

Green Ports and Shipping in Asia

Simon K W NG

Head of Transport and Sustainability Research

Civic Exchange

Presentation at 7th UNCRD EST Forum, Bali, Indonesia | 23 April 2013

Plenary Session 5: Green Freight Issues – A Framework for a Regional Agreement on Green Freight in Asia



The costs of port and ship emissions

Exhaust emissions from ships

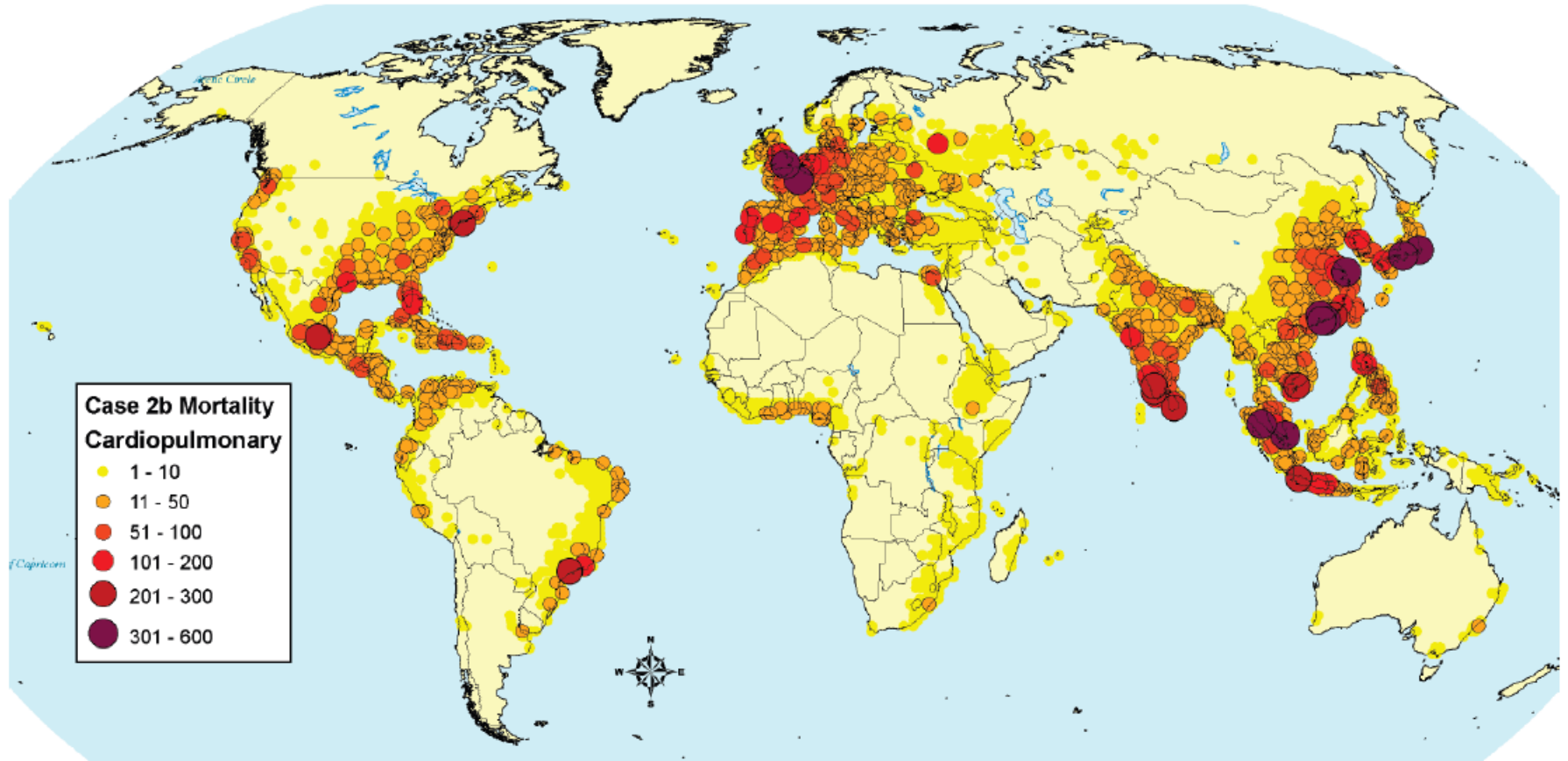


Marine fuel

- Bunker fuel
 - Bunker fuel/marine fuel oil (max. 3.5% sulphur (S)) burnt by ocean-going vessels is thousands of times higher in sulphur content than fuel used by vehicles (0.005% S for ULSD; 0.001% S for Euro V diesel), leading to higher SO_2 and PM_{10} emissions.



Ship PM_{2.5} emissions and mortality



Source: Corbett et al (2007) Mortality from ship emissions: A Global Assessment

Proximity to population and health impact





International best practice

International trend in emissions control

- International Maritime Organization (IMO)
 - adopted MARPOL Convention Annex VI in 2005
 - global cap on fuel sulphur limits (3.5% now, 0.5% post-2020)
 - Emission control areas (ECAs) (1% now, 0.1% post-2015)
- In North America
 - Clean Air Action Plan (San Pedro Bay Port)
 - Fuel switching
 - Vessel speed reduction
 - On-shore power
 - Clean truck program
 - North America ECA

International trend in emissions control

- Europe
 - Effective from 1 January 2010, all ships are required to use fuel with a sulphur content of 0.1% or less while at berth in all European Community ports and within inland waters
 - On-shore power
 - LNG for vessels
 - Baltic Sea ECA and North Sea ECA
 - Electrification of cargo handling equipment

