

Initial Environmental Examination

June 2021

Cambodia: Greater Mekong Subregion Health Security Project (Additional Financing)

Part 1 of 2: Main Report

Prepared by the Ministry of Health, Cambodia, for the Asian Development Bank. This is an updated version of the draft originally posted in October 2016 available on <https://www.adb.org/projects/documents/gms-health-security-project-cam-oct-2016-iee>

CURRENCY EQUIVALENTS

(as of 30 June 2021)

Currency unit – riel (KR)

KR1.00 = \$0.000245

\$1.00 = KR4,079.52

ABBREVIATIONS

ADB	–	Asian Development Bank
CDC	–	Communicable Diseases Control
CEP	–	Commitment on Environmental Protection
COD	–	Chemical oxygen demand
CPMU	–	Central Project Management Unit
EA	–	Environmental assessment / Executing Agency
EIA	–	Environmental Impact Assessment
EIAR	–	Environmental Impact Assessment Report
EID	–	Emerging Infectious Diseases
EMP	–	Environmental Management Plan
GOL	–	Government of Lao People's Democratic Republic
GMS	–	Greater Mekong Subregion
HIV	–	Human Immunodeficiency Virus
GMS-HSP	–	Greater Mekong Sub-region-Health Security Project
ICU	–	incentive care unit
IEE	–	Initial Environmental Examination
IP	–	Indigenous peoples
IPC	–	Infection Prevention and Control
Lao PDR	–	Lao People's Democratic Republic
MOE	–	Ministry of Environment
MOH	–	Ministry of Health
PMU	–	Project Management Unit
PHD	–	Provincial Health Department
PIA	–	Provincial Implementing Agency
PPMU	–	Provincial Project Management Unit
REA	–	Rapid Environmental Assessment
SWM	–	Solid Waste Management
WHO	–	World Health Organization

NOTE

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I. INTRODUCTION

A. Background of the Project

1. **The original project.** The Asian Development Bank (ADB) approved the GMS Health Security Project on 22 November 2016, for a total of \$125 million equivalent comprising: (i) four concessional loans to Cambodia (\$21 million), the Lao People's Democratic Republic (\$4 million), Myanmar (\$12 million), and Viet Nam (\$80 million) from its ordinary capital resources; and (ii) a grant to the Lao People's Democratic Republic (\$8 million) from its Special Funds resources. The Cambodia loan became effective on 24 January 2017.

2. The GMS Health Security Project has three outputs: (i) regional cooperation and communicable disease control in border areas improved, (ii) national disease surveillance and outbreak response systems strengthened, and (iii) laboratory services and hospital infection prevention and control improved. In Cambodia, the project is implemented in 14 provinces and includes investment for infection prevention and control (IPC) and laboratory equipment in 53 provincial and district referral hospitals. The implementation of the original project in Cambodia is already at advanced stage, with facility refurbishment works and equipment installation already completed as of April 2021.

3. **Proposed additional financing.** Given the sustained threat posed by COVID-19 in Cambodia, the MOH requested ADB in 2021 to provide \$25 million additional loan financing for the ongoing project. The project will include \$5 million grant financing from the Japan Fund for Poverty Reduction (JFPR) to support interventions on COVID-19 surveillance, response and clinical care. The JFPR grant will finance ICT and oxygen therapy equipment; ambulances; consulting services and specified training, workshops and community mobilization expenditure. The proposed additional financing will support the Ministry of Health (MOH) in responding to the coronavirus disease (COVID-19). The additional financing will provide targeted investments for additional 81 provincial and district referral hospitals not covered under the original project. It will focus on upgrading of hospital clinical care, laboratory, infection prevention and control (IPC), and human resource capacity to respond to COVID-19 and other public health threats. The proposed additional financing loan will help strengthen surveillance, response, and risk communications capacity for COVID-19 and other communicable diseases nation-wide. The additional financing will complement ADB's support under the COVID-19 Active Response and Expenditure Support (CARES) Program.¹

4. The impact and outcome of the overall project remain unchanged from the original project. The additional financing will contribute to Cambodia's progress towards compliance with the requirements of the IHR and the Asia Pacific Strategy for Emerging Diseases, in-line with the original project outcome indicators.² This will be achieved through a nationwide scale-up of investment at the subnational level across the priority capacity areas of: (i) surveillance and risk communications, (ii) laboratory and IPC; and (iii) health service provision. Activities under the additional financing will be delivered through existing project outputs 2, 3 and 4.

5. **Output 2: National disease surveillance and outbreak response systems**

¹ ADB. 2020. [COVID-19 Active Response and Expenditure Support Program](#).

² WHO. 2017. [Asia Pacific Strategy for Emerging Diseases and Public Health Emergencies](#). Geneva. The Asia Pacific Strategy for Emerging Diseases and Public Health Emergencies provides a strategic roadmap to support country progress towards achieving the IHR core capacities.

strengthened. The project loan will finance (i) a nationwide program of trainings to strengthen subnational capacity for communicable disease prevention, detection and response; (ii) outbreak response vehicles for provincial and national agencies; and (iii) health education campaigns to enhance communities' preparedness for COVID-19 and other communicable disease threats.

6. The JFPR grant will finance computer hardware for central, provincial and district health agencies to enhance COVID-19 outbreak management and contact tracing efforts. It will support COVID-19 specific trainings for (i) surveillance staff on data management tools;³ (ii) rapid response teams on outbreak management; and (iii) health and non-health staff on COVID-19 risk communications.

7. **Output 3: Laboratory services and hospital IPC improved.** The project loan will support 8 provincial hospitals and 73 district referral hospitals not included under the original project. It will (i) equip laboratories in these 81 hospitals for communicable disease diagnostics and clinical management, including COVID-19 rapid testing; (ii) renovate laboratories in 62 of these hospitals; (iii) install modern solid waste treatment systems to 42 hospitals; and (iv) supply medical waste treatment equipment, autoclaves, washing machines and other IPC equipment to hospitals where upgrading is required. Female and male hospital staff will be trained on laboratory and IPC practices.

8. **Output 4: Emergency preparedness and response capacity for COVID-19 strengthened.** The JFPR grant will enhance COVID-19 clinical care capacity in 14 provincial hospitals. It will equip hospitals with (i) oxygen plants for onsite generation of oxygen supply, (ii) clinical equipment for provision of oxygen therapy, and (iii) an ambulance for the transportation of COVID-19 patients requiring emergency care. Female and male clinical staff will be trained on oxygen therapy and the management for COVID-19 patients. Staff will also be trained to identify and provide support and referral options to persons affected by gender-based violence and mental health issues linked to the pandemic. Technicians will be trained in operation and maintenance of oxygen plants and ambulances.

B. Purpose and Structure of the Report

9. The original project was classified as a Category B project in accordance with the ADB's 2009 Safeguards Policy Statement. The additional financing proposed in 2021 was also classified as Category B in accordance with ADB's SPS. The Initial Environmental Examination (IEE) presented in this report reflects both the scope of the original project (with IEE cleared in 2019), and the extended scope as proposed in 2021 under the Additional Financing (AF). The IEE assesses the environmental impacts of the project including the newly proposed activities under the AF, and identifies measures to mitigate negative impacts.

10. The following methodology has been implemented in the preparation of the original IEE in 2016 (and subsequently updated in 2019 and 2020) and the preparation of this updated IEE dated April 2021 that reflects the expanded scope supported under the AF:

- (i) Review of project-related documents and literature relevant to the project areas initially surveyed/assessment.
- (ii) Targeted site visits to view the environmental conditions in all target project areas and the general location of the projects and the conditions of participating referral hospitals.

³ Including the Event Monitoring System, Media Screening System, and WHO's 'Go Data' tool.

- (iii) Consultation with hospital management and staff through questionnaires, face-to-face meetings and online consultation (during COVID-19 pandemic given travel restrictions) to source information on project area characteristics, required refurbishment works and potential project impacts.
- (iv) Identification of existing environmental and socio-economic characteristics to develop project baseline.
- (v) Analysis of typical environmental impacts of project components and identification of required mitigation measures to minimize and mitigate potential impacts.
- (vi) Definition of grievance redress mechanism (GRM) to address possible community concerns and complaints during project implementation.
- (vii) Development of institutional arrangements for implementation of environmental management and monitoring requirements, as defined in the environmental management plan (EMP).

C. Conclusion

11. This updated IEE for the original project and the proposed Additional Financing confirms that project classifies as category B for environment as per ADB's Safeguard Policy Statement. The proposed project under the AF has a similar scope as the original project and does not affect the project's environment safeguards categorization. During project implementation, some structures of the laboratories will need to be repaired and refurbished before assembly of the equipment. Small shelters (7x7m) will be built for the medical waste storage and treatment equipment. Negative environmental impacts and risks during this phase will be minor, localized and temporary. Such impacts include generation of noise, dust and construction waste, and minor and risks to community and occupational health and safety. These can readily be mitigated to acceptable levels through implementation of standard environmental management practices. No sensitive sites such as wetlands, rivers or natural forest that may classify as critical or natural habitat will be affected.

12. During operation stage, solid waste generated by the operation of the hospitals are likely to be the sources of negative impacts on the environment if they are not managed properly. These pollution sources are long-term and consecutive, and therefore, mitigation measures have been incorporated in the project design. Technical systems for the collection and treatment of medical waste will be provided to those referral hospitals where service gaps have been identified. The project will also provide capacity building in basic operation and maintenance (O&M) environmental management of these solid waste treatment facilities. Overall, the project including its AF component is expected to significantly improve infection prevention and control (IPC) as well as waste management capacities and practices in referral hospitals of Cambodia. Upon project completion, all referral hospitals in Cambodia will be equipped with (or have access to nearby) modern, non-incineration based medical waste treatment facilities, either financed through the GMS Health Security Project and its Additional Financing, or other projects supported by the World Bank and the Global Fund.

II. POLICY AND LEGAL FRAMEWORK

13. This chapter discusses the policy and legal framework as well as the institutional set-up relevant to the environmental assessment of the project.

A. ADB Safeguard Policy Framework

A1. *Safeguard Policy Statement*

14. This IEE has been prepared in accordance with the ADB's Safeguard Policy Statement, 2009 (SPS) which governs the environmental and social safeguards of ADB' operations. Environmental Safeguard Requirements 1 of the SPS outlines the requirements the borrowers/clients are required to meet when delivering environmental safeguards for projects supported by ADB. These requirements include assessing impacts, planning and managing impact mitigations, preparing environmental assessment reports, disclosing information and undertaking consultation, establishing grievance redress mechanism (GRM), and monitoring and reporting. Safeguard Requirements¹ (SR1): environment of SPS 2009 also includes specific environmental safeguard requirements pertaining to biodiversity conservation and sustainable management of natural resources, pollution prevention and abatement, occupational health and safety, and conservation of physical cultural resources.

A2. *Screening and categorization*

15. At an early stage of the project, ADB screens and categorizes proposed projects based on the significance of potential project impacts and risks. Screening and categorization is undertaken to (i) reflect the significance of potential impacts or risks that a project might present; (ii) identify the level of assessment and institutional resources required for the safeguard measures; and (iv) determine disclosure requirements. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. 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 expected environmental impacts, and are assigned to one of the following four categories:

- (i) **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.
- (ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an Environmental Impact Assessment (EIA) are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
- (iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.
- (iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all projects will result in insignificant impacts.

16. The Rapid Environmental Assessment (REA) checklist for the original project and the preparation of the original IEE was completed on 14 June 2019. A more detailed REA was conducted in 2019 the 27 referral hospitals included in the scope of the original project. A second REA checklist was completed on 20 April 2021 for the additional scope proposed under the Additional Financing. The REAs concluded that the original project and the additional financing classified as category B for environment safeguards as per ADB's SPS, requiring the preparation of an IEE.

B. Cambodia Environmental Laws and Guidelines

17. Implementation of the project is governed by the environmental acts, rules, policies and regulations of the Government of Cambodia. These regulations impose restrictions and guidelines on the activities to minimize and/or mitigate likely impacts to the environment. The original project and the AF involve minor building refurbishment activities on existing hospital components. New buildings are limited to small structures for the housing of medical waste storage and treatment equipment (7x7m). Key laws, regulations and decrees of relevance to the project (including AF) are described below.

B1. Key Environmental Laws and Regulation

18. The **Law on Environmental Protection and Natural Resources Management** (NS/RKM/1296/36) was enacted in 1996 and is the main law for protection of the environment in Cambodia. Article 6 of the law requires that environmental impact assessment (EIA) be undertaken for proposed projects with the Ministry of Environment designated as the authority to review EIAs prior to submission of project proposals to the Government for approval.

19. The original project was subject to **Sub-Decree on Environmental Impact Assessment and Process** (Sub-Decree 72, 11 August 1999) which supports the Law of Environmental Protection and Natural Resources and sets out institutional responsibilities, impact assessment requirements and the procedures for undertaking the environmental assessment process. The annex to the sub-decree lists all projects (public or private) for which an environmental assessment is required. A project such as the GMS Health Security Project including the Additional Financing as documented in this IEE, involving the construction of small buildings and minor repairs of existing facilities, is not required to undertake an environmental impact assessment (EIA) or an Initial EIA (IEIA) because only buildings that have a height greater than or equal to 12m or floor area greater than or equal to 8,000m² are subject to IEIA. For types of projects that are not included in the annex, a Project Description and an Environmental Protection Contract (EPC) is to be submitted to MOE for screening.

20. Under the Sub-decree, the MoE is responsible for review of IEIAs and EIAs and to collaborate with the line ministries. The MoE has the authority to approve or reject a project. The Council for the Development of Cambodia (CDC) has overall jurisdiction over projects and has the power to comment and require amendments or additions to IEIAs and EIAs. The MoE has further responsibility in the monitoring of project implementation. The MoE implements these responsibilities through its Department of Environmental Impact Assessment and Monitoring. Besides the MoE, other ministries with responsibility for the project have the right to examine and approve projects, following MoE review.

21. Article 1 of the Sub-decree states that public participation is to be encouraged in the implementation of the IEIA process so that the conceptual inputs and suggestions of the public are to be taken into account for consideration prior to the implementation of any project.

22. On 3rd February 2020, the Ministry of Environment (MOE) issued **Prakas No. 021 on Classification of Environmental Impact Assessment for Development Project** (Prakas No.021). This regulation serves as an update to Sub-Decree No. 72 on the Environmental Impact Assessment dated 11 August 1999 (Sub-Decree No. 72); Joint-Prakas No. 1428 on public service fees dated 20 November 2014 issued by the Ministry of Economy and Finance (MEF) and MOE (Prakas No. 1428).

23. Prakas No. 021 aims to classify whether infrastructure projects should be subject to IEIA; or full EIA based on the nature and/or scale of the project. This new regulation also lists projects that are required to prepare an environmental protection contract (EPC) together with an Environmental Management and Monitoring Plan (EMMP) where there is minimal impact on the environment.

24. The Additional Financing is subject to Prakas No. 021, and thus subject to EPC and EMMP. The EPC is an agreement between the project owner (MOH) and MOE to protect the environment and manage natural resources. Given the range of construction/renovations required under the Additional Financing, it is assumed that a blanket EPC, covering all identified requirements would suffice. This IEE has been prepared to serve as EPC and EMMP.

25. Other environmental laws and regulations applicable during the construction activities in the small buildings are the following:

26. **Sub-Decree ANK/BK No. 42 (July 2000) - The Control of Air Pollution and Noise Disturbance.**⁴ The sub-decree aims to protect the environment quality and public health against air pollutants and noise pollution through monitoring, prevention and mitigation activities. For dust control, there should be no visible emissions from stockpiles of materials, crushers or batching plants. At sensitive receptors a standard of Total Suspended Particles (TSP) < 0.33 mg/m³ 24-hour average should be met.⁵ All vehicles should be well maintained and comply with the air quality regulations.

27. **Noise.** The regulation stipulates maximum permitted noise levels in residential and public areas as following: 75 dB between 6 am and 6 pm, 70 dB between 6 pm and 10 pm and 50 dB between 10 pm and 6 am.⁶ This project adopts noise level standards as set out in World Health Organization (WHO) Air Quality Guidelines (2005): one-hour noise at daytime <55 dBA and nighttime 45 dBA, which are more stringent than the national standards. Noise level standards relevant to this project are: one-hour noise at daytime < 55 dBA and nighttime 45 dBA.

⁴ Sub-Decree on Control of Air Pollution and Noise Disturbance, N0 42 ANRK.BK, 10 July 2000.

⁵ The World Health Organization guideline (2005) for 24 h is 50 µg/m³ for PM10 and 25 µg/m³ for PM2.5.

⁶ The IFC EHS guidelines give stricter noise level standards for community noise (at daytime < 55 dBA and nighttime 45 dBA).

