From Science to Policy:
Ship emissions control strategy in Hong Kong and the Pearl River Delta

從科學到政策
香港及珠江三角洲船舶排放管制策略

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運輸及可持續發展研究主管

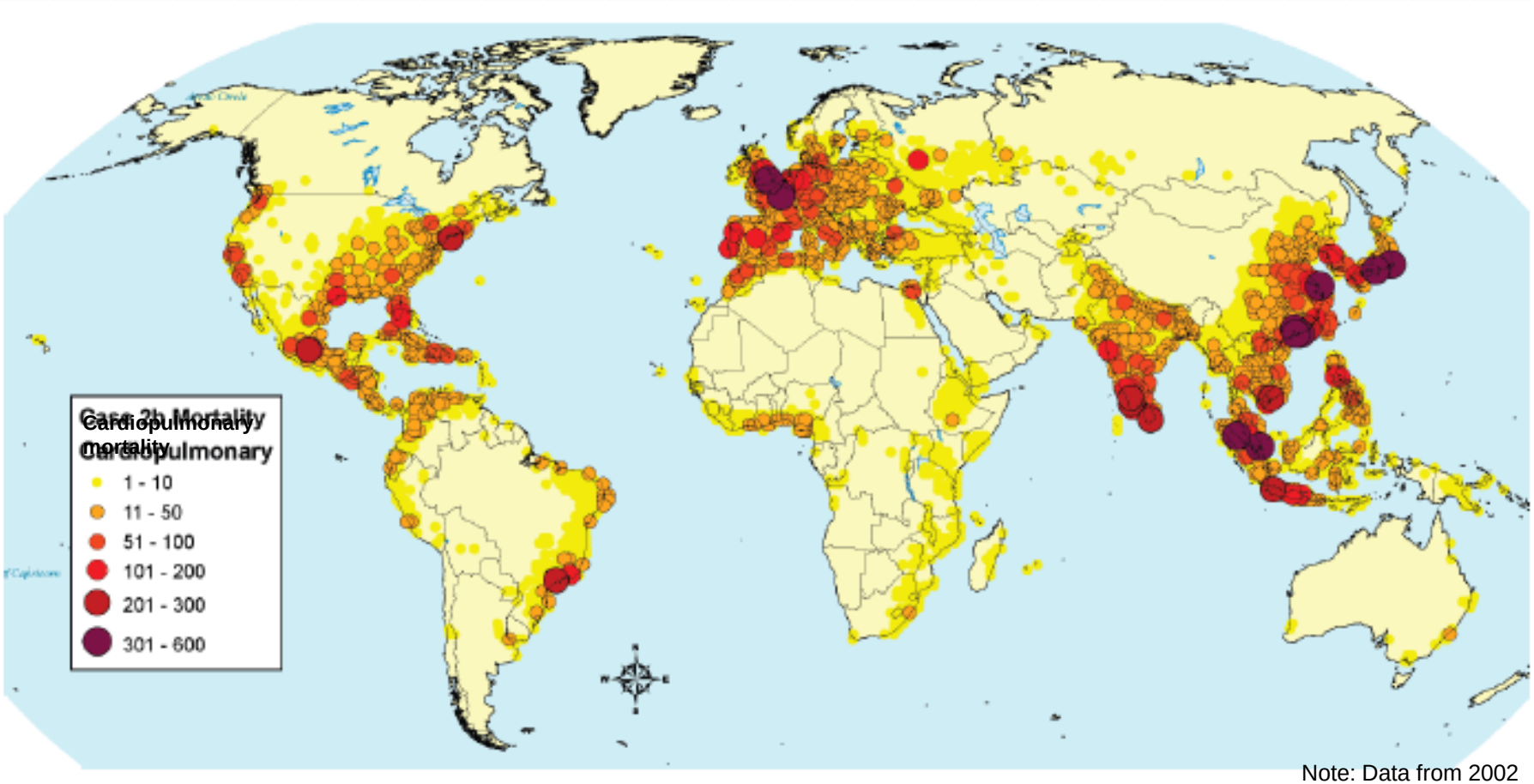
Civic Exchange 思匯政策研究所

10 December 2012

思匯
CIVIC EXCHANGE

Exhaust emissions from ships
船舶排放

Ship emissions and mortality
船舶排放與死亡率

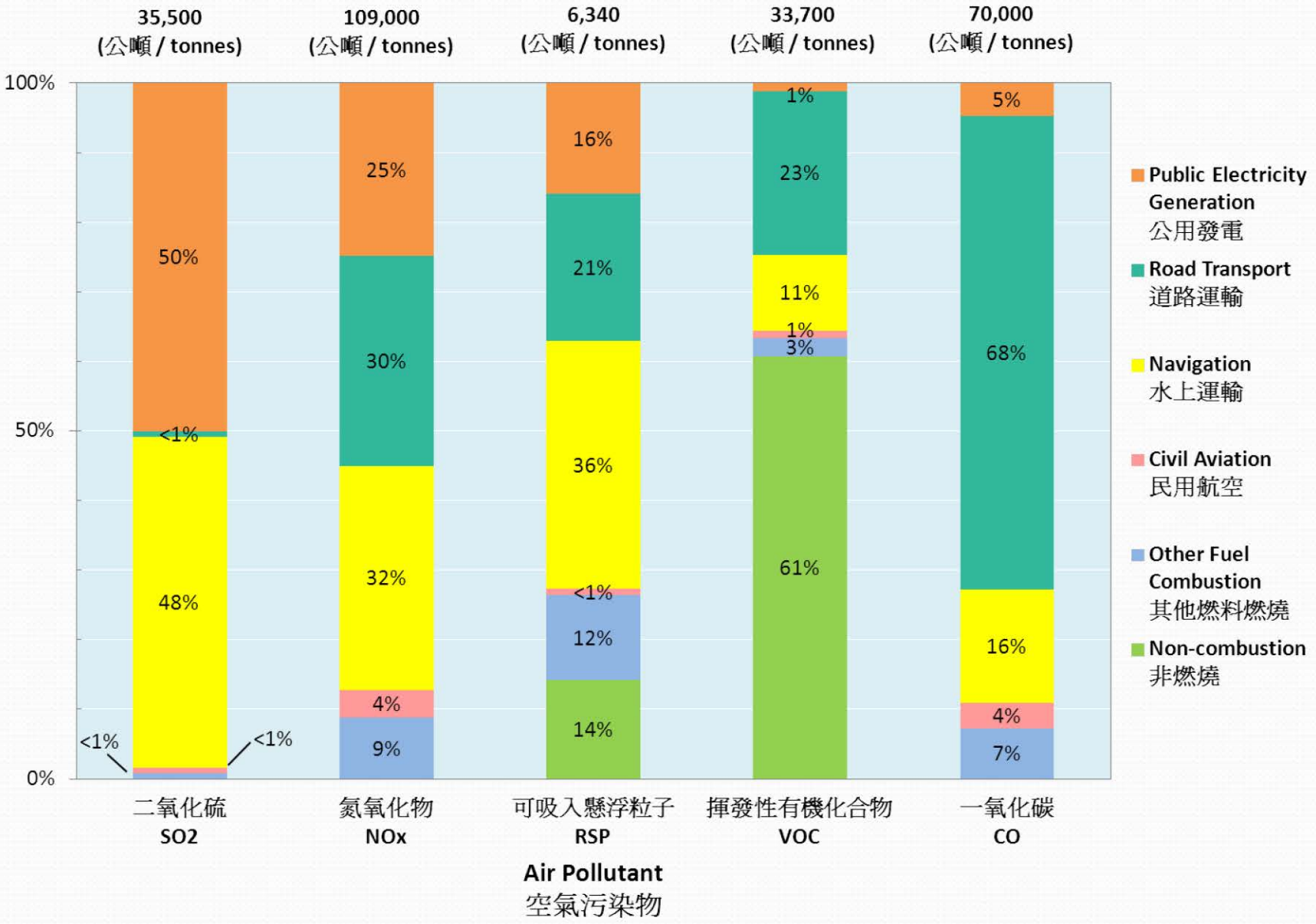


Note: Data from 2002

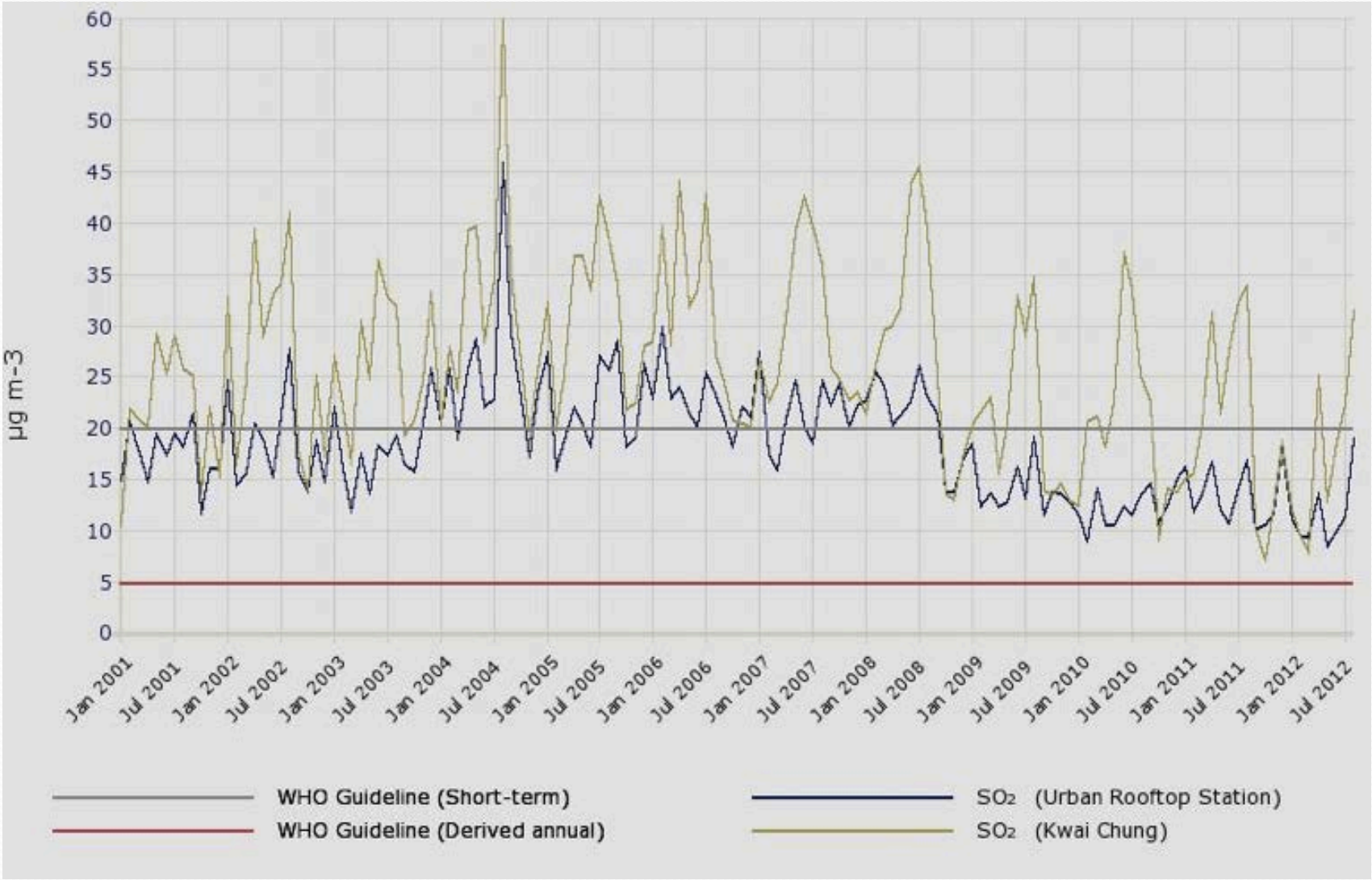
Proximity to population and health impact
港口靠近民居與健康影響

