

# **2010 Hong Kong Emission Inventory Report**

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Security Classification : Unrestricted

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**October 2012**

## **CONTENT**

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
<b>2</b>	<b>SCOPE OF EMISSION INVENTORY .....</b>	<b>1</b>
<b>3</b>	<b>2010 EMISSION INVENTORY .....</b>	<b>2</b>
<b>4</b>	<b>RECALCULATION OF HISTORICAL EMISSION INVENTORY .....</b>	<b>6</b>
<b>5</b>	<b>EMISSION TREND FROM 1997 TO 2010.....</b>	<b>7</b>
<b>6</b>	<b>COMPARISON OF PREVIOUS AND RECALCULATED EMISSION INVENTORY .....</b>	<b>12</b>
<b>7</b>	<b>EMISSION REDUCTION TARGETS .....</b>	<b>13</b>

### **Annexes**

**Annex 1 - Breakdown of emission inventory by source categories from 2008 to 2010**

**Annex 2 - Summary of revisions of emission inventory**

**Annex 3 - Comparison between the previous and recalculated inventories from 1997  
to 2007**

## **1. INTRODUCTION**

1.1 The emission inventory for Hong Kong was first uploaded to EPD's website in March 2000. Emission inventory provides essential information on the levels of air pollutant emissions for the formulation of air quality management strategy. It helps assess the effectiveness of emission control measures that are in implementation, identify areas where control actions should be stepped up, support air quality impact modeling and assessment, etc.

1.2 Making reference to international developments and technological advancement, we have been making effort to improve the methodology to compile emission inventory including the collection of supporting data with an aim to provide a better support to the management of our air quality. Whenever there are improved methods or more representative local data that can better account for the emissions, we will adopt them to update the emission inventory. We will also follow international practice to update as well the emission inventory for past years as far as practicable based on the improved method to enable meaningful emission trend analysis to be made.

1.3 This report presents the Hong Kong emission inventory from 2008 to 2010. In view of the adoption of improved methods for the compilation of emissions for some sources such as vessels and motor vehicles, we have recalculated the historical emission inventories from 1997 to 2007 based on the new methods. Changes made in the emission compilation methods are highlighted and comparisons between the historical and recalculated emission inventories are presented in Sections 4 and 6 in this report.

## **2 SCOPE OF EMISSION INVENTORY**

2.1 The emission inventory comprised five criteria air pollutants, namely: respirable suspended particulates (RSP), sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), volatile organic compounds (VOC), and carbon monoxide (CO).

2.2 Emissions are compiled according to specific source categories. The sources include power electricity generation, road transport, navigation, civil aviation, other fuel combustion sources and non-combustion sources.

### 3. 2010 EMISSION INVENTORY

3.1 The table below shows the emission inventory for 2010 under different emission source categories including public electricity generation, road transport, navigation, civil aviation, other fuel combustion sources and non-combustion sources. **Annex 1** shows a breakdown of emissions from various emission sources from 2008 to 2010.

#### **Breakdown of 2010 Emission Inventory**

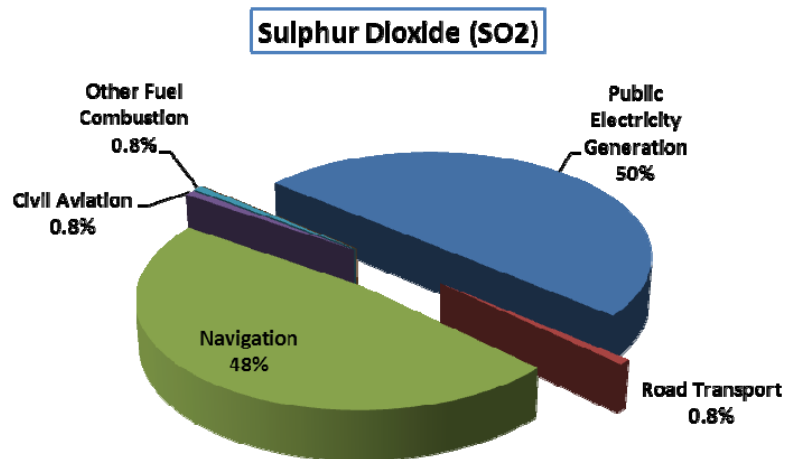
<b>Pollution Sources</b>	<b>SO<sub>2</sub></b>	<b>NO<sub>x</sub></b>	<b>RSP</b>	<b>VOC</b>	<b>CO</b>
Public Electricity Generation	17,800	27,000	1,010	413	3,310
Road Transport	286	32,700	1,340	7,900	47,600
Navigation	16,900	35,000	2,260	3,660	11,400
Civil Aviation	299	4,350	54	396	2,530
Other Fuel Combustion	268	9,520	778	849	5,100
Non-combustion	N/A	N/A	898	20,500	N/A
<b>Total Emission (Tonnes)</b>	<b>35,500</b>	<b>109,000</b>	<b>6,340</b>	<b>33,700</b>	<b>70,000</b>

Note: All figures were rounded to three significant figures.  
N/A denotes Not applicable

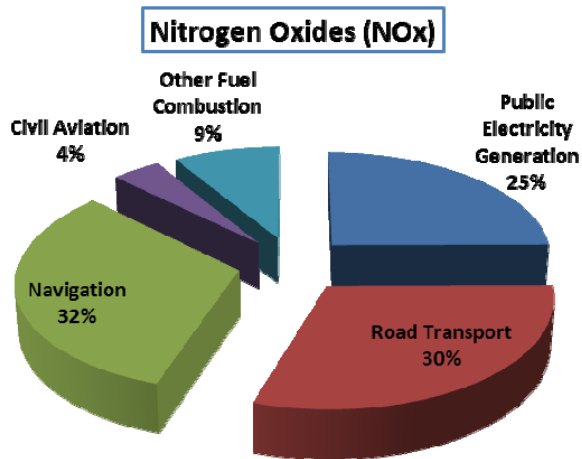
3.2 The major sources of SO<sub>2</sub> emissions in 2010 were public electricity generation and navigation, accounting for 50% and 48% of the total emission respectively. For NO<sub>x</sub>, the major emitters in 2010 were navigation (32%), road transport (30%) and public electricity generation (25%). RSP, similar to NO<sub>x</sub>, were mainly emitted from navigation (36%), road transport (21%) and public electricity generation (16%). Significant amounts of RSP were also emitted from non-combustion (14%) and other fuel combustion sources (12%). The major sources of VOC emissions included non-combustion sources (61%), road transport (23%) and navigation (11%). For CO, the major sources were road transport (68%) and navigation (16%).

