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WORLD MARITIME UNIVERSITY

Malmö, Sweden

**THE EVALUATION ON INSPECTION
IMPLEMENTATION AND THE REVIEW ON
ENVIRONMENTAL IMPACT ASSESSMENT
REPORT**

**CASE STUDY: THE DEVELOPMENT OF THE SIHANOUKVILLE
AUTONOMOUS PORT IN CAMBODIA REGARDING SPECIAL
ECONOMIC ZONE**

By

**CHANTHA SRENG
Cambodia**

A dissertation submitted to the World Maritime University in partial
fulfilment of the requirement for the award of the degree of

**MASTER OF SCIENCE
In
MARITIME AFFAIRS**

(OCEAN SUSTAINABILITY, GOVERNANCE MANAGEMENT)

2019

Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature):

(Date):

Supervised by:

Supervisor's affiliation.....

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Abstract

Title of Dissertation: The Evaluation on Inspection Implementation and the Review on Environmental Impact Assessment Report. Case Study: The Development of the Sihanoukville Autonomous Port in Cambodia Regarding Special Economic Zone

Degree: MSc

Port development contributes to various environmental impacts on marine ecosystems and such impacts may cause serious damages toward the marine environment and coastal areas if there are no proper solutions. The EIA is conducted to identify any environmental impacts possibly happened from the port development. It guides advanced to predict on impacts and finds mitigating measures for sustainable development. This research examines the activities should be done and the procedure to conduct an EIA report in Cambodia and who are involved in this review and approval procedure. Moreover, the relevant international and national regulation and laws are reviewed to cope with the issues arising from the PAS's development. Furthermore, the author evaluates the inspection implementation of technical officers on the port implementation. Besides, the EIA report of the PAS is reviewed regarding environmental components and what components should be included. The potential environmental components consider to include in the report are dredging impacts, underwater noise pollution, sedimentation and erosion and land reclamations. This research concludes the results found and some suggestions and recommendations provided to improve the EIA report and protect the marine environment in the coastal area in Cambodia.

Keywords: Environmental impacts assessment; the Purpose of EIA; Dredging impacts; Underwater noise pollution; Sedimentation and erosion impacts; Land reclamation issues.

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List of Abbreviations

United Nations (UN)

Environmental Impact Statement (EIS)

Environmental Impact Assessment (EIA)

Environmental Management Plan (EMP)

Ministry of Environment of Cambodia (MoE)

Initial Environmental Impact Assessment (IEIA)

Provincial/Urban Environmental Office (PEO)

The Law on Lands Management, Urbanization and Construction (LLMUC)

The Law on Environmental Protection and Natural Resource Management
(LEPNRM)

Convention for the Prevention of Pollution by Sewage (MARPOL)

Sihanoukville Autonomous Port (PAS)

The Royal Government of Cambodia (RGC)

The Convention on Biological Diversity (CBD)

Environmental Application Form (EAF)

Special Economic Zone (SEZ)

Project Owners (PO)

Initial Environmental Impact Assessment (IEIA)

Environmental Application Form (EAF)

Investment Application (IA)

Council for Development in Cambodia (CDC)

Environmental Management Plan (EMP)

I. Introduction

1. Background of Research

Maritime shipping is the most important transportation mode regarding its capacity for loading and world connection. Over 80% in volume and 70% of the value of the globe trade are carried by ships (UNCTAD, 2017). Ports are playing an important role to connect the multiple trading activities from one country to another, both locally and internationally. It is a stimulating factor for a coastal nation to boost its economy (Jose. & Wu., 2005). Due to its ability to constructively advanced transportation, ports are continuously expanded in order to be able to accommodate or handle the massively increased number of ships. Shipping is considered as causing the least environmental harm if compared to other modes of transportation. However, port development through the construction and operation can lead to noticeably marine environmental impact.

While ports and shipping bring vast benefits to the economy, they also generate environmental issues on ocean and costal area either directly and indirectly (Bailey &Solomon, 2004). The environmental issues resulting from port construction and operations, namely water pollution, toxic air, noise and vibrating pollution, invasive species, oil spills or leakage are causing environmental impacts (McConnell., 2002). These negative impacts contribute to the damage of marine habitats, climate change, marine living organisms (population and biodiversity), the instruction of dangerous species and the devastation of coastal and marine ecosystems (Halpern, McLeod, Rosenberg. & Crowder., 2008).

In general, port development always causes environmental impacts in or around the project being conducted. To identify these adverse impacts, an environmental impact assessment (EIA) is carried out. The EIA is practised to evaluate the possibly of adverse impacts in advance arising from a potential project on the environment. Decision makers accordingly refer to the EIA report which is processed systematically to take into consideration on potential negative impacts before the project is operated in an appointed area. Then the proposal will be

submitted to be approved by relevant authorities. The EIA report details critical damages resulting from the project implementation. The project is evaluated by the consultation between the stakeholders involved and public participation. Hence, EIA is a tool for environmental protection. The main purpose of EIA is to support the decision makers to identify feasibly harmful environmental outcomes commencing from project activities. In addition, EIA helps to ensure that the project will be done in a proper manner through recommended measures to reduce the environmental impacts. In addition, it contributes to sustainability of environmental development (Jay., et al, 2007). Furthermore, EIA is a procedure for environmental assessment in order to make legislation, to apply policies and plans and to institute developed projects. Presently, it is undertaken broadly to be an instrument for environmental management. The impacts either environmental or socio-economic are described with regard to the surrounding environment and human health. The proposal will be or not be approved according to the balance between the impacts and benefits resulted from the project development after the consideration of approval authorities (Ramanathan., 2001).

As seaports are located in coastal areas that has the ability to cause marine pollution which has been a concern internationally over the last decades and stakeholders have been working together to find solutions for eliminating or minimizing the pollution issues. The International Maritime Organization (IMO), which is a specialized agency of the United Nations dealing with the safety and security of ships and the preservation of marine environment from ship activities, has adopted a convention called the International Convention for the Prevention of Pollution from Ships (MARPOL). This Convention intends to maintain oceans environmentally friendly from oil, oily substances, solid waste, sewage and air emission from ship exhaustion (www.imo.org). Hence this global regulation is also able to apply for any pollutions arising from port activities, especially while ships navigating in the port areas or docking at ports. In fact, states have their own laws to tackle their coastal pollution from untreated water in their juridical territories.

The coastline of Cambodia, spreads in four provinces, which is located in the Gulf of Thailand with a length of 435 kilometres. They are Koh Kong, Kampot, Kep and Sihanoukville. Of the 435 km, Sihanoukville coastline accounts for 235 km to the southwest of Phnom Penh, the capital city. Sihanoukville is the most well-known province for its economy and development, resulting from its international deep-sea port called Sihanoukville Autonomous Port (PAS) which was founded at the beginning of 1956. Its whole area covers about 125 ha and now consists of 8 berths facilitated with advanced cargo handling equipment. The majority of the garment products from Cambodia are transported through this port to the United States and the European Union via Singapore. In addition, the materials used for garment factories are brought from China, Taiwan and other countries via this port. The port has just enhanced its capacity to dock bigger vessels with a depth of 14.5 metres. This new terminal is capable of weighing goods from ships between 40,000 to 50,000 tonnes, which is double the capacity of the existing one (Sokhorng.,2018; Sisovanna., 2011; PAS, 2019 & Sihanoukville Autonomous Port,2018).

Due to the port development for the last three decades after the liberation from the Khmer Rouge, the PAS has enhanced its capacity in several stages and EIA proposals were submitted to be approved many times. According to these EIA reports, PAS is necessarily abided to collaborate in environmental protection leading to sustainable development. Therefore, to follow up these obligations, officers from the Ministry of Environment and authorities involved have monitored and inspected the PAS's EIA implementation every 6 months. As a consequence, the monitors are able to discover whether the PAS has or has not complied with its environmental contract. With regard to the reports done by officers, the author will investigate the differences between the implementation and its obligations.



Figure 1: Sihanoukville's Autonomous Port of Cambodia

Source: Port Autonome de Sihanoukville(PAS)

2. Problem Statement

The topic has mentioned above is really important for Cambodia's development to cope with or mitigate the environmental issues regarding ocean pollution which is arising from port activities in the Sihanoukville coastal area. It is much more constructive if the research can look for the problems and; solutions, which can be applied in real practice to tackle the problems. Furthermore, the topic is very relevant the career of the author because he is working for the Ministry of Environment of Cambodia, in the Department of Environmental Inspection, which is dealing with all kinds of pollution issues and EIA is now also part of this department. The last but not least, it is strongly hoped that this research can enhance the capacity of the author and to advance his future career with broadly comprehensive knowledge and experiences.

3. Research Questions

Data collection will support examining the problems which Cambodia has been facing and the following actions to mitigate these problems contributed from the development and the operations of the Sihanoukville Port. The objectives for this research are:

1. What are the required activities in order to conduct an EIA report?
2. How is an EIA procedure in Cambodia conducted? According to this procedure, who is responsible with, to issue an official EIA report?
3. What are the environmental impacts should be revised and included in the EIA report regarding the PAS's project and how do technical officers implement inspections based on the inspection reports?
4. What are related regulations and laws which can cope with environmental issues both national and international aspects?

