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Panel on Environmental Affairs

Report of the Delegation to Study Overseas Experience in Air Quality Control, Management of Municipal Solid Waste, Renewable Energy and Total Water Management

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Volume I : Report

February 2007

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CONTENTS

Chapter I : Introduction

Background

1.1 Similar to other metropolitan cities, Hong Kong is facing acute environmental pollution, particularly in respect of air quality, waste management and water quality.

1.2 The Panel on Environmental Affairs is the committee of the Legislative Council (LegCo) with the responsibility of monitoring policies and issues of concern on environmental and conservation matters. The Panel's terms of reference and membership list for the 2005-2006 session is in **Appendix I**.

The study

1.3 Over the years, the Administration has introduced various measures to tackle environmental pollution. In monitoring the progress made in the avoidance of mitigation of environmental pollution, the Panel holds the view that the Administration has been too conservative in setting the targets for resolving pollution problems. By way of illustration, the targets of reducing the amount of MSW generated in Hong Kong by 1% per annum up to the year 2014 and the recommended contribution from renewable energy to annual electricity demand at 1% in 2012, 2% in 2017 and 3% in 2022 are far too low. There is also a lack of a policy on total water management to conserve water resources and reduce pollution. Members consider that the Administration should take more vigorous measures to tackle the pollution problem in a holistic manner taking into account technological advancement and overseas experience.

1.4 To be in a better position to advise and monitor the Administration in implementing policies on air quality control, waste management and water quality management, the Panel has decided to conduct a study on the successful experience of other places. The Panel has selected a number of places that have attained significant achievements in respect of air quality control, waste management, development of renewable energy, and water quality management. The places selected are Japan, Denmark and Finland. Japan has been selected because it is famous for its active measures to improve air quality and global warming as well as advanced technology for waste disposal. Denmark on the other hand is the forerunner in the application of wind power and other forms of renewable energy while Finland tops the world in its water management.

1.5 In August 2006, a delegation of the Panel visited Tokyo, Sapporo, Copenhagen as well as Helsinki and met with the authorities and relevant organizations to acquire first-hand information on the latest development in the recycling and disposal of MSW, application of renewable energy in wider scale, measures to improve air quality and water management. The visit programme and a list of persons/organizations visited by the delegation during the tour are given in **Appendices II and III** respectively. The delegation comprised –

Panel members

Hon CHOY So-yuk (Head of delegation)
Hon Emily LAU Wai-hing
Hon LAU Kong-wah
Hon LEE Wing-tat (only joined the Denmark and Finland legs)

Non-Panel Member

Hon TAM Yiu-chung (only joined the Japan leg)

The following officials from the relevant government departments have also been invited to join different legs of the visit according to their work profiles –

Mr LAU Hoi-nam (only joined the Japan leg)
Senior Environmental Protection Officer (Mobile Source Control)1
Environmental Protection Department

Dr Ellen CHAN (only joined the Japan leg)
Assistant Director (Environmental Infrastructure)
Environmental Protection Department

Mr Joseph CHAN (only joined the Denmark leg)
Senior Engineer/Energy Efficiency
Electrical and Mechanical Services Department

Mr WONG Chung-leung (only joined the Finland leg)
Senior Engineer/Resources Planning
Water Supplies Department

Upon completion of the visit, the delegation published a report setting out, among other things, its observations on the essential factors and elements which have attributed to the success and sustainability on the avoidance and mitigation of environmental pollution.

The report

1.6 In this report, we have set out in **Chapter II** the experience of Japan in tackling the problems of air pollution and global warming. The focus of **Chapter III** is on waste management and measures taken by the Japanese Government in reducing and recycling MSW. We have provided in **Chapter IV** a brief account on the development of renewable energy, particularly wind energy, in Denmark and in **Chapter V** the management of water resources in Finland.

1.7 The report of the delegation comes in two volumes, with Volume I on the background, findings and observations, and Volume II enclosing reference materials acquired from the visit and documents which the delegation has considered in drawing up its observations. To economize on the use of paper, only Volume I is printed for distribution, Volume II is available for reference at the Legislative Council Library, and the list of documents contained in Volume II is given in **Appendix IV**.