Table 1: Noise level guidelines of IFC

Table 1.7.1- Noise Level Guidelines ⁵⁴		
Receptor	One Hour L _{Aeq} (dBA)	
	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational ⁵⁵	55	45
Industrial; commercial	70	70

Source: IFC Environmental, Health and Safety General Guidelines, 2007 (from Guidelines for Community Noise, World Health Organization (WHO))

28. **Vibration.** There is no standard for vibration in Cambodia. The following standard is recommended: the vibration levels at any vibration sensitive property or location should be less than 1mm/second peak particle velocity (ppv). The level of 1mm/second ppv is derived from the US Bureau of Mines publications for avoidance of damage and the United Kingdom Greater London Council (GLC) standard for avoidance of nuisance. The General EHS Guidelines mentions but does not recommend a limit value for vibration.

29. **Solid waste management** is primarily regulated through the Law on Environmental Protection and Natural Resources Management (1996), **Sub-Decree No. 36 on Solid Waste Management (1999)** and **Sub-Decree No. 113 on Urban Solid Waste Management (2015)**. Cambodia's Law on Environmental Protection and Natural Resource Management (1996) designates the MOE as the leading agency tasked with formulating policies, issuing regulations and coordinating actions on waste management and pollution control. Sub-Decree No. 36 on Solid Waste Management stipulates that the collection, transportation, recycling, minimization and disposal of waste in provinces and cities is the responsibility of provincial and city authorities. Sub-Decree No. 113 on Urban Solid Waste Management confirms this administrative organizational structure.

30. Sub-Decree 36 defines what fractions of solid waste classify as hazardous wastes. Infectious waste and waste from production of drugs and medicines as well as expired drugs are classified as hazardous waste. The sub-decree specifies that any treatment or disposal facility for hazardous waste is subject to prior approval from the MOE. Per sub-decree, the monitoring of packing, storage, transport, recycling, treatment and disposal of hazardous waste is the responsibility of the MOE.

31. The MOE issued the **Environmental Guidelines (Ordinance) on Solid Waste Management in the Kingdom of Cambodia (2006)**.⁷ These guidelines apply to all activities related to discarding, storage, collection, transport, recycling, treatment, composting and disposal of all kinds of solid waste. The Ordinance includes guidelines specific to medical waste management. It classifies medical waste into three categories, including general non-hazardous waste, sharp waste, and infectious waste, and provides directives on segregation, packaging, temporary storage, and treatment. The Ordinance also specifies medical waste monitoring requirements at point of production, during transport, and at point of treatment/disposal. According to the Ordinance, three treatment options are possible for medical waste, including incineration, disinfection, and sterilization. The type of treatment also affects acceptable disposal options. The

⁷ Ministry of Environment, Cambodia. 2006. Environmental Guidelines on Solid Waste Management in the Kingdom of Cambodia. Phnom Penh.

disposal in landfills of untreated medical waste including sharp waste and infectious waste is not permitted.

32. **Sub-Decree ANK/BK No. 27 (April 1999) - Water Pollution Control.**⁸ The purpose of the sub-decree is to regulate water pollution control in order to prevent and reduce the water pollution of public water bodies so that the protection of human health and the conservation of biodiversity can be ensured. It also applies to all sources of pollution and all activities causing pollution of public water areas. Additionally, it also gives the pollution types, effluent standards, and water quality standards in different areas.

33. As a minimum, all discharges of liquid wastes from construction camps, work sites or operations, to streams or water courses should be: biological oxygen demand (BOD) < 50mg/L; Turbidity <5 NTU; SS <50 mg/L; Temperature <45°C; pH = 6-9; Oil & Grease <5 mg/L and Dissolved Oxygen >4 mg/L.

34. There is no legal standard for performance of onsite septic tanks, but these should be checked for correct operation to avoid smell, overflowing and surface water logging.

35. **Sub-Decree ANK/BK No. 86 (Construction permits).** Chapter 1, Article 2 of the Sub-Decree ANK/BK No. 86 (December 1997) indicates that reconstruction, renovation, expansions and floor additions of existing building shall be subject to construction permit, which applies to public and private facilities of more than 3,000m² of floor space and extension including existing buildings of a surface of more of 3,000m². The project including the AF component is thus not subject to construction permit by the Ministry of Land Management, Urban Planning, and Construction. The construction and/or refurbishment activities are on existing referral hospital compounds which are government-owned land, with a footprint significantly lower than 3,000m².

B2. Other relevant laws and regulations

36. **Royal Decree “Protected Natural Areas”** issued in November 1993 gives protection to environment, land, forests, wetlands and coastal zones. The decree covers twenty-three (23) locations representing 18% of Cambodia’s total area and is under the jurisdiction of the Ministry of Environment.

37. The Prakas on Prohibition of Hunting and Catching Wildlife Animals, 1996 specifically bans hunting of animals and birds for food. All contractor’s workers must observe this law.

38. In 2008, Cambodia introduced the **Protected Area Law** (No. NS/RKM/0208/07), which explicitly defines protected areas as (i) national parks; (ii) wildlife sanctuaries; (iii) protected landscapes; (iv) multiple use areas; (v) Ramsar sites; (vi) biosphere reserves; (viii) natural heritage sites; and (ix) marine parks.

39. The **Labor Law** of 1997 governs relations between employers and workers resulting from employment contracts to be performed within Cambodia.⁹ The key sections relevant to this project include:

- Chapter VIII Health and Safety of Worker. The key provisions relate to the quality of the premises; cleaning and hygiene; lodging of personnel, if applicable (such as workers

⁸ Sub-Decree on Water Pollution Control, No. 27 ANRK.BK issued 6 April 1999.

⁹ Labour Law (1997) Decree No. CS/RKM/0397/01.

camp); ventilation and sanitation; individual protective instruments and work clothes; lighting and noise levels in the workplace.

- Article 230: Work places must guarantee the safety of workers.
- Article 248: All occupational illness, as defined by law, shall be considered a work-related accident. The law also sets out how accidents should be managed in terms of compensation.

B3. Applicable Prakas and Guidelines from Ministry of Health (MOH)

40. MOH provides the legal framework for managing the environmental and social risks in the health sector and issues regulations relating to medical waste management through sub-decrees and technical guidelines on waste segregation, collection, storage, transportation, treatment and disposal. In 2008, the MOH issued the **Regulation (Prakas) on Healthcare Waste Management in Cambodia**.¹⁰ The Prakas defines medical waste as waste which consists wholly or partly of human or animal tissue, blood or other body fluids, excretions, drugs, or other pharmaceutical products, swabs or dressings, syringes, needles or other sharp instruments. The Prakas provides definitions of all categories of medical waste; the requirements for the identification, labelling and classification of medical waste; and technical requirements for segregation, collection, storage, handling, transportation, treatment, and disposal of all categories of wastes generated from healthcare establishments in Cambodia.

41. Based on Article 18 of the Prakas, treatment and disposal of medical waste may be through high temperature incineration, sterilization chemical treatment, dry and wet treatment, microwave, landfilling, or inertization and encapsulation. The emissions from incineration must comply with the maximum allowable discharge levels of particulate matter and the maximum allowable concentration of hazardous substance in ambient air in accordance with MOE Sub-Decree ANK/BK No. 42 (July 2000) on the control of air pollution and noise disturbance. Per sub-decree, incinerators should be designed with combustion temperature ranging from 800°C – 1200 °C.

42. The **Technical Guideline on Healthcare Waste Management (2012)** issued by the MOH provide technical specifications for specific components of medical waste management.¹¹ The guideline operationalizes the MOH Prakas on Healthcare Waste Management (2008) as well as the MOE Law on Environmental Protection and Natural Resource Management (1996) and its Sub-Decree 36 on Solid Waste Management (1999). The guideline defines subcategories of medical waste, including: infectious waste, pathological waste, sharp waste, pharmaceutical waste, genotoxic waste, chemical waste, waste with high content of heavy metals, pressurized containers and radioactive waste. The guideline provides technical specifications for specific components of medical waste management, including (i) segregation, packaging, labelling and temporary storage for medical waste; (ii) medical waste transportation; (iii) local pre-treatment and/or disposal (encapsulation); and (iv) treatment and safe disposal (landfilling). The guideline also defines medical waste management policy requirements for health care facilities (HCF) (section 5).

43. **The National Guidelines for IPC in Health Facilities (2017)** issued by MOH provide detailed measures and procedures for standard precautions, transmission-based precautions and specific procedures for managing patients in isolation unit/centers.¹² The guidelines also specify

¹⁰ Ministry of Health, Cambodia. 2008. Prakas on Health-Care Waste Management in Cambodia. Phnom Penh.

¹¹ Ministry of Health, Cambodia. 2011. Technical Guidelines on Healthcare Waste Management. Phnom Penh.

¹² Ministry of Health, Cambodia. 2017. National Guidelines for IPC in Health Facilities. Phnom Penh.

requirements for safe medical waste handling and storage within HCF, in line with the MOH Technical Guideline on Healthcare Waste Management (2012). The national guidelines are consistent with World Health Organization (WHO)'s guidelines for IPC in health facilities.

44. **COVID-19 related laws and guidelines.** The Government of Cambodia issued a law on Prevention of COVID-19 Pandemic on 12 March 2021. The law sets forth health, administrative and other measures to be taken in order to combat and prevent the spread of COVID-19 and other severe and dangerous contagious diseases for the purpose of protecting people's lives, public health, and public order. The Government of Cambodia also worked closely with WHO to develop guidelines for combating the COVID-19 pandemic, and has established a hotline (115) that is free of charge.

B4. International Conventions

45. The Government of Cambodia is signatory to the following relevant environmental treaties and conventions:

- UNESCO World Heritage Convention, 1991;
- UN Framework Convention on Climate Change (UNFCCC), ratified in 1995;
- Kyoto Protocol, ratified in 2002;
- Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal, 2001;
- Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol on Substances that Deplete the Ozone Layer, 2001;
- Stockholm Convention on Persistent Organic Pollutants, 2001;
- Convention on Biological Diversity, 1995;
- Cartagena Protocol on Biosafety, 2003;
- UN Convention to Combat Desertification (UNCCD), ratified in 1997;
- Ramsar Convention on Wetlands, 1999; and
- CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), 1997.

III. DESCRIPTION OF THE PROJECT

A. Original Project

A1. Impact, Outcomes, Project Overview

46. The original project is helping Cambodia, the Lao People's Democratic Republic (Lao PDR), Myanmar, and Viet Nam comply with the International Health Regulations (IHR) and the requirement to develop core health system capacities to respond to public health threats of national and international concern.¹³ Project investments support three outputs: (i) regional cooperation and communicable disease control in border areas improved, (ii) national disease surveillance and outbreak response system strengthened, and (iii) laboratory services and hospital infection prevention and control (IPC) improved. The Asian Development Bank (ADB) approved the original project on 22 November 2016, for a total of \$125 million equivalent to Cambodia, the Lao PDR, Myanmar, and Viet Nam.

47. The project is aligned with the following impact: GMS public health security strengthened.¹⁴ The project will have the following outcome: GMS health system performance with regard to health security improved.

A2. Subproject locations

48. The original project is being implemented in 14 provinces, including investments for 53 provincial and district referral hospitals. The proposed provinces include: at the northeast border with Lao PDR and Viet Nam: Preah Vihear, Stung Treng, Ratanakiri, Mondulhiri and Kratie; at the northwest border with Thailand: Battambang, Pailin, Banteay Meanchey; and at the southeast border with Viet Nam: Kandal, Kampot, Prey Veng, Svay Rieng and Tboung Khmum. These are poor border districts hospitals in provinces in terms of shortage of equipment for infection prevention and control (IPC) and Laboratory bio-safety. The northeastern provinces are indigenous peoples populated area. The main focus of the original project is on the border provinces and districts. The map below shows the provinces including the referral hospitals included in the original project.

¹³ World Health Organization (WHO). 2016. *International Health Regulations (2005). Third Edition*. Geneva.

¹⁴ Defined by the Greater Mekong Subregion Health Security Project.



A3. Project Outputs

49. The original project includes 3 outputs, as described below.

50. **Output 1: Strengthening regional, cross-border, and inter-sectoral CDC.** MOH has made progress with regional information sharing and inter-sectoral and cross-border cooperation for CDC. In border areas, MEVs are more likely to get and spread infectious diseases and are less using formal health services. Under this component, the Project supports (i) regional, cross-border, and inter-sectoral information sharing and coordination of outbreak control among GMS countries, (ii) regional capacity for evidence-based CDC, (iii) development of better disease control strategies for MEVs in border areas, and (iv) increased CDC for MEVs in hotspots along economic corridors in targeted border areas. Support is needed for information exchange, simulation exercises, joint outbreak control, strategic planning for MEV disease control strategies in border areas, outreach to MEVs, and improving access of MEVs to CDC.

51. **Output 2: Strengthening national disease surveillance and outbreak response.** MOH has a functioning surveillance system for notifiable diseases in place, and surveillance of HIV, malaria and tuberculosis is strong. However, the system needs to be further computerized, extended to reach all health centers and communities by employing syndromic reporting, and data management has to be improved. Linkages or integration among surveillance systems with Health Management Information System/District Health Information System will also be considered. MOH also needs to improve capacity for risk analysis, community preparedness, and disease outbreak response. Under this output, the Project supports: (i) syndromic reporting at

community level; (ii) web-based reporting including information technology support; (iii) linking of disease surveillance systems, including linking clinical and laboratory surveillance; (iv) improving capacity for risk analysis, risk communication, and community preparedness; (v) improving capacity of outbreak response teams including transport; and (vi) improving screening and quarantine capacity at border points of entry and quarantine centers. Support is needed for system design, training information technology equipment, vehicles, training, and equipment for screening and outbreak control.

52. Output 3: Improving laboratory services and hospital infection prevention and control. District facilities are unable to comply with internationally acceptable levels of biosafety or to guarantee the accuracy of their laboratory testing. Underlying problems are substandard training of laboratory staff, lack of quality control, and insufficient facilities, equipment, and supplies. The quality assurance systems are in a nascent stage, and there are no national laboratory audit systems. Nosocomial or hospital-acquired infections are becoming a major public health threat. Under this component, it is proposed that the Project supports improving biosafety and quality of laboratory services and expanding services for CDC. Inputs will be (i) staff training for provincial and district hospitals for internal quality improvement, (ii) preparing standard operating procedures, (iii) providing basic equipment, supplies and minor repairs for laboratory facilities, (iv) setting up external quality assurance and audit system for compliance with national biosafety and quality guidelines, and (v) setting up a laboratory network. For infection control in hospitals, the Project will support roll out of IPC through training in hospital hygiene and special case management, provision of basic equipment and minor repairs of wards.

53. A more detailed description of the activities under the original project which involve (or involved) minor construction works and/or equipment installation is presented in **Appendix 1**. The description includes the full list of participating referral hospitals including a description of existing services, and works (to be) executed in those facilities.

B. Additional Financing

54. Cambodia's early efforts to build preparedness and response capacity for COVID-19 were guided by MOH's Response Plan for COVID-19: March 2020 to February 2021.¹⁵ The one-year plan prioritized nine focus areas for health system strengthening specific to COVID-19 readiness.¹⁶ In 2021 MOH incorporated the roll-out of COVID-19 vaccination as a key pillar of the country's response strategy.¹⁷ However, with a third of the population under the age of 16, efforts to achieve herd immunity will be hindered until vaccines are approved for use in this age group. Variants of the virus have the potential to further impede the efficacy of vaccination as a sole control strategy. MOH recognize a parallel need to accelerate efforts to build health system capacity in-line with the IHR.¹⁸ The IHR require State parties to develop minimum core public health capacities to detect, assess, report, and respond to public health events of national and international concern. Despite progress towards these requirements, Cambodia's compliance across the 13 IHR core capacity areas is 50%.¹⁹ Deficiencies are most pronounced at the subnational level, particularly across the IHR core capacity areas of health service provision,

¹⁵ MOH. *Cambodia Response Plan for COVID-19. March 2020 to February 2021*.

¹⁶ The plan was aligned with the focus areas under WHO's Strategic Preparedness and Response Plan for COVID-19. WHO. 3 February 2020 (Draft). [2019 Novel Coronavirus \(2019 nCoV\): Strategic Preparedness and Response Plan](#). Geneva.

¹⁷ Ministry of Health. 2021. *National Deployment and Vaccination Plan For COVID-19 Vaccines*. Phnom Penh.

¹⁸ Government of Cambodia. 2016. *Cambodian National Work Plan for Emerging Diseases and Public Health Emergencies to Achieve IHR Core Capacities 2016–2020*. Phnom Penh

¹⁹ WHO. [Electronic State Parties Self-Assessment Annual Reporting](#) (accessed 28 April 2021).

laboratory, surveillance and risk communications.