3.3 The following pie charts show a breakdown of emissions for each pollutant in 2010 by source categories.

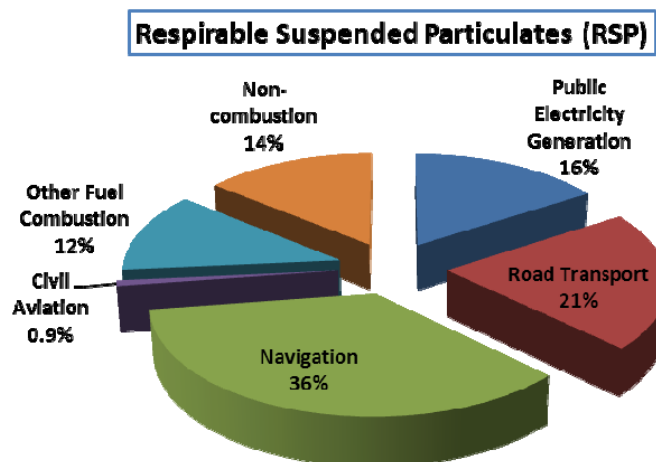
Total SO<sub>2</sub> emission = 35,500 Tonnes



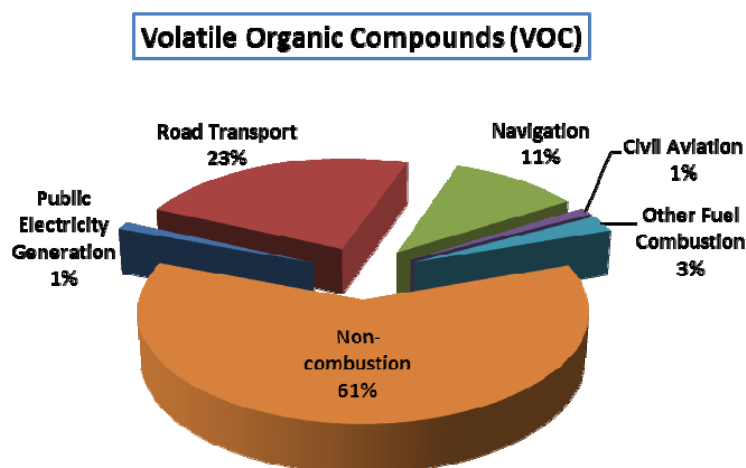
Total NO<sub>x</sub> emission = 109,000 Tonnes



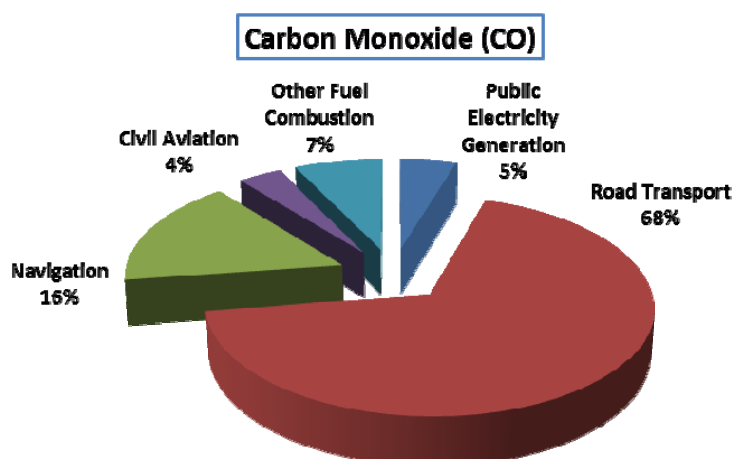
Total RSP emission = 6,340 Tonnes



Total VOC emission = 33,700 Tonnes



Total CO emission = 70,000 Tonnes



#### 4 RECALCULATION OF HISTORICAL EMISSION INVENTORY

4.1 Whenever there are improved methods or more representative local data that can better account for the emissions, we will adopt the latest information to update the emission inventory. We will also use the improved method to update the emission inventory for past years as far as practicable to enable a meaningful emission trend analysis to be made.

4.2 Recalculation of historical emission inventory is widely adopted in the European Community, California Air Resources Board (CARB), United Nations Environment Programme (UNEP), Intergovernmental Panel on Climate Change (IPCC), etc. when methods are changed or refined, when new sources categories are included in the inventory or when assumptions used in the estimates are revised.

4.3 Since the publication of emission inventory on EPD's website in 2000, EPD made a number of revisions in the emission compilation and recalculated the historical emissions. Changes in methodology and emission data over the years are tabulated in **Annex 2**.

4.4 After the compilation of the 2007 emission inventory in 2008, EPD has conducted studies on emissions from various sources including vessels and vehicles with a view to better reflecting the actual emissions. The studies encompass the use of latest methodologies and locally available data. The study results have been adopted in the compilation of emission inventory for 2010 as well as in the recalculation of historical emissions from 1997 to 2009. Major changes in the compilation of emission inventory are appended as follows.

- ◆ EPD commissioned a local university to conduct a comprehensive [study on marine emission inventory](#) in 2008. The study collected extensive local vessel activity data and reviewed the latest emission compilation methodologies adopted by advanced places such as the Port of Los Angeles of the USA. Sulphur contents of the fuels used by different types of vessels were considered. The study concluded that the emission compilation methodology now adopted by these advanced places can provide more realistic estimates of marine emissions. We have thus adopted the study findings and updated the previous emission inventory for marine vessels. Under the updated methodology, emissions from vessels were higher than our previous estimation.
- ◆ We have conducted emission measurements for on-road vehicles in recent years by means of remote sensing equipment and advanced portable emission measurement system. The measurements have provided a more robust basis for us to estimate vehicle emissions. They have also found that vehicles with inadequate maintenance, e.g., LPG vehicles with worn-out catalytic converters, could emit considerably higher than their normal levels. We have made use of the findings to upgrade our vehicle emission estimation model (the latest version is EMFAC-HK Version 2.1, released on EPD's website in April 2012), which is used for compiling vehicle emission inventory.
- ◆ Since the implementation of the Air Pollution Control (Volatile Organic Compounds) Regulation in April 2007, we have used the sales report data submitted by importers under the Regulation to compile VOC emissions of regulated products such as six types of consumer products, printing inks, paints, adhesives and sealants. Emissions from cleansing solvents during the application of paints have also been estimated. We also made reference to studies by a local University on printing industry, solvent

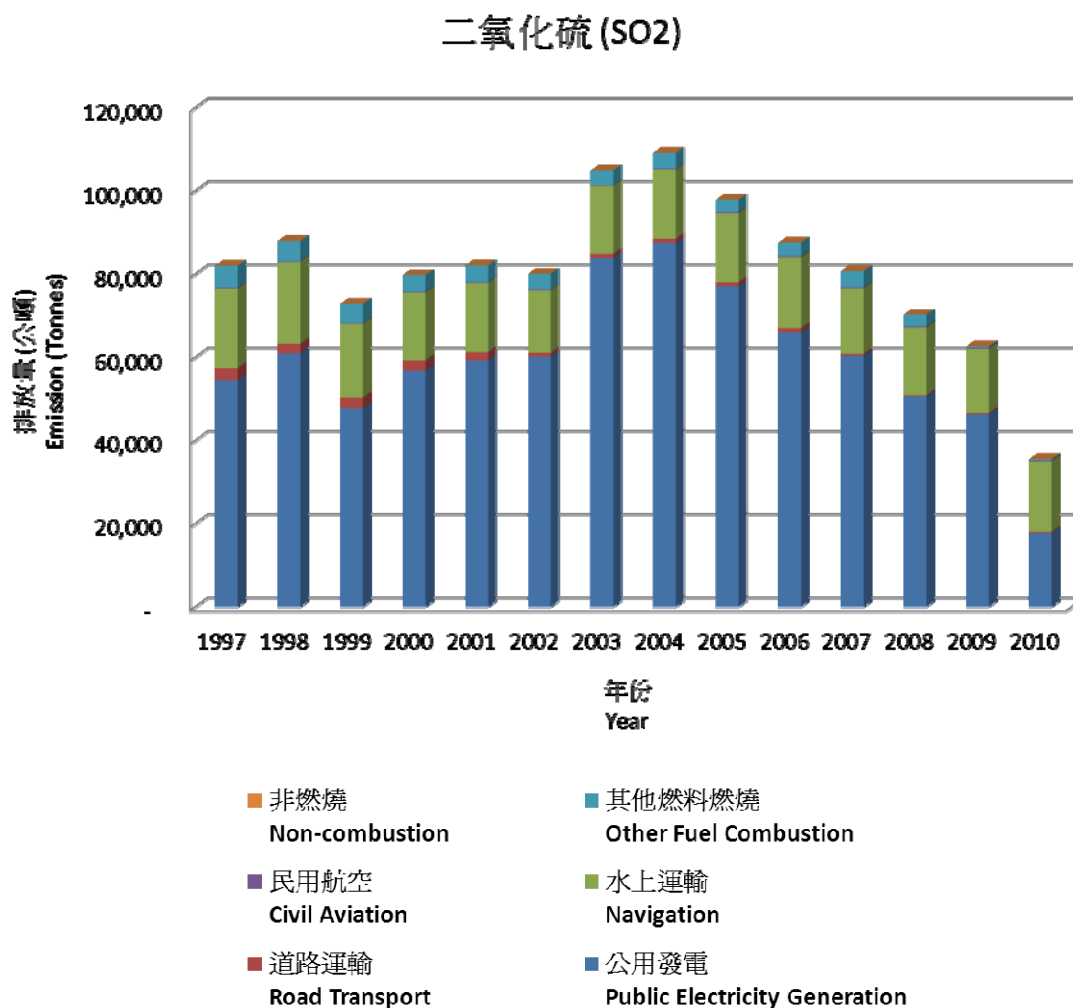
usage for coatings and VOC containing products, and survey data for marine paints to assess emissions from VOC containing products.

