

Identifying Environmentally-important Shipping Routes and Ports in the Global Supply-chain Network

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CO₂ emissions from transportation sector account for 27% of global CO₂ emissions in 2019. In particular, maritime transportation sector accounts for 2% of the global CO₂ emissions in that year. Thus, it is crucial to reduce CO₂ emissions in this sector for achieving future climate goals. With a rapid increase in demand for maritime transport services through the development of global supply-chain networks, the International Maritime Organization (IMO) has noted that CO₂ emissions will continue to grow due to expanding supply-chain networks. Based on the Sea-web Movements Database provided by the IHS Markit Ltd, this study focuses on 8881 container ships owned by shipping companies in 2020 that play an important role in international trade. We estimated energy consumptions of a specific container ship that moves between ports and calculated the energy-related CO₂ emissions for a specific shipping route by totalizing CO₂ emissions from the movement of container ships. We visualize the CO₂ emissions network for more than 44 million shipping routes and identify environmentally-important routes and ports by using network centrality analysis and cluster analysis. The results show that Pasir Panjang (Singapore) and Tokyo (Japan) were identified as key ports in the global supply chains network. Thus, we suggest that effective CO₂ mitigation policies with a focus on the key ports and relevant shipping routes are necessary.