Research Assessment Exercise 2020
Impact Case Study

University: The Hong Kong Polytechnic University
Unit of Assessment (UoA): BUSINESS (22)

Title of case study: Maritime Safety

(1) Summary of the impact

This case study concerns research in the field of maritime safety management in busy ports. The unit developed statistical models to identify factors contributing to maritime accidents and conducted detailed analysis of accident records and literature reviews. As a result, the research has enhanced understanding of maritime safety and informed six consultancy projects within Hong Kong since 2016 that involved international engineering firms. The research has led to a maritime traffic impact assessment approach being adopted by engineering consultancy firms as the first Technical Guidance to enhance maritime safety, acting as a framework to observe the reduction of maritime accidents.

(2) Underpinning research

The research ran from 2005 to 2019 and was conducted primarily by Professor Chin-Shan Lu, Dr Tsz Leung Yip, Dr Meifeng Luo and Dr Dong Yang, supported by PhD student SH Shin (2013–2016). All projects were conducted mainly at the Hong Kong Polytechnic University, involving the three research centres in the Department of Logistics and Maritime Studies, namely CY Tung International Centre for Maritime Studies, IMC-Frank Tsao Maritime Library and R&D Centre, and Shipping Research Centre.

The researchers aimed to assess the factors contributing to various maritime accidents and conducted detailed analysis of accident records and literature reviews. Such analysis enabled the documentation of the principal mechanisms of maritime accidents. The researchers first determined the contributing factors in maritime accidents in port [1], quantified the effectiveness of the double-hull design of tankers [2], discovered the issues underlying ship fuel spills [3] and confirmed the contribution of crew training to passenger safety on board passenger ships [4]. Dr Luo and his student conducted a survey to propose various research directions for maritime safety [5]. Human factors were considered in the safety problems of container terminals [6]. More general statistical models were developed for maritime safety analysis.

The researchers have pursued local interest and impact regarding issues of marine safety policy and management, raised social awareness of maritime safety and contributed to the safety of marine traffic in deprived communities through knowledge dissemination. These research findings formed the foundation of the Technical Guidance and then directly fed into recommendations for the consultancy projects on maritime traffic assessment. The Technical Guidance is regarded as the first technical framework to enhance marine traffic safety in Hong Kong.

Through the consultancy projects, improving safety measures within the community enhanced maritime safety. The research team was particularly interested in putting the application of the research to the consideration of the government. Members of the team have served as members of the Port Operations Committee and the Marine Department, and one has been a co-opted member of Hong Kong Maritime and Port Board.

(3) References to the research

Journal Articles:

[1] Yip, T. L. (2008). Port traffic risks – A study of accidents in Hong Kong waters. *Transportation Research Part E, 44*(5), 921–931. doi:10.1016/j.tre.2006.09.002. IF: 4.253 (leading journal in field); Citations (web of science): 66.

[2] Yip, T. L., Talley, W. K., & Jin, D. (2011). The effectiveness of double hulls in reducing vessel-accident oil spillage. *Marine Pollution Bulletin, 62*(11), 2427–2432. doi:10.1016/j.marpolbul.2011.08.026. IF: 3.782; Citations: 32.

[3] Talley, W. K., Yip, T. L., & Jin, D. (2012). Determinants of vessel-accident bunker spills. *Transportation Research Part D, 17*(8), 605–609. doi:10.1016/j.trd.2012.07.005. IF: 4.051; Citations: 7.

[4] Yip, T. L., Jin, D., & Talley, W. K. (2015). Determinants of injuries in passenger vessel accidents. *Accident Analysis and Prevention, 82*, 112–117. doi:10.1016/j.aap.2015.05.025. IF: 3.058; Citations: 13.

[5] Luo, M., & Shin, S. H. (2016). Half-century research developments in maritime accidents: Future directions. *Accident Analysis & Prevention, 123*, 448–460. doi:10.1016/j.aap.2016.04.010. IF: 3.058; Citations: 9.

[6] Lu, C. S., & Kuo, S. Y. (2016). The effect of job stress on self-reported safety behaviour in container terminal operations: The moderating role of emotional intelligence. *Transportation Research Part F: Traffic Psychology and Behaviour, 37*, 10–26. doi:10.1016/j.trf.2015.12.008. IF: 2.360; Citations: 4.