4. Research Objectives

This research aims to find the inspection implementation of responsible officers towards the port and what are the possible impacts should be more included in the existing EIA report on the development of the Sihanoukville Port regarding its Special Economic Zone (SEZ). Therefore, the objectives are covered below:

1. To ascertain the activities should be done to conduct an EIA in Cambodia
2. To examine the procedure to conduct an EIA and who is involved with the procedure to accomplish an EIA report
3. To examine the environmental impacts should be revised and included in an EIA report regarding the PAS's project and to evaluate the inspection implementation of the technical officers according to the inspection reports
4. To develop related solutions to enforce the implementation of an EIA report under the Cambodian constitution and the international conventions which deal with marine pollutions

5. Research Methodologies

This study relies on either literature review which is gained from the internet and library or especially the inspection and EIA reports issued officially by the Ministry of Environment of Cambodia (MoE). They are crucial methods for this research. This means the primary and secondary sources are practised to discover all the problems or objectives, which have been mentioned. In addition, a qualitative approach is mainly

used for this type of research. Moreover, this study will also use the case study method to discuss the findings. In this case, importantly the EIA report of Sihanoukville Port regarding the SEZ will be reviewed and examined. In fact, some information will be requested from local colleagues who are involving or able to collect and provide additional data. This is also an important approach to obtain sources. The last but not least, reports of EIA monitoring of the PAS implementation done by officers every 6 months from the Ministry of Environment of Cambodia is significant sources to evaluate the implementation of the PAS's obligations.

6. Structure of Research

In this dissertation, the study will mainly focus on the inspection implementation of responsible officers and the EIA report which have already been approved by the Ministry of Environment of Cambodia. This will base on the reports have already done by the monitoring of technical officers. From the reports, all negative implementation will be observed to produce protective measures to deal with the issues that have happened or not been implemented properly.

To structure this dissertation, the author will, in the **first chapter**, review the environmental impact assessment in general. This involves EIA to start a project and what EIA has been done internationally, when EIA has been carried out. This chapter mostly focuses on literate review of EIA background and the benefits of EIA.

The **second chapter** will address the background of the Sihanoukville Port and the overview of marine products in the Cambodian coastal area, which consisting of mangrove forests, coral reefs and seagrass beds. These marine components will be impacted by the pollution arising from the port development and operation.

The **third chapter** will study on the EIA which is used fundamentally and the EIA process which is used to conduct an EIA report. In addition, the purposes of EIA report will be mentioned.

The **fourth chapter** will briefly review the relevant laws and regulations which Cambodia has already taken part in, at both national and international levels. There are some laws that would be considered, more specific the Law of Environmental Protection and Natural Resources Management, Sub-Decree on water pollution control, sub- degree on environmental impact assessment, the laws on land management, as well as urbanization and construction. Further, the role of the Ministry of Environment of Cambodia in terms of coastal zone management in protecting and conserving the coastal natural resources and the environment, Sub-Decree on air and noise pollution, Sub-Decree on waste management, the convention on biological diversity and the MARPOL.

The **fifth chapter** will investigate EIA reports in Cambodia. This will include some elements such as what activities should be done to conduct an EIA, the procedure to conduct an EIA and who is involved with the procedure to accomplish an EIA report or how an EIA report can be approved. This is the process that a project owner and consultant company should accomplish to generate a great EIA document to be consented by decision makers.

The **sixth chapter** will discuss the findings regarding the inspection reports done by technical officers and the EIA report approved by the MoE. The author will examine what has missed in the EIA report and what should the technical offers include and proof to conduct an inspection report.

Last but not the least, the **seventh chapter** will summarize what have discussed in the paper including chapter 1, 2, 3, 4, 5 and 6. Finally, the author will provide comments to improve EIA report regarding the Sihanoukville Port on the SEZ in Cambodia.

7. Scope and Limitations of Research

The research intends to evaluate the implementation of technical officers regarding their inspection reports and examine the missed environmental impacts in EIA report of the PAS. Therefore, it can be information to the public regarding the aspects which

the port has implemented and the failures which the officers have faced. According to these failures, the consequences that the port should receive with its in compliance will be given. Moreover, the dissertation will deal with environmental compensations learnt from other countries, which can be practised by Cambodian governmental officers in charge of the issues to deal with the failures of compliance of the EIA report and how monitoring offices respond to the failures found. This means, more options in implementation can be used to suit Cambodian situation in terms of people's attitudes, financial capacity, politics condition and human resources. The last but not the least, stakeholders will understand clearly what their duties are as regards to joint venture to prevent the environmental pollution from happening due to the negligence of the port in the coastal areas in Cambodia.

There were some difficulties when the research is conducted because there was a lack of information the author needed to be completely satisfied. Further, the information collected might be not up to date because of the political situation in Cambodia which put pressure on the authorities concerned to disclose it publicly. The related documents to address the issues above are not publicly disclosed therefore, it takes time to officially request these from the Ministry of Environment of Cambodia. Furthermore, the research will focus on only the inspection and EIA reports which might be very limited or information acquired is out of date. To put forward a good result, the author will put all efforts to retrieve relevant sources to shape the research with a reasonable outcome.

Chapter Two

II. The Overview of Port Background and Marine Situation in the Project Area

1. The Sihanoukville Port Background

The Cambodian Sihanoukville Autonomous Port (PAS) was established in 1956 and its operation was stopped due to the Cambodian Khmer Rouge conflict between 1975 to 1979. After that it operates again by relying on the workers, human resources, machinery and out of date facilities to carry out its shipment and container managing performance and transportation. The port has developed continuously through technical aids from many development organizations and the countries in the region. Likewise, the growth also results from studies and research. According to the continuous increase of cargo size during the 1990s, the Royal Government of Cambodia (RGC) and Japan International Cooperation Agency (JICA) in 2002 helped to develop this port by enhancing and generating more terminals in order to accommodate larger cargo containers in a more appropriate and productive manner (PAS, 2019). The new terminals costs \$74m were invested by JICA to enhance the port volume of cargo handling from 10,000t to 50,000t (Sihanoukville Autonomous Port, 2018).

The PAS is based in Preah Sihanouk Province in the southwest of the country and it now covers an area of 125 hectares, of which, 70 hectares are used as special Economic Zone for the purpose of attracting investors by establishing a passenger terminal. The PAS is the most important port in Cambodia because it is the only deep seaport where the majority of the products imported come to the port (Port of Sihanoukville, 2018). There are 8 terminals with a length of 1 330 meters and furnished with advanced cargo-handling facilities (“Special report on, 2018”). The present port is capable of handling over 70% of trade transportation in Cambodia (Cambodian Construction Association, 2018). The PAS is operating satisfactory for the whole year due to the absence of natural disasters affecting the port, namely tidal storms, earthquakes, tsunamis and floodings (PAS, 2019 and “Special report on, 2018”).

The new Sihanoukville Autonomous Port was just launched on 24 June 2018 after completing the construction to enhance its capacity to turn into transitional scale standard port being able to accommodate over 1 million TEUs (Twenty-foot equivalent units) annually. A new terminal with a depth of 14.5 meters and the frontage of 350 meters has also been constructed. With both the current and new terminals, Sihanoukville Port will be able to obtain ships over 60, 000 tons, which will account for 93 percent of all vessels in 2023. H.E Sun Chanthol stated that in the past five years, the number of containers has increased by 12.6 percent or 459,839 TEUs on average. At the same time, in the initial 5 months of 2018, the number of containers reached 207,047 TEUs. Compared to the first 5 months in 2017, it increased 19.6 percent (Cambodian Construction Association, 2018)

PAS is owned by the Cambodian government and it functions in the same way as other international ports either in the same region or on the globe. It supplies high service quality which is promptly and punctual performance with affordable cost compared to various ports in the area. PAS provides a variety of significant services, such as navigating, handling cargo, storing cargo and warehousing, serving as special economic zone and supplying logistics for offshore oil discovery (PAS, 2019). At the end of quarter two in 2018, a multi-purpose terminal, which costs \$74 million, was introduced by dividing bulk cargo and general cargo zones to hold agricultural items for exporting and coal and building materials for importing (Port of Sihanoukville, 2018).

2. The overview of Marine habitats in the Project Area

The development project is located in the Sihanoukville coastal area where some marine habitats are growing. These habitats are significantly useful for the marine ecosystem. These habitats including mangrove forest, coral reefs and seagrass beds are main habitats for living organisms in the area. However, due to the development project, these habitats are going to be impacted resulting from the pollutions arising

from project activities such as port construction, harbour building, breakwater, dredging, pile-drilling and land reclamations. Therefore, these components are considered in advance in the EIA report to be protected; otherwise, the marine environment in the area might possibly collapse.

2.1 Mangrove Forest

The mangrove forest along the coastal zone of Cambodia was about 85,100 ha in 1992, which is located in three provinces, namely Koh Kong, Siem Reap and Kompong Speu, with 75% (63 200 ha), 16%(13 200 ha) and 9%(7 300) respectively. It was reported that there was only 63,039 ha in 1997 and it decreased to 56 241 ha by 2002. There were approximately 74 species which were divided into 35 families and 53 groups. However, there were just 17 families and 35 species recognized by the Ministry of Environment of Cambodia.

According to the Ministry of Environment of Cambodia (2008), Mangrove forests are the main source of food for people and habitat for fish. More than 70% of the residents living along the coastal areas depend on their products and assets from mangrove forests, essentially fishing. The mangrove forests will be impacted by the water pollution and sedimentation from the dredging and land reclamation and oil leak from ships, vehicles and other machineries. Therefore, the impacts from the port development will severely damage sea fish nurseries and fish productivity and the capability of preventing storm surge and firewood for local use.

2.2 Coral Reefs

Coral reefs supply food and shelter for fish and benthic organisms. It provides fish and other organisms to enhance their productivity by protecting surrounding areas from high wave energies. Therefore, they are very beneficial to coastal systems. There were 14 of 24 species listed as soft coral and sea fans. Generally, coral reefs are found throughout the islands of Cambodia, such as Koh Chhlarm, Koh Thas, Koh Takeo, Koh Tang, Koh Ses, Koh Russey, Koh Pring, Koh Rong Sanlem , Koh Rong and Koh Polowai Island (Dararath, 2000).

In addition, coral reefs do not only provide food and habitats for many kinds of fish, but also offer people viable products to help support their family economy. Coral reefs, if unspoiled and healthy, can protect coastal communities from an intensive Tsunami wave (Ministry of Environment, 2013). Coral reef may be impacted by the port activities because water pollution, sediment and oil leak may drift or spread over within the long distance from the port area due to the strong storms and waves. They may cover on coral resulting in blocking the sunlight and breathing difficulty.

