

AIR QUALITY MANAGEMENT IN HOCHIMINH CITY

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1. General Introduction

1.1. The total area of HoChiMinh City (HCMC) is about 2095 sq km with 18 inner urban districts occupying an area of 140 sq km. The official population is 5.285 million, and the number of unregistered persons is estimated to be over 2 million. The average population density is 2,523 persons per sq km (2001 statistical yearbook).



During the past decade, HCMC has implemented policy reforms and developed a market economy, entering into a period of rapid modernization and industrialization. As Vietnam's major industrial and commercial center, HCMC in 2001 contributed approximately 17% of the national GDP (VND 484,492 billion [USD32.3 billion]). GDP per capita is USD1,460¹.

¹ Statistical Yearbook, 2001.

1.2.

(a) Government in HCMC

People’s Committee represents the government in HCMC. The organizational structure of HCMC’s government including one chairman, five vice-chairmen and some municipal departments is described as below:

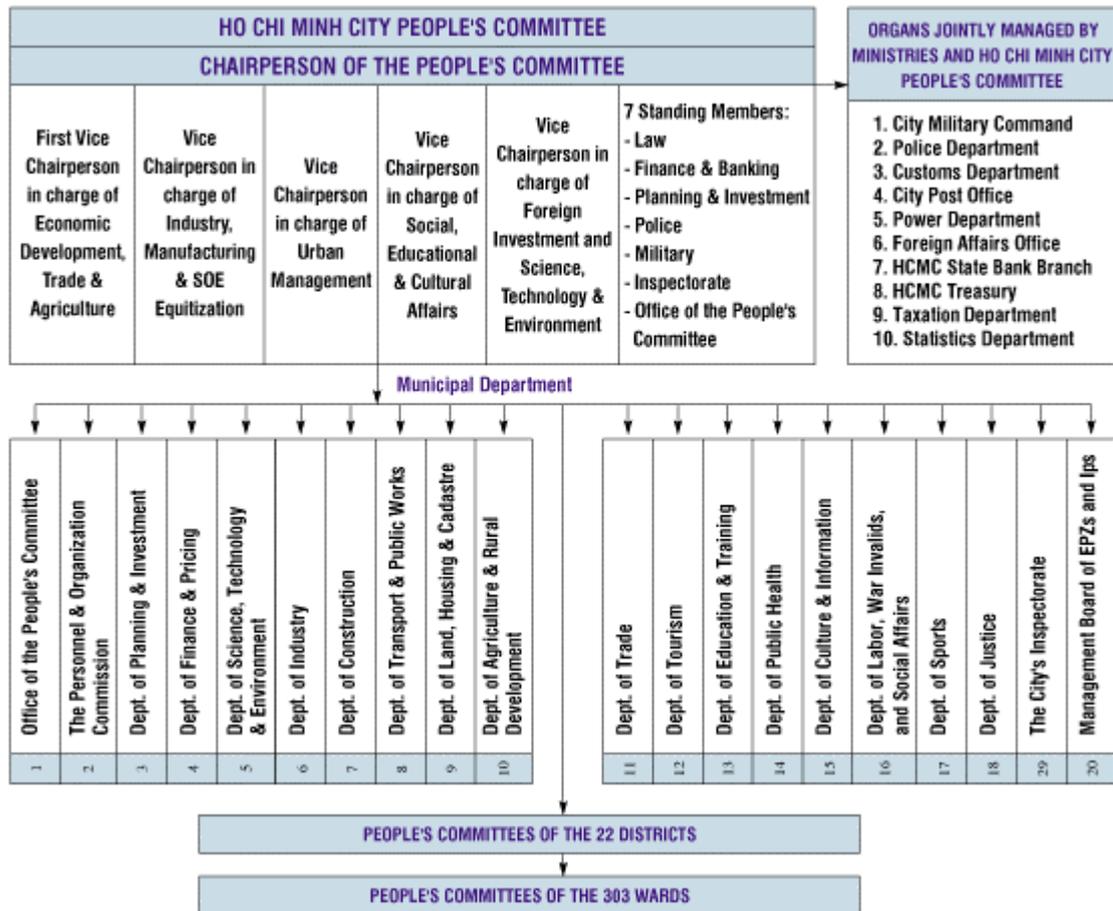


Figure 1. Organizational structure of local government

Department of Science, Technology and Environment (DOSTE)

DOSTE is one of the key departments that are responsible for the air quality management in HCMC. DOSTE has prepared the environmental management strategy from 2002 to 2010 in which includes air quality management action plan. DOSTE’s main functions on environmental protection include:

- (i) Developing and guiding the implementation of strategy and policy of environmental protection, plan to prevent control and remedy environmental degradation, pollution and incidents;
- (ii) Organizing, establishing and managing monitoring systems, periodically assessing the current state of the environment, forecasting environmental changes;

- (iii) Appraising EIA reports on projects and on production or business establishments;
- (iv) Issuing, revoking, certificates of compliance with environmental standards;
- (v) Supervising, inspecting, checking the observance of environmental protection legislation; setting disputes, appeals or complaints concerning environmental pollution;
- (vi) Educating, propagandizing, disseminating knowledge and legislation in environmental protection;
- (vii) Organizing research and development activities and application of scientific and technological advances in the field of environmental protection;
- (viii) Developing international relations in the field of environmental protection.