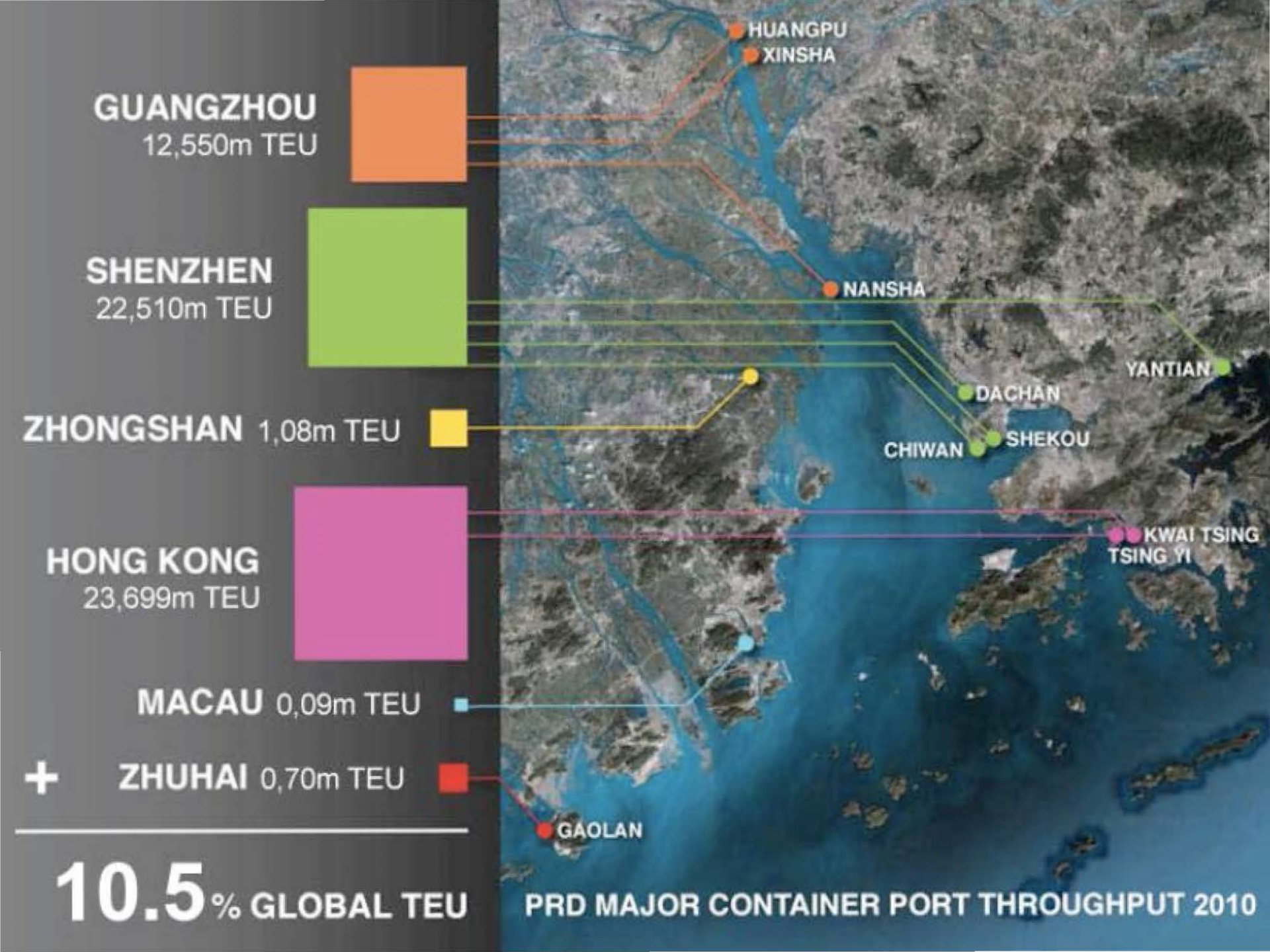
2010 年排放清單

2010 Emission Inventory

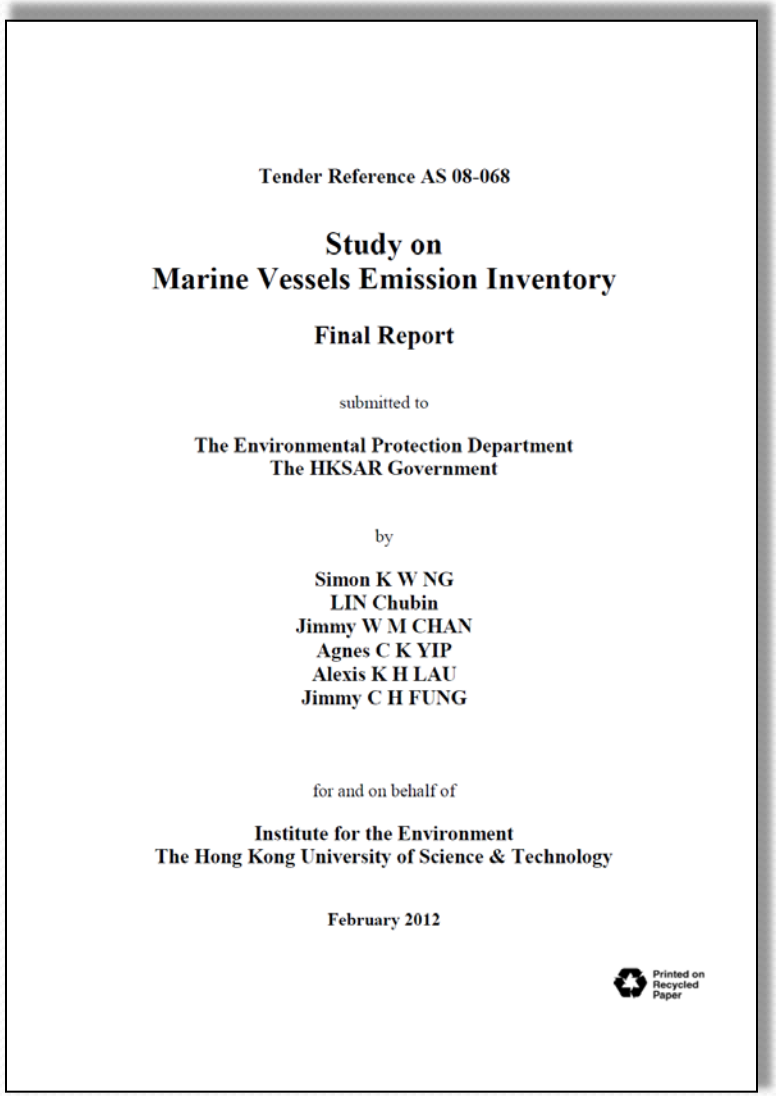


Ship emissions and urban air quality: SO_2
船舶排放與空氣質量：二氧化硫
Monthly means 月均濃度 (2001-2012)




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
HUANGPU
XINSHA
NANSHA
YANTIAN
DACHAN
SHEKOU
CHIWAN
KWAI TSING
TSING YI
GAOLAN
PRD MAJOR CONTAINER PORT THROUGHPUT 2010

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

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

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- ship emission inventory for Hong Kong