- ◆ We adopted aircraft engine data from the Emission and Dispersion Modeling System (EDMS) Version 5.1.3 which was released in November 2010 in compiling emissions from different types of aircraft arriving at and departing from the Hong Kong International Airport. We also considered emissions from auxiliary power units when parking at the airport for maintenance, cleaning and loading and unloading of freights.
- ◆ Emission factors of non-road mobile equipment have been revised based on a local survey completed in 2012 on power ranges and ages of non-road mobile equipment and vehicles operating at the closed area within the airport, container terminal and construction site. Information was also collected from the trade.
- ◆ Emission inventory has been supplemented with new emission sources such as new organic liquid storage tanks, construction sites and cooking processes.



## 5 EMISSION TREND FROM 1997 TO 2010

### SO<sub>2</sub> Emission Trend

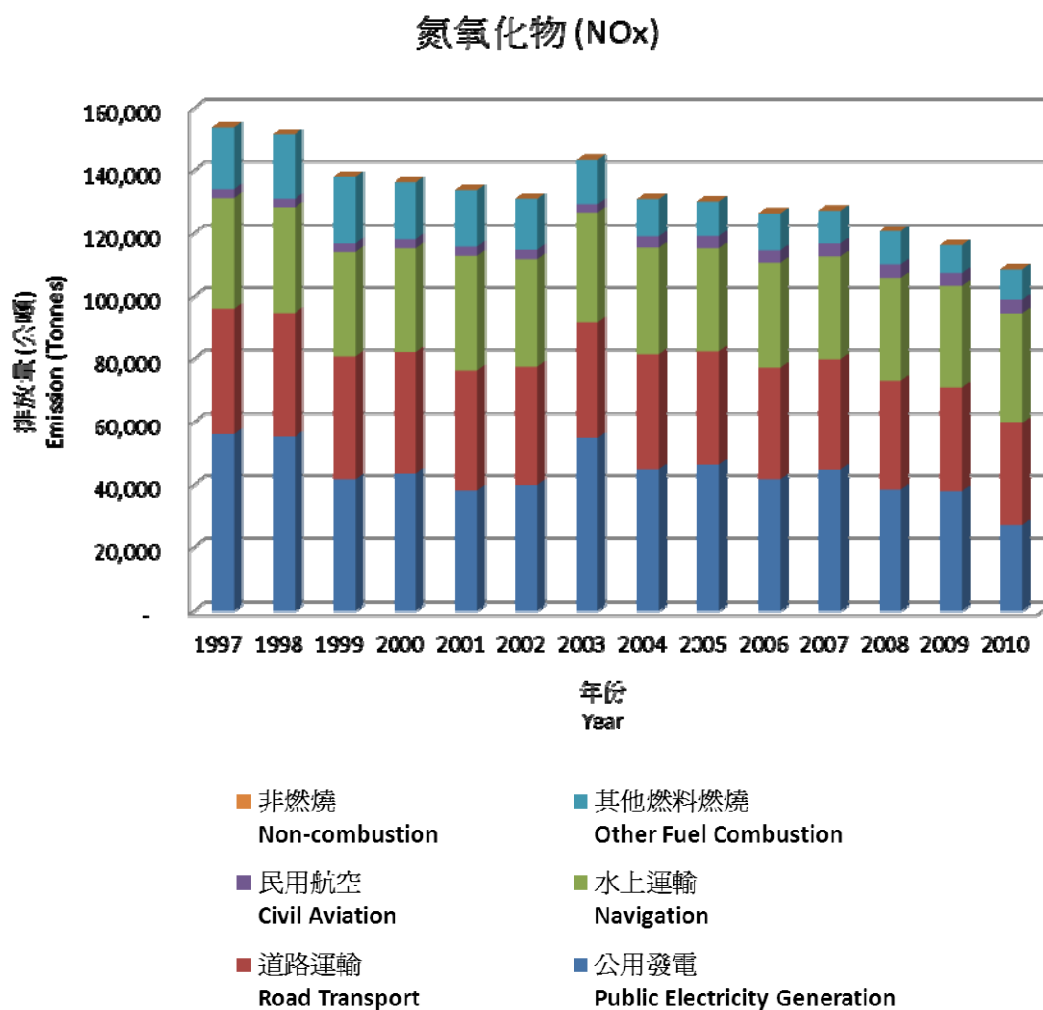


5.1 Public electricity generation is the primary source of SO<sub>2</sub> emission. It contributed about 50% of Hong Kong's total emission in 2010. Since 2005, we have imposed on power plants statutory emission caps that are progressively tightened as far as practicable. Power companies were also required to increase the use of clean fuel and retrofit emission abatement devices in their generation units. Subsequent to the increased use of natural gas and low emission coals in electricity generation and the full operation of flue gas desulphurization (FGD) units at coal-fired generation units, SO<sub>2</sub> emissions from power plants had been substantially reduced by 77%, from 77,100 tonnes in 2005 to 17,800 tonnes in 2010.

5.2 Most ocean-going vessels (OGVs) nowadays burn heavy fuel oil while cruising and berthing. Because of the high sulphur content of heavy fuel oil (up to a maximum 3.5%), SO<sub>2</sub> emissions from marine vessels became the second largest source of SO<sub>2</sub> emission following power plants and accounted for 48% of the total emissions in 2010.

5.3 The use of clean fuel with low sulphur content has substantially reduced emissions from fuel combustion processes. For instance, the cap on the sulphur content of diesel used in industrial and commercial sectors was tightened in October 2008 from 0.5% by weight to 0.005% (i.e. the level of ultra-low sulphur diesel). Since December 2007, SO<sub>2</sub> emissions from vehicles had been substantially reduced after the introduction of Euro V diesel, whose sulphur content is capped at 0.001%, on the local market.