2.3 Seagrass Beds

Seagrass beds have been discovered in the coastal area in the Kompot Province of Cambodia stretching to Phu Quoc Island of Vietnam. It consists of wide ranges of seagrass, namely *Syringodium isoetifolium*, *Cymodocea seradatta*, *Halodule pinipolio* and *Enhalus acoroides* (Dararath, 2000). Seagrass habitats in Cambodia can be divided into two main types: extensive seagrass meadows down the mainland, and the combination of seagrass with coral. Extensive patchy beds are found not far off the riverbank at Kompot town and massive habitats at the east of Tonsay island. In the water border between Koh Rong and Koh Rong Sanlem, other seagrass beds have been noticed. There is 32,429 ha of seagrass bed in total in the Kompot Province (Vibol, nd).

Seagrasses are crucial for the marine ecosystem due to their environmental modifications to generate distinctive habitation. They provide either food and habitats for benthic organisms or a variation of services for humans. In addition, seagrasses are used to wrap houses, produce furniture, cover roofs, make bandages, create mattresses and even fertilize fields. Moreover, they help fisheries and biodiversity by making water clear and absorbing carbon dioxide out of the atmosphere. Therefore, it is recognized globally as the third most precious ecosystem (Reynolds, nd).

In addition to the advantages described, these marine habitats are crucial to the marine ecosystem, especially organisms which are residing in the area. In order to mitigate or eliminate any adversely environmental impacts, the EIA is reviewed and developed in Cambodia regarding the international EIA basic. Therefore, what is EIA and how it is

developed? What are the process of EIA in general and what are the benefits or the purposes of EIA? In the Chapter three, these questions will be detailed clearly according to previous studies.

Chapter Three

III. The Review of Environmental Impact Assessment

The EIA is the report which provides a contract between a company holding the project and the government or institutions which are responsible with environmental issues arising from the project activities, such as construction and operation. Therefore, an EIA report is a basic promise which a company has to prepare before a project starts to convince the government or institution to give the approval and the project owner has to abide by the report in order to protect the environment around the area of the project taking place. Otherwise, the company has to take responsibility for the damage of the environment according to the regulation or laws of a country. So what is EIA and what are the benefits of EIA?

1. The Review of EIA

The EIA is used to evaluate the main project on how the project owner implementing the promise written in the report and assesses the significant environmental issues happening during the project activities. It is a system used to consider problems that might happen in advance from a project and it helps decision maker to give approval or not on a project submitted by the project owner. Furthermore, EIA process will generate an EIA report, which details important issues likely to happen. The process of the evaluation requires the involvement from public consultation. Therefore, an environmental management tool is included in the EIA report (Jay, et al. 2006).

The development is allowed as long as it is not causing serious environmental impacts by acting in a proper way, which is the main aim of the EIA report. Therefore, EIA plays a main role supporting decision makers to determine what the environmental are resulting from a project. In the EIA report, the main aspects likely to arise from the development, in terms of environmental impacts, are written and these impacts will be mitigated or eliminated by taking measures which are employed by project owners. So, some project proposals might be rejected due the lack of issue mitigations to cope with negative environmental impacts possibly originated from the project itself. Regarding the aim of EIA, sustainability seems to be focused more significantly

(Sadler,1996) and more environmental components included in the EIA report are reviewed and discovered in order to develop within more environmental sustainability (Glasson et. al., 2005). Even though sustainable forms are being discovered, the main role of EIA is precisely stated (Cashmore et al., 2004).

The EIA is the procedure of reviewing the possible results that might happen from the proposed development. It is used to identify, predict, evaluate and mitigate the negative impacts in advance resulting from the project proposals prepared by the project owners regarding social and environmental problems. It is very important for policy makers to take decision and also project owners have to make commitments to what is promised in the report (Yousefi, Noorollahi & Peirow,2015). EIA is used as a tool to plan and manage for sustainable development that is aimed at identifying the change of environmental conditions and the impacts around the project area direct and indirect. It also gives possible measures to reduce the impacts (Snell & Cowell, 2006).

EIA was officially generated in 1969 as a substance of the National Environmental Policy Act (NEPA) through the US government (EI-Fadi & EI-Fadel, 2004) and EIA legislation is adapted differently from one country to another (Momtaz, 2002; Toro et al., 2010). There are over 100 nations over the world that have implement EIA legally (Petts, 2009; Wood, 2002) including both developing and transitional economies (Lee & George, 2013). Some developed nations have applied EIA over 30 years such as Australia, Canada and New Zealand (Baba, 2003) while many developing nations developed projects inadequate in terms of detail study of EIA and put less efforts to eliminate or reduce the negatively environmental issues (Appiah-Opoku, 2001). Environmental impacts seem to be increasing in developing countries starting from the beginning of 1990 (Bilsborrow, 1992).

2. The EIA process

The EIA is a process which determines the environmental outcomes priority from the activities of development. It consists of many steps as shown in Figure 2.

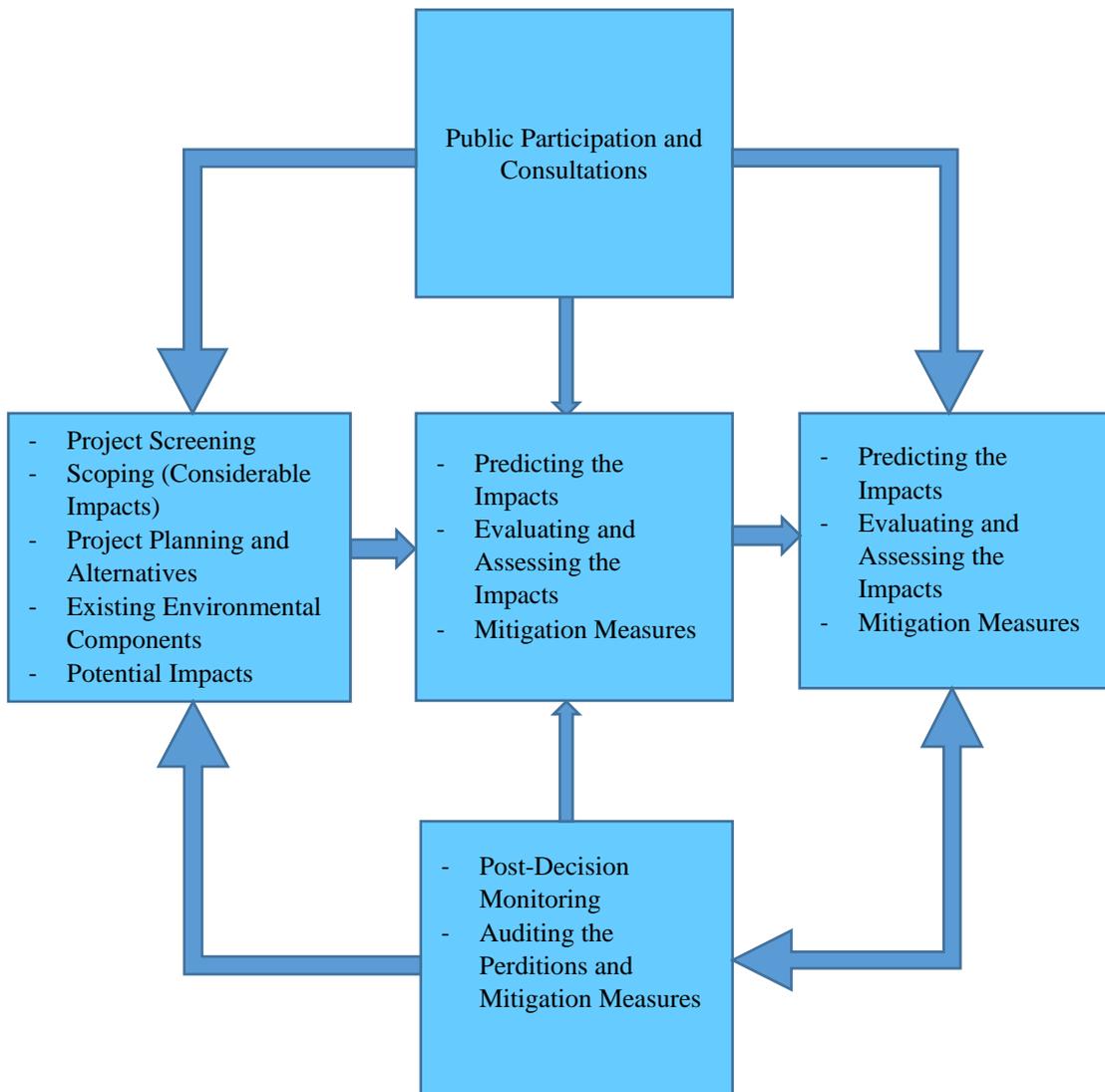


Figure 2: the general process of EIA in order to conduct an EIA report
Source: Modified from (Glasson, J., & Therivel, R. 2013)

- *Project screening* helps to make the EIA application of the projects less wide, which are possibly main environmental issues. It may identify the EIA legislation used in a nation while doing the evaluation.
- *Scoping* attempts to find probably adverse impacts arising from a project and solutions used to solve or mitigate the impacts at the beginning.
- *The consideration of alternatives* helps to make sure that other useful means can be used such as new project locations, scales, procedures, frameworks and working situations.
- *The description of the project/development action* mentions clearly the aims of the projects and a comprehension of different aspects, such as phases of development, site and procedures.
- *The description of the environmental baseline* focuses on the environmental conditions either today and the future when the project taking place. It also takes responsibility for the changes of the environment due to natural phenomena and human activities.
- *The identification of the main impacts* shows how the key environmental outcomes, both negative and positive, are determined at an early stage in order to take all impacts into account.
- *The prediction of impacts* intends to recognize the environmental situation in the impact area by comparing it between the absence of project and the presence of project.
- *The evaluation and assessment of significance* assess all significantly predicted impacts to be able to draw attention to principle negative impacts.
- *Mitigation* considers available measures which can be used for avoidance, reduction, remedy or compensation from the constructively environmental damages. Furthermore, the positive impacts can be possibly enhanced somewhere to offset the damages.
- *Public consultation and participation* is an important stage which the public is allowed to participate and raise voice in the process of EIA. When the public's issues are considered in the process of decision making, the EIA report seems

to be more detailed, comprehensive, qualitative and effective because all stakeholders are involved.

