16: 1241-1255.
46 ADB. 2011. Sourcebook for Safeguard Requirement 1: Environment. ADB, Manila.

VI. Analysis of Alternatives

261. Three options below, including “zero option” (i.e. no-project option), were considered for the Project.

Option 1: HCMCUMP Phase 1 in Phuoc Tan commune, Long Thanh District, Dong Nai Province

Option 2: HCMCUMP Phase 1 in Long Tan Commune, Nhơn Trach District, Dong Nai Province (SELECTED)

Option 3: Zero option (no project)

262. Locations of Option 1 and Option 2 are indicated in Figure 34.

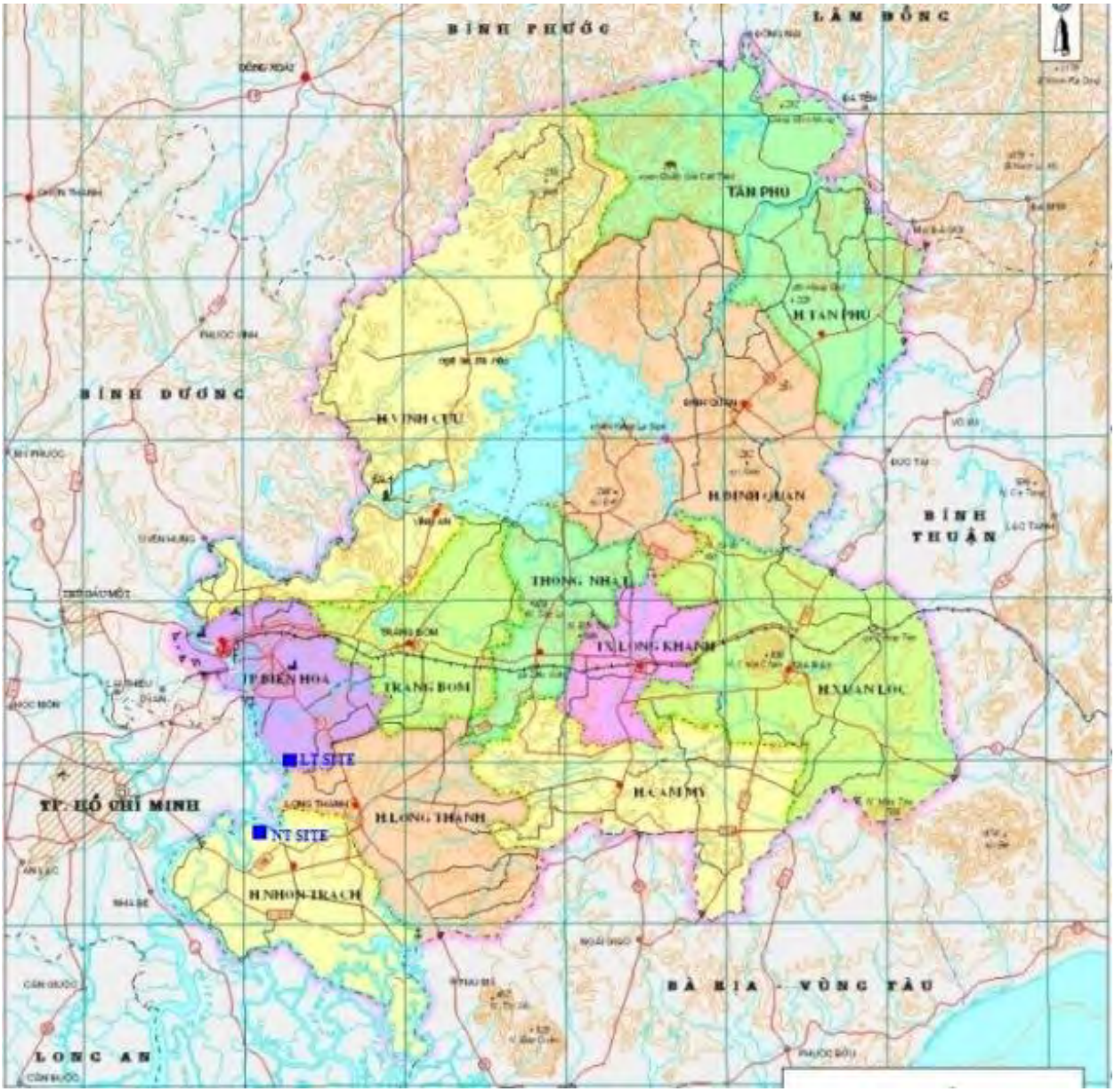


Figure 34: Locations of Option 1 (NT SITE) and Option B (LT SITE) in Dong Nai Province

263. The site of Option 1 is located in the area assigned for the Long Thanh Ecotourism Development Project (LTEDP) of 843 ha in Dong Nai Province, Phuoc Tan, Tam Phuoc Commune, Bien Hoa City, and Tam An Commune. Long Thanh district is planning the construction of a modern ecological urban area, including housing, commercial and cultural centers, public parks, recreation and other services according to the needs of the population living in the vicinity of the area. CHPMU and HCMCUMP were planning to build the new campus of HCMCUMP in the area of LTEDP in early 2018, however, the agreement on the use of the land from Long Thanh Golf Investment and Trading Joint Stock Company (LTJSC), the developer of LTEDP, was not obtained. Therefore, CHPMU and HCMCUMP explored another site within the same Province, which is accessible for the students of HCMCUMP original campus in Ho Chi Minh City, in late August 2018, and found the site of the University Village Project in Nhơn Trach District (Option 2: Selected).

264. The analysis and comparison of environmental and social impacts of Option 1 and Option 2 indicate that:

(i) Option 1 and Option 2 are very similar in project activities in 3 phases: pre-construction, construction and operation, therefore, most of the foreseen impacts caused by wastes, environmental pollution, safety and climate change are very similar.

(ii) Because of difference in location, there are some differences in impact scale and magnitude, especially social impacts. Option 1 site is close to a sensitive receptor (LTEDP), therefore, social impacts may be higher than that at Option 2 Site.

265. The existing HCMCUMP's classrooms, laboratories, and skill labs are unable to accommodate increased student numbers while maintaining teaching quality. A lack of adjacent land and restrictions on the development of educational campuses in central city locations prevent HCMCUMP from expanding in their current location in Ho Chi Minh City, therefore Option 3 (zero option) is not meaningful.

VII. Public Consultation and Disclosure of Information

266. This section describes the process undertaken to involve the public in the Project design and recommended measures for continuing public participation. It summarizes major comments received from beneficiaries and affected people, local officials, community leaders, and others, and explains how these comments were addressed.

267. Meaningful community participation is one of the basic conditions to ensure community acceptance of the Project as well as to mitigate adverse impacts and issues that the team preparing the IEE is not aware of. In fact, if the community is involved as early as possible in the Project preparation process, the closer it can be to establishing a close relationship between the community and the Project. The community can contribute with valuable proposals for the Project; increase communication with the Owner, Design Consultant, Environmental Consultant and local authorities in the Project area. Consultation results can be used to evaluate, adjust design options, propose mitigation measures, and demonstrate community support in the implementation of the Project.

A. LEGAL CONSIDEARATIONS

268. Regarding the Vietnamese legislation, community consultations should be carried out in accordance with the provisions of Paragraphs 1 and 2, Article 21 of Law No. 55/2014/QH13 (para.17) and Circular No. 27/2015/TT-BTNMT (para.17). In addition, for Projects receiving ODA from ADB, community consultation is important and necessary as required under ADB SPS 2009.

269. Decree No. 18/2015/NĐ-CP (para.17) and Circular No. 27/2015/TT-BTNMT (para.17) require public consultation for the prepatration of Vietnamese EIA. Public consultation must be implemented in 2 ways:

(i) The Project Owner sends a letter, attaching a Vietnamese EIA report or its executive summary to ask the CoPC where project location is, to give comments and suggestions on environmental impacts and mitigation measures indicated in the EIA report. The letter also asks the CoPC to organize a public consultation meeting and invite the project affected households, representatives of local organizations and other stakeholders to join the meeting;

(ii) The Project Owner in collaboration with CoPC organizes a public consultation meeting with participation of the above-mentioned stakeholders and present the anticipated impacts and proposed mitigation measures and answer the questions, record the suggestions of the participants. All comments of the local People's Committees and participants must be reflected in the EIA report.

B. PUBLIC CONSULTATION

270. The Project's stakeholders include:

- Persons affected by land acquisition and environmental impacts when the Project is implemented;
- Institutional organizations such as: i) CHPMU and HCMCUMP (Project owner); ii) People's Committee/People's Council; iii) DoNREs; and v) others;
- Other organizations and individuals that have an interest in the results and/or impacts of the Project.

271. In August and September 2018, three (3) public consultation meetings were held to (i) discuss general information about the Project; (ii) discuss possible impacts on local communities and mitigation measures; (iii) summarize and explain key findings from the public consultation; (iv) collect information for the proposed mitigation measures and compensation and resettlement plans; and (v) to collect the perception of responsibility of CHPMU and local authorities and work proposed for both sides.

272. In addition, some meetings were held between the Project Owner (CHPMU and HCMCUMP) and ADB with representatives of DoNRE and Departement of Construction of Dong Nai Province, and Nhơn Trach DPC in August 2018.

273. Two public consultations were held in Nhơn Trach District office on 30 August 2018 and on 5 September 2018. In both meetings, all participants were representatives of Nhơn Trach District and Long Tan CoPC. No project affected households joined the meetings, because Dong Nai PPC considered that at the time the number of affected households was not

clear. The comments mainly related to social issues, which are indicated in the Resettlement Plan of the project. Relating to environmental issues, the following comments were obtained from participants:

- Local authorities fully support the Project;
- The project area is low, affected by climate change, can be flooded (1m deep), so during construction, it is necessary to build embankment to protect the project.
- As the project area has canals, there should be an alternative canal to drain water and for agricultural production. Filling small canals may affect the flow. Because Tra canal is an administrative boundary of the two communes, this should be taken into account in project design. These contents should be included in the Vietnamese EIA.
- During the construction phase, noise, dust and garbage are discharged, however, the impact is small due to small number of households in the project area. Only 4 households have residential land in the project area, of which only 2 households have houses.
- Domestic solid waste collection should be provided.
- Spoils from the project construction phase can be disposed of on surrounding private agricultural land but an agreement between the project owner and the land lord must be reached.
- Disposal site for construction wastes must be approved by DPC by written letter.
- Wastewater treatment plant for the campus should be installed and well operated.

274. The third public consultation was held on 24 September 2018. It was organized by Long Tan CoPC. The objective of this meeting was to consult to affected households on environmental and social safeguards issues. For environmental issues, the affected people were consulted on (i) possible impacts on local communities and mitigation measures; (ii) grievance redress mechanism; and (iii) public consultation and participation during implementation of project construction. For social issues, affected households were consulted on the main content of draft resettlement plan such as: i) project design, scope of land acquisition, social impacts and mitigation measures; (ii) cut-off date, eligibility and entitlements, principle for compensation unit price, income restoration strategy; (iii) grievance redress mechanism; (iv) public consultation and participation during implementation of resettlement plan; (v) implementation arrangement; (vi) implementation schedule; and (vii) community-based monitoring and issues of gender.

275. For the third public consultation meeting, the project owner (HCMCUMP) and Long Tan CoPC sent invitation letters to all 25 affected households, however, only 7 land owners were present in the meeting. The other ones are households having land in the Project area but live in far places (Bien Hoa City, Ho Chi Minh City and Tien Giang Province etc.), so they did not wish to participate in the meeting. In addition to the Project owner (CHPMU and HCMCUMP), the representatives of the local authorities were present in the meeting. Representatives of social organizations also participated in the meeting to hear the predicted environmental and social impacts, proposed mitigation measures. List of participants in the third meeting is given in **Appendix 12**.

276. Related to environment, a summary of the environmental impacts and recommended mitigation measures was provided, and a questionnaire was distributed to all participants.

Evaluating comments and requirements given by the participants in the filled questionnaire sheets, the following results are indicated:

a. Suggestions and requirements of the project affected households:
- During the Land Acquisition: Project owner must provide adequate compensation for the land owners to assure their life after land acquisition would be better than before land acquisition (7/7 households).
- During the construction: Do not cause significant impacts on the nature: no impacts to the natural creeks, water flow and agricultural land; minimize noise, dust to residential areas and do no damage local roads during material transport (some households).
- During the operation: Do not cause environmental pollution (by noise, solid wastes, wastewaters, air emission) to the communes; do not cause impacts to local social security (some households).

277. Long Tan CoPC suggested the followings:

a. During the Land Acquisition: Project owner must:
- Strictly follow the policies and mitigation measures presented at the public consultation meeting;
- Sufficiently compensate for the land owners to assure their life after land acquisition would be better;
- Support in legal documents preparation; construct houses for the households to be relocated and support in other policies for the project affected people.

b. During the construction: Project owner must:
- Maintain the natural landscape (Nipa Palm belts) as much as possible;
- Not cause soil erosion impacting the surrounding area;
- Construct dikes to prevent leakage of eroded soil to the surrounding area;
- Compensate if the agricultural production of farmers will be damaged.
- Well manage material and waste transport to avoid air, dust, noise pollution for residential areas: no overloading of trucks, cover truck body by suitable materials to avoid dust pollution; keep truck velocity; avoid or repair damages to local roads.
- Well manage labor force from other districts to assure local social security.

c. During the operation: The Project owner must:
- Construct and well operate wastewater collection and treatment system; solid waste management system; carry out solid waste segregation and disposal complying with the legal guidelines for environmental protection;
- Properly treat medical wastes to avoid impacts to community health;
- Well manage students and labor force in the campus to avoid social impacts.

278. All the comments/opinions provide by the public consultations and other meetings are reflected in this IEE, especially the EMP (Table 31).

C. INFORMATION DISCLOSURE

279. The disclosure of information on the Project aims to initiate a continuous process of information exchange and facilitate the participation of stakeholders throughout the Project

implementation process starting from the pre-construction phase, through information exchange meetings.

280. Disclosure of the IEE is part of the communication strategy for the parties involved. ADB SPS 2009 requires the borrower to provide relevant environmental information, including information from IEE and environmental monitoring report in a timely manner, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. During this IEE process, information on the project, its environmental and social impacts and mitigation measures were disclosed to the stakeholders in three public consultation meetings with local authorities and project affected households held in August and September 2018 as described above.

281. This IEE and its EMP will be disclosed on the project website at www.adb.org.

D. FUTURE CONSULTATION ACTIVITIES

282. Public Consultation is an important part of the EMP and should include the notification of local communities when Project activities are going to take place, with disclosure of the results of monitoring programs to local communities and other stakeholders.

283. Following the Vietnamese regulations (paras.268-269), public consultation will be implemented again during the preparation of Vietnamese EIA. This environmental consultation will include consultation with Long Tan CoPC by letter and with project affected households and local social organizations by meetings. In this consultation, the Project owner will present all main potential impacts and mitigation measures and obtain comments/requirements from local authorities and people to incorporate into the final EIA report. After EIA approval by MoNRE, a summary of EIA report and requirements of MoNRE in impact mitigation will be disclosed at Long Tan CoPC office. The Project owner will implement effective measures to mitigate the negative impacts to meet the requirements of local authorities and people, Vietnam and ADB policies.

284. Before implementing the Project, CHPMU will inform affected peoples about the time and progress of the construction work. Prior to construction, the Vietnamese EIA (para.28) will be disclosed to affected peoples and other stakeholders at People's Committees offices. The Environmental Safeguard Officer of the Construction Supervision Consultant (CSC ESO) will prepare a Project Information Booklet (PIB), which includes (i) the Project information, (ii) summary of this IEE and the Vietnamese EIA, and (iii) the information of the grievance redress mechanism and appeal procedures, in Vietnamese language. The PIB will be disseminated to all affected peoples mainly through the consultation meeting which will be held by CHPMU at the Commune Office. CHPMU will prepare slideshow and present the content of the PIB to local authorities and commune representative residents in the meeting.

285. According to GOV law, environmental monitoring reports during construction phase must be disclosed at the project site office and at CoPC office. The key information of the semi-annual environmental monitoring reports will be translated into Vietnamese by the CSC ESO and made available at the Project site and Long Tan CoPC Office. This will be available on the ADB website as well as HCMCUMP website.

286. During the construction process, the CHPMU will regularly inform the public about the construction activities and progress, measures to manage the environment and the operation of the information system. Affected people will be informed about policies and procedures to ensure their lives will not be seriously affected. If they have any questions or concerns about the Project, the CHPMU will be responsible for helping and resolving. The contact details of Grievance Redress Mechanism will be made public for easy access by the community when they wish to make a complaint. All complaints must be recorded.

VIII. Grievance Redress Mechanism

287. A well-defined grievance redress mechanism (GRM) will be established prior to construction to address affected persons' grievances and complaints regarding environmental issues and compensation for damages caused by construction activities of the project in a timely and satisfactory manner, while GRM on involuntary resettlement will be established separately. All affected persons will be made fully aware of their rights, and the detailed procedures for filing grievances and an appeal process will be published through an effective public information campaign. The grievance redress mechanism and appeal procedures will be explained in a Project Information Booklet (PIB), prepared by CSC and sent to the Commune People's Committee (CoPC) for consultation during a local Project consultation meeting.

A. ROLES AND RESPONSIBILITIES

288. During the construction phase, **CHPMU** will play a central role in the coordination of the GRM. CHPMU will establish a **GRM Unit** (GRMU) composed of relevant CHPMU project staff including Environmental Safeguard Officer (ESO) to handle complaints from affected persons. CHPMU ESO assisted by CSC ESO will provide the necessary training to improve grievance procedures.

289. Basically, main contents of the GRM include the following items: (i) Steps in GRM for the Project and participation of stakeholders; (ii) Time frame for the procedure; (iii) Grievance intake form; (iv) Participants in grievance redress procedure, and (v) Procedure of complaint/grievance redress.

290. **Long Tan Commune People's Committee (CoPC) and/or complainants** will: (i) draft a written complaint to be signed by the complainant indicating name of complainant, date and address of the complainant, description of complaint and supporting documents, if any; and (ii) send the complaint to the GRMU. They also may participate in GRM meetings, and provide relevant information related to the submitted complaints as required.

291. The GRMU will: (i) receive all complaints from people seeking access to the GRM and promptly acknowledge them (within 5 working days); (ii) register the complaints; (iii) determine eligibility of a complaint; (iv) screen and forward the complaint to contractors if required; (v) coordinate and monitor activities by contractors; (vi) track and record all actions taken by the GRMU, (vi) provide information and feedback to CoPC and complainants, (vii) maintain a complaint registration and tracking system.

B. GRM PROCEDURE

292. The procedure for grievance redress is defined below and summarized in Figure 35.

293. **Stage 1: Access to the GRM.** If a concern arises, the complainant will make his/her complaint known to CoPC or to the GRMU. Complaints can also be sent directly to the contractor through the hotline number provided for construction related matters such as noise, dust and other emergency matters which require immediate action. Contractors are required to report back to the GRMU as well as the CSC on complaints received and resolved. For more complex construction matters, the GRMU will forward the complaint to the contractors with recommendations for action.

294. **Stage 2: Submission and Registration.** The CoPC or complainant will submit a written or verbal complaint to the GRMU. The GRMU will register the complaint. The GRMU will register the complaint in the grievance registry and issue an acknowledgement of receipt within 5 working days of the complaint with information on when a decision will be made regarding the complaint. The GRMU will handle all questions and queries of project related activities.

295. Affected persons are entitled to lodge complaints regarding environmental pollution and damage caused by project's construction. Affected persons' complaints can be made verbally or in written form, however, in cases where affected persons do not have the writing skills or are unable to express their grievances verbally, they are encouraged to seek assistance from the recognized local groups, mass unions, village heads or community chiefs to have their grievances recorded in writing, and to have access to documentation, and any survey or valuation of assets, to ensure that where disputes do occur, all the details have been recorded accurately enabling all parties to be treated fairly. In case the affected persons cannot prepare a written complaint by themselves, officer of GRMU or local authority shall help them. Throughout the grievance redress process, the committee will ensure that the concerned affected persons are provided with copies of complaints and decisions or resolutions reached.

296. **Stage 3: Determine Eligibility.** The GRMU will determine whether the complaint is eligible for the grievance mechanism. A screening procedure based on simple eligibility criteria will be established for the GRMU. Criteria include: (i) the complainant is directly affected by the project; (ii) in case of representation, the complainant has a valid representation authorization; (iii) the complaint relates to environmental or social safeguards aspects of the project. If the complaint is deemed ineligible, the complainant is informed of the decision and the reasons for ineligibility. A response on the eligibility shall be given to the complainant within 10 working days after receipt of the complaint.