香港船舶排放清單

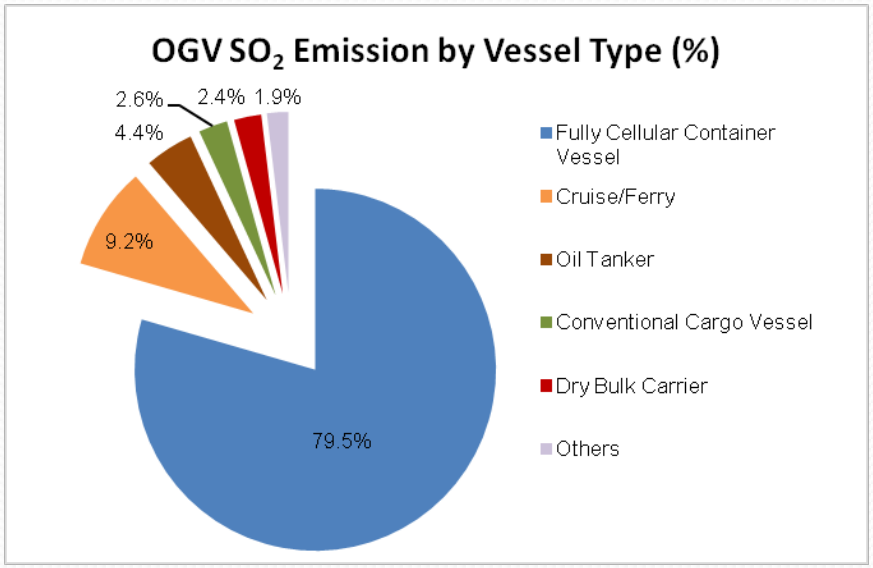
- 2007 as base year

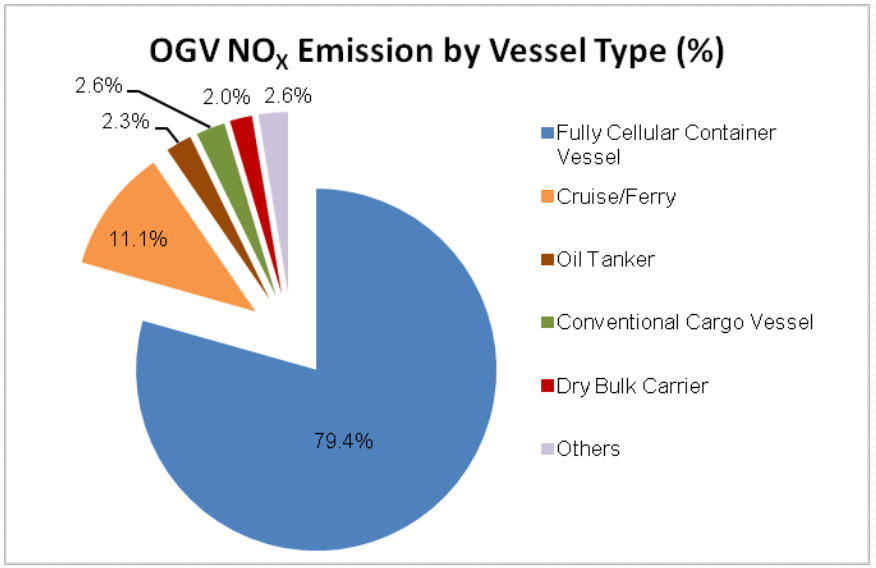
2007年為基礎年

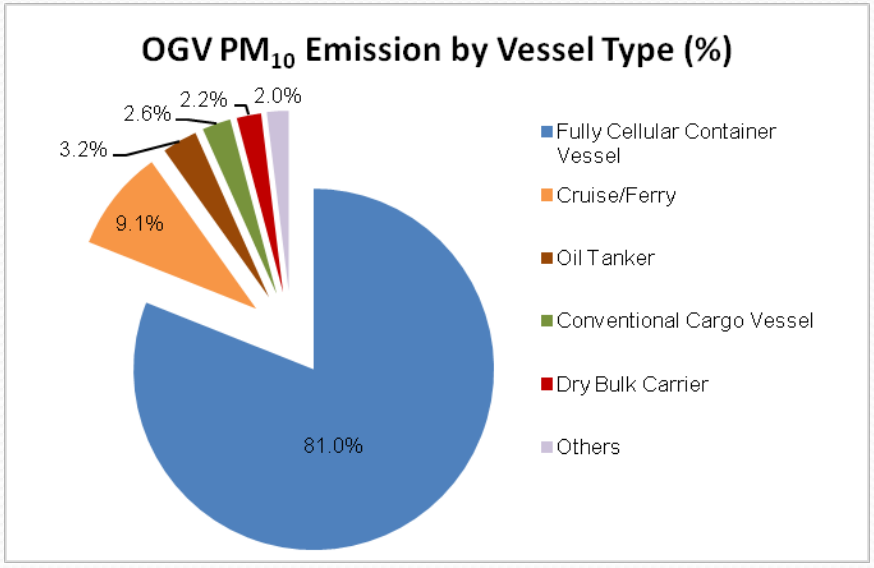
- activity-based approach

以動力法計算排放

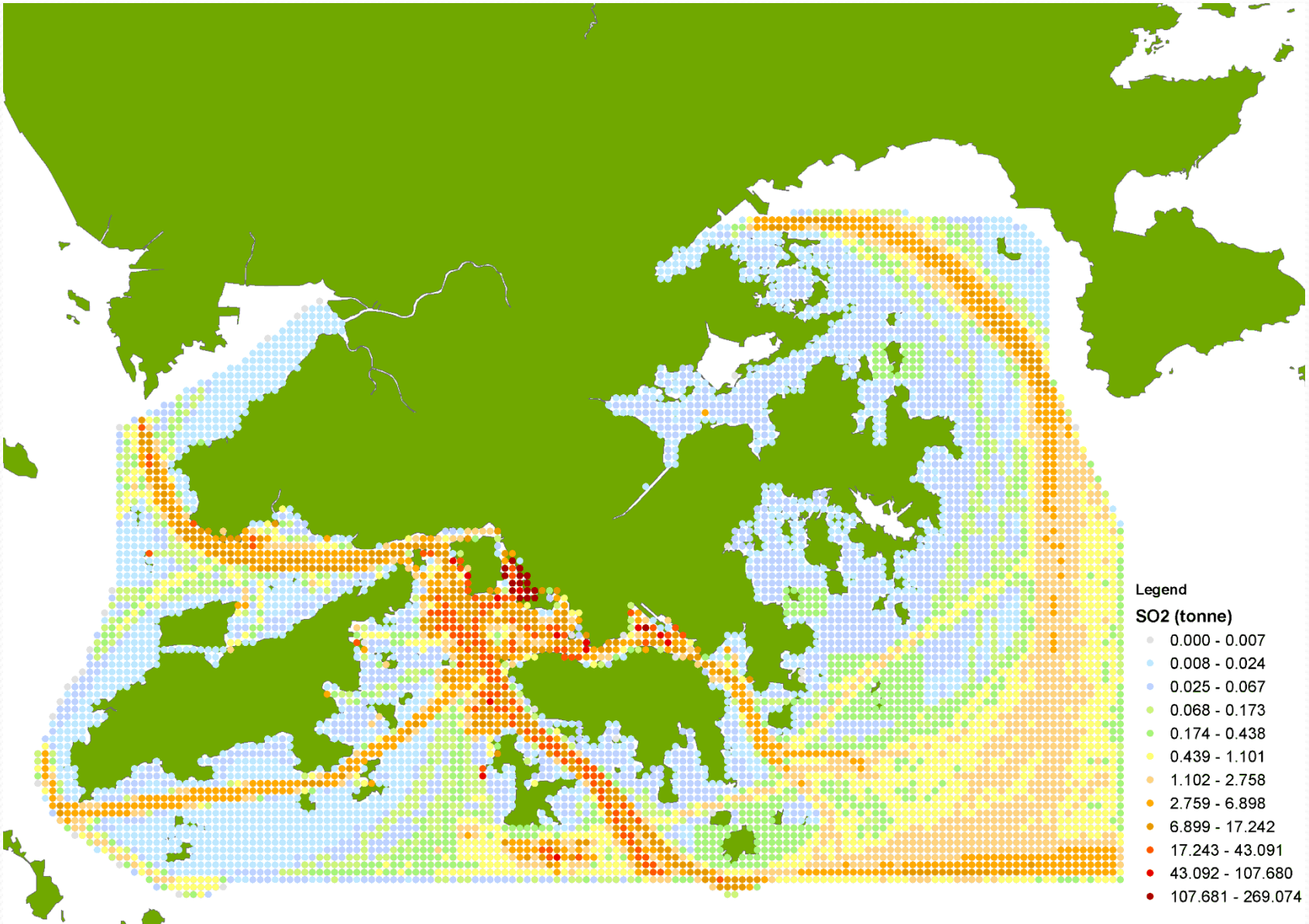
OGV emissions by vessel type
按船舶類別劃分的遠洋船排放佔有率



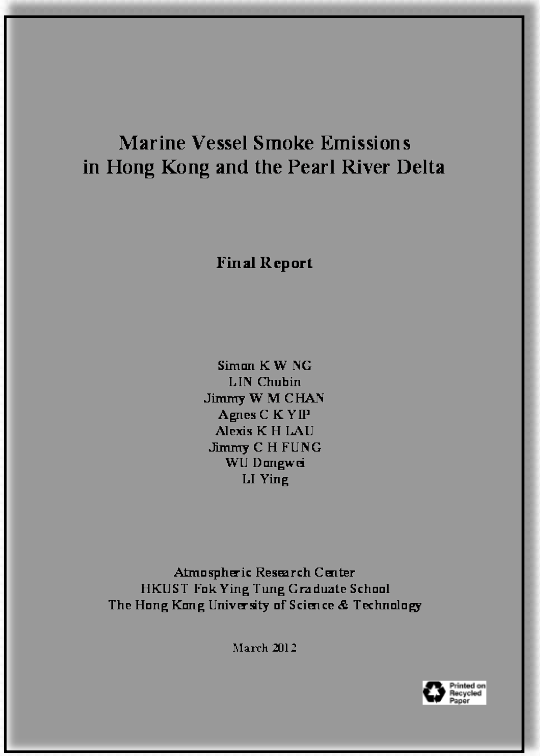




Spatial distribution of ship emissions 2007
2007年船舶排放的空間分佈