- *EIS presentation* is crucial stage in which project owners present their statements to get approval from the government. The project proposal might be rejected if the presentation does not deliver well.
- *Review* is a step whereby the EIS is evaluated by decision makers and comments are provided by technical officers on what should be included in the statement.
- *Decision-making on the project* will be done by stakeholders who review the statement (government/institution) after replying to the comments provided by technical officers. If the response satisfies the decision makers, the statement will be edited and submitted again.
- *Post-decision monitoring* leads to successful project management because all development impacts will be recorded and project owners are able to correct those mistakes at an early stage.
- *Auditing* is the last stage which is used to assess the implementation of the project by differentiating actual consequences with forecasted consequence. It can be seen whether the project operators have abided by the promise in the EIA and put the most effort to mitigate or eliminates all negative impacts effectively. This process contributes to the level of project owners' commitments to environmental protection (Glasson & Therivel, 2013).

In practice, the EIA process might be a cycle because all steps have to be reviewed again during the implementation and it will be amended in the exact period according to each country. In addition, some countries might not follow all the steps above regarding their experiences. For instance, post- decision monitoring is not mentioned in the UK EIA Legislation (Glasson & Therivel, 2013).

3. The Purposes of EIA

EIA is a contract done by PO in order to verify that they will carry out their operation in accordance with the government strategic plans. Therefore, all projects which are likely to cause environmental damages have to prepare Environmental Impact Statement (EIS) and submit to government to get approval. It is essential for the government to deal with project owners when environmental issues happen from project activities. According to Glasson and Therivel (2013), there are 4 main purposes to get project owners to prepare EIA reports, such as an aid to decision-making, an aid to the formulation of development action, a vehicle for stakeholder consultation and an instrument for sustainable development.

3.1 An aid to decision-making

EIA is playing a very important role for decision makers, on both at local and national levels, who are involved the process of EIS review. It helps them to examine environmental components which exist in or nearby the area of the project taking place. The reviewers are able to decide whether the projects are allowed or other projects should be replaced within the requested areas according to the predicted impacts either negative and positive. A well prepared EIS itself is not enough for decision makers, hence some related documents are also attached such as business plans. EIA is not a replacement for decision making, but it really assists to simplify some alternatives relevant to a development proposal which should contribute to an organized and informed decision-making. In addition, stakeholders, namely project owners, public interest groups and planning regulators refer to EIA in their negotiation in which outcomes can be proficiently balanced between environment and development (Glasson & Therivel, 2013).

3.2 An aid to the formulation of development actions

Project developers may have difficulty to carry out their activities if EIA reports are not specified their action plans clearly. Therefore, the EIA reports guide them to implement their activities more accurately. Even though EIA is a barrier for project developers, it provides them enormous advantages because it offers them basic

information to identify location and possible issues. Moreover, development activities can be formulated precisely designating areas where a project can be changed to mitigate or remove environmental damages. When developers examine all related environmental issues at the early stage, the development can contribute to becoming greater environmental friendly; the relationship among developers, public and planning regulators is enhanced; development activities can be consented faster; the financial expenditure is reduced due to less waste on unimportant activities. Since people are now starting consuming environment products and understanding the consequences of environmental impacts, developers should take action in advance to draw attention to environmental protection in EIA. EIA can be used to determine probable conflicts which are arising from environmental damages. Therefore, the negotiation among stakeholders may be prioritised to environmental gain solutions in order to prevent or compensate to environmental damages which will lead to less local opposition and avoiding from public expense on environmental depletion (Glasson & Therivel, 2013).

3.3 A vehicle for stakeholder consultation and participation

Development activities may result in devastating damages on the environment directly and indirectly, which will last long period and affecting many groups of local people residing in the development area. Therefore, the consultation and public participation are considered widely and importantly by the government at all levels. The government should get involved with the main stakeholders to plan and develop projects. Furthermore, EIA is very beneficial vehicle to get the involvement of local communities and stakeholders. When the public participates actively delivering its concerns and the public is well informed, better development plans are produced. So the participation of the public has to be encouraged in the EIA process (Glasson & Therivel, 2013).

3.4 An instrument for sustainable development

Development plans should focus on any destructive effects toward existing environment. This may contribute to sustainable development avoiding massive expenditure to repair the environmental damages or closing projects down. Some

serious cases of pollution, impacts may occur in decades after the development closed due to omitting residual environmental issues. Hence, environmental impacts should rather be prevented or mitigated at the early stage when development plans are being done. There is a saying that to prevent is rather than to cure. In total, sustainable development requires clear plans to cope with environmental issues generated by human activities, otherwise more complaints and oppositions will appear to the negative impacts (Glasson & Therivel, 2013).

Chapter Four

IV. International and National Legal Aspect

International and national legal aspects play a main role to protect environmental issues. The national law applies for any negative environmental exploitation taking place in a country, and is formed by experts in that particular country regarding its environmental condition; whereas international law is developed internationally by parties involved. Each national party implements the treaty through domestic/national laws. An international legal is a framework to assist the law drafters in a country or region. Therefore, relevant legal aspects are applied to all EIA reports to cope with any environmental pollution or crimes arising from development projects.

1. International Convention

1.1 The Convention on Biological Diversity (CBD)

The Convention on Biological Diversity (CBD) conducted its preliminary meeting for signature in Rio de Janeiro on June 5th, 1992 and it entered into effect on December 29th, 1993. As of 2019, there are 196 parties and 168 signatories (United Nations, nd). This convention is recognized internationally for the purpose of protecting biodiversity of organisms on earth with sustainability. The three main objectives of the CBD are to conserve the biological diversity, to employ the biodiversity components with sustainability and to share the benefits from using biodiversity fairly and equitably (International Union for, 2008). Cambodia ratified CBD on February 9th, 1995 (United Nations, nd) and, according to Article 26, it has obligations to implement the convention effectively (The royal government, 2014). This study is mainly focused on the Article 14 which describes the impact assessment and minimizing adverse impacts. Therefore, the Article stated that:

1. Each Contracting Party, as far as possible and as appropriate, shall:
 - (a) Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or

minimizing such effects and, where appropriate, allow for public participation in such procedures

- (b) Introduce appropriate arrangements to ensure that the environmental consequences of its programmes and policies that are likely to have significant adverse impacts on biological diversity are duly taken into account
- (c) Promote, on the basis of reciprocity, notification, exchange of information and consultation on activities under their jurisdiction or control which are likely to significantly affect adversely the biological diversity of other States or areas beyond the limits of national jurisdiction, by encouraging the conclusion of bilateral, regional or multilateral arrangements, as appropriate
- (d) In the case of imminent or grave danger or damage, originating under its jurisdiction or control, to biological diversity within the area under jurisdiction of other States or in areas beyond the limits of national jurisdiction, notify immediately the potentially affected States of such danger or damage, as well as initiate action to prevent or minimize such danger or damage and
- (e) Promote national arrangements for emergency responses to activities or events, whether caused naturally or otherwise, which present a grave and imminent danger to biological diversity and encourage international cooperation to supplement such national efforts and, where appropriate and

agreed by the States or regional economic Integration organizations concerned, to establish joint contingency plans.

2. The Conference of the Parties shall examine, on the basis of studies to be carried out, the issue of liability and redress, including restoration and compensation, for damage to biological diversity, except where such liability is a purely internal matter (United Nations, 1992, P.9).

Article No 14 concerns the efforts that state parties to CBD should undertake to protect biological diversity with sustainability under their jurisdiction. Therefore, an individual party should introduce the EIA report to any development projects which have the potential to cause significantly adverse impacts on biodiversity. The party has the right to develop or conduct any projects within its jurisdiction for the purpose of its economic growth. A nation has to abide by the aims of the Convention by promoting biological diversity and sustainability as well as carrying out the probable preventive or mitigating measures and activities.

1.2 The Convention for the Prevention of Pollution from Ships

The Convention for the Prevention of Pollution from Ships (MARPOL) is an international convention to protect the marine environment from ships' activities. It intends to protect the ocean from oil pollution and other substances, such as toxic liquid substances, dangerous substances, sewage, garbage and air pollution. Annex IV details the regulations on the discharge of sewage from ships. According to regulation 8, sewage is allowed to be released when sewage is already treated with an approval system abided by regulations and 4 nautical miles beyond the closest land. In some cases, ships are able to discharge the sewage into the sea at a distance of 12 miles from nearest land according to IMO regulations. In addition, ships which are permitted to discharge sewage have to be certified by the administration on their treatment plants. Furthermore, shipping companies have to apply state laws when sewage is discharged in juridical territories. However, MARPOL concerns many kind of wastes other

hazardous substances discharged into the sea water. Therefore, the pollutions resulted from the ship operations in the PAS must be dealt by this convention.

2. National Legislation

Where international laws may exist to mitigate, reduce and prevent the impacts of any pollution, a national policy must provide the overall framework and parameters to outline the expectations the government expects from industry, with regards to the identification, reduction, control and prevent all forms of land; and air and marine pollution. Cambodia's Sihanoukville Port development draws from this national policy to develop a specific strategy on how this project will address any potential marine pollution.

2.1 The Law of Environmental Conservation and Natural Resources Management

The Law on Environmental Protection and Natural Resource Management (LEPNRM) was established on 24 December 1996 by the National Assembly of Cambodia and outlines the following requirements in the purposes of environmental protection which relevant ministries and stakeholders should join venture.