### NOx Emission Trend



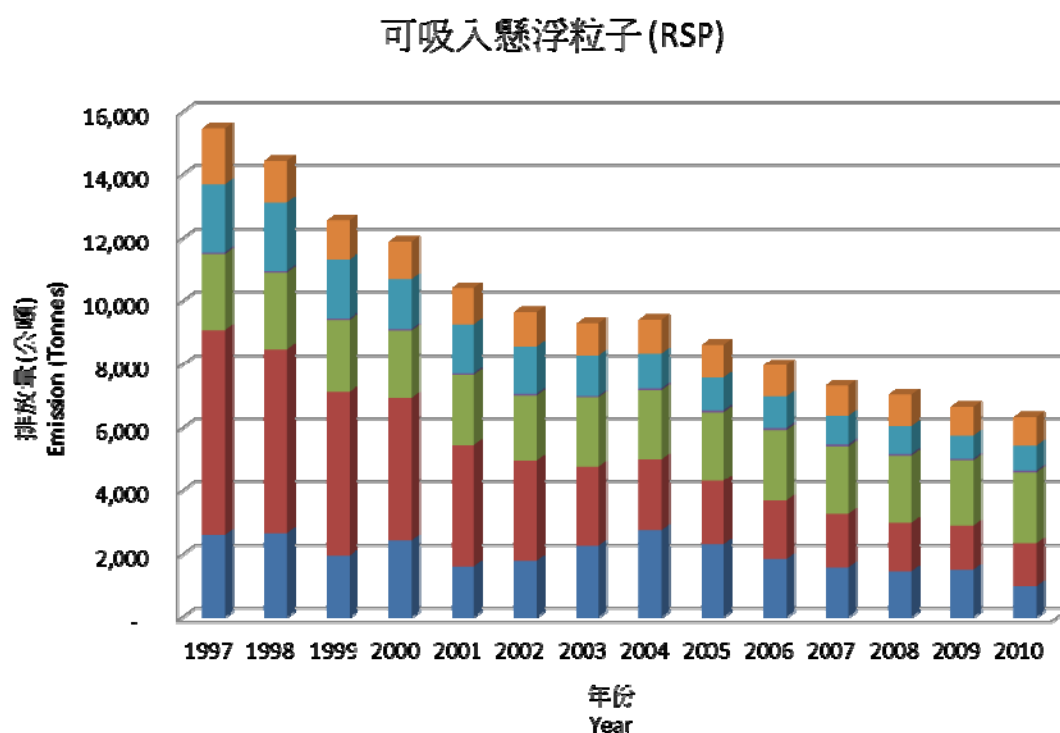
5.4 Public electricity generation was a major source of NO<sub>x</sub> emissions. It contributed to 25% of the total NO<sub>x</sub> emission in 2010. The emission caps on power plants since 2005 have also covered NO<sub>x</sub>. To meet the NO<sub>x</sub> emission caps, the power companies would have to increase the use of natural gas and retrofit NO<sub>x</sub> abatement devices at coal-fired generation units. As a result, NO<sub>x</sub> emissions from power plants had been reduced by 42%, i.e. from 46,400 tonnes in 2005 to 27,000 tonnes in 2010.

5.5 Vehicles were a major NO<sub>x</sub> emission source. The NO<sub>x</sub> emission accounted for 30% of the total emission in 2010 and has a direct impact on roadside air quality. To reduce the emissions, vehicle emission standards had been progressively tightened from Euro III in

2001 to Euro V in 2012. Apart from mandating the retrofit of emission reduction device to pre-Euro diesel vehicles, various incentive schemes have been launched since 2007 to encourage owners to early phase-out their pre-Euro, Euro I and Euro II diesel commercial vehicles or to use environment-friendly vehicles to further reduce the emissions.

5.6 The rapid economic developments in the PRD region have increased the activities of cargo and passenger vessels in Hong Kong waters. Over the years, emission from navigation was on an increasing trend. Subsequent to the implementation of control measures to reduce emissions from power plants and vehicles, marine vessels became the largest NOx emission source and accounted for 32% of the total emission in 2010.

### RSP Emission Trend



- 非燃燒  
Non-combustion
- 其他燃料燃燒  
Other Fuel Combustion
- 民用航空  
Civil Aviation
- 水上運輸  
Navigation
- 道路運輸  
Road Transport
- 公用發電  
Public Electricity Generation

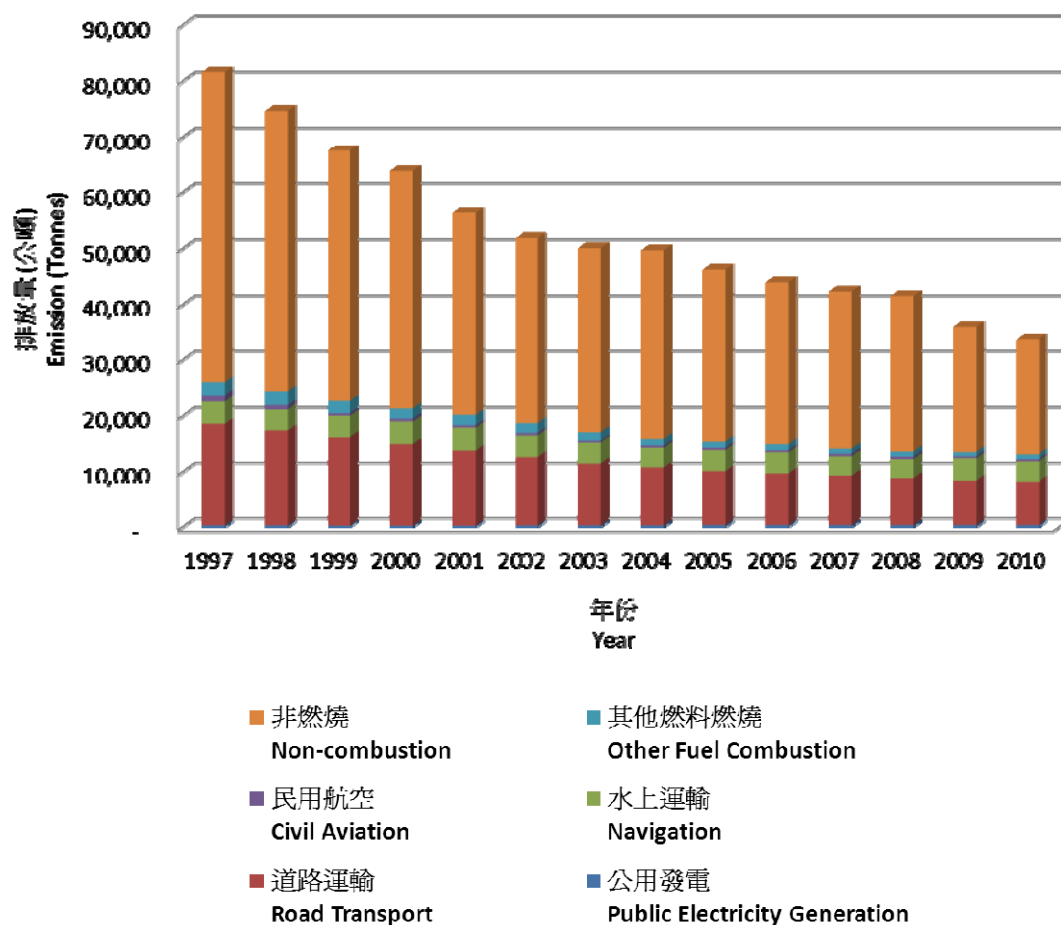
5.7 Most ocean-going vessels (OGVs) nowadays burn heavy fuel oil while cruising and berthing. OGVs are a significant source of particulates because of the use of heavy fuel oil. Subsequent to the implementation of control measures to reduce emissions from power plants and vehicles, marine vessels became the largest RSP emission source and accounted for 36% of the total emissions in 2010.

5.8 Public electricity generation is a major RSP emission source. It contributed about 16% of total RSP emission in 2010. The emission caps on power plants since 2005 have also covered RSP. To meet the RSP caps, the power companies would have to increase the use of natural gas and low emission coals in electricity generation. As a result, RSP emissions from power plants had been reduced by 56%, i.e. from 2,320 tonnes in 2005 to 1,010 tonnes in 2010.