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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Atmospheric Research Center
HKUST Fok Ying Tung Graduate School
The Hong Kong University of Science & Technology

March 2012

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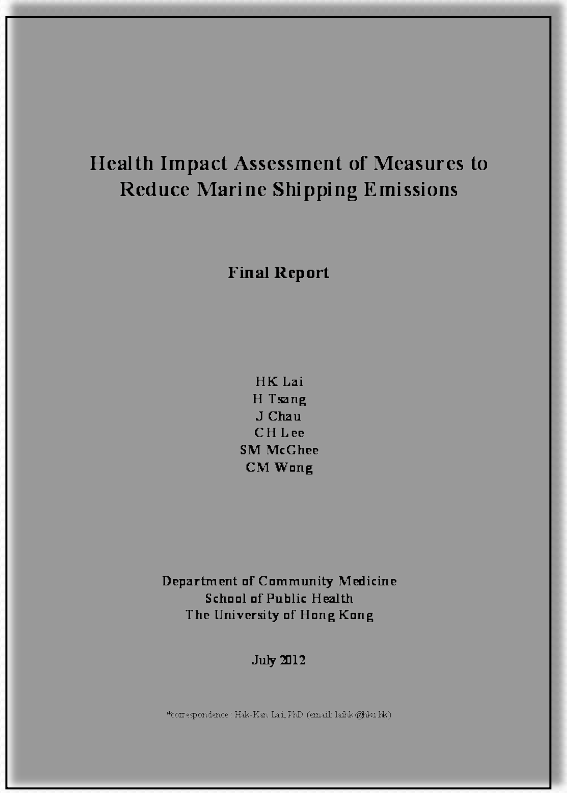
Health Impact Assessment of Measures to
Reduce Marine Shipping Emissions