297. **Stage 4: Assessment and Decision on Action.** If the complaint is eligible, the GRMU will inform the complainant within 10 working days after receipt of the complaint that his/her complaint is eligible, including indication of the grievance assessment process and timeframe. The GRMU, with support of relevant authorities, will conduct an assessment and gather information about the complaint and key issues and concerns to determine how the complaint might be resolved. The CoPC and community members will participate in the assessment as necessary. If outside experts or technical information is needed, the GRMU may seek such guidance and may request all parties concerned to participate in the GRM process.

298. The decision on the solution will be by Nhơn Trach DPC. The GRMU will develop an action plan and identify responsibilities for the plan. This action plan will be reported directly to the complainant and/or CoPC through the GRMU. The response shall not be submitted later than 30 days after receipt of the complaint. If this timeframe cannot be ensured, the complainant shall be informed accordingly prior to the deadline of 30 days.

299. **Stage 5: Implementation of Actions.** Implementation of the action plan commences with close collaboration of relevant project stakeholders depending on the type of complaint.

300. **Stage 6: Monitoring and Reporting on Implementation.** The GRMU will monitor the implementation of actions and record. As part of the monitoring process, the GRMU will consult the relevant project stakeholders, as needed. The monitoring time frame will be complaint-specific depending on the implementation of the actions.

301. **Stage 7: Closure of the Complaint.** When complaint redress and monitoring is completed, the GRU will prepare a final report which is shared with the complainant and CoPC, and filed. The complainant will confirm completion of the actions and agree to the closure of the complaint. The grievance dossier is closed and filed in the project archive.

302. If efforts to resolve disputes using the grievance procedures remain unresolved or unsatisfactory, affected persons have the right to directly discuss their concerns or problems with the ADB Southeast Asia Department through the ADB Vietnam Resident Mission (VRM). If affected persons are still not satisfied with the responses of VRM, they can directly contact the ADB Office of the Special Project Facilitator (OSPF).

303. During the construction process, CHPMU must regularly inform the public about the construction activities and progress, measures to manage the environment and the operation of the information system.

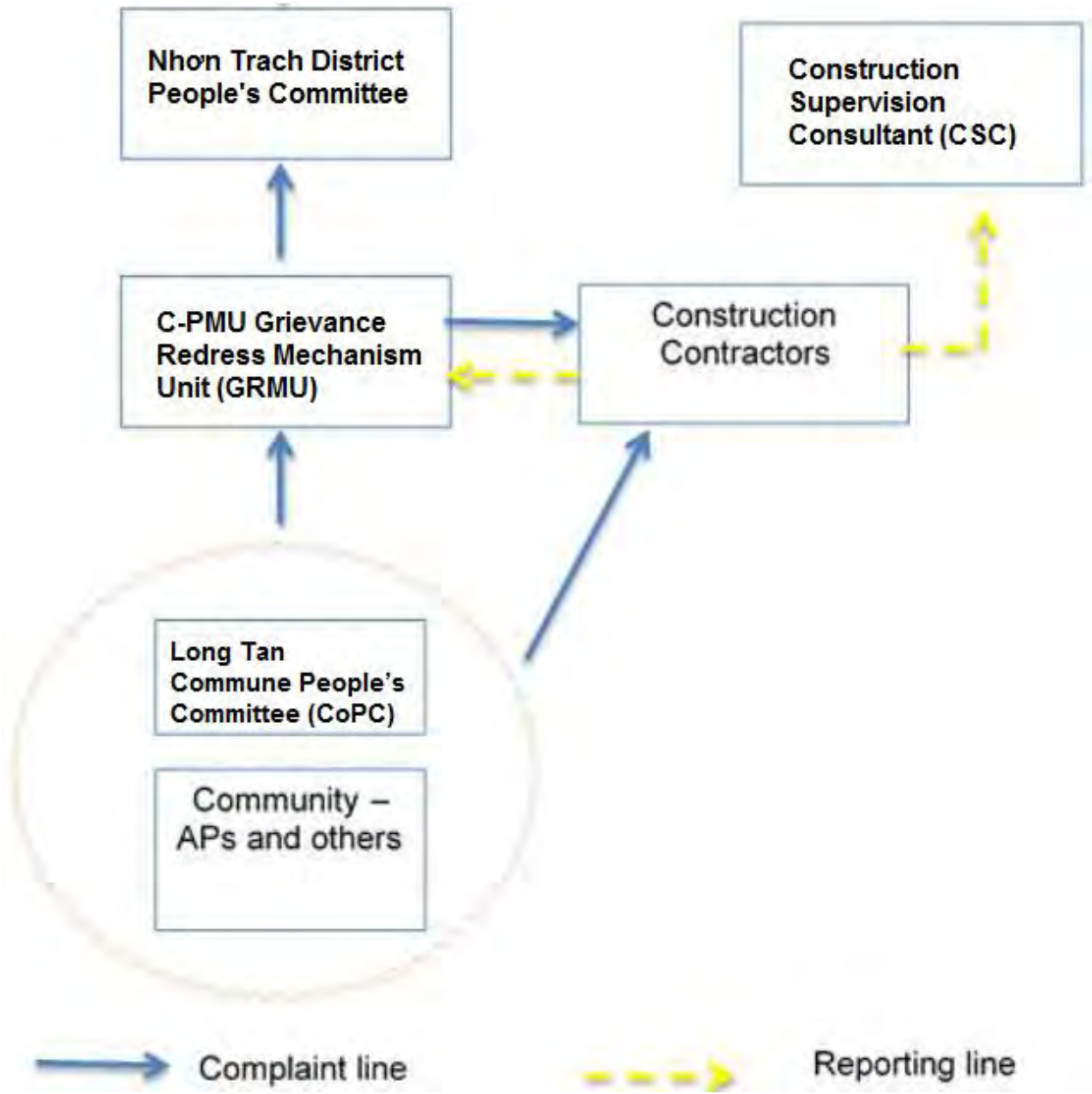


Figure 35: Complaint/Reporting Line of the Project Grievance Redress Mechanism

IX. Environmental Management Plan (EMP)

304. The purpose of the Environmental Management Plan (EMP) is to implement the identified mitigation and management measures to avoid, reduce, mitigate and compensate anticipated adverse environmental and social impacts, implement a monitoring and reporting plan and assure the compliance of the Project with Vietnamese relevant laws, ADB SPS 2009 and the International Finance Institution Environmental, Health and Safety Guidelines (IFC EHS Guidelines). The EMP includes the results of the public consultations, part of the IEE, and a

clear definition of the responsibilities and budget for each task. External to the EMP is a Resettlement Plan that addresses in detail the economic displacement.

305. Environmental mitigation measures indicated in the (updated) IEE and EMP will be included in the contractors' bidding documents, technical specifications and contracts.

A. IMPLEMENTATION ARRANGEMENTS AND RESPONSIBILITIES

1. Executing Agency and Implementing Agency

306. The Ministry of Health (MOH) through the Central Health Project Management Unit (CHPMU)[47] is the executing agency and will have overall responsibility in project coordination and implementation of HCMCUMP Phase 1.[48]

2. Project Management and Implementation

307. CHPMU will function as Project Coordinating Unit for the Project and has overall management, coordination, implementation, monitoring and evaluation and reporting functions of the Project. It will prepare annual work plan, budget and reports and; consolidate reports for the Project to comply with the requirements of MOH and ADB; and other reports requested by MOH management and ADB. It will be headed by a full-time project director and a deputy director appointed by the MOH Minister. CHPMU will also be responsible for the management and disbursement of the project loan and government counterpart funds; coordination with ADB and other relevant government agencies and stakeholders; preparation of quarterly progress reports, semi-annual environmental monitoring report, midterm report, project completion reports, and ensure preparation and submission of annual audited project financial statements.

308. **CHPMU** will oversee the day-to-day implementation of the Project. Individual consultants will be hired to assist the CHPMU in managing the implementation of Project activities including: (i) preparation of detailed annual operation plan and budget; (ii) procurement and contract management of the civil works, equipment, goods and services contracts in accordance with the government and the ADB's requirements and procedures; (iii) recruitment of consulting services (firms and individual consultants) for the detailed engineering design (DED), construction supervision consultant (CSC) including environmental safeguards officer, social safeguards, baseline and midterm studies/surveys, and financial audit; (iv) establishment and management of the advance account set-up at MOH-CHPMU for the ADB loan including preparation of withdrawal applications and maintenance of financial records; and (v) provide overall administrative support for finance, procurement and translation services for the project.

309. **CHPMU** will assign the following MOH staff: (i) project manager; (ii) project implementation specialist; (iii) civil works officer; (iv) planning and monitoring and evaluation officer; (v) environmental safeguards officer (CHPMU ESO); (vi) social safeguards officer; (vii) accountant; and (viii) procurement officer. The project will hire the following consultants to

[47] CHPMU is an existing unit within MOH responsible for health civil works projects.

[48] An MOH steering committee may be established to provide guidance and oversight on the project, which will be chaired by the minister or vice minister along with senior official from key MOH departments, presidents of HMU and HCMCUMP, representatives of the Ministry of Education and Training, Ministry of Finance, among others.

provide technical and coordination support to CHPMU: (i) project development and management specialist, (ii) financial management specialist, (iii) procurement specialist, and (iv) social safeguards specialists.

310. These organizations will be supported by a **Construction Supervision Consultant (CSC)** which includes a National Environmental Safeguard Officer (CSC ESO) who assists CHPMU in monitoring the implementation of the day-to-day EMP and supporting the contractor in preparing the monthly EMP implementation reports at the site along with the proposing improvements to the contractor for synthesis sent to CHPMU and maintaining contact with the local community.

311. The **contractor** will appoint an Environment, Health and Safety Manager (EHS Manager). The EHS Manager will have overall responsibility for ensuring the implementation of the EMP by the contractor, development of Contractor Environmental Management Plan (CEMP) that outline the manner by which they will comply with the requirements of the IEE and EMP.

312. **HCMCUMP** will be the Operation Agency. CHPMU will make sure that HCMCUMP will be involved during the detailed design and its opinions are incorporated into the Project design.

313. Department of Natural Resources and Environment (DoNRE) of Dong Nai Province will oversee the environmental management and take responsibility to monitor the compliance of governmental environmental requirements during Project implementation phases for all related Project activities (like the environmental monitoring of water, soil, air, others).

314. ADB will conduct due diligence on environmental matters during the Project review missions. ADB will review the semi-annual environmental monitoring reports submitted by CHPMU and will disclose the reports on its website. If CHPMU fails to meet safeguards requirements described in the EMP, ADB will seek corrective measures and advise the EA on items in need of follow-up actions.

Table 29: Specific responsibilities for the implementation of the EMP

Entity	Responsibilities
Central healthcare Project management unit (CHPMU) (IA)	- Involve HMU during the detailed design and make sure its opinions are incorporated into the Project design - Assign a CHPMU ESO - Mobilize CSC and ensure the assignment of CSC ESO. - Revise the IEE and EMP as required during detailed design. - Obtain all necessary environmental clearances and permits for the Project, including the approval of Vietnamese EIA - Ensure that Vietnamese EIA and (revised) IEE/EMP requirements are included in the bidding documents and civil works contracts. - Coordinate development and delivery of the institutional capacity building program described in this EMP. - Require the contractor to develop CEMP in compliance with the EMP, and review and approve EMP. - Ensure the contractor implements the CEMP properly and in compliance with the requirements of the EMP and the relevant requirements and regulations of the GOV and ADB, and with any Project environmental or social loan covenants and assurances. - Identify any environmental issues during implementation and propose necessary corrective

Entity	Responsibilities
	actions. - Undertake ongoing outreach and communications with Project stakeholders and affected persons. - Ensure implementation of the GRM such that complaints from affected persons are efficiently and effectively resolved. - Ensure implementation of the EMoP presented in the EMP through the CSC/contractor. - Prepare and submit semi-annual environmental monitoring reports during the construction phase and submit to ADB. - Review the annual environmental monitoring reports submitted by HMU during the operation phase and submit to ADB. - Disclose the relevant information from the semi-annual environmental monitoring reports to affected persons promptly upon the reports submission to ADB.
Detailed Engineering Design (DED) Consultant	- Incorporate HMU's opinion as well as environmental safeguards requirements into the detailed design consistent with the approved project documents including but not limited to approved basic design, this IEE report, and Viet Nam Construction Law, Building Code, Climate Change Resilient Design Standard, Greenhouse Building Design, Fire Code, Electrical and Mechanical Codes, and Vietnamese and international environmental and social safeguards standards
Construction Supervision Consultant (CSC)	- Assign a CSC ESO as well as Sanitary Engineer (Water Supply and Sewerage/Drainage) and Safety Engineer. - The Safety Engineer will i. Coordinate with the contractor and require preparation and implementation of OHS plan; and ii. Ensure the safety of buildings, life and properties for contractor, workers and the community - The CSC ESO will; i. Review the updated IEE and EMP, if any; ii. Confirm that mitigation measures have been reflected in detailed engineering design; iii. Review Contractor Environmental Management Plan (CEMP) to ensure compliance with the EMP; iv. Prepare a Project Information Booklet (PIB) written in Vietnamese language which includes (a) the Project information; (b) summary of the IEEs and the Vietnamese EIA; and (c) the information of the grievance redress mechanism and appeal procedures, to be disseminated to the affected persons; v. Provide technical assistance and support to CHPMU and contractors on mitigation measures and EMP implementation; vi. Deliver the construction and operation phase capacity building programs to the staff of the CHPMU, HMU and contractor; vii. Ensure that environmental effect monitoring (sampling and analysis of air quality, noise level, surface/ground water quality, soil quality, etc.) according to the environmental monitoring plan of the EMP is conducted under the CSC budget during the construction phase; viii. Submit the result of the environment effect monitoring to CHPMU; ix. Assist main contractor to prepare monthly environmental reports on EMP implementation, including any spills, accidents, fires and grievances received, and action taken; x. Conduct site inspections in compliance with the EMoP; and xi. Review and consolidate monthly reports prepared by contractor and assist CHPMU in preparing semi-annual environmental monitoring reports.
Main Contractor	- Assign an Environment, Health and Safety (EHS) Manager - Prepare CEMP which detail the means by which the contractors will comply with EMP (to be done either at the bidding stage or once contract is awarded). - Provide technical assistance and support to the contractor and CHPMU on mitigation measures

Entity	Responsibilities
	and EMP implementation. - Conduct site inspections in compliance with EMP environmental motoring plan. - With the support by the CSC, prepare and submit to CHPMU monthly environmental reports on EMP implementation, including any spills, accidents, fires and grievances received, and action taken.
Ho Chi Minh City University of Medicine and Pharmacy (HCMCUMP)	- Take responsibility for environmental management during Project operation. - Implement mitigation measures during the operation phase. - Ensure implementation of the environmental monitoring presented in the EMoP during operation phase. - Prepare and submit annual environmental monitoring reports during the operation phase, until the issuance of ADB's Project Completion Report unless a longer period is agreed, and submit them to CHPMU who will review the report and submit to ADB for disclosure on ADB website
Department of Natural Resources and Environment (DoNRE)	- The provincial environmental management agency is the DoNRE of Ha Nam province, representing MoNRE for environmental management in the province. - DoNRE of Ha Nam province is responsible for monitoring the compliance of governmental environmental requirements during Project implementation phases for all related Project activities (like the environmental monitoring of water, soil, air, others).

EIA = Environmental Impact Assessment, CEMP = Contractor Environmental Management Plan, CSC = Construction Supervision Consultant, EMP = Environmental Management Plan, EMoP = Environmental Monitoring Plan, ESO = environmental safeguard officer, GRM = Grievance Redress Mechanism, IEE = Initial Environmental Examination, PMU = Project Management Unit

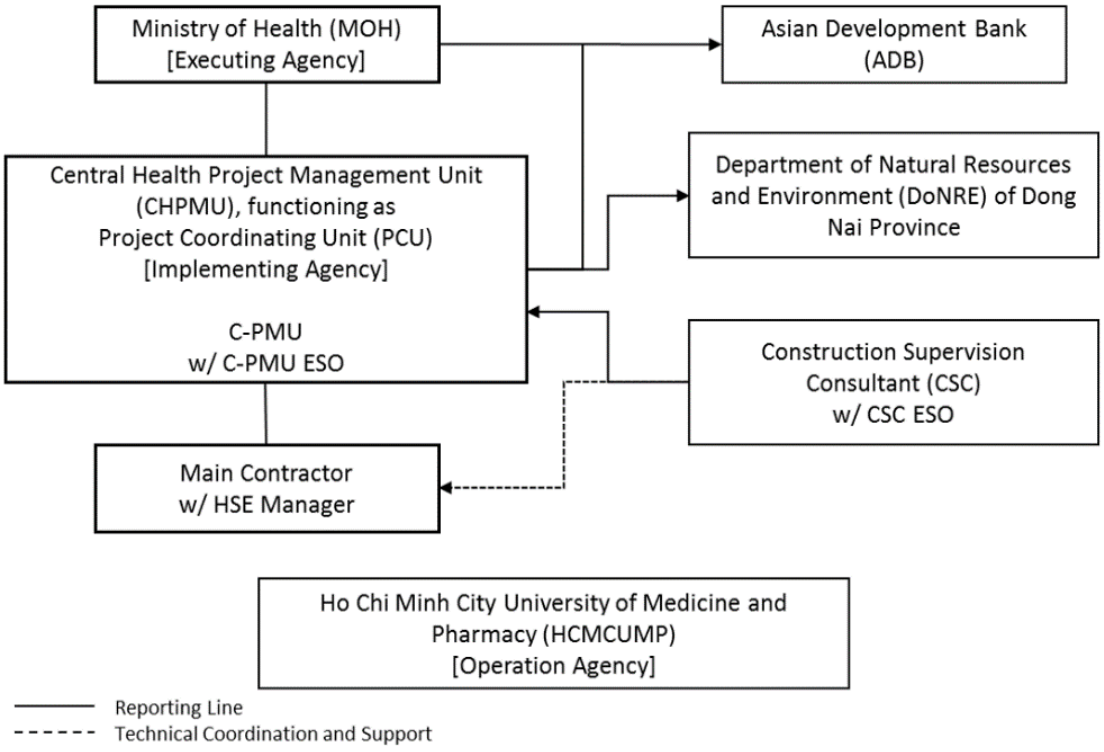


Figure 36: Project Management Structure

3. Capacity Building

315. Some strengthening programs are listed in Table 30 and the calculation of the costs for these programs is based on information from similar capacity building and training activities implemented in Vietnam, and in consultation with CHPMU and HCMCUMP.

Table 30: Institutional strengthening and training programs

Topic	Trainers	Attendees	Contents	Frequency	Total Budget	Source of Funds
Environmental Management during Construction	CSC ESO	CHPMU and Contractors	- GOV laws and regulations - ADB SPS 2009 - EMP Implementation during the construction phase - GRM - IFC EHS Guidelines	Prior to construction and annually during construction	USD 3,500	CSC Budget
Environmental Management during Operation	CSC ESO	CHPMU and HCMCUMP	- GOV laws and regulations - ADB SPS 2009 - EMP implementation during the operation phase - IFC EHS Guidelines	Prior to operation	USD 2,500	CSC Budget

ADB SPS 2009 = ADB Safeguard Policy Statement (2009), CHPMU = Central Health Project Management Unit, CSC = Construction Supervision Consultant, EMP = Environmental Management Plan, ESO = Environmental Safeguard Officer, GOV = Government of Vietnam, HMU = Hanoi Medical University, IFC EHS Guidelines = International Finance Corporation Environmental, Health, and Safety Guidelines

B. IMPACT MITIGATION PLAN

316. The potential impacts of the Project during pre-construction, construction and operation have been identified before under Chapter V. The corresponding mitigation measures with source of funds and supervision/implementation responsibilities are presented in Table 31. This table is compiled for HCMCUMP Phase 1 considering the IFC EHS General Guidelines, the IFC EHS Guidelines for HCF, the IFC EHS Guidelines for THD and Vietnam Environmental Guidelines and National Technical Regulations for Environment (Environmental Standards).

