

# Implementation of the Port Safety, Health, and Environmental Management System at Bangkok and Laem Chabang Ports

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## Key Message

- Ports and harbors are crucial centers of economic activity in East Asia, providing the gateway to domestic, regional, and international markets.
- The safety of port facilities, port workers, and the surrounding communities, and the protection of the environment are interconnected and synergistic elements in the management and operation of today's ports. Ports have an ever-increasing responsibility locally and internationally with regard to policy, legal instruments, and standards covering maritime safety, protection of marine environment, and sustainable development.
- The Port Safety, Health, and Environmental Management System (PSHEMS) is a unique and effective management system

that integrates three international standards (International Standards Organization [ISO] 9001, ISO 14001, and Occupational Health and Safety Assessment Series [OHSAS] 18001) that contribute to sustainable port management. PSHEMS provides ports with procedures for improving operational safety, safeguarding workers and surrounding communities, and protecting the environment and port installations, while enhancing the efficiency and quality of services being provided to customers.

## Abstract

Port authorities and operators face a number of challenges with respect to the role and impact of ports in the sustainable development of coastal areas. The

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development and adoption of international safety, environment, and security standards by global bodies have emphasized that an effective management system must not only encompass operational activities, but also establish quality, safety, health, and environmental objectives and procedures into each process. To achieve sustainability of port operations, authorities and stakeholders should be able to: (a) manage the port's growth and development effectively; (b) ensure safety and promote the health and welfare of workers; and (c) adhere to globally recognized environmental quality standards. To do so systematically, port authorities have to establish a system of governance that specifically addresses these concerns.

The implementation of PSHEMS, an integrated management system, in Bangkok and Laem Chabang Ports, Thailand, has proven to be an

effective approach in ensuring health and safety of port workers, reducing environmental impacts of port operation, and enhancing the port's business performance.

This case study discusses how PSHEMS was implemented in the ports of Bangkok and Laem Chabang, the outcomes, and the lessons learned from PSHEMS implementation.

## Background

### PSHEMS

The PSHEM Code (PEMSEA, 2012; Box 1) provides port authorities and operators with guidance that enables them to establish and implement PSHEMS and assess and improve their operational

#### Box 1. PSHEM Code.

The PSHEM Code is aimed at providing port authorities and companies operating within the port, whose activities may have an effect on the health and safety of people, environment, cargo, and port installation, with a voluntary standard against which to measure the performance of their operations with regard to quality, safety, health and the protection of the environment. The PSHEM Code is structured using the Continual Improvement Process.



procedures that are consistent with relevant and applicable international and national regulations, guidelines, and standards. The development and implementation of PSHEMS results in the improvement of the port's performance, including continual improvement of port operations with respect to safety, health, and environment protection, as well as quality and productivity performance over time. The PSHEMS further ensures compliance with mandatory national rules, regulations, and standards, as well as any applicable international conventions, codes, guidelines, recommendations, and standards, whether of international organizations or nongovernment port industry associations, where relevant and appropriate.

The essential components of PSHEMS cover the ISO 9001 standard on Quality Management Systems (QMS) and the ISO 14001 standard on Environmental Management Systems (EMS) as well as the OHSAS 18001 standard on Occupational Health and Safety Management Systems.

### **Bangkok Port**

Bangkok Port is one of the five main ports in Thailand. It is located on the east side of the Chao Phraya River in Klong Toey District, Bangkok, and is under the jurisdiction of the Port Authority of Thailand (PAT). Bangkok Port is a river port, positioned as Thailand's second largest port with a throughput of 1.6 million twenty-foot equivalent (TEU) in 2015. It has a total land area (within the customs fence) of about 145.36 ha. Bangkok Port offers cargo services to promote and facilitate international transportation. The services of Bangkok Port include container storage and inbound cargo service, outbound container freight station service, open stuffing area, empty container yard service, reefer container service, and a coastal and barge terminal.