- To Establish an agreed identification and monitoring programme with relevant government ministries and regional authorities that clearly sets out the inspection, monitoring and control guidelines of any source of pollution. Guidelines must identify the source, type and levels of any pollutants and how each will be handled, contained, treated and disposed. Inclusion of the National Sub-Decrees Regulation must form part of this process
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- To conduct a regional and national environmental protection plan to identify environmental and resource management issues that relate to local coastal

socio-economic development. The plan shall be reviewed on a 5 yearly basis and revised where necessary, in consultation with relevant regional and government officials.

- To make sure any natural resources have been identified and appropriate conservation and management is implemented.
- Any violation of the project's environmental management plan will result in the prosecution of the developer and enforcement of financial fines being applied. The developer will be expected to rectify any such violation/s to the satisfaction of the governmental authority and in accordance with related Sub-Decree.

The Ministry of Environment (MOE) will co-ordinate related ministries to ensure that the responsibility of environmental protection and the management of natural resources remains the priority, plus the enforcement of penalties applied. Regarding the pollutions arising from the PAS, all stakeholders should solve the issues together to find solutions.

2.2 Sub-Decree on Water Pollution Control

A Draft Sub-Decree on Water Pollution Control (WPC) was conducted and presented to the government in 1995. This draft covers the rules and standards that relate to conservation of biodiversity and protection of public health related to any effluent discharge from the 'source' into any fresh water and sea water locations.

The Sihanoukville Port development will be expected to comply with this Sub-Decree during the initial site establishment, construction phase and ongoing operation and the protection of ground water and marine water quality because this Sub-Decree deals with any illegal discharges of wastewater into the ocean and any public water sources. Therefore, wastewater must be treated and under the standard provided by the MoE before releasing it into public waterways. Regarding the Sihanoukville Port development, wastewater both from ships and operational activities may be generated, especially from the SEZ consisting of many industrial factories. The Sub-Decree covers all wastewater crimes arising from the port.

2.3 Sub-Decree on Environmental Impact Assessment

The Ministry of Environment (MOE) has developed a draft Environmental Impact Assessment (EIA) Sub-Decree to manage the environment, biological diversity and resources for future generations. This document has been developed with assistance from the United Nations Development Program (UNDP), United Nations Environment Programme (UNEP) and the Asian Development Bank (ADB). The EIA Sub-Decree outlines that all development projects should

- promote conservation and the protection of natural resources
- be developed to be economically sustainable
- identify and maintain any local cultural and social economic values.
- ensure all related Ministries and local authorities form part of the consultation process.
- consultation with the public to minimise impact on the local communities.
- approve the EIA before any site work commences.
- implement vocational training to MOE and other ministry representatives and to ensure awareness and compliance of the EIA applied to each subsequent development.

The MoE will closely monitor the Sihanoukville Port development to ensure the developer closely comply with all aspects of the EIA, as this project has the potential to have considerable impact upon human health as well as the marine and land-based environment.

2.4 Sub-Decree on Solid Waste Management

The Sub-Decree No 113 on solid waste management was developed and entered into force on 27th August 2015 by the RGC under the MoE. The Sub-Decree aims at the improvement of effective solid waste management to ensure that public health and the environment is protected. The waste has to be stored properly into its categories introduced by the MoE in order to be collected and reproduced easily. The waste storage has to be managed effectively avoiding the release of bad and toxic substances which cause public health problems. Furthermore, any businesses/industries must apply for waste disposal approval and be in charge of the service fee required by the

government. The businesses owners must take responsibility for any activities which contributes to environmental issues from illegally waste disposed. This Sub-Decree deals with any solid waste discarded improperly by the PAS operations, such as kitchen waste, office waste and construction waste. The PAS must abide by this Sub-Decree; otherwise, it will take responsible for any environmental damages resulted from its implementation.

2.5 Sub- Decree on Air and Noise Pollution

The Sub-Decree on air and noise pollution was established and put into effect on 10th July 2000 by the MoE. The main purpose of this Sub-Decree is to prevent air and noise pollution resulting from any development activities. According to this Sub-Decree, all industrial and business owners must get approval from the MoE in advance to release polluted substances into the air. The polluted air and noise discharged into the atmosphere must be under the limited standard which is allowed by the MoE. Likewise, all machines and vehicles, which produce pollutions, such as air and noise pollutions, are prohibited to import into Cambodia. The industrial owners or responsible person must take into account any activities causing air and noise pollution. In case the technical officers find that the toxic substances and noise are not up to the standards and have contributed to serious environmental issues, the owner could be fined, imprisoned or the business operation is stopped temporarily waiting for any possible solutions. Due to the PAS developed the SEZ, there are many industrial factories operating. These factories may release some air pollutants into the atmosphere contributing to air pollution. Therefore, this Sub-Decree is potentially important to cope with any air pollution under the control of the PAS.

2.6 The Laws on Land Management, Urbanization and Construction

The National Assembly of the Kingdom of Cambodia in 24 May 1994 established a policy regarding Law on Lands Management, Urbanization and Construction (LLMUC). The primary purpose is to develop sustainable construction in coastal regions and the environmental management of all land based and marine zones. LLMUC primary role is to:

- promote urban and rural development.

- foster sub-committees in each city and regional province, which should be done by the National Committee.
- establish land use plans for each province and city.
- establish land use plans for the urbanisation of the environment, which must consider the economic development patrimony and all natural resources in consultation with the National Committee.
- ensure that land use plans and construction must acknowledge protection zones relating to the environment and patrimony.
- prosecute any violations to those permits issued.
- oversee the compliance to the construction plan and building licence submitted by the developers approved person.

This law will cope with any port expansion which is not comply with the agreement in the EIA report. Hence, the PAS is capable of expending the port area regarding the approval area. Otherwise.

3. The Roles of Ministry of Environment on Marine Protection

The primary role and responsibility of the Ministry of Environment (MOE) was described in a Sub-Decree No 171 on Organisation and Functioning of General Secretariat of National Committee on Coastal Area Management and Development approved by the Council of the Ministry in late 1997, with the primary task to supervise and manage the environment within the Kingdom of Cambodia.

The Ministry of Environment's roles and responsibilities with regard to the management of coastal zones is outlined in a Sub-Decree that outlines to following.

- Enforce environmental policy in a constructive manner.
- Ensure all developments are sustainable and align with National and Regional Action Plans with the co-operation of inter-ministries.
- Establish legal instruments to ensure any development is sustainable.
- Evaluate all proposed private and public development EIA.
- Consult with relevant ministries regarding conservation, development, and management of natural resources as outlined within in Article 59 of the Constitution of the Kingdom of Cambodia.

- Administer the National Protected Area System as defined by Royal Degree to
- designate and establish protected areas. Reviewed areas are added into the system as warranted.
- Identify the source of any potential contaminants, and implement controls to prevent and/or mitigate an impact to the environment.
- Establish inspection procedures and guidelines to evaluate and oversee the ongoing operation of environmental services throughout the country.
- Conduct research to analyse and manage environmental data.
- Establish pollution reduction and compliance targets for ministries to oversee.
- Provide incentives to developers and operations that deliver on environmental conservation.
- Develop close working ties with non-governmental organisations (NGOs), international, national and local communities to deliver solutions that solve issues affecting the environment.

The Sihanoukville Port development management team must establish a strict governance that will prevent and mitigate pollution from land based sources or that from shipping-use. All entities including MOE, the Ministry of Public Works and Transportation should co-operate with Port Authority to help identify any potential sources that will impact upon this working environmental.

Chapter Five

V. General EIA Report in Cambodia

According to Articles 6 and 7, the LEPNRM 1996, development projects have possibly caused environmental in the operation area. There is no exception for either public or private projects. EIA reports are done by the project owners and then submitted to the MoE for examination and evaluate before the decision approval. To get the EIA process working, the Department of EIA was initiated by the MoE under the Sub-Decree in 1997. It was stated that more guided EIA processes were needed in 1999 under the Sub-Decree No 72 which described all EIA procedures, such as EIA contents. Activities should be done before submitting the EIA report to the MoE and; the EIA procedures and related laws abided by PO (Opendevelopment, 2014).

1. The Criteria contains in EIA Reports in Cambodia

The EIA report may consist of different criteria due to each country condition or situation. Some criteria must be varied to deal with actual environmental issues. Therefore, Cambodia also has its own EIA criteria guided by the MoE. According to the Guidebook on EIA (2012), the contents required are:

- Project Overview
- Methodology and the study scope
- Related laws and regulatory
- Project description and action plan
- Overview of existing environment in the develop area
- Description of public participation
- Measure to mitigate the environmental issues
- Environmental management plan
- Analysis between economy and environmental loss
- Conclusion and recommendations

2. Activities should be done to conduct an EIA

To conduct an EIA report, the project owners must get some activities done to be ready for applying to the MoE or responsible institution for the approval of the development projects. According to the MoE, degree No 72, the project owners (PO) must prepare

some reports required by the Cambodian Government which the MoE takes responsibility for reviewing. First of all, the PO or responsible person must prepare Initial Environmental Impact Assessment (IEIA) which is abided by the EIA requirement, in the Sub-Decree No 72, and then they must submit the IEIA report to the MoE in order to evaluate the IEIA and the report of pre-feasibility study. Some findings and recommendations will be provided to be revised. The full EIA report and pre-feasibility study must be conducted and sent to the MoE after the IEIA consent. The full EIA report is done when the development project seems to have significant damages towards the environment both biological and physical resources (Natural resources, ecosystem and living organisms) and public health and welfare towards human being residing nearby or far beyond the development areas. In case the project conducted at the province, the PO must submit an EIA report and pre-feasibility study to the Provincial/Urban Environmental Office (PEO) to access the report. Likewise, the IEIA or EIA report must follow the guidelines generated by the MoE and the PO must be in charge of the fee service for the process of evaluation and recommendations regarding the submitted project. The MoE will have to propose the service fee to the Ministry of Economy and Finance to get consensus before charging the PO. The agreed fee will be included in the national budget for national expenses or expenditures. Furthermore, the PO must donate some required amount of money to the Environmental Endowment Fund which stated in the LEPRM. This is a contribution to help improve the environmental situation and the fund is not incorporated into the national budget but to the MoE budget for any environmental uses.