Table 31: Impact Mitigation Plan of HCMCUMP Phase 1 and Influence Area

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
Pre-Construction					
0.	General Impact	- Establishment of Grievance Redress Mechanism (GRM). - Consultation and Information Disclosure (cf. para. 284 of the IEE)	CHPMU budget	CHPMU	CHPMU assisted by CSC
		- Update of IEE and EMP if necessary. - Training and Capacity Building. - Conduct traffic risk assessment.	CSC budget	CHPMU	CHPMU assisted by CSC
		- Detailed Design: ✓ HCMCUMP Phase 1 may have its design adapted during detailing phase, if needed, to minimize impacts. ✓ Incorporation of EMP in design and contract. ✓ Avoid obstruction and filling of existing natural creek/canals. If waterway alteration is unavoidable, design a flow diversion channel (or sluice) to maintain the original flow, connecting to the surrounding waterway. The design of the diversion channel should be approved by DoNRE in advance of the land clearance. ✓ Maintain natural landscape and mangrove trees (Nipa palms) as much as possible. ✓ Take account impacts of climate change, especially increased flood, inundation, and other natural disasters. (Elevete the whole project site by at least 2.0 m. Provide some reservoirs within the campus to reduce water logginf. Create green patches to facilitate the matural drain of water and improve microclimate.) ✓ Consider energy conservation, water conservation, waste management planning for prevention, recycling and reuse, treatment, disposal, storage and transportation, integrity of workplace structures, severe weather and facility shutdown, workspace and exit, fire precautions[49], lavatories and showers, potable water supply, clean eating area, lighting, safe access, first aid, air supply and work environment temperature, flood protection, wind circulation, landscape, building failure, sustainability, extreme weather events and earthquakes. ✓ The masterplan and posterior detailed design of the infrastructures should consider any	Detailed Design Consultant budget	CHPMU	Detailed Design Consultant

[49] International Finance Corporation's Good Practice Note: IFC Life and Fire Safety: Hotels <https://www.ifc.org/wps/wcm/connect/6f82f5f7-1985-4bfb-b201-574758b77392/p_GPN_LFS-Hotels.pdf?MOD=AJPERES> shall be referred.

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
		valid contributions from the affected persons/people from neighboring villages (up to the extent possible). ✓ Select appropriate colors for the exterior of the new facilities. ✓ Select construction materials for the exterior of the new facilities in order to ensure blending with the surroundings. ✓ Before commencement of the works, determine the exact boundaries and location of the construction and scope of works. The construction area must be according to the design. ✓ Promote active modes of transportation (walking and cycling) inside the campus (e.g. through safe and wide sidewalks connecting all campus locations, dedicated/segregated cycle ways, docking stations on every location within the campus, safe crossing points at key areas along the road network, and others). Design walking and cycling routes to be direct, pleasant, well-marked and accessible. ✓ Promote a clear hierarchy of road users in the final design, prioritizing pedestrians and cyclists over motorized vehicles. ✓ Explore feasibility of using renewables (e.g. solar) for on-site energy production and use. ✓ Ensure that the whole site is accessible and uses 'universal' and 'all age' and physical, mental and sensory impairment friendly design principles. ✓ Ensure healthy design principles are included in the final Project architecture design. ✓ Design the built environment (building features, street furniture) to reduce potential for water accumulation that can promote vector breeding (e.g. mosquitos responsible for transmission of dengue). ✓ Make sure the appropriate solutions indicated in the design of the Project for avoidance of disruption of the water supply to farmers in neighboring operating rice paddies will be put in place. ✓ Design a wastewater treatment system which effluent complies with the Vietnam National Technical Regulation for Domestic Wastewater Quality (QCVN14:2008/BTNMT). + Toilet water shall be collected separately from other domestic water and discharged to septic tanks of each building before discharge to the wastewater treatment plant (WTP), while other domestic wastewater from lavatory basin, bathrooms, toilet floors and canteens, etc. shall be driven directly to WTP. + Stormwater shall be collected in the internal drainage then discharged to the common drainage systems of the campus. Rainwater flowing over roofs and balconies shall be collected to sewer manholes then to the common drainage.			
		- Prepare Contractor Environmental Management Plan (CEMP) which includes: ✓ Traffic and noise/dust/vibration/emissions management plan;	Contractor (civil works)	CHPMU assisted by	Contractor

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
		✓ Waste management plan; ✓ Wastewater management plan; ✓ Worker accommodation management plan; ✓ Occupational and community health and safety management plan; and ✓ Grievance redress mechanism. - Make a contract with licensed waste collection/treatment company to make sure they collect wastes on time. - Plan in advance to avoid and minimize all impacts on local infrastrucutres such as roads, pipelines and creek/canals. If there will be any impacts on local infrastructures, foresee to repair them immediately. - Facilitate the access to the selected community surveillance team for the supervision of the construction activities.	budget	CSC	
1.	Social Impacts due to Land Acquisition and Land Use Change	- Public consultation and disclosure of information should occur frequently to assure compensation is done fairly and grievances are addressed adequately. - A resettlement plan should be updated and monitored, in close collaboration with relevant organizations in accordance with the most updated regulations. - Acquisition of land and livelihood restoration according to Resettlement Plan and its updates. - Support Affected Persons by providing available Project information accordingly. - Before construction and clearance of the impacted water ways, assure the surrounding affected rice fields will not have their supply of water affected by applying the designated engineering solutions defined under the detailed design for the facilities and the HCMCUMP Phase 1 area. - Announce the scope and duration of the works before commencement, to affected peoples and all relevant authorities. - Publicly announce the clearance and construction plans. - Livelihood restoration must be frequently monitored, and any necessary assistance provided to the affected persons.	HCMCUMP and Dong Nai Province as counterpart fund	CHPMU ESO and CSC ESO	Contractor
2.	Impacts on life and health of workers during UXO clearance	- Engage experienced Military Engineering Unit or accredited contractor (BOMICEN) for safe detection and removal of UXOs. - Ensure implementation of safety procedures during UXO detection and removal process - During this process, warning signs will be in place to warn local residents.	UXO budget	CHPMU ESO and CSC ESO	A Military Engineering Unit or BOMICEN
Construction Phase					

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
3.	Impacts on air quality, noise and vibration due to construction activity	- Ensure that emissions do not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards by applying the most stringent legislated standards, whether they would be national or current WHO Air Quality Guidelines, or other internationally recognized sources - Ensure that emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards.[50] - Avoid, or when avoidance is not possible always use, whenever applicable and necessary, recommended prevention and control techniques for VOC emissions, particulate matter and ozone depleting substances. - Use canvas to cover piled materials and avoid erosion and dispersion of materials. - Selecting equipment with lower sound power levels - Installing silencers for fans - Installing suitable mufflers on engine exhausts and compressor components - Installing acoustic enclosures for equipment casing radiating noise - Improving the acoustic performance of constructed buildings, apply sound insulation - Installing vibration isolation for mechanical equipment - Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas - Re-locating noise sources to less sensitive areas to take advantage of distance - Siting permanent facilities away from community areas if possible - Reducing project traffic routing through community areas wherever possible - Developing a mechanism to record and respond to complaints - Minimizing dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression, bag house, or cyclone) - Minimizing dust from open area sources, including storage piles, by using control measures such as installing enclosures and covers, and increasing the moisture content - Dust suppression techniques should be implemented, such as applying water to minimize	Contractor (civil works) budget	CHPMU ESO and CSC ESO	Contractor

[50] As a general rule, this Guideline suggests 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed. (Impacts should be estimated through qualitative or quantitative assessments by the use of baseline air quality assessments and atmospheric dispersion models to assess potential ground level concentrations.

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
		dust from vehicle movements - Managing emissions from mobile sources - Avoiding open burning of solid waste			
4.	Impacts on air quality and surface/ground water quality due to construction vehicle/machinery	- Drivers should be instructed on the benefits of driving practices that reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits - All construction machinery must have licenses of air emission provided by Vietnam Authority - Implementing a regular vehicle maintenance and repair program - All construction machinery is fully licensed and fully equipped with communication devices in order to avoid spillages to the soil or surface water. - Avoiding or minimizing project transportation through community areas - Use standard-tested construction equipment, (less emissions and toxic gases, dust ...). - Requiring the contractor to strictly use standard machines and follow the manuals. - Using noise control devices, such as temporary noise barriers and deflectors for impact activities, and exhaust muffling devices for combustion engines. - If a concrete mixer is used on site, the dry concrete mixing has to be conducted in a full covered area at least 500 m away from the residential area. Do not place the concrete-mixer or the asphalt-mixer near the boundaries of the construction site. - The construction machinery will be checked according to the emission standards of Vietnam for CO, hydrocarbons and smoke. - Maintain a regular inspection and maintenance of all machinery to ensure good technical conditions. - Foresee that cleaning of machinery or construction vehicles is done in appropriate facilities to impede contamination from any hazardous substances to surface and groundwater. - Understand the quality, quantity, frequency and sources of liquid effluents in the Project area. This includes knowledge about the locations, routes and integrity of internal drainage systems and discharge points - Plan and implement the segregation of liquid effluents principally along industrial, utility, sanitary, and run-off (storm) water categories, in order to limit the volume of water requiring specialized treatment. Characteristics of individual streams may also be used for source segregation.	Contractor (civil works) budget	CHPMU ESO and CSC ESO	Contractor
5.	Impacts from	- Implementation of a traffic and noise/dust/vibration/emissions management plan (as part of	Contractor	CHPMU ESO	Contractor

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
	transportation of construction materials and waste	the CEMP) that will include a purpose, scope, safe driving policy, roles and responsibilities (including roles for the contractor site EHS Manager, contractor workers, subcontractor workers and drivers); traffic management procedures; worksite requirements; community safety requirements; performance and monitoring; deliverables (site layout and traffic flow patterns and schedule; road safety rules and practices; training registries; vehicle inspection registries; records of road safety campaigns; monthly transportation performance reports; registry for accidents/incidents and major near misses. - Establish maximum speeds for ALL vehicles associated with the Project and impose strict penalties for non-compliance (zero-tolerance). The transportation vehicles on road must run properly with a specified speed. - The transporting material vehicles must be covered to avoid dust falling on the road and impeding the circulation process of surrounding vehicles. - Frequently water, clean and reinforce the road if necessary. - Increase the awareness of workers by organizing capacity building sessions, in order to avoid or minimize adverse social impacts. - Coordinate with local authorities the management of residents to ensure security in the province. - Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries: - Emphasizing safety aspects among drivers ✓ Improving driving skills and requiring licensing of drivers ✓ Adopting limits for trip duration and arranging driver rosters to avoid overtiredness ✓ Avoiding dangerous routes and times of day to reduce the risk of accidents ✓ Use of speed control devices (governors) on trucks, and remote monitoring of driver actions - Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.	(civil works) budget	and CSC ESO	
6.	Impacts on local hydrology	- Avoid obstruction and filling of existing natural creek/canals. If waterway alteration is unavoidable, design and construct a flow diversion channel (or sluice) to maintain the original flow, connecting to the surrounding waterway. The design of the diversion channel should be approved by DoNRE in advance of the land clearance.	Contractor (civil works) budget	CHPMU ESO and CSC ESO	Contractor
7.	Impacts from	- Implement waste management plan (as part of CEMP).	Contractor	CHPMU ESO	Contractor

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
	generation of hazardous and non-hazardous waste	- The waste collection from construction works should be done at designated points only. The waste collection points should be prepared for different types of wastes: construction, hazardous, non-hazardous and domestic solid wastes. - Install trash bins at worker camps and construction sites. - Make a contract with licensed waste collection/treatment company to make sure they collect and treat wastes following national regulations. - Clean the collection points every day. - For unused dredged materials (spoils), contractor must: ✓ Find a site for disposal; design and construct the disposal site complying with guidelines for environmental protection. This disposal site must be approved and permitted by the DPC; ✓ Properly store dredged materials to avoid erosion and leakage of spoils to the surrounding fields. ✓ Properly transport the unused materials to the disposal site avoiding dust emission and leakage of spoils to road. - For general waste: ✓ Properly collect all types of construction, industrial and domestic solid wastes generated at the construction sites and segregate them into non-hazardous and hazardous; the waste collection from construction sites should be done at designated points only. ✓ For sanitary (domestic) solid waste: the Contractors must install trash bins in worker camps and every construction site; sign contracts with local functional units for collection and transport of trash to dump sites as stipulated. ✓ For construction wastes such as concrete and rubble, iron or steel odds and ends, damaged formwork, etc.: the wastes that can be recycled such as paper, iron and steel, etc. shall be collected separately and recycled. ✓ Hazardous wastes (oily waste, used batteries and fluorescent lamps, etc.), waste bentonite etc. should be safely collected, classified, temporarily stored, transported and treated in compliance with Circular No. 36/2015/TT-BTNMT and other relevant regulations. - The procedures for transportation of hazardous materials (Hazmats) should include: ✓ Proper labeling of containers, including the identification and quantity of the contents, hazards, and shipper contact information	(civil works) budget	and CSC ESO	

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
		✓ Providing a shipping document (e.g. shipping manifest) that describes the contents of the load and its associated hazards in addition to the labeling of the containers. The shipping document should establish a chain-of-custody using multiple signed copies to show that the waste was properly shipped, transported and received by the recycling or treatment/disposal facility ✓ Ensuring that the volume, nature, integrity and protection of packaging and containers used for transport are appropriate for the type and quantity of hazardous material and modes of transport involved ✓ Ensuring adequate transport vehicle specifications ✓ Training employees involved in the transportation of hazardous materials regarding proper shipping procedures and emergency procedures ✓ Using labeling and placarding (external signs on transport vehicles), as required.			
8.	Impacts from generation of domestic/construction wastewater	- Implement wastewater management plan (as part of CEMP). - The Contractor will be responsible for compliance with the relevant Vietnamese regulations on wastewater discharges into surroundings (QCVN 14/2008/BTNMT for domestic wastewater and QCVN 40/2011/BTNMT for industrial wastewater). - Construction wastewater will be directed to temporary detention and settling pits which will be installed/constructed by the contractor prior to the construction work at the Project site, located away from surface waters and sized to the needs. The minimum capacity of detention and settling pits shall be calculated following the practical volume of construction wastewater and rain water at each construction site, when the CEMP is prepared. - Domestic wastewater may include effluents from domestic sewage, food service, and laundry facilities serving site employees. The contractor will; ✓ Install septic tank(s) prior to the Project construction work. The capacity of the septic systems shall be calculated based on the volume of domestic wastewater generated at each construction site, when the CEMP is prepared. ✓ Segregate wastewater streams to ensure compatibility with selected treatment option; ✓ Provide sufficient number of portable/constructed toilets on site for construction workers, which will be connected to the septic systems installed by the contractor. ✓ Segregae and pre-treat oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into sewer systems. ✓ Sign a contract with Urban Environmental Company, who dispose the sludge from	Contractor (civil works) budget	CHPMU ESO and CSC ESO	Contractor

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
		sanitary wastewater treatment system to a lisenced solid disposal site in Dong Nai Province.			
9.	Impacts on local traffic	- In order to mitigate the impacts of material transportation for construction sites on traffic to and from the project site, the Contractor shall take measures such as installation of signaling lights and signs on the access route to construction sites. Warning signs shall be available at the places where accidents are likely to occur. The signs shall include warnings of speed limit for every road section. - Heaping up and unloading construction materials or machines or equipment along roads shall be prohibited. - Traffic Police shall strictly control traffic safety along the roads in use for transportation of materials. The local road may be damaged due to heavy duty trucks. When the construction is accomplished, the contractor shall repair the road. - Since the project may contribute to a significant increase in traffic along existing roads, recommended measures include: ✓ Minimizing pedestrian interaction with construction vehicles ✓ Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations where children may be present. ✓ Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaigns) ✓ Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents ✓ Use locally sourced materials, whenever possible, to minimize transport distances. ✓ Locating associated facilities such as worker camps close to project sites and arranging worker bus transport to minimizing external traffic ✓ Employ safe traffic control measures, including road signs and flag persons to warn of dangerous conditions.			
10.	Changes in landscape	- Preserve existing vegetation when feasible. - Enforce compliance with building codes of the area - Plan, implement and maintain an appropriate landscaping program for the site that takes into account restoration or creation of native vegetation cover with local fauna and flora.	Contractor (civil works) budget	CHPMU ESO and CSC ESO	Contractor
11.	Impacts of habitat	- During land clearance, maintain the vegetation and trees, especially the area of mangrove, as	Contractor	CHPMU ESO	Contractor

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
	loss due to vegetation clearance	much as possible to protect the biological environment as well as the landscape; - Do not cut down any trees or vegetation outside the Project site; - Cut off trees step by step according to the project implementation progress, and not in one time; - Catching and hunting of wild animals is prohibited. - Properly collect biomass waste (leaves, roots, etc.) for reuse. Do not dispose them into creeks.	(civil works) budget	and CSC ESO	
12.	Impacts from materials extraction at quarry/borrow site	- Procure materials only from Department of Natural Resources and Environment (DoNRE) authorized quarries. If the contractor shall operate the quarry site, required environmental permits shall be secured prior to operation of quarry/borrow areas. Ensure borrow pits are left in a tidy state with stable side slopes and proper drainage in order to avoid creation of water bodies favorable for mosquito breeding.	Contractor (civil works) budget	CHPMU ESO and CSC ESO	Contractor
13.	Impacts of storm water; Soil erosion and land slide	- Ensure proper design of the ground so that storm water could be well controlled; erosion and land slide could be minimized. - Maintain wild vegetation covers along existing waterways (creek/canals) and ground surface as much as possible for erosion control. - Provide grass cover and other suitable slope stabilization measures on ground slopes and on long term stockpile of spoils. - Rainwater flowing over the construction site and water from dug holes shall be pumped to a temporary drainage to be constructed by the contractor prior to construction work. The drainage shall be designed to quickly drain rain water such that local water logging does not occur. Deposit tanks shall be arranged on rain water drains for dregs to settle before wastewater is discharged to the existing waterway. The capacity of the deposit tanks shall be calculated when the CEMP is prepared. - In case acidic water from the Project site flows into the surrounding land causing soil acidification, it will adversely affect the agricultural fields. To mitigate the impact, the contractor will have to treat acidic soil (pH <5.0) with lime or lime powder. The amount of lime shall be calculated based on th pH and volume of the contaminated soil.			
14.	Occupational and community health and safety impacts	- Implement an occupation and community health and safety management plan (as part of the CEMP) to be prepared according to Section 2 on Occupational Health and Safety from the IFC EHS General Guidelines, IFC EHS HCF Guidelines and IFC EHS THD Guidelines. - IFC EHS Guidelines indicate that employers and supervisors are obliged to implement all	Contractor (civil works) budget	CHPMU ESO and CSC ESO	Contractor

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
		reasonable precautions to protect the health and safety of workers. This section provides guidance and examples of reasonable precautions to implement in managing principal risks to occupational health and safety on: ✓ General Facility Design and Operation: Integrity of workplace structures, severe weather and facility shutdown, workspace and exit, fire precautions, lavatories and showers, potable water supply, clean eating area, lighting, safe access, first aid, air supply, work environment temperature ✓ Communication and Training: OHS training, visitor orientation, new task employee and contractor training, basic OHS training, area signage, labelling of equipment, communicate hazard codes ✓ Physical Hazards: rotating and moving equipment, noise, vibration, electrical, eye hazards, welding/Hot work, Industrial vehicle driving and site traffic, working environment temperature, ergonomics, repetitive motion, manual handling, working at heights, illumination ✓ Chemical Hazards: air quality, fire and explosions; corrosive, oxidizing and reactive chemicals, asbestos containing materials (ACM) ✓ Biological Hazards ✓ Radiological Hazards ✓ Personal Protective Equipment (PPE) ✓ Special Hazards Environments: confined space, lone and isolated workers ✓ Monitoring: accidents and diseases monitoring - More in detail, some guidelines are essential: ensure the living conditions for workers like facilities for resting, clean water, food, accommodation, and others meet international standards for worker accommodations to prevent communicable, food-borne, water-borne and vector-borne illnesses; - Full (personal protective equipment) PPE in order to avoid the negative effects on health, prevent diseases and not affect the environment of the residential areas; - When executing works in height, transporting, handling and installing the machinery and equipment, workers should be equipped with all means of PPE such as protective helmets, masks, reflective clothing, lights and flags. - Workers will be trained on manipulation, testing, commissioning and technical correct and timely response when problems occur;			

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
		- Provide a workforce health/emergency services on site - Especially for community's health and safety; ✓ Restrict access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community. ✓ Remove hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials. ✓ The incidence of road accidents involving project vehicles during construction should be minimized through a combination of education and awareness-raising, and the adoption of procedures. ✓ Deploy information, education and behavior change communication to workers on communicable diseases as appropriate (e.g. sexually transmitted infections, including HIV, vector-borne diseases), road traffic safety and driving behavior through communities, and respectful interaction with local populations.			
15.	Impacts on local society and economy due to worker force influx	- Employ as many local people as possible for simple jobs (earthwork, material transport, cooking, safeguarding, etc.). - Use local suppliers of goods and services where possible. - Frequently educate workers about relationships with local residents and communicable diseases. - Register the temporary residence of workers with local police - Closely collaborate with local authority and organization to monitor and control illegal activities related to construction workers - The contractor will make a list of temporary absences and residence of workers at site and should enforce site rules at all times.	Contractor (civil works) budget	CHPMU ESO and CSC ESO	Contractor
16.	Impacts on physical cultural resources	- Relocate according to local standards and traditions, existing scattered graves (if any are found) in the area. Construction activities will be immediately suspended if any physical cultural resources are encountered and can only be resumed after assuring these resources are conserved and avoidance of destroying and damaging is assured by providing for the use of "chance find" procedures that include a pre-approved management and conservation	Contractor (civil works) budget	CHPMU ESO and CSC ESO	Contractor

