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## Shipping network design in a growth market: The case of Indonesia

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## ABSTRACT

This paper investigates the design issues of a shipping network when cargo demand increases rapidly. A gravity-type model for origin-destination (OD) demand estimation is first presented and calibrated based on the current cargo volumes of the Indonesian maritime market. A model for maximizing total social welfare is then proposed to design the shipping network with cargo demand levels forecasted for future years. The results show that for the Indonesian maritime market, a hub-and-spoke network with fully connected hub ports is better than a network with sequentially connected hub ports in terms of total social welfare. The optimal choices for the international gateway and domestic hub ports vary as cargo demand increases over time. The results suggest that a progressive policy can be promising for infrastructure investments in developing countries: government planning and regulations may be introduced in early years to enhance infrastructure utilization and economic return. With increased demand the market may be liberalized to promote healthy competition.

## 1. Introduction

The Republic of Indonesia, which consists of approximately 17,500 islands, is an archipelago country in Southeast Asia. According to BPS Statistics Indonesia<sup>1</sup> (2015), Indonesia is divided into 34 administrative provinces over five main islands and four archipelagos. The country shares land borders with Malaysia, East Timor and Papua New Guinea, and marine boundaries with Singapore, Philippines and Australia. As the world's largest archipelago country, marine shipping is a major transportation mode for Indonesia. The Indonesian president, Joko Widodo, has declared twice that he wants to transform the country into a strong maritime nation, confirming the nation's policy priority of developing the maritime sector.

However, Indonesia is still relying on neighboring countries for the distribution and logistics services of international trades. Currently, 90% of Indonesian international cargoes are transshipped through hub ports in Singapore or Malaysia (Bahagia et al., 2015). In order to develop its own international gateway ports and to achieve the vision of an economically strong maritime nation, the Indonesian government has initiated several maritime programs. One program, called Pendulum Nusantara, was proposed by the state corporation PELINDO 2 in 2012. This program plans to develop six main hub ports connected with regular shipping services, as depicted in Fig. 1 (Lino, 2012). The Pendulum Nusantara program also includes the Sorong-West Pacific Hub Port Development Project, which aims to develop the Port of Sorong into an international gateway in the West Pacific, connecting East Asia to Oceania, as shown in Fig. 2. The implementation, which started in January 2016, is expected to be finished by 2018 (Desfika, 2016). The

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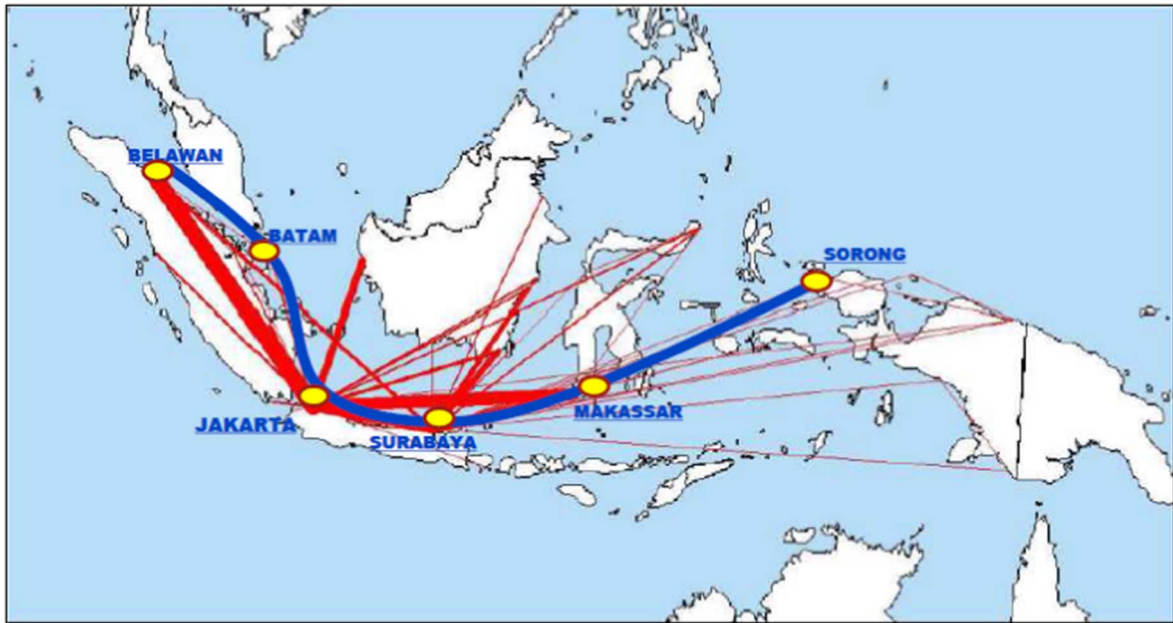


Fig. 1. Proposed main routes for "Pendulum Nusantara".

Source: Indonesian Ministry of National Development Planning, 2014.



Fig. 2. Sorong-West Pacific hub port development project.

Source: Indonesian Ministry of National Development Planning, 2014.

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