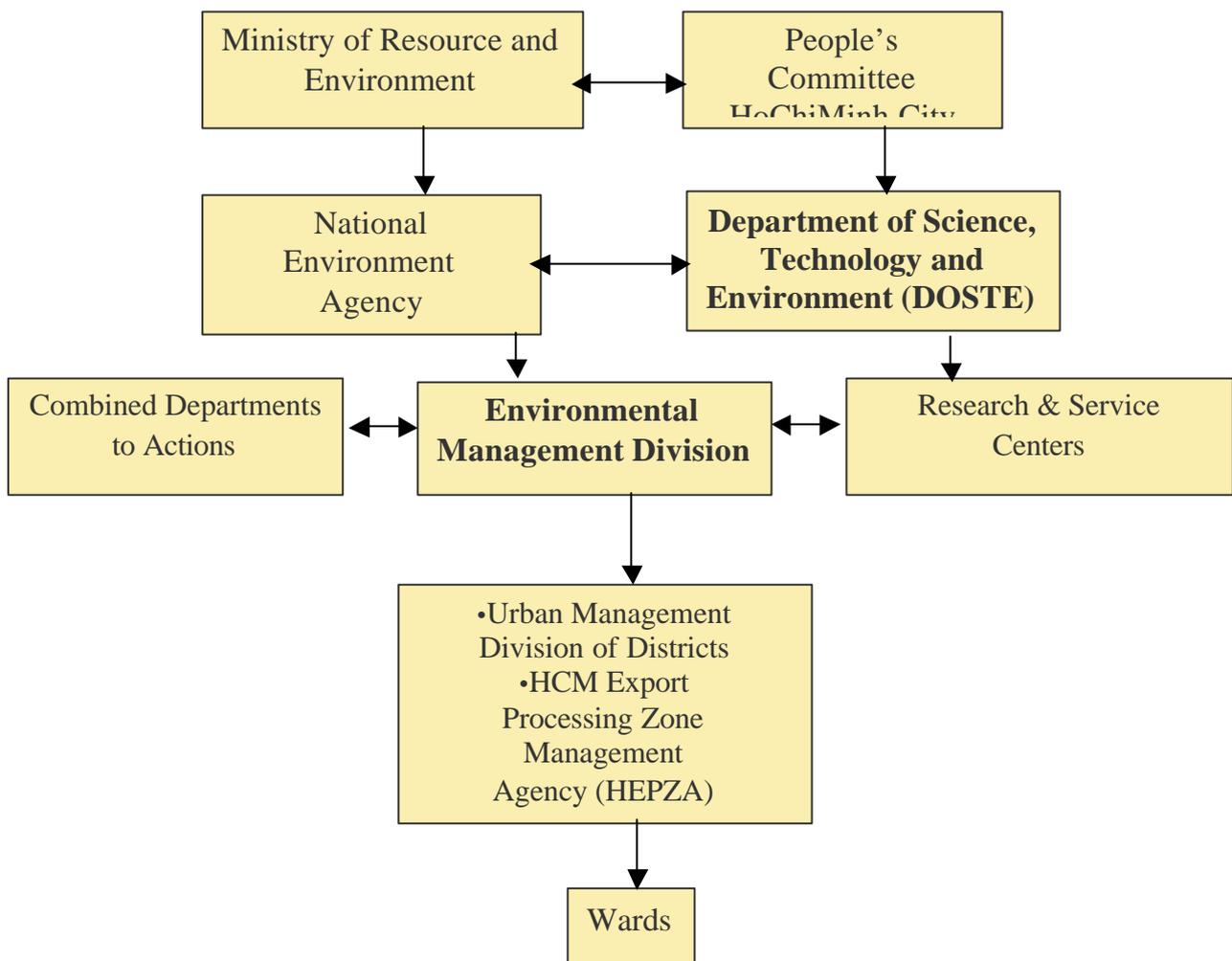


Figure 2. Environmental management structure in HCMC

Existing legislation, regulations, standards for pollutants

Some air quality standards have been developed and issued since 1995 and are as follows:

- TCVN 5937: 1995 - Air quality - Ambient air quality
- TCVN 5938: 1995 - Air quality - maximum permitted concentration for toxic components in the air
- TCVN 5939: 1995 - Air quality - Industrial emission standards - inorganic substances and dust
- TCVN 5940: 1995 - Air quality - Industrial emission standards - organic substances
- TCVN 6438: 1998 - Air quality - Road vehicles emission - maximum permitted limits
- Some more than 50 TCVN on analysis methods for air quality standards and air emission