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
		approach for materials that may be discovered during project implementation. Construction activities can resume only after thorough investigation and with the permission of Provincial Department of Culture, Sport and Tourism. - The project will not remove any physical cultural resources unless the following conditions are met: ✓ No alternatives to removal are available. ✓ The overall benefits of the project substantially outweigh the anticipated cultural heritage loss from removal - Any removal is conducted in accordance with relevant provisions of national and/or local laws, regulations, and protected area management plans and national obligations under international laws, and employs the best available techniques.			
Operational Phase					
17.	Impacts of Traffic Increase	- Promote collective transportation to the area. - Promote use of active modes of transportation (walking and cycling) inside the campus. Incentivize walking, cycling, and use of public transport by students and staff. (for example. through active transport campaigns, shared cycling schemes, cycling clubs). - If needed, frequently water any internal roads to reduce dust and keep the roads cleaned. - Since the project may contribute to a significant increase in traffic in the Project area, in order to mitigate the risk and impacts of traffic accidents; ✓ Increase the awareness of workers and students by organizing capacity building sessions ✓ Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaigns) ✓ Collaborate with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations where children may be present. ✓ Ensure a vehicular speed limit on site. ✓ Employ safe traffic control measures, including road signs and flag persons to warn of dangerous conditions ✓ Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries: ✓ Coordinate with emergency responders to ensure that appropriate first aid is provided in the event of accidents	HCMCUMP Operational Budget	HCMCUMP	HCMCUMP

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
18.	Impacts of solid/liquid waste including hazardous and non-hazardous wastes	- For non-hazardous solid wastes: ✓ Each housing block must install 3 types of solid waste containers with labels: organic, inorganic and reusable; ✓ All domestic wastes must be collected, segregated and hauled to trash collection points by sanitation workers with trash trolleys. Trash collection points will be enclosed with walls and covered with sheets. From the points, trash will be transported by a licensed waste collection/treatment company. - For hazardous and medical solid wastes: ✓ Segregate hazardous and non-hazardous wastes; ✓ Hazardous and medical wastes should be managed complying with MoNRE and with the Joint Circular 58/2015/TTLT – BYT-BTNMT dated 31 December 2015 of MOH and MoNRE on management of medical wastes. ✓ Arrange a specific storage zone for hazardous waste, equipped with cement-floor, enclosing walls, roof to store trash containers that are coded for every sort of hazardous waste. ✓ Register hazardous waste sources ✓ Hire a functional licensed hazardous waste collection/treatment company. ✓ Medical waste may be burned by a specific incinerator, permitted by provincial DoNRE. - Minimize hazardous waste generation by implementing stringent waste segregation to prevent the commingling of non-hazardous and hazardous waste to be managed. - Provide training and incentives to employees in order to meet objectives.	HCMCUMP Operational Budget	HCMCUMP	HCMCUMP
19.	Impacts of wastewater	- Wastewater from buildings established under Phase 1 shall be separately collected as wash water and toilet water: ✓ Wash water: including wastewater from lavatory basin, bathrooms, toilet floors and canteens shall be driven to waste stacks in connection boxes, then to manholes of wastewater collection systems (downstream of septic tanks) to be treated in wastewater treatment stations of the Campus. ✓ Toilet water shall be collected in soil stacks (separately from waste stacks). Toilet water shall be discharged to septic tanks of every building before discharge to the wastewater treatment station of the Campus. - The Project Owner must install adequate capacities for the treatment of wastewater from the whole Campus. A pre-fabricated, compact and closed wastewater treatment plant may be			

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
		most appropriate given the relatively small volume of wastewater and the proximity to lecture and dormitory facilities. Such a facility would require approximately 200m2 of land but can be installed underground. The waste water after treatment shall achieve the permissible limits in National Technical Regulation for Domestic Wastewater (QCVN 14: 2008/BTNMT; column B, K = 1.0) and was led into the drainage system of the district (Chapter III.D, paras.66, 67, 68).			
20.	Impacts of offensive smell	- Properly manage domestic wastewater and solid wastes at buildings, offices and other places in the Campus; - Well clean toilets in buildings, offices and other places in the Campus; - Carry out odor control at the centralized wastewater treatment stations and at temporary solid waste storage sites.			
21.	Impacts from land changes on landscape	- The campus will be planned accordingly to the adaptation to the actual landscape to imprint the least impacts possible.	HCMCUMP Operational Budget	HCMCUMP	HCMCUMP
22.	Impacts on occupational and comunity health and safety	- Provision of training on EHS to the staff - Prepare instruction board or post with practices and guidance on safety risk by fire etc. on public places inside the campus to teachers, students and other staff. - Training to all new employees to ensure they are apprised of the basic site rules of work and the necessary procedures for an emergency situation (fire, failure of buildings, accidental and natural hazards, others). - Hazardous areas, installations, materials, safety measures and emergency exits should be marked properly and in accordance to international standards; - Copies of the hazard coding system should be posted outside the facility at emergency entrance doors; - Information on the hazardous materials at the facility should be shared proactively. - Against power failure, providing stand-by electric generators for housing areas; maintain a technical team for examination, maintenance and service of electric generators as well as the power grid so as to ensure immediate response to any incident.Cooperate with Provincial Department of Public Security for training against fire, natural hazards - Provide visual safety instruction at public places for community - Provide instruction on first aid to reduce accidental damage. - Incorporation of siting and safety engineering criteria to prevent failures due to natural risks posed by earthquakes, wind, flooding, landslides and fire. To this end, all project structures	HCMCUMP Operational Budget	HCMCUMP	HCMCUMP

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
		should be designed in accordance with engineering and design criteria mandated by site-specific risks, including but not limited to seismic activity, slope stability, wind loading, and other dynamic loads - Application of locally regulated or internationally recognized building codes to ensure structures are designed and constructed in accordance with sound architectural and engineering practice, including aspects of fire prevention and response - Engineers and architects responsible for designing and constructing facilities, building, plants and other structures should certify the applicability and appropriateness of the structural criteria employed. - Depending on the nature of a project, guidance provided in the ICC or comparable codes should be followed, as appropriate, with respect to: ✓ Existing structures ✓ Soils and foundations ✓ Site grading ✓ Structural design ✓ Specific requirements based on intended use and occupancy ✓ Accessibility and means of egress ✓ Types of construction ✓ Roof design and construction ✓ Fire-resistant construction ✓ Flood-resistant construction - Project sponsors' architects and professional consulting engineers should demonstrate that affected buildings meet these life and fire safety objectives. - Life and fire safety systems and equipment should be designed and installed using appropriate prescriptive standards and/or performance based design, and sound engineering practices. - Life and fire safety design criteria for all existing buildings should incorporate all local building codes and fire department			
23.	Impacts on local society and economy due to an increase of	- Prioritize local people in training and employment in particular those who were directly affected by the land acquisition. - Organize and participate in campaigns to promote harmonious lifestyle and to prevent discord between workers and local people.	HCMCUMP Operational Budget	HCMCUMP	HCMCUMP

No.	Impact	Mitigation Measure	Source of Funds	Responsibilities	
				Supervision	Implementation
	social crimes/tensions	- Ensure the public, green, recreational and cultural spaces within the campus are accessible to local populations. - Have adequate public consultation and information disclosure actions that the public opinion can be recorded and heard in a timely manner. Public consultation should be performed during all phases of the Project. - Create a grievance mechanism to collect, monitor and respond to arisen social and cultural issues during the HCMCUMP Phase 1 operation. - Capacity building and awareness of environmental sanitation to community in the region and participate in volunteering Labor Days for environmental protection. - Supervise and educate, inspect the implementation of regulations on hygiene, security and order, prevention of social evils. - Close collaboration with local authority and organization to monitor and control illegal activities related to workers or students. - Mitigate any impacts on the existing infrastructure arising from the 6,050 students and 200 staff, like accommodation, restaurants, supermarkets, health facilities, schools for the staff's children and any others: ✓ It is expected private business will rise in the area to accommodate the rising needs ✓ It is expected some of the directly affected people will apply their compensation into their own businesses to suppress the needs of the incoming immigration.			
Positive Impacts					
24.		Job opportunities for local people			
25.		Improvement of life quality / health services			
26.		Improvement of educational level			
27.		Improvement of infrastructures			
28.		Increase of local GDP			

C. ENVIRONMENTAL MONITORING PLAN

317. The environmental monitoring plan (EMoP) for the EMP presented in Table 32 focuses on all three phases (pre-construction, construction, operation) of the Project with the purpose to determine the effectiveness of the impact mitigations, and to document any unexpected positive or negative environmental impacts of the Project.

318. The environmental monitoring plan will be carried out by the CSC / Contractor and under the responsibility of CHPMU during construction phase and by HCMCUMP during operation phase. CHPMU ESO will function to coordinate and provide logistical support as needed for construction phase and HCMCUMP for the operational phase.

319. After the pre-construction and construction works are completed, the potential impact of the operation activities will be supervised by HCMCUMP.

320. The environmental standards of Vietnam should be applied for guidance and IFC EHS Guidelines should be followed to supplement standards that are not provided by the GOV. The applicable standards of environmental effect monitoring are presented in **Appendix 11**.

321. **Reporting Requirements**: The contractor will submit monthly reports to CHPMU on the implementation and compliance with the CEMP, as per approved format of the CHPMU, including but not limited to information on all spills, accidents and near misses, grievances received and appropriate actions taken, contractors' activities, manpower, equipment, materials and workmanship compliance, actual vs targeted accomplishments, environmental monitoring and compliance with EMP and with Gender, Social and occupational health and safety issues and concerns, variation orders, contractors' claims, consultants' personnel, activities, etc. Tentative schedule is within 7 days after the end of each month.

322. During the construction phase, based on the contractors' monthly reports and the compliance inspection and ambient monitoring results, CHPMU ESO will, with the support of CSC ESO, prepare Project environmental monitoring reports semi-annually and submit them to CHPMU who will review the reports and submit them to ADB for disclosure on ADB website.

323. During the operation phase, HCMCUMP will prepare Project environmental monitoring reports annually, until the issuance of ADB's Project Completion Report unless a longer period is agreed and submit them to CHPMU who will review the report and submit to ADB for disclosure on ADB website.

324. CHPMU will disclose relevant information from these semi-annual and annual environmental monitoring reports to the affected people promptly upon submission of each report.

Table 32: Environmental Monitoring Plan (EMoP)

Environmental indicators	Location	Monitoring media and Reporting	Frequency	Implementation Responsibility	Source of Funds
Pre-Construction Phase					
General Impact	CHPMU and HCMCUMP Phase 1	Fieldwork, community consultation and information, literature review, secondary data collection, engagement of related stakeholders (CSC, CHPMU, HCMCUMP, contractor, Project's consultant…) to make plans	Once before HCMCUMP Phase 1 starts	CHPMU	Project Management budget / Design budget / The CSC budget / Civil works budget
Clearance of Land and Resettlement Activities	HCMCUMP Phase 1	Fieldwork, Community Consultation and Information, Resettlement Plan and other necessary support plans	Once before HCMCUMP Phase 1 starts	HCMCUMP	HCMCUMP and Dong Nai Province as Counterpart Fund
UXO Clearance	HCMCUMP Phase 1	Consultation with appropriate legal authorities, Field Work to ensure the UXO plan is developed and implemented	Once prior to the beginning of the works	BOMICEN	UXO Budget
Construction Phase					
Air Quality Assessment (dust, PM_{10} or $PM_{2.5}$, CO, NO_x, SO_x), noise level	Construction site	Field works with analysis approved by DoNRE. (Include visual observations of dust and noise from the contractor and reported by people). Environmental Monitoring Report	Quarterly during Construction	CSC	CSC budget
Surface Water Quality (pH, TSS, DO, BOD, COD, NH_4, NO_3, Total P, Fe, As, Cr, Hg, oil and grease, Total Coliform, E.coli and other parameters as necessary)	Construction Site	Field works with analysis methods approved by DoNRE. Environmental Monitoring Report	Quarterly during construction or more frequently if a major contamination is determined after detailed assessment	CSC	CSC budget
Waste Water Quality (pH, TSS, DO, BOD, COD, NH_4, NO_3, Total P oil and grease, E.coli and other parameters as necessary)	Construction Site and Workers Camps	Field works with analysis methods approved by DoNRE. Environmental Monitoring Report	Quarterly during Construction	CSC	CSC budget

Environmental indicators	Location	Monitoring media and Reporting	Frequency	Implementation Responsibility	Source of Funds
Soil Quality (As, Cd, Pb, Cr, Cu, Zn, oil and grease)	Construction Site	Field works with analysis methods approved by DoNRE. Environmental Monitoring Report	In case of soil contamination	CSC	CSC budget
Domestic and Construction Wastes	Waste collection and disposal sites at HCMCUMP Phase 1 and Worker Camps	Visual observations and reporting	Monthly	CHPMU/CSC	The project management budget managed by the PMU and CSC budget
Grievances (Social Impacts)	Application of Grievance Mechanism, HCMCUMP Phase 1 and surrounding communities	Information hotline phone, forms	Continuous public input	CHPMU/CSC	Same as above
Occupational Health and Safety (near misses, incidents, or accidents resulting in injuries) and Emergency Response	Transport routes from/to and HCMCUMP site	Recurring reports of contractor	Continuously / Daily	CHPMU/CSC	Same as above
Mitigation of Dust (spraying water, cover transporting vehicles, maintenance of vehicles etc.)	Every location with construction activities inside HCMCUMP Phase 1 area	Recurring reports of contractor	Weekly when there are construction activities	CHPMU/CSC	Same as above
Mitigation of Wastewater (detention ponds, septic systems)	Construction sites, worker camps	Recurring reports of contractor	Monthly	CHPMU/CSC	Same as above
The quality of the facilities and quality of education	HCMCUMP Phase 1	Regular reports and documents	Annually	CHPMU/CSC	Same as above
Community Health and Safety	Area of Influence and Surrounding Communities	Regular reports and documents	Frequently and Randomly	CHPMU/CSC	Same as above

Environmental indicators	Location	Monitoring media and Reporting	Frequency	Implementation Responsibility	Source of Funds
Operational Phase					
Quality of facilities and education programs	HCMCUMP facilities in Phase 1	Technical reports and other documentation	Annually	HCMCUMP	HCMCUMP Operational Budget
Impacts from emissions from transportation vehicles in the Project area and area of Influence affecting the air quality	HCMCUMP site area of influence	Regular reports and documents	Annually	HCMCUMP	Same as above
Impacts on road traffic in the Project area, area of Influence and neighboring communes	HCMCUMP site and surrounding road	Ongoing, random	Frequently and Randomly	HCMCUMP	Same as above
Impacts from non-hazardous solid wastes	HCMCUMP site area of influence	Daily	Daily	HCMCUMP	Same as above
Impacts from land changes on landscape	HCMCUMP site area of influence	Ongoing, random	Frequently and Randomly	HCMCUMP	Same as above
Impacts related to occupational health and safety	HCMCUMP site area of influence	Ongoing, random	Frequently and Randomly	HCMCUMP	Same as above
Impacts on local society and economy due to an increase of social crimes/tensions	HCMCUMP site area of influence	Ongoing, random	Frequently and Randomly	HCMCUMP	Same as above
Impacts from the pressure on physical cultural resources in surrounding communities	Area of Influence and Surrounding Communities	Ongoing, random	Frequently and Randomly	HCMCUMP	Same as above
Community Health and Safety	HCMCUMP site area of influence	Technical reports and other documentation	Frequently and randomly	HCMCUMP	Same as above

325. The marginal costs for implementing the EMP are primarily for environmental monitoring because the costs for implementing impact mitigation measures are included with the construction costs in contractor bid documents.

326. Performance monitoring is essential to assess the overall performance of EMP. A performance monitoring system with performance monitoring indicators is usually built by the EA for all phases of development of HCMCUMP Phase 1 Project. These should be updated with the evolution of the Project, if necessary (Table 33).

Table 33: Performance Monitoring Indicators

Concerns	Indicator	Goal
Environment	Habitat changes, disturbances, change of land use	Compliance with IFC EHS Guidelines section 4.1, more specifically on preservation of vegetation and biota up to a maximum extent and area. Limit Project impacts to these receptors as much as possible.
	Water quality	Compliance with IFC EHS Guidelines, environmental laws and regulations and meet all required standards. Wastewater management plan in place.
	Air quality	Compliance with IFC EHS guidelines, environmental laws and regulations and meet all required standards. Waste avoidance, Public Transports are primarily used inside the Project area and surroundings.
	Soil quality	Compliance with IFC EHS guidelines, environmental laws and regulations and meet all required standards. Construction and operations are done without spillages of any kind.
	EMP Compliance and Update	EMP is strictly followed by the Contractor and Stakeholders participate in IEE monitoring and updates
	Raw materials and Hazardous wastes	Implement program with procedures to dispose, collect and store all the wastes
Community Consultation, Capacity Building and Trainings	The IA training	Up to last stage of construction, the compulsory courses will be defined, implemented and have total attendance
	Community consultation and disclosure of information	Meetings with stakeholders to participate in IEE. Stakeholders are invited to continue consultations and to introduce mechanisms to resolve complaints
	Education Programs	Aiming to improve the education level in medicine related courses and teach according to international levels of expertise.
Social Impacts	Public safety occupational health	Compliance with guidelines on safety and occupational health of the Government of Vietnam and ADB SPS 2009
	Physical cultural resources	No valuable physical cultural resources or relics unearthed have damaged value
	Traffic	Zero accidents/injuries/fatalities; minimize disruption, blockage.

D. EMERGENCY RESPONSE PLAN

327. The Emergency Response Plan (ERP) outlines the roles and responsibilities of the people involved in the Project, in case of an emergency, to assure there is an action plan to respond swiftly and adequately to the situation. The detailed requirements for the ERP system are described in **Appendix 4**. The final version of the ERP should figure two appendixes, one with all the Project based contacts and local authorities relevant for the Emergency procedures and another appendix with the site facilities layout, muster points and evacuation routes. The update of the ERP and the development of these 2 appendixes should be part of the final adaptations on the EMP.

E. COST ESTIMATION FOR THE IMPLEMENTATION OF THE EMP

328. The funds for implementation of mitigation measures during pre-construction phase, include compensation, resettlement and site clearance is a separate package from Counterpart fund.

329. During the construction phase, funding for the implementation of mitigation measures falls under the responsibility of the contractor and is specified in the construction dossiers from construction budget. The cost of construction mitigation measures is included in the construction contract, which is estimated at 1% of the construction contract. The budget for the environmental monitoring program during this period was estimated and will be implemented by the CSC in the CSC budget. Cost estimate for environmental safeguards is described in Table 34.

330. During the operation period, the funds shall be managed by the Operation Agency which is HCMCUMP. The cost of mitigation measures in operation management is included in the cost of operating the facility.

Table 34: Cost Estimate for HCMCUMP Phase 1 Environmental Safeguards

Item	Unit	Cost (USD)	Unit rate	Source of Funds
Pre-construction Phase				
Vietnamese EIA preparation				
Make an EIA report	1	44,550	Package	CHPMU budget
Verification of EIA report	1	1,550	Package	CHPMU budget
UXO clearance[51]	1	25,050	Package	CHPMU budget (ODA funds)
TOTAL Pre-construction Phase		71,150		
Construction Phase				
1. Environmental Effect Monitoring[52]				
Air, noise	Quarterly over 04 years at 04 locations	6,400	100 USD x 04 (time/year) x 04 (year)x 04 locations	CSC Budget
Surface water	Quarterly over 04 years at 01 location	1,600	100 USD x 04 (time/year) x 04 (year)x 01 locations	CSC Budget
Wastewater	Quarterly over 04 years at 02 locations[53]	4,800	150 USD x 04 (time/year) x 04 (year)x 02 locations	CSC Budget
Soil	Once in the beginning of the works	600	150 USD x 01 (time) x 04 locations	CSC Budget
2. Construction Supervision Consultant Environmental Safeguards Officer (CSC ESO)[54]	Person	37,960	3,046 USD x 10 months + traveling cost and per diem (150USD/person/day x 10days/year x 5years)	CSC Budget
3. Capacity Building[55]	Course Development and Delivery	3,500	Package	CSC Budget
TOTAL Construction Phase		*54,860*		
Operation Phase (first 2 years)				
1. Capacity Building	Course Development and Delivery	2,500	Package	CSC Budget
TOTAL Operation Phase		*2,500*		
GRAND TOTAL Construction + Operation		*128,510*		

[51] The cost for UXO clearance is 66,800 USD covering both HMU and HCMCUMP. The cost for each university was calculated based on the area size (16 ha for HMU and 10 ha for HCMCUMP).
[52] See Table 32: Environmental Monitoring Plan (EMoP).
[53] One of domestic wastewater and another one of construction wastewater.
[54] 1 month for PIB preparation, preparation and delivery of trainings and CEMP review, 8 months for monitoring reports preparation assuming 3 years and 4 months for construction, and 1 month for delivery of trainings and preparation of final reports
55 See Table 30: Institutional strengthening and training programs.