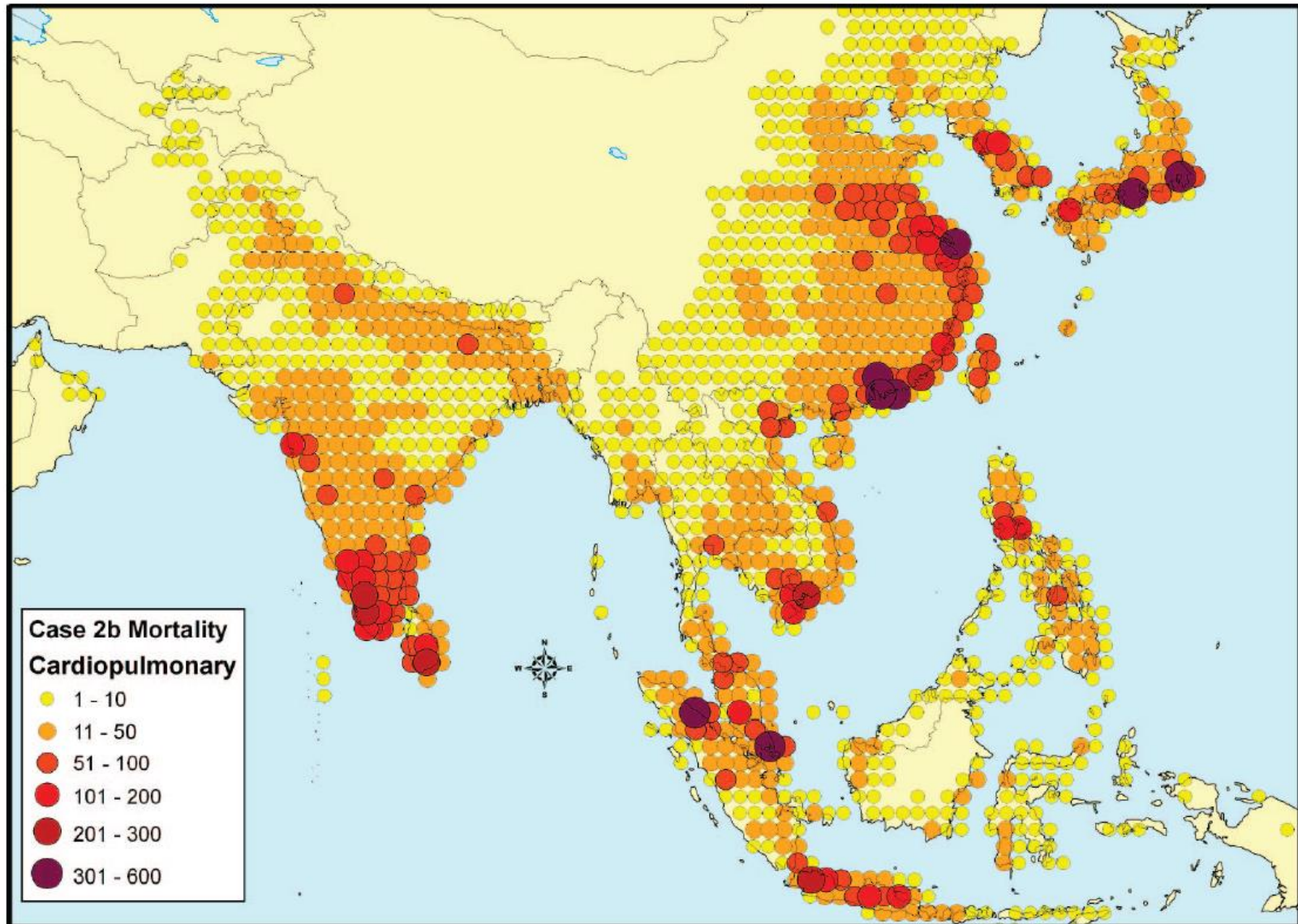
Selected emissions control measures

Technology	General Emissions Control Technologies				
Name	Diesel Oxidative Catalysts (DOC)	Diesel Particulate Filters (DPF)	Selective Catalytic Reduction (SCR)	Exhaust Gas Scrubbers	Shore power
Application	Trucks CHE (>750hp) Marine & CHE (<750hp) Locomotives	Truck CHE (>750hp) Marine Locomotive	Truck CHE (>750hp) Marine Locomotive	CHE Marine Locomotive	Marine
Targeted Air Pollutant	PM 20-30% HC 50-90% CO 70-90%	PM up to 90% HC, CO 60-90%	NOx 70-90%	SOx 90-99% PM 60-80%	Net emissions reductions
Technology	On-Engine Modification			Diesel Fuel Alternatives	Operational Strategies
Name	Exhaust Gas Recirculation (EGR)	Engine Replacement, Repower, Rebuild	Slide Valves	Ultra Low Sulphur Diesel (ULSD)	Vessel Speed Reduction (VSR)
Application	Truck Marine Locomotive	Truck CHE Marine Locomotive	Truck CHE Marine Locomotive	Truck CHE Marine Locomotive	Marine
Targeted Air Pollutant	NOx 40-50% PM 70% (with DPF)	NOx up to 90% PM up to 90%	PM 10-50% NOx 10-25%	PM 5-15% SOx 99%	net reductions in NOx, PM