Final Report

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July 2012

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香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF PUBLIC HEALTH
THE UNIVERSITY OF HONG KONG
香港大學公共衛生學院

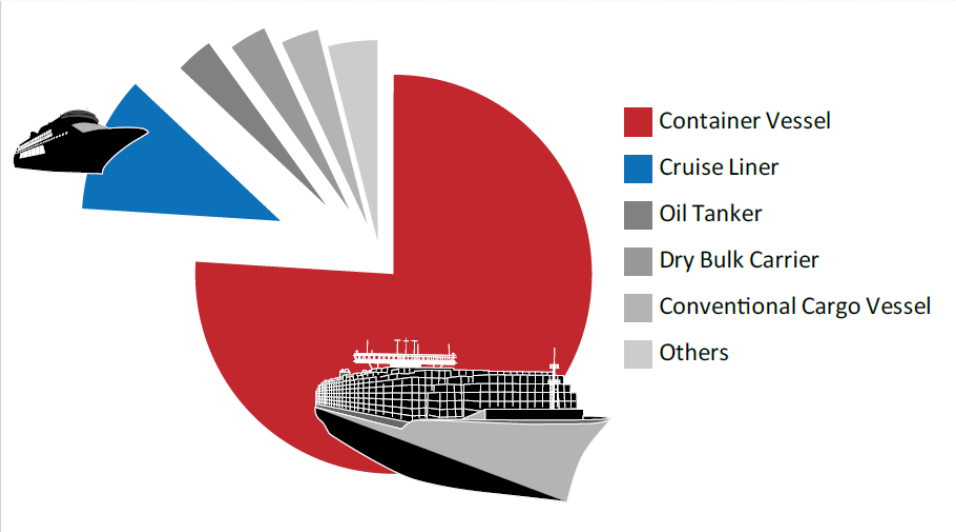
思匯
CIVIC EXCHANGE

Emission inventory 排放清單 → **Dispersion 擴散** → **Health impact 健康影響** → **Policy recommendation 政策建議**

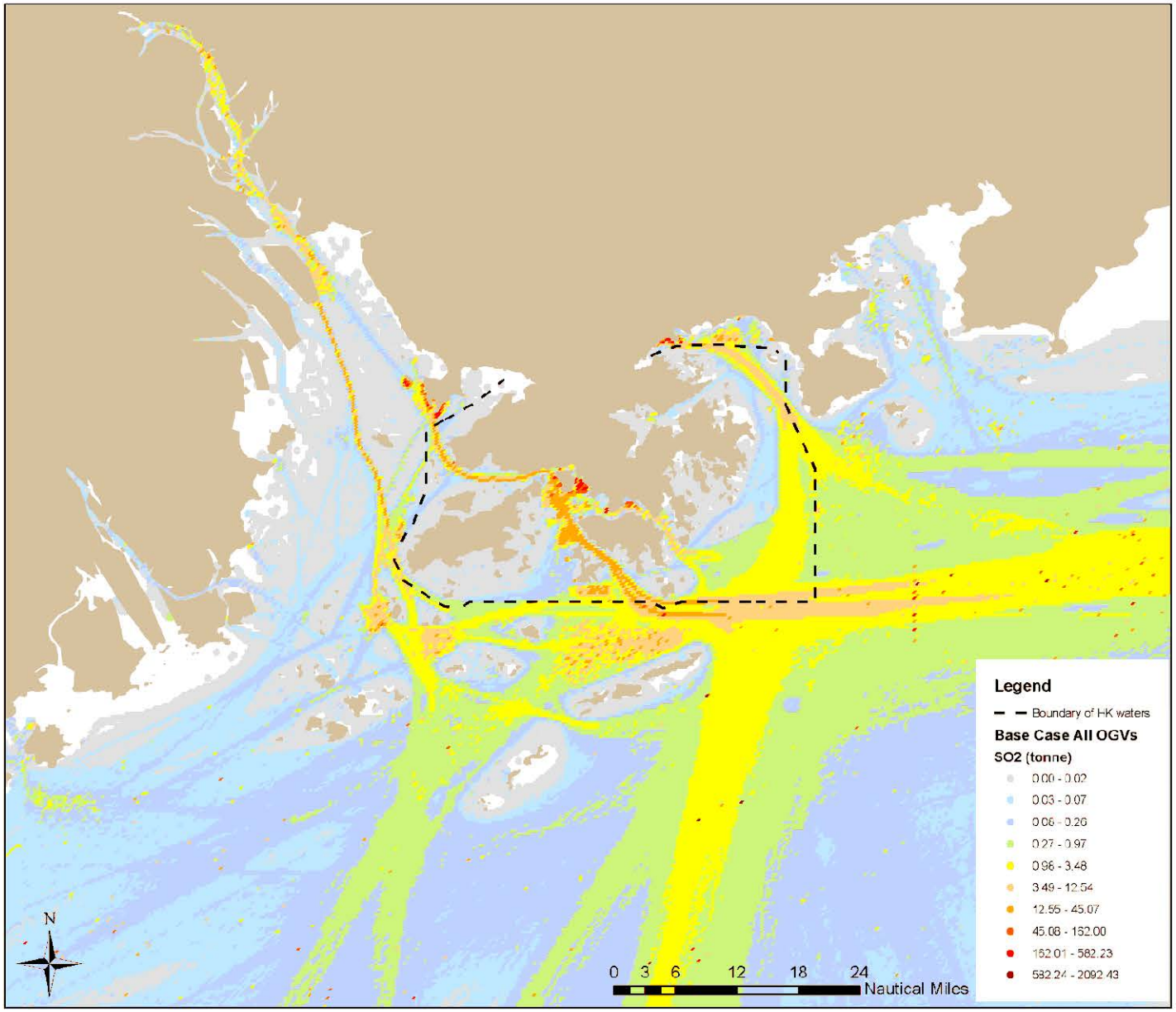
2008 OGV emissions inventory
2008年遠洋船排放清單

(tonne 噸)

