

Marine vessels air pollution control and collaboration in the Pearl River Delta

珠三角船舶空气污染控制及区域合作

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20 March 2013

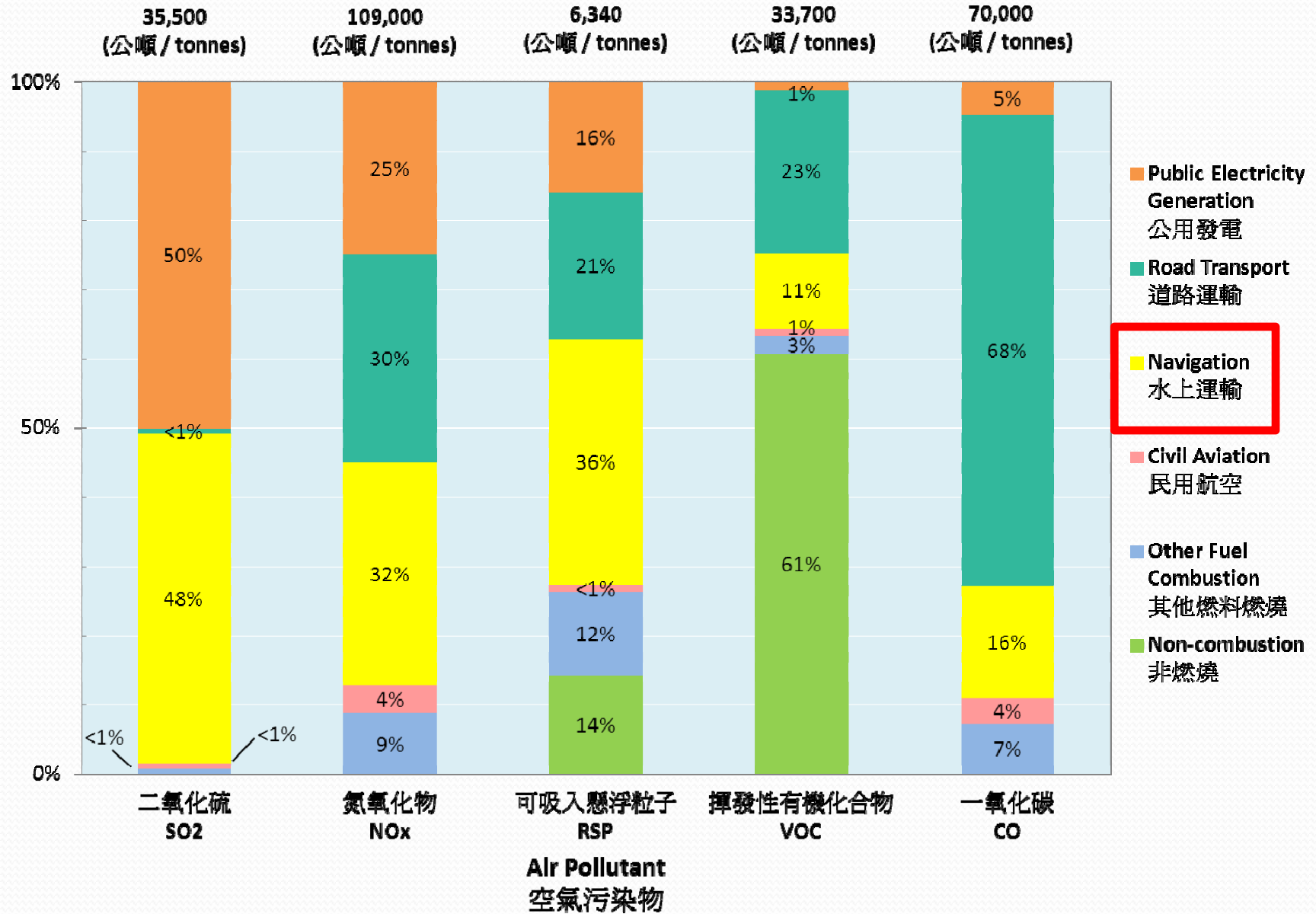
Ship emissions in Hong Kong