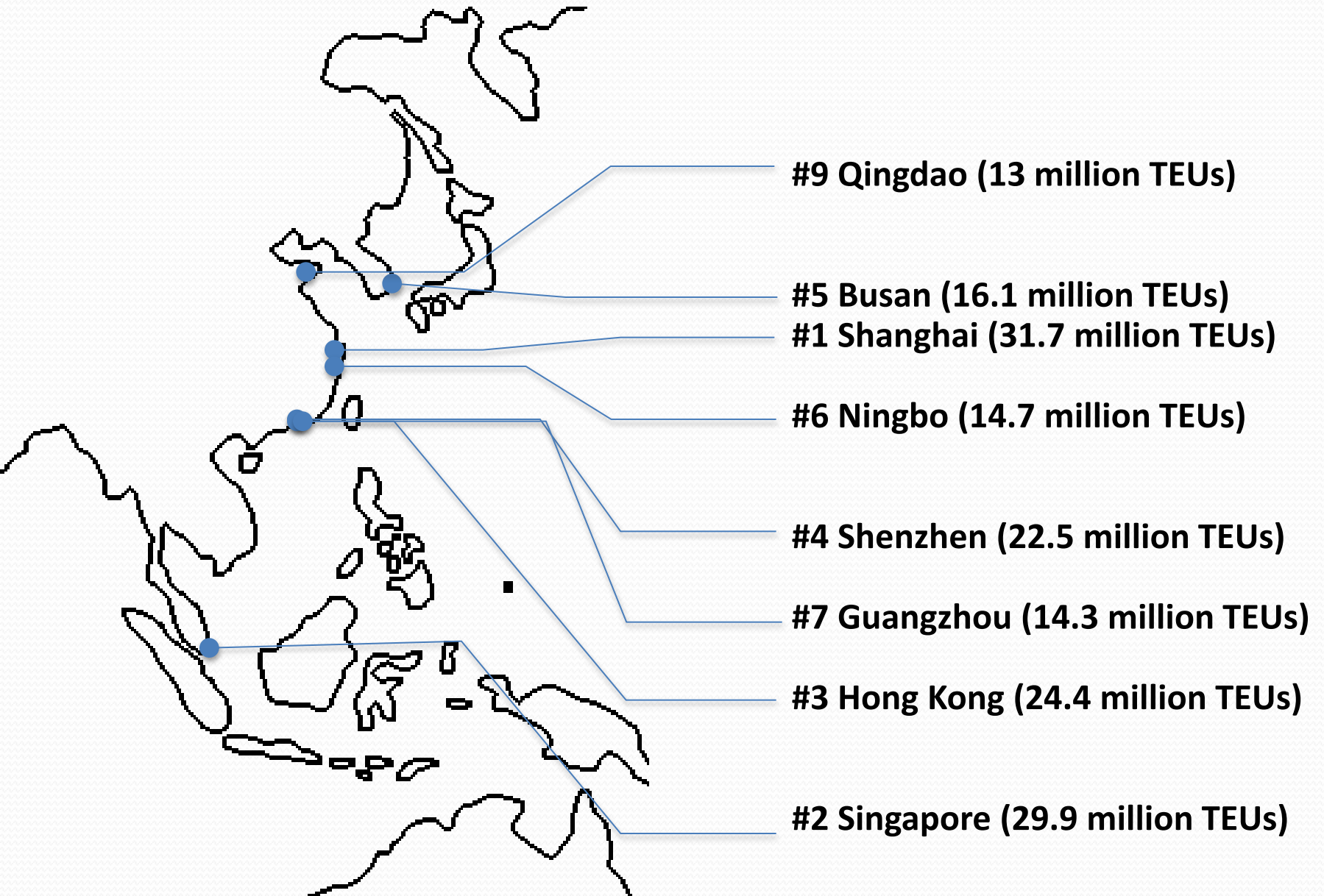


Greening harbours in Asia

Ship PM_{2.5} emissions and mortality in Asia



Top ten container ports in Asia, 2011





Hong Kong's experience:
science, engagement and policy

Study on Marine Vessels Emission Inventory in Hong Kong

Tender Reference AS 08-068

**Study on
Marine Vessels Emission Inventory
Final Report**

submitted to

**The Environmental Protection Department
The HKSAR Government**

by

**Simon K W NG
LIN Chubin
Jimmy W M CHAN
Agnes C K YIP
Alexis K H LAU
Jimmy C H FUNG**

for and on behalf of

**Institute for the Environment
The Hong Kong University of Science & Technology**

February 2012

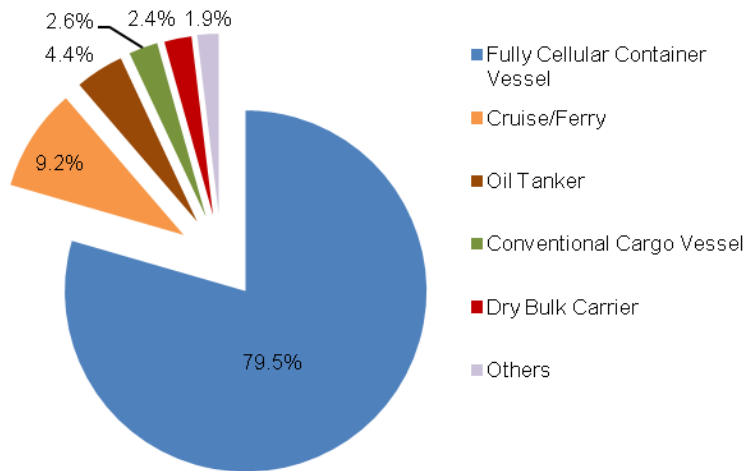


Printed on
Recycled
Paper

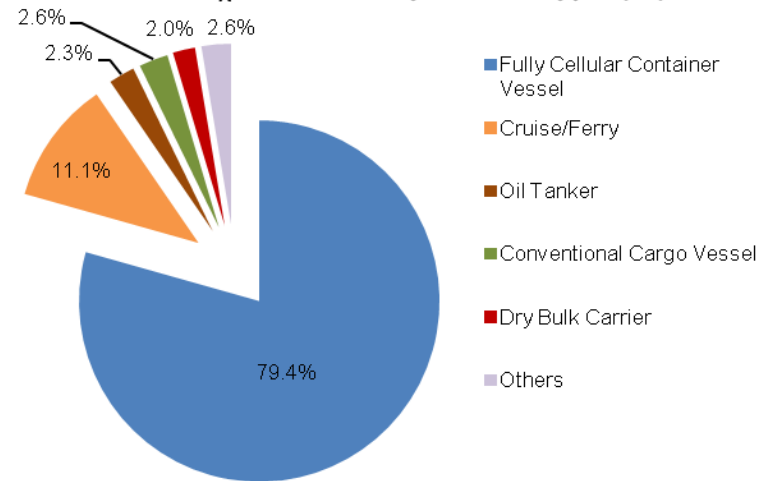
- ship emission inventory for Hong Kong
- 2007 as base year
- activity-based approach
- detailed bottom-up inventory