Table 1: Vietnamese and World Health Organization Pollutant Standards

Pollutant	VN Standard	WHO Standard	Time Period
Particulate Matter	200 $\mu\text{g}/\text{m}^3$	150 $\mu\text{g}/\text{m}^3$	24 hours
Sulfur Dioxide	300 $\mu\text{g}/\text{m}^3$	125 $\mu\text{g}/\text{m}^3$	24 hours
Nitrogen Dioxide	100 $\mu\text{g}/\text{m}^3$	150 $\mu\text{g}/\text{m}^3$	24 hours
Carbon Monoxide	10 mg/m^3	10 mg/m^3	8 hours

Air Quality Monitoring System

The air quality management system in HCMC has been established step by step:

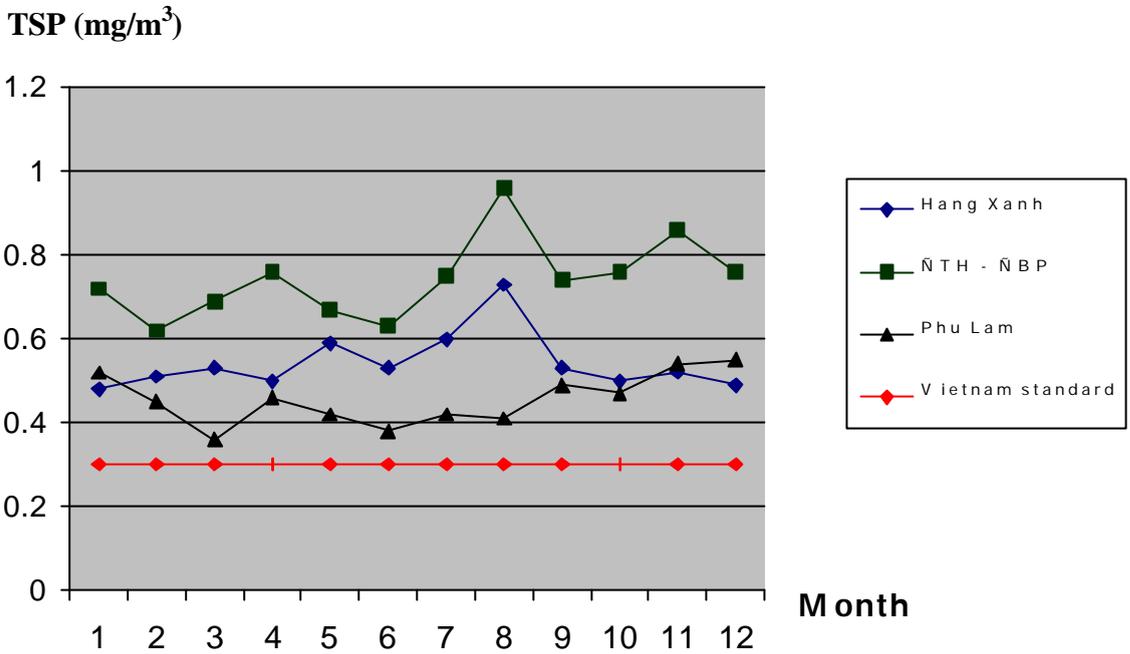
- The end of 1992: The network includes four ambient air monitoring stations (PM, SO₂, NO_x) and three stations for roadside monitoring (PM, NO_x, Pb, noise).
- In June 2000, the automatically air quality monitoring system supported by UNDP & DANIDA, includes two urban background stations (monitor PM₁₀, SO₂, NO_x, CO, O₃), two roadside stations (monitor PM₁₀, NO_x, CO, O₃), were installed.
- In November 2002, more new five automatically air quality monitoring stations were installed by NORAD support, includes three urban background stations (monitor PM₁₀, SO₂, NO_x, O₃), two roadside stations (monitor PM₁₀, NO_x, CO, O₃).

Budget for HCMC People's Committee covers maintenance and operation of whole air quality monitoring system and staff complement.