(4) Details of the impact

The major findings from the research were the principal mechanisms of maritime accidents. The research team have raised the awareness of maritime safety and enhanced the process of maritime traffic impact assessment (MTIA). As a result, the team have been invited to share their latest research findings in engineering consultancy firms. The key findings have led not only to greater awareness of maritime safety measures but also to enhanced maritime safety practices and policies. Dr Yip and his colleagues have developed the Technical Guidance for MTIA.

4.1 Formulating a consistent maritime traffic impact assessment

As a response to the two most serious maritime accidents (2008, 2012) in Hong Kong history, the Marine Department requires an MTIA for any proposed works on Hong Kong waters to assess the anticipated maritime traffic implications of carrying out works and to devise appropriate traffic management measures to control the impacts. When [redacted], was working on a consultancy project related to marine works, its management realised the need for technical guidance via an MTIA for its analysis and sponsored Dr Yip to develop a 'Technical Guidance' based on their research, especially that related to Hong Kong port [1]. The Technical Guidance has been successfully '*adopted [for] various engineering and planning studies*' in Hong Kong and is being used as a reference for assessing maritime traffic impacts and operational improvements [ref. a].

Dr Yip advised the temporary maritime traffic management on the dredging works for Kwai Tsing Container Terminals and the approach channel, which was the largest area of dredging works in Hong Kong in the presence of congested maritime traffic [ref. b], while [redacted] is a leading traffic consultancy in Hong Kong. The dredging work was completed in 2018 without serious maritime accidents.

4.2 Contribution to consultancy projects

Dr Yip was commissioned to provide technical support on six consultancy projects, totalling HKD 1,417,000 [ref. c]. These consultancy projects ranged from a local major development to international key infrastructure. The clients included local government departments and world-class developers. The tasks covered initial design and construction monitoring. The research team ensured marine traffic safety was considered early in each project as evidence of the adoption of research findings.

In each consultancy project, the team supported leading consultancy firms and provided solutions to marine traffic issues, including marine safety and temporary marine traffic management for infrastructure design, construction and monitoring. The research team brought the latest results and knowledge to advance the techniques and technology related to marine traffic safety [ref. d]. As commissioned by [redacted], Dr Yip assessed the fire accidents on container vessels because fires onboard at port are among the greatest hazards for container terminals [ref. e]. BMT Asia Pacific appointed Dr Yip to articulate a solution that minimises canal excavation while ensuring adequate canal capacity and safety for the Nicaragua Canal design, which allowed more and larger ships to cross the Pacific and Atlantic Oceans.

The consultancy projects, carried out in collaboration with the research team, highlighted consistency with data gathered on historic accidents. Another key insight to emerge pertained to a link between accident frequency and maritime traffic, providing further detailed analysis of a range of maritime operations and facilitating the assessment of maritime safety [ref. a, b, e].

4.3 Engagement in government policies and regulations

Team members have also been appointed to the government consultation committees in recognition of their expertise in maritime safety. Dr Yip has been appointed as a member of the Port Operations Committee [ref. f], which advises the Director of Marine on all matters affecting the efficient operations of the Port of Hong Kong. Through his ongoing membership, Dr Yip has helped address the technological and operational dimensions of maritime traffic in the port of Hong Kong. To safely manage a port, the government needs to be able to assess all risk factors. Thus, this membership provides evidence of how Dr Yip's research has influenced a public organisation's work.

4.4 Raising the awareness of the general public

The team have contributed to raising awareness. Professor Lu published a key article on maritime safety [ref. g] in the *South China Morning Post*, the leading English-language newspaper in Hong Kong. The article was one of the first to document the rising influence of public awareness on maritime safety and influence policy. The team engaged with Hong Kong communities, including shipowners, ship operators, ship managers and the general public, to increase awareness and continuously enhance maritime safety.

(5) Sources to corroborate the impact

(a) Reference letter from [redacted]
(b) Reference letter from [redacted]
(c) Partial list of [redacted]
(d) Figure – Maritime accidents in Hong Kong waters 2009–2018

(e) Reference letter from [redacted]
(f) Appointment letter as a member of the Port Operations Committee from the Marine Department
(g) Safety first: Building a 'safety climate' is key to avoiding marine accidents. *South China Morning Post*, 21 April 2017.