X. Findings, Recommendations and Conclusions

331. The initial evaluation of the HCMCUMP Phase 1 preliminary design, final location and environmental conditions on site showed that the expected environmental impacts will be primarily related to the land acquisition and the changes in landscape and use of land, and impact of pollutants generated in the process of construction. These impacts can be minimized and managed. There is no identified sensitive biota at site and the biodiversity is common for the area. Most of the area was previously used for agriculture or aquaculture and is now abandoned.

332. Social impacts will be felt along all phases of development of HCMCUMP Phase 1 since they stem mainly from economic displacement during pre-construction, increased industrial traffic and the presence of a construction workforce during construction, and the increased affluence of teachers and students in the area (including the consequent pressure on the existing infrastructure, social structures, and others) during operation. These risks can also be avoided, minimized and managed, and in general the local population if in favor of the development of the Project since the benefits will surpass the predicted impacts.

333. During consultation meetings, the affected people and CoPCs stressed that it would be of upmost importance to implement mitigation measures related to control of construction wastes, wastewater, noise and dust pollution during construction and control of wastewater, solid wastes, medical wastes and social impacts in operation of the Campus. CHPMU and HCMCUMP will ensure that all the mitigation measures proposed in this IEE (Table 31) will be properly implemented.

334. IEE concluded that the description of the Project's feasibility design combined with the available information on the environmental factors affected is sufficient to determine the scope of the environmental impact of the Project.

335. No further assessment is needed, and the Project can be classified as Category B for Environment under ADB SPS 2009.

Appendix 1: List of common plant species at the Project Area (identified by Institute for Environmental Science and Development, VESDEC, August 2018)

No.	LATIN NAME	FAMILY	VIETNAMESE NAME	LIFE-FORM	EN	HABITAT TYPE[56]				
						Cor	Rf	Gar	Re/Em	Pond
	POLYPODIOPSIDA									
1.	*Acrostichum aureum L.*	ADIANTACEAE	Ráng đại	Fern		O			O	
2.	*Marsilea quadrifolia L.*	MARSILEACEAE	Rau bợ	Fern			O			
3.	*Lygodium flexnosum* (L.) Sw.	SCHIZEACEAE	Bòng bong	Fern		R		R	R	
4.	*Salvinia cucullata* Roxb.	SALVINIACEAE	Bèo tai chuột	Fern			R			
5.	*Stenochlena palustris* (Burmf.) Bedd.	ADIANTACEAE	Dây choại	Fern		R		R		
	MAGNOLIOPSIDA									
6.	*Acacia auriculaeformis A. Cunn. ex Benth.*	FABACEAE	Keo lá tràm	Wood		O		C	O	
7.	*Acanthus ebracteatus* Vahl.	ACANTHACEAE	Ô rô	Semi-aquatic		C				
8.	*Annona glabra* L.	ANNONACEAE	Bình Bát	Shrub		C		O	O	O
9.	*Annona squamosa*	ANNONACEAE	Mãng cầu	Wood				O		
10.	*Ageratum conyzoides* L.	ASTERACEAE	Cứt lợn	Grass			O	C	O	
11.	*Barringtonia conoidea* Griff.	LECYTHIDACEAE	Chiếc chùy	Wood		C				
12.	*Calophyllum inophyllum* L.	GUTTIFERAE	Mù u	Wood				R		
13.	*Cayratia trifolia* (L.) Domino	VITACEAE	Vác	Liana		O				
14.	*Cerbera odollam* Gaertn.	APOCYNACEAE	Mướp xác	Wood		O				
15.	*Cleome chelidonii* L.f.	CAPPARACEAE	Màng màng tím	Grass			O	C	C	
16.	*Clitoria macrophylla* Wall ex Benth.	FABACEAE	Biếc lá to	Liana				R		
17.	*Derris trifolia* Lour.	FABACEAE	Dây cóc kèn	Liana		C				
18.	*Eclipta alba* (L.) Hassk.	ASTERACEAE	Cỏ mực	Grass				O	O	
19.	*Eucalyptus tereticornis J.E. Sm.*	MYRTACEAE	Bạch đàn	Wood				C	O	
20.	*Chromolaena odorata* (L.) R.M.King	ASTERACEAE	Cỏ hôi	Grass		O		O	O	
21.	*Euphorbia hirta L.*	EUPHORBIACEAE	Cỏ sữa	Grass				R	R	
22.	*Fagraea crenulata* Maingay ex Cl.	LOGANIACEAE	Bàng nước	Wood		R				
23.	*Ficus microcarpa* L.f.	MORACEAE	Gừa	Wood					R	
24.	*Ficus hirta* Vahl.	MORACEAE	Ngái	Wood		C				
25.	*Glochidion littorale* Bt.	EUPHORBIACEAE	Trâm bột	Shrub		C				
26.	*Gymnopetalum cochinchinensis* Gagn.	CUCURBITACEAE	Cứt quạ	Liana				O		

[56] HABITAT TYPE CODE: Cor = Canal Corridor, Rf = Rice Field, Gar = Garden, Em/Re = Rural residence and Embankment, Pond = Pond
ABUNDANCE CODE: R = Rare, O = Occasional, C = Common, A = Abundant, D = Dominant

No.	LATIN NAME	FAMILY	VIETNAMESE NAME	LIFE-FORM	EN	HABITAT TYPE[56]				
						Cor	Rf	Gar	Re/Em	Pond
27.	*Hedyotis diffusa* Wild.	RUBIACEAE	An điền	Grass				O	O	
28.	*Ipomoea aquatica* Forssk.	CONVOLVULACEAE	Rau muống	Liana						O
29.	*Ludwidgia hyssopifolia* (G.Don) Excell.	ONAGRACEAE	Rau mương	Grass			C	O	O	O
30.	*Mangifera spp.*	ANACARDIACEAE	Xoài	Wood				O		
31.	*Melaleuca cajuputi* Powel.	MYRTACEAE	Tràm	Wood		O		O		
32.	*Melastoma affine* D. Don.	MELASTOMACEAE	Muôi đa hùng	Shrub		O			O	
33.	*Nelumbo nucifera* Gaertn.	NELUMBONACEAE	Sen	Aquatic						R
34.	*Passiflora foetida* L.	PASSIFLORACEAE	Lạc tiên	Liana		R				
35.	*Phyllanthus urinaria L.*	EUPHORBIACEAE	Chó đẻ	Grass				R	R	
36.	*Phyllathus reticulata*	EUPHORBIACEAE	Phèn đen	Shrub				O	O	
37.	*Ruella tuberosa L.*	ACANTHACEAE	Trái nổ	Grass				R		
38.	*Sida acuta L.*	MALVACEAE	Chổi đực	Shrub				R	R	
39.	*Sonneratia caseolaris* (L.) Engl.	SONNERATIACEAE	Bần chua	Wood		A				
40.	*Scleromitrion verticillatum* (L.) Wang	RUBIACEAE	An điền	Grass			C			
41.	*Sphenoclea zeylanicum* Gaertn.	SPHAENOCLEACEAE	Xà bông	Grass			R			
42.	*Stachytarpheta jamaicensis* (L.) Vahl	VERBENACEAE	Hải tiên	Grass				R	R	
43.	*Terminalia catappa L.*	COMBRETACEAE	Bàng	Wood				R		
44.	*Urena lobata L.*	MALVACEAE	Ké hoa đào	Shrub				O		
45.	*Urena procumbens L.*	MALVACEAE	Ké khuyết	Shrub				R		
	LILIOPSIDA									
46.	*Aglaodorum griffithii* (Schott.)	ARACEAE	Mái dầm	Semi -aquatic		A				O
47.	*Chloris barbata* Sw.	POACEAE	Cỏ lục lông	Grass				R		
48.	*Cocos nucifera* L.	ARECACEAE	Dừa	Wood		O		A	C	
49.	*Colocasia esculenta* (L.) Schott.	ARACEAE	Khoai môn	Grass					O	
50.	*Commellna difiusa* Burm. f.	COMMELINACEAE	Rau trai	Grass		O		C	C	O
51.	*Cynodon dactylum L.*	POACEAE	Cỏ chỉ	Grass				C	C	
52.	*Cyperus digitatus* Roxb.	CYPERACEAE	U du tía	Grass			C			
53.	*Cyperus entrerianus* Boeckl.	CYPERACEAE	Cú dẹp	Grass				R		
54.	*Cyperus imbricatus* Retz.	CYPERACEAE	U kết lợp	Grass						
55.	*Cyperus iria L.*	CYPERACEAE	Cú rận	Grass			O			
56.	*Cyperus malaccensis* Lamk.	CYPERACEAE	Lác nước	Grass		R				R
57.	*Echinochloa crus-galli* L.	POACEAE	Lòng vực	Grass			O			
58.	*Eichhornia crassipes* (Maret) Solms	PONTEDERIACEAE	Lục bình	Aquatic		C				A
59.	*Eleusine indica* (L) gaertn.	POACEAE	Mầm trầu	Grass				O	O	
60.	*Eragrostis pilosa* (L.) P.Beauv.	POACEAE	Cỏ tình thảo	Grass				R		

No.	LATIN NAME	FAMILY	VIETNAMESE NAME	LIFE-FORM	EN	HABITAT TYPE[56]				
						Cor	Rf	Gar	Re/Em	Pond
61.	*Fimbristylis littoralis* Gaud.	CYPERACEAE	Cỏ lông tượng	Grass			O			
62.	*Monochoria hastata* (L.) Solms	PONTEDERIACEAE	Rau mác thon	Aquatic			R			
63.	*Nypa fruticans* Wurmb.	ARECACEAE	Dừa nước	Wood		D			O	C
64.	*Oryza sativa L.*	POACEAE	Lúa	Grass			D			
65.	*Panicum repens L.*	POACEAE	Cỏ ống	Grass		C			C	C
66.	*Panicum sarmentosum* Roxb.	POACEAE	Cỏ voi	Grass		C				
67.	*Pennisetum polystachyon* (L.) Schult.	POACEAE	Cỏ mỹ	Grass				R		
68.	*Bambusa sp.*	POACEAE	Tre	Shrub				O		
69.	*Hanguana malayana* Merr.	HAGUANACEAE	Chuối nước	Semi -aquatic		A				O

Appendix 2: List of common fauna species in the Project Area (identified by Institute for Environmental Science and Development, VESDEC, August 2018)

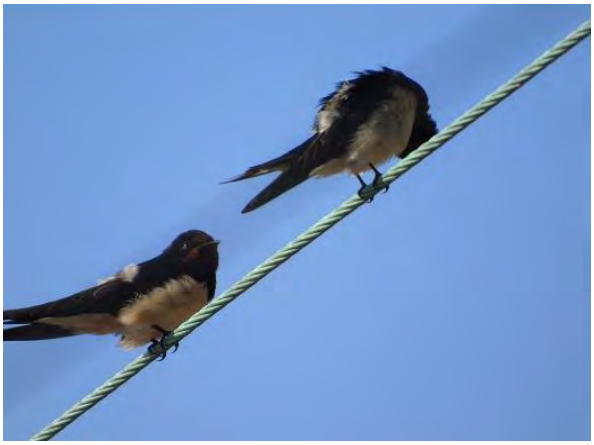
NO.	LATIN NAME	FAMILY	VIETNAMESE	EN	HABITAT TYPE[57]				
					Cor	Rf	Gar	Re/Em	Pond
	MANMALIA								
1.	*Mus musculus* Linnaeus, 1758	MURIDAE	Chuột nhà					+	
2.	*Mus caroli* Bonhote, 1902	MURIDAE	Chuột đồng			+	+		
3.	*Cynopterus brachyotis* Müller, 1838	PTEROPODIDAE	Dơi chó tai ngắn		+		+		
	AVES								
1.	*Centropus sinensis* Hume, 1873	CUCUCLIDAE	Bìm bịp lớn		+		+		
2.	*Egretta garzetta* Linnaeus, 1766	ARDEIDAE	Cò trắng		+	+			
3.	*Passer montanus* Dubois, 1885	PLOCEIDAE	Sẻ				+	+	
4.	*Hirundo rustica* Scopoli, 1786	HIRUNDINIDAE	Nhạn bụng hung		+	+	+	+	
5.	*Streptopelia chinensis* Temminck, 1810	COLUMBIDAE	Cu gáy				+		
6.	*Dicrurus paradiseus* Gould, 1836	DICRYRIDAE	Chèo bẻo cờ đuôi chẻ		+		+		
7.	*Halcyon chloris* Sharpe, 1892	ALCEDINIDAE	Sả khoang cổ		+				
	HERPETOLOGICA								
1.	*Mabuya longicaudata* Hallowell, 1857	SCINCIDAE	Thằn lằn đuôi dài				+	+	
2.	*Xenochrophis piscator* Scheider, 1799	COLUBRRIDAE	Rắn nước		+	+			+
3.	*Enhydris jagori* Peter, 1863	COLUBRRIDAE	Rắn bù lịch		+				
4.	*Trimeresurus albolabris* Gray, 1842	VIPERIDAE	Rắn lục mép		+		+		
5.	*Bufo melanostictus* Schneider	BUFONIDAE	Cóc nhà				+		
6.	*Hoplobatrachus rugulosus* Wieg., 1835	DICROGLOSSIDAE	Ếch		+	+			+
7.	*Kaloula pulchra* Gray, 1831	MICROHYLIDAE	Ễng ương		+	+	+	+	
	FISH								
1.	*Periophthalmus schlosseri* Pallas	PERIOPHTHAMIDAE	Cá thòi lòi		+				
2.	*Anabas testudineus* Bloch	ANABANTIDAE	Cá rô đồng		+	+			+
3.	*Clarias macrocephalus* Günther,1864	CLARIIDAE	Cá trê		+				+
4.	*Fluta alba* Zuiew, 1793	FLUTIDAE	Lươn đồng		+	+			+
5.	*Mystus gulio* Hamilton	BAGRIDAE	Cá chốt		+	+			
6.	*Trichogaster microlepis* Gunther	ANABANTIDAE	Cá sặc		+				+
7.	*Oreochromis niloticus* Linnaeus, 1758	CICHLIDAE	Cá rô phi						+

[57] HABITAT TYPE CODE: Cor = Canal Corridor, Rf = Rice Field, Gar = Garden, Em/Re = Rural residence and Embankment, Pond = Pond

Appendix 3: Photos of birds found at the Project Area (by Institute for Environmental Science and Development, VESDEC, August 2018)

Agretta garzetta

Halcyon chloris



Hirundo rustica

Passer montanus

Appendix 4: Emergency Response Plans

Purpose:

This document describes a framework for emergency preparedness, incident management and emergency response of which the CONTRACTOR is required to implement. It defines functional roles within the CONTRACTOR for managing and supporting emergency response. It lays out actions to be taken by site personnel and visitors in the event of an emergency situation developing on, or in the vicinity of, the site. It sets out the basic key actions to effectively control and deal with any perceived emergency situation. Upon completion, all emergency response plans will be shared with the local authorities and communities with regular communication being maintained with all parties. In support of this Project, the CONTRACTOR shall maintain a record of all such correspondence and ensure that any alteration and updates to these plans are also shared with all parties with full records being kept. The emergency contacts of local and regional emergency and health authorities will be developed. The Project site Medical Provider is responsible for engagement with local medical services and health authorities in emergency situations. The appropriate method of communication in an emergency at the site will also be developed as part of the final environmental management plan package.

Scope:

These requirements apply to the CONTRACTOR, all Subcontractors, and suppliers engaged on any portion of the works associated with the Project where CONTRACTOR has a prevailing influence and responsibility over the performance of the works. The Emergency Response, including Medical, shall be permitted to attend any off-site incident that may be related to site works. This may include such things as road traffic accidents, personal injury or any emergency that may be related to the Project. After further investigation, the CONTRACTOR, or Subcontractor may have not been directly involved, and no further follow up action will be required, but Emergency services will be available to attend off-site incidents. This document is for guidance in the event of emergency and it is not intended to restrict those persons responsible from taking whatever actions they may deem necessary to aid other persons or contain an emergency by use of their on-site knowledge or their professional judgement. These procedures are applicable to all areas of the Project site including workers' accommodation camps and describe the role and responsibilities of all personnel in the event of emergencies originating within the site. All plans will be fully reviewed on an annual basis and each time site conditions or hazards are subject to change. Where there is a statutory requirement for certain plans to be produced (such as Fire Fighting and Oil Spill Response) these will be copied to the relevant local authorities for approval. Where hazards are identified which have the potential for significant internal or external impacts consideration shall be given for the development of Business Continuity contingencies. It will be the responsibility of CONTRACTOR Site Manager

to review the potential impact and develop the necessary level of response. These business continuity requirements shall also be subject to annual review or when site conditions or hazard impacts materially change.

Definitions:

Project Owner	CHPMU
Contractor:	TBD
ERT	Emergency Response Team
EERT	External Emergency Response Team
Level 1 Incident	An incident which is managed locally by on-site personnel and is self-contained.
Level 2 Emergency	A situation that has escalated from Level 1, cannot be managed independently by the Level 1 Site Activity Group and requires additional resources and/or the involvement of local authorities. Some incidents would default to Level 2 automatically such as the case of a major oil spill, large fire, off-site incident/accident or a Project related fatality on/off site.
Level 3 Crisis	An incident or emergency situation that is so significant in impact and consequences that it requires strategic management support at a senior level. Assistance from third parties external to the Project owner such as specialist contractors and Government Agencies may be required to contain and manage the situation.
Site Response Group	The Level 1 primary response group comprised of an On-Scene Commander, Emergency Response Team (Rescue Team/ Suppression Team) and Security Team.
Incident Management Team	The Level 2 response team mobilized to provide support to Level 1. Resources for the Incident Management Team would be located on and off-site from the incident and comprise: Incident Commander, CONTRACTOR EHS Manager, Local Authority representatives.
On-Scene Commander	The On-Scene Commander dictates initial Level 1 response strategy, deploys available resources and maintains communications with the Incident Management Team. The On-

	Scene Commander is the leader of the Site Activity Group and would normally be the CONTRACTOR Site EHS Manager.
Incident Commander	The Incident Commander leads the Incident Management Team in the event of a Level 2 & 3 situation. He will maintain communications with the On-Scene Commander on the incident, its management and resources deployed. The position of Incident Commander would normally be CONTRACTOR Site Manager.
Medical Provider	TBD

The contractor must implement an Emergency Response Plan (ERP) during construction that ensures:

- The contractor is ready to respond to emergencies;
- Involved parties during construction works and all workers know the actions to be undertaken in the event of an emergency.

The contractor shall also provide and maintain the financial and human resources required to respond swiftly in case of an emergency during the construction process.

Roles and responsibilities

Before the construction, the contractor in collaboration with EA/IA, should meet with the EERT to discuss the overall construction process, including, but not limited to:

- Location of the Project;
- Construction time frame;
- All engineering and special construction equipment that will be used;
- Any hazardous materials that will be taken to and stored at the school and the details about the use/handling systems and manage them;
- Emergency management plan of the contractor;
- The name and contact details of the emergency response team leaders and members.

The warning process

The signs of emergency may be a combination of: Sound alarms (alarm sirens, bells or others); Visual alarms (rotating lights in orange or red); Direct communication via telephone, mobile or two-way radio and Public loudspeaker system. Some best practices in Vietnam for sounding these alarms are:

- Immediate call the attention of the others where there is an emergency;
- Sound the most adequate alarm;
- Report emergency situations to ERT.

The responsible on site will be the ERT senior engineer, followed by the ERT manager and if both are absent, the remaining elements of the team are entitled to contact directly the EERT. In case there are some exceptions they should be defined inside the Emergency Management Plan.

When there is a contact with the EERT, it is important to report the following information: type of emergency, exact location of emergency, estimation of the extent of the emergency, estimated number of victims, time of occurrence, in case of a spillage of toxic materials indicate the type of substance spilled, and in case of fire or explosion there should be indication of the source of the event. These details will allow EERT to prepare an appropriate response. On site, for a swift action, there should always be disclosure on the name and the contact details of the relevant organizations and people for emergency situations. The tables below show the standard procedures to be implemented on-site for evacuation.

