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Life cycle assessment of high pressure-cooked smoked milkfish production: A case study in semarang, indonesia

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Abstract

This research aims to assess and measure the environmental impacts of high pressurecooked smoked milkfish (HPCSM) production. Although the literature about measuring the environmental impact is abundant, research about this topic implemented in a HPCSM production remains limited. The assessment was performed using the life cycle assessment (LCA), which is considered as a holistic assessment since it regards the entire life cycle of products from cradle to grave. To make a contribution, the LCA was supplemented with the eco-efficiency index to assess the affordability and sustainability status of the business. To exhibit the methods, a case study has been carried out in Semarang, Indonesia, where the centre of HPCSM production is located. Forty enterprises (thirty-one small-, eight medium-, and one large-scale) were assessed. Results showed that the production process has several environmental impacts, such as climate change, photochemical oxidant formation, acidification, fine dust, eutrophication, ecotoxicity (fresh water), human toxicity, metals depletion, waste, and water stress indicator. In addition, the analysis of eco-efficiency index revealed that all type

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Life Cycle Assessment of High Pressure-Cooked Smoked Milkfish Production: A Case Study in Semarang, Indonesia

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Abstract

This research aims to assess and measure the environmental impacts of high pressure-cooked smoked milkfish (HPCSM) production. Although the literature about measuring the environmental impact is abundant, research about this topic implemented in a HPCSM production remains limited. The assessment was performed using the life cycle assessment (LCA), which is considered as a holistic assessment since it regards the entire life cycle of products from cradle to grave. To make a contribution, the LCA was supplemented with the eco-efficiency index to assess the affordability and sustainability status of the business. To exhibit the methods, a case study has been carried out in Semarang, Indonesia, where the centre of HPCSM production is located. Forty enterprises (thirty-one small-, eight medium-, and one large-scale) were assessed. Results showed that the production process has several environmental impacts, such as climate change, photochemical oxidant formation, acidification, fine dust, eutrophication, ecotoxicity (fresh water), human toxicity, metals depletion, waste, and water stress indicator. In addition, the analysis of eco-efficiency index revealed that all type of products is considered as affordable but not sustainable. The recommendations for the improvement to minimize the environmental impacts and the sustainability status of the enterprises are also provided.

Keywords: Eco-efficiency index; Life cycle assessment; Water scarcity; High pressure-cooked smoked milkfish.

1. Introduction

Life cycle assessment (LCA) is a measurement method which quantifies numerous environmental impacts related to the whole life cycle (i.e., from cradle to grave) of particular products, processes, or activities (Finnveden *et al.,* 2009). Especially in manufacturing and construction, LCA has been broadly applied; for example, in iron and steel industries (Olmez *et al.,* 2016; Ma *et al.,* 2018; Rossi *et al.,* 2017), in building analysis (Fay *et al.,* 2000; Ramesh *et al.,* 2020), and food productions (Andersson *et al.,* 1998; Cederberg and Stadig, 2003; Beauchemin *et al.,* 2020). However, to the best of our knowledge, there is limited—or even no—study analysing the environmental impacts using LCA in high pressure-cooked smoked milkfish (HPCSM) production.

Milkfish *(Chanos chanos)*, which is the sole living species in the Chanidae family (Nelson, 2006), is a big toothless silver fish which exists in warm parts of the Indian and Pacific oceans. The species is called "bandeng" in Bahasa. It has many bones that makes it difficult to eat. As the technology and demand of more nutritional consumption are increasing, processing milkfish with high pressure cooker is made. This makes the bones of the fish get softened so that it is easier to be consumed—it is usually called soft-boned or boneless milkfish, or "bandeng presto" in Bahasa Indonesia—while the nutritional value is not being affected and decreased.