55. In early 2021, the Government of Cambodia has requested \$25 million additional financing for the GMS Health Security Project to strengthen preparedness and response capacity of the health system for COVID-19 and other emerging disease threats. The project will include \$5 million grant financing from the Japan Fund for Poverty Reduction (JFPR) to support interventions on COVID-19 surveillance, response and clinical care. The JFPR grant will finance ICT and oxygen therapy equipment; ambulances; consulting services and specified training, workshops and community mobilization expenditure. The proposed additional financing will support the Ministry of Health (MOH) in responding to coronavirus disease (COVID-19). The additional financing will provide targeted investment for 81 provincial and district referral hospitals not supported under the original project requiring immediate upgrading of hospital clinical care, laboratory, IPC, and human resource capacity to respond to COVID-19 and other future public health threats. Further, the proposed project will strengthen for surveillance, response, and risk communications capacity for COVID-19 and other epidemic prone diseases nation-wide. The additional financing project remains aligned with the outcome of the original project: Greater Mekong Subregion (GMS) health system performance with regard to health security improved.

56. The impact and outcome of the overall project remain unchanged from the original project. The additional financing will contribute to Cambodia's progress towards compliance with the requirements of the IHR and the Asia Pacific Strategy for Emerging Diseases, in-line with the original project outcome indicators.²⁰ This will be achieved through a nationwide scale-up of investment at the subnational across four IHR core capacity areas (i) health service provision, (ii) laboratory, (iii) surveillance and (iv) risk communications. Activities under the additional financing will be delivered through existing project outputs 2, 3 and 4.

57. **Output 2: National disease surveillance and outbreak response systems strengthened.** The project loan will finance (i) a nationwide program of trainings to strengthen subnational capacity for communicable disease prevention, detection and response; (ii) outbreak response vehicles for provincial and national agencies; and (iii) health education campaigns to enhance communities' preparedness for COVID-19 and other communicable disease threats.

58. The JFPR grant will finance computer hardware for central, provincial and district health agencies to enhance COVID-19 outbreak management and contact tracing efforts. It will support COVID-19 specific trainings for (i) surveillance staff on data management tools;²¹ (ii) rapid response teams on outbreak management; and (iii) health and non-health staff on COVID-19 risk communications.

59. **Output 3: Laboratory services and hospital IPC improved.** The project loan will support 8 provincial hospitals and 73 district referral hospitals not included under the original project. It will (i) equip laboratories in these 81 hospitals for communicable disease diagnostics and clinical management, including COVID-19 rapid testing; (ii) renovate laboratories in 62 of these hospitals; (iii) install modern solid waste treatment systems to 42 hospitals; and (iv) supply medical waste treatment equipment, autoclaves, washing machines and other IPC equipment to hospitals where upgrading is required. Female and male hospital staff will be trained on laboratory and IPC practices.

²⁰ WHO. 2017. [Asia Pacific Strategy for Emerging Diseases and Public Health Emergencies](#). Geneva. The Asia Pacific Strategy for Emerging Diseases and Public Health Emergencies provides a strategic roadmap to support country progress towards achieving the IHR core capacities.

²¹ Including the Event Monitoring System, Media Screening System, and WHO's 'Go Data' tool.

60. **Output 4: Emergency preparedness and response capacity for COVID-19 strengthened.** The JFPR grant will enhance COVID-19 clinical care capacity in 14 provincial hospitals. It will equip hospitals with (i) oxygen plants for onsite generation of oxygen supply, (ii) clinical equipment for provision of oxygen therapy, and (iii) an ambulance for the transportation of COVID-19 patients requiring emergency care. Female and male clinical staff will be trained on oxygen therapy and the management for COVID-19 patients. Staff will also be trained to identify and provide support and referral options to persons affected by gender-based violence and mental health issues linked to the pandemic. Technicians will be trained in operation and maintenance of oxygen plants and ambulances.

61. A more detailed description of the activities under the additional financing loan which involve minor refurbishment works and/or equipment installation is presented in **Appendix 2**. The description includes the full list of participating referral hospitals including a description of sensitive receptors, flood history, existing services, and works to be executed or equipment to be provided in those facilities.

C. Project Outputs with Environmental Implications

62. The need for an IEE under the original project is triggered by project output 3, which includes minor works, provision of laboratory and treatment equipment, and training for equipment for infection prevention and control (IPC) including laundry services and waste disposal. Outputs 1 and 2 have no significant environment implications and are not further discussed in this IEE.

63. The activities supported through the Additional Financing under outputs 3 and 4 will also require minor refurbishment works and the installation of equipment for intensive care units (ICU), diagnostic laboratories, and solid waste treatment equipment.

64. The IEE thus focuses on those potential impacts related to relevant project activities under the loan project, namely: (i) minor repair and improvement works; (ii) laboratory equipment commissioning; (iii) and installation and operation of solid waste management facilities, as described below:

65. **Project Activity 1 – Minor repair and refurbishment works.** This activity includes the minor repair and improvement works of the hospital facilities for laboratories, installation of new or upgraded equipment and auxiliary devices, IPC equipment and devices including laundry equipment, computer systems, etc. The laboratories will comply with BSL-2 or BSL-3 standard requirements for laboratories (see Table 2). All laboratory facilities will be rehabilitated in conformance with the *Building Brief for Referral Hospitals* developed by the Civil Works Group of the MOH with technical support of the World Bank and JICA, to fit the CPA guidelines for referral hospitals and to meet the minimum requirements of developing countries as recommended by the World Health Organization.²²

66. **Project Activity 2 – Laboratory equipment commissioning including IPC services.** This activity includes the mobilization, equipment installation, commissioning, demobilization, recurrent maintenance checks by the suppliers/contractors, and the operation from installation and during the life of the equipment. The equipment means the totality of the laboratory equipment, auxiliary equipment, laundry and washing/drying equipment, and relevant IPC devices and supplies, laundry equipment including the transport vehicles for the transport of laboratory

²² Civil Works Group, Ministry of Health. 2003. *Building Brief – Referral Hospitals*. Phnom Penh.

specimen procured under the Project.

67. **Project Activity 3 - Waste Management facilities.** The collective activity indicates existing activities that include: (1) the storage and segregation (as applicable) of medical infectious/hazardous and non-infectious/non-hazardous wastes; (2) collection and transfer for disposal or recycling (as applicable); (3) internal and external transportation of medical waste; recycling or composting of non-hazardous wastes; and (4) disposal at: (i) an approved and dedicated disposal facility such as a provincial hospital. Under the additional financing, 42 microwave-based waste treatment systems will be installed in referral hospitals where treatment capacity gaps have been identified (see Appendix 2). The proposed microwave-based waste management will transform the medical waste from hospitals into a compact, dry, inert material, with a weight reduction of 25% and a volume reduction of 80% and it can be disposed as normal solid waste to public dumping site of municipalities.

68. The drawing of shelters to be constructed for the waste treatment equipment is provided in Figure 1. A microwave-based waste treatment system (STERILWAVE 100) will be applied (Figure 2). The system allows for on-site conversion of bio-hazardous medical waste including sharps into ordinary municipal waste. The waste is sterilized using microwaves and converted into inert municipal waste, reducing its volume by more than 80% and its weight by 25%. The Sterilwave 100 is particularly suited to medical facilities generating small amounts of waste. This biomedical waste management system can treat up to 20kg of waste per hour. The Sterilwave 100 was approved by the French Ministry of Health in 2017 and complies with the strictest environmental and bacteriological reduction standards. It uses a suspended vessel and rotating grinder blades to grind down all types of waste, including metallic objects. Biohazardous waste is sterilized using microwaves and converted into inert municipal waste, reducing its volume by more than 80% and its weight by 25%. Its environmental impact and operating costs are reduced while ensuring the safety of the operator. As it uses microwave technology, the Sterilwave does not need a steam generator, so there is no risk from excess pressure and no liquid effluent is produced. The system can reach a bacterial inactivation higher than international regulatory standards (up to 8log10). It is relatively safe as does not involve pressurization unlike in an autoclave.

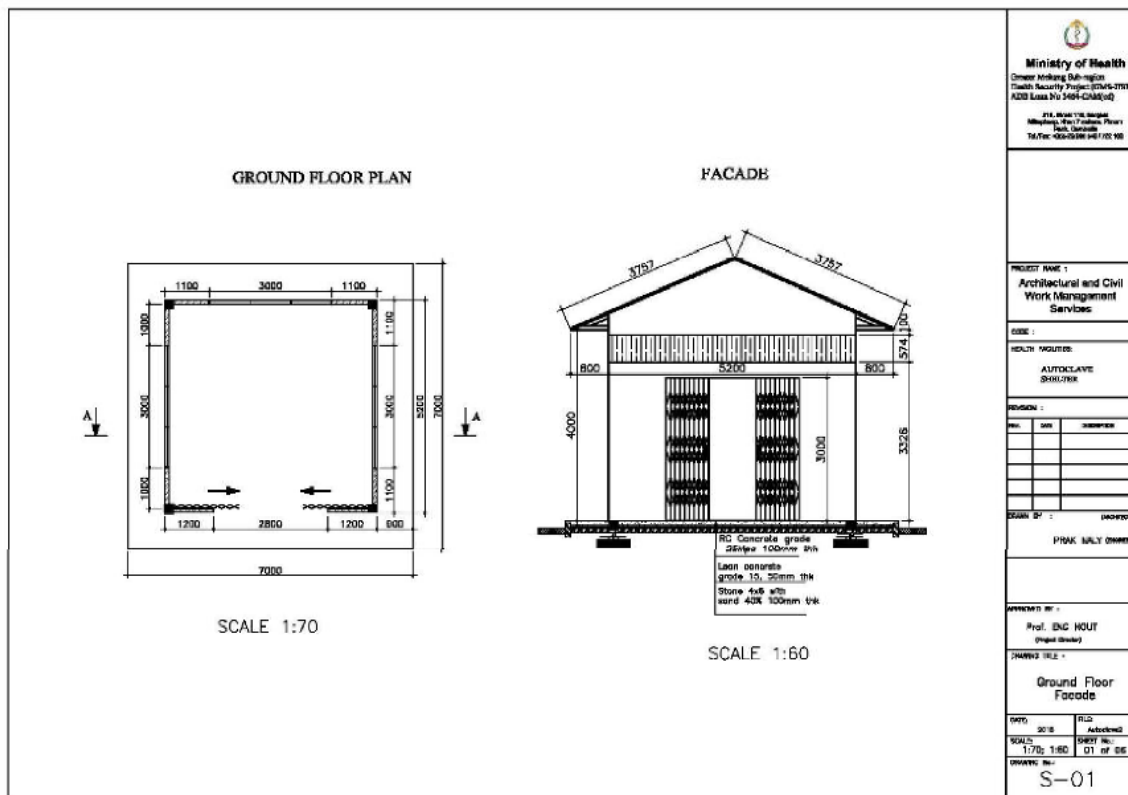


Table 2: Biosafety Level (BSL) requirements for laboratories

BSL-1

As the lowest of the four, biosafety level 1 applies to laboratory settings in which personnel work with low-risk microbes that pose little to no threat of infection in healthy adults. An example of a microbe that is typically worked with at a BSL-1 is a non-pathogenic strain of *E. coli*.

This laboratory setting typically consists of research taking place on benches without the use of special contaminant equipment. A BSL-1 lab, which is not required to be isolated from surrounding facilities, houses activities that require only standard microbial practices, such as:

- Mechanical pipetting only (no mouth pipetting allowed)
- Safe sharps handling
- Avoidance of splashes or aerosols
- Daily decontamination of all work surfaces when work is complete
- Hand washing
- Prohibition of food, drink and smoking materials in lab setting
- Personal protective equipment, such as; eye protection, gloves and a lab coat or gown
- Biohazard signs
-

BSL-1 labs also require immediate decontamination after spills. Infection materials are also decontaminated prior to disposal, generally through the use of an autoclave.

BSL-2

This biosafety level covers laboratories that work with agents associated with human diseases (i.e. pathogenic or infectious organisms) that pose a moderate health hazard. Examples of agents typically worked with in a BSL-2 include equine encephalitis viruses and HIV, as well as *Staphylococcus aureus* (staph infections).

BSL-2 laboratories maintain the same standard microbial practices as BSL-1 labs, but also includes enhanced measures due to the potential risk of the aforementioned microbes. Personnel working in BSL-2 labs are expected to take even greater care to prevent injuries such as cuts and other breaches of the skin, as well as ingestion and mucous membrane exposures. In addition to BSL 1 expectation, the following practices are required in a BSL 2 lab setting:

- Appropriate personal protective equipment (PPE) must be worn, including lab coats and gloves. Eye protection and face shields can also be worn, as needed.
- All procedures that can cause infection from aerosols or splashes are performed within a biological safety cabinet (BSC).
- An autoclave or an alternative method of decontamination is available for proper disposals.
- The laboratory has self-closing, lockable doors.
- A sink and eyewash station should be readily available.
- Biohazard warning signs
-

Access to a BSL-2 lab is far more restrictive than a BSL-1 lab. Outside personnel, or those with an increased risk of contamination, are often restricted from entering when work is being conducted.

BSL-3

Again building upon the two prior biosafety levels, a BSL-3 laboratory typically includes work on microbes that are either indigenous or exotic, and can cause serious or potentially lethal disease through inhalation. Examples of microbes worked with in a BSL-3 includes; yellow fever, West Nile virus, and the bacteria that causes tuberculosis.

The microbes are so serious that the work is often strictly controlled and registered with the appropriate government agencies. Laboratory personnel are also under medical surveillance and could receive immunizations for microbes they work with. Common requirements in a BSL-3 laboratory include:

- Standard personal protective equipment must be worn, and respirators might be required
- Solid-front wraparound gowns, scrub suits or coveralls are often required
- All work with microbes must be performed within an appropriate BSC
- Access hands-free sink and eyewash are available near the exit
- Sustained directional airflow to draw air into the laboratory from clean areas towards potentially contaminated areas (Exhaust air cannot be re-circulated)
- A self-closing set of locking doors with access away from general building corridors

Access to a BSL-3 laboratory is restricted and controlled at all times.

69. Equipment purchases will be in accordance with established MOH standards and will partly replace old and non-functioning equipment, upgrade technology for existing procedures, or provide new services. The Project including the Additional Financing will also support the purchase of an initial inventory of reagents and other supplies needed to properly utilize the new equipment. Procurement and supply of equipment will be closely coordinated with the other components of the project implementation.

70. Once completed, the newly improved and renovated facilities and supplies, equipment and related devices, computers and related systems, and transport vehicles that are part of the Project need to be properly maintained to realize benefits and justify investments. The Project will ensure that hospital personnel are properly trained to use the equipment and operating manuals are supplied in the Cambodian language. The Government of Cambodia shall support the preparation of guidelines for preventive maintenance and training of hospital personnel in preventive maintenance procedures.

71. The Government of Cambodia has also assured that the supplies needed to operate the equipment, as well as the costs of maintenance will be provided during and beyond the project period through recurrent costs and adequate increases in operation and maintenance budgets.

72. Investments will be made with the assurance from the Government of Cambodia that all facilities included in this Project including the Additional Financing have adequate safe water, sanitation, and medical waste management systems, including waste water systems, proper containers to segregate contaminated and hazardous waste, proper collection and storage facilities, and access to modern medical waste treatment and disposal facilities in compliance with the country's environmental laws and the safeguards policy of the ADB. It is incumbent upon the Government of Cambodia that hospital personnel in all facilities covered by the project will be trained in the theory, methodologies, and supervision of modern medical waste and waste water management practices.

D. Implementation Schedule, Institutional Arrangements

73. The Ministry of Health (MOH), through its Department of Planning and Health Information (DPHI), is the executing agency for the original project and the additional financing. The Communicable Diseases Control Department (CDCD) in MOH is the coordinating IA. The Director of CDCD is the Project Manager. The existing CDC2 PMU in the coordinating IA will be continued for day-to-day project implementation. The provincial health departments also serve as IAs.

74. The project management unit (PMU) of the original project will support the implementation of the additional financing, supplemented by a national IPC, a national environment consultants and a national civil engineer to coordinate EMP implementation. Implementing agencies are the Department of Communicable Disease Control, the Department of Hospital Services, the National Institute for Public Health, and provincial health departments (PHD). IPC focal points will be identified in each participating PHD and referral hospital, who will be in charge for day-to-day EMP implementation supervision. The additional financing will be implemented from 1 January 2022 to 31 December 2023.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Overview

75. Cambodia lies in the southwestern part of the Southeast Asian peninsula and has a land area of 181,035 km². International borders are shared with Thailand to the west, the Lao People's Democratic Republic (Lao PDR) to the north, and the Socialist Republic of Viet Nam to the east and southeast. The country has a coastline of 440 km.

76. There are three distinct topographic regions: the central plains, the flat coastal areas, and the mountain ranges with high plateaus. Two-thirds of the country's population live in the central lowlands. The country is also classified into four environmental regions, i.e. Plain, Tonle Sap, Coastal, and Plateau and Mountainous. The capital city Phnom Penh and the provinces of Tboung Khmum, Kandal, Prey Veng, Svay Rieng are situated in the Plain Region; Kratie, Monduliri, Ratanakiri, Stung Treng and Preah Vihear Provinces are in the Plateau and Mountainous Region; Kampot in the Coastal Region; and Banteay Meanchey, Battambang, and Pailin Provinces are in the Tonle Sap Region. Cambodia faces high disaster risks from flood and drought, due both to high levels of exposure and vulnerability.