Finally, the PO must complete the Environmental Application Form (EAF) and submit it to the MoE in order to the development projects to be listed. The EAF will be submitted to the MoE in case the projects develop at the national level, whereas the EAF must be submitted to PEO if the project is located in the province or urban-area.

3. The Procedure to Conduct an EIA

The procedures to get the EIA report approval are likely to be more complicated due to its various stages and reviewers. As shown in the Figure 1.3 there are many steps to get a development project approved. Generally, there are two main EIA processes in

Cambodia, such as the procedure of the EIA process for reviewing proposed project and procedures of the EIA process for reviewing existing projects. The project owners have to prepare their EIA reports before implementing its activities. Therefore, the Figure 3 presents the whole EIA process for new proposed projects.

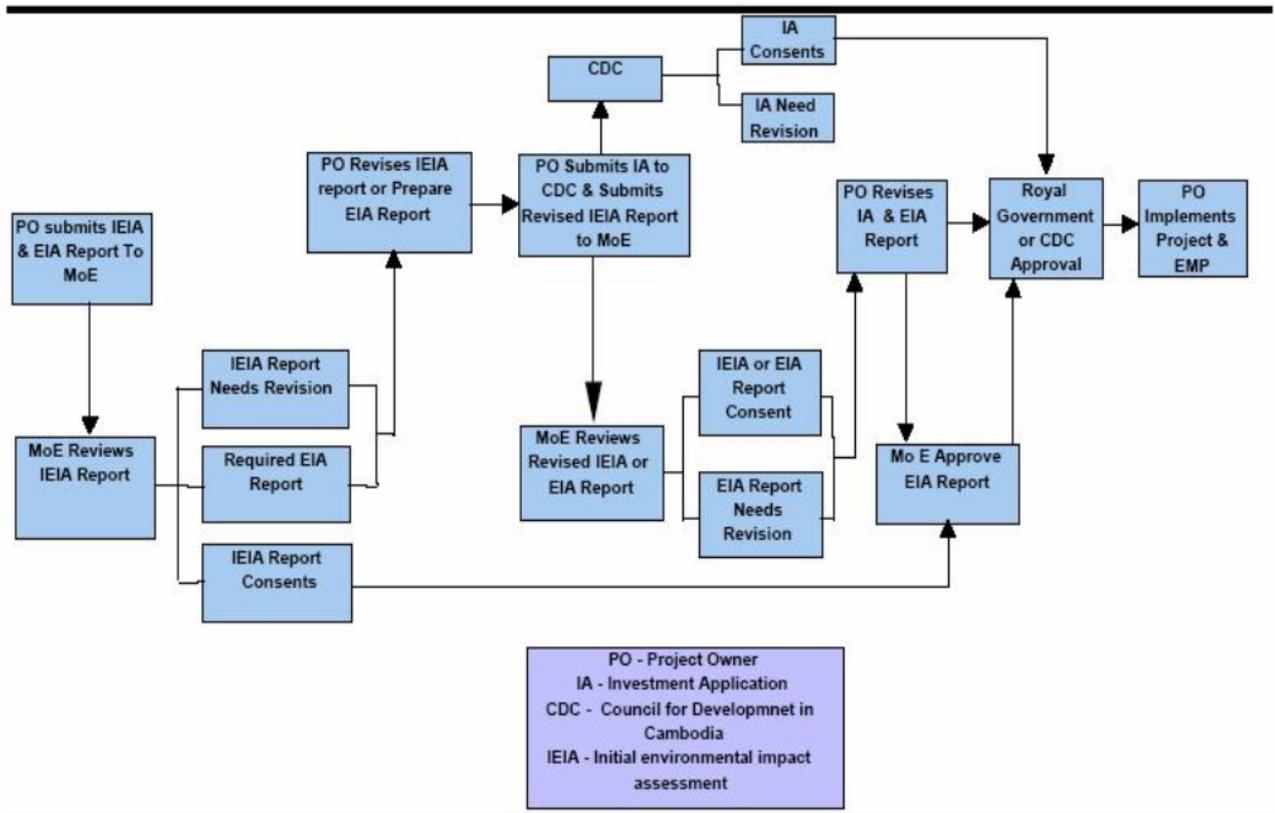


Figure 3: the EIA procedure in Cambodia

Source: (OpenDevelopment, 2014). Retrieved from

<https://opendevelopmentcambodia.net/topics/environmental-impact-assessments/>

Firstly, the PO must produce an EIA or IEIA report and submit them to the MoE. Then the MoE will go through the submitted report in detail. In addition, a copy of the report has to be sent to the related ministries for a review. After, the IEIA report will be reviewed by the MoE by providing feedback to PO and other project approval ministries/ institutions. This process will take 30 days (working day) starting from the day which the IEIA report is submitted or registered. At this stage, the IEIA report

needs to be reviewed or prepared EIA report and the IEIA report is consent. If the MoE is unable to find any mistakes that should be revised, which means the IEIA has already abided by all the requirements in the Sub-Decree No 72. Therefore, the IEIA is consented by the MoE. After that the PO or responsible person will have to prepare and submit a full EIA report to the MoE to get approval. It will then be given to the Royal Government or CDC to sign the report which is the final step. The PO or responsible person has to implement its development projects and environmental management plan (EMP) in accordance with all aspects commended and described in the EIA report. However, if the MoE finds any errors in the IEIA report, recommendations are provided by the MoE to PO. Therefore, the IEIA report needs to be revised and attached within the EIA prepared report. After that PO has submitted IA to CDC to be approved, the revised IEIA report must be submitted to the MoE. In this case the EIA and IA are relevant to each other because these two reports have to be approved by these two organizations (The development projects are not operated if CDC rejects their IA even though the IEIA or EIA is signed by the MoE). The MoE will have to revise the IEIA or EIA again by making sure that if the PO has already edited it regarding the previous recommendations. The IEIA or EIA is possibly consented or has to be revised a second time according to extra recommendations. It is then resubmitted to the MoE for approval. After that the RGC or CDC will sign the reports. Finally, the PO is able to implement the project in accordance with the EMP. The PO or responsible person must operate their development project within the procedure mentioned in the EIA report and must be aware of the findings and recommendations provided by the MoE.

Chapter Six

VI. The Discussion of Finding

1. The Data Collection results

This research focus on two official inspection reports of technical officers on the PAS and an EIA report provided by the Ministry of Cambodia. There were more documents requested, but the responsible officers had difficulty in obtaining the needed documents due to the private and internal reasons. Furthermore, they seem not to cooperate well by not replying and not having enough time to search for the requested data. However, the documents reviewed are significantly important to evaluate the implementation of both project owners and audit officers. The two inspection reports done by technical officers at the MoE of Cambodia were issued on March 20 and August 21, 2018 on the monitoring of environmental implementation by the Sihanoukville project. Therefore, these report will help to examine the result of PO and monitoring officers regarding their responsibilities on environmental protection. In addition, the EIA report on the port expansion will be beneficial to focus on more environmental components excluded in the report. These reports are useful and creditable because they were approved officially by the MoE.

2. The EIA Report Review on Port Enhancement Project

According to the EIA report re-edited on January 15, 2006, provided by the MoE on Sihanoukville Port enhancement related to the SEZ, there are some elements that should be considered and included into the report.

2.1 The Environmental components included in the EIA Report

The EIA report of the PAS development regarding the SEZ, some environmental impact components have included, such as under water impact, the impacts on coastal area, the impacts on plants, the impacts on landscape and tourism, air pollution, water pollution, land pollution, noise, vibration disturbance and smell disturbance and erosion.

2.2 Possible Environmental Components that Should Be Considered

Regarding the EIA report, there are possibly environmental impacts that should be revised and included in the report, namely sedimentation and erosion, dredging impacts, underwater noise pollution, and land reclamation, in order to prevent any adverse issues in advance on the marine environment. Therefore, this study will only be concerned with environmental parts which are needed to be discussed such as effects, mitigating measures and environmental compensations.

2.2.1 Sedimentation and Erosion

According to the existing EIA report, there were 50% of the total area covered by bushes which needed to be cleared. So, during the port construction, the surface area will be erased or washed away continuously. The explanation in the report does not mention what will be the issues resulting from erosion and does not provide enough support regarding the impacts. Adding to the existing description, the erosion will run off the top soil of the area into the coastal area where the project is taking place and it will then cause sedimentation. When excessive sedimentation occurs, the course of the water might have an impact on the marine environment, for example natural habitat loss, fishery resource decreased, recreational loss, nutrient unbalance, change in the water circulation, resulting coral reef pollution, turbidity arising, greenery decrease and coastal area changes (Sedimentation, 2019). For instance, the overload increase of sedimentation will impact marine habitats (mangroves, seagrass and corals) by killing them through suffocation. The sedimentation may cause turbidity resulting in higher water-temperature, slowly growth of vegetation in the water and decreasingly production of algae and macrophytes due to the lack of sunlight penetration; at the same time, fish productivity goes down due to the insufficiency of oxygen, fish eggs covered with tiny particles and fish gills soaking with sediment. Likewise, it may contribute to flooding because storm sewers and reservoirs are filled with sediments and may require dredging in case of too much sediment. The last but not least, eutrophic problems may occur from sediments containing a variety of noxious organic chemicals, heavy metals and nutrients when there is too much sediment present in the marine environment (UN Environment, 2014).

Furthermore, some natural phenomena including water currents, wave processing and sediment movement, may be seriously impacted by building the port, dockyard and seawall. The geography alongside the coastal region may probably be changed. This may happen within the coastal area where the current and waves hit strongly (EI-Asmar & White, 2002). According to Dean, Chen & Broder. (1997), the constructive erosion can arise because the long-shore drift is stopped by the embankment contributing to powerful smashes between waves and the sea edge.