香港的船舶空气污染物排放



2010 年排放清單

2010 Emission Inventory



Proximity to population and health impact

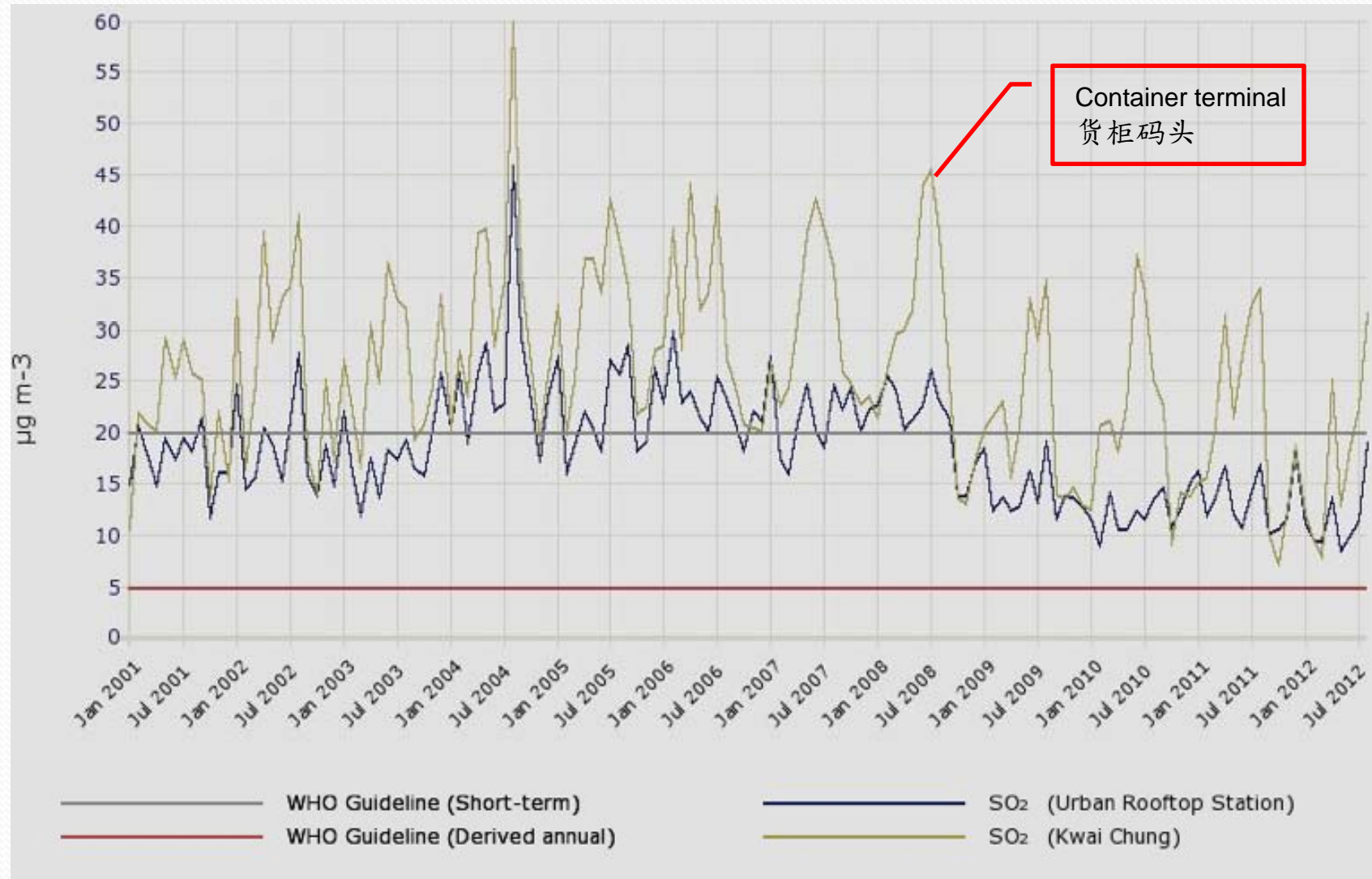
港口靠近民居与健康影响



Ship emissions and urban air quality: SO₂

船舶排放与空气质量：二氧化硫

Monthly means 月均浓度 (2001-2012)