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Challenges to the Green Marine Economy in China: Case Study of Qianhe Environmental Terminal's Bankruptcy

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Abstract

The expansion of the world fleet has increased consequently discharge of oily sewage and garbage, which has become a threat to the marine ecology environment. Qianhe Terminal for Oily Wastewater and Garbage (Qianhe) was the first professional terminal to receive and dispose of oily sewage and garbage from ships in Ningbo-Zhoushan Port which was the largest port in the world. However, this terminal bankrupted after only two years of operation. In this study, the Interpretative Structural Model (ISM) is used to investigate why the bankruptcy of Qianhe happened as it was and find out the causes from different perspectives. The ISM-based model analyzed the interrelationships among those causes and their positions in the structural hierarchy from high- to low-level. The contributions provide lessons learning from the bankruptcy for ecology environment economy and offer managerial insight for the port policy.

Keywords: Port environment; Interpretative Structural Model (ISM); Bankruptcy; Policy

1. Introduction

With the development of the world economy, trade and global influence is expanding rapidly. China is the world's largest country in goods trade since 2001. Among the top 10 world ports, 7 ports are in China. However, the increasing number of the ship brought an increase in illegal discharge of garbage and sewage from ships, which threatened the marine ecology environment in China. According to the international conventions, oily sewage and garbage should be received and treated in the ports. Therefore, the ports must build an oil sewage and ship garbage receiving facilities, which contributes to the development of the green environmental protection industry.

Ningbo-Zhoushan Port is the largest port in the world. In 2019, this port handled 1.12 billion tons of cargo and welcomed more than 3500 ships each day on average. The vast ship traffic has brought a considerable demand for receiving the garbage and sewage from the ships. That's why Qianhe Environmental Protection Terminal was built. Qianhe is the first comprehensive environmental protection terminal in China to dispose of abandoned oil-polluted water and ship garbage. However, the terminal was in operation for only two years and was shut down by June 2020. This was a shocking event in the green marine industry of China. It would be a valuable issue arousing our concerns.

Nowadays, whether a port is good or not depends not only on its economic condition but also on its ecological environment. Good and well-planned environmental practices contribute to enhancing the competitive position of ports (Wakeman, 2009). Because of the complexity of the port-construction, the analysis of the ecological and environmental protection system of the port must be carried out from several levels (Bekovnik and Bajec, 2015):

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Marine Oil Spills: Implications on Response Plan

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Abstract

Understanding oil spill detection, modelling is critical in formulating oil spill response to minimize the catastrophic environmental impact due to oil spill. This paper provides the key research results for oil spill response from various published literatures over few decades which are based on case studies, laboratory tests, field visits and modelling work. This paper presents an overview and summary of literature reviews on offshore oil spills, fate of spilled oil, response plans and cleanup methods. A brief discussion on the technological advancements in identifying oil spills and oil spill modelling is presented. Discussions on the response methods include recent advances in spill response plans and cleanup methods. The synthesis of published literatures from various previous work on understanding and mitigation strategies of oil spill disaster would immensely contribute scientific knowledge to deal with the future oil spill.

Keywords: Oil spill; Response plan; Cleanup; Environment

1. Introduction

Huge demands for crude oil in recent times have increased offshore exploration and production activities around the world. Exploration and Production (E&P) activities, as well as oil transportation, carry the risk of the oil spill in the marine environment. The marine oil spill has a catastrophic impact on marine ecology, coastal ecosystems, and human health (Jafarinejad, 2017). With the advancement of technology in recent times and the implementation of technological changes like improvements in ship hulls and navigation systems have reduced marine spill cases in many folds (Chang *et al.,* 2014). Although there has been much more advancement in transportation technology and safety measures, still oil transportation continues to be a highly risky activity. Last decade, there have been 62 spills of different sizes resulting in 164,000 tons of oil lost (ITOPF, 2019). This review paper deals with the offshore oil spill, fate of the oil, which could be useful in developing effective response plans. This discussion would help create new strategies to solve the complexity of oil spill events. Many researchers have studied the various aspects of oil spill, new technologies and advancements in response plan, which are being discussed here for better insight.

2. Major oil spills around the world

Marine oil spills can be in the form of few barrels to thousands of barrels. The volume of oil spills is not a measure of the severity of the damage. The geographical location of the discharge and sensitivity of the nearby shore is also crucial. A map showing some of the prominent oil spills around the world in figure 1. Ecological impact related to some of the significant oil spills are presented in table 1.