OGV emissions by vessel type

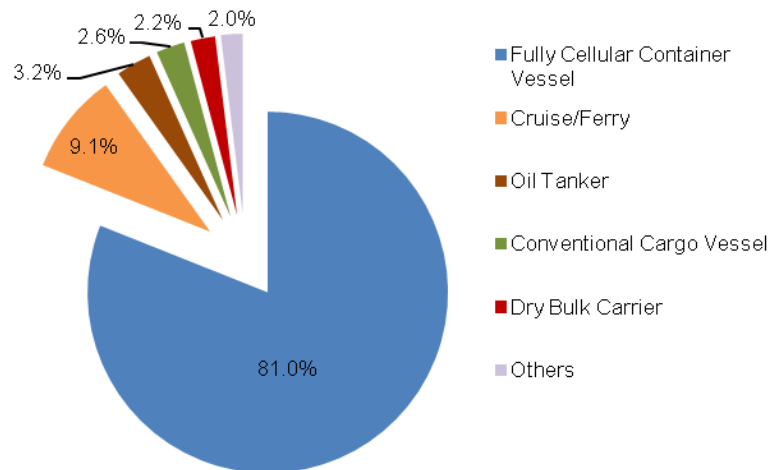
OGV SO₂ Emission by Vessel Type (%)



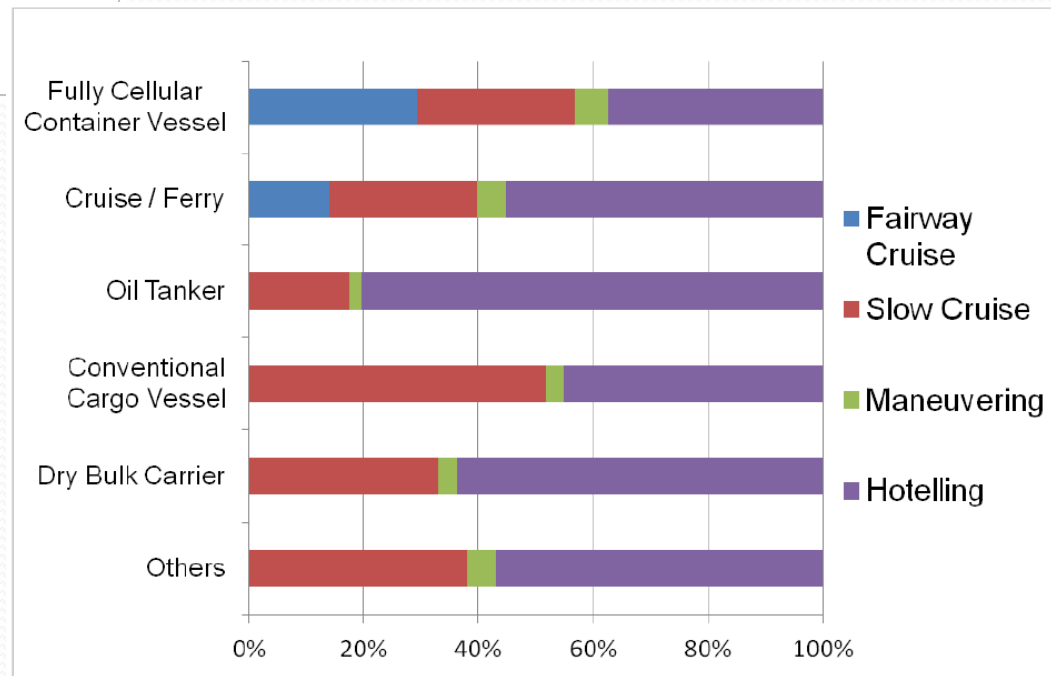
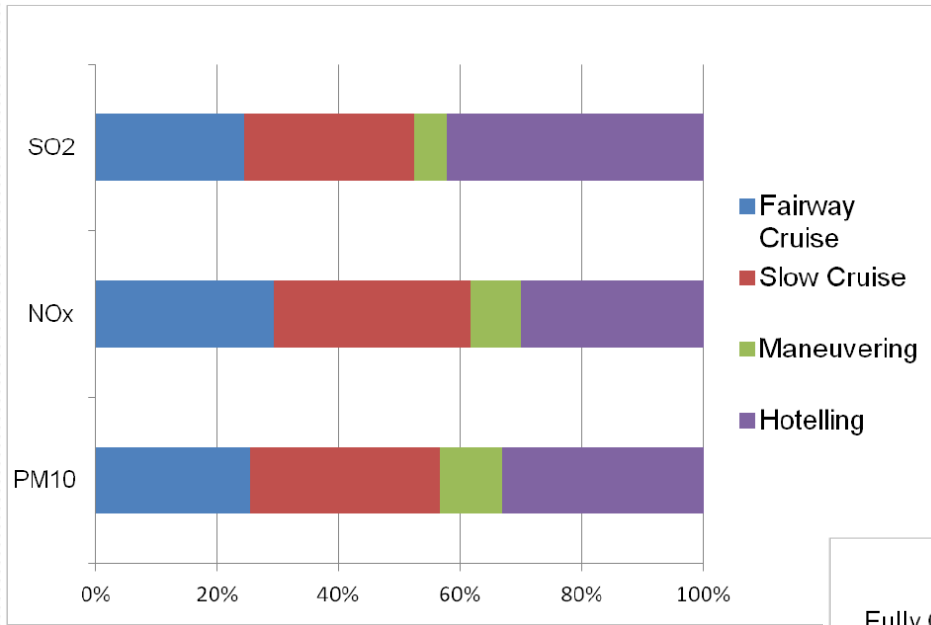
OGV NO_x Emission by Vessel Type (%)