Study on Marine Vessels Emission Inventory

香港船舶排放清單研究

Tender Reference AS 08-068

**Study on
Marine Vessels Emission Inventory**

Final Report

submitted to

**The Environmental Protection Department
The HKSAR Government**

by

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for and on behalf of

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

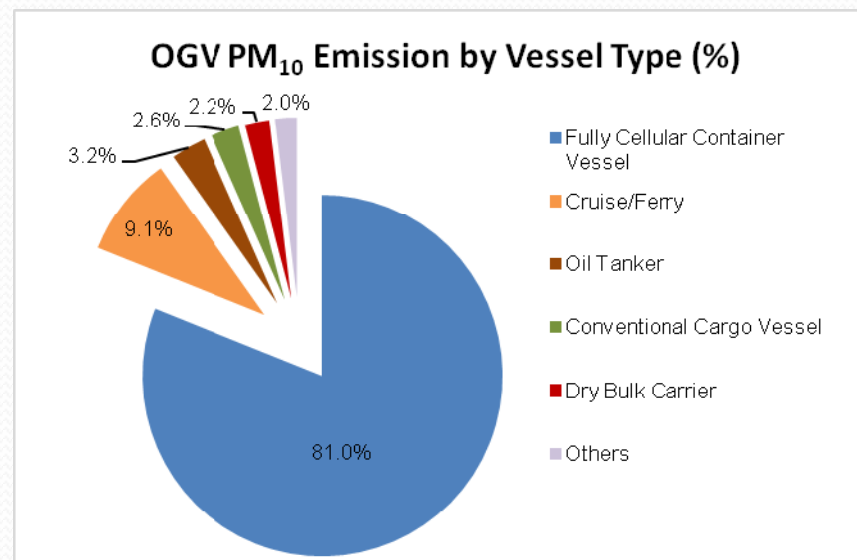
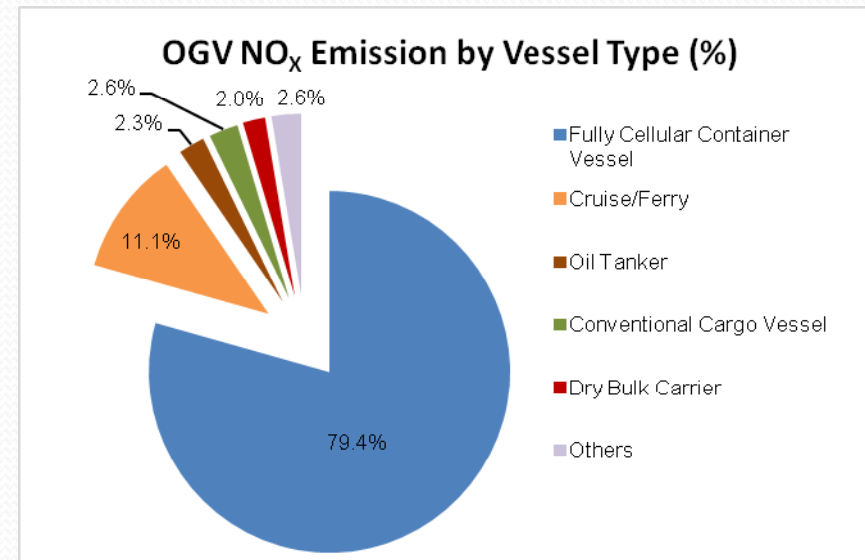
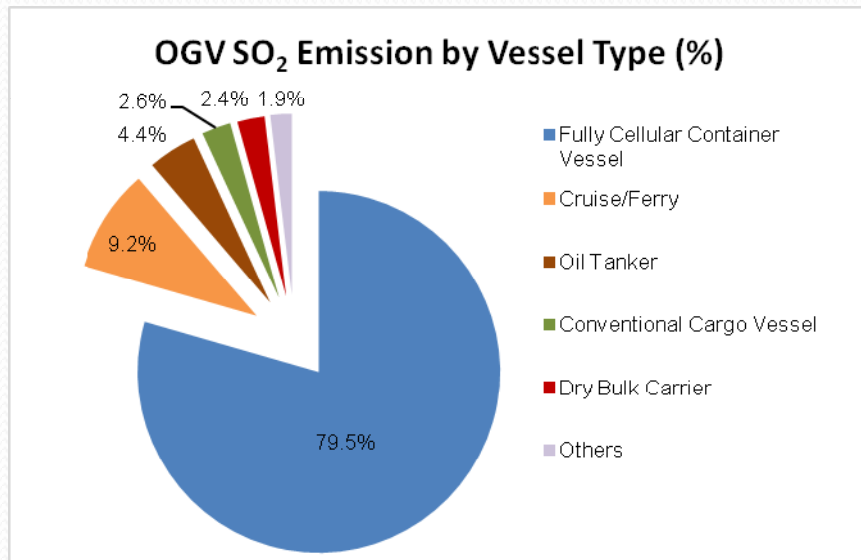
February 2012



- ship emission inventory for Hong Kong
香港船舶排放清單
- 2007 as base year
2007年為基礎年
- activity-based approach
以動力法計算排放

