An Estimation of the Economic Direct Loss Caused by Blockade of International Straits and Canals on Global Trade and Economy

Yasuhiro AKAKURA[1] and Kenji ONO[2]
[1] National Institute for Land and Infrastructure Management, MLIT
& Graduate School of Management, Kyoto University
[2] Graduate School of Management, Kyoto University
Email: akakura-y83ab@mlit.go.jp

Abstract

The highly frequent, stable and inexpensive maritime transportation has contributed great progress of economic globalization. The international specialization, which is the subdivision of manufacturing process and the overseas transfer of some process, has developed, and the trade volume of intermediate goods has increased greatly. However, the advanced global supply-chain represented by the Just-in-Time system has been much vulnerable against a disruption of transport. Moreover, world shipping operations concentrate at major straits and canals, which are called chokepoints. Therefore, a blockade of any one of these chokepoints will result in the devastating impact on the global trade and economy.

This study estimates the economic direct loss caused by the blockade of chokepoints: the Strait of Malacca and Hormuz, and the Suez and Panama Canal. First, ship passages through these chokepoints are identified by the ship movement data, which are tracked by AIS (Automated Identification System) signals. Then, through cargo volumes and values are estimated from the shipping capacities. It is noted that proportions of cargo volumes and values through these chokepoints to the global maritime trade volume have increased. The total cargo value passing Straits of Malacca amounts to US$ 3 trillion, which accounts for 18% of global trade.

In addition, the past natural and man-made disasters, which had the possibility to cause the blockade, are collected to prepare various loss scenarios. At the early stage of a blockade, the relevant transport will temporally stop due to the maelstrom of traffic and, many cargoes will probably shift to the air transportation. When the blockade continues, the shipping lines will seek detour routes, for which some additional navigation cost and time will be incurred. Functions of the ports next to the chokepoint will be temporally paralyzed. The direct economic loss is calculated by considering these various additional costs. The scale of the loss may reach huge amount, if the US$ 7 billion direct loss of the 2014/15 US West Coast case is referred.

Until now, it is hard to say that the importance of chokepoints is recognized sufficiently. Except for some studies in particular straits and for limited cargo commodities, there seems no previous studies that challenged to quantification of an impact of blockade on global maritime trade. The significance of this study is tackling to identify possible risks latent in these chokepoints and urging need to build resilient global-supply chain system against various disasters.

Keywords

Global Supply-Chain, Maritime Trade, Chokepoint, Container, Bulk Cargo

MEETING FORMAT*

*Select an option (X).

	Regular Poster Presentation
	Young Scientist Poster Presentation
X	Regular Oral Presentation
	Young Scientist Oral Presentation
	Symposia
	Roundtable

AREAS*

Natural hazards		Seismic
		Flooding
		Subsidence
		Hurricanes
		Landslides
		Volcanic eruption
		Wildfire
Technological and manmade hazards		Chemical and petrochemical industry
		Nuclear industry
		New and emergent technologies
	X	Transportation
		Natech
		Critical infrastructures
		Cyber attacks
		Terrorism
Complex hazard interactions and systemic risks		Climate change and its impact
		Natech
		Epidemics / pandemics
		Critical infrastructures

TOPICS*

*Select an option (X)

Learning from experience		Organizations, territories and experience feedback
		Expertise and knowledge management
		Weak signals
		Early warning systems
Social and human sciences for risk and disaster management		Human, organizational and societal factors
		Risk perception, communication and governance
		Systemic approaches
		Risk and safety culture
		Resilience, vulnerability and sustainability: concepts and applications
		History and learning from major accidents and disasters
		Territorial and geographical approaches to major accidents and disasters
		Social and behavioral aspects

Cross-disciplinary challenges for integrated disaster risk management		Compound/cascading disasters (simultaneous and/or co-located) and Mega-disasters
		Connecting observed data and disaster risk management decision-making
		Practical applications of Integrated Disaster Risk Management
		Development and disasters
		Build Back Better (than Before)
		Disaster-driven innovation and transformation
		STGs and disaster governance
Complex systems		Complexity Modeling
		System of Systems / Distributed Systems
		Critical Infrastructures
		Probabilistic Networks
Economics and Insurance	X	Disaster impacts and economic loss estimation
		Cost-benefit approaches
		Insurance and reinsurance
Decision, risk and uncertainty		Decision aiding and decision analysis.
		Disaster risk communication
		Ethics.
		Gender
		Responsibility
		Governance, citizen participation and deliberation
		Community engagement and communication
		Scientific evidence-based decision-making, modelling and analytics
		Policy analysis
		Uncertainty and ambiguity
		Multi-criteria decision aid and analysis
		Operational research
Artificial intelligence, big data and text data mining		Disaster informatics, big data, etc.
		Deep learning
		Neural networks
		Experts systems
		Text data mining

Engineering Models		Numerical modelling & functional numerical modeling Formal models / formal proofs
		Model-based approach
		Safe and resilient design and management.

Legislation, standardization and implementation		Certification and standardization.
		Regulation and legislation.
		Legal issues (scientific expertise, liability, etc.).
		Precautionary principle and risk control and mitigation.

SIGNIFICANCE TO THE FIELD*

*Select an option (X)

	Demonstrates current theory or practice
	Employs established methods to a new question
	Presents new data
X	Presents new analysis
	Presents a new model
	Groundbreaking
	Assesses developments in the field, in one or more countries
	Other (Please specify)

EXPECTED CONTRIBUTIONS*

*Select an option (X)

	Theoretical
X	Applied
	Theoretical and Applied
	Review
	Perspective
	Other (Please specify, e.g. success/failure practices, lessons learned, and other implementation evidence)