To mitigate the erosion and sedimentation, in the case of the Shihanoukville Port, there are some measures that should be taken. Firstly, the development area should be cleared step by step where the project needs to develop construction buildings earlier avoiding widespread land clearing. Land clearing should be planned properly to prevent soil runoff during the rainy seasons and storm in the absence of bushes. Secondly, an upslope down wall should be constructed to prevent edge from collapsing when wave-storm are hitting or big natural stones should be placed along the shore to reduce wave hitting power. Thirdly, trucks used to load the dirt and any flyable materials should be covered to mitigate the dispersing amount. Fourthly, stockpiles of any construction materials should be stored and covered properly far beyond from the edge of water avoiding too heavy pressure on the edge, especially during the rainy season. The above methods are just primary ideas to decrease the level of erosion and sedimentation.

Moreover, building ports, harbours and breakwater requires extensive knowledge to recognize the possible negative impacts before developing the port because the coastal nature is very complicated and predation might be varied from actually natural phenomena. Some countries employed the Groynes to mitigate coastal erosion because it is able to partly block wave-storm towards the seashore. Another method is to refill sand regularly called sand nourishment (Hanson, et., 2002). It is commonly used by developed countries especially in Europe because it is known as an environmentally

friendly technique (Hamm, et al., 2002) and it contributes to coastal beauty and more space for recreations (ClimateChangePost, 2019). Hence, these methods have already been taken to deal with erosion and sedimentation issues, so the Sihaloukville Port should consider some of these techniques.

2.2.2 Dredging Impacts

According to the report, dredging impacts are not considered as an impact from the port development. The watercourse and harbour are needed to be constructed to accommodate ships. Dredging is a process of developing a coastal area to build the harbour and navigational ways by making them deeper to generate ways available for ships. The process of excavating of surface soil and disposing it in the vulnerable zone may result in negative issues on marine environment (Erftemeijer & Robin Lewis, 2006). Therefore, the impacts can be marine pollution, such as turbidity which leads to light penetrating issues for living organisms to be able to survive (Henley, et al., 2000). Fish navigational ways, seafloor ecosystem, habitat loss (seagrass, coral reef), sedimentation (Jayaprakash, et al., 2008) and dredging can contribute to coastal erosion (Wal & Pye, 2004). Furthermore, dredging operations have a significant impact on the marine environment are the dredging operation (digging away of substratum from sea bottom) and from the disposal process. The removal of materials can be delayed by substratum while dredging as, the materials are transferred to the top. Overfilling from channel boats or pipeline spillage also delay dredging operations (Erftemeijer & Levis, 2006; Jensen & Mogensen, 2000). Moreover, dredging may generate sedimentation and turbidity which affects the coral. Turbidity blocks sunlight which is very important for photosynthesis and sedimentation, where there is coral. This leads to difficulties for the nourishing apparatus beneath a sediment cover and active costs related to mucus production, sediment removal and weakened feeding. Suspended sediments, in particular powdery, reduce the quality and amount of light volumes, contributing to a decrease in photosynthetic productivity of zooxanthellae (Richmond, 1993; Falkowski et al., 1990; Erftemeijer et al, 2012). To reduce these impacts, the project has to study carefully the significant negative impacts which cause marine issues and to take action in advance. Hence, remote sensing should be

employed to estimate the differences in biodiversity and its size impacted over time because of dredging (Zainal et al., 2012). Regarding the impacts, the EIA report of Sihanoukville Port should cover the dredging as an important impact needed concern.

2.2.3 Underwater Noise Pollutions

Some activities are required, such as port building, breakwater, harbours and pile drilling and dredging during the port development. Due to the port enhancement, there are more vessels arriving and accommodated at the port during port operation. In both stages, either port construction or port operation, produce underwater noise pollution which is a potential impact on the marine environment. The pile drilling contributes to environmental issue of strong noise volume which disturbs fish and marine mammals (Bailey et al., 2010; Madsen et al., 2006; Wilhelmsson et al., 2006). The significant effect on marine mammals are auditory injury, change of behaviour, short term moving away and hearing issues (Southall et al., 2008). Marine species may be negatively impacted by anthropogenic sound relying on the levels of sound happening under water (Bailey et al., 2010). The behavioural change of marine mammals could happen up to 70 km far beyond the pile-drilling site. However, bottlenose dolphins and mink whales are exposed to the noise of pile drilling from 50 km and 40 km individually (Bailey et al., 2010). Underwater noise has a polluting impact on marine habitat as the marine fauna is vulnerable to the acoustic environment. Fish and mammals communicate by their sound to group cohesion and reproductive aggregation (Myrberg, 1997) and the artificial sound may disrupt and confuse their communication and cause unhealthy ecosystem (Slabekoorn et al., 2010). According to Weilgart. (2013), small fish may swim way from the noise or dive down into the seafloor. Fish eggs are potentially impacted by noise because they cannot move away from noise resulting in fatalities. Likewise, when the noise reaches up to 236dB, small fish might be killed. Therefore, during port construction, underwater noise should be also considered as a marine impact in the EIA report because there are 10 mammal species in Cambodian water (Beasley & Davidson, 2007) and underwater noise effects them within a distance of 70km.

Furthermore, underwater noise is a concern for scientists due to its impact on oceans (McDonald et., 2016) and it importantly arises from ship operation (Andrew et.,2011). Shipping noise has potential effect on the environment in coastal areas (Bittencourt et al., 2014). To deal with the noise issue at ports, ships have to speed down before docking and be equipped with electric motors to steer propellers to decrease noise. In addition, upgrading fuel efficiency is also useful in reducing noise (Jones, 2019). Regarding the Cambodian case, more ships are coming to the Sihanoukville Port and might produce louder noise which in turn will have an impact on marine life. Therefore, project developer should pay attention on how to mitigate noise pollution within the port area, especially underwater noise and it should be a concern in the EIA report.

2.2.4 Land Reclamation

Land reclamation is to address the need of new land for residing and developing to boost the economy in a country. Some countries have reclaimed land largely in coastal areas, such as the Netherland, the United Kingdom, Japan, South Korea and Singapore. The Nevertheless, such reclamation has frequently led to numerous environmental issues, namely biodiversity destruction, water pollution on coastlines and reduction of fishery resource (Wang et al., 2014). Hence, reclamation activities are now strictly controlled and rarely occur (Hoeksema, 2007; Suzuki, 2003). According to Brown et al. (2006), the globe's land mass is covered by coastline with just 5% and 40% of the people are settling there internationally and it is potentially useful for human well-being. Unfortunately, 66% of coastal areas is pressured by human development and climate change. Furthermore, land reclamation contributes to the decrease of coastal wetlands, the functional drop of coastal ecosystem and services, the loss of bird habitats, the fall in coastal disaster protection capacity and the damage of spawning and nursery of fishery (Wang et al., 2014). In case of port development in Cambodia, there are both outer water and inland reclamation in order to build more berths and infrastructure, including roads, railways and landfill. Figure 3 shows the land reclamation for the future container berths, rail terminal, commercial and administration zone and customs zone. Therefore, it impacts both marine lives and

inland creatures such as birds, vegetation, residents and land pollution. Therefore, the absence of land reclamation in the EIA report is needed to be reconsidered by project developers and responsible authorities.



Figure 4: Land reclamation for the Sihanoukville Port
 Source: Port Authority of Sihanoukville

	Future expansion for 10 container berths
	Future Railway terminal
	Commercial and administration zone
	Customs zone

The findings above just focus on the environmental part which some environmental impacts were missed in the EIA report of the PAS. Hence the EIA report should include these components in order to search for more mitigating measures.

3. The Inspection Results

According to the two reports issued on March 20 and August 21, 2018, in order to transform the port to be multiple purposes (Special Economic Zone), some port activities need to be developed, such as dock construction, dredging and port expansion. The technical officers included that these activities have not affected the marine and surrounded environment by only focussing on three main environmental issues including air quality, noise pollution and turbidity. The results of the inspection show that air quality is fine compared to the previous data. Moreover, noise pollution generated by project activities affects people residing around the port, but using modern equipment and machines can reduce noise pollution. Regarding this report, the responsible officers did not examine any impacts related to the marine environment, namely water quality caused by the dredging and port expansion and the disturbance to marine lives resulting from pollution. In addition, the inspection officers seem to completely depend on only the report of port operators by not doing their own experiment and monitoring. Therefore, the inspection activities were not implemented properly and professionally.

According to Sub-Decree 42 on the control of air pollution and noise disturbance of the MoE of Cambodia, there is a standard of air pollutants and noise levels to limit or measure whether the air is toxic or the noise is over the limit. Therefore, Table 1 shows the ambient air quality standard, while Table 2 illustrates the maximum standard of noise level allowable in the public and residential areas (dB(A)).

Table 1.

The standard of Air Quality limited by the MoE of Cambodia

No.	Parameter	1 Hour Average Mg/m ³	8 Hour Average Mg/m ³	24 Hour Average Mg/m ³	1year Average Mg/m ³
1	Carbon Monoxide (CO)	40	20		
2	Nitrogen Dioxide (NO ₂)	0.30		0.10	
3	Sulfur Dioxide (SO ₂)	0.50		0.30	0.10
4	Ozone (O ₃)	0.20			
5	Lead (Pb)			0.005	
6	Total Suspended Particulate (TSP)			0.33	0.10

According to Table 1, all emissions released into the atmosphere have to be under the standard issued by the MoE of Cambodia, otherwise the release is illegal and needed adjustment. Hence, based on the standard described in Table 1, inspection officers must verify the air pollution levels caused by the development project by taking samples in the project and nearby the project area. Therefore, technical officers are able to determine the air pollution levels compared to the standard rather than relying on port operators.

Table 2.