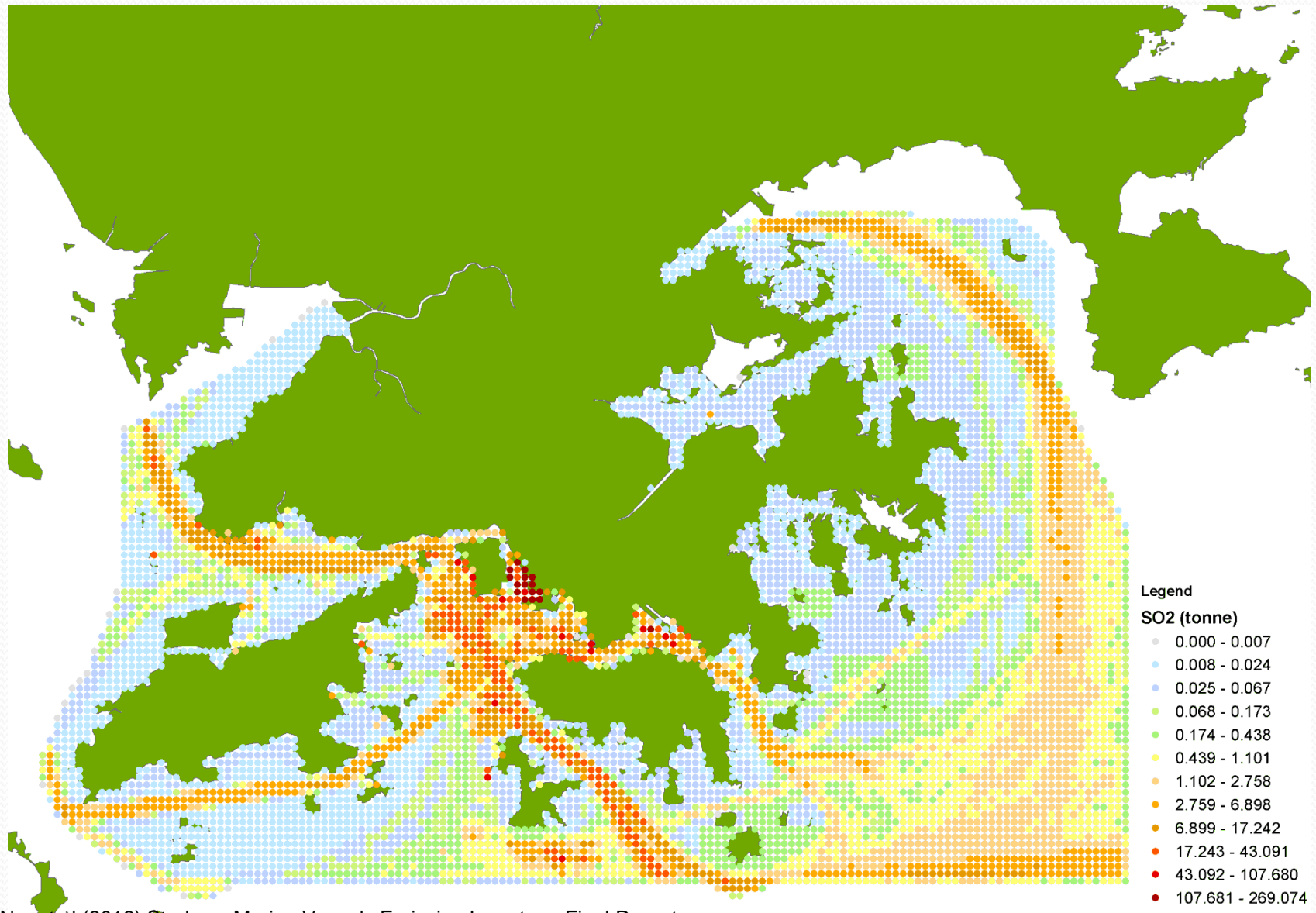
OGV PM₁₀ Emission by Vessel Type (%)



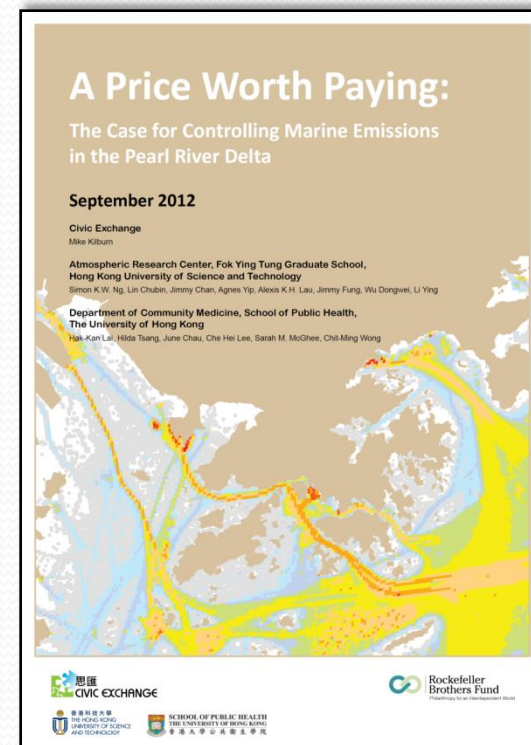
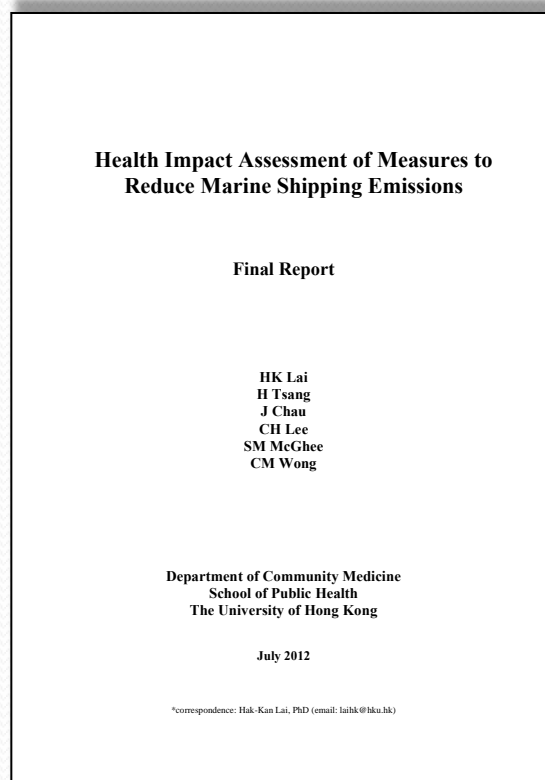
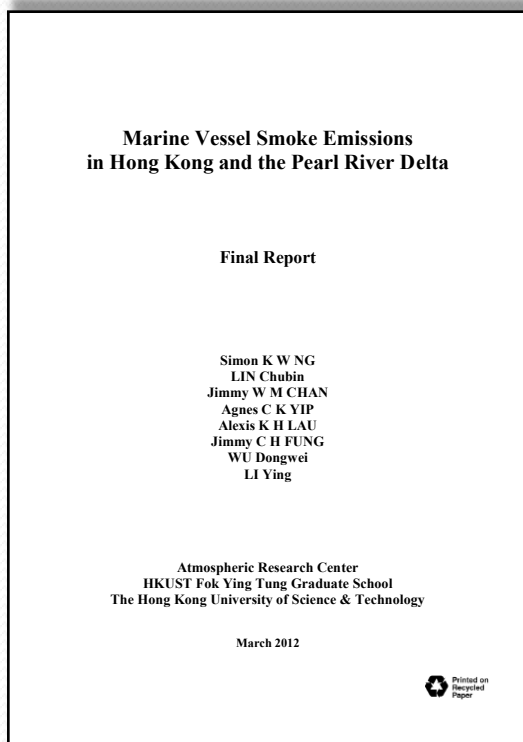
OGV emissions by mode