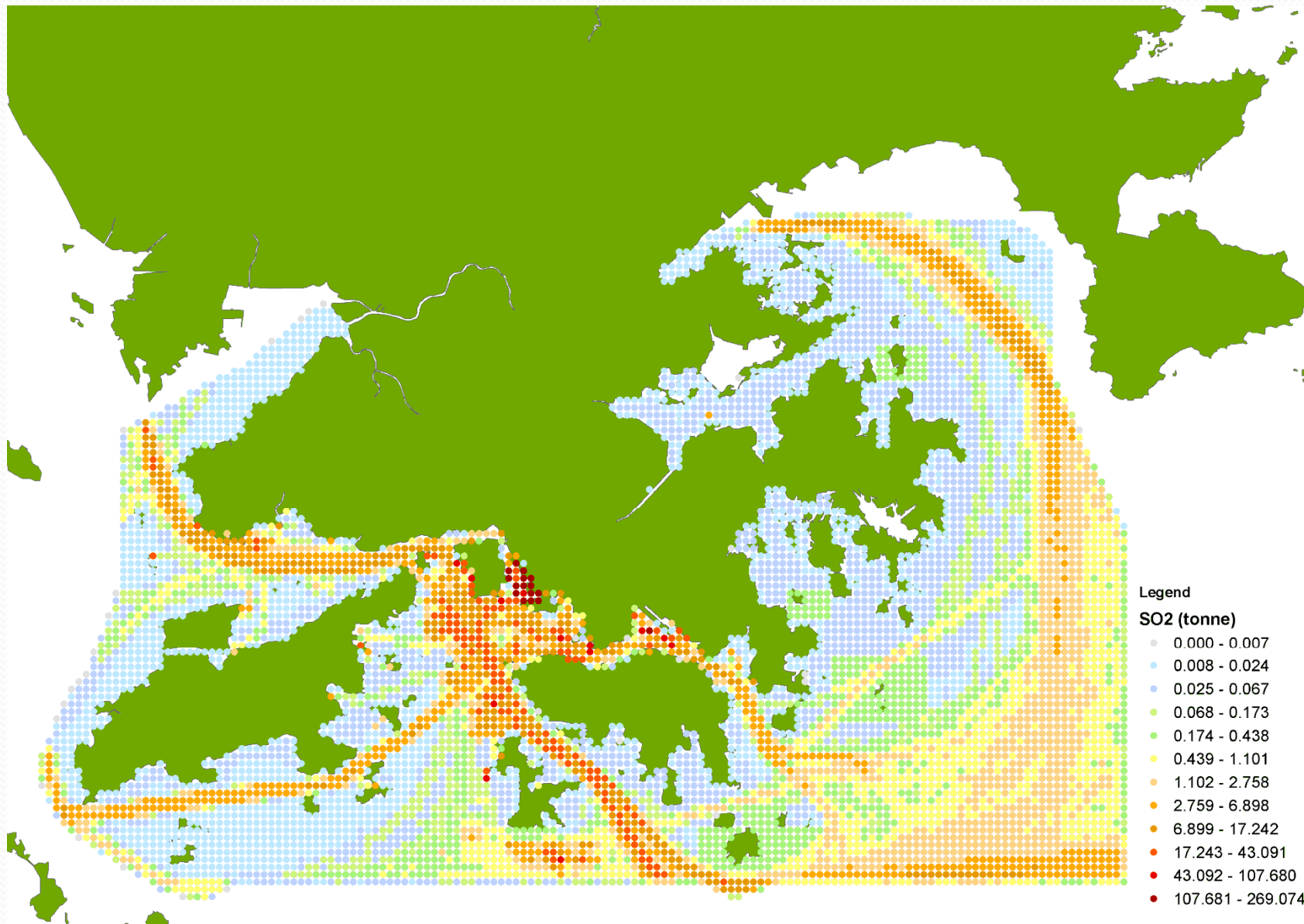
OGV emissions by vessel type

按船舶类别划分的远洋船排放占有率



Spatial distribution of ship emissions 2007

2007年船舶排放的空间分布





Ship emissions in the PRD

珠三角的船舶空气污染物排放

GUANGZHOU
12,550m TEU



SHENZHEN
22,510m TEU



ZHONGSHAN 1,08m TEU



HONG KONG
23,699m TEU



MACAU 0,09m TEU



+ ZHUHAI 0,70m TEU



10.5% GLOBAL TEU



PRD MAJOR CONTAINER PORT THROUGHPUT 2010

PRD ship emissions study 珠三角船舶污染研究


**Marine Vessel Smoke Emissions
in Hong Kong and the Pearl River Delta**

Final Report

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March 2012

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**Health Impact Assessment of Measures to
Reduce Marine Shipping Emissions**

Final Report

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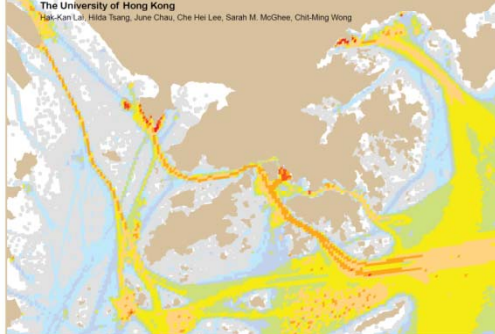
A Price Worth Paying:
The Case for Controlling Marine Emissions
in the Pearl River Delta





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 Rockefeller Brothers Fund
 香港科技大學