Chapter II : Air quality control

2.1 Air quality in Hong Kong is typical of any large modern city. High concentrations of particulates and nitrogen oxides (NO_x) in the urban areas are the most pressing problems, causing a nuisance and constituting a health concern. The problems are compounded by a combination of factors, including high population density, high-rise buildings that hinder or prevent circulation of air at street level and a high concentration of vehicles, particularly diesel vehicles, at urban roadside. The deteriorating regional air quality as a result of rapid economic and industrial development in the Pearl River Delta Region has further aggravated the air pollution problem in Hong Kong.

2.2 To improve air quality on the local front, the Administration has introduced a range of measures, mainly in the form of statutory controls, to reduce emissions from the polluting sources. Major industrial emission sources have been placed under licensing control since 1987 and high sulphur fuels have been banned since 1990. All coal fired power plants built after 1991 are required to have flue gas desulphurization system and low nitrogen oxide burners while all new power plants approved after 1996 are required to use natural gas. Apart from statutory controls, grants have been provided to owners of diesel taxis, light buses and pre-Euro diesel vehicles for the purpose of switching over to liquefied petroleum gas (LPG), installation of particulate traps and the fitting of catalytic converters with a view to reducing motor vehicle emissions. On the regional front, the Hong Kong Special Administrative Region Government and the Guangdong Provincial Government reached a consensus in April 2002 to reduce by 2010, on a best endeavour basis, the regional emissions of sulphur dioxide (SO_2), NO_x, respirable suspended particulates and volatile organic compounds by 40%, 20%, 55% and 55% respectively, using 1997 as the base year.

2.3 Despite the various measures taken by the Administration, the air pollution problem in Hong Kong remains serious as evidenced by the fact that 64% of the time the Air Pollution Index for road side stations were at high level[Note]. To be in a better position to advise and monitor the Administration's efforts in tackling air pollution, the delegation has selected Tokyo as a place for study in view of its active measures to improve air quality and global warming.

[Note] Acute health effects are not expected but chronic effects may be observed if one is exposed to such levels persistently for a long time.

Overseas experience

2.4 Tokyo, like other metropolitan cities, is facing problems of global warming and air pollution brought about by the increasing amount of carbon dioxide (CO_2) as a result of enormous energy consumption and surge in the number of vehicles. To tackle the problem, the Tokyo Metropolitan Government (TMG) has promulgated a policy stating that "Tokyo starts the reform to make healthy and safe environment and to build sustainable society". On the basis of the established policy and a report submitted by the Tokyo Metropolitan Council for the Environment in November 2001 taking into account views of stakeholders, TMG formulated a new "TMG Master Plan for Environment" in January 2002. The plan sets numerical targets, wherever feasible, towards the year 2015. These targets include achieving the environmental quality standard for suspended particulate matter (PM) by 2010 in all monitoring and measuring stations, reducing Tokyo greenhouse emissions by 6% using 1990 as the base level, restoring the function of artificial forest by implementing planned thinning and promotion of mixed forest.

2.5 The delegation has met with representatives of TMG to discuss the implementation and effectiveness of the Master Plan.

Meeting with representative of TMG

The Master Plan contains the following five specific strategic programmes –

(1) Getting blue sky back for Tokyo – taking extensive air pollution preventive measures;

(2) Positively addressing the global crisis issue from Tokyo – preventing global warming;

(3) Cooling the city of Tokyo – taking measures against the heat island phenomenon;

(4) Regaining greenery for Tokyo – conserving and regenerating the precious natural environment; and

(5) Taking the initiative in formulating a new eco-friendly framework – fostering an eco-friendly attitude in urban development.