77. The population of Cambodia was 16 million in 2017, with 76% living in rural areas but a very rapid rate of urbanization. Cambodia's population relies heavily on agriculture and fisheries, providing 25% of GDP but employing 49% of the country's labor force. Industry and services form rapidly growing sectors of the economy. The rate of undernourishment in Cambodia remains high, at around 15%, as does the national poverty rate. Natural resource dependence is also high, and the changes in the dynamics of the Mekong River, expected due to the largescale damming which is ongoing in most of the Mekong countries, may have negative ramifications for precarious livelihoods in Cambodia.

Table 3: Key country indicators

INDICATOR	VALUE
POPULATION UNDERNOURISHED ²³	15.3% (2014-2016)
NATIONAL POVERTY RATE ²⁴	14% (2014)
NET ANNUAL MIGRATION RATE ²⁵	-0.2% (2010-2015)
INFANT MORTALITY RATE (BETWEEN AGE 0 AND 1) ²⁵	2.99% (2010-2015)
AVERAGE ANNUAL CHANGE IN URBAN POPULATION ²⁶	1.78% (2010-2015)
DEPENDENTS PER 100 INDEPENDENT ADULTS ²⁵	84.6 (2015)
URBAN POPULATION AS % OF TOTAL POPULATION ²⁷	23.4% (2018)
EXTERNAL DEBT RATIO TO GNI ²⁸	54.4% (2016)
GOVERNMENT EXPENDITURE RATIO TO GDP ²⁸	22% (2017)

²³ FAO, IFAD, UNICEF, WFP, WHO (2017) *The state of food security and nutrition in the world. Building Resilience for peace and food security*. FAO. Rome.

²⁴ ADB (2018a) Basic Statistics 2018. Available at: <https://www.adb.org/publications/basic-statistics-2018> [accessed 11/01/19]

²⁵ UNDESA (2017) World Population Prospects 2017. Available at: <https://population.un.org/wpp/Download/Standard/Population/> [accessed 11/01/19]

²⁶ UNDESA (2018) World Urbanization Prospects 2018. Available at: <https://population.un.org/wup/Download/> [accessed 11/01/19]

²⁷ CIA (2018) *The World Factbook*. Central Intelligence Agency. Washington DC.

²⁸ ADB (2018b) Key Indicators for Asia and the Pacific 2018, 49th Edition. Asian Development Bank.

78. The site description of the 27 hospitals included in the original project scope, including photographs and maps of hospitals, access roads and topography and soils, is presented in **Appendix 1**. The description of the referral hospitals included in the Additional Financing loan is included in **Appendix 2**. None of the participating referral hospitals is located in a protected area and none is in an area of ecological interest or environmental sensitivity. The hospital campus areas do not contain cultural, historical and archeological features. There are no landmines or UXOs within the hospital campuses and most are at low risk of flooding. All hospitals have direct access to double bituminous sealed treatment (DBST) roads.

B. Climate

79. **Overview.** Cambodia's climate is tropical, with high temperatures, and two distinct seasons: a monsoon-driven rainy season (May-October) with south-westerly winds ushering in clouds and moisture that accounts for anywhere between 80-90% of the country's annual precipitation, and a dry season (November-April), with cooler temperatures, particularly between November and January. Average temperatures are relatively uniform across the country, but are highest in the early summer months before the rainy season begins, when maximum temperatures often exceed 32°C. Temperatures remain between 25-27°C throughout the rest of the year. The wet season arrives with the summer monsoon, in May through November, bringing the heaviest rainfall to the southeast and northwest. The annual average rainfall is typically 1,400-2,000mm with higher rates in the coastal and highland areas and lower rates in other inland regions. Inter-annual variations in climate result from the El Niño Southern Oscillation, which influences the nature of the monsoons in the region. El Nino events generally bring warmer and drier than average winter conditions across Southeast Asia, while La Niña episodes bring cooler than average conditions.

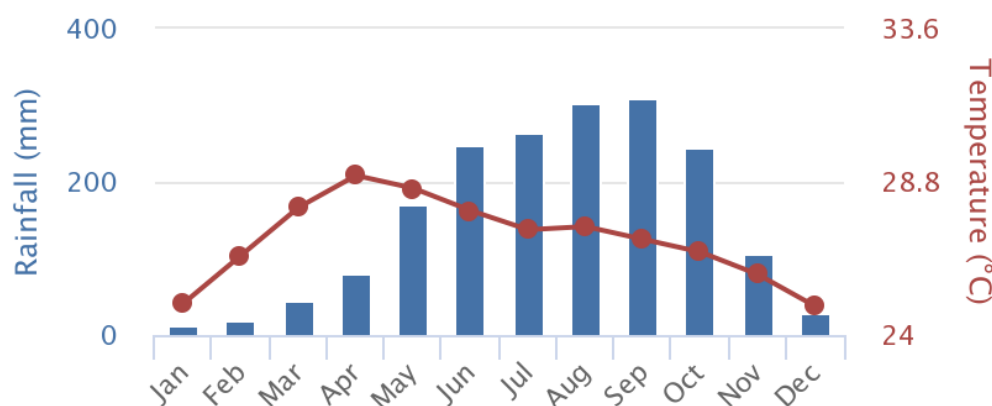


Figure 3: Average monthly temperature and rainfall in Cambodia (1901-2015)²⁹

80. **Historic temperature trends.** The Berkeley Earth dataset suggests Phnom Penh has experienced around 1°C of warming over the 20th century, based on the change between 1900-1917 and 2000-2017. Most of this warming took place in the latter half of the century, with 0.8°C reported between 1960 and 2003.³⁰ Warming is strongest in the dry season (Nov-Apr) at 0.2-0.23°C per decade, compared to 0.13-0.16°C in the wet season.

²⁹ World Bank Climate Change Knowledge Portal (2018). Climate Data: Historical. URL: <https://climateportal.worldbank.org>.

³⁰ UNDP (2006) UNDP Climate Change Country Profiles: Cambodia. United Nations Development Programme

81. **Historic precipitation trends.** No statistically significant changes in precipitation were detected over the 20th century, either in terms of annual rainfall or extreme events.³⁰ Precipitation variability is linked to the El Niño Southern Oscillation phenomenon, with years of strong El Niño correlated with years of moderate and severe drought over the 20th century.³¹

82. **Project temperature changes.** Cambodia faces temperature rises of up to 3.1°C by 2080-2099 on the highest emissions pathway (RCP8.5), compared with the 1986-2005 baseline. The lower rates of warming projected under lower emissions pathways highlight the potential benefits of aggressive global emissions reductions over the 21st century. The projected warming is slightly below the global average of 3.7°C. There is a distinct difference between average temperature rises and rises in minimum and maximum temperatures. Annual minimum and maximum temperatures are typically projected to rise 10-20% faster than average temperatures.

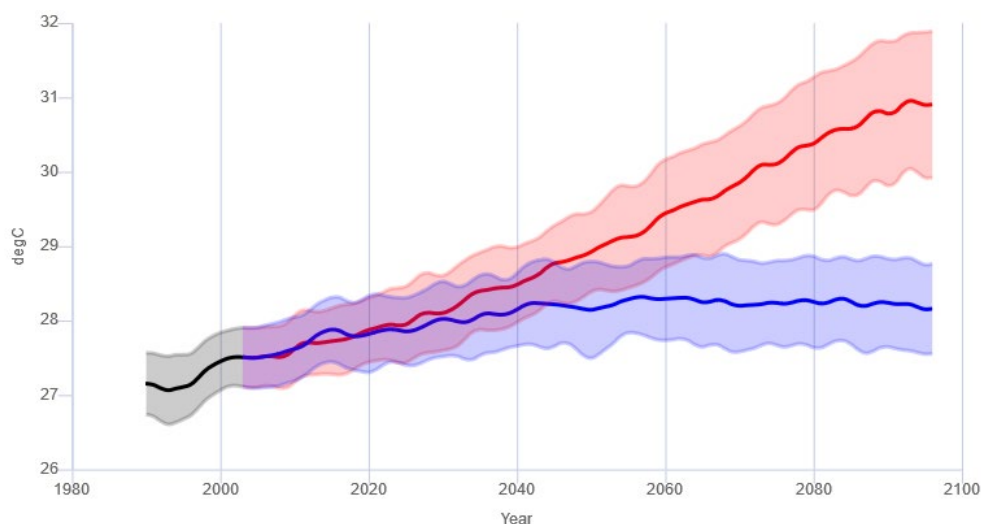


Figure 4: Historic and projected average annual temperature in Cambodia under RCP2.6 (blue) and RCP8.5 (red) estimated by the model ensemble. Shading represents the standard deviation of the model ensemble.³²

83. **Projected precipitation changes.** Most models in the ensemble project greater annual rates, with increasing levels under higher emissions pathways. However, uncertainty remains high. The poor performance of global climate models in consistently projecting precipitation trends has been linked to their poor simulation of the El Niño phenomenon,^{33,34} an important area for future development. While considerable uncertainty surrounds projections of local long-term future precipitation trends some global trends are evident. The intensity of sub-daily extreme rainfall events appears to be increasing with temperature, a finding supported by evidence from different regions of Asia.³⁵ The limited available research specific to Cambodia broadly supports

³¹ Lyon, B. (2004). The strength of El Niño and the spatial extent of tropical drought. *Advances in Geosciences*, 31

³² World Bank Climate Change Knowledge Portal (2018). Climate by Sector: Interactive Climate Indicator Dashboard. URL: <https://climateportal.worldbank.org>.

³³ Yun, K.S., Yeh, S.W. and Ha, K.J. 2016. Inter-El Niño variability in CMIP5 models: Model deficiencies and future changes. *Journal of Geophysical Research: Atmospheres*, 121, 3894-3906.

³⁴ Chen, C., Cane, M.A., Wittenberg, A.T. and Chen, D. 2017. ENSO in the CMIP5 simulations: life cycles, diversity, and responses to climate change. *Journal of Climate*, 30, 775-801.

³⁵ Westra, S., Fowler, H. J., Evans, J. P., Alexander, L. V., Berg, P., Johnson, F., Kendon, E. J., Lenderink, G., Roberts, N. (2014). Future changes to the intensity and frequency of short-duration extreme rainfall. *Reviews of Geophysics*, 52, 522-555.

this trend. However, further research is required.

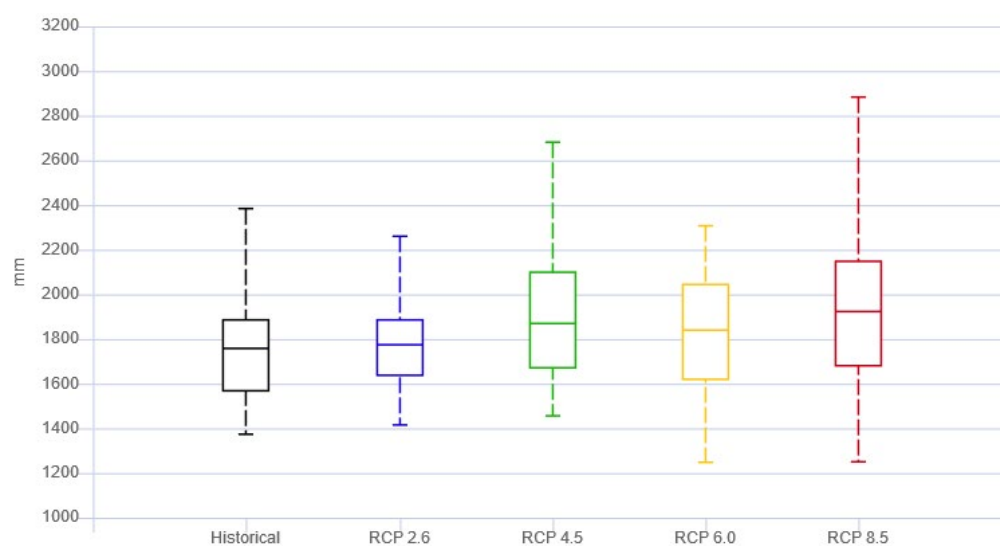


Figure 5: Projected average annual precipitation for Cambodia in the period 2080-2099. ³⁶

84. **Disaster risk.** Cambodia faces high disaster risk levels, ranked 53 out of 191 countries by the 2019 Inform Risk Index (**Table 4**), driven particularly by its exposure to flood hazard. Cambodia has extremely high exposure to flooding (ranked joint 4th), including, riverine and flash flooding. Cambodia also has some limited exposure to tropical cyclones and their associated hazards (ranked 39th). Drought exposure is slightly lower (ranked 54th), but is still significant as highlighted by the severe drought of 2015-2017. Cambodia's overall ranking on the INFORM risk index is somewhat exacerbated by its lack of coping capacity and to a lesser extent by the vulnerability of the population.

Table 4: Selected indicators from the INFORM 2019 Index for Risk Management for Cambodia

FLOOD	TROPICAL CYCLONE	DROUGHT	VULNERABILITY	LACK OF COPING CAPACITY	OVERALL INFORM RISK LEVEL	RANK
(0-10)	(0-10)	(0-10)	(0-10)	(0-10)	(0-10)	(1-191)
9.5 [4.5]	4.0 [1.7]	4.7 [3.2]	3.8 [3.6]	6.6 [4.5]	4.8 [3.8]	53

Note: For the sub-categories of risk (e.g. "Flood") higher scores represent greater risks. Conversely the most at-risk country is ranked 1st. Global average scores are shown in brackets.

85. **Heat waves.** Cambodia regularly experiences high maximum temperatures, with an average monthly maximum of around 31.6°C and an average April maximum of 34.4°C. The current median probability of a heat wave (defined as a period of 3 or more days where the daily temperature is above the long-term 95th percentile of daily mean temperature) is around 3%.³⁷

86. **Flood risk.** The World Resources Institute's AQUEDUCT Global Flood Analyzer can be used to establish a baseline level of flood exposure. As of 2010, assuming protection for up to a

³⁶ World Bank Climate Change Knowledge Portal (2018). Climate by Sector: Interactive Climate Indicator Dashboard. URL: <https://climateportal.worldbank.org>.

³⁷ World Bank Climate Change Knowledge Portal (2018). Climate by Sector: Interactive Climate Indicator Dashboard. URL: <https://climateportal.worldbank.org>.

1-in-25 year event, the population annually affected by flooding in Cambodia is estimated at 90,000 people and expected annual urban damage is estimated at \$105 million. Economic development and climate change are both expected to increase these figures. The climate change component can be isolated and by 2030 is expected to increase the annually affected population by 70,000 people, and urban damage by \$226 million under the RCP8.5 emissions pathway (AQUEDUCT Scenario B).³⁸

87. Paltan et al. (2018) demonstrate that even under lower emissions pathways, consistent with the Paris Climate Agreement almost all Asian countries face an increase in the frequency of extreme river flows.³⁹ What would historically have been a 1-in-100 year flow, could become a 1-in-50 year or 1-in-25 year event in most of South, Southeast, and East Asia. There is good agreement among models about this trend.

88. In terms of the proportion of the population affected Cambodia is one of the world's most flood-exposed countries in the world.⁴⁰ Willner et al. (2018) suggest that around 4 million people, or 25% of the population, are affected when an extreme river flood strikes.⁴¹ Another study conducted by the World Bank put the increase in the population exposed to flood by 2050 at 19%.⁴² The UNISDR estimate that Cambodia experiences over \$250 million in average annual losses (just over 1% of GDP). Vastila et al. (2010) show that increases in rainfall during the wet season (i.e. increasing extremes) resulting from climate change have strong potential to increase the peak discharge of the Mekong river and hence increase the population exposed to river flooding in the vicinity of its floodplains.⁴³ However, the impact of upstream hydropower development along the Mekong and its tributaries may act to offset the climate change signal, causing dry season flows to increase and wet season flows to reduce.⁴⁴

C. Air Quality

89. At the beginning of 2021, Cambodia was experiencing a period of "Moderate" quality air, according to recommended levels by the World Health Organisation (WHO). The concentration of the PM_{2.5} pollutant was 20.9 µg/m³.⁴⁵ According to figures from 2019, Phnom Penh, the capital city, experienced "Moderate" quality air for 11 months of the year with figures between 12.1 and 35.4 µg/m³. Only during August was the quality any better with a "Good" reading of 10.2 µg/m³. Looking back over the years, the air quality is getting slightly worse. In 2017 it was 20.8 µg/m³, 2018 - 20.1 µg/m³ and in 2019 it was 21.1 µg/m³.