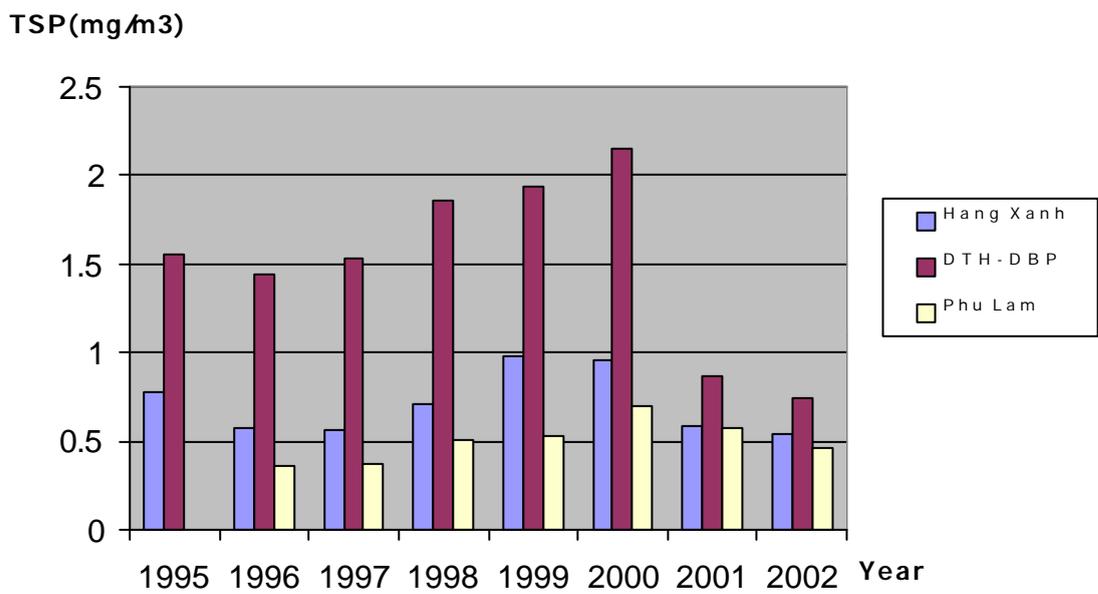
Air quality situation

The ambient monitoring has shown that air pollution is a major environmental concern in HCMC and is likely to be causing significant health impacts. Figures 3 and 4 show results of ambient monitoring of particulate matters in three roadside air stations in HCMC.

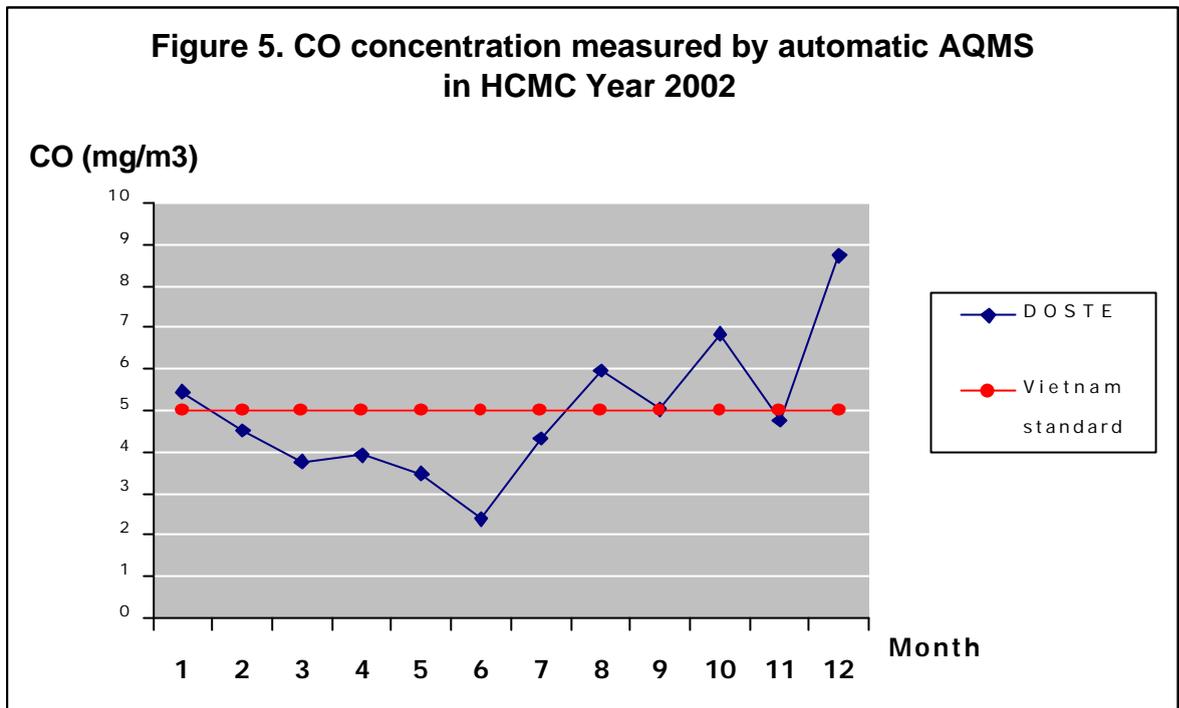
**Figure 3. TSP in Roadside Air in HCMC
Year 2002**