5.9 Road transport is also a major RSP emission source. RSP emission from vehicles accounted for 21% of the total emission in 2010. The government had progressively tightened vehicle emission standards from Euro III in 2001 to Euro V in 2012. Apart from mandating the retrofit of emission reduction device to pre-Euro diesel vehicles, various incentive schemes have been launched since 2007 to encourage owners to early phase-out their pre-Euro, Euro I and Euro II diesel commercial vehicles or to use environment-friendly vehicles to further reduce the emissions.

### VOC Emission Trend

#### 揮發性有機化合物 (VOC)

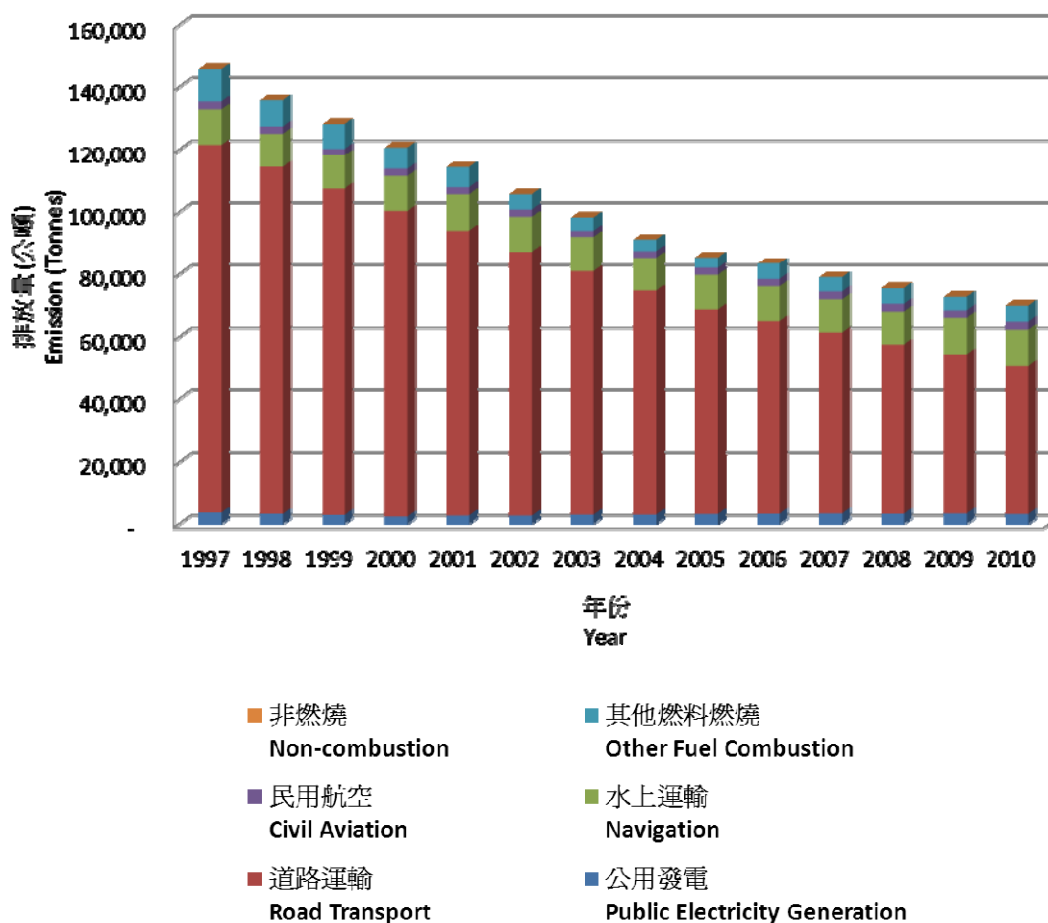


5.10 VOCs play a significant role in the formation of ozone and fine particulates in the atmosphere causing smog and reducing visibility. To reduce VOC emissions, we introduced in April 2007 the Air Pollution Control (Volatile Organic Compounds) Regulation to prohibit in phases (from 2008 to 2010) import and local manufacture of six categories of consumer products, fifty one types of architectural paints and seven types of printing inks with VOC contents exceeding the legal limits and control emissions from lithographic heatset web printing machines. The Regulation was amended in 2009 to bring more products (adhesives and sealants, vehicle refinishing paints, vessel paints and pleasure craft paints) into control in phases starting from January 2010. In 2010, paints, printing and consumer products contributed to about 49% of the total VOC emissions.

5.11 Road transport is a major VOC emission source, contributing to 23% of total VOC emission in 2010. The introduction of the evaporative emission standard for newly registered vehicles in 1999 and the progressive tightening of vehicle emission standards from Euro III in 2001 to Euro V in 2012 had reduced the petrol vapour emission from petrol vehicles. The incentive schemes encouraging owners to early phase-out their pre-Euro, Euro I and Euro II diesel commercial vehicles or to use environment-friendly vehicles also help reduce VOC emissions.

## CO Emission Trend

### 一氧化碳 (CO)



5.12 Road transport is a major CO emission source, contributing to 68% of total CO emission in 2010. The progressive tightening of vehicle emission standards from Euro III in 2001 to Euro V in 2012 had significantly reduced the CO emission. The various incentive schemes encouraging owners to early phase-out their pre-Euro, Euro I and Euro II diesel commercial vehicles or to switch to new environment-friendly vehicles also help reduce the emissions.

## 6 COMPARISON OF PREVIOUS AND RECALCULATED EMISSION INVENTORY

6.1 Based on the revisions mentioned in Section 4, we have recalculated historical emission inventories. Nevertheless, there are few vehicle measurement data for aged vehicles and that the use of recent measurement data by using remote sensing equipment or the PEMS to back cast historical vehicles emissions up to 1990 could induce great uncertainties. Therefore, historical vehicle emissions from 1990 to 1996 have not been recalculated. Comparisons between the previous and recalculated inventories from 1997 to 2007 are shown in Annex 3.

## 7 EMISSION REDUCTION TARGETS

7.1 The HKSAR Government reached a consensus with the Guangdong Provincial Government in April 2002 to reduce, on a best endeavour basis, the emissions of SO<sub>2</sub>, NO<sub>x</sub>, RSP and VOC in the Pearl River Delta (PRD) Region<sup>1</sup> by 40%, 20%, 55% and 55% respectively by 2010, using 1997 as the base year.

7.2 The HKSAR Government implemented a series of control measures to achieve the 2010 emission reduction targets. Key emission reduction control measures include:

- Since 2005, we have imposed on power plants statutory emission caps that are progressively tightened as far as practicable. To meet the emissions caps in 2010, power plants have implemented measures to reduce the emissions of SO<sub>2</sub>, NO<sub>x</sub> and RSP by increasing the use of natural gas and low emission coals in electricity generation, retrofitting coal-fired generation units with flue gas desulphurization units, low NO<sub>x</sub> burners and selective catalytic convertors.
- To reduce emissions from vehicles, emission standard was tightened to Euro IV in October 2006. Euro V diesel was introduced to Hong Kong in December 2007 to further reduce SO<sub>2</sub> emissions from vehicles. Since 2007, the Government launched various one-off grants encouraging owners to early phase-out their pre-Euro, Euro I and Euro II diesel commercial vehicles or to use environment-friendly vehicles.
- The Government introduced the Air Pollution Control (Volatile Organic Compounds) Regulation in 2007 to limit the VOC contents of selected consumer products, paints and printing inks in phases, as well as controlling the emissions from certain printing machines. The Regulation was amended in October 2009 to expand the scope of control to cover adhesives and sealants, vehicle refinishing paints and marine vessel paints in phases.
- In 1999, the Government introduced the Air Pollution Control (Petrol Filling Stations)(Vapour Recovery) Regulation requiring petrol filling stations to install a system to recover petrol vapour emitted during the unloading of petrol from petrol tankers into underground storage tanks. The Regulation was amended in 2004 requiring stations to install a system to recover petrol vapour emitted during vehicle refueling with effect from 31 March 2005.
- In October 2008, the Government amended the Air Pollution Control (Fuel Restriction) Regulations to mandate the use of ultra-low sulphur diesel in industrial

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<sup>1</sup> The PRD Region includes the whole territory of HKSAR and the Pearl River Delta Economic Zone (PRDEZ). The PRDEZ includes Guangzhou, Shenzhen, Zhuhai, Dongguan, Zhongshan, Foshan, Jiangmen, Huizhou (Huicheng, Huiyang, Huidong, Boluo), and Zhaoqing (Duanzhou, Dinghu, Gaoyao, Sihui).

and commercial sectors to further reduce SO<sub>2</sub> emissions.