Evacuation procedures

Process	Note
Moving out as quickly as possible as a group, avoiding running and panicking.	All the workers/employees, subcontractors, construction site visitors move out under the guidance of ERT.
To evacuate through the evacuation routes were regulated.	The ERT should determine a safe gathering point inside the facilities to where all people should go to. The ERT needs to check if all people left the premises safely.
Missing persons are reported to the ERT	ERT contact should contact EERT immediately.
Evaluate if any injured people need special care and support any wounded to be evacuated and transfer the people to the medical group from EERT	ERT should provide transportation if necessary.

Response procedures in case of health emergencies

Process	Note
Conduct first aid immediately if it is safe for both the assistant and the victim	ERT should have basic knowledge on first aids Don't move the injured unless ERT cannot support the victim in their position, for example with under a collapsed structure
Call emergency medical services EERT and/or the nearest hospital.	ERT responsible should contact EERT
Create the conditions to lead the EERT to position the emergency incident	An ERT member should be at the scene to meet EERT when approaching the location. This person is responsible for keeping the orange safety flag to attract their attention and the lead position

Firefighting response procedures

Process	Note
When there is a fire alarm	Call the attention of other people ERT team should communicate with the required agency Reports/emergency contact with ERT team
Stop all operations and evacuate	All the workers/employees, sub-contractors and customers should move to the gathering safe point following evacuation procedures.
ERT conducts fire/fire control measures (if applicable)	Following the instructions as trained, ERT members try to put the fire down if possible
Contact the fire station and the nearest police and, if possible, the emergency medical service.	When EERT is contacted, ERT team leader will provide the location, the cause of the fire, estimated the level of burns injuries, if any.
Facilitate EERT (or other firefighting team) to arrive at the location of the incident.	An ERT member at the scene should meet EERT when approaching the location. This person is responsible for keeping the orange safety flag to attract their attention and the lead position.
ERT should leave the area immediately when their safety is in danger	Follow proper evacuation procedures.

Training and Competence:

All persons visiting or working on site will receive training in the actions to be undertaken in the event of an emergency. This training will be provided as part of the site induction program and will include all CONTRACTOR, Subcontractors, occasional visitors and deliveries. This training will change as work activities evolve. The evacuation route and assembling point will be developed at each stage, and training to all workforce will be undertaken. This training will be re-enforced by the identification of site musters and undertaking of evacuations drills which will organized by the CONTRACTOR EHS Manager in conjunction with the CONTRACTOR Site Manager. Emergency Response exercises will be conducted quarterly at major mobilization stage, the nature and range of these exercises will reflect the number of persons on site and range of activities being undertaken, they will escalate as construction activities increase. All personnel with specific emergency duties will receive induction and training in the CONTRACTOR incident management and emergency response procedures.

Appendix 5: Health Profile of Dong Nai Province – the proposed second campus of HCMC University of Medicine and Pharmacy

Determinants of health

Socio - Demographic Profile

In 2016, the population at Dong Nai (South East Region) was estimated at 2,963,800 people, with population growth rate of 2.28% (refer to Table 1). The average urban and rural populations were 1,037,900 people and 1,925,900 people, respectively. While the sex ratio was 94.1 males/100 females, in which 1,437,000 were males and 1,526,800 were females[58]. The life expectancy in Dong Nai was 76 years[59].

With a total land area of approximately 5863.6 km^2, the population density of Dong Nai in 2016 was posted at 505 person/km^2. This represents an increase of 70 person/km^2 (16.09 percent) from the population density of 435 person/km^2 in 2010.

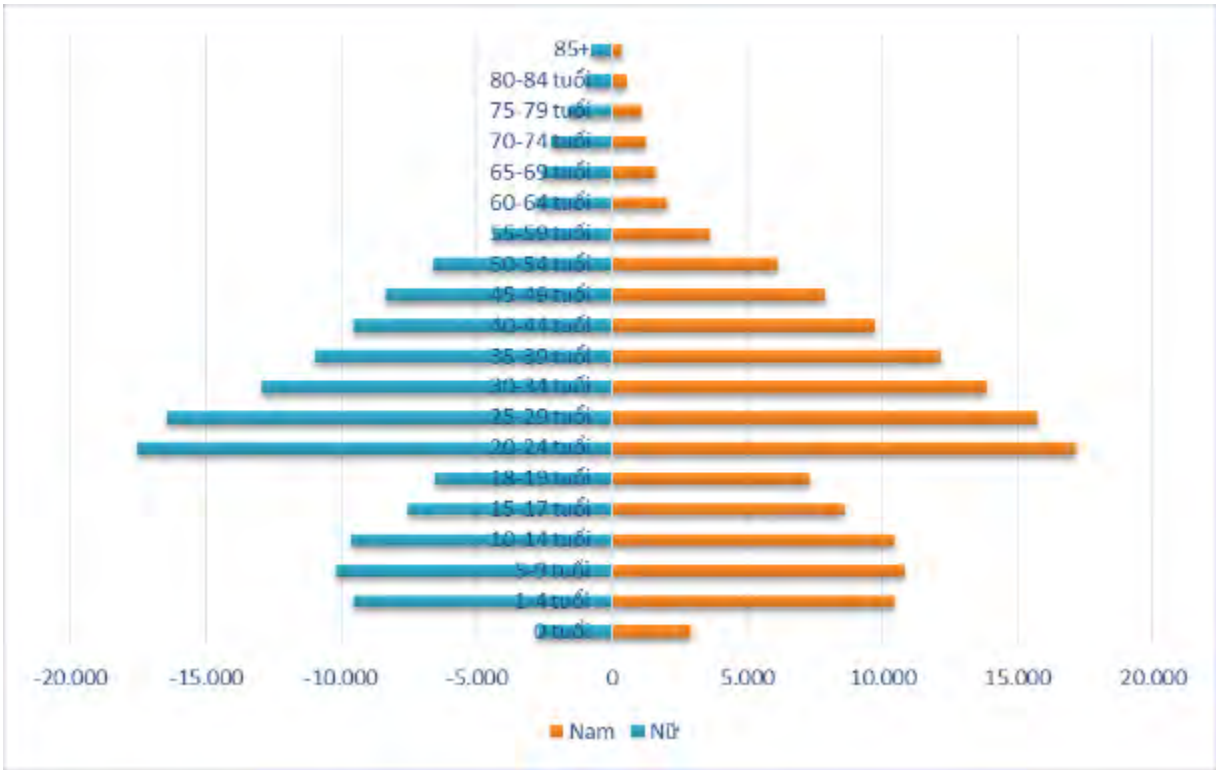
Table 1. Population indicators

In-migration rate	16.5%
Out-migration rate	5.3%
Net-migration rate	11.2%
Crude birth rate	14.7%
Crude death rate	4.8%
Natural increase rate	9.9%
Total fertility rate	1.67 children per women
Infant mortality rate	7.5/1,000 live births
Under-five mortality rate	11.3/1,000 live births
Population growth rate	2.28%
Percentage of literate population at 15 years of age and above	97%
Average age of first marriage	26.9 years

Source: General Statistics Office of Viet Nam. 2016. Population and Employment. In: Statistical Yearbook of Vietnam 2016. Hanoi: Statistical Publishing House. pp. 51-151.

The general shape of the population pyramid of Long Thanh District, Dong Nai indicated that the age and sex composition of the population is similar to other developing countries with relatively smaller proportion in the older age categories and larger proportion of the population in the less than 25 years of age categories, as shown in Figure 1.

[58] General Statistics Office of Viet Nam. 2016. Population and Employment. In: Statistical Yearbook of Vietnam 2016. Hanoi: Statistical Publishing House. pp. 51-151.
[59] Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.



Source: Dong Nai Health Centre for Prevention and Dong Nai Hospital. 2018.

Figure 1: Population pyramid of Long Thanh District, Dong Nai

The life expectancy trends in the population also showed marked improvement which indicates improvement in the health status of the population. Based from Table 2, the life expectancy at birth for the whole of Viet Nam had increased from 70.2 to 70.8 for males while it had increased from 75.6 to 76.1 for females from year 2006 to 2016, respectively. Several factors may have contributed to the increase in life expectancy such as improved accessibility of health services and improved diagnostic and other health services. Table 2 below shows the trend in life expectancy for years 2010-2016 (footnote 1).

Table 2. Life expectancy at birth from 2006-2016

Year	Male	Female	Viet Nam	South East Region
2006	70.2	75.6	72.8	75.0
2010	70.3	75.7	72.9	75.5
2013	70.5	75.9	73.1	75.7
2014	70.6	76.0	73.2	75.9
2015	70.7	76,1	73.3	76.0
2016	70.8	76.1	73.4	76.0

Source: General Statistics Office of Viet Nam. 2016. Population and Employment. In: Statistical Yearbook of Vietnam 2016. Hanoi: Statistical Publishing House. pp. 51-151.

Employment

The total labor force aged 15 years and above in Dong Nai was 1,634,700 million persons in 2016 (Table 3). There was an increase of 4,400 thousand workers in comparison with that in 2015. The percentage of employed workers at age 15 years of age and above as compared to population was at 54%.

Table 3: Employment rate

Labor force at 15 years of age and above	1,634,700 persons
Percentage of employed workers at age 15 years of age and above as compared to population	54%
Percentage of trained employed workers at 15 years of age and above	20.6%

Source: General Statistics Office of Viet Nam. 2016. Population and Employment. In: Statistical Yearbook of Vietnam 2016. Hanoi: Statistical Publishing House. pp. 51-151.

With reference to the General Statistics Office, the total employed population aged 15 years and above working in Viet Nam reached 53.3 million persons in 2016. About 41.9 % of the employed population (22.3 million persons) worked in the agriculture, forestry and fishing sector.

The unemployment rate of labor force at working age for the South East region was 2.46% in 2016, in which the rates for the urban and rural areas were 2.61% and 2.19%, respectively. While the unemployment rate for male was at 2.76% and for female at 2.10 (footnote 1).

Education

In 2016, Dong Nai had 286 kindergartens and 547 schools of general education (Table 4). This correspond to an increase of 34 kindergarten schools from 2010 - 2016, which resulted to an increase in the number of classes, teachers and pupils.

For the general education, the increase in the number of school is not substantial. As an example, only 3 schools were built and there was no increase in the number of schools for upper secondary from 2010 - 2016. The reason might be due to the size and network of schools and classes in some mountainous provinces which were re-arranged[60].

Table 4: The number of schools, classes, teachers and pupils in Dong Nai province

	Number of schools	Number of classes	Number of teachers	Number of children/pupils
Kindergarten	286	4,457	6,310	133,614
Number of schools of general education	547	13,576	21791	488,017
Primary schools	301	7526	9911	251,825
Lower secondary	172	4206	7982	162,811
Upper secondary	48	1844	3898	73,381
Primary and lower secondary	4			
Lower and upper secondary	22			

[60] General Statistics Office of Viet Nam. 2016. Education. In: Statistical Yearbook of Vietnam 2016. Hanoi: Statistical Publishing House. pp. 675 - 713.

Source: General Statistics Office of Viet Nam. 2016. Education. In: Statistical Yearbook of Vietnam 2016. Hanoi: Statistical Publishing House. pp. 675 - 713.

The percentage of graduates of upper secondary education in 2015-2016 reached 95.34%. The percentage of literate population at 15 years of age and above was 97%[2]. The number of teachers in universities was 1,236, of which 187 was public universities. There were 20,739 undergraduate students, in which 6,441 was from public universities (footnote 3).

Health Outcomes

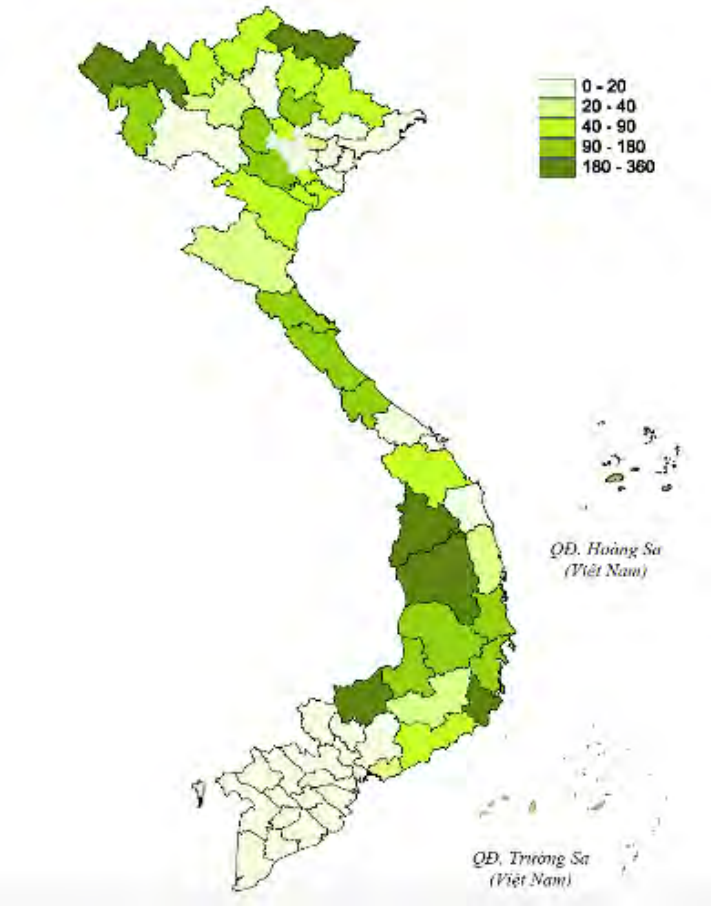
Health Indicators

Tuberculosis

Dong Nai ranked second in the most number of TB cases detected for the South East region in 2015. The number of TB case-detected was 3,577 (123.1/100,000 persons) and AFB+ Smear positive pulmonary TB was 1,566 (53.9/100,000 persons). There were 1,468 TB registered patients treated with the cured rate of 86.3% and mortality rate of 2.5% (footnote 2).

Malaria

There were 139 malaria cases reported and the rate of malaria morbidity per 100000 inhabitants is at 4.78% (Figure 2).

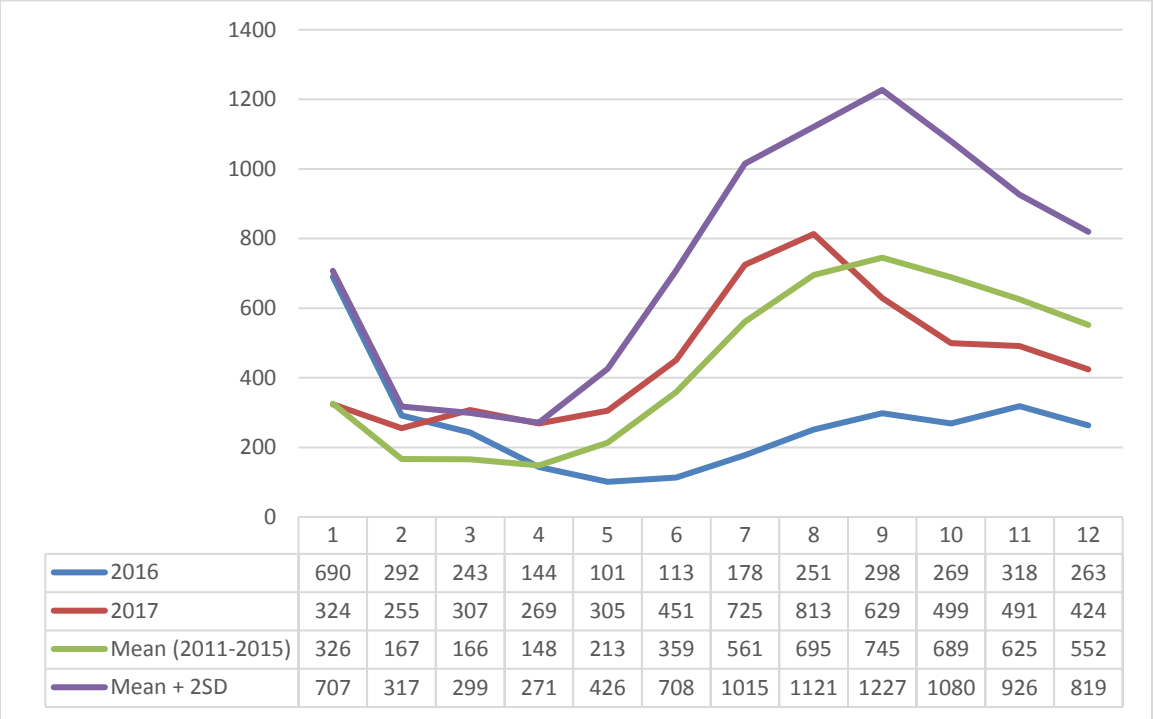


Source: Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.

Figure 2: Rate of Malaria Morbidity per 100 000 Inhabitant

Dengue Hemorrhagic Fever and Zika

Dong Nai had high number of Dengue cases with type 1, 2 and 4. Type 4 is the most frequent and increasing in 2017 compared to previous years (Figure 3 and Figure 4). The province had five Zika cases reported in 2017[61].

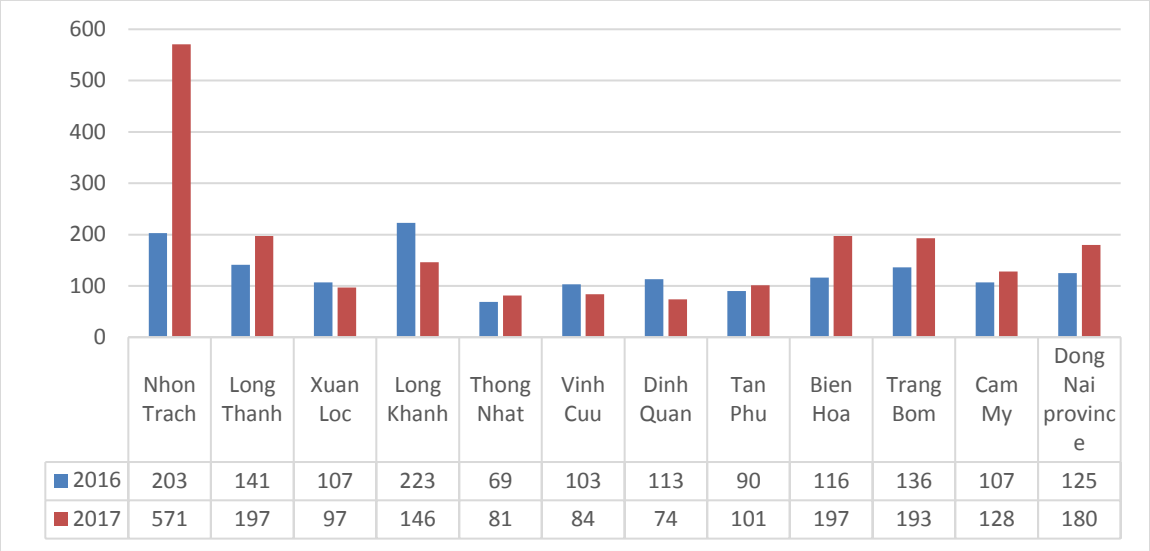


	1	2	3	4	5	6	7	8	9	10	11	12
2016	690	292	243	144	101	113	178	251	298	269	318	263
2017	324	255	307	269	305	451	725	813	629	499	491	424
Mean (2011-2015)	326	167	166	148	213	359	561	695	745	689	625	552
Mean + 2SD	707	317	299	271	426	708	1015	1121	1227	1080	926	819

Source: Provincial Health Centre for Prevention. 2017. Report on results of control and prevention of Zika and Dengue hemorrhagic fever in Dong Nai in 2017.

Figure 3: The number of Dengue cases in 2016 and 2017 and the mean number of Dengue cases and the mean ± 2 x standard deviation (SD) between 2011-2015 in Dong Nai province.

[61] Provincial Health Centre for Prevention. 2017. Report on results of control and prevention of Zika and Dengue haemorrhagic fever in Dong Nai in 2017.



Source: Provincial Health Centre for Prevention. 2017. Report on results of control and prevention of Zika and Dengue hemorrhagic fever in Dong Nai in 2017.

Figure 4: The number of Dengue cases per 100,000 persons in 11 districts of Dong Nai province in 2016 and 2017

HIV/AIDS

The prevalence of HIV infected people and people with AIDS in Dong Nai were 5,651 (194.5/100,000) and 1,268, respectively. The number of deaths due to HIV/AIDS was 1,533. The number of new HIV infected people and people with AIDS were 224 (7.7/100,000) and 64, respectively. There were 8 deaths reported in 2015 (footnote 2).