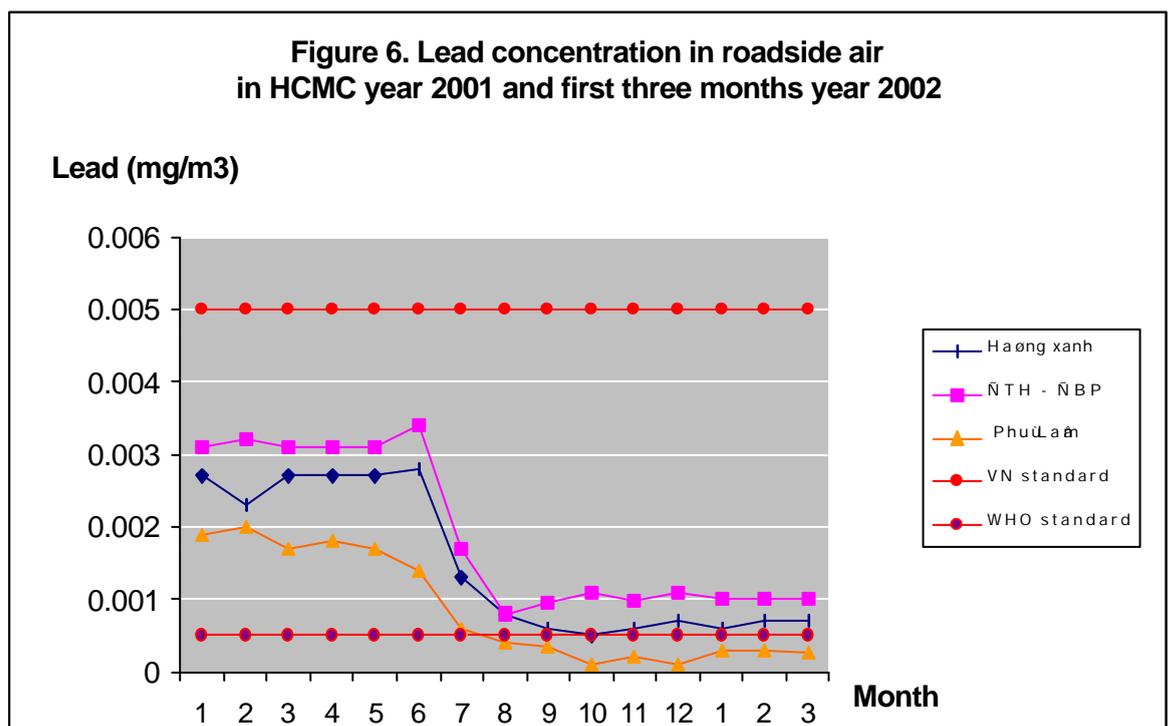
**Figure 4. Trend of TSP in Roadside Air
in HCMC during 1995-2002**



- Besides TSP, CO is also a main pollutant in roadside air in HCMC. Figure 5 shows results of ambient monitoring of CO in one automatically roadside air station in HCMC.



- Lead levels monitored in Hang Xanh, Phu Lam and Dien Bien Phu-Dinh Tien Hoang during 1996-2000 are lower than Vietnam standard, but 4-6 times higher than WHO standards. However, lead concentration decreased substantially after July 2001 due to using unleaded gasoline (See Figure 6).



- Results of monitoring from the automatically air quality monitoring system are showed in following Figure 7. Air Quality Index (AQI) in traffic area is mainly in from Moderate to Poor category while AQI in residential area is usually in from Good to Moderate category.

