



## Topics

- Transport safety
- Maritime security
- Environmental management

# MARITIME INSIGHT

## C.Y. Tung International Centre for Maritime Studies

Maritime Education | Research | Consultancy

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Preface

## ***One step back, two steps forward***

*Now especially, the maritime industry needs to sail its way under the direction of both industrial players' interests and public concerns. The truth is that the two aspects could be combined so that industrial players are potentially gaining more from pursuing solutions which consider public concerns. Port safety, maritime security and environmental issues are increasingly appearing as both public concerns and corporate social responsibilities. Maritime related environmental management and safety control will contribute to sustainable international trade and the global supply chain. The ICMS MARITIME INSIGHT in June endeavours to summarise new efforts that are being done and to bring forward topics for further discussions in academic research.*

## **When transport safety succeeds, shipping efficiency flourishes.**

**How far are we going in regards to safety, at the port, on board and abroad? Does improving safety make sense and does it make a difference to shipping efficiency? Human behaviour may have the final say.**

*Port safety and maritime security have been attracting increasing public concerns. A recent example of such a case was the accident which happened at Genoa port causing 7 deaths, 2 missing after the Ship slammed into the dock, toppling the control tower into the harbour. Once again, passionate discussions about port safety would continue.*

*As is obvious that the oceans and sea yield vast revenues each year and are economically indispensable for those who live in the maritime zones. However, they could also be the source of dangers threatening the security of international trade and the global supply chain. Dangers in international shipping and maritime range from piracy violence (Wong and Yip, 2012), to port disruption on supply chains (Lam and Yip, 2012), and port traffic risks (Yip, 2008). More in depth research into the effects of national culture on human failures in container shipping empirically was examined by Lu et al. (2012). This set of articles reflects the contemporary maritime security problems which are consistent with three main maritime security activities, namely, port security, vessel security and marine security (Source: Wikipedia).*



In a way different from previous analyses which have ignored near-miss attacks, Wong and Yip (2012) attempted to consider maritime piracy within the framework of safety with 'piracy attacks' being viewed as unwanted events like other maritime accidents and then to quantify aspects of the success or failure of maritime piracy. Binary models were used to quantify how piracy characteristics

and behaviour determine the rate of success and degree of violence of piracy attacks. Three major approaches of pirate attacks were identified based on empirical data. Pirates committing low-level violence prefer to take items that allow them to get in and out quickly, these pirates are generally not well organized or well trained. Pirates committing major violence are well-armed and organised with automatic weapons to target the people, the cargo and the vessel when the vessels are steaming. A multi-layer defence strategy against pirates of different levels is recommended.

**P**ORT disruption to supply chains is maritime piracy to international shipping. Any disruptions happening at a port may have a great impact on the effective and efficient management of flows of cargo in the supply chain. There are not much literatures talking about port

disruptions and risk management. Lam and Yip (2012) argued that any possible port disruption, such as equipment breakdown, electrical outages and industrial accidents, could all result in a collapse of the whole supply chain system. Gurning and Cahoon (2011) analysed multiple mitigation strategies for managing maritime disruptions in the wheat supply chain. But the authors did not specifically study how disruption affects the various stages and parties in a supply chain. Lam and Yip (2012) applied the Petri Net in analysing the impact of port disruption on supply chains and the parties involved, in a way which can better accommodate complex systems compared to Markov Chain used by Gurning and Cahoon (2011). The approach could also estimate the impact of the recent labour strike at container terminals in Hong Kong.

#### **Petri Net Method**

The concept of Petri Net is originally developed by Carl Adam Petri (1962) as a general purpose mathematical tool for the study of communication with automata. Petri Net method is characterised by its ability to model and visualise the properties of complex systems such as process synchronisation, asynchronous events, concurrent operations and conflicts or resource sharing (Zurawski and Zhou, 1994).

To enhance port efficiency as well as security whilst reducing port accidents, Yip

#### **The Pattern of Hong Kong Port Traffic Risk**

(2008) investigated port traffic risk issues by discussing historic accidents in the Hong Kong port. Search findings identified factors that can contribute to reducing the security level of port accidents. The port of registration, vessel types and the accident type are critical to the number of injuries and fatalities. It was found that port traffic risks follow certain pattern. **Collision accidents mostly happen when port traffic is heavy. Passenger-type vessels have higher potential for injuries during accidents.**

**T**he endeavours to ensure transport safety and maritime security may have a nexus with human behaviour not only at seaports but also on board. The emergency of multinational

crews drawn from different countries working on the same ship has important implications for safety in international safe ship operations. Based on five dimensions of national culture construct, Lu et al. (2012) evaluated seafarers' perception of the five dimensions, power distance, collectivism/individualism, uncertainty avoidance, masculinity/femininity and Confucian dynamism, each of which seems to be related to a different degree of human failures in ship operations. For example, low power distance might be good for work safety. With this understanding, effective action plans could be developed to reduce human failure in vessel management.