Air pollution preventive measures

2.6 Despite the substantial improvement in reducing industrial smoke and emissions from factories following the enactment of various policies to tackle pollution at source, the continuous growth of vehicles, particularly diesel vehicles which account for about 80% of NO_x and almost all PM, has resulted in a low compliance rate with the environmental quality standards. To this end, TMG, in collaboration with the eight prefectures and municipalities, has implemented diesel vehicle emissions control regulations since October 2003. Diesel vehicles, including buses, trucks and special category vehicles like concrete mixers, garbage collection trucks and refrigerator/freezer vehicles, failing to comply with the PM emissions regulation will be banned from traveling through the metropolitan area. Owners are given seven years, from the date of new vehicle registration, to replace their vehicles with low-pollution models or retrofit them with a diesel PM reduction system certified by TMG.

2.7 To assist small and medium enterprises with difficult financial status to comply with the regulation, TMG has set up a loan mediation programme to provide subsidy for the installation of PM reduction system and other measures. Details of the Loan Mediation Programme are given below –

Loan Mediation Program	Motor vehicle pollution control promotion fund	• Assurance by Tokyo Credit Assurance Association for loans from financial organizations. • Loans available for purchase of low-emission vehicles designated by TMG or replacement with vehicles compliant with the latest regulations (however, replacement with non-diesel vehicle is required if vehicle is 3.5 tons or less). • Interest rate is long-term prime rate. • TMG subsidy to cover interest payment (half of interest rate) and subsidy in guarantee fee (2/3).
	Special loans	• Obtain assurance from a commercial bank and make loan. • Loans available for replacement of diesel trucks and buses that are subject to the NOx and PM Law by vehicles that comply with the latest regulations.
Diesel Vehicle Subsidy Program PM reduction system		Subject vehicles: Long-term regulation diesel vehicle exceeding 3.5 tons (passenger vehicles do not apply). (Ceiling) • ¥200,000 per unit for large vehicles (exceeding 8 tons in total body weight) • ¥100,000 per unit for smaller vehicles (between 3.5 tons and 8 tons in total body weight)

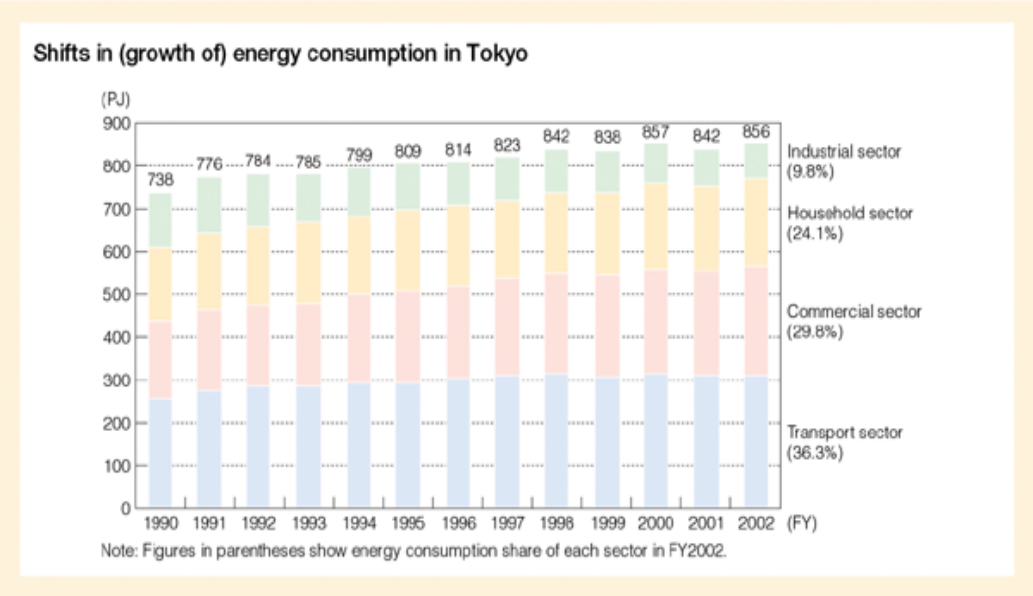
2.8 Following the recommendation of the General Council on Natural Resources and Energy that sulphur-free (containing less than 10 part-per-million (ppm) sulphur) fuel should be made available from 2008 for gasoline and 2007 for diesel, the Petroleum Association of Japan, at the request of TMG, has begun full distribution of sulphur-free fuel from January 2005, two years ahead for diesel and three years for gasoline. TMG has also appealed to 12 vehicle manufacturers and the Japan Automobile Manufacturers Association Inc. on the production of environmentally friendly vehicles to meet the country's exhaust emission regulations. Types of low-pollution vehicles include those fuelled with compressed natural gas, LPG and hybrid cars. Enterprises using 200 vehicles or more in the Metropolis are required to convert their vehicles to "ultra-low-pollution vehicles" as designated by TMG. To expedite the introduction of low-emission vehicles, TMG has implemented the following assistance measures –