Spatial distribution of ship SO₂ emissions in Hong Kong, 2007



Pearl River Delta ship emissions study



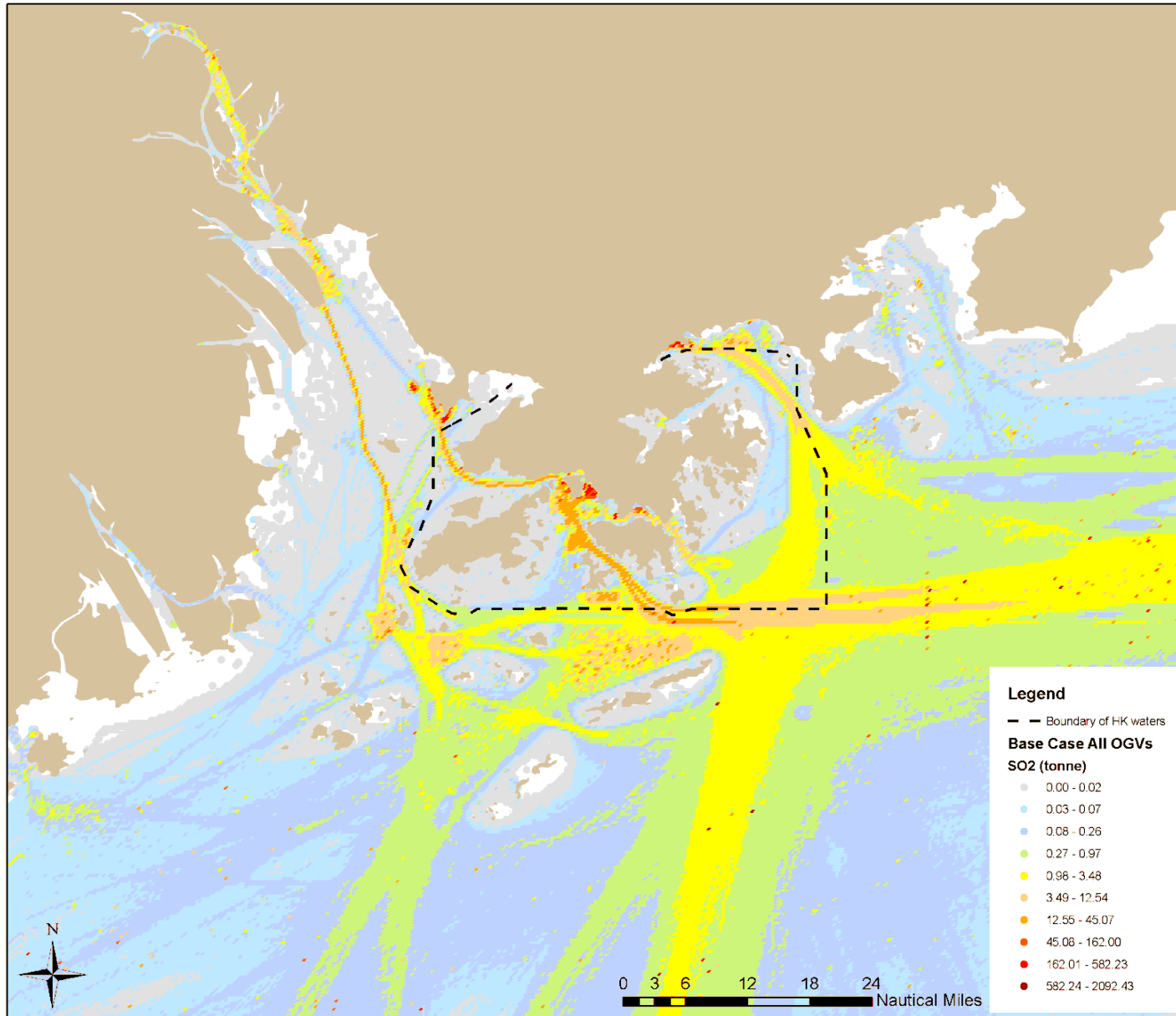
Emission inventory

Dispersion

Health impact

Policy recommendation

Spatial distribution of SO₂ emissions in PRD



Control scenarios



Control measure 1

Switching to 0.5% sulphur fuel at berth inside Hong Kong waters, OGVs only



Control measure 2

Switching to 0.1% sulphur fuel inside Hong Kong waters, OGVs only



Control measure 3

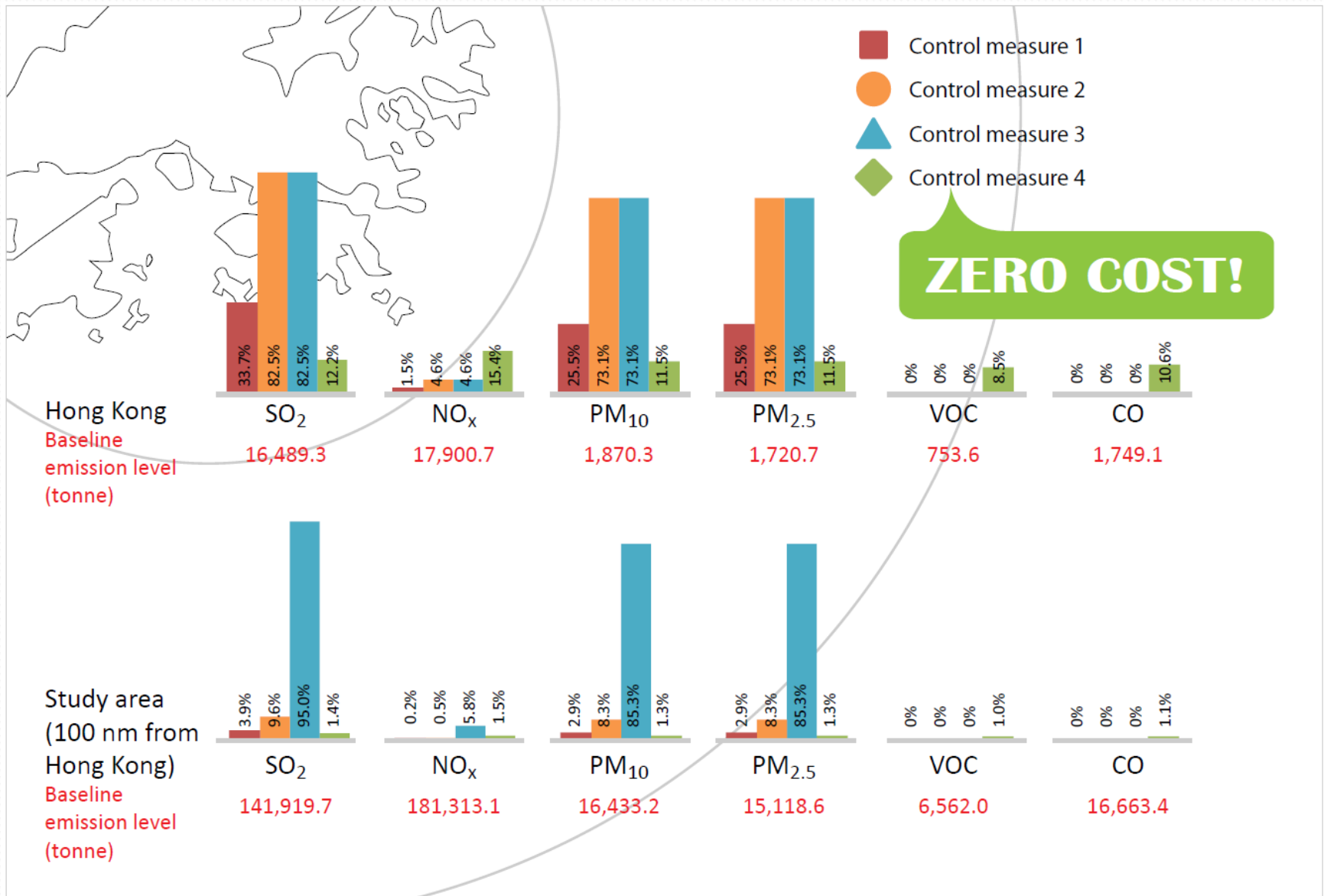
ECA (all vessels switching to 0.1% sulphur fuel within 100 nm of Hong Kong)



Control measure 4

Vessel speed limit at 12 knots in Hong Kong waters for OGVs

Emission reduction benefits



Health impacts

		Hong Kong	Inner PRD	Outer PRD	Total
Annual deaths (all causes, all ages)		39,799	67,070	86,041	192,910
Excess deaths due to SO ₂ from ship emissions		385	93	42	519
Excess deaths under four ship emission control policies (% improvement)					
Control Measure 1	At-berth fuel switch (0.5% sulphur limit) in Hong Kong waters - OGVs	197 (49%)	64 (31%)	28 (33%)	288 (44%)