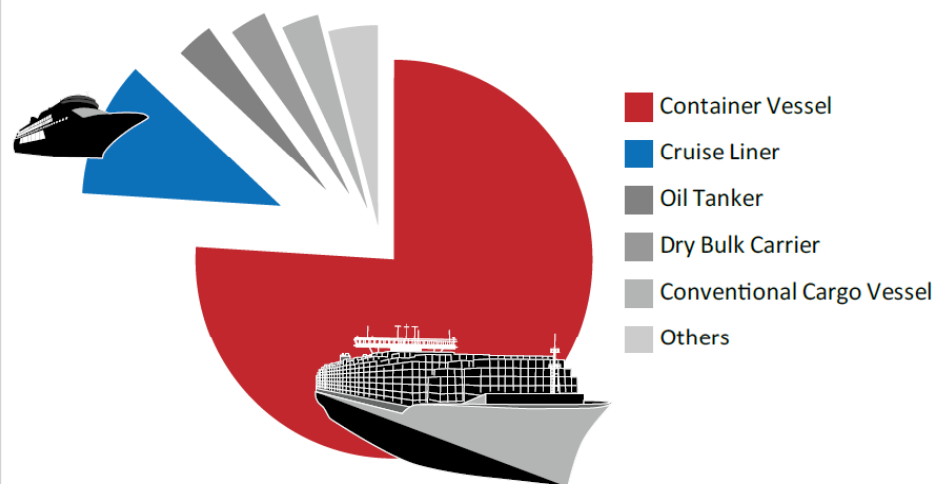


2008 OGV emissions inventory

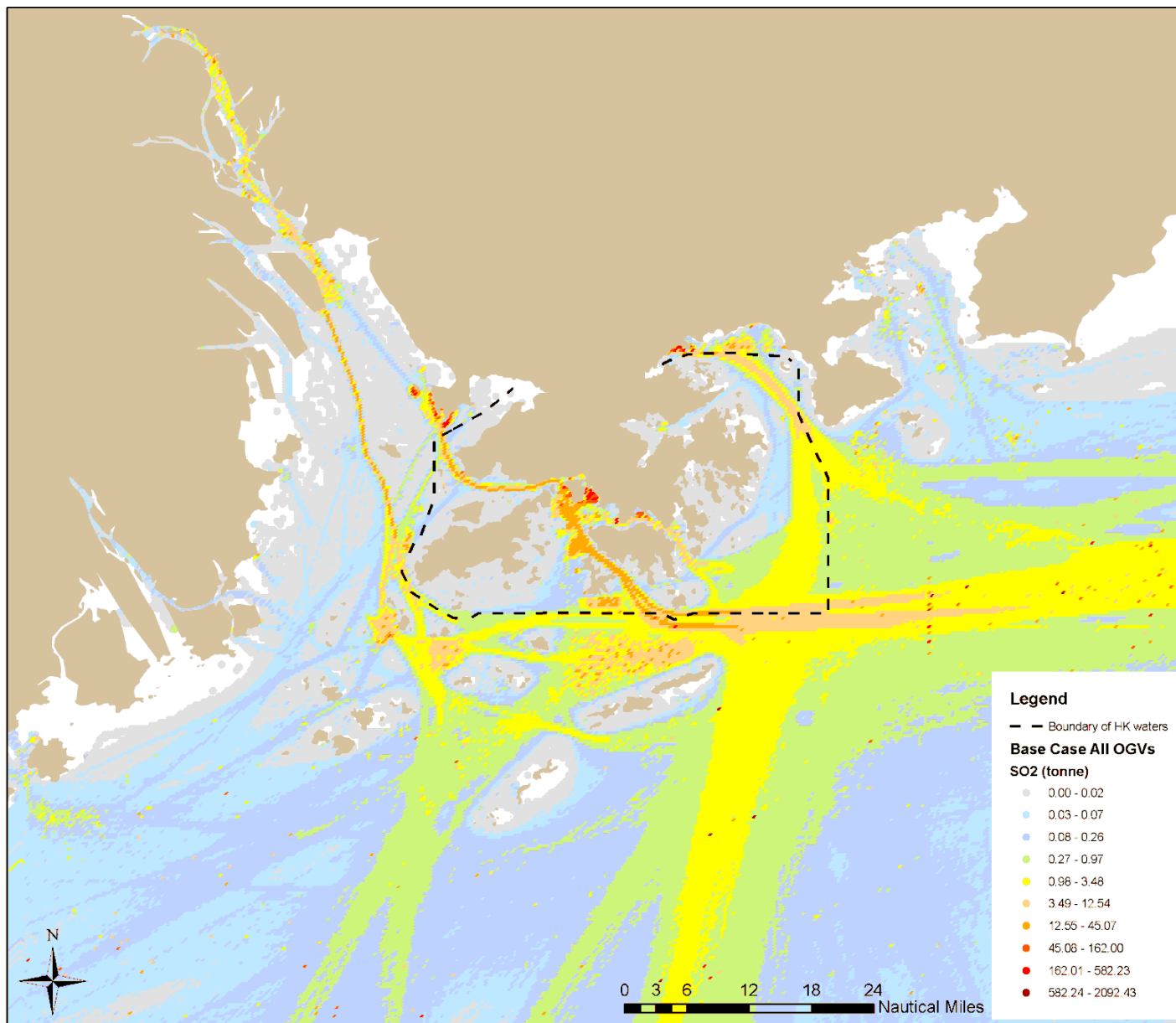
2008年远洋船排放清单

(tonne 噸)