In March 1991, an explosion caused by an unidentified chemical occurred in the dangerous cargo warehouse of Bangkok Port. The accident caused loss of life, cargo, property, and damage to the environment. Total damage was estimated at US\$ 8 million (Poopetch, 2014). The fire started in a warehouse for hazardous substances that spread rapidly via several large explosions. The incident prompted the PAT to step up its efforts towards improving its safety, health, and environment (SHE) governance. In March 2005, PEMSEA introduced PSHEMS to the PAT, who in turn decided to implement PSHEMS in Bangkok Port. PAT recognized that PSHEMS is an integrated management system designed to provide port authorities or individual port operators with a management framework for enhancing efficiency, cost-effectiveness, and profit for their operations.

### **Laem Chabang Port**

Laem Chabang Port is Thailand's main deep-sea port, covering an area of 1,041 ha. Located on the eastern part of Thailand, Laem Chabang Port is an international port that serves as a trade gateway for the rest of Thailand and Indochina.

Since its inaugural operation in January 1991, Laem Chabang Port has grown to become Thailand's most important seaport, servicing 70% of the country's sea transport volume (Apai and Thammapreddee, 2014). It offers universal services for the global exchange of goods, with several multipurpose terminals for containers, roll on/roll off (RO/RO), passengers, general cargo, and shipyard.

However, since the port's construction, which involved dredging, land reclamation, and construction of a breakwater, shore erosion and sedimentation have impacted on properties and users in the coastal area. It also faced a number of challenges with regard to SHE in the port. In

addition, coastal users and communities in the area raised issues such as:

- air pollution, increasing accidents, and economic losses due to trucks transiting all roads connecting to the port;
- increasing volume of solid and hazardous wastes generated by the port's operations and poor waste management practices within the port;
- the perceived high risk due to the sheer volume of inbound and outbound dangerous goods cargo being handled each year (more than one million tons); and
- concern over the potential for targeted terrorism, involving, for example, destruction of property, port disruption, and environmental damage to the area.

Following the successful application of PSHEMS in Bangkok Port, PAT implemented the same management system in Laem Chabang Port in 2008, with support from PEMSEA.

## Approach and Methodology

Bangkok and Laem Chabang Ports successfully implemented PSHEMS through the following key steps:

- 1. Define scope of PSHEMS.** One of the first steps in developing PSHEMS was to define the scope of the management system. For example, the initial scope of PSHEMS development and implementation in Bangkok Port was limited to dangerous goods handling since this is one of the core processes in port operations with the highest threat on SHE. Bangkok Port also took into consideration the availability of resources, manpower and time constraints in determining the scope of PSHEMS. Later on, with the initial progress achieved in dangerous goods handling, the scope was broadened to include all other services in the organization.

The implementation of PSHEMS in Laem Chabang Port started with the management system of the port authority, focusing on port governance since it oversees the port area as well as the terminal operations conducted by private port operators.

- 2. Set up a representative PSHEMS Working Group.**

To be able to effectively control and monitor PSHEMS development and implementation activities (Box 1), Administrative Committees were established, headed by the Managing Directors of Bangkok Port and Laem Chabang Port. To support the committees, working teams composed of representatives from all concerned units in the ports were established. The working teams were subdivided into three groups: operational, equipment handling, and administrative. Each group was assigned to review specific processes in order to determine their alignment with the PSHEM Code requirements. Bangkok Port also provided a working area for PSHEMS-related activities. Apart from the working teams, internal audit teams were also established and trained. The audit team was responsible for monitoring, controlling, and improving PSHEMS.

- 3. Build capacity at all levels.** Several training were provided by PEMSEA to the personnel of Bangkok and Laem Chabang Ports to enhance their understanding on the essential elements of PSHEMS and equip them with the methodologies for the development and implementation of PSHEMS (Box 2). The first training was on Applicable International Regulations Concerning Port Operation and PSHEMS Design and Implementation. It aimed to enhance understanding on and to facilitate identification of international and national regulations relating to SHE. Subsequent workshops were conducted to guide the local teams through the different phases of PSHEMS development and implementation including the requirements for certification. In addition to increasing the awareness of the project team on relevant regulations, practical exercises

### Box 2. PSHEMS development.

A series of training on PSHEMS were conducted by PEMSEA and participated in by relevant departments of the port authority and operators. The training courses included:

- **Phase 1:** Understanding PSHEMS and Initial Status Review
- **Phase 2:** PSHEMS Strategic Planning
- **Phase 3:** System Development and Documentation
- **Phase 4:** Implementing and Monitoring
- **Phase 5:** PSHEMS Internal Auditing
- **Phase 6:** Continual Improvement of PSHEMS

enhanced their auditing skills and enabled them to assess the strengths and weaknesses in port operations and to identify areas for improvement.