## **Worth waiting for? The global rise of maritime related environmental awareness**

**Today, what really matters in the Shipping Industry? Ports, Vessels and Containers are candidates. The best answer may be: the shipping activities related environmental management.**

*In support of the continued world trade and international shipping activities, practices and concerns against environmental issues are increasingly embraced by shipping industries. As were massively and extensively discussed during the fifth International Forum on Shipping, Ports and Airports (IFSPA) held in 2012 in Hong Kong, topics about sustainable growth and development, sustainable supply chain management and sustainable performance in international ports, green shipping practices and environmental efficiency of ports accounted for a large proportion of the papers published in the conference proceedings (Yip et al. 2012). On the one hand, the good news is that over the past few years, we've seen the increasing awareness of the environmental side of shipping activities. On the other hand, measures for evaluating environmental management performance in the shipping industry, such as green shipping practices, did not exist when searching literature before 2010. Measurements are yet to be developed, implemented and empirically examined. This set of articles was selected by ICMS in order to offer some measuring and management implications, focusing on topics ranging from the conceptualisation of green shipping practices (Lai et al. 2011), to an evaluation of green shipping networks to minimise external costs in the Pearl River Delta region (Lun et al. 2012), to measures for evaluating green shipping practices implementation (Lai and Lun 2013), and to regional cooperation and management of port pollution (Homsombat et al. 2013).*



(Photography: Fang Zhang, 2013)

**T**he green shipping practices (GSPs) were initially brought about and defined as a conception by Lai et al. (2011) of the Shipping Research Centre (SRC), The Hong Kong Polytechnic University. GSPs are environmental management practices undertaken by shipping firms with an emphasis on waste reduction and resource conservation in handling and distribution. There are potential gains from pursuing environmental protection by improving shipping activities proposed by Lai et al. (2011). A.P. Moller-Maersk Group (Maersk) was taken as a case to illustrate six dimensions of GSPs and this can help to conceptualise GSPs. A set of testable propositions was developed to examine the antecedents and consequences of adopting GSPs from the institutional theoretic perspective.

**Take Green to Shipping Practices**

***Six dimensions of GSPs and four propositions of adopting GSPs***

Six dimensions of GSPs	<ul style="list-style-type: none"> <li>(1) Company policy and procedure</li> <li>(2) Shipping Documentation</li> <li>(3) Shipping equipment</li> <li>(4) Shipper cooperation</li> <li>(5) Shipping materials</li> <li>(6) Shipping design and compliance</li> </ul>
Four propositions of adopting GSPs	<ul style="list-style-type: none"> <li>(1) When shipping firms encounter strongly enforced regulatory environmental requirements</li> <li>(2) When shipping firms exposed to industrial institutionalized norms on environmental protection</li> <li>(3) When shipping firms facing strong environmental request from customers</li> </ul> <p>Shipping firms will attain both environmental and productivity performance gains</p> <p style="text-align: right;">(Source: Lai et al. 2011)</p>

As a further step and endeavour to evaluate the environmental damage caused by shipping-related activities, Lun et al. (2013) of SRC, evaluated the external cost incurred from barge and containership usage in the Pearl River Delta (PRD) region and, based on this external cost, determine the environmental damage caused by container shipping activities in the region. Ports in the region were classified into feeder ports, direct ports, and hub ports as a result of applying the external cost approach. Policy makers could track the findings with helpful guidance on ways to strengthen the

**METHODOLOGY:** Using the external cost of containerships and barges to evaluate and analyse the environmental impact caused by container traffic in the PRD region, adopting the “benefit transfer” approach to estimate the external costs for different transport modes based on the data provided by the European Commission to estimate the benefits of developing green shipping hubs in the PRD regions.

**Four key container ports** in the PRD region are the ports of Hong Kong (HK), Yantian (YT), Chiwan (CW), and Shekou (SK).