³⁸ WRI (2018) AQUEDUCT Global Flood Analyzer. Available at: <https://floods.wri.org/#> [Accessed: 22/11/2018]

³⁹ Paltan, H., Allen, M., Hausteine, K., Fuldauer, L., & Dadson, S. (2018). Global implications of 1.5°C and 2°C warmer worlds on extreme river flows Global implications of 1.5°C and 2°C warmer worlds on extreme river flows. *Environmental Research Letters*, 13. <https://doi.org/10.1088/1748-9326/aad985>

⁴⁰ Kundzewicz, Z. W., Kanae, S., Seneviratne, S. I., Handmer, J., Nicholls, N., Peduzzi, P., ... Sherstyukov, B. (2014). Flood risk and climate change: global and regional perspectives. *Hydrological Sciences Journal*, 59(1), 1–28

⁴¹ Willner, S., Levermann, A., Zhao, F., Frieler, K. (2018) Adaptation required to preserve future high-end river flood risk at present levels. *Science Advances*: 4:1

⁴² Winsemius, Hessel C.; Jongman, Brenden; Veldkamp, Ted I.E.; Hallegatte, Stéphane; Bangalore, Mook; Ward, Philip J.. 2015. Disaster risk, climate change, and poverty : assessing the global exposure of poor people to floods and droughts (English). Policy Research working paper; no. WPS 7480. Washington, D.C. : World Bank Group.

⁴³ Vastila, K., Kumm, M., Sangmanee, C., & Chinvarno, S. (2010). Modelling climate change impacts on the flood pulse in the Lower Mekong floodplains. *Journal of Water and Climate Change*, 1(1), 67–86

⁴⁴ Lauri, H., de Moel, H., Ward, P. J., Rasanen, T. A., Keskinen, M., & Kumm, M. (2012). Future changes in Mekong River hydrology: impact of climate change and reservoir operation on discharge. *Hydrology and Earth System Sciences*, 16(12), 4603–4619

⁴⁵ <https://www.iqair.com/cambodia>

90. Because of the climate and the cycle of the seasons, the quantity of dust in the air is significantly higher in the dry season. Most of Cambodia is agricultural land covered with sparse vegetation. As most of it is relatively flat, the winds pick up the dry dust from the land and carry it towards the cities. As the wind meets a building or other object it loses its ability to carry as much, consequently, it drops its contents, i.e. the dust. The dry season can last between 5 to 6 months.

D. Water resources

91. In rural area of Cambodia, people traditionally use rivers, lakes, ponds and shallow dug wells for their domestic water needs. In the rainy season, people mainly use rainwater for drinking and cooking. Access to clean water drinking (piped water supply) varies significantly throughout the country. From socio-economic survey of National Road No.56, 2012 shows that 37% sourced their drinking water from ponds or lakes while 34% have piped water supply and 16% fetched their drinking water from tube wells. Others 13% use river/canal or buy or catch rainwater for their daily consumption. Generally, in Cambodia only 30% of rural populations have access to safe drinking water.

92. The referral hospitals are connected to and accessing public municipal water supply systems, with some relying on groundwater through drilled wells/boreholes wells.

93. The Mekong River is a prominent geographical feature of the country, flowing from Lao PDR in the north to the Mekong Delta of Viet Nam in the south and feeding the Tonle Sap lake. The Tonle Sap is a vital natural resource, covering almost 10% of the nation's surface area during the peak of the Southwest Monsoon season and constituting the nation's primary protein source. Cambodia's topography includes the low-lying central plains of the Mekong, which are surrounded by mountainous and highland regions.

94. Groundwater in Cambodia is plentiful but water quality is important as current and future development projects include accessing groundwater resources for drinking and irrigation. Additionally, various chemicals present in the groundwater can cause serious health problems or water that tastes unpleasant. Since 2005, Rural/research Development Institute (RDI) has tested over 10,000 wells as part of a program to characterize water quality throughout Cambodia. More than fifty percent of Cambodians rely on groundwater for drinking in the dry season (2008 census).

E. Ecological resources

95. Cambodia is rich in biodiversity. It is home to the third-largest lowland dry evergreen forest in Southeast Asia, with 2,300 plant species, 14 endangered animals, and one of seven elephant corridors left in the world.⁴⁶

96. Nearly 40 percent of Cambodia's land is protected. Many protected areas were created by royal decree in 1993 to protect ecologically and culturally important places. More detailed guidelines on managing the country's protected areas came in the 2008 Protected Areas Law. By late 2017, Cambodia had almost 50 protected areas. These covered more than 7.5 million hectares – the equivalent of 41 percent of the country's total land. In October 2017 it was reported that the environment ministry was preparing to recommend a further six areas for protection.⁴⁷ In early 2017 the government announced a new sub-decree that protects almost 1.5 million hectares

⁴⁶ <https://www.usaid.gov/cambodia/environment-and-global-climate-change>

⁴⁷ <https://opendevelopmentcambodia.net/topics/protected-areas/>

as “Biodiversity Conservation Corridors”.⁴⁸ The new corridors connect existing protected areas, allowing species migration. They are found in Keo Seima and Snuol districts, the Phnom Proek forest, along the Phnom Kravanh mountains in Pursat and Koh Kong province, and in the Prey Lang and Kulen Prum Tep forests.



Figure 6: Network of protected areas in Cambodia⁴⁹

97. According to the royal decree and sub-decrees, no clearance or building is allowed in the core or conservation zones, and development within the sustainable use or community zones requires government approval. Any development in these areas or in adjacent areas is subject to an environmental and social impact assessment.⁵⁰

98. However, illegal timber harvesting and wildlife poaching remain serious threats to preserving Cambodia’s precious natural resources. Additionally, forest land conversion for agriculture, overexploitation of key species, mine exploration and undervaluing of ecological services such as soil fertility, carbon sequestration and watershed stability also contribute to

⁴⁸ Touch Sokha. 2017. Newly protected areas to span 1.5 m hectares. *Phnom Penh Post*, 30 January 2017.

⁴⁹ <https://www.ibat-alliance.org/>

⁵⁰ Protected Areas Law 2008, Articles 36 & 44.

Cambodia's rapid deforestation rate. Deforestation not only threatens biodiversity; it can have devastating effects of increasing flooding and erosion in the Mekong river basin, endangering livelihoods from fishing and rice cultivation, and reducing water storage and availability in the dry season.

F. Reference Baseline Data for Health Care Waste Management in Cambodia

F1. IPC scoring of referral hospitals

99. A key component of the project is the improvement of health care waste management practices in the project areas. The results of a review of existing health care waste management practices in the project areas are summarized below.

100. The baseline data from IPC assessing group conducted during June 2018 is presented here. The assessment team met first with the hospital management team, especially the RH Directors and the IPC focal points/IPC committees. The team was split into 2 sub-groups (sub-team) of 3 persons in the way that each sub-group was assessing IPC and another sub-group was conducting assessment of laboratory.

101. The assessment consisted of interviewing the concerned staff and then observing/inspecting inside the wards and outside the wards as per module (or vice-versa). All hospital units, wards, e.g. laboratory, wastes management location, garbage disposal, incinerators, washing location, laundry etc., were visited.

102. The graph below shows the acceptable minimum scores rank from the highest 81% to lowest 48%. There are 11 hospitals out of 27 hospitals assessed having received scores more than 70%.

103. Formally in the IPC National Guidelines, the IPC M&E assessment tools are composed of 9 components which requires scores equal or more than 70%. The component no. 9 related to "Isolation Precautions" is excluded from interpretation for the gap, due to this component is not common for all hospitals, mainly not related to Complementary Package Activities (CPA-1) and (CPA-2).⁵¹ It is identified the gaps only within 8 components, focusing mainly on those whose scores are lower than scoring of 70%. The gaps are identified in 4 components, (1) IPC program (organization and structure); (2) cleaning– Sterilization; (3) Health care wastes management; (4) Personal Protective Equipment (PPE). Figure 7 below shows the gaps to be addressed in the 4 components:

⁵¹ CPA is a classification of hospitals in terms of equipment and services including CPA1, CPA2, CPA3. The CPA1 is lowest level of hospital.

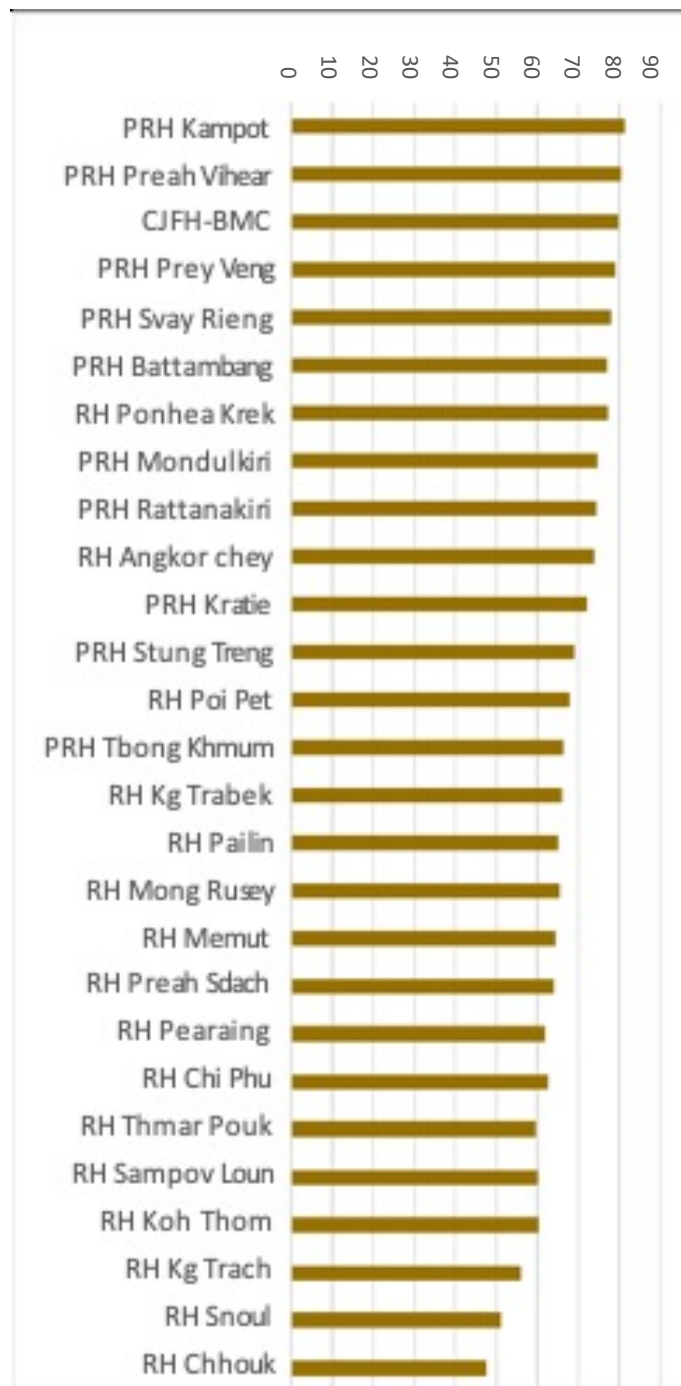


Figure 7: IPC scoring of referral hospitals

	IPC Components	Scores
1	IPC Program	59
6	Cleaning-Sterilization	61
7	HC wastes management	63
5	PPE standards	66
2	IPC Environment	80
3	HCF Cleaning	85
4	Hand Hygiene	77
8	Prevention sharp injuries	75

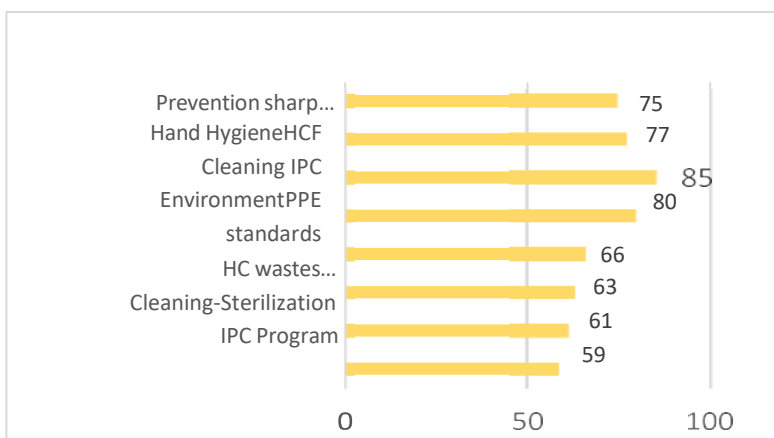


Figure 8: IPC scoring for various IPC elements

104. Based on the average score per Referral Hospital (RH), three categories of RH were established in terms of gaps filling intervention priority. The RH with a score lower than 60% should be the 1st group priority, in terms of equipment and consumables, as well as capacity building. Priority no. 2 goes to hospitals whose scores are between 60% and 69% and priority no.3 for those whose scores are equal or above 70%. Consequently, 3 of 27 assessed RHs were in the first (1st) priority group, 13 RHs were in the second (2nd) priority group, and 11 RHs were in the third (3rd) priority group. Additional criteria priority should be for RH located closer to the border area and/or economic corridor. These findings should be taken into account while developing IPC improvement plan, e. g. proposed IPC activities and training plan and the establishment of the supply list of equipment and consumables.

F2. Healthcare Waste Generation

105. Healthcare waste (medical waste) generated from hospitals includes both non-hazardous waste and hazardous waste. No quantification of non-infectious and infectious waste components of medical waste has been available in the project areas surveyed. WHO estimates that about 85% of the medical waste from developing countries is non-infectious or generally risk-free healthcare waste, which is comparable to domestic waste. The remaining 15% of healthcare waste is regarded as hazardous and may create a variety of health risks. The MOH in Cambodia states that about 80% of the medical waste generated in a health care facility is general waste while the remaining 20% comprises wastes that contain harmful microorganisms that can cause infections and outbreaks while other hazardous substances can affect human/animal lives and cause toxicity and environmental pollution, respectively. Hazardous healthcare waste can be classified into the following categories: infectious waste, highly infectious waste, sharps, pathological/anatomical waste, pharmaceutical waste, genotoxic waste, chemical waste, waste with high content of heavy metals, pressurized containers, and radioactive waste.

106. The amount of medical waste generated depends on the hospital size and its scope of services. There has been no data recorded of medical waste generation rates in Cambodia. According to surveys on medical waste management conducted by the MOH in Viet Nam and WHO, a provincial general hospital typically generates 0.64 kg/bed/day of general medical waste and 0.14 kg/bed/day of hazardous medical waste, while a district hospital typically generates 0.62 kg/bed/day of general medical waste and 0.11 kg/bed/day of hazardous medical waste. Assuming each provincial hospital has 200 beds, hence $0.64\text{kg} \times 200 = 128\text{kg/day/hospital}$ and

hazardous medical waste=0.14kgx200=28kg/day. In terms of the relative proportion of hazardous waste generated, infectious waste and pathological waste represents about 15%, sharps represent about 1%, chemical and pharmaceutical waste represents about 3%, other waste such as waste with high content of heavy metals, and pressurized containers share represent less than 1%.

F3. Healthcare Waste Prevention and Minimization

107. The prevention of waste production and/or its reduction/minimization is not regularly practiced by healthcare establishments in Cambodia. Measures such as source reduction (modification of purchasing procedures, control of inventory, and production of less toxic materials), good management and control practices applied particularly to the purchase and use of chemicals and pharmaceuticals, and using of recyclable materials are not typically implemented.

108. Healthcare waste contains quantities of valuable and recyclable materials such as plastic, metals, paper and carton. However, waste recycling is not centrally implemented at hospital level despite the fact that it is carried out unofficially by the different offices.

F4. Healthcare Waste Segregation

109. Cambodia has not formally implemented segregation of wastes into color-coded bags or containers. Within the hospitals that received supports (mainly IPC) from MOH, basic segregation has been introduced but without standard operating procedures or regular training provided. Other countries like Vietnam, for example have institutionalized the segregation of three separate containers into different colors: general waste in green bags, clinical waste in yellow bags, and toxic wastes in black bags. The MOH has started to develop its own system, contained in their National Guideline on Health Care Waste Management under the leadership of the MOH and in coordination with the relevant regulations by the MOE as the regulatory body. In other developing countries, sharps are segregated and placed into rigid containers with certain specifications to avoid accidental punctures or spillage during handling. In Cambodia, the provincial hospitals who were interviewed to be accountable for the sharps. However, their treatment and ultimate disposal has not progressed into something environmentally acceptable. The provincial hospitals after collecting the hazardous wastes from the district hospitals, either incinerate them using low-temperature open incinerators or bury them at unsecured waste pits within their property boundaries. The successful practice of waste segregation and disposal is one of the biggest challenges in medical waste management in most developing countries such as Cambodia. There are limitations reported, as follows:

- (i) Knowledge, attitude and practices among waste generators including hospital staff, patients and visitors are unsatisfactory
- (ii) Supply of equipment for waste segregation, especially sharp containers is insufficient in both the district hospitals and health centers as a consequence of inadequate funding
- (iii) No system has been generally introduced as a policy by the relevant authorities for enforcement

F5. Healthcare Waste Storage

110. All of the visited district hospitals do not have a formally designated places to store

healthcare waste except for different cans and bags of different sizes and materials. Most of the storage containers in district hospitals, do not meet design and operating regulations because of the following shortcomings:

- (i) The storage areas do not incorporate separate places for different categories of healthcare waste. As a result, general waste and clinical waste that were segregated at sources and separately collected and transported are mixed again at storage places. Chemical waste is not collected and centrally stored. Liquid wastes are disposed of in the sinks although some of the hospitals have separate septic vaults for liquid wastes for wastes are disposed.
- (ii) The storage areas do not have roofs and locks. Unauthorized people and animals can easily access hazardous waste.
- (iii) Storage duration often exceeds 24 hours in hot weather.