Child Health

Past studies have shown that percentage of children under 5 years who were underweight in Viet Nam has gradually declined from 18.9% in 2009 to 14.1% in 2015. Similarly, stunting declined from 31.9% in 2009 to 24.6 % in 2015; wasting declined from 6.9% in 2009 to 6.4% in 2015 (Table 5).

Table 5: Trends in nutritional status of children less than five years

Indicator	Year		
	2009	**2012**	**2015**
Stunting	31.9	26.7	24.5
Wasting	6.9	6.7	6.4
Underweight	18.9	16.2	14.1

Source: Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.

For Dong Nai, the percentage of children under 5 years who were underweight (about 1,481 children were surveyed) was at 8.8% and stunting at 24.5%. The percentage for wasting was at 5.3%.

The province had 54,865 infants (<1 year of age) in 2016, in which 97.6% were fully vaccinated. The percentage for the other type of vaccination were as follows:

a. BCG (91.4%)
b. DPT, Hib3 and VGB (93%)
c. OPV (92.4%)

d. Measles (92.4%)

Reproductive Health

According to the 2015 data on reproductive health, a total of 357,078 persons in Dong Nai uses contraceptives. Majority of the population prefers the use of IUD; wherein 130,799 cases were reported. This was followed by condom at 103,832 cases (footnote 2). Table 6 represents the reproductive health indicators for Dong Nai Province.

Table 6: Reproductive Health Indicators

Number of delivery received antenatal care ≥ 3 times in 3 trimesters	85.3%
Births were attended by healthcare workers	99.7%
Rate of postnatal care	90.3%
Maternal mortality ratio per 100,000 live births	7.5%
Percentage of child breastfed within one hour of birth	71.3%
Percentage of new-born received vitamin K1	99.9%
Percentage of pregnant women receiving the 2nd tetanus vaccination	99.7%
Proportion of under-weight new-born (<2,500 gram)	3.9%

Source: Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.

Mental Health

The rate of schizophrenia and epilepsy in Dong Nai were 142.5 and 71.7, respectively (footnote 2).

Traffic accidents and food poisoning

Table 7 showed the various indicators related to traffic accident and food poisoning.

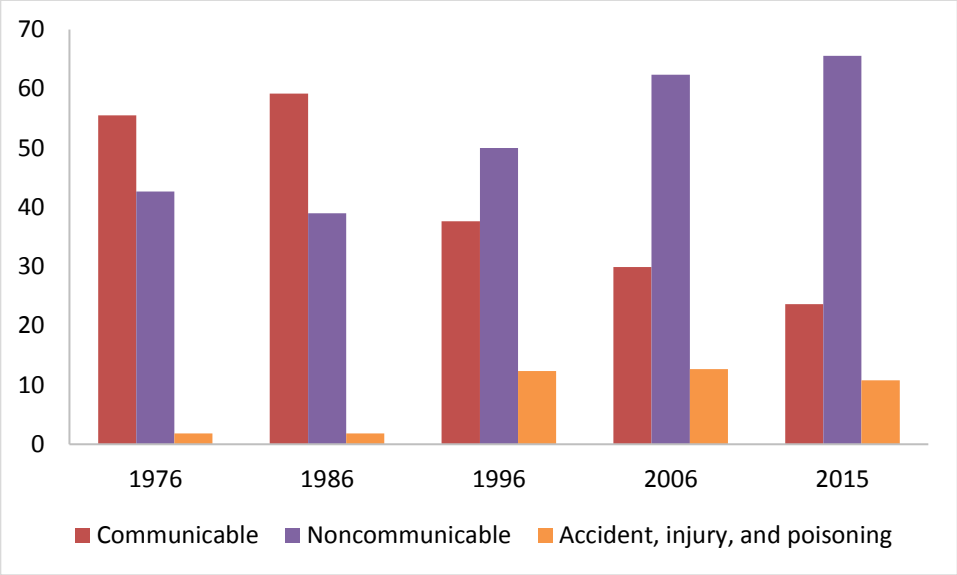
Table 7: Traffic accident and food poisoning in 2005-2016

Indicators	2010	2011	2012	2013	2014	2015	2016
The number of accidents	357	367	591	522	519	536	546
The number of deaths	339	382	329	339	328	346	362
The number of injured persons	6,520	8,769	6,520	8,976	8,656	9,686	9,468
The number of food poisoning outbreaks	6	4	5	8	1	4	5
The number of persons suffering food poisoning	211	238	214	148	142	167	255
The number of deaths due to food poisoning	0	0	4	1	0	0	0

Source: Dong Nai Health Centre for Prevention and Dong Nai Hospital. 2018.

Morbidity

In Viet Nam, the leading cause of Morbidity in 2016 were no communicable diseases (Figure 5). A total of 65.56% cases were reported while only 23.63% for communicable diseases (footnote 2).



Source: Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.

Figure 5: Trend of Morbidity by Category

For the South East region of Viet Nam, the leading causes of morbidity in 2016 are presented in Table 8 and Table 9.

Table 8: Leading Causes of Morbidity

No	Morbidities	Cases (per 100000 inhabitants)
1	Essential hypertension	572.6
2	Cataract and other lens disorder	571.6
3	Other injuries of specified, unspecified and multiple body regions	462.4
4	Other arthropod-borne viral fevers and viral hemorrhagic fevers	440.5
5	Pneumonia	417.6
6	Acute pharyngitis and acute tonsillitis	353.7
7	Acute bronchitis and acute bronchiolitis	336.3
8	Gastritis and duodenitis	285.9
9	Fracture of other limb bones	282.0
10	Diabetes Mellitus	273.5

Source: Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.

Table 9: Top 10 causes of morbidities in 2012

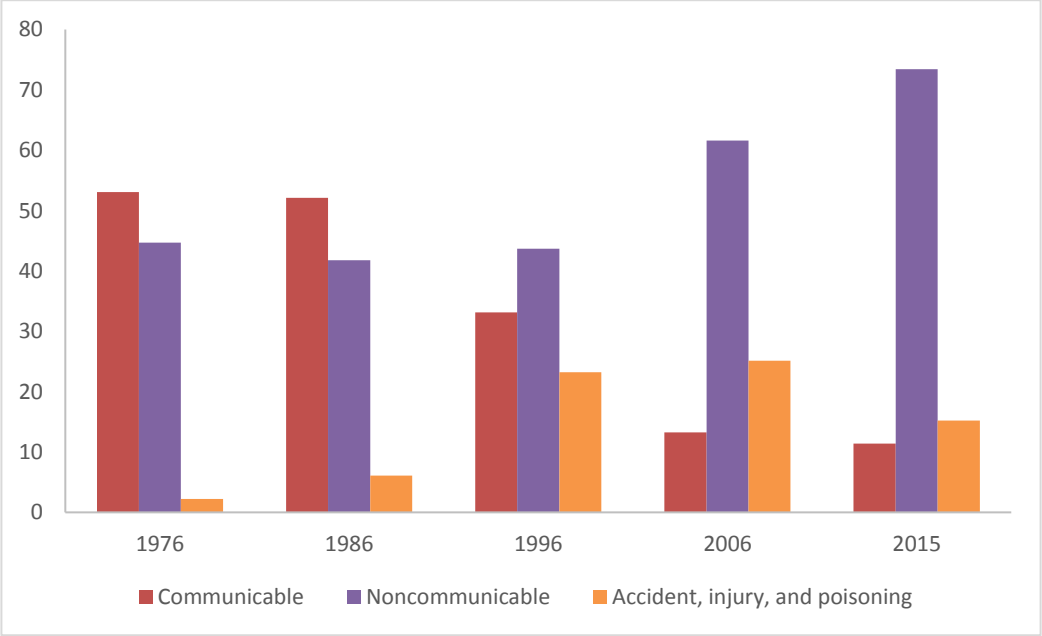
No	Morbidities	ICD-10	Frequency	/100,000 persons
1	Arthropod-borne viral fevers and viral hemorrhagic fevers	A90-A94, A96-A99	10,112	386.05
2	Hypertension	I10	9,212	394.72
3	Specified and unspecified injuries	S00-S02, S69-S99, T00-T14	9,088	346.96
4	Pneumonia	J12-J18	8,760	334.44
5	Road traffic accidents	V01-V99	6,520	279.37
6	Other virus infections	A81-89, B03-B34	5,896	225.10
7	Intestinal infections	A02-A08	5,254	225.13
8	Infectious gastroenteritis and colitis, unspecified	A09	4,570	195.82
9	Acute pharyngitis and amigdalitis	J02-J03	3,984	170.71
10	Intracranial injuries	S06	3,010	128.97

Source: Dong Nai Health Centre for Prevention and Dong Nai Hospital. 2018.

Mortality

The leading cause of Morbidity in Viet Nam for 2016 were no communicable diseases (Figure 6 and Table 10). A total of 73.41% deaths were reported while only 11.40% for communicable diseases.

Figure 6: Trend of Morbidity by Category



Source: Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.

For the South East region of Viet Nam, the leading causes of mortality in 2016 are presented in Table 10.

Table 10. Leading Causes of Mortality

No	Diseases	Deaths (per 100000 inhabitants)
1	Other respiratory disorder originating in the perinatal period	2.79
2	Pneumonia	2.26
3	Intracranial Injury	1.75
4	Acute myocardial infarction	1.47
5	HIV	1.30
6	Septicemia	1.11
7	Intracerebral Hemorrhage	0.69
8	Other heart diseases	0.67
9	Cerebral infarction	0.58
10	Essential hypertension	0.40

Source: Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.

Health Services

Curative Care

About 14% of the population used traditional medicine or combination of modern and traditional medicine62. Table 11 shows the curative care and consultation in Dong Nai province from 2010 to 2016.

Table 11: Curative care and consultation in Dong Nai province from 2010 to 2016

	2010	2013	2014	2015	2016
1. Consultation times	5,539,389	6,191,106	6,162,140	6,322,986	6,380,181
- Provincial hospitals	2,597,951	3,066,287	3,151,807	3,294,657	3,466,745
- District hospitals	974,008	1,343,654	1,492,033	1,432,566	1,513,436
- Health communes	1,967,430	1,787,666	1,518,300	1,595,763	1,598,756
2. Number of outpatients	3,767,998	3,971,891	3,959,747	4,103,127	4,125,560
3. Number of outpatients' days	1,771,391	2,219,215	2,202,393	2,230,637	2,236,680
4. Number of inpatients	260,047	301,582	375,166	502,624	512,365
5. Number of blood tests	13,316,460	17,112,881	15,457,710	17,909,120	8,073,731
6. Number of X Rays	660,936	795,264	798,129	726,300	834,102
7. Number of ultrasonic	532,125	645,198	733,105	725,476	776,836
8. Number of CT Scan	43,176	60,702	60,803	64,469	73,629
9. Number of surgeries	63,208	273,512	287,188	293,686	301,236
10. Number of deaths at the hospital	542	510	520	866	743

Source: Dong Nai Health Centre for Prevention and Dong Nai Hospital. 2018.

[62] Dong Nai Health Centre for Prevention and Dong Nai Hospital. 2018.

Facilities

Dong Nai had 8 provincial hospital with 4,430 beds, 8 district hospitals with 1,465 beds, 9 inter-district polyclinics with 120 beds, and 4 private hospitals with 303 registered beds in 2015. The province has 171 community health centers with 855 beds (footnote 2). The number of hospital beds was 26/10.000 persons (not included beds at commune levels). All health care facilities (100%) managed medical wastes and disposals by the standard requirements of the country.

The number of district hospitals will change substantially in the future as the Ministry of Health promulgated the Circular No. 37/2016/TT-BYT to merge district hospitals and district health center to avoid overlapping fulfilment of tasks, downsizing organizational structure, and improving operational efficiency[63].

Manpower

All health communes (100%) have midwives, assistant pediatricians or assistant obstetricians. There were 98.3% health communes with medical doctors and 96.5% health communes reaching national criteria. All villages (100%) have volunteered health workers in communes and town districts. The province has 8,084 healthcare workers, in which 1,431 working at commune levels, 2,003 at district level and 4,650 at provincial level (footnote 2).

The number of physicians and pharmacists were 7.2 and 1.14/10.000 persons, respectively. Data on manpower of the province is presented in Table 12:

Table 12: Healthcare manpower of Dong Nai province

	Total	Comm.	Dist.	Prov.
Total of health personnel	8,084	1,431	2,003	4,650
Medical PhD and higher	4	0	0	4
Medical master sciences	51	0	2	49
Medical doctor	1,330	181	334	815
Public Health PhD	0	0	0	0
Master of Public Health	1	0	1	0
Bachelor of Public Health	24	0	6	18
Assistant doctors	938	550	243	145
Higher degree technician	83	0	17	66
Med technician	306	0	87	219
Element med technician	7	0	3	4
High degree nurses	144	1	20	123
2nd degree nurses	2,330	251	520	1,559
Element nurse	61	15	5	41
High degree nurses	34	4	14	16
2nd Midwives	651	207	153	291
Element Midwives	14	13	0	1

[63] Ministry of Health. 2016. Circular No. 37/2016/TT-BYT of October, 25, 2016 - "Guidance on functions, tasks, powers and organizational structures of medical centres of suburban, urban districts, provincial cities, and municipality-controlled cities.", 2016,

Pharmacists PhD	0	0	0	0
Pharmacists Master	7	0	0	7
Pharmacists	132	2	38	92
Pharmacists Technician	526	181	144	201
Element Pharmacists	16	6	2	8
Traditional medicine practitioners	6	2	3	1

Source: Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.

Health Coverage

The National Assemble promulgated the Law on Health Insurance in 2008[64] and Amendments to the Law on Health Insurance in 2014[65] which aimed to cover health insurance for the whole population of Viet Nam. Further, a resolution was passed with one of the targets was to achieve Economic target Health insurance coverage over 80% of the population by 2020.[66]

The percentage of population in Viet Nam that have insurance increased from 21.10% in 2004 to 76.30% (footnote 8) in 2015 (Table 13).

Table 13: Health Insurance subscription

YEAR	No. of people insured ('000000)	Percentage of Population have insurance
2004	18.39	21.10
2006	36.87	43.90
2008	37.70	43.76
2010	52.41	60.92
2012	58.98	66.44
2014	65.00	71.00
2015	68.32	76.30

Source: Ministry of Health. 2017. Health Statistics Yearbook 2017. Hanoi: Medical Publishing House.

[64] The National Assembly. 2008. Law No. 25/2008/QH12 of November 14, 2008 - Health Insurance.
[65] The National Assembly. 2014. Law No. 46/2014/QH13 of June 13, 2014 - Amendments to the Law on Health Insurance. 2014.
[66] On Five-Year Socio-Economic Development Plan from 2016 - 2020, Resolution No. 142/2016/QH13

Appendix 6: Results of Air Quality Analysis

ITE VIMCERTS 009	VIỆN NHIỆT ĐỚI MÔI TRƯỜNG Institute for Tropicalization and Environment	Địa chỉ: 57A Trương Quốc Dung, P.10, Q. Phú Nhuận, TP.HCM. ĐT: 028.38446262-65, 38459208. Fax: 028.38423670, 38422329.
PK.18.187	**PHIẾU KẾT QUẢ THỬ NGHIỆM** **TEST REPORT**	Ngày: 05/09/2018

1. Nơi yêu cầu: Lê Trình.
2. Địa điểm lấy mẫu: Dự án Đại học Y dược thành phố Hồ Chí Minh, xã Long Tân, huyện Nhơn Trạch, tỉnh Đồng Nai.
3. Tên mẫu: K_1: Khu vực nhà dân sát bờ sông.
   K_2: Khu vực ruộng lúa.
   K_3: Khu vực bến tàu.
   K_4: Khu vực đường Lý Thái Tổ (gần chùa Long Hương).
4. Số lượng mẫu: 04 mẫu.
5. Ngày nhận mẫu: 29/08/2018.
6. Thời gian thử nghiệm: 29/08/2018 – 05/09/2018.
7. Kết quả thử nghiệm:

TT	Thông số		Đơn vị	Phương pháp thử	Kết quả thử nghiệm			
					K_1	K_2	K_3	K_4
1.	Nhiệt độ		°C	QCVN 46:2012/BTNMT (*)	29	30	31	32
2.	Độ ẩm		%		77	72	67	60
3.	Tốc độ gió		m/s		0,8-1,8	1,1-2,4	0,6-1,1	1,0-2,1
4.	Hướng gió		-	-	Đông Nam	Đông Nam	Đông Nam	Đông Nam
5.	Tiếng ồn	L_{Amax}	dBA	TCVN 7878-2:2010 (*)	58,5	51,2	60,1	76,3
		L_{Amin}			39,7	35,7	42,4	56,8
		L_{Aeq}			46,3	45,8	50,7	68,5
6.	Bụi tổng		µg/m³	TCVN 5067:1995 (*)	79	84	127	235
7.	SO_2		µg/m³	TCVN 5971:1995 (*)	58	51	61	72
8.	NO_2		µg/m³	TCVN 6137:2009 (*)	47	48	52	60
9.	CO		µg/m³	HD-CV-01 (*)	2.000	2.100	2.700	3.600
10.	Pb		µg/m³	TCVN 5067:1995 (*) TCVN 6152:1996	KPH (LOD=0,1)	KPH (LOD=0,1)	0,5	0,9

Ghi chú: *Kết quả chỉ có giá trị trên mẫu thử nghiệm.*
KPH: không phát hiện.
LOD: giới hạn phát hiện.

ĐẠI DIỆN NHÓM THỬ NGHIỆM	TRƯỞNG PHÒNG KSÔNKK	TL. VIỆN TRƯỞNG TRƯỞNG BAN KH-TH
Lê Thị Thúy Hằng	Thái Tiến Dũng	Bùi Hồng Hà

1. Không được trích sao một phần phiếu kết quả thử nghiệm này nếu không có sự đồng ý của Viện NĐMT/ This test report shall not partially be reproduced, except wholly, without written approval of ITE director.
2. Tên mẫu, tên khách hàng ghi theo yêu cầu của nơi gửi mẫu/ Name of sample and customer are reported as the customer's request.

BM.23.01b-06 Trang: 1/1

Appendix 7: Results of Surface Water, Groundwater Analysis

ITE	VIỆN NHIỆT ĐỚI MÔI TRƯỜNG Institute for Tropicalization and Environment	Địa chỉ: 57A Trương Quốc Dụng, Quận Phú Nhuận, Tp Hồ Chí Minh. ĐT: 028.38446262-65, 028.38455140 Fax: 028.38423670, 38455140
QT.18.0855	**PHIẾU KẾT QUẢ THỬ NGHIỆM** **TEST REPORT**	Ngày: 04/09/2018

1. Nơi yêu cầu: Lê Trình

2. Tên mẫu: Nước ngầm, nước mặt, đất

3. Số lượng mẫu: 09

4. Ngày nhận mẫu: 29/08/2018

5. Thời gian thử nghiệm: 07 ngày

6. Kết quả thử nghiệm: Xem các trang kèm theo

Phòng thí nghiệm đạt Tiêu chuẩn theo ISO/IEC 17025:2005
Phòng thí nghiệm đạt TCVN/QS 877:2014
Phòng thí nghiệm đủ điều kiện quan trắc môi trường theo VIMCERTS 009

ĐẠI DIỆN NHÓM THỬ NGHIỆM	TRƯỞNG PHÒNG QT&PTMT	TL. VIỆN TRƯỞNG TRƯỞNG BAN KHTH
NGUYỄN PHÚ BẢO	TRẦN TUẤN VIỆT	BÙI HỒNG HÀ

1. Không được trích sao một phần phiếu kết quả thử nghiệm này nếu không có sự đồng ý của Viện trưởng Viện NĐMT.
2. Tên mẫu, tên khách hàng được ghi theo yêu cầu của nơi gửi mẫu.