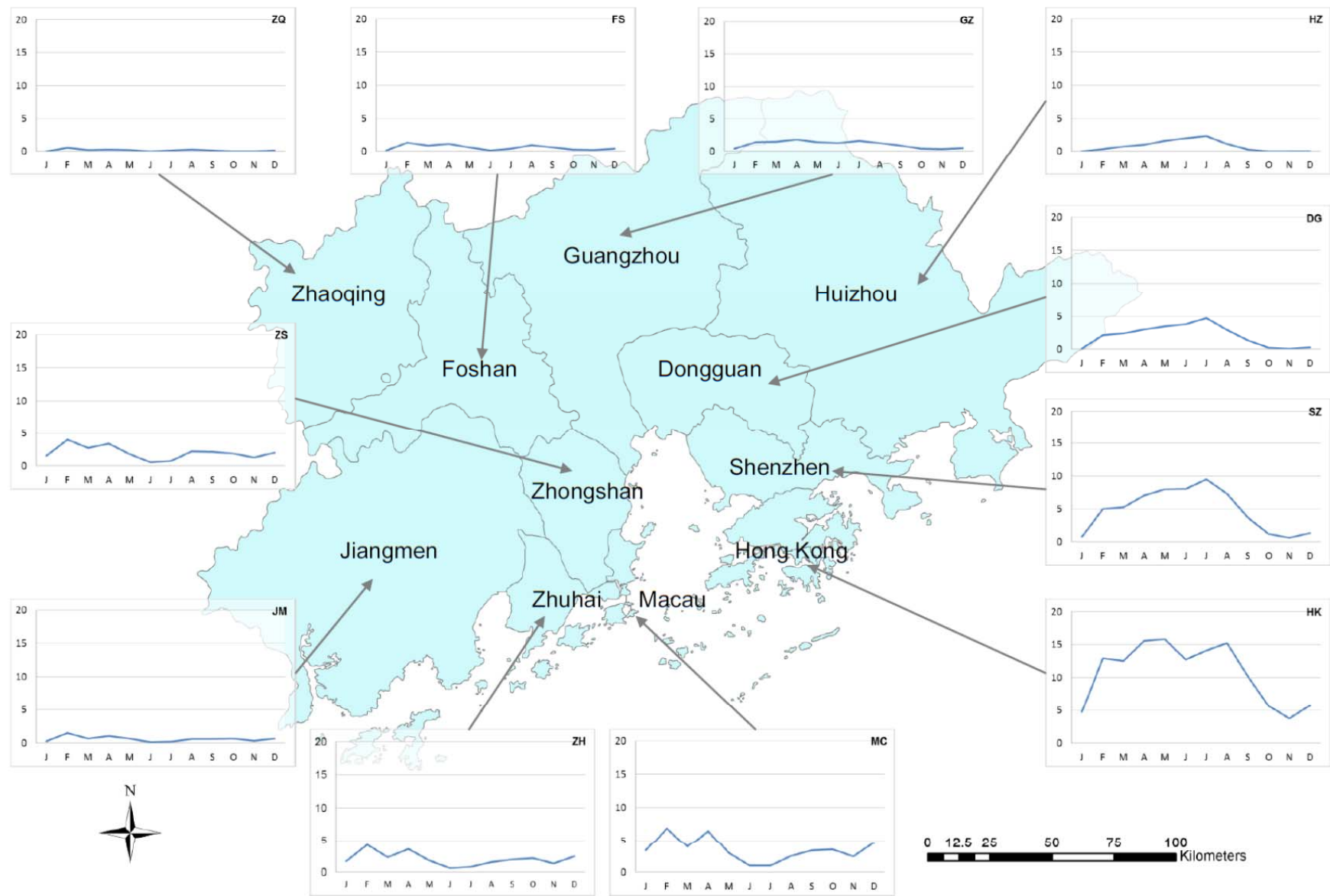
	SO ₂	NO _x	PM ₁₀	PM _{2.5}	VOC	CO
Within Hong Kong waters	16,489.3	17,900.7	1,870.3	1,720.7	753.6	1,749.1
Outside Hong Kong waters but within 100 nm from Hong Kong	125,430.4	163,412.4	14,563.0	13,397.9	5,808.4	14,914.3
Total	141,919.7	181,313.1	16,433.2	15,118.6	6,562.0	16,663.4