7.3 According to the 2010 emissions and the recalculated 1997 emissions, Hong Kong fully met the emission reduction targets for 2010. Emission reductions in 2010 for the four pollutants range from 30% to 59% when compared with emissions in 1997. The emission reduction targets were also met if the previous method was used in compiling the emission inventory. The changes in emissions in 2010, for both the latest and previous methods, compared with emissions in 1997 are shown in the following table.

**Table 7-1 Changes in emissions for the four air pollutants between 1997 and 2010**

Pollutant	Emissions under Latest Calculation Methods* (Tonnes)			Emissions under Previous Calculation Methods* (Tonnes)		
	1997 (recalculated using latest method)	2010	Change in Emission	1997	2010	Change in Emission
SO <sub>2</sub>	82,000	35,500	-57%	66,200	22,100	-67%
NO <sub>x</sub>	154,000	109,000	-30%	123,700	75,700	-39%
RSP	15,500	6,340	-59%	11,500	4,560	-60%
VOC	81,700	33,700	-59%	68,800	27,100	-61%

\*Emission figures are presented in 3 significant figures, the change in emissions may not match with the above if the above figures were used for calculation.

- End -



**Annex 1 – Breakdown of Emission Inventory by Source Categories from 2008 to 2010**

<b>Emission Source</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
<b>SO<sub>2</sub></b>			
Public Electricity Generation	50,600	46,300	17,800
Road Transport	288	271	286
Navigation	16,300	15,400	16,900
Civil Aviation	297	276	299
Other Fuel Combustion	2,850	348	268
Non-combustion	N/A	N/A	N/A
<b>Total</b>	<b>70,300</b>	<b>62,600</b>	<b>35,500</b>
<b>NO<sub>x</sub></b>			
Public Electricity Generation	38,500	38,100	27,000
Road Transport	34,600	33,000	32,700
Navigation	32,700	32,300	35,000
Civil Aviation	4,270	4,000	4,350
Other Fuel Combustion	10,600	8,870	9,520
Non-combustion	N/A	N/A	N/A
<b>Total</b>	<b>121,000</b>	<b>116,000</b>	<b>109,000</b>
<b>RSP</b>			
Public Electricity Generation	1,480	1,530	1,010
Road Transport	1,520	1,370	1,340
Navigation	2,130	2,080	2,260
Civil Aviation	59	52	54
Other Fuel Combustion	869	724	778
Non-combustion	992	901	898
<b>Total</b>	<b>7,050</b>	<b>6,660</b>	<b>6,340</b>
<b>VOC</b>			
Public Electricity Generation	422	433	413
Road Transport	8,550	8,090	7,900
Navigation	3,400	3,990	3,660
Civil Aviation	443	362	396
Other Fuel Combustion	908	769	849
Non-combustion	27,800	22,300	20,500
<b>Total</b>	<b>41,600</b>	<b>35,900</b>	<b>33,700</b>
<b>CO</b>			
Public Electricity Generation	3,420	3,520	3,310
Road Transport	54,200	51,000	47,600
Navigation	10,400	11,700	11,400
Civil Aviation	2,480	2,310	2,530
Other Fuel Combustion	5,060	4,390	5,100
Non-combustion	N/A	N/A	N/A
<b>Total</b>	<b>75,600</b>	<b>72,900</b>	<b>70,000</b>

\* Figures are rounded to three significant figures.  
N/A denotes Not applicable.

## Annex 2 – Summary of Revisions of Emission Inventory

There are 6 major emission sources included in the emission inventory, namely, Public Electricity Generation, Road Transport, Navigation, Civil Aviation, Other Fuel Combustion and Non-Combustion sources. The table below summarizes the revisions of emission inventory since its first publication in March 2000.

<b>Revision Date</b>	<b>Emission Inventory Revised</b>	<b>Revisions and Updates</b>
March 2000	1990-1998	<ul style="list-style-type: none"> <li>• First publication of emission inventory for PM, SO<sub>2</sub>, NO<sub>x</sub>, NMVOCs and CO from combustion sources at the EPD's website.</li> </ul>
December 2000	1990-1999	<ul style="list-style-type: none"> <li>• Amended emission inventory for Public Electricity Generation, Road Transport and Other Fuel Combustion sources.</li> </ul>
December 2001	1990-2000	<ul style="list-style-type: none"> <li>• Amended combustion sources emissions (including emission factors for VOC emission from coal-fired electricity generation units, vehicle kilometer travel (vkt) for Road Transport, emission estimation methods for Navigation and Civil Aviation and surrogates for Other Fuel Combustion emissions).</li> </ul>
February 2003	1990-2001	<ul style="list-style-type: none"> <li>• Replaced C&amp;SD retained import data for fuel with Energy End-use data from EMSD.</li> <li>• Amended vkt data.</li> </ul>
June 2004	1990-2002	<ul style="list-style-type: none"> <li>• Replaced emission estimated using emission factors with sophisticated EMFAC model to estimate emissions from Road Transport.</li> <li>• Included additional emission sources for RSP and VOC.</li> <li>• Replaced 2000 to 2001 Public Electricity Generation emissions for SO<sub>2</sub>, NO<sub>x</sub> and PM with data provided the power companies.</li> </ul>
January to March 2005	1990-2003	<ul style="list-style-type: none"> <li>• Amended 2000 to 2002 SO<sub>2</sub>, NO<sub>x</sub> and PM emissions for Public Electricity Generation according to data provided by the power companies.</li> <li>• Updated emissions estimated using the EMFAC model.</li> <li>• Amended 2001-02 emissions using Energy End-Use Data from EMSD.</li> <li>• Excluded Biogenic VOC emission sources from total VOC emission.</li> </ul>
December 2005	1990-2004	<ul style="list-style-type: none"> <li>• Amended 2002-03 emissions using Energy End-Use Data from EMSD.</li> <li>• Updated emission factors for VOC emissions from the printing industry.</li> </ul>
December 2006	1990-2005	<ul style="list-style-type: none"> <li>• Amended 2003 to 2004 SO<sub>2</sub>, NO<sub>x</sub> and PM emissions for Public Electricity Generation according to data provided by the power companies.</li> <li>• Updated fuel use for vehicles to calculate 1998 to 2004 SO<sub>2</sub> emissions.</li> <li>• Updated emission factors for VOC emissions from the printing industry.</li> </ul>
January 2008	1990-2006	<ul style="list-style-type: none"> <li>• Replaced Power Plant PM emissions with RSP emissions using emission factors from USEPA.</li> <li>• Updated emission factors for emission from non-road mobile equipment at the airport, container terminal and</li> </ul>