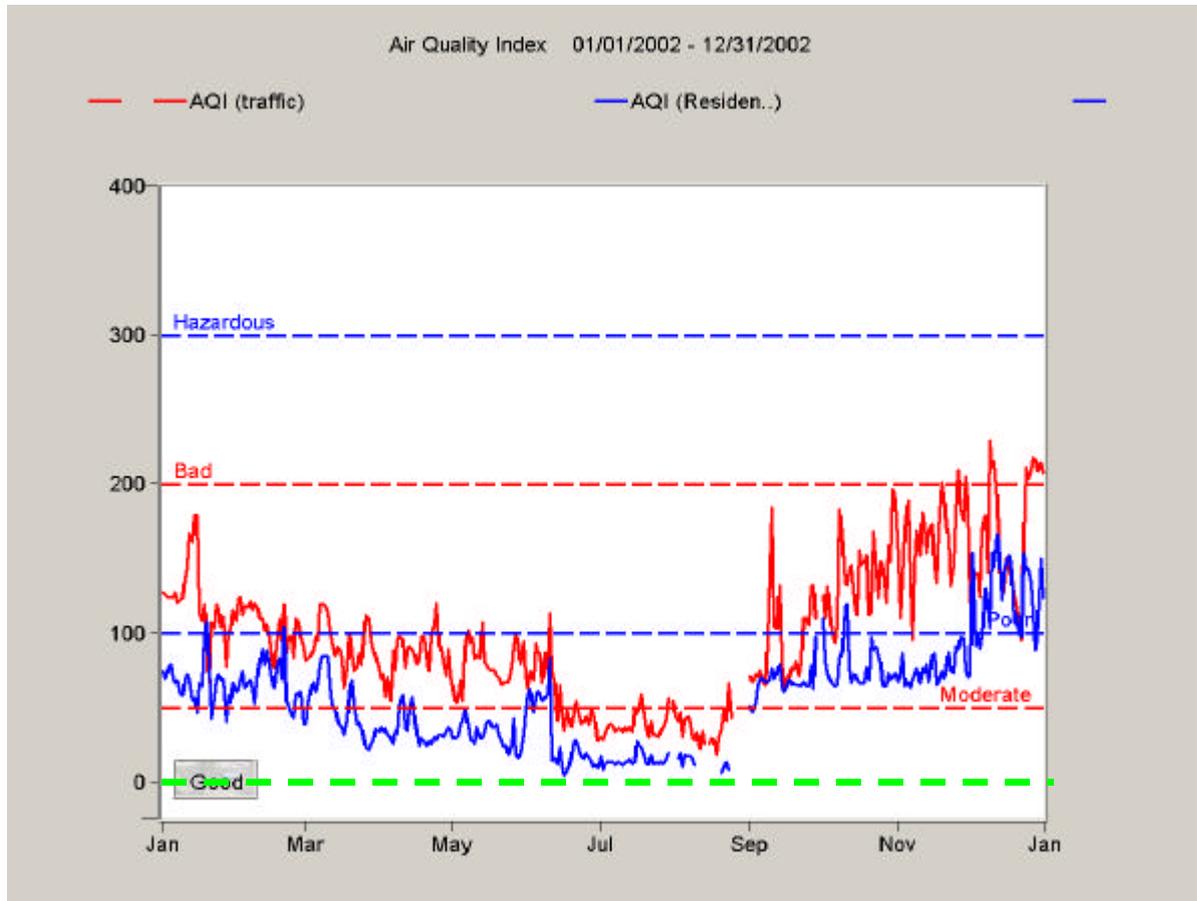


Figure 7. Daily Air Quality Index (AQI) in 2002

2. Air pollution from sectoral perspectives

2.1. Air pollution issue from industry

HCMC has about 28,000 industries, the majority of which are small-scale industries located mainly within residential areas. There are about 700 medium- and large-scale industries, about 500 of which located in the urban districts, but few of them have pollution control facilities. Ten industrial zones (with 104 enterprises in operation) have been created along with two export-processing zones (with 120 enterprises in operation).

In 2001, HCMC had 28,573 industrial establishments, of which 128 were centrally state-owned enterprises, and 152 were locally state-owned, 27,901 private enterprises, and 390 industrial joint venture establishments. Industry comprised

46.6% of the City's GDP. The value of industrial production in 2001 reached VND 66,927 billion, an increase of 16.2% over 2000².

Table 2. Industrial establishments by main industrial activities in HCMC³

Manufacturing industry	1995	1996	2000	2001
Foodstuff and beverage	4770	4083	3665	3784
Tobacco	9	10	6	6
Textile product	5583	5065	3714	3398
Paper and its derivatives	552	486	670	752
Chemical and chemical products	518	630	651	688
Rubber and plastic products	2053	2106	2673	2792

Air quality are has recently become a serious problem as a result of emissions from industries such as cement plants, steel mills, fertilizer plants, chemical factories, rubber processing plants and tobacco manufacturing.

Table 3. Pollution emissions from main industrial activities (tons/year)

	Industrial Activities	Capacity	TSP	NO2	SO2	CO	Hydro Carbon
01	Power Plants	1,751 MW	646	8,773	54,633	1,966	727
02	Boilers & Furnaces	210,000 ton FO / year	578	2,016	78	84	52
03	Steel Mills	259,000 ton steel / year	1,787		466	18,907	
04	Construction Material (cement, tile,)		12,793	1,336	624	153	40

(Source: DOSTE-2000)

Controlling industrial pollution

Command and Control measures

As a result of a pollution survey of 265 industries in HCMC, two "black books" were compiled that listed 87 polluting industrial enterprises. These enterprises have been asked to undertake pollution control measures (such as end-of-pipe treatment and cleaner production methods) for meeting the environmental standards.

Economic instrument: Cleaner Production (CP) measures

- A project entitled, Reduction of Industrial pollution in HCMC, supported by the United Nations Industrial Development Organization (UNIDO) and funded by Swedish International Development Co-operation Agency (SIDA), was

² Statistical Yearbook, 2001

³ Statistical Yearbook, 2001

launched in 15 companies from the food processing, textile-dyeing processing and pulp and paper industries as a demonstration exercise. Implementation of cleaner production measures in these companies contributed significantly to environmental improvement including reductions in wastewater discharges (20-66%), air emissions (30-70%) and solid waste generation (up to 27%). The Government and UNIDO are now approving phase 3 of this project.

- For wider dissemination of CP concept and benefits, DOSTE conducted series of training programs that targeted nine environmental sensitive sectors and 1,000 small & medium enterprises in HCMC for two years, in 1999 and 2000.
- A project on energy saving and its efficient use, supported by European Union (EU), has been implemented in HCMC since 1998. Under this project, 40 businesses (including industries, hotels, research centers) attended two training courses on energy audit, cost-benefit analyses, market research and establishing a project; and five pilot projects (in four industries and one hotel) were implemented. The results of the project showed a 15% increase in energy savings and an increase in production capacity.