BM23.01 Lần ban hành 01 Trang: 1/6

ITE

QT.18.0855	**PHIẾU KẾT QUẢ THỬ NGHIỆM** **TEST REPORT**	Ngày: 04/09/2018

Tên mẫu, ký hiệu mẫu:

STT	Ký hiệu mẫu	Tên mẫu	Vị trí	Tọa độ
1	QT.18.08.190	NN1	Hộ Bùi Thành Hiệp, ấp Long Hiệu, xã Long Tân	X=1190495 Y = 0624890
2	QT.18.08.191	NN2	Hộ Vũ Văn Tạc, ấp Long Hiệu, xã Long Tân	X = 1189010 Y = 0623495
3	QT.18.08.192	NM1	Cuối kênh trong khu vực dự án	X=1188912 Y = 0623657
4	QT.18.08.193	NM2	Điểm giữa dự án và ngã ba sông Vàm Kinh	X = 1188647 Y = 0623702
5	QT.18.08.194	NM3	Điểm tại ngã 3 sông Vàm Kinh và Đồng Môn	X = 1187320 Y = 0625719
6	QT.18.08.195	NM4	Điểm tại bến ghe ấp Long Hiệu, xã Long Tân	X = 1190427 Y = 0624906
7	QT.18.08.196	Đ1	Cuối kênh trong khu vực dự án	X=1188912 Y = 0623657
8	QT.18.08.197	Đ2	Cánh đồng lúa khu vực dự án	X=1188712 Y = 0622657
9	QT.18.08.198	Đ3	Cánh đồng lúa khu vực dự án	X=1190495 Y = 0624890

1. Không được trích sao một phần phiếu kết quả thử nghiệm này nếu không có sự đồng ý của Viện trưởng Viện NĐMT.
2. Tên mẫu, tên khách hàng ghi theo yêu cầu của nơi gửi mẫu.

Appendix 8: Results of Groundwater Quality Analysis

ITE

QT.18.0855	PHIẾU KẾT QUẢ THỬ NGHIỆM TEST REPORT	Ngày: 04/09/2018

Nước ngầm:

TT	Thông số	Phương pháp thử	Đơn vị	Kết quả thử nghiệm	
				QT.18.08.190	QT.18.08.191
1	pH	TCVN 6492:2011	-	6,4	6,5
2	SS	ISO 11923:1997	mg/L	17	4
3	EC	SMEWW 2510B 2012	µS/cm	782	10
4	Độ mặn	SMEWW 2520B 2012	%	0,04	0
5	Độ đục	TCVN 6184:2008	NTU	14	2,4
6	$N-NO_2$	SMEWW 4500 – NO_2^- B:2012	mg/L	0,014	<0,010
7	$N-NO_3$	SMEWW 4500 – NO_3^- .E:2012	mg/L	0,88	0,84
8	$N-NH_4$	TCVN 6179:1996	mg/L	0,122	KPH LOD=0,026
9	$P-PO_4$	TCVN 62 2:2008	mg/L	KPH LOD=0,003	KPH LOD=0,003
10	Tổng Phốt pho	TCVN 6202:2008	mg/L	KPH LOD=0,10	KPH LOD=0,10
11	BOD_5	SMEWW 5210B:2012	mgO_2/L	4	1
12	Tổng Fe	US EPA Method 6020A	mg/L	0,265	0,015
13	Mn	SMEWW 3125B:2012	mg/L	0,090	0,002
14	Cd	SMEWW 3125B:2012	mg/L	KPH LOD=0,001	KPH LOD=0,001
15	Tổng Cr	SMEWW 3125B:2012	mg/L	KPH LOD=0,0015	KPH LOD=0,0015
16	As	SMEWW 3125B:2012	mg/L	KPH LOD=0,00007	KPH LOD=0,00007
17	Hg	SMEWW 3125B:2012	mg/L	KPH LOD=0,0002	KPH LOD=0,0002
18	Tổng Dầu mỡ	SMEWW 5520B:2012	mg/L	KPH LOD=0,3	KPH LOD=0,3
19	E.Coli	TCVN 6187-2:1996	MPN/100mL	4	9

1. Không được trích sao một phần phiếu kết quả thử nghiệm này nếu không có sự đồng ý của Viện trưởng Viện NĐMT.
2. Tên mẫu, tên khách hàng ghi theo yêu cầu của nơi gửi mẫu.

ITE

QT.18.0855	PHIẾU KẾT QUẢ THỬ NGHIỆM TEST REPORT	Ngày: 04/09/2018

Nước mặt:

TT	Thông số	Phương pháp thử	Đơn vị	Kết quả thử nghiệm	
				QT.18.08.194	QT.18.08.195
	pH	TCVN 6492:2011	-	6,6	6,7
2	SS	ISO 11923:1997	mg/L	35	48
3	EC	SMEWW 2510B 2012	µS/cm	96	54
4	Độ mặn	SMEWW 2520B 2012	%	0	0
5	Độ đục	TCVN 6184:2008	NTU	21	31
6	$N - NO_2$	SMEWW 4500 – NO_2^- B:2012	mg/L	0,011	0,012
7	$N - NO_3$	SMEWW 4500 – NO_3^- .E:2012	mg/L	0,99	1,02
8	$N - NH_4$	TCVN 6179:1996	mg/L	0,175	0,091
9	$P - PO_4$	TCVN 6202:2008	mg/L	0,063	0,074
10	Tổng Phốt pho	TCVN 6202:2008	mg/L	KPH LOD=0,10	KPH LOD=0,10
11	BOD_5	SMEWW 5210B:2012	mgO_2/L	10	9
12	COD	SMEWW 5220C:2012	mgO_2/L	44	29
13	Tổng Fe	US EPA Method 6020A	mg/L	0,388	0,301
14	Cd	SMEWW 3125B:2012	mg/L	KPH LOD=0,001	KPH LOD=0,001
15	Tổng Cr	SMEWW 3125B:2012	mg/L	KPH LOD=0,0015	KPH LOD=0,0015
16	As	SMEWW 3125B:2012	mg/L	KPH LOD=0,00007	KPH LOD=0,00007
17	Hg	SMEWW 3125B:2012	mg/L	KPH LOD=0,0002	KPH LOD=0,0002
18	Tổng Dầu mỡ	SMEWW 5520B:2012	mg/L	1,24	0,98
19	Tổng Coliforms	TCVN 6187-2:1996	MPN/100mL	2800	7500
20	DO	TCVN 7325:2004	mg/L	5,9	6,0

1. Không được trích sao một phần phiếu kết quả thử nghiệm này nếu không có sự đồng ý của Viện trưởng Viện NDMT.
2. Tên mẫu, tên khách hàng ghi theo yêu cầu của nơi gửi mẫu.

Appendix 9: Results of Soil Analysis

ITE

QT.18.0855	PHIẾU KẾT QUẢ THỬ NGHIỆM TEST REPORT	Ngày: 04/09/2018

Mẫu Đất:

TT	Thông số	Phương pháp thử	Đơn vị	Kết quả thử nghiệm		
				QT.18.08.196	QT.18.08.197	QT.18.08.198
1	Cu	US EPA Method 3051A; SMEWW 3125B:2012	mg/kg khô	8,90	57,5	51,0
2	Pb	US EPA Method 3051A; SMEWW 3125B:2012	mg/kg khô	13,0	58,1	42,1
3	Zn	US EPA Method 3051A; SMEWW 3125B:2012	mg/kg khô	35,9	66,4	69,1
4	Cd	US EPA Method 3051A; SMEWW 3125B:2012	mg/kg khô	KPH	KPH	KPH
5	Tổng Cr	US EPA Method 3051A; SMEWW 3125B:2012	mg/kg khô	28,9	72,3	48,3
6	As	US EPA Method 3051A; SMEWW 3125B:2012	mg/kg khô	7,87	57,9	31,4

Ghi chú: KPH: Không phát hiện; LOD: Giới hạn phát hiện

1. Không được trích sao một phần phiếu kết quả thử nghiệm này nếu không có sự đồng ý của Viện trưởng Viện NĐMT.
2. Tên mẫu, tên khách hàng ghi theo yêu cầu của nơi gửi mẫu.

Appendix 10: Results of Pesticide Analysis

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Appendix 7: Results of Pesticide Analysis

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ANALYTICAL REPORT

Sample code Nr.	743-2018-00059601
Analytical Report Nr.	AR-18-VD-064900-01-EN / EUVNHC-00048633

Mr. Le Trinh, VESDEC

179 Bach Dang Street
Tan Binh District,
Ho Chi Minh City

Việt Nam

Sample described as:	ĐẤT D2
Conditioning:	Sample in plastic bag
Sample reception date:	31/08/2018
Analysis Time:	31/08/2018 - 08/09/2018
Client due date:	07/09/2018
Your purchase order reference:	BORA18080237

NO.	PARAMETERS	UNIT	TEST METHOD	RESULTS
1	VD658 VD (b) Screened pesticides (GC-MS)	mg/kg	Internal method (EHC-TP1-008) (GC-MS)	Not Detected

List of screened molecules (* = limit of quantification)

VD658 VD Organochlorine pesticides (LOQ* mg/kg)

(b) Aldrin (0.02) | (b) DDD, o,p- (0.02) | (b) DDD, p,p- (0.02) | (b) DDE, o,p- (0.02) | (b) DDE, p,p'- (0.02) | (b) DDT, o,p'- (0.02)
(b) DDT, p,p'- (0.02) | (b) Dieldrin (0.02) | (b) Endosulfan, alpha- (0.02) | (b) Endosulfan, beta- (0.02) | (b) Endrin (0.02) | (b) HCH, alpha- (0.02)
(b) HCH, beta- (0.02) | (b) Lindane (gamma-HCH) (0.02) | (b) Heptachlor (0.02) | (b) Heptachlor epoxide (0.02) | (b) Hexachlorobenzene (HCB) (0.02) | (b) Iendrin (0.02)

SIGNATURE

Nguyễn Phương Phi
Production Director

Lý Hoàng Hải
General Director

Report electronically validated by Nguyễn Phương Phi 12/09/2018

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ANALYTICAL REPORT

EXPLANATORY NOTE
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Results have been obtained and reported in accordance with our general sales conditions available on request.
When declaring compliance or non-compliance, the uncertainty associated with the result has been added or subtracted in order to obtain a result that can be compared to regulatory limits or specifications. The uncertainty has not been taken into account for standards that already include measurement uncertainty.
The tests are identified by a five-digit code, their description is available on request.
The tests identified by the two letters code VD are performed in laboratory Eurofins Sac Ky Hai Dang (Ho Chi Minh). The symbol (b) identifies the tests performed by this laboratory under accreditation Environmental Monitoring Services Lab. Certificate

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ANALYTICAL REPORT

Sample code Nr.	743-2018-00059602
Analytical Report Nr.	AR-18-VD-064901-01-EN / EUVNHC-00048633

Mr. Le Trinh, VESDEC

179 Bach Dang Street
Tan Binh District,
Ho Chi Minh City

Việt Nam

Sample described as:	ĐẤT D3
Conditioning:	Sample in plastic bag
Sample reception date:	31/08/2018
Analysis Time:	31/08/2018 - 06/09/2018
Client due date:	07/09/2018
Your purchase order reference:	83RA18080237

NO.	PARAMETERS	UNIT	TEST METHOD	RESULTS
1	VD658 VD (b) Screened pesticides (GC-MS)	mg/kg	Internal method (EHC-TP1-008) (GC-MS)	Not Detected

List of screened molecules (* = limit of quantification)

VD658 VD Organochlorine pesticides (LOQ* mg/kg)

(b)	Aldrin (0.02)	(b)	DDD, o,p'- (0.02)	(b)	DDD, p,p'- (0.02)	(b)	DDE, o,p'- (0.02)	(b)	DDE, p,p'- (0.02)	(b)	DDT, o,p'- (0.02)
(b)	DDT, p,p'- (0.02)	(b)	Dieldrin (0.02)	(b)	Endosulfan, alpha- (0.02)	(b)	Endosulfan, beta- (0.02)	(b)	Endrin (0.02)	(b)	HCH, alpha- (0.02)
(b)	HCH, beta- (0.02)	(b)	Lindane (gamma-HCH) (0.02)	(b)	Heptachlor (0.02)	(b)	Heptachlor epoxide (0.02)	(b)	Hexachlorobenzene (HCB) (0.02)	(b)	Isodrin (0.02)

SIGNATURE

Nguyễn Phương Phi
Production Director

Lý Hoàng Hải
General Director

Report electronically validated by Nguyễn Phương Phi 12/09/2018

eurofins | Sac Ky Hai Dang

743-2018-00059602 - Page 2 / 2

ANALYTICAL REPORT

EXPLANATORY NOTE

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Results have been obtained and reported in accordance with our general sales conditions available on request.
When declaring compliance or non-compliance, the uncertainty associated with the result has been added or subtracted in order to obtain a result that can be compared to regulatory limits or specifications. The uncertainty has not been taken into account for standards that already include measurement uncertainty.
The tests are identified by a five-digit code, their description is available on request.
The tests identified by the two letters code VD are performed in laboratory Eurofins Sac Ky Hai Dang (Ho Chi Minh). The symbol (b) identifies the tests performed by this laboratory under accreditation Environmental Monitoring Services Lab. Certificate

Appendix 11: Applicable Standards of Environmental Effect Monitoring

Table A: Applicable Environmental Standards - Air Quality Standards Applicable to the HMU Phase 1

Indicator	QCVN 05: 2013/BTNMT - National technical standards on ambient air quality (µg/m³)				WHO Ambient Air Quality Guidelines, 2005 (µg/m³)			
	Avg 1h	Avg 8h	Avg 24h	Avg 1yr	Avg 1h	Avg 8h	Avg 24h	Avg 1yr
SO_2	350	-	125	50	-	-	20 (24h)	-
CO	30.000	10.000	-	-	-	-	-	-
NO_2	200	-	100	40	200 (1h)	-	-	40 (1yr)
O_3	200	120	-	-	-	100 (8h)	-	-
TSP	300	-	200	100	-	-	-	-
PM_{10}	-	-	150	50	-	-	50 (24h)	20 (1yr)
$PM_{2.5}$	-	-	50	25	-	-	25 (24h)	10 (1yr)

Table B: Applicable Environmental Standards - Noise Quality Standards Applicable to the HMU Phase 1

Receptor	WHO Guidelines for Community Noise, 1999 One Hour L_{Aeq} (dBA)		QCVN 26: 2010/BTNMT: National technical regulation on noise One Hour L_{Aeq} (dBA)	
	Daytime 7h00 – 22h00	Night time 22h00 – 7h00	Daytime 6h00 – 21h00	Night time 21h00 – 6h00
Residential, Institutional, Educational, Religious	55	45	55	45
Industrial, Commercial	70	70	70	55
An equivalence was considered between Residential areas from WHO and special areas from QCVN 26:2010 and between industrial and commercial areas and Normal areas from Vietnamese Legislation. The latter includes apartment buildings, hotels, guest houses and administrative offices, therefore there is a difference between thresholds from day time and night times.				

Table C: Applicable Environmental Standards - Surface Water Quality Standards Applicable to HMU Phase 1

Compound (µg/l)	QCVN 08-MT: 2015/BTNMT - National technical regulation on surface water			
	A1*	A2*	B1*	B2*
pH	6-8,5	6-8,5	5,5-9	5,5-9
BOD_5 (20^oC)	4	6	15	25
COD	10	15	30	50
DO	≥ 6	≥ 5	≥ 4	≥ 2
TSS	20	30	50	100
NH_4^+	0,3	0,3	0,9	0,9
NO^{-2}	0,05	0,05	0,05	0,05
NO^{-3}	2	5	10	15
Total N				
Cl-	250	350	350	_
F-	1	1,5	1,5	2
PO_4^{3-}	0,1	0,2	0,3	0,5
Total Phosphorus				
CN-	0,05	0,05	0,05	0,05
As	0,01	0,02	0,05	0,1
Cd	0,005	0,005	0,01	0,01

Compound (µg/l)	QCVN 08-MT: 2015/BTNMT - National technical regulation on surface water			
	A1*	A2*	B1*	B2*
Pb	0,02	0,02	0,05	0,05
Cr^{6+}	0,01	0,02	0,04	0,05
Total Chromium	0,05	0,1	0,5	1
Cu	0,1	0,2	0,5	1
Zn	0,5	1	1,5	2
Ni	0,1	0,1	0,1	0,1
Mn	0,1	0,2	0,5	1
Hg	0,001	0,001	0,001	0,002
Fe	0,5	1	1,5	2
Surfactant	0,1	0,2	0,4	0,5
Aldrin	0,1	0,1	0,1	0,1
BHC	0,02	0,02	0,02	0,02
Dieldrin	0,1	0,1	0,1	0,1
DDTs	1,0	1,0	1,0	1,0
Heptachlor & Heptachlorepoxide	0,2	0,2	0,2	0,2
Total Phenol	0,005	0,005	0,01	0,02
Oils & Grease	0,3	0,5	1	1
Total Radioactivity α	0,1	0,1	0,1	0,1
Total Radioactivity β	1,0	1,0	1,0	1,0
Coliform	2500	5000	7500	10000
E.Coli	20	50	100	200

* - A1 - Domestic water supply (after normal treatment), aquatic animal and plant conservation (and others like A2, B1 and B2).
A2 - Domestic water supply, but after suitable treatment technology or other uses like B1 and B2.
B1 - For irrigation or other purposes requiring water quality of similar uses.
B2 - Navigation and other purposes with low quality water requirements.

Table D: Applicable Environmental Standards - Wastewater Discharge Quality Standards applicable to HMU Phase 1

Indicators	QCVN 14: 2008/BTNMT - National technical regulation on domestic wastewater		Indicative Values for Treated Sanitary Sewage Discharges IFC EHS Guidelines**
	A*	B*	
pH	5-9	5-9	6-9
BOD_5 (20^oC)	30	50	
BOD			30
COD			125
TSS	50	100	50
TDS	500	1000	
Sulphur	1	4	
NH_4^+	5	10	
NO^{-3}	30	50	
Total Nitrogen			10
Oil and grease	10	20	
PO_4^{3-}	6	10	
Total Phosphorus			2
Coliforms	3000	5000	400

* - Column A defines the value of the pollutants for the calculation of the maximum allowable values in domestic wastewater discharged into water sources used for domestic water supply (with the quality of water in columns A1 and A2 of the National Technical Regulation on surface water quality). Column B defines the value of the pollution as the basis for calculating the maximum allowable value in daily-life wastewater discharged into water sources not used for domestic water supply (water quality equivalent to columns B1 and B2 of the National Technical Regulation on surface water quality or coastal waters).

** - Not applicable to centralized, municipal, wastewater systems which are included in EHS Guidelines for Water and Sanitation. Applicable as indicative guideline values applicable to sanitary wastewater discharges.

Table E: Applicable Environmental Standards - Soil Quality Standards applicable to HMU Phase 1

TT	QCVN 03-MT:2015/BTNMT National technical standards on limits of some heavy metals in the soil					
	Parameter	Agricultural land	Forestry land	Land for living	Industrial land	Commercial land, services
1	Arsenic (As)	15	20	15	25	20
2	Cadmium (Cd)	1,5	3	2	10	5
3	Lead (Pb)	70	100	70	300	200
4	Chromium (Cr)	150	200	200	250	250
5	Copper (Cu)	100	150	100	300	200
6	Zink (Zn)	200	200	200	300	300

Regarding soil quality standards, International Standards are not so easily applicable to local samples. In general, soil pollution standards are related to the concentration of the pollutant, the current and future use of the area and the exposure pathways available to the receptors. Further the soil pollution standards are to be adapted according to their clay and organic matter content. As such, a universal scheme for this comparison should be a topic for further investigation, beyond this study.

Appendix 12: List of Participants in the Third Consultation Meeting (24 September 2018 in Long Tan Commune)

No.	Name	Career	Address
	I. Affected Households		
1	Võ Hồng Long	Farmer	Ấp Phú Mỹ 1, xã Phú Hội
2	Lưu Văn Tiến	Farmer	Ấp Phú Mỹ 1, xã Phú Hội
3	Lê Thị Nga	Farmer	Ấp Phú Mỹ 1, xã Phú Hội
4	Phạm Thị Thắm	Farmer	Ấp Phú Mỹ 1, xã Phú Hội
5	Bùi Kim Danh	Farmer	Ấp Bến Săng, xã Phước Thiền
6	Nguyễn Văn Canh	Farmer	Ấp Tàu, xã Phước Thiền
7	Dương Thị Dung	Farmer	Ấp Bình Phú, xã Long Tân
	II. **People's Committee**		
8	Võ Tấn Hạnh	Head of Land Administrative Department	Nhơn Trach District
9	Nguyễn Hồng Phúc	Chairman	Long Tân commune
10	Huỳnh Nam Trung	Officer of Land Administrative Section	Long Tân commune
11	Phạm Ngọc Phước	Officer	Long Tân commune
12	Trương Văn Quyền	Vice Chairman	Phước Thiền Commune
	III. Social Organization		
13	Hồ Thị Khánh Tiết	Vice Chairwoman of Fatherland Front	Long Tân commune
14	Nguyễn Huỳnh Vũ Lang	Vice Director of Culture Center	Long Tân commune
	IV. Project Owner		
15	Do Van Dung	Vice Dean,	HCMCUMP
16	Doan Chinh Linh	Officer	HCMCUMP
17	Nguyen The Tai	Officer	CHPMU (MoH)

Appendix 13: Photos of the Third Consultation Meeting (24 September 2018 in Long Tan Commune)