(Source: Lun, Lai and Cheng 2013)

logistics capability of the PRD region while reducing the environmental harm from shipping activities. The reduction in external cost represents reduced socio-environmental damage caused by container shipping activities. Since the external cost of barges was much lower than that of containerships, the findings suggested that the overall external cost in the PRD region could be reduced by using barges to tranship containers from feeder ports to hub ports. By choosing the shortest equivalent containership distance and hence the lowest external cost of transport,

three green shipping networks were identified.

***Three green shipping networks identified by the study***

For Asia-Europe trade originating from Yantian, use the route via Hong Kong to Europe destinations,

For Trans-Pacific trade to the west coast of the USA originating from Shekou and Chiwan, an alternative to this route is to transship containers via Hong Kong,

For Trans-Pacific trade to the east coast of the USA originating from Hong Kong, Shekou and Chiwan, results suggest developing a green shipping hub in Yantian to handle containers to the east coast of the USA.

(Source: Lun, Lai and Cheng, 2013)

**D**ESPITE the need for environmental management in shipping, there is no existing measurement scale that comprehensively captures green shipping practices in shipping operations according to Lai et al. (2013a). In view of this, the authors investigated the construct of and developed a measurement scale for evaluating GSP implementation in the shipping industry. Based on conceptualisation of GSP in an earlier study and survey data collected from 107 shipping firms, a six-dimensional GSP measurement scale was developed, refined, and tested specifically for evaluating GSP implementation in the sea transportation context. The implementation of GSP was evaluated by first-and second-order levels and validated by confirmatory factor analysis (CFA).

**Measures for evaluating green shipping practices implementation**

**FINDINGS:** Assessed the construct of GSP implementation by providing a validated 30-item measurement scale for the practical use of shipping firms to evaluate the different facets of environment-based shipping practices. The empirical results suggest that all the 30 measurement items are critical attributes of the six underlying factors of GSP implementation. The validated GSP construct and the measurement scale provide assessment tools for shipping firms to assess and identify deficiencies in their GSP implementation that call for improvement actions. Shipping firms can use the evaluation results obtained from using the tools to plan their assessment, reporting, and monitoring mechanisms for GSP implementation.

(Source: Lai et al. 2013a)

To investigate how green practices on shipping design for compliance (SDC) is related to shipping firms' financial and service performance, how company policy and procedure as well as shipper cooperation differentiates the performance outcomes of shipping firms in their SDC for environmental management, interested readers could refer to the latest study regarding green shipping practices by Lai et al. (2013b).

**The aforementioned green practices are particularly aiming at the shipping firms, while greening marine environment would not progress without efforts from ports managers.**

**T**he prevention of air emissions from shipping is the most controversial topic in the maritime society due to its contribution to reducing greenhouse gas emissions. Reducing emissions from ships in port may greatly and immediately benefit local residents in the port environment. Homsombat et al. (2013) studied the regional administration of ports and examined the managerial and policy implications of a pollution tax for port environmental protection and social welfare improvement. The spillover effects of air emissions from one port to another have been incorporated into their spatial game models, which assume that there are a number of symmetric shipping lines at the two ports in the framework of Cournot competition. The decision variable is the local emission taxation to trade-off port production against local and regional ship emissions. The impact of a pollution tax on the spillover effects is investigated. Effective regional cooperation of pollution taxation is found to greatly reduce shipping emissions at ports.

**In conclusion, this collection of papers have addressed contemporary maritime issues such as port safety and the environment management whilst considering the implications to the involved multi-parties. It is expected that more research around these topics will be conducted in the future.**

**Remarks***Maritime security*

According to Wikipedia, maritime security was concerned with the prevention of intentional damage through sabotage, subversion, or terrorism. Maritime security is one of the three basic roles of the United States Coast Guard has gradually developed in response to a series of catastrophic events, which began in 1917.

(Source: Wikipedia)

*Marine safety*

The Coast Guard performs its marine safety mission by conducting marine inspection, marine investigation, waterways management, port safety, and merchant mariner credentialing activities. The marine safety mission is the largest mission performed by Prevention Departments at U.S. Coast Guard Sectors. U.S. Coast Guard personnel that contribute to the marine safety program at field units are eligible to earn the Marine Safety Insignia.

(Source: Wikipedia)

*Port disruption*

Port disruption is an event that causes a sudden interruption on material or product flow in a supply chain, leading to a halt in movement of cargoes.

(Source: Wilson, 2007)

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