Communication and Support measures

- A Revolving Fund for Pollution Mitigation was established to support industries in environmental protection. A low-interest loan (at 0.85% a year) will be extent to industries to invest in pollution control measures and technologies. At present, enterprises are being evaluated for receiving loan from the Fund.
- In early 2001, a “Green Book” listing 50 enterprises that successfully met the environmental protection requirements was published to encourage and raise public awareness about environmental protection.

2.2. Air pollution issue from transportation

A recent survey, in October 2002 revealed that there were 2,225,000 motorcycles and 189,000 automobiles of all kinds officially registered in HCMC. Many of the trucks and buses are old, and use obsolete technology; the majority of the motorcycles, cars and vans are relatively new, but tend to use old technology and have no pollution control devices.

The public transport (bus) network of the city only meets 3% total demand. The 97% rest demand are satisfied by 56% from motorbikes, 30 % from bicycles, 3% from cars and 8% by foot.⁴ Transportation infrastructure is poor; the density of traffic system is 0,81 km/km² (standards 4-6 km/km²); and average traffic speed is only 4-5 km/h.

⁴ Vietnam Register, 2002. Integrated action plan to reduce vehicle emissions in Vietnam. ADB

Using clean (LPG/CNG)/alternative fuel for vehicles in HCMC is just in some pilot projects.

By far, the greatest cause of air pollution in HCMC is due to vehicle emissions that are affecting public health.

Table 5. Estimates of pollution emissions from transport in HCMC (tons/year)

Year	Number of Vehicle		TSP	NO _x	SO ₂	CO	Hydro-carbon
	2 wheelers	Auto-mobiles					
1997	1,289,000	105,000	2,014	16,368	4,331	113,255	13,295
2000	1,600,000	123,000	3,182	25,846	6,843	186,843	21,006

Controlling air pollution from traffic

- By 2003, all vehicles have to be inspected annually to insure that they meet the environmental standards.
- In July 2001, the programme to ensure that all vehicles in Vietnam were using unleaded gasoline was phased out.
- HCMC is one of the cities selected (for the period 1999-2001) for the project “Analyses of Technical Options for Mitigating Environmental Emissions from the Urban Transportation system in Selected Asian countries”, funded by SIDA under Asian Regional Research program in Energy, Environment & Climate in Asian Institute of Technology (AIT).
- The project, Energy-Transportation and Pollution, supported by the French Agency for Environment and Energy Management-ADEME and the AIT aims to establish and conduct a programme on urban transportation in HCMC (2000-2001).
- Other projects concerned with improving the infrastructure, upgrading and widening the streets, planning the route and transportation timetables especially during the rush hour, and limiting the use of old vehicles in the City have contributed to a reduction pollution from traffic in the past few years.

3. Improving the capacity of HCMC government in urban air quality management

3.1. Constrains to air quality management activities in HCMC

Institutional/organizational constraints

There is limited enforcement of effluent standards, and consequently, little incentive for industries in HCMC to invest in pollution control. The poor implementation and enforcement are due to a lack of manpower, specific knowledge, technologies and materials.

Financial constraints

High costs of treatment of pollution, which can affect the price of a product, create difficulties in meeting standards. Penalties charged are small compared to the cost of treatment, which means that polluters are prepared to pay the fines rather than take measures to reduce their emissions. Economic instruments (such as environmental fees, pollution fees and the polluter pays principle) are seldom used.