Control Measure 2	0.1% sulphur limit in Hong Kong waters - OGVs	114 (70%)	57 (39%)	25 (40%)	195 (62%)
Control Measure 3	ECA up to 100 nm from Hong Kong (0.1% sulphur limit) - All ships	33 (91%)	11 (88%)	3 (93%)	46 (91%)
Control Measure 4	Vessel speed reduction (12 knot) in Hong Kong waters - OGVs	229 (41%)	57 (39%)	21 (50%)	306 (41%)

Source: http://www.civic-exchange.org/wp/wp-content/uploads/2013/03/201209PriceWorthPaying_en.pdf

Voluntary industry-led initiatives

Fair Winds Charter

The Fair Winds Charter

2011 - 2012

As international carriers, we recognize the emissions from our ships affect air quality in Hong Kong and the Pearl River Delta region. As responsible businesses, WE VOLUNTARILY COMMIT TO :

- Switching to a fuel containing 0.50% sulphur content or less ("low sulphur fuel") while at berth (at the terminal or at anchorage) in Hong Kong, to the maximum extent possible;
- Undertaking this voluntary initiative between 1 January 2011 and 31 December 2012;
- Collaborating within our sector and with the Hong Kong SAR and Guangdong Governments to introduce regulation on ship emissions, consistent with international standards.