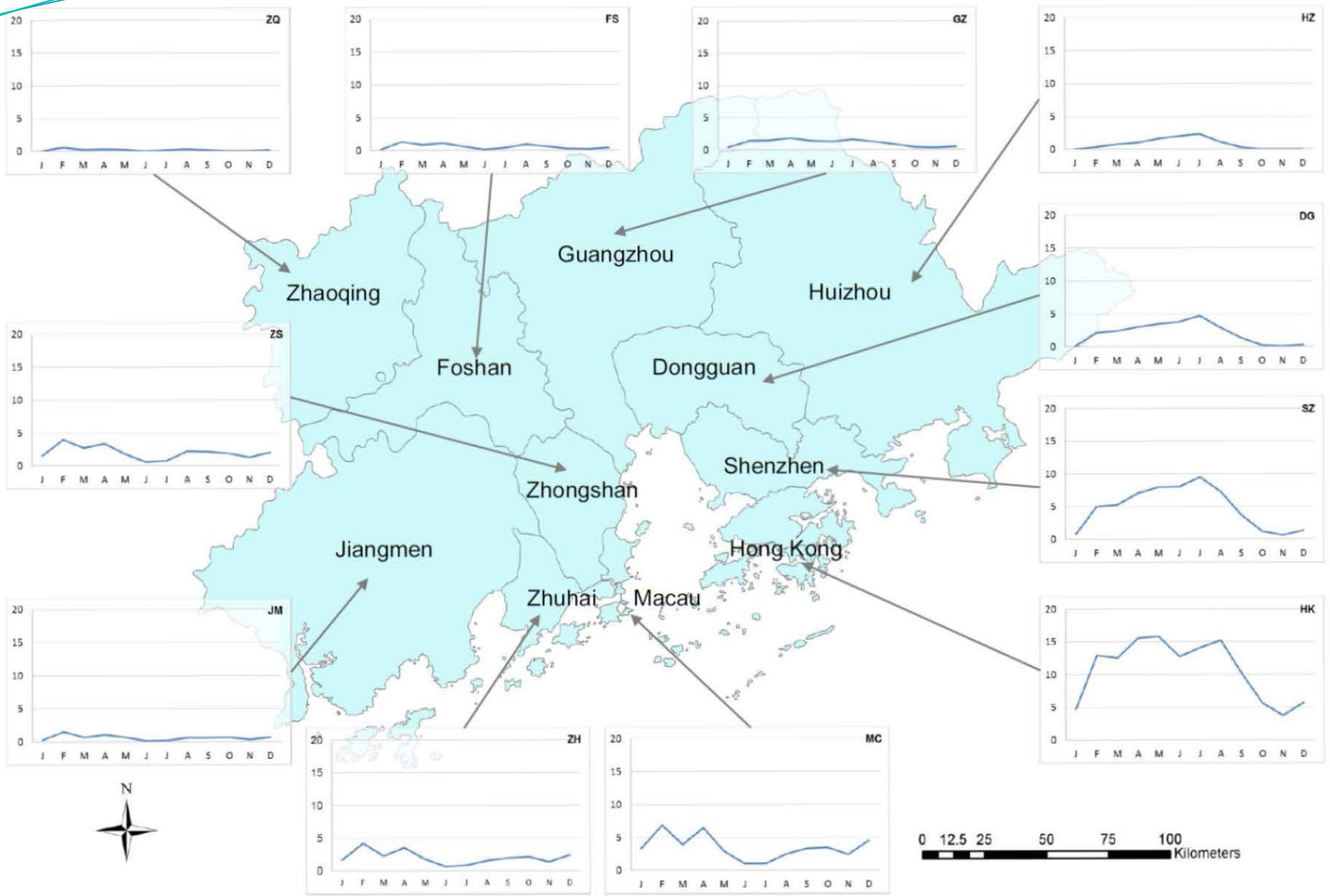
	SO_2	NO_X	PM_{10}	$PM_{2.5}$	VOC	CO
Within Hong Kong waters	16,489.3	17,900.7	1,870.3	1,720.7	753.6	1,749.1
Outside Hong Kong waters but within 100 nm from Hong Kong	125,430.4	163,412.4	14,563.0	13,397.9	5,808.4	14,914.3
Total	**141,919.7**	**181,313.1**	**16,433.2**	**15,118.6**	**6,562.0**	**16,663.4**



Spatial distribution (baseline) 基線空間分佈



Dispersion 污染物擴散



Monthly average SO_2 concentrations attributable to ship emissions, 2008

Control scenarios 管制方案

FWC
0.5% sulphur

Control measure 1

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

HK
0.1% sulphur

Control measure 2

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

ECA
0.1% sulphur

Control measure 3

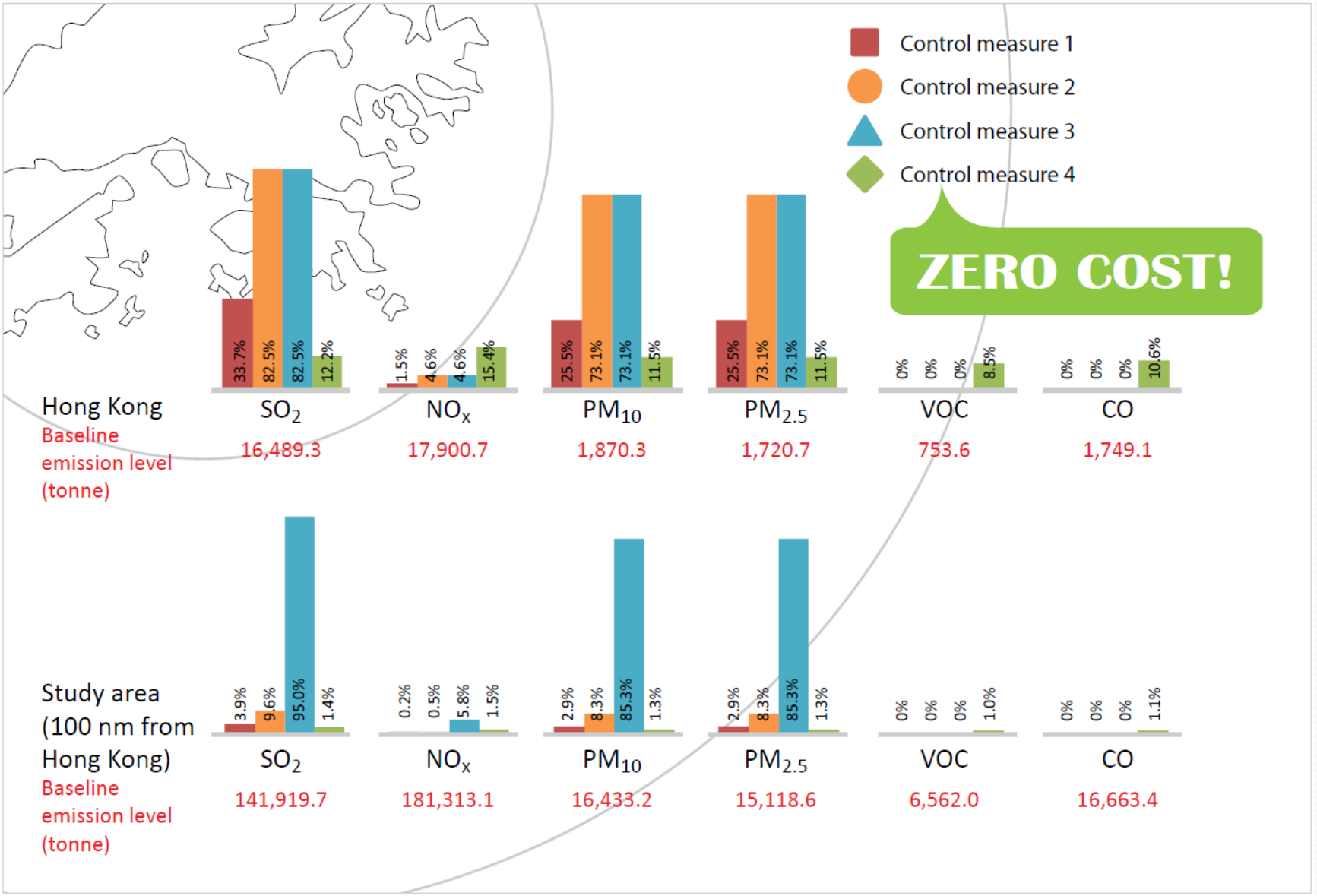
ECA (all vessels switching to 0.1% sulphur fuel within 100 nm of Hong Kong)