		<p>construction sites.</p> <ul style="list-style-type: none"> <li>• Included VOC emissions from evaporation of gasoline.</li> <li>• Included RSP emissions from tyre, brake and road wear.</li> <li>• Amended estimation method for VOC emissions from printing industry and fuel storage tanks.</li> <li>• Updated emission factors for Civil Aviation emission sources.</li> </ul>
January 2009	1990-2007	<ul style="list-style-type: none"> <li>• Used information collected from Government Departments and shipping industry to estimate emissions from local vessels.</li> <li>• Updated emission factors for emission from non-road mobile equipment at the airport and container terminal.</li> </ul>
September 2012	1990-2010	<ul style="list-style-type: none"> <li>• Based on the results from the Marine Emission Study report completed in 2012 to update emissions from Navigation. Additional information for fuel use and activities were used to calculate the emission.</li> <li>• Amended emission factors for NOx emission from vehicles using data collected from PEMS.</li> <li>• Used updated version of EMFAC (version 2.1) for Road Transport emission estimation.</li> <li>• Used updated version of EDMS (version 5.1.3) for Civil Aviation emission estimation.</li> <li>• Included emissions when aircraft parking at the airport for cleaning, maintenance and loading/unloading of freights.</li> <li>• Used Sales Report data to calculated VOC emissions from products controlled under the VOC Regulation.</li> <li>• Used further local data for VOC emission calculation.</li> <li>• Used new reported and survey results to calculate emissions from Other Fuel Combustion sources.</li> <li>• Included RSP emissions from construction sites, cooking and VOC emissions from storage of naphthalene, kerosene and use of cleaning solvents associated with paint use.</li> </ul>

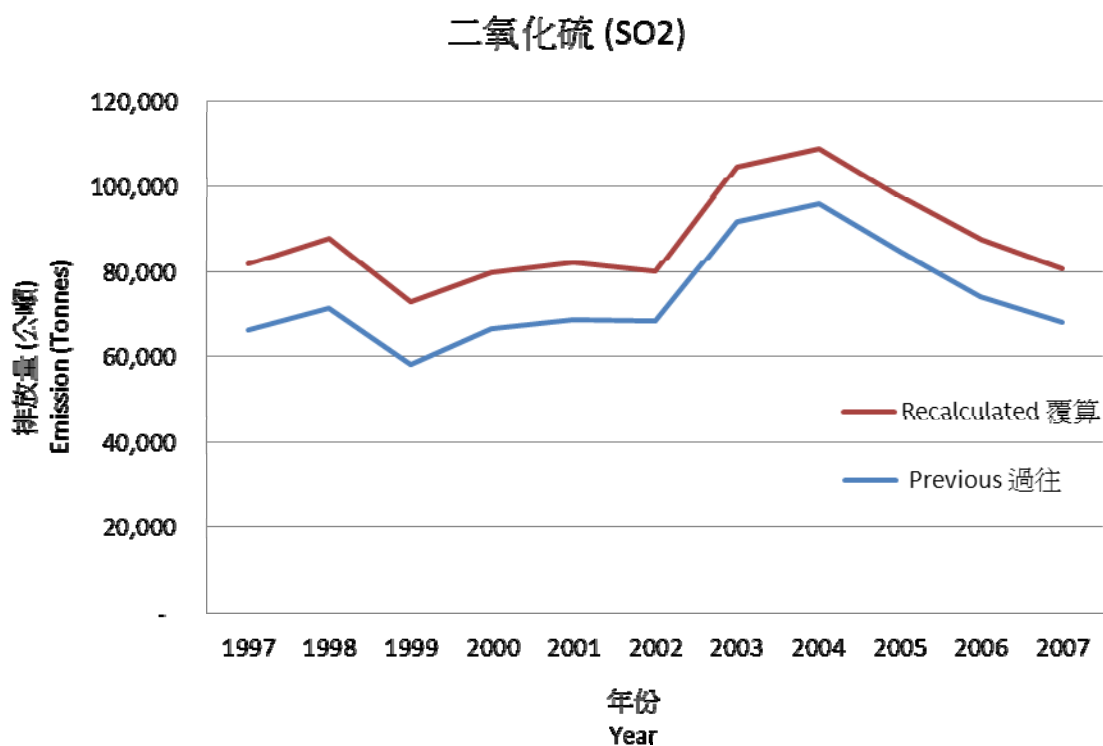
**Annex 3 – Comparison between the previous and recalculated inventories from 1997 to 2007**

**Table A3-1 Changes in SO<sub>2</sub> emission inventories from 1997 to 2007**

Year	SO <sub>2</sub> (Tonnes)	
	Previous*	Recalculated*
1997	66,200	82,000
1998	71,400	87,900
1999	58,100	72,800
2000	66,700	79,800
2001	68,800	82,100
2002	68,400	80,100
2003	91,900	105,000
2004	96,000	109,000
2005	84,900	97,900
2006	74,200	87,500
2007	68,100	80,700

\* Figures are rounded to three significant figures.

**Figure A3-1 SO<sub>2</sub> emissions trend from 1997 to 2007**

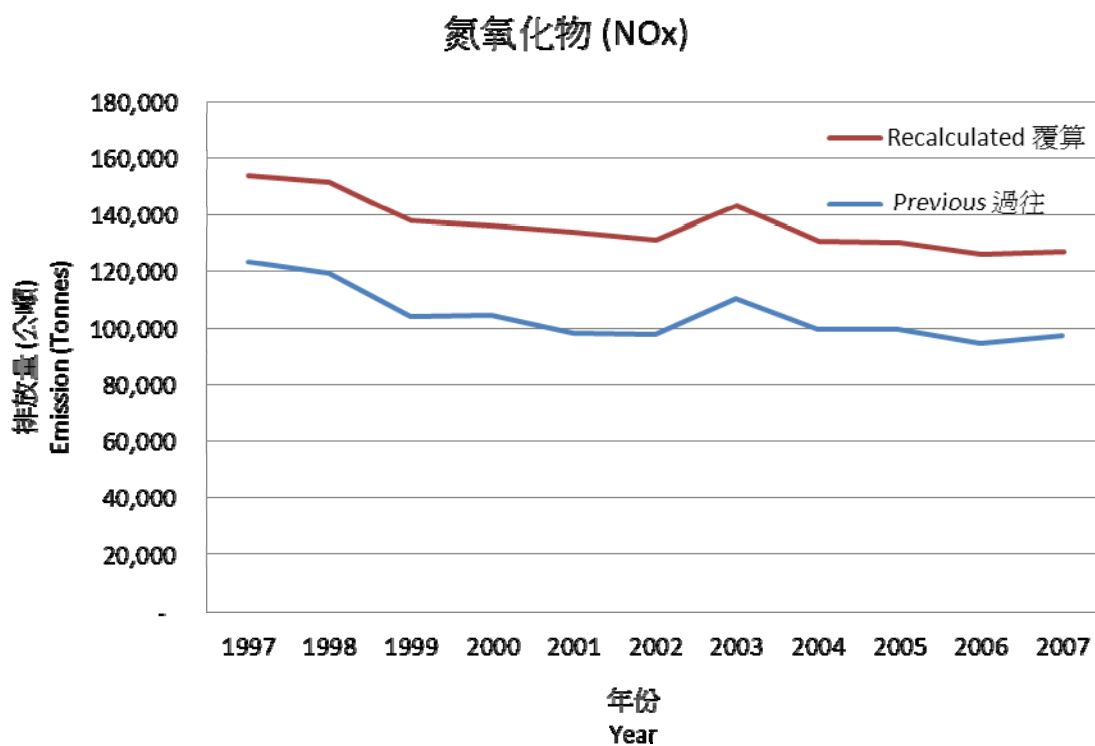


**Table A3-2 Changes in NOx emission inventories from 1997 to 2007**

Year	NOx (Tonnes)	
	Previous*	Recalculated*
1997	124,000	154,000
1998	120,000	151,000
1999	104,000	138,000
2000	104,000	136,000
2001	98,000	134,000
2002	97,600	131,000
2003	110,000	143,000
2004	99,400	131,000
2005	99,500	130,000
2006	94,500	126,000
2007	97,200	127,000

\* Figures are rounded to three significant figures.