In support of the HKLSA FAIR WINDS CHARTER, WE :

- Urge the Hong Kong SAR Government to take a lead and work with the Guangdong Government to regulate the use of low sulphur fuel in the Pearl River Delta region by 31 December 2012. Urge the Hong Kong SAR Government to encourage broader industry participation by providing incentives, as it has done with other transport modes.
- Encourage the container terminals to support this initiative by offering advantages to participating ships, as well as by addressing emissions from cargo handling equipment, and the trucks and local craft that service the terminals.
- Encourage ocean-going passenger liners and other maritime users of the Port of Hong Kong to use low sulphur fuel while at berth in Hong Kong.
- Encourage cargo producers and buyers to favour participating shipping lines as a way of meeting their sustainable supply chain commitments.
- Welcome the support of end consumers who purchase the goods that the shipping industry carries.



CHINA NAVIGATION



Crystal Cruises



EVERGREEN LINE

HAMBURG SÜD

Hapag-Lloyd



HÖEGH AUTOLINERS



Prestige Cruise Holdings



Government incentive scheme for OGVs


Public Consultation
Study Reports
Guidelines & References
Advanced Search

Get Adobe Reader
香港家書
空氣質素指標

Port Facilities and Light Dues Incentive Scheme For Ocean Going Vessels using Cleaner Fuel

Port Facilities and Light Dues Incentive Scheme

[Background](#)
[Eligibility](#)
[Registration](#)
[List of Registered Vessels](#)
[Application](#)
[Fuel Switch Log Sheet](#)
[News and Events](#)
[References](#)
[Further Information](#)



Background

Ocean going vessels (OGVs) run on residual oil, whose sulphur content is 2.8% on average. The emission of OGVs while at berth accounts for about 40% of their total emission within Hong Kong waters. To reduce marine emission, the Government is encouraging OGVs to use fuel with sulphur content not more than 0.5% while at berth in Hong Kong waters by a 3-year incentive scheme that reduces the port facilities and light dues of OGVs that have adopted this green practice. The use of low sulphur fuel can substantially reduce air pollution at locations close to their berthing areas.

[\[Back to top\]](#)

Policy Address 2013

Vessel Emission Reduction

140. In 2011, marine vessels were the largest source of respirable suspended particulates, nitrogen oxides and sulphur dioxide. In particular, the emissions of ocean-going vessels at berth accounted for about 40% of their total emissions within Hong Kong waters. In September 2012, the Government launched an incentive scheme to encourage ocean-going vessels at berth to switch to low-sulphur diesel. We are also considering bringing in new legislation to enforce the requirement of fuel switch at berth. We plan to submit our proposal to this Council in the next legislative session following the completion of consultation with the maritime sector. Meanwhile, we are stepping up our efforts with the Guangdong Provincial Government in exploring the feasibility of requiring ocean-going vessels to switch to low-sulphur diesel while berthing in Pearl River Delta ports. Also, the first berth of the Kai Tak Cruise Terminal will be commissioned in the middle of this year. We plan to seek funding approval from this Council to install on-shore power supply facilities for use by cruise vessels with such facilities. This will enable cruise vessels to switch to electric power while berthing and hence minimise their impact on air quality. We are also promoting the use of cleaner fuels among local vessels. We have conducted relevant tests and consulted the relevant sector.



A new Clean Air Plan 2013



- Greening ports
 - A world trend
 - Regulating OGV
 - FWC and fuel switch incentive scheme
 - Regional fuel switch at berth
 - PRD ECA
 - Upgrading fuel for local crafts
 - On-shore power
 - Slow steaming

Regional Cooperation Plan, June 2012

《共建優質生活圈專項規劃》

廣東省住房和城鄉建設廳
香港特別行政區政府環境局
澳門特別行政區政府運輸工務司
2012年6月

An Extract from the *Regional Cooperation Plan on Building a Quality Living Area*²¹ on recommendations related to marine pollution.

- (4) Exploring opportunities in controlling air pollutant emissions from vessels in the Greater PRD waters
- ① proposing to conduct a joint basic study on controlling air pollution from vessels in the Greater PRD waters by the three sides, including compilation of an emissions inventory on vessels in the Greater PRD waters, for projecting the quantity of air pollution from vessels from 2012 to 2020; and
 - ② formulating cooperation plans on controlling air pollutant emissions from vessels. Cooperation proposals include:
 - making reference to the regulations under Annex VI to the International Convention for the Prevention of Marine Pollution from Ships (MARPOL) to tackle vessel emissions, considering comprehensively the technical feasibility, emission reduction benefits and cost effectiveness of different measures, jointly formulating emissions reduction targets for vessels and their fuel standards, and actively encouraging other options that would bring similar emission reduction benefits, with a view to further strengthening control of vessel emissions;
 - restricting emissions from vessels, including NOX emissions from new vessels which should be in line with the latest development of the engine manufacturing and ship building industries as well as the shipping sector;
 - examining measures to encourage vehicles entering the port areas to use cleaner fuels, controlling emissions from non-road mobile machinery (NRMM), and enhancing modal coordination, with a view to reducing air pollutant emissions in their vicinity;
 - exploring the possibility of using cleaner energy by providing onshore power supply to cruise vessels and ocean-going vessels berthing at the Greater PRD ports;
 - considering requiring ocean-going vessels at berth and at anchorage at the Greater PRD ports to use low sulphur fuel or onshore power;
 - providing incentives to encourage more ocean-going vessels to switching to cleaner fuel while at berth in Hong Kong waters; and
 - studying and exploring the establishment of an "Emission Control Area" in Greater PRD waters.

Conclusion: ship emissions control in Asia

- Regulations
 - Way behind North America and Europe
 - At-berth fuel switching regulation for OGVs (Hong Kong)
- Voluntary action
 - Fair Winds Charter (Hong Kong)
- Incentive program
 - Green Port Program (Singapore)
 - Incentive Scheme for OGVs to switch fuel (Hong Kong)



End of presentation

kwsng@civic-exchange.org