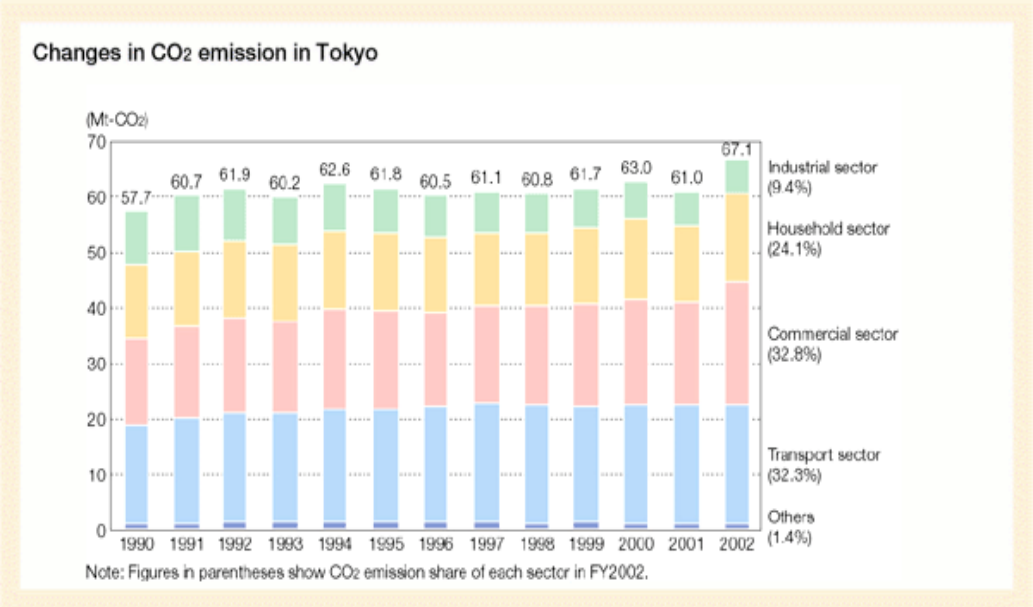
- Assistance measures for introduction of low-emission vehicles
  - Loan mediation for introduction of low-emission vehicles
  - Assistance to regular route bus operators to cover part of their expense for introducing CNG vehicles
  - Financial support provided for installation of CNG fueling stations

2.9 To tackle the impact of traffic congestion on the environment, effort has been made by TMG in the promotion of Transportation Demand Management (TDM). As rapport from stakeholders is crucial in the implementation of TDM plans, a Transportation Demand Management Administrative Liaison Group has been established since 2002 to facilitate exchange of information and cooperation with wards and municipalities. It has also set up subcommittees to study issues in specific areas, including flow of goods and Park & Ride etc, to divert traffic flow away from the center of the city. With the expansion of loading capacity to carry more goods, the number of goods vehicles running on streets has been reduced. The provision of more parking spaces at lower charges at the outskirts of the metropolitan area also helps to encourage people to park their cars at these parking places and make use of public transport to reach the city centre. Meanwhile, TMG has been studying road pricing systems with a view to reducing traffic volume at specified zones. However, decisions on the systems to be adopted and the levy to be charged have yet to be made pending the provision of diverted routes and opinions from stakeholders.

Prevention of global warming