The standard of Noise Levels issued by the MoE of Cambodia regarding the areas

No.	Areas	Period of Times		
		From 6 AM to 6 PM	From 6PM to 10 PM	From 10PM to 6 AM
1	Quiet Areas - Libraries - Hospitals - Schools - Kindergarten	45	40	35
2	Residential Areas - Hotels - Administrative offices - Villas and flats	60	50	45
3	Commercial and Service areas and area of multiple businesses	70	65	50
4	Small industrial factories mingling in residential areas	75	70	50

Regarding Table 2, any noise levels which are not in accordance with the provided standard, are illicit. When the noise levels exceed the limited levels, it might disturb human and living organisms. The inspection officers should measure noise levels by using a noise monitoring tool which is employed to determine the surface noise arising from the running engines. This tool is significantly useful to detect the noise levels and

how seabirds are impacted when they are feeding in the area. According to the two inspection reports received, there is no evidence provided by the inspection officers on the noise levels resulted from project activities. Therefore, the reports are not completely believable because the reports are fully based on port operators.

To sum up, the two provided reports were not completely done professionally due to the insufficiency on proof to evaluate the port operations whether they cause environmental issues or not. Moreover, inspection officers should pay more attention environmental aspects, such as underwater noise pollution, sedimentation, erosion and marine habitat damages which are possibly impacted by the development project regarding the activities of dredging, berth building, port enhancement and port operation.

Chapter Seven

VII. Conclusion and Recommendations

1. Conclusion

The EIA report plays a significant role in uniting all development projects which tend to have serious environmental impacts. Development is done everywhere to meet people's needs and especially boost the national economy. The development certainly contributes to both environmental and social economic impacts in the area or nearby where the development project is taking place. Therefore, the EIA report is a contract to promise that the PO will have to make commitments on environmental protection by finding any possible mitigation measures for the purpose of elimination or mitigation adverse impacts to minimum. The research conducted aims at evaluating existing EIA report of the Sihanoukville Port in Cambodia. The findings will help to improve the sustainable development by learning from other developed countries in which they are well implemented. The findings of failure of the port implementation are key aspects to help improve implementation more effectively by reviewing any negative aspects and include more findings. The port development results in marine ecosystem depletion in which marine species and other factors are impacted, such as habitats and living organisms. In summary, the EIA report should detail all components that tend to be damaged before and during the project operations in order to prevent or reduce any impacts beforehand. This effort is not only to prevent environment pollution within the sustainability but also the project itself.

The EIA process is not much varied from one country to another due to its situation and the basic concept as a guideline to complete an EIA. Generally, there are some common stages practised, such as project screening, scoping, alternative considering, project describing, environmental baseline reviewing, significant evaluating and assessing, mitigating, public consulting and participating, EIS presenting, EIS reviewing, decision-making, post-decision monitoring and auditing. This process will sometimes have to be prepared for a period of time (project revision). Some stages have to be revised due to insufficient information or extra recommendations provided by technical officers after the inspection. Some projects have to be revised or amended

for the given period according to the contract or even earlier in case there are some serious issues that occurred due to the development project activities.

The EIA is bound the promise of PO towards the government in order to develop within sustainability in terms of minimum negative impacts on human beings and the environment. Therefore, EIA reports have to be reviewed by responsible organizations and approved before the projects start. There are four main purposes of conducting EIA reports, such as assisting the decision makers to consider the possible environmental components which should be included in reports. Furthermore, decision makers should evaluate whether the project should be allowed in that area or another project is replaced in order to balance between the benefits and losses. The second, it helps to form the development actions which will have to be implemented stated in the report. In addition, developers should be capable of knowing what should be revised related to environmental impacts and what kind of activities should be involved with the public in order to raise their voice within any concerns. The third purpose is that it should be a vehicle for stakeholders' consultation and participation because public participation is an activity in which local experiences and concerns toward the development project are shared. Hence, developers are able to know in advance avoiding the public complaints. The fourth purpose helps to develop within sustainability because the EIA focuses on intensive impacts which will happen. Therefore, developers should find mitigation measures in advance to cope with any adverse issues arising from the development. Likewise, a clear plan is crucial to prevent environmental damages.

According to the discussion, the EIA report on the Sihanoukville Port regarding the development of SEZ, there are still some environmental aspects that should be considered towards sustainable development. The suitability depends on all stakeholders involved; importantly responsible authorities who monitor or inspect the port operations based on the contract stated in the EIA report. Inspection officers should focus mainly on their responsibilities rather than relying on only the report of

the port operators. They should practice more professionally by providing proof or experiment in their inspection reports while making assumptions in relation to environmental pollutions arising from port activities. Moreover, the EIA reports have missed some potentially environmental impacts, such as sedimentation and erosion, dredging effects, underwater noise pollution and land reclamation impacts, which should be reconsidered and paid attention due to their vast damages on either the marine ecosystem or the inland environment.

2. Recommendations

Regarding the study on the EIA report of Sihanoukville development, there should be some components that should be dealt with to prevent or mitigate environmental impacts resulting from port activities with the purpose of environmentally friendly development within sustainability.

2.1 Specific Recommendations based on the findings

First of all, the Cambodian Government should get all the development projects, which have potential impacts on environment, to process all required activities. This taken action is showing that the project owners are willing to comply with Cambodian regulations and laws. Likewise, when project owners done all the actives, they acknowledge their responsibilities well on environmental protection and their donation to local communities which tend to impacts from the development projects. Therefore, the government can monitor what kind of projects operate in Cambodia.

Secondly, the procedure to conduct an EIA report in Cambodia is quite complicated because there are many steps to get the report approve. The ministry of environment of Cambodia should be the main organisation which is prioritized in terms of the report review and authorisation and other ministries and organizations should be involved with only recommendation procedure not the approval. Therefore, there are some steps eliminated and it is more easy for project owners to conduct an EIA report.

Thirdly, the EIA report of the PAS should focus on more environmental impact components such as dredging impacts, underwater noise pollution, sedimentation and erosion impacts and land reclamation because they are potential impacts on marine environment resulted from port development. Of course, the technical offers, who take responsible for port inspection in terms of environmental issues, should be trained more on how to do marine inspection. Moreover, they should provide evidences to their assumptions toward environmental impacts by not just relying on the port operators. Therefore, they should conduct official experiment before concluding.

Last but not the list, due to the Sihanoukville Port is an autonomous public port, it is challenging to implement legal measures to grapple the issues because the port project is a massive project which brings huge amounts of finances to support Cambodia's economy. In case; there are some environmental issues or crimes occurring and no action taken, the port is not temporally postponed or closed, otherwise it might affect Cambodian economic flows. Furthermore, there must be some power from the higher hierarchy, who should tackle corruption pressured on inspection officers when polluted issues or crimes are found. Therefore, the government itself, especially port director general should make high commitments to prevent marine environment pollution and appoint the right officers in charge of the right specialization. When environmental damages happen due to the carelessness of responsible officers, legal measure should apply on only those responsible officers and not the whole port. For doing so, the corruption might be reduced leading to environmental crime decrease, but still relying on the government's commitments.

2.2 General Recommendation to Protect and Preserve Environment

According to the findings above, the government should impose strict regulations to any development projects, which cause environmental pollution intentionally or unintentionally. In addition, the government officers should monitor or inspect suspicious pollution sources frequently. Likewise, they should follow up order letters in which technical offices inform about pollution sources. If they do not correct these

problems, the government should take legal actions to discuss with them. Furthermore, the government has to confirm that all industrial factories or any project developments must complete all legal requirements approved by the governmental administration before running their development activities. Last but not least, technical officers should be trained to enhance their capacities on how to monitor or take action against marine pollution arising from development projects.

The development projects, especially port expansion within coastal area, should employ advanced technologies in the process of port construction and operation to reduce any adverse marine damages caused by development activities. All relevant parties should establish joint venture to study in detail the process of the marine ecological system on how it reacts towards any disturbance from human activities such as noise pollution, polluted water, sedimentation, and turbidity. With regard to the reaction, some modelling tools should be conducted to predict the impacts in advance in order to respond or find mitigating measures to cope with environmental depletions. Therefore, all relevant marine components should be examined for the process of implementing modelling tools.

The PO or responsible person must abide by introduced national laws and regulations as well as international conventions which are related to the project characteristics. In this port development case, the nationally and internationally legal tools consist of all the above mentioned. Therefore, the PO should reflect on these legal tools before engaging in any activities which contribute to environmental damages. Any environmental issues or crimes resulting from development projects are the responsibility of person responsible.

Sihanoukville Port should have its own water treatment plant because the SEZ consists of many industrial factories which release huge amounts of wastewater and these amounts are over the capacity of the public treatment plant. Therefore, the wastewater must be treated before discharged into the public drainage system.

Even though, there are some measures used to mitigate or eliminate environmental impacts, still environment cannot be completely recovered. Hence, a compensation programme should be employed to offset the environmental loss from the port development. To compensate for the damages, regarding the Port of Tokyo, some projects have been conducted to conserve and generate new spots for nature. There are many parks created, namely Greenery at Tokyo Waterfront City, Wild Bird Park, Waterbirds Wintering at Kasai Marine Park, Kasai Maine Park, Sea Forest Project “Umi-no-Mori” and the restoration of coastal projects. The purpose of creating parks is to use them for sports ground, barbecues, natural observation, fishing and beach recreation which are beneficial for people living in Tokyo city. Further, they are useful for tourist attraction and obviously for environmental protection, such as bird ground habitats, marine creature nesting (sea turtles) and fish spawning areas. Therefore, the Cambodian government should consider some projects to compensate for the environmental damages learnt from the Japanese government or natural reserve area where there is no disturbance from human activities. Cambodia’s coastal area is available for mangrove forests, so there should be more and more mangroves planted and listed as conservation areas because they are such a natural compensation by creating new habitats for marine organisms, spawning areas, coastal protection from erosion and storm surge, oxygen source and as well as the main sources of food for people.

Finally, the government of Cambodia should place big stones as a seawall along the coastlines. This seawall is a strong defence to protect the sea bank from storm surges and strong waves, which result in coastal erosion and seashore collapse.

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