**Figure A3-2 NOx emission trend from 1997 to 2007**

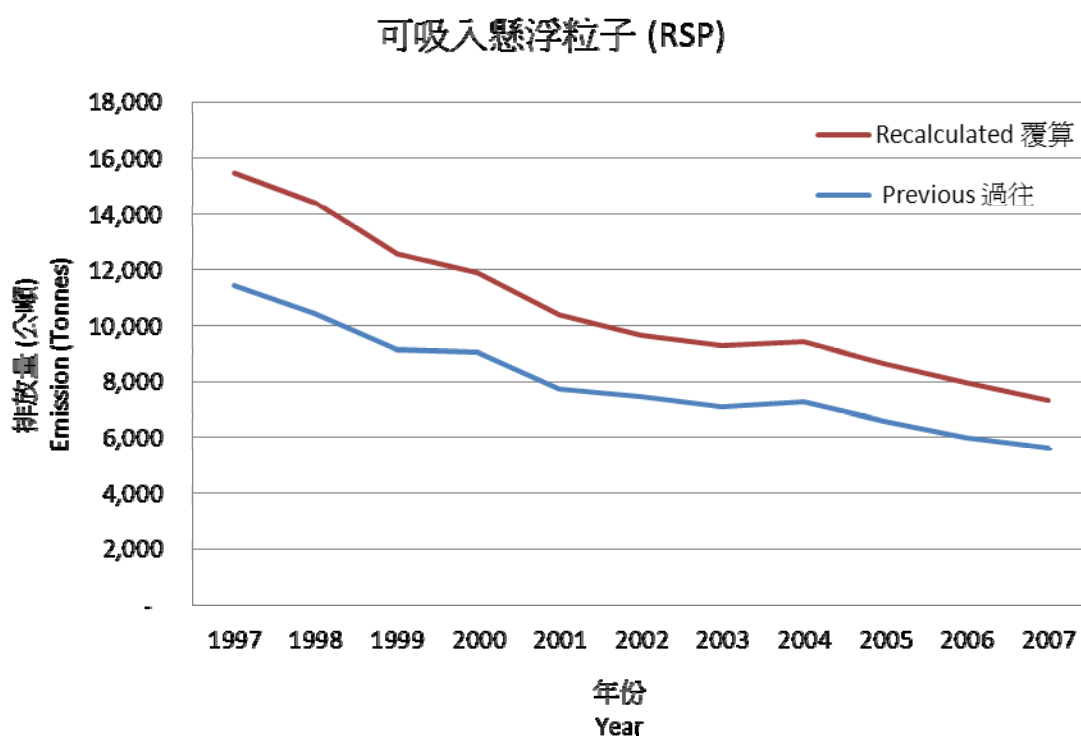


**Table A3-3 Changes in RSP emission inventories from 1997 to 2007**

Year	RSP (Tonnes)	
	Previous*	Recalculated*
1997	11,500	15,500
1998	10,400	14,400
1999	9,160	12,600
2000	9,050	11,900
2001	7,720	10,400
2002	7,480	9,660
2003	7,100	9,310
2004	7,290	9,420
2005	6,580	8,630
2006	6,010	7,980
2007	5,640	7,330

\* Figures are rounded to three significant figures.

**Figure A3-3 RSP emission trend from 1997 to 2007**

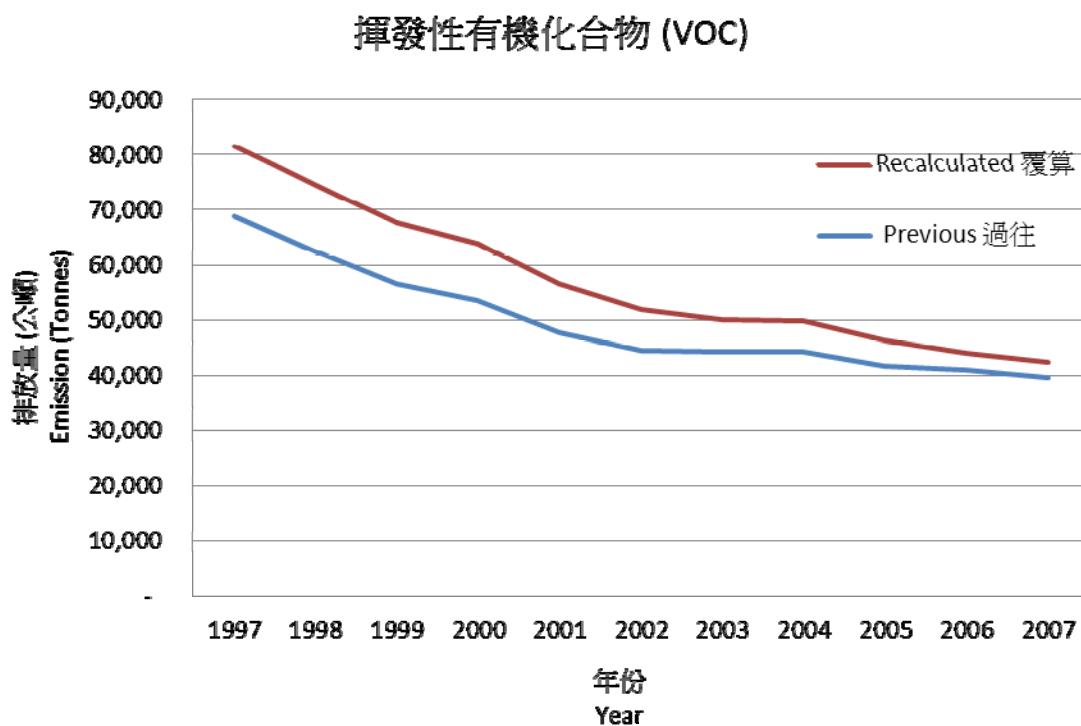


**Table A3-4 Changes in VOC emission inventories from 1997 to 2007**

Year	VOC (Tonnes)	
	Previous*	Recalculated*
1997	68,800	81,700
1998	62,600	74,700
1999	56,500	67,600
2000	53,600	63,900
2001	47,800	56,500
2002	44,500	51,900
2003	44,200	50,100
2004	44,300	49,700
2005	41,800	46,300
2006	41,000	44,100
2007	39,700	42,400

\* Figures are rounded to three significant figures.

**Figure A3-4 VOC emission trend from 1997 to 2007**



**Table A3-5 Changes in CO emission inventories from 1997 to 2007**

Year	CO (Tonnes)	
	Previous*	Recalculated*
1997	144,000	146,000
1998	131,000	136,000
1999	121,000	128,000
2000	114,000	121,000
2001	99,900	114,000
2002	90,000	106,000
2003	90,100	98,200
2004	85,000	91,200
2005	78,100	85,500
2006	75,000	83,600
2007	72,000	79,100

\* Figures are rounded to three significant figures.

**Figure A3-5 CO emission trend from 1997 to 2007**