F6. Healthcare Waste Collection

111. All target provincial and district hospitals were surveyed, the staff assigned to be responsible for collecting healthcare waste from the generation point to interim storage points in the departments have been generally on an ad-hoc basis. No institutionalized committees have been formed to take on the function. Some weaknesses in collection have been observed in the region as follows:

- (i) Provision of equipment, waste containers in different sizes are not sufficient.
- (ii) There is no budget appropriation for staff nor equipment and materials to meet these recurring needs.
- (iii) Design of hazardous waste containers do not meet requirements.
- (iv) Codification and labeling, waste bags and containers, especially those for clinical waste and chemical waste are not properly color-coded and labeled.

F7. Healthcare Waste Transportation

112. Some primary health care workers are made responsible for internal collection from the district hospitals. All of the district hospitals visited lack specialized equipment for waste transportation. Hazardous waste is often transported by hand causing spillage and spread of disease throughout the hospital. Internal transportation plans in which the timetable and route of transportation are clearly identified are not available.

113. No private contractors or responsible government agency transports general waste out of the hospitals to a disposal facility. The district hospitals themselves manage their medical waste internally, except for donor-provided sharps safety boxes and certain anatomical wastes that the districts send to the provincial hospitals for disposal.

F8. Healthcare Waste Treatment

114. No models for health care waste treatment were observed in the district hospitals visited.

115. Healthcare waste treatment technologies applied in the region are (i) medium temperature incineration, (ii) low temperature incineration, (iii) waste burial, (iv) steam autoclave, (v) chemical disinfection:

- (i) Medium temperature incineration: Pyrolytic incinerators that incinerate waste at 800 – 900°C are reported to be used at the provincial hospitals but these have not been confirmed by actual visits. The emissions from incinerators have not been monitored since they were installed, but polluting gas emissions and high operating costs are reported.
- (ii) Low temperature incineration: Drum incinerators, brick incinerator or one chamber, open incinerators are still common in district hospitals even though their design is out of date. Because of low effectiveness and high environmental impacts, such incinerators are no longer recommended. The gas emissions from these incinerators have reportedly been very polluted.
- (iii) Waste burial: District hospitals bury healthcare waste on their premises. Safe burial of healthcare waste is recommended by WHO. However, in comparison with requirements of sanitary landfill, the bury pits observed in hospitals often have the following shortcomings: (i) inadequate sealing of base and sides to minimize the movement of wastewater or leachate off site, (ii) no presence of site personnel capable of effective control of daily operations, (iii) no surface water collection, (iv) access to site and working areas difficult for waste delivery and site vehicles, (v) lack of surface water collection trenches around site boundaries, (vi) lack of a final cover to minimize rainwater infiltration when each phase of the landfill is completed
- (iv) Wet thermal disinfection: Steam autoclaves are commonly used by hospitals to primarily treat highly infectious waste. Although wet thermal disinfection has been introduced in Cambodia at present, application of autoclave for healthcare waste treatment is still limited to microbiological laboratories where highly infectious waste is mostly generated.
- (v) Chemical disinfection: Using disinfectants to treat contaminated materials is very common in provincial and district hospitals. However, application of chemical disinfection for healthcare waste treatment, particularly for highly infectious waste treatment is still limited to microbiological laboratories and in areas of infectious disease outbreaks.

F9. Wastewater Collection and Treatment

116. Hospital wastewater includes wastewater generated from healthcare activities and wastewater from toilets. Old hospitals often have a collection system for storm water, a collection system and septic tanks for wastewater from toilets but only a few of those visited have separate collection lines and separate septic tanks for wastewater generated from healthcare activities. In consequence, wastewater from healthcare activities with a high content of pathogens and certain amount of pharmaceuticals and chemicals is discharged into the stormwater system line or discharged onto the land without any treatment. Beside these weaknesses in design, there are weaknesses in operation and maintenance in terms of wastewater collection and treatment as follows:

- (i) Hospital staff often discharge chemical and pharmaceutical waste into wastewater collection systems. This practice can harm the wastewater treatment plant, if any.
- (ii) In the district hospitals areas visited, staff and patients do not know how to properly maintain toilet and sanitary facilities in the hospitals. This often results in blockages of the wastewater collection system. Regular and corrective maintenance of wastewater collection system is rarely carried out.

V. POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Rapid Environmental Assessment, Categorization

117. In order to identify potential environmental impacts of the project components, an initial environmental screening was first carried out using the ADB rapid environmental assessment forms (REAs) to screen the proposed activities required for the installation of new or improved laboratory facilities/equipment such as minor repair, construction of building for microwave-based waste management and improvement works on the provincial and district hospitals at border provinces. The REA was conducted for the original project and the Additional Financing loan. See **Appendix 3** for forms used. While the district and provincial hospitals are all existing facilities and whatever improvements are introduced bring mostly positive health and environment impacts, the REAs concluded that some activities categorized as Category B because the project involves minor refurbishment works, the construction of small shelters, the management of infectious, hazardous, medical solid waste and wastewater, and the risks inherent in the handling of laboratory wastes.

118. The ADB safeguard policy statement 2009 requires that the project's activities need to be carefully considered to avoid and/or to minimize the negative impacts on the natural environment and social environment (including environmental public health and occupational health), and provide the appropriate measures to mitigate such impacts. In accordance with the ADB guidelines, the potential impacts of medical solid and liquid wastes including laboratory wastes, being hazardous along with deficient sanitation and laundry facilities and the lack of effective wastewater equipment and treatment systems categorizes the health facilities as having potential for negative environmental impacts that need to be mitigated.

119. The TOR initially categorized this project as requiring an Initial Environmental Examination (IEE) Report and an Environmental Management Plan both of which are required for a Category B Project. It is understood that this project was tentatively classified as a Category B from the ADB project documents during an initial screening of anticipated potential environmental impacts based on the concept document. This categorization was examined through the representative visits to the different project sites and the proposed project component descriptions and how the project proponent intends to mitigate the potential negative environmental impacts of the project.

120. In accordance with the ADB's *Safeguards Policy Statement* (2009), Category B Projects are those judged to have some adverse environmental impacts, but of lesser degree and/or significance than those for Category A projects that require a full-blown Environmental Impact Statement arising from major adverse impacts on the environment. For a Category B project, an IEE is required to determine whether or not significant environmental impacts warranting an Environmental Impact Assessment (EIA) are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.

B. Environmental Assessment Methodology

121. For the original project, a survey was conducted by the safeguards consultant and the IPC consultant team in all 27 target provincial and district referral hospitals. The assessment methodology for the 81 referral hospitals included in the scope of the Additional Financing had to be adjusted given travel restrictions related to the COVID-19 pandemic. For these facilities, the assessment was based on a questionnaire survey with participating referral hospitals and various online meetings with relevant staff. The main objectives of the field and online surveys were to:

- (i) Assess the current practices and environmental conditions, focused on the medical waste (solid and liquid) management of the health care facilities (provincial and district referral hospitals);
- (ii) Meet and discuss with hospital management, involved staff and IPC focal points, consult them about their needs and plans about the environmental management of the sub-components of the original project and the additional financing, to institute environmental safeguards from the impacts of laboratory waste, infectious disease bio-hazards, hospital safety and hygiene for infection prevention and control, and medical solid and liquid waste management; and
- (iii) Collect environmental baseline data of the representative provinces included in the target areas.

122. The surveys were carried out by a combination of methods, i.e. observation, photo-documentation, data/document review and analysis, and interview with hospital management, involved staff and IPC focal points. The survey team earlier developed sets of Rapid Environmental Assessment (REA) checklists for health care facilities. The data and information on environmental issues focused on medical solid and liquid waste management and hospital safety and hygiene for infection prevention and control of participating hospitals.

123. The Safeguards Consultant and IPC team conducted the meetings with the Provincial and district referral hospital management, staff and Laboratory staff/IPC focal points were held with participation of the relevant staff to discuss the environmental situation in their respective areas focusing on the medical and laboratory waste management.

B1. Scoping of Potential Environmental Impacts and Mitigating Measures

124. For the purposes of the assessment, the following categories of impacts have been developed:

- (i) **NO IMPACT:** The potential impact of the project is assessed as NO IMPACT if the project activity is physically removed in space or time from the environmental component, or if the impact is so small as to be un-measurable (i.e. negligible).
- (ii) **MAJOR IMPACT – POSITIVE OR NEGATIVE:** An impact is said to be MAJOR if the project has the potential to affect an environmental component. The following criteria were used to determine whether a given impact is MAJOR:
 - a. spatial scale of the impact (site, local, regional, or national/ international);
 - b. time horizon of the impact (short, medium, or long term);
 - c. magnitude of the change in the environmental component brought about by the project activities (small, moderate, large);
 - d. importance to local human populations;
 - e. compliance with international, national, provincial, or district environmental protection laws, standards, and regulations;
 - f. compliance with ADB guidelines, policies, and regulations.
- (iii) **MINOR IMPACT – POSITIVE OR NEGATIVE:** If an impact occurs but does not meet the criteria for a Major Impact it is assigned the category MINOR. Minor impacts occur along a spectrum ranging from those impacts that are close to being major impacts to those that are close to being negligible impacts. The judgments made in relation to the position of specific impacts along this spectrum

are discussed in the text accompanying the environmental screening.

- (iv) **UNKNOWN IMPACT:** The potential impact of the project will be assessed as being UNKNOWN if the magnitude of the effect cannot be predicted for any of the following reasons:
- the nature and location of the project activity is uncertain;
 - the occurrence of the environmental component within the study area is uncertain;
 - the time scale of the effect is unknown; or
 - the spatial scale over which the effect may occur is unknown.

125. These categories have been applied to other ADB infrastructure projects and have been adapted from ADB, *Safeguard Policy Statement (2009)*. The following key is used in the environmental screening.

NO impact	O
MINOR NEGATIVE impact	X
MAJOR NEGATIVE impact	XX
MINOR POSITIVE impact	+
MAJOR POSITIVE impact	++
UNKNOWN impact	?

C. Results of Impact Assessment

126. The purpose of this section is to undertake further assessment of likely environmental impacts of the project components/sub-components based on the scoping exercise which addresses the potential impacts of the structural processes to be implemented and relevant activities under the loan program, namely: (i) minor repair and improvement works; (ii) laboratory equipment commissioning including infection prevention and control (IPC) services; (iii) operations of the existing solid waste management facilities and (iv) operation of existing wastewater treatment facilities. Since the project does not involve major civil works, the environmental assessment covers the pre-procurement, procurement/minor repair (including the commissioning stage), and the operation stage of the project (including additional financing). Only potential impacts that have direct and relevant significance are further assessed and addressed.

Table 5: Environmental impacts and risks, mitigation measures

Potential Impact and/or risk	Design Stage	Implementation Stage	Operation Stage	Description of Impacts and Mitigation Measures
Dust generation and air emissions	O	X	O	Activity/Component: Minor repair works and the construction of small shelters for microwave-based waste management

Potential Impact and/or risk	Design Stage	Implementation Stage	Operation Stage	Description of Impacts and Mitigation Measures
				<p>Impact: During minor repair works and the construction of small shelters for microwave-based waste management, localized, temporary negative impacts may result from dust generation from removal and installation of existing equipment, frames, cabinets, and supports to clear the way for new laboratory improvements and equipment. No impacts are expected during the operation stage.</p> <p>Mitigation measures will include use of wet rags and vacuum cleaners for dust suppression, containment and minimization of work areas, and utilizing temporary protective curtains on existing facilities and equipment.</p>
	O	X	++	<p>Activity/Component: Laboratory Equipment Commissioning including IPC.</p> <p>Impact: Negative Impact as above for dust emissions during equipment installation. No significant impacts anticipated during equipment operation.</p> <p>Mitigation measures: As a mitigating and control measure, emissions from the labs will be collected and treated to ensure the compliance with relevant environmental standards of Cambodia as current regulations on air (poison gases and odor). IPC “standard precautions” to be implemented to enhance positive impact during operations.</p>
	O	O	X	<p>Activity/Component: Medical waste treatment equipment</p> <p>Impact: Negative impact as above for dust emissions during equipment installation. During operation, emissions from malfunctioning medical waste treatment equipment/</p> <p>Mitigation measures: For IPC, autoclaves will be designed and controlled to ensure compliance with relevant Cambodia air quality emissions standards namely criteria contained in MOE regulations on: air (odor and particulates) and water quality – for steam condensate of medical liquid waste from autoclaves permitted level. Non-incinerator technology will be applied for medical solid waste management facilities to ensure compliance with relevant the environmental standards of Cambodia on air quality, particulates and odor.</p>
Odor generation	O	O	O	<p>Activity/component: Minor repair works and construction of small shelters for microwave-based waste management</p>

Potential Impact and/or risk	Design Stage	Implementation Stage	Operation Stage	Description of Impacts and Mitigation Measures
				Impact: No impact
	O	O	X	<p>Activity/component: Laboratory equipment commissioning including IPC Services.</p> <p>Impact: During operation improper use or maintenance of lab facilities and equipment may result in minor, localized impacts from odor generation.</p> <p>Mitigation measures will include development and implementation of guidance and action for operation of the labs and training of personnel in proper operation of the labs and microwave- based waste management.</p>
	O	O	X	<p>Activity/Component: Medical waste treatment equipment</p> <p>Impact: During operation improper use or maintenance of waste storage areas may result in minor, localized impacts from odor generation.</p> <p>Mitigation measures will include development of operational procedures for temporary and permanent waste storage areas, regular removal of waste from temporary storage areas and training of personnel in proper waste management practices.</p>
	O	O	X	<p>Activity/Component: Wastewater Treatment Facilities</p> <p>Impacts: During operation improper use or maintenance of wastewater treatment facilities may result in minor, localized impacts from odor generation.</p> <p>Mitigation measures will include development of appropriate operational procedures and training for personnel.</p>
Noise generation	O	X	O	<p>Activity/Component: Minor repair works, and construction of small shelter for microwave-based waste management</p> <p>Impacts: During minor repair and improvement work, minor, localized, temporary impacts may result from noise generation from use of tools and installation of equipment. No impacts are expected during the operation phase of the works.</p> <p>Mitigation measures will include restriction of noisy</p>

Potential Impact and/or risk	Design Stage	Implementation Stage	Operation Stage	Description of Impacts and Mitigation Measures
				activities to day time hours, installation of noise dampers, proper maintenance of tools and equipment, erection of temporary acoustic shields in the vicinity of sensitive receivers and notification of the affected rooms of the duration and extent of installation works.
	O	X	O	<p>Activity/Component: Laboratory equipment commissioning including IPC Services and ICUs.</p> <p>Impacts: Minor, localized, temporary impacts may result from noise generation from use of tools and installation of equipment. No impacts are expected during the operation phase.</p> <p>Mitigation measures: same as above.</p>
	O	O	X	<p>Activity/Component: Solid waste and wastewater management facilities</p> <p>Impacts: During collection, transport and disposal operations, minor, localized, temporary impacts may result from noise generation from use of containers, vehicles and equipment.</p> <p>Mitigation measures will include restriction of noisy activities to day time hours, installation of noise dampers, proper maintenance of equipment, erection of temporary acoustic shields in the vicinity of sensitive receivers and notification of the affected areas of the duration medical waste management activities.</p>
Surface water quality deterioration	O	X	O	<p>Activity/Component: Minor repair works and the construction of small shelters for microwave-based waste management</p> <p>Impacts: Minor negative impacts on surface water quality as a result of dirt and sediment laden drainage water from cleaning during minor civil works. This may include cleaning chemicals, fuels or oils used and disposal of litter and general solid waste.</p> <p>Mitigation measures will include preparation of temporary drain containment or basins, and keeping left-over scrap materials in locations removed from the drainage ways.</p>
	O	X	X	Activity/Component: Laboratory equipment commissioning including IPC services and ICUs.