#### 4. Assess compliance with existing legal obligations.

The initial status review of the port management system required the port authority or operator to assess the existing management system of the port, including its compliance with legal requirements and international practice. For example, the safe handling and transport of dangerous goods in Bangkok and Laem Chabang Ports were assessed in relation to the International Maritime Dangerous Goods Code and Recommendations on the Safe Transport of Dangerous Cargoes and Related Activities in Port Areas. The specific provisions of these two international instruments were reviewed, and applicable provisions to both ports were identified. Action plans were then developed in the respective ports to address gaps in the implementation of relevant and applicable provisions of these instruments specifically those relating to SHE aspects.

5. **Identify health and safety hazards and environmental risks.** As part of the initial status review, health issues concerning employees, safety hazards, and environmental risks were identified for each process area. With the implementation of PSHEMS, the ports were able to create one system

that helped to effectively and efficiently deliver their improvement programs on employees' health, monitoring safety risks and hazards, reducing inefficiencies, and maximizing resources. It allowed the port to identify SHE risks and hazards, and implement and monitor improvement programs in a coherent manner to achieve its objectives.

6. **Document and monitor the implementation of PSHEMS.** The development of the management system and documentation of the PSHEMS manual were challenging tasks since they covered the requirements of three management systems – ISO 9001, ISO 14001, and OHSAS 18001 standards. However, even if these systems differ in their approach and degree of prescription, the three standards are compatible in content, terminology, and many of the requirements.

## Results

The implementation of PSHEMS in Bangkok and Laem Chabang Ports showed significant impacts with regard to reduction of accidents in the port areas, improvements in environmental performance and increased port productivity (UWE, 2009; PAT, 2010; ASEAN-GTZ, 2011). These are demonstrated in the following examples:

### Bangkok Port

**Improved traffic management capability.** Traffic management was considered a priority concern for the port. Its solution would greatly enhance the management of SHE concerns. With the support of the German International Cooperation (GIZ) under the Sustainable Port Development in the ASEAN Region Project, the port undertook a rapid transport assessment to study the existing traffic situation of Bangkok Port, prepared a streamlined emission inventory, and formulated a work program for the development and implementation of a Port Traffic Management (PTM) Plan at the beginning of 2011.

Short-term measures that were implemented included the introduction of traffic control policies and procedures at the gatehouse, the appointment of a PTM officer who cooperated with the Highway Authority to address offsite issues, and the introduction of a safety guidebook. Medium-term measures included the introduction of a port park and ride scheme on a voluntary basis and the establishment of key routes as clearways. Long-term measures included the study for Bangkok Port's Land Use Master Plan and the program for the increased use of rail for the movement of goods within the port area. All in all, these measures yielded significant benefits and improved the traffic management capability of Bangkok Port, resulting in faster turnaround time for equipment and the reduction of vehicle volume inside the port (ASEAN-GTZ, 2011).

**Reduction of DG-related incidents.** Several measures were undertaken to prevent accidents in the dangerous goods area. These included the strict regulation of access to the warehouse area by cargo trucks, which were required to park in a designated area and only enter when the dispatch process was already completed. In addition, a safety sign was posted at the entrance showing the number of accidents that occurred in the dangerous good warehouse resulting in increased awareness for safety

in handling and improved compliance with control procedures.

In terms of capacity building, the Dangerous Goods Training Course was revised based on the prescribed course developed by GIZ. In particular, a dramatic reduction in the number of incidents/accidents related to handling occurred and the zero incidents/accidents were achieved (Poopetch, 2014).