Spatial distribution (baseline) 基线空间分布

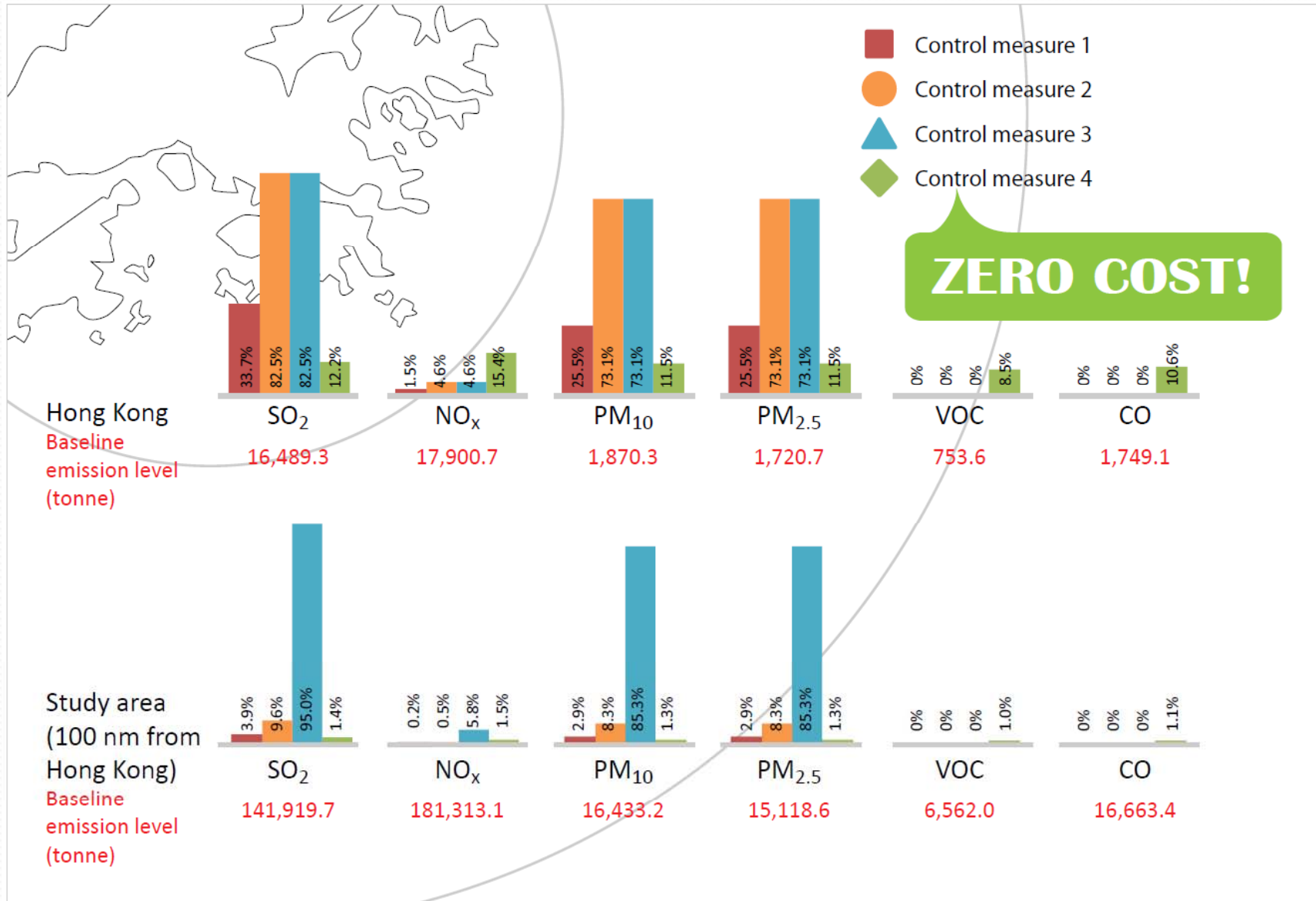


Dispersion 污染物扩散



Monthly average SO₂ concentrations attributable to ship emissions, 2008

Emission reduction benefits 減排效益

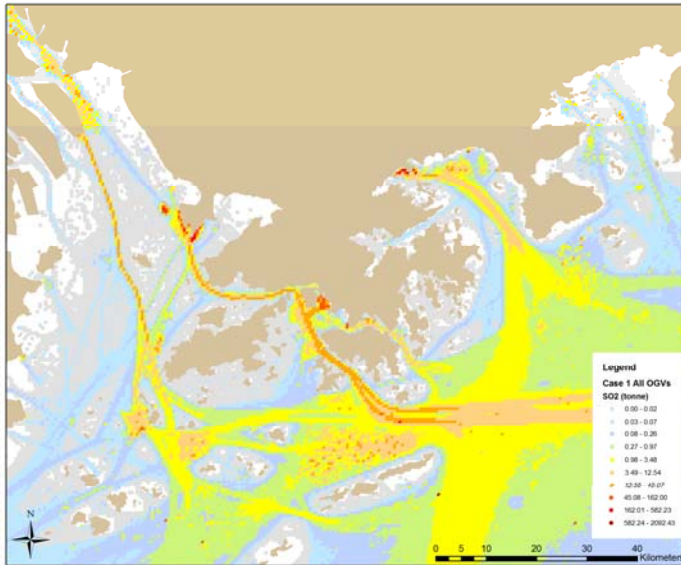


- FWC**
0.5% sulphur
- 乘風約章**
含硫量0.5%
- HK**
0.1% sulphur
- HK**
含硫量0.1%
- ECA**
0.1% sulphur
- 排放控制區
含硫量0.1%
- Slow**
- 慢駛**

