

Direct and indirect impacts of flood and climate change adaptation in Indonesia: AIM/CGE
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Abstract

(i) Research purposes

Geographically, Indonesia is a prone country to disaster and climate change. According to the statistical data of the Indonesian National Board for Disaster Management, about 23 thousand times of disasters occurred in Indonesia from 1815 to 2018. Flood is the most frequently occurred disaster in Indonesia (about 9 thousand times). Flood in Indonesia is a complex issue that requires the comprehensive and continuous efforts from both state and non-state actors in Indonesia. In other hands, climate change (without any efforts) will increase the disaster risk and affect the long-term economic development goals in Indonesia. In recent years, the Indonesian government is strengthening the climate change adaptation through numerous efforts such as the 2016 NDCs and the update of 2014 RAN-API (National Adaptation Plan). Disaster risk reduction and climate change adaptation are interlinked particularly on reducing vulnerability and increasing the resilience of the key development sectors in Indonesia.

Against this background, this study tries to link two main recent issues in Indonesia (disaster risk reduction and climate change adaptation) into one single analysis. This study analyzes the economic impacts of three selected floods and the current climate change adaptation measures applied for flood risk reduction in Indonesia using AIM/CGE model. As the best knowledge of the authors, this study is considered as “pioneer” for the Indonesian case both in terms of methodology and policy analysis. The findings of the study can provide the overall picture (characteristics) of flood and its economic impacts within an economic system of Indonesia. It can also provide insights for policy makers and other related stakeholders in Indonesia on the effectiveness of the current climate change adaptation measures for flood risk reduction in Indonesia.

(ii) Methods

This study employs the computable general equilibrium (AIM/CGE) model to analyze the direct and indirect impacts of flood in Indonesia. Although this study uses the static CGE model, it can capture the total economic impacts of floods and climate change adaptation measures within the economic system of Indonesia. The AIM/CGE model used in this study is the country model of Indonesia. The analysis is conducted using two simulation scenarios: (i) SIM 1: considering flood damages without adaptation; and (ii) SIM 2: considering flood damages with adaptation.

(iii) Description of data

This study uses three main following data: (i) 2010 Indonesian IO table published by the Bureau of Statistics of Indonesia (called BPS in Bahasa); (ii) damages and losses data of the 2007 Jakarta flood, the 2010 West Papua flood, and the 2014 North Sulawesi flood based on the reports published by the Indonesian national board for disaster management (BNPB) and the national development planning (BAPPENAS); (iii) the annual budget of the Indonesian government spent for adaptation measures for flood risk reduction.

The 2010 Indonesian IO table is originally available at 185 sectors to represent the economic flows of Indonesia. The original 2010 Indonesian IO table is disaggregated to cover more specifically for electricity and energy sectors in Indonesia. It then is grouped to meet the analytical needs of the study. As a result, the 2010 Indonesian IO table at 46 sectors classification is used as the main input data of the AIM/CGE model. This study used a static CGE model without considering the future changes of the socio-economic situation (such as population, economic growth) that might affect the future economic impacts of flood in Indonesia.

The damages and losses data of three selected flood cases are based on the reports published by two main agencies responsible for disaster management (the Indonesian national board for disaster management or called as BNPB in Bahasa) and development planning (called as BAPPENAS in Bahasa). The damages and losses data are in monetary values, which are consistent with both the IO and CGE models. The damages and losses data then are translated as shocks of existing capital and labor.

The annual budget of the Indonesian government spent on the hard measure of flood risk reduction is used in the simulation scenario parts. This study focuses only on the budget spent on the hard adaptation measures for flood risk reduction under the Ministry of Public Works of Indonesia.

(ii) Findings

The expected findings of this study are three folds. First is the economic losses (GDP, employment, and welfare) caused by floods in Indonesia at national and at sectoral levels. Second is patterns of economic losses (both direct and spillover) of each selected flood in Indonesia. Third is the effectiveness (impacts) of the current climate change adaptation measures applied for flood risk reduction in Indonesia.

Keywords: flood, climate change adaptation, Indonesia, AIM/CGE