



The Potential of Strategic Environmental Assessment to Address The Challenges of Climate Change to Reduce The Risks of Disasters: A Case Study From Semarang, Indonesia

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Abstract

Indonesia as an archipelagic country is likely to suffer severely from the impacts of climate change since most of its major cities are located in coastal zones. Semarang, a heavily populated coastal city in Central Java Province, is vulnerable to the impacts of climate change as it already experiences disastrous flooding and tidal inundation annually, with devastating impacts on the community. Globally, changes in climate patterns are considered to be primarily responsible for sea level rise. The implementation of Strategic Environmental Assessment (SEA) in Indonesia, which is at an early stage, provides a framework for assessing and managing environmental risks. SEA may contribute to the integration of climate change considerations into policies, plans and programmes, which is useful to support Disaster Risk Reduction (DRR). However, there are some challenges in incorporating climate change into SEA which include capacity building, funding, data problems, integration of SEA into regional planning documents and communication. Some efforts, such as providing training for the local SEA team, expanding the membership of this team by including universities and/ or NGOs to enhance the SEA process and engaging the Bureau of Statistics and the Meteorological Agency to support data collecting are some proposed solutions to integrate climate change into SEA in Indonesia in order to improve disaster risk management.

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1. Introduction

Indonesia, as an archipelago and a developing country, is highly vulnerable to the impacts of climate change since most of its major cities are located in the coastal areas. Semarang, one of the most heavily populated coastal cities, is facing threats from sea level rise. This and other impacts from climate change will increase in the future and will severely affect human safety and health. The current laws that address the impacts of natural disasters are inadequate because they have not successfully integrated all environmental factors, particularly those related to climate change. Therefore, long-term policy addressing the impacts of climate change on government planning is needed.

This paper aims to analyse the challenges of mainstreaming climate change consideration using SEA in Indonesia, particularly for Semarang, in order to improve that region's Disaster Risk Reduction (DRR) strategies. The research will mainly be conducted by reviewing secondary data, including journal articles, research reports, books and other academic sources on SEA, DRR and climate change mitigation and adaptation.

The IPCC (Inter Governmental Panel on Climate Change) has observed that there is evidence of the warming of the climate system such as increases in temperatures, snow and ice melting and sea level rise. It is predicted that for the next two decades there will be a rise of about 0.2oC in global temperature per decade (IPCC, 2007). The rising of global temperature will also cause changes in precipitation, sea levels and the frequency and severity of extreme events (IPCC, 2007). These changes in the climate system will affect all systems and sectors in the world, particularly ecosystems, food production, industry and settlements, society, human health and safety and water availability. In Asia in particular, the impacts will include a decrease in the availability of freshwater especially in large river basins, increased flooding from both rivers and the sea, an increase in problems of natural resource and environmental management and increasing morbidity and mortality numbers (IPCC, 2007).

The poverty rate in Indonesia, as shown in the BPS-Statistics Indonesia's (Badan Pusat Statistic) data (13.33 per cent in 2010) (BPS, 2010), shows the low resilience of some parts of the community in adapting to the impacts of climate change, especially increased frequency of extreme weather events which will likely increase natural hazard occurrence such as floods, droughts and landslides. These are among the most important impacts of climate change that have to be faced by Indonesia and especially by the low resilience community. Therefore, to avoid the poor's burden particularly due to disaster, Disaster Risk Reduction (DRR) must be considered in development planning.

2. Potential Impacts on Semarang

Semarang, the capital of Central Java Province, is a heavily populated city (density 4,032 people/ km² in 2009) located on the coast of the Java Sea (BPS Kota Semarang, 2009) (Figure 1). However, the topography of this city also comprises hilly areas besides lowland areas. The lowland part makes up approximately 34 per cent of the city's land area, with an elevation of 5 meters above sea level (asl) or below, while the highest elevation of the hilly part is 348 meters asl (Sutanta *et al.*, 2012).

The lowlying part of Semarang is the city centre, and is the main settlement, industrial and government offices area. All the transportation system centres (airport, train and bus station) and the main road connecting the west and east parts of Java are also located along this lowland area. Therefore, the most significant effect of climate change that has to be considered for this area is sea level rise.

Semarang experiences several types of natural hazards (Table 1) including earthquakes, flooding, landslides, land subsidence, sea level rise and typhoons (Sutanta, 2002; Marfai, 2007; Kuehn *et al.*, 2010, Abidin *et al.*, 2010 cited in Sutanta *et al.*, 2012).

Table 1. List of Natural Hazards Experienced by Semarang

Types of hazards	Severity	Affected Area	Remark
Earthquake	Low-medium	Wide	Unpredictable
Typhoon	Medium	Wide	Unpredictable
Landslide	High	Small	Partially predictable
Flooding	Medium-high	Wide	Partially predictable
Sea level rise	Low	Local	Predictable

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