Potential Impact and/or risk	Design Stage	Implementation Stage	Operation Stage	Description of Impacts and Mitigation Measures
				<p>Impacts: Minor negative impact and mitigating measures same as above during installation stage. During operation stage, surface water quality may be adversely affected as a result of spills or leakage of chemicals generated from the laboratory activities including bio-wastes and laundry water emissions.</p> <p>Mitigation measures will include development and operation of the O&M for the labs. Wastewater from the labs will be collected and treated to ensure compliance with the current standards for the medical wastewater.</p>
	O	O	+ (X)	<p>Activity/Component: Solid Waste Management Facilities</p> <p>Impacts: Overall, significant benefit expected from the project by improving medical waste treatment capacities of participating referral hospitals. During operation stage, surface water quality could be adversely affected by improper disposal of solid waste</p> <p>Mitigation measures will include maintenance of storage areas and provision of bins for solid waste collection and training of solid waste collectors and hospital staff in proper health care waste management to protect waterways. Discharge from solid waste facilities will comply with criteria contained in the applicable Cambodia MOE and MOH regulations.</p>
	O	O	++ (X)	<p>Activity/Component: Laboratory wastewater treatment facilities</p> <p>Impacts: Overall, significant benefit expected from the project by improving wastewater treatment capacities of participating referral hospitals. Negative impacts during operations of sub-standard wastewater collection and treatment facilities in existing provincial and district hospitals.</p> <p>Mitigating measures will include the proper design and improvement in operations of laboratory wastewater disposal facilities with discharge that complies with the criteria contained in the current applicable MOE standards for medical wastewater.</p>
Groundwater quality	O	X	O	<p>Activity/Component: Minor repair works and construction of small shelter for microwave-based waste management</p>

Potential Impact and/or risk	Design Stage	Implementation Stage	Operation Stage	Description of Impacts and Mitigation Measures
deterioration, soil contamination				<p>Impacts: Minor negative impacts on groundwater quality as a result of dirt and sediment laden drainage water from cleaning during minor works and preparation for lab equipment installation that will seep through ground water sources or wells. This may include cleaning chemicals, fuels or oils used and disposal of litter and general solid waste.</p> <p>Mitigation measures will include preparation of temporary drain containment or basins, and keeping left-over scrap.</p>
	O	X	X	<p>Activity/Component: Laboratory equipment commissioning including IPC Services and ICUs.</p> <p>Impacts: Minor negative impact and mitigating measures same as above during installation stage. During operation stage, groundwater quality may be adversely affected as a result of spills or leakage of chemicals generated from the laboratory activities including bio-wastes and laundry water emissions.</p> <p>Mitigation measures will include protecting groundwater sources permanently and the development and operation of the O&M for the labs. Wastewater from the labs will be collected and treated to ensure compliance with the current standards for the medical wastewater before discharging to the environment.</p>
	O	O	+(X)	<p>Activity/Component: Solid Waste Management Facilities</p> <p>Impacts: Overall, significant risk reduction benefit expected from the project by improving medical waste treatment capacities of participating referral hospitals. During operation stage, ground water quality could be adversely affected by improper disposal of solid waste.</p> <p>Mitigation measures will include maintenance of storage areas and provision of bins for solid waste collection and training of solid waste collectors and hospital staff in proper health care waste management to protect ground water sources. Discharge from solid waste facilities will comply with criteria contained in the applicable Cambodia MOH and MOE regulations.</p>
	O	O	++(X)	<p>Activity/Component: Wastewater treatment facilities</p> <p>Impacts: Overall, significant benefit expected from the</p>

Potential Impact and/or risk	Design Stage	Implementation Stage	Operation Stage	Description of Impacts and Mitigation Measures
				<p>project by improving wastewater treatment capacities of participating referral hospitals. Negative impacts during operations of sub-standard wastewater facilities in existing provincial and district hospitals with emissions that could affect groundwater quality.</p> <p>Mitigating measures will include the proper design and improvement in operations of wastewater disposal facilities with discharge that complies with the criteria contained in the current applicable MOE standards for medical wastewater.</p>
Soil contamination	O	X	O	<p>Activity/Component: Minor repairs and construction of small shelters for microwave-based waste management</p> <p>Impacts: During minor works, minor impacts of cleaning activities resulting in contamination of soils with cleaning chemicals and agents from repair and improvement activities.</p> <p>Mitigation measures will include ensuring that a barrier between the working surfaces and the soil are used to avoid contamination during the works.</p>
	O	O	++ (X)	<p>Activity/component: Solid Waste Management Facilities</p> <p>Impacts: Overall, significant risk reduction benefit expected from the project by improving medical waste treatment capacities of participating referral hospitals. During operation stage, soil could be adversely affected by improper disposal of solid waste particularly for hospitals that bury medical wastes into their own grounds.</p> <p>Mitigation measures will include ensuring sealing and containment of burial pits or dumping grounds prior to external municipal disposal. Discharge from solid waste facilities will comply with criteria contained in the applicable Cambodia and MOE regulations.</p>
	O	O	X	<p>Activity/Component: Laboratory wastewater treatment facilities</p> <p>Impacts: Negative impacts during operation of sub-standard wastewater facilities in existing provincial and district hospitals with emissions that could affect surrounding soils.</p> <p>Mitigating measures will include the proper design and</p>

Potential Impact and/or risk	Design Stage	Implementation Stage	Operation Stage	Description of Impacts and Mitigation Measures
				improvement in operations of wastewater disposal facilities with discharge that complies with the criteria contained in the current applicable MOE standards for medical wastewater.
Amenity of surrounding land use	O	X	O	<p>Activity/Component: Minor repair and construction of building for microwave-based waste management</p> <p>Impact: During implementation very minor, localized and temporary impacts to amenity of surrounding land use may occur in the form of dust and noise generation.</p> <p>Mitigation measures: Such impacts will be readily mitigated through the range of measures previously described on dust, odor and noise.</p>
Risks to public health and safety	O	X	O	<p>Activity/Component: Minor repairs and construction of shelters for microwave-based waste management</p> <p>Risks: Some demolition or disassembly of existing fixtures in preparation for laboratory equipment and ICU installation may cause risks in public safety for patients and nearby receivers if not properly managed.</p> <p>Mitigating measures include adopting and ensuring that the suppliers and works contractors comply with safety guidelines established by the provincial and district hospitals.</p>
	O	O	++	<p>Activity/Component: Laboratory equipment and ICU commissioning including IPC services</p> <p>Risks: Positive impact from enhance ICU capacities, improved laboratory equipment and safer laboratory diagnostic services for hospital staff and the public.</p>
	O	O	++ (X)	<p>Activity/Component: Solid Waste Management Facilities</p> <p>Risks: Overall, significant risk reduction benefit expected from the project by improving medical waste treatment capacities of participating referral hospitals. Deficient or improperly managed solid waste facilities from storage, collection to disposal could result in risks to public health and safety.</p> <p>Mitigating measures include ensuring that the applicable Cambodian regulations on SWM are complied with. The supplier of medical waste treatment</p>

Potential Impact and/or risk	Design Stage	Implementation Stage	Operation Stage	Description of Impacts and Mitigation Measures
				equipment will develop SOP in Khmer and provide training to facility operators.
	O	O	++ (X)	<p>Activity/Component: Wastewater Treatment Facilities</p> <p>Risks: Overall, significant risk reduction benefit expected from the project by improving wastewater management capacities of participating referral hospitals. Deficient or improperly managed wastewater facilities or the lack of it by the hospitals could have risks to public health and safety.</p> <p>Mitigating measures include ensuring that systems are properly operated and maintained, and that the applicable Cambodian regulations on wastewater discharge are complied with.</p>
Occupational health and safety risks	O	X	O	<p>Activity/Component: Minor repairs and construction of shelters for microwave- based waste management.</p> <p>Risks: Some demolition or disassembly of existing fixtures in preparation for laboratory equipment installation may cause risks for construction workers in the form of dust and noise.</p> <p>Mitigating measures include adopting and ensuring that the hospitals health and safety guidelines are established and practiced by the provincial and district hospitals. Workers will be provided with appropriate personal safety equipment and will be trained in its use prior to commencement of works on the site.</p>
	O	O	++	<p>Activity/Component: Laboratory equipment commissioning including IPC Services and ICUs</p> <p>Risks: Positive impact from improved laboratory equipment and safer laboratory diagnostic services for hospital staff, the patients and the public.</p>
	O	O	++ (X)	<p>Activity/Component: Solid Waste Management Facilities</p> <p>Risks: Overall, significant risk reduction benefit expected from the project by improving medical waste treatment capacities of participating referral hospitals. Deficient or improperly managed solid waste facilities from storage, collection to disposal could result in risks to workers.</p> <p>Mitigating measures include ensuring that the</p>

Potential Impact and/or risk	Design Stage	Implementation Stage	Operation Stage	Description of Impacts and Mitigation Measures
				applicable Cambodia regulations on SWM are complied with. The supplier of medical waste treatment equipment will develop SOP in Khmer and provide training to facility operators, also covering operational safety.
	O	O	++ (X)	<p>Activity/Component: Laboratory Wastewater Treatment Facilities</p> <p>Risks: Overall, significant risk reduction benefit expected from the project by improving wastewater management capacities of participating referral hospitals. Deficient or improperly managed wastewater facilities or the lack of it by the hospitals will increase the risks to hospital staff.</p> <p>Mitigation measures include ensuring that systems are properly operated and maintained, and that the applicable Cambodian regulations on wastewater discharge are complied with.</p>
Risk of COVID-19 virus	O	X	X	<p>Activity/Component: all</p> <p>Risks: Workers executing minor works and installing equipment may be exposed to or bring in COVID-19.</p> <p>Mitigation measures: Works contractors and equipment suppliers to follow and implement MOH guideline and WHO public health and social measures in the workplace in the context of COVID-19 (issued 10 May 2020)</p>

VI. ENVIRONMENTAL MANAGEMENT PLAN

A. Institutional Arrangements for Project Implementation

127. Table 6 summarizes the proposed environmental management responsibilities of key parties involved in the project.

Table 6: Environmental Management Institutional Arrangements

Agency	Environmental Management Responsibilities
ADB	<ul style="list-style-type: none"> • Sign loan agreement with Government of Cambodia including environment-related covenants • Review of site specific SEMP and environmental monitoring reports • Review of EMP implementation • Disclosure of monitoring reports in ADB's website
MOH	<ul style="list-style-type: none"> • Responsibility for overall project implementation, including environmental management activities and implementation of EMP • Coordination of environment-related activities of project implementation units including implementation of aspects of EMP • Responsibility for project operation including operation stage environmental performance • Allocation of staff with responsibility for environmental issues during operation • Preparation of monitoring reports on EMP implementation and submission to ADB
PIU/PHD/ Hospitals	<ul style="list-style-type: none"> • Responsibility for province level project implementation • Responsibility for implementing EMP including obtaining environmental approvals for works within province • Responsibility for pre-construction stage and construction stage environmental management, monitoring and reporting
MOE	<ul style="list-style-type: none"> • Provision of advice to PIUs as required on environmental issues
MOE and ADB	<ul style="list-style-type: none"> • Approval of IEE/EMP for works within districts
Suppliers and contractors	<ul style="list-style-type: none"> • Implementation of environmental management commitments contained in site specific EMPs • Monitoring and reporting of environmental performance

ADB = Asian Development Bank, EARF = environmental assessment and review framework, EMP = environmental management plan, MOE = Ministry of Environment, MOH = Ministry of Health, PIU = project implementing units, SEMP = site-specific environmental management plan.

Source: Asian Development Bank.

128. Responsible personnel assigned by the MOH would have primary responsibility for environmental issues and activities during project implementation.

B. Environmental Management Plan

129. Table 7 contains the environmental management plan (EMP) for the pre- construction, construction and operations stages of sub-components as assessed. During project implementation, the EA, through the project management unit and national consultants will validate the EMPs for the site specific project sub-components on a continuing process. When relevant, EMPs will be included in the bid and contract documents. Reference will be made to new site information obtained to update site specific mitigation measures for inclusion in the EMP.

Table 7: Environmental Management Plan (EMP)

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation	Estimated Costs
Design, Pre-Implementation				
Permits, environmental approvals for contractor	Ensure compliance with domestic requirements	Secure construction permit and ECC by relevant environment authority	Hospital management, PIU	PIU budget
EMP in Bidding Documents	Contractually binding environmental obligations of contractors	Ensure that the EMP is attached to and referred to in bidding documents	PIU	PIU budget
Assignment of safeguard staff	Adequate EMP implementation capacities in place	PIU to appoint qualified specialist to coordinate EMP implementation. Ensure that each hospital has IPC focal point (in charge of EMP supervision during works). PIU to recruit environment consultant to support project implementation and monitoring/reporting.	IPC focal point assigned to be responsible for implementing the EMP	PIU budget
Contractor EMP capacities strengthened	Good environmental management performance of contractors	Contractor to develop contractor EMP (CEMP) based on this IEE and EMP, including an emergency preparedness and response guideline for construction emergencies and site health and safety guidelines.	Contractors	Contractor budget

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation	Estimated Costs
		<p>Contractor to designate an Environmental Health and Safety officer (EHSO) to implement and monitor CEMP and health and safety guidelines.</p> <p>Contractor to orient/train workers regularly to ensure they know CEMP and health and safety requirements. Training shall be conducted by EHSO.</p>		
Construction support preparation	Environmental Education awareness	Environmental Protection Training: PIC Environment Consultant and/or PMU environment officer to provide on-the-job training on implementation & supervision of environmental mitigation measures to PMU, PIU and contractors.	PIU, PIC	Included in contract of PIC.
	Complaints procedures established	The Project Grievance Redress Mechanism will be established and contact persons for the sub-project provided to affected persons and included on sign boards at construction sites, camps and each village.	PIU, PIC	Included in contract of PIC.
Possible presence of UXOs at site (in case of construction of shelters)	UXO clearance certificate	Secure UXO clearance certificate from relevant authority prior to commencement of works.	MOH, PIU	MOH budget
Implementation Phase (minor works, equipment installation)				

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation	Estimated Costs
Dust emissions and generation	Minimize emissions of dust and other pollutants	<p>Use wet rags and vacuum cleaners for dust suppression</p> <p>Contain and minimize air pollution in work areas</p> <p>Ensure construction equipment and vehicles are maintained in good condition</p> <p>Utilize temporary protective curtains on existing facilities and equipment</p>	Supplier/contractor	Included in works contracts
Noise generation	Minimize noise generation	<p>Proper maintenance of tools and equipment</p> <p>Limit noisy construction activities to day time hours 7am-5pm</p> <p>Install noise dampers</p> <p>Notify affected rooms of schedule and duration</p> <p>Ensure noise levels are within stipulated requirements for health centers</p>	Supplier/contractor	Included in works contracts
Surface water and groundwater quality	Minimize generation of potential water pollutants	<p>Store chemicals in secure area, with concrete floor and weatherproof roof</p> <p>Prepare temporary drain containment or basins</p> <p>Keep left-over scrap materials in locations removed from the drainage ways</p> <p>Use prescribed O&M standards for the labs</p>	Supplier/contractor	Included in works contracts
Soil contamination	Avoid adverse impacts from disturbed soils	<p>Installing equipment and minor reparations will not create soil contamination.</p> <p>In any case the supplier and contractor will ensure that an impermeable barrier between the working surfaces and the soil are used to avoid contamination during the</p>	Supplier/contractor	Included in works contracts

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation	Estimated Costs
		works. The solid and liquid waste will be managed, stored and disposed of according to the relevant national guidelines		
Risks to public and worker health and safety	Minimize risk of accidents to public and workers	Adopt and ensure that the hospitals health and safety guidelines are established and practiced Provide PPE and safety training to all workers Appropriate first aid measures are available on site and emergency contact numbers are clearly displayed on sites including emergency evaluation procedures and maps	Supplier/contractor	Included in works contracts
COVID-19 risk	Prevention of COVID- 19	Follow and implement MOH guideline and WHO public health and social measures in the workplace in the context of COVID-19 (issued 10 May 2020)	Supplier/contractor	Included in works contracts
Access roads to construction site	Risk of accidents and disturbance during material and equipment delivery	Adopt alternative access road away from patients and ambulance access road, hauling construction material and equipment during low traffic time	Supplier/contractor	Included in works contracts
Site hand over	Site restoration to at least pre-project status	Remove debris, clean-up site to at least to pre-project status	Supplier/contractor	Included in works contracts
Operation Phase				
Dust and other emission generation	Minimize emissions of dust and other pollutants	Ensure compliance with relevant Cambodia air quality emissions standards Only non-incinerator technology should be considered for medical solid waste treatment facilities to ensure compliance with relevant	MOH and MOE, waste treatment equipment supplier, hospitals	Overall project costs (equipment), Hospital operations budget (maintenance)

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation	Estimated Costs
		environmental standards of Cambodia on air quality, particulates and odor		
Odor generation	Minimize odor generation	<p>Develop and implement guidance and action for operation of the labs and training of personnel in proper operation of the labs</p> <p>Regularly remove waste from temporary storage areas and train personnel in proper waste management practices.</p>	MOH, waste treatment equipment supplier, hospitals	Overall project costs (equipment), Hospital operations budget (maintenance)
Noise generation	Minimize noise generation	<p>Ensure solid waste equipment and vehicles are maintained in good condition</p> <p>Install noise dampers or erect temporary acoustic shields at noise sources</p> <p>Limit noisy operational activities to day time hours</p>	Hospitals	Hospital operations budget (maintenance)
Surface water and groundwater quality	Minimize generation of potential water pollutants and maintain water quality	<p>Store chemicals in secure area, with concrete floor and weatherproof roof</p> <p>Keep left-over scrap materials in locations removed from the drainage ways</p> <p>Use prescribed O&M standards for the labs</p> <p>Maintain storage areas and provide bins for solid waste collection and prevent leaching</p> <p>Train solid waste collectors and hospital staff in proper health care waste management to protect waterways.</p> <p>Ensure that discharge from solid waste and</p>	Hospitals	Hospital operations budget

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation	Estimated Costs
		<p>wastewater treatment facilities will comply with criteria contained in the applicable Cambodia and MOE regulations.</p> <p>Ensure that wastewater from the laboratories will be conveyed directly to a wastewater treatment facility or in its absence, will be collected, stored and treated/disposed of by a licensed waste management contractor</p>		
Soil contamination	Avoid adverse impacts from disturbed soils	<p>Ensure sealing and containment of burial pits or dumping grounds prior to external municipal disposal.</p> <p>Ensure that discharge from solid waste facilities will comply with criteria contained in the applicable Cambodia and MOE regulations.</p> <p>Improve operations of wastewater disposal facilities with discharge that complies with the current applicable MOE standards for medical wastewater.</p>	Hospitals	Hospital operations budget
Risks to public and worker health & safety, including COVID-19	Minimize risk of accidents involving public or health care workers	<p>Secure access to all facilities, ensuring that only those with authorization have access to critical units (laboratories, ICUs, waste storage and treatment, etc).</p> <p>Provide no-access signs at strategic locations.</p> <p>Provide training to health workers on IPC, COVID-19.</p> <p>Develop operating procedures for health care waste management</p>	Hospitals	Hospital operations budget

Issue	Performance Objective	Mitigation Measure	Responsibility for Implementation	Estimated Costs
		systems Train personnel in implementation of operating procedures Emergency evacuation procedures to be clearly signposted at appropriate locations.		