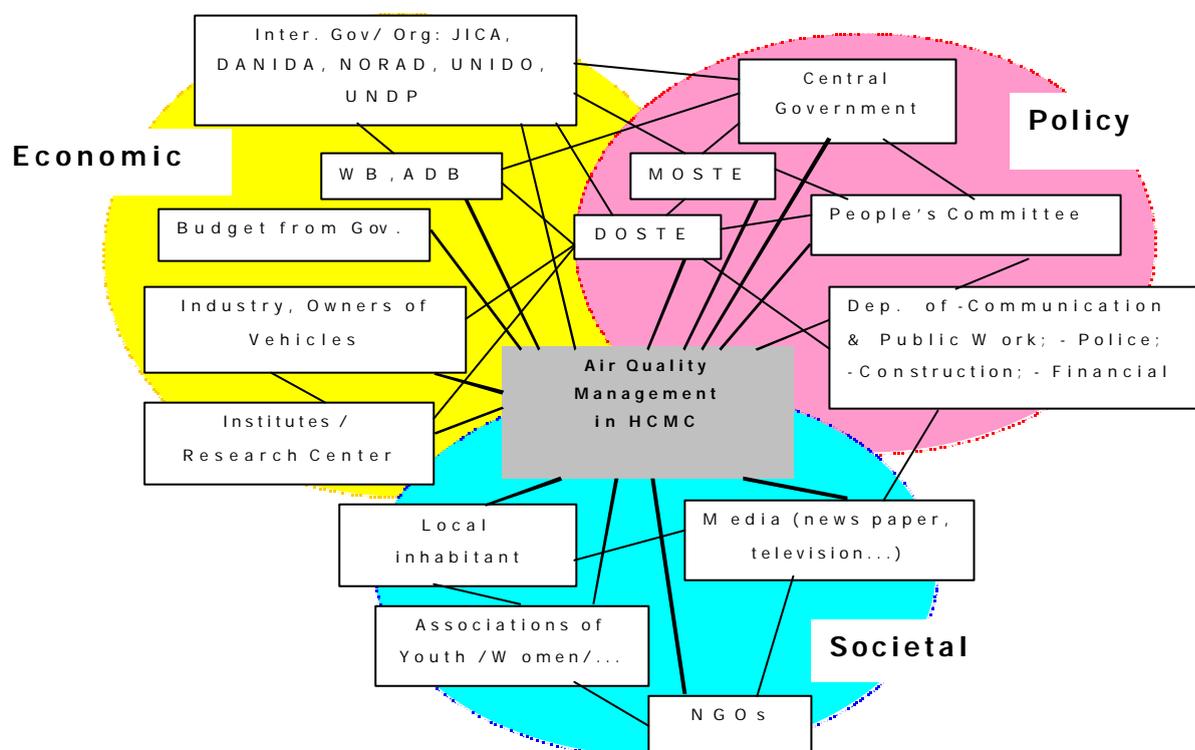


Figure 8. Networks for Air Quality Management in HCMC

Other constraints

- One of the drawbacks of environmental management is the limited participation of the public in the policy-making activities of the Government.
- Environmental problems do not appear to be among the priorities of other government agencies. For example, if the police imposed strict fines on vehicle users who create too much noise, smog and dust, the pollution level from traffic would be lower.
- Enforcement sometimes depends on the prevailing economic situations and on personal attitudes.

3.2. Future directions

The City will continue to implement the following measures/projects to reduce air pollution:

- Command and Control measures;
- Communication and Support measures (e.g. Revolving Fund for Pollution Mitigation);
- Project on Reduction of Industrial pollution: Cleaner Production Program in HCMC, supported and funded by SIDA;
- Project on Energy-Transportation and Pollution, supported by the Agency for Environment and Energy Management-ADEME (French) and Asian Institute of Technology-AIT.
- Action plans for air quality management that were included in the Environmental strategy in HCMC during 2002-2010.

The following are air pollution control projects proposals for collaboration: *Action plan for air quality management*⁵

Mitigating air pollution from stationary sources

- Implement programs for abatement of industrial emissions;
- Review industrial emissions standards for key industries;
- Identify major sources of industrial air pollution;
- Revise penalty charges for exceeding emissions standards;
- Increase the number and improve the quality of emissions inspections;
- Introduce compulsory self-monitoring of emissions;
- Develop a revolving fund for pollution abatement; and
- Examine feasibility and introduce charges for industrial emissions.

Mitigating air pollution from mobile sources:

- Establish a motor vehicles inspection system; and
- Strengthen vehicle emissions enforcement capability.

Improving fuel quality:

- Promote use of cleaner fuels; and
- Examine potential for alternative fuels.

Reducing emissions from vehicles:

- Introduce pollution control technologies.

Reducing traffic congestion and improving traffic flow:

- Establish transport policies to improve future accessibility and minimize congestion; and
- Formulate transport policies to encourage use of public transport.

⁵ Based on “Environmental Strategy in HCMC 2002 – 2010”

Setting up an air quality monitoring & modeling system

- Monitor air quality in industrial areas;
- Establish GIS-based data including information related to pollution sources; and
- Use modeling software to forecast pollution levels in the city.

Raising public awareness

- Develop a public outreach program.

Political and Institutional issues

- Enhance the capabilities of the environmental management agency and relevant institutions.

Monitor Implementation, Input and Coordination of Air Quality Action Plan

Studying to Impact of Air Pollution on Citizen's Health

- Conduct an emission inventory;
- Identify air pollution levels;
- Support studies on pollution-related health problems;
- Analyze the relationships between air pollution and health/mortality; and
- Make recommendations for improvement.

4. Conclusion remarks

Air pollution problems including emissions from both industry and transportation are the most concern of authorities and people in HCMC. Implementing measures/projects for controlling air pollution in HCMC are more and more effective. However, the air quality management is a multi sectoral-related issue so it requires a cooperation of many institutions including domestic and foreign partners. By implementing the air quality management action plans, it will contribute to overcome existing constrains and problems and to achieve step by step City's goals for sustainable development

HCMC's experiences in air quality management (such as establishing the air quality monitoring system, measures in controlling air pollution, public awareness programs, air quality management action plans, etc.) could be completely replicated in other cities in Viet Nam.

The cooperation between Kitakyushu Initiatives Network cities should focus in following main areas:

- Enhancing the capabilities of local cities in environmental management;
- Developing public outreach programs to raise public awareness;
- Introducing and transferring state-of-art pollution control technologies as well as clean fuels;
- Studying to impact of air pollution on citizen's health.