**Improvements in the overall physical environment.** With the implementation of PSHEMS, Bangkok Port exhibited notable improvements in its physical environment, as shown in Box 3.

### Laem Chabang Port

**Improved waste management regulations and procedures.** In 2011, Laem Chabang Port, in cooperation with GIZ for the implementation of the Sustainable Port Development in the ASEAN Region, improved the management of waste generated on board ships and cargo residues, and avoided daily illegal operational spillages and discharges. The immediate outputs of the project were the development and implementation of the

#### Box 3. Bangkok Port activities.

##### Access area in front of the West Main.



BEFORE



AFTER

Port Regulations on Waste Management and the Port Waste Management Manual.

**Reduction of greenhouse gases.** In 2010, Laem Chabang Port initiated a Green Port Program to address its carbon monoxide (CO) emissions. The port decided to set up a Wind Farm Power Pilot Project to increase the proportion of green energy to the port's total electricity consumption. Eighty-four units of 18-m high wind turbines designed especially for the port were installed during the first phase of the project. The combined power generation capacity of all 84 units was around 840 kW/hr. The system is expected to generate electricity at an average of 2.5 million kW/yr, which will decrease CO emissions into the atmosphere by about 1.4 million tons per year.

**Reduced carbon emissions.** The new policy of Laem Chabang Port, under the Green Port Program, required that all new rubber-tired gantry (RTG) installations be electric-powered. Some private terminal operators, (e.g., LCB Container Terminal 1 Ltd.), started to modify their heavy-duty handling equipment (e.g., RTG crane) from diesel fuel to electrical power. The modification of 20 RTGs was expected to reduce CO emissions by about 1.80 tons/year.

In addition, since March 2009, Hutchison Laem Chabang Terminal Co., Ltd. installed 12 units of electric RTGs in container terminals C1 and C2. Laem Chabang Port will likewise apply more electric supply for ships berthing at the quay wall.

**Natural resources conservation and preservation of mangroves.** Situated in a coastal area of a Laem Chabang village, the port has a natural mangrove forest covering an area of about 4.5 ha. To preserve its diversity, Laem Chabang Port, together with Laem Chabang Municipality and Kasetsart University (Sriracha campus), entered into a Memorandum of Understanding in the latter part of 2008 to collectively undertake activities to preserve and rehabilitate the mangrove forest.

The Natural Resources Preservation Program encouraged people to participate in many activities, such as collecting garbage, surveying types and density of mangrove stands, replanting of the destroyed areas of the forest, monitoring seawater quality, etc. Moreover, academic activities conducted around the port enhanced knowledge on environment and natural resource preservation for the local communities and school and university students. The forest within the port area is used as a recreation site for the general public. The port has likewise undertaken activities related to natural resource rehabilitation, such as planting trees within and around the port.

## Lessons Learned

Most of the lessons learned by the PAT with regard to the experiences of Bangkok Port and Laem Chabang Port in the development and implementation of PSHEMS are **management imperatives that can be applied in other ports and port authorities and operators** in the East Asian region.

Key lessons learned include:

- **Securing support from top management** and port authority was key to sustainability of PSHEMS. Top management provides not just resources but also the overall direction and strategy that would guide the whole organization.
- A working group and **working teams composed of representatives from all concerned units** ensured that the development and implementation of PSHEMS were relevant, well-planned, and supported across the entire operation.
- With the limited available resources at the start of the PSHEMS Project, the scope of work was **focused on a small manageable area** (e.g., the handling of dangerous cargoes in the case of Bangkok Port). This proved to be a good strategy not only in giving the port personnel experience in developing and implementing a new system cost-effectively, but also in addressing an area of the operation with greatest risk to SHE.

- Although time-consuming, **proper and adequate training** was essential in order to improve the competency of personnel tasked to develop and implement PSHEMS.
- **Internal audit and management review processes** were necessary for the system to **remain effective and be continually improved**, including adapting policies and procedures to applicable new or amended national and international regulations, and revising existing rules and regulations accordingly.
- The **exchange of knowledge and experience** in SHE with other ports, port authorities and port operators, local governments, and universities was a mutually beneficial way to improve port governance.

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