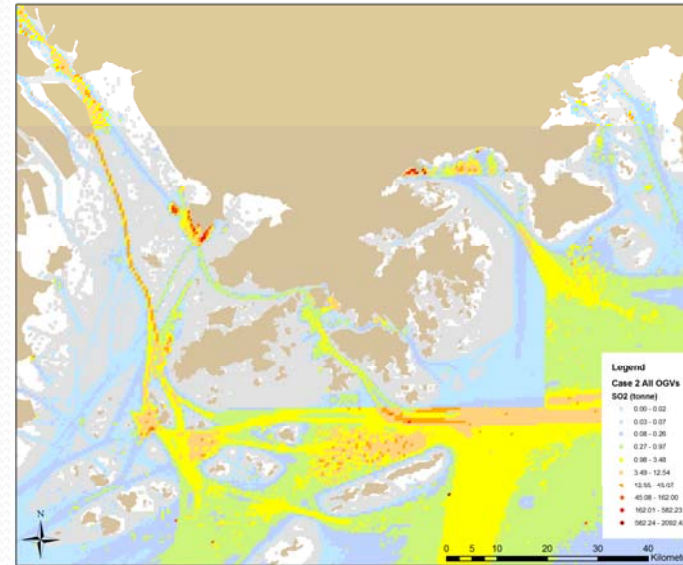
Emission maps under 4 control cases

管制方案下的排放分布图

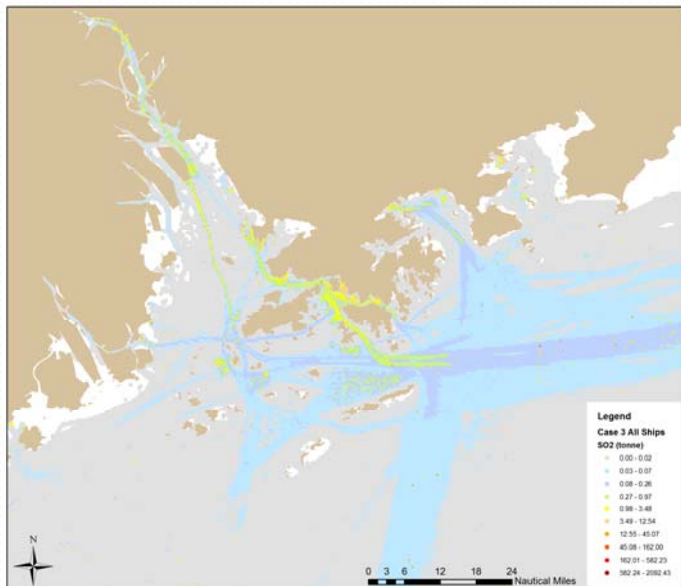
FWC
0.5% sulphur



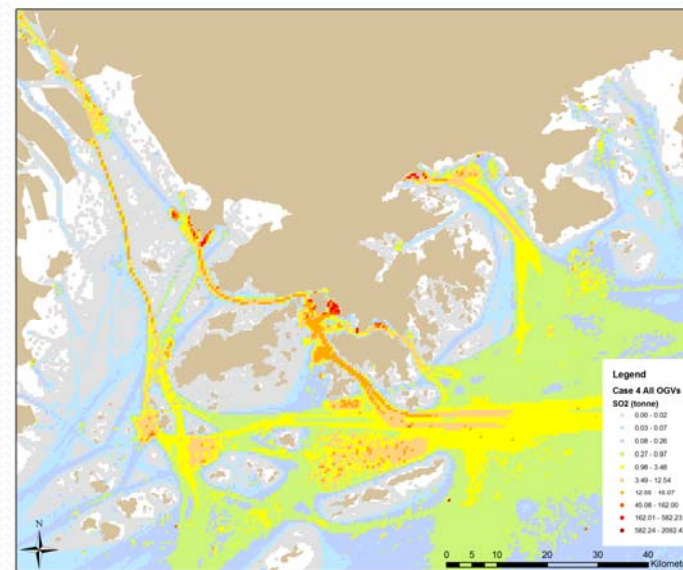
HK
0.1% sulphur



ECA
0.1% sulphur



Slow



Health impacts 健康影响

		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%)

- ECA bringing most health benefits to PRD

排放控制区将为珠三角地区的公众健康带来最大裨益



Regional collaboration

区域合作

Scope of collaboration 合作范畴

- Scientific research 科研
 - Emission inventory
排放清单
 - Health impact assessment
健康影响评估
 - Cost benefit analysis
成本效益分析

Scope of collaboration 合作范畴

- Information / experience sharing 信息和经验共享
 - Voluntary action (e.g. Fair Winds Charter)
自愿行动（例如：乘风约章）
 - Emissions control strategy and regulation (e.g. HK government incentive scheme for ocean-going vessels)
排放管控策略和规管（例如：港口设施及灯标费宽减计划）
 - Health and other benefits
健康及其他效益
 - Stakeholder engagement (different government agencies, shipping companies, terminal operators, academics, etc)
持份者接触及交流（不同政府机关、船舶公司、码头营办商、学者等）

Scope of collaboration 合作范畴

- Region-wide policy framework 区域性政策框架
 - Study on the Action Plan for the Bay Area of the Pearl River Estuary (2009-11) 「环珠江口宜居湾区建设重点行动计划」研究
 - Framework Agreement on Hong Kong/Guangdong Co-operation (2010) 《粤港合作框架協議》
 - Regional Cooperation Plan on Building a Quality Living Area (2012) 《共建优质生活圈专项规划》
 - Emissions Control Area (ECA) in HK/PRD
香港/珠三角排放控制区
 - Air quality objectives and fuel/emission standards tighter than other places in the Mainland
比国内其他地区更严格的空气质量目标及燃料/排放标准

Regional Cooperation Plan, June 2012

共建优质生活圈专项规划 2012年6月

《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.

Scope of collaboration 合作范畴

- Major Air Pollutant Emission Reduction Plan for the PRD Region up to 2020

珠三角地区直至2020年的主要空气污染物减排目标

Pollutant 污染物	Area 地区	2010 Emission (tonnes) 2010年排放量 (公吨)	2015 Emission Reduction Targets 2015年减排目标	2020 Emission Reduction Target Ranges 2020年减排目标幅度
SO ₂ 二氧化硫	Hong Kong 香港	35,000	-25%	-35% -- -75%
	PRD Economic Zone 珠三角经济区	507,000	-16%	-20% -- -35%
NO _x 氮氧化物	Hong Kong 香港	108,600	-10%	-20% -- -30%
	PRD Economic Zone 珠三角经济区	889,000	-18%	-20% -- -40%
RSP 可吸入颗粒物	Hong Kong 香港	6,340	-10%	-15% -- -40%
	PRD Economic Zone 珠三角经济区	637,000	-10%	-15% -- -25%
VOC 挥发性有机化合物	Hong Kong 香港	33,700	-5%	-15%
	PRD Economic Zone 珠三角经济区	903,000	-10%	-15% -- -25%



End of Presentation. Thank you.

报告完毕 谢谢！

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