MOE = Ministry of Environment, MOH = Ministry of Health, SWM = solid waste management.

C. Environmental Monitoring Plan

130. Table 7 contain the environmental monitoring plan for the pre-implementation, implementation and operation stages of the project components. Two types of environmental monitoring are required to be implemented:

- (i) Environmental effects monitoring is conducted to estimate the impacts of the sub-project on ambient environmental conditions.
- (ii) Project environmental performance monitoring is conducted to evaluate compliance with environment-related operating procedures, national standards, and/or supplier's specifications including the requirements of the EMP.

Table 8: Environmental Monitoring Plan

Mitigation Measure	Parameters	Location	Methods	Frequency	Responsibility
During Project Implementation					
Dust suppression	Visible dust	At all work areas (laboratory, ICUs, waste storage/ treatment building, wastewater treatment site)	Visual inspection	During windy conditions, in case of complaints	Contractor, PIC
Noise minimization	Noise levels near sensitive receivers (nearest patient rooms)	At all work areas (laboratory, ICUs, waste storage/ treatment building, wastewater treatment site) and adjoining rooms	Handheld noise meter [indoor ward room dB(A)=30]	During noisy activities	Contractor, PIC

Water quality protection	Visible sedimentation, waste or other pollutants in waterways	At surface waterways and wells in vicinity of the hospitals	Visual inspection	Weekly or after rain events	Contractor, PIC
Occupational health and safety	Wearing of PPE, accidents	At all work sites	Visual inspection	Daily and weekly	Contractor, PIC
Community health and safety	Access control, safety signage, GRM	At work site entrances	Visual inspection	Daily and weekly	Contractor, PIC
COVID-19 risks	Adherence to MOH and WHO guidelines for COVID-19 risk management	At all working areas	Hand hygiene Respiratory hygiene Physical distancing	Weekly	PIC
Operation Phase					
Infection prevention and control (IPC) performance	Adherence to national guidelines for IPC, handling, storage and disposal of laboratory samples	Ambient conditions at site and around	Visual inspection	Weekly for first 6 months and then monthly thereafter	MOH, hospitals
Water quality protection	Visible sediment, waste or other pollutants in waterways	In waterways and wells in vicinity of effluent discharge from solid waste or wastewater facilities	As specified in Cambodia standards	Semi-annually	MOE, MOH
Waste management performance	Performance of medical waste collection and treatment system	At medical waste shelter	Visual inspection	Monthly	Hospitals, MOH
Prevention of COVID-19	Temperature check and testing (if any)	At all working areas	Hand hygiene Respiratory hygiene Physical distancing	Daily	Hospitals

D. Environmental Reporting

131. Table 8 presents the environmental reporting system for the pre- construction, construction and operation stages of the project. The safeguards monitoring report (social and environmental) shall be prepared and submitted annually to ADB (as per loan covenant and PAM).

Table 9: Environmental Reporting Requirements

Report	By whom	To whom	Frequency	Content
Supplier/ Contractor's Environmental Performance Report	Contractors	PMU	Weekly	Status of works Reporting as per indicators in environment monitoring plan Trainings conducted Grievances received Accidents and incidents
Safeguards Monitoring Report	MOH/PMU	ADB	Annually until PCR is issued	As per format agreed with ADB, but covering items above plus compliance with environment covenants of the loan agreement, training activities conducted by PIU, unanticipated impacts, proposed corrective actions

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Public Consultation Undertaken

132. Public consultations for the original project were undertaken during June 2019 in 27 target hospitals. A total of 194 participants attended the consultations, included 48 female participants. The consultations included the following:

- (i) Meetings and consultations with hospital management-directors, laboratory staff and infection control and prevention (IPC) staff to inform them about the need for rapid environmental assessments and obtain the current status of the district hospital facilities and health centers and the upgrades or improvements that they are proposing based on their own diagnosis.
- (ii) Meetings and consultations with the District Health Office Director and/or Hospital Director together with their management and staff, laboratory and IPC staff representatives to brief them about the environmental assessments that each hospital has to undertake to identify the current status of environmental conditions in the vicinity of the health facilities and identify the scope of required project interventions.

133. The consultations showed a high level of acceptance of the project as the project will improve the hospitals' and health centers' current state and capability for improved laboratory services and IPC. Some suggestions were forwarded regarding the laboratory equipment needed, waste management containers, disposal technologies that are non-burn. Representatives of international non-government organizations were concerned about the health effects of incinerators. Some of the related environmental concerns included the lack of proper management of health care waste, the lack of adequate staff for operations and maintenance of the facilities, and the basic lack of medical and non- medical equipment. Such concerns were incorporated in the mitigation and monitoring plans.

134. The project management and MOH proposed installations and operations of microwave-based healthcare waste management in 27 hospitals since healthcare waste management in hospitals faced difficulties with the obsolete/old incinerators.

135. Public consultation during preparation of the additional financing loan was affected by the COVID-19 pandemic and related traveling and gathering restrictions. Meetings and consultations with hospital management-directors and infection control and prevention (IPC) staff were held virtually. A questionnaire survey was conducted to assess current practices and gaps in referral hospitals, and to identify required project interventions. This also included interventions related to solid and liquid waste management. In total, 80 hospital staff participated in the consultation. As for the original project, the management of participating referral hospitals confirmed their preference for non-incineration based medical waste treatment systems.

136. The consultation for the additional financing also identified some site-specific sensitivities. Out of the 81 hospitals that will receive some form of support under the Additional Financing, 15 are located near rivers and/or forested areas, and 5 referral hospitals reported flooding events in the last 10 years. All referral hospitals confirmed that there was adequate space within existing hospital compounds for the construction of new small structures (i.e. for the waste storage and treatment shelter), and that no land acquisition was required.

B. Future Public Consultations and Information Disclosure

137. Public consultation is an on-going process and the consultations will continue with the project affected communities and interested non-government organizations, if any, during the implementation phases of the project. Project information including schedule and scope of minor works will be disclosed at project sites.

138. District level workshops will be undertaken to discuss project interventions, potential environmental impacts of project activities and required mitigation measures. Representatives at the workshops will include MOH and hospital management, mass organizations (Women's Union, Youth Union and Farmers Association), other relevant district level organizations such as the District Committee for Ethnic Minorities, Commune People's Committee and other relevant stakeholder representatives.

139. Meetings with potentially affected households, sensitive receivers (schools, temples etc.) and nearby landowners will be held to discuss specific issues of concern and mitigation measures. The grievance redress mechanism (GRM) including access points will also be disclosed. The PIC and MOH will conduct informal interviews with nearby communities and hospital staff during periodic site visits. The results of such consultations will be documented in the annual safeguards monitoring reports to ADB. The original IEE was disclosed on the ADB website before the ADB Board consideration of the original project. This updated IEE will be disclosed on the ADB website before ADB approval of the additional financing loan. All safeguards monitoring reports will be disclosed on the project website.

C. Grievance Redress Mechanism (GRM)

140. A grievance redress mechanism will be established for the project, with GRM sub-systems to be established in each hospital. If any affected person (AP) wishes to express her/his concerns about the minor repair/refurbishment of hospital facilities and microwave-based waste management system installation, they will be advised to go through the following steps:

141. **Step 1: The hospital management committee** (consisting of hospital director, deputy director, chief of services and chief of wards): The complainant can express her/his concerns by submitting the letter of complaint to the hospital committee; then the hospital management committee has to deal with issues immediately.

142. **Step 2: Feedback boxes.** Alternatively, the complainant can use feedback boxes attached in each hospital building. The hospital management committee must check the feedback boxes at the end of every week and conduct a meeting among their members to address any of the issues.

143. **Step 3: Provincial Technical Working Group** (consisting of representatives from provincial department of health, provincial hospital management, operational districts referral hospital, district hospitals). The complaint can be dealt with and decision at this stage. The Provincial Technical Working Group holds its meeting every 3 months and shall implement the decision.

144. **Stage 4: PIU at national level (10 working days).** If no solution is found under Step 3, the complainant may address his/her complaint to the PIU. This level has 10 working days within

which the PIU meets with the aggrieved party and tries to resolve the situation. Within 10 working days of submission of the grievance, the PIU must make a written decision and submit copies to the Department of Hospital/MOH and the APs.

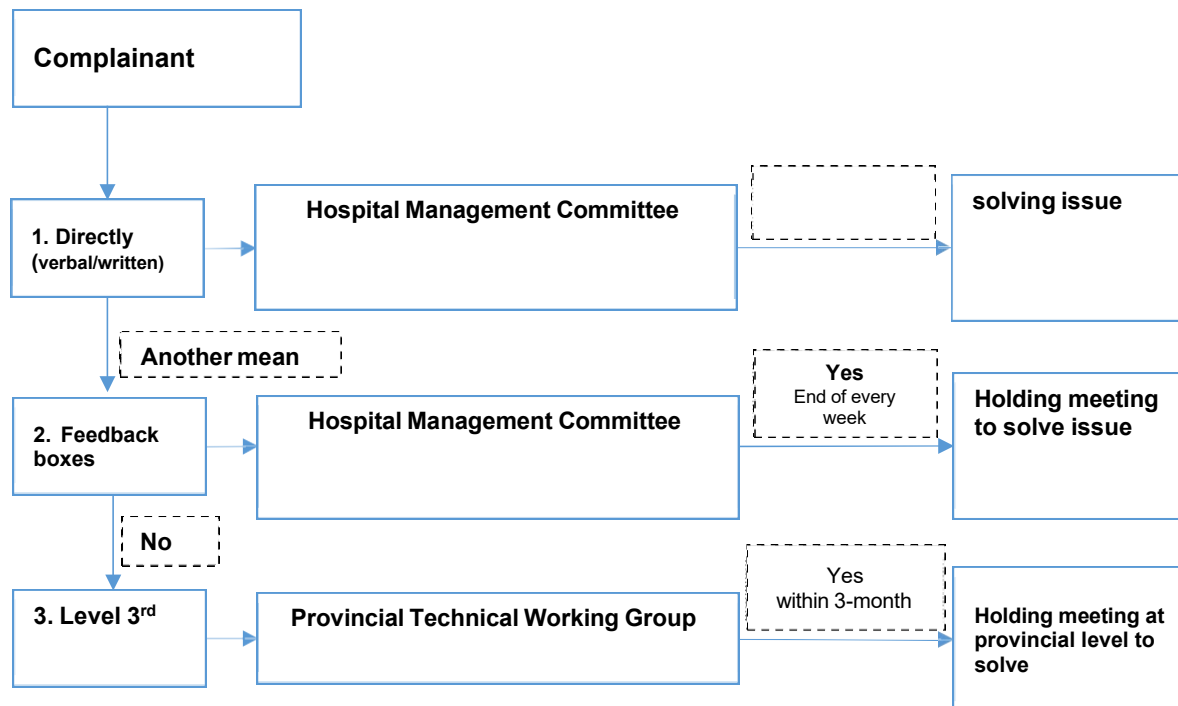


Figure 9: Grievance Redress Mechanism in Hospitals

VIII. CONCLUSION AND RECOMMENDATIONS

145. The proposed original project including the additional financing loan includes minor repair/renovation and refurbishment works of existing hospital laboratories, and construction of small shelters (7x7m) for microwave-based medical waste treatment (integrated biomedical waste treatment) within the participating hospitals' campuses and away from patient's wards.

146. The assessment conducted for the project including the additional financing loan as presented in this IEE concludes that environmental impacts will be highly localized (i.e. within existing hospital compounds), very short-term (i.e. during short minor repair/refurbishment phase) and reversible.

147. Some structures of the laboratories of the hospitals need to be repaired and upgraded before assembly of the equipment. However, the negative impacts during project implementation will be minor due to the limited scale of the activities, and these negative impacts will be localized and temporary. Such impacts include generation of noise and dust, deterioration of water quality through sediment laden runoff or improper management of construction debris. Risks to community and occupational health and safety will need to be properly managed, including the safety and comfort of patients during minor repair works. COVID-19 risk management protocols as established by the MOH and WHO will need to be adhered to. Most impacts can be readily mitigated to acceptable levels through implementation of standard environmental management practices. There is no protected area of area of ecological or cultural interest sensitive area, cultural, historical and archeological area within hospitals' campuses/premises.

148. The environmental mitigation measures and environmental monitoring plan, as presented in this updated IEE and EMP shall be attached to the bidding documents for works contractors, who shall develop their own contractor EMP, including Occupational Health and Safety and Community Health and Safety plans, including COVID-19 risk management and prevention.

149. During operation stage, waste generated by the operation of the hospitals are likely to be the sources of negative impacts on the environment if they are not managed properly. These pollution sources are long-term and consecutive, and therefore, mitigation measures have been incorporated in the project design. Laboratories will comply with standardized biosafety level 2 or 3 for the provincial referral hospitals and the district referral hospitals, as per WHO standards.⁵²

150. Technical systems for the collection and treatment of hazardous medical waste will be provided to those referral hospitals where service gaps have been identified. As a result of the project, Cambodia will reach 100% hazardous medical waste treatment coverage for CPA-1 to CPA-3 referral hospitals outside of Phnom Penh. The project will also provide capacity building in basic operation and maintenance (O&M) environmental management of these solid waste treatment facilities. Overall, the project including its AF component is expected to significantly improve infection prevention and control (IPC) as well as waste management capacities and practices in referral hospitals of Cambodia.

151. Consultations conducted during project preparation confirms the support from local authorities and the hospitals' management for the project. Consultation with and information

⁵² Biosafety Level 3 is applicable to clinical, diagnostic, teaching, research, or production facilities where work is performed with indigenous or exotic agents that may cause serious or potentially lethal disease through the inhalation route of exposure. WHO. 2004. Laboratory Biosafety Manual. Third edition. Geneva.

dissemination to potentially affected people will be conducted prior to and during minor works. Such information will include project schedule and scope, and the grievance redress mechanism (GRM) access points and procedure. Good cooperation between all stakeholders, especially hospital management and awarded contractors will need to be ensured during project implementation.

152. MOH, through its PMU and the consultants, shall monitor the project to ensure compliance with the ADB SPS 2009, the Cambodian regulatory and policy framework, and this IEE/EMP. Annual safeguards monitoring reports will be prepared and disclosed on the project website.

153. The GMS health security project, including the additional financing loan, will bring forth more positive than negative environmental impacts and greater national health security. Overall the project will significantly improve healthcare waste management capacities and this will mean a reduced risk of environmental pollution and health impacts to staff and people living near the hospitals.