Slow

Control measure 4

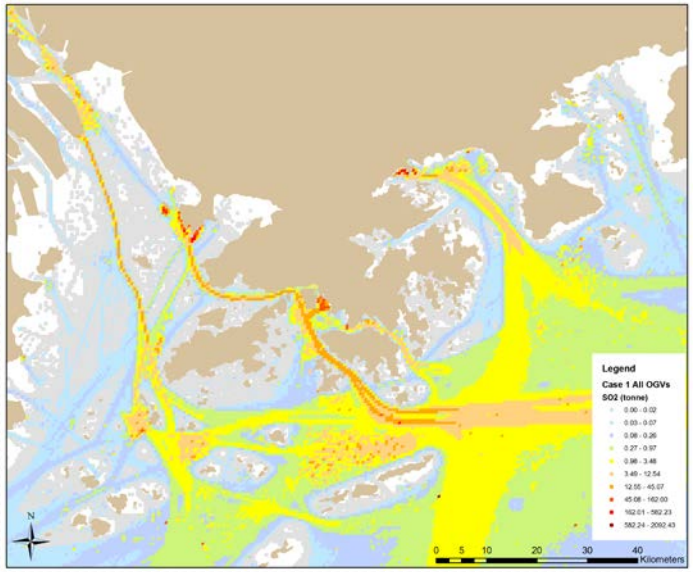
Vessel speed limit at 12 knots in Hong Kong waters for OGVs

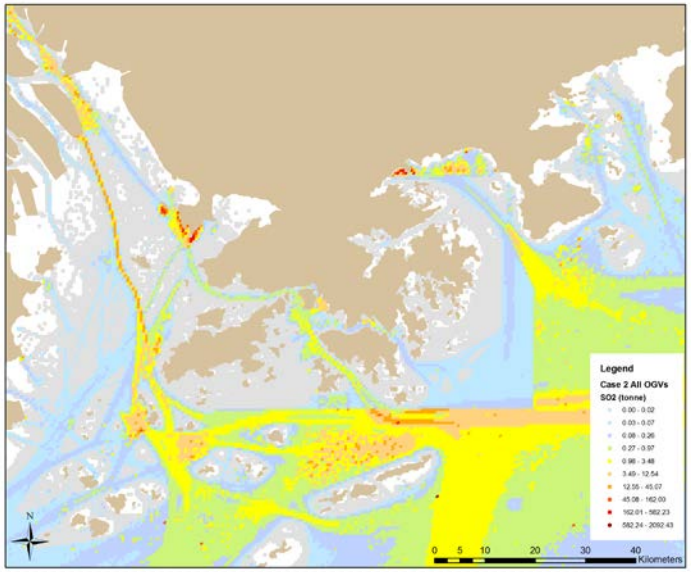
Emission reduction benefits 減排效益



Emission maps under 4 control cases
管制方案下的排放分布圖

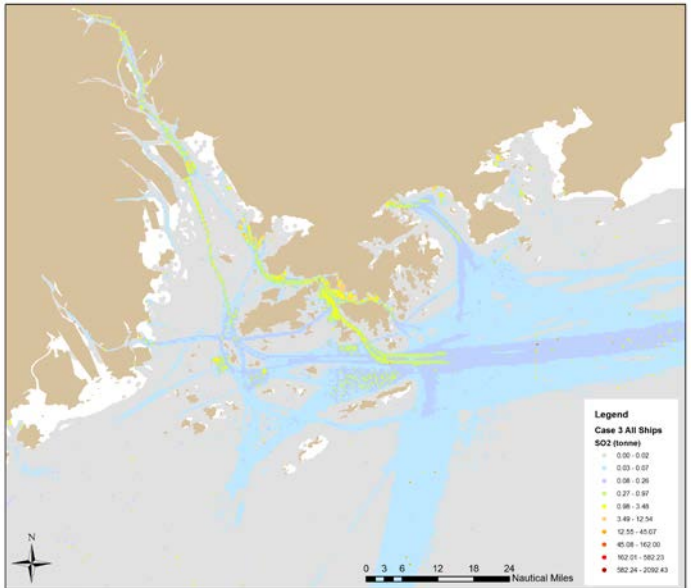
FWC
0.5% sulphur

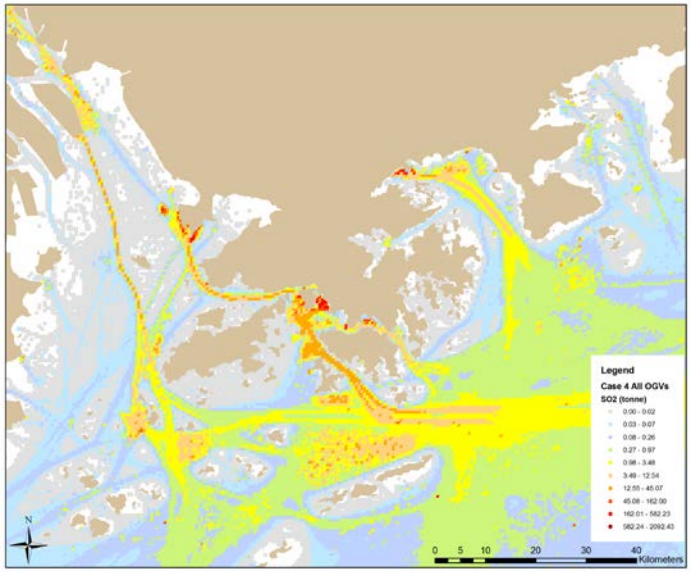




HK
0.1% sulphur

ECA
0.1% sulphur





Slow

Health impacts 健康影響

		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%)

- Hong Kong bearing 74% of the impact of ship emissions

香港承受了船舶污染74%的健康影響

- ECA bringing most health benefits to PRD

排放控制區將爲珠三角地區的公衆健康帶來最大裨益

Policy recommendations 政策建議

- **A PRD ECA 珠三角排放控制區**
  - reduce SO_2 by 95% 減少95%二氧化硫
  - Reduce PM by 85% 減少85%懸浮粒子
  - reduce excess deaths by 91% 減少91%額外死亡個案
- Fuel switching and vessel speed reduction

轉油及船舶減速

  - short and medium term measures 短、中期措施
- Hong Kong should take the lead, and work with Guangdong / Macau under current framework

香港應帶頭推動船舶減排，並與廣東省及澳門政府在現有框架下合作

Voluntary industry-led initiatives 業界自願措施

Fair Winds Charter 乘風約章

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 :

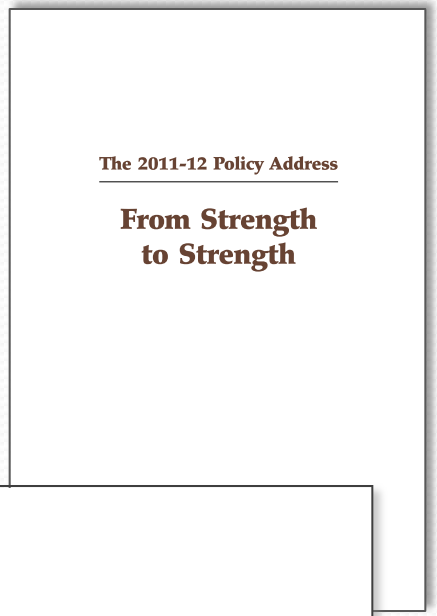
- Urge the Hong Kong SAR Government to take a lead and work with the Guangdong Government to regulate the use of low sulphur fuel in the Pearl River Delta region by 31 December 2012. Urge the Hong Kong SAR Government to encourage broader industry participation by providing incentives, as it has done 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 COSCO

ALIANÇA APL Crystal Cruises CMA CGM EVERGREEN LINE HAMBURG SÜD Hapag-Lloyd HÖEGH AUTOLINERS

韓進海運 HANJIN SHIPPING HMM MAERSK LINE MOL Mitsui O.S.K. Lines NYK LINE OOCL We take it personally Prestige Cruise Holdings YANG MING

Chief Executive's Policy Address, 2011-12
香港行政長官施政報告 2011-12



Clean Fuels for Vessels

128. We will explore with the governments of Guangdong, Shenzhen and Macao proposals for requiring ocean-going vessels to switch to low-sulphur diesel while berthing in Pearl River Delta (PRD) waters, and setting up an Emission Control Area in PRD waters. We will also study, in collaboration with the relevant trades, ways to improve the quality of vessel fuels sold locally to reduce vessel emissions.

Government incentive scheme for OGVs
港口設施及燈標費寬減計劃

Public Consultation
Study Reports
Guidelines & References
Advanced Search

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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.

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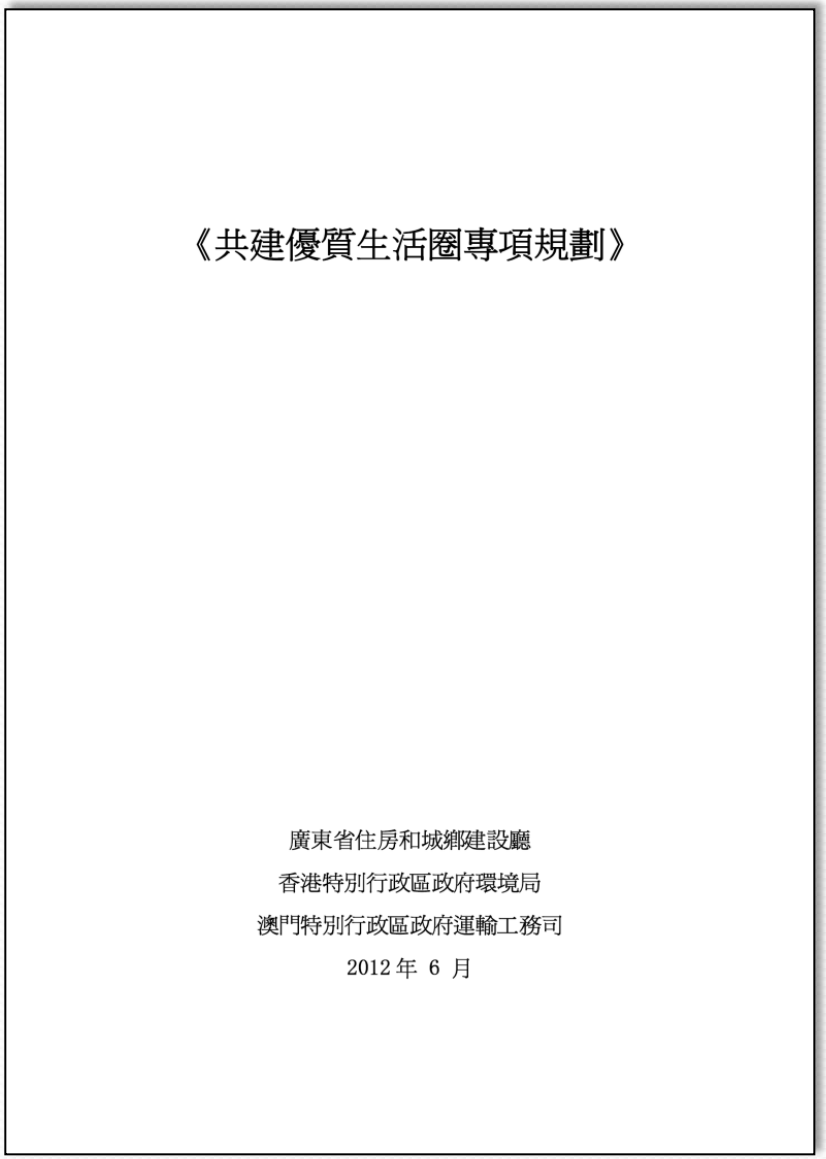
Regional Cooperation Plan, June 2012
共建優質生活圈專項規劃 2012年6月


《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.

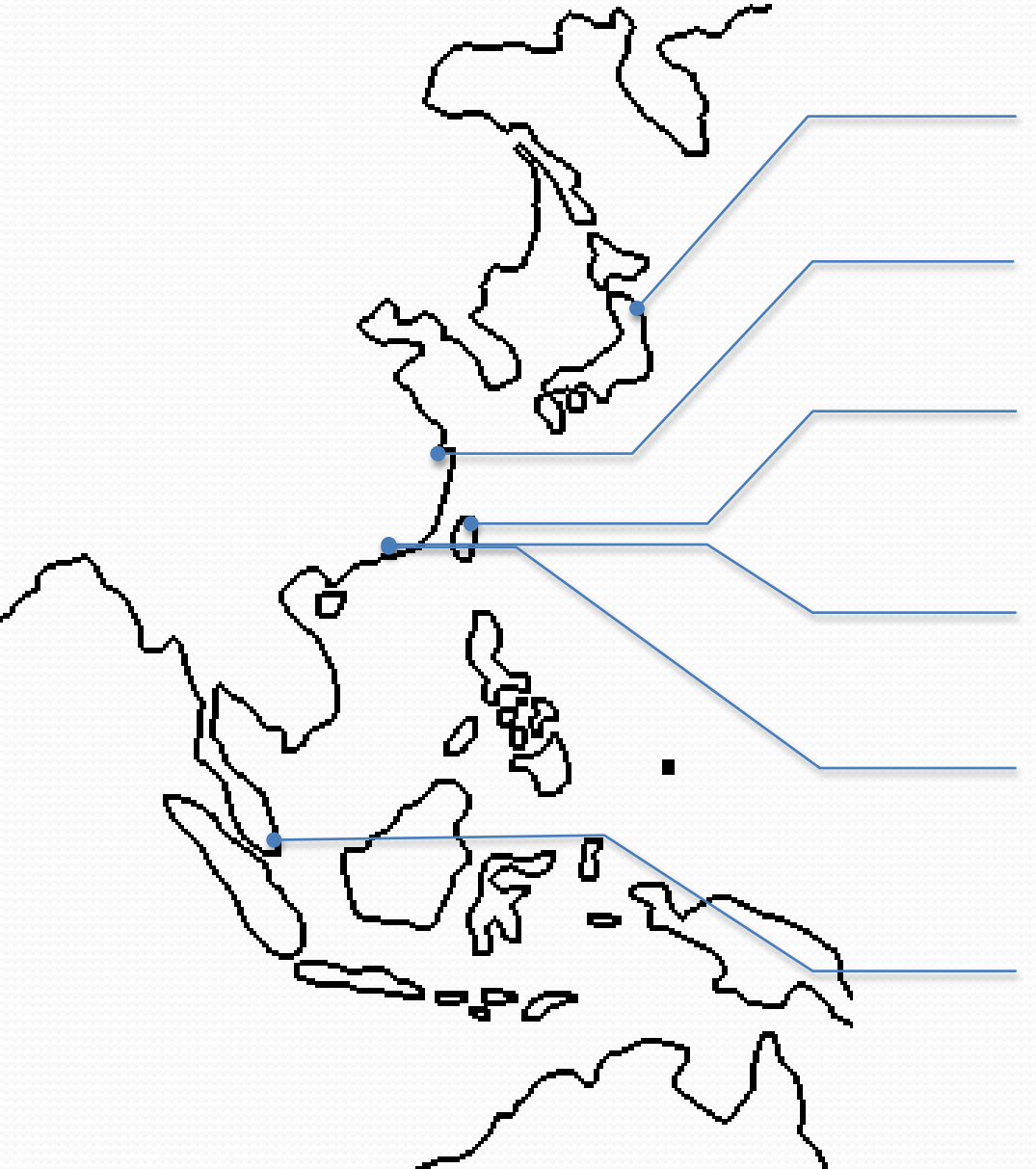
(4) Exploring opportunities in controlling air pollutant emissions from vessels in the Greater PRD waters

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.**

Regional Collaboration 區域協作



Japan
- MILT reviewing possible ECA

Shanghai
- Emissions Inventory and Policy

Taiwan
- Fuel switch & slow steam
- Emissions Inventory

Shenzhen & Guangzhou
- Green Ports activities
- Shore power

Hong Kong
- Fair Winds Charter
- EPD Ship Emissions Inventory

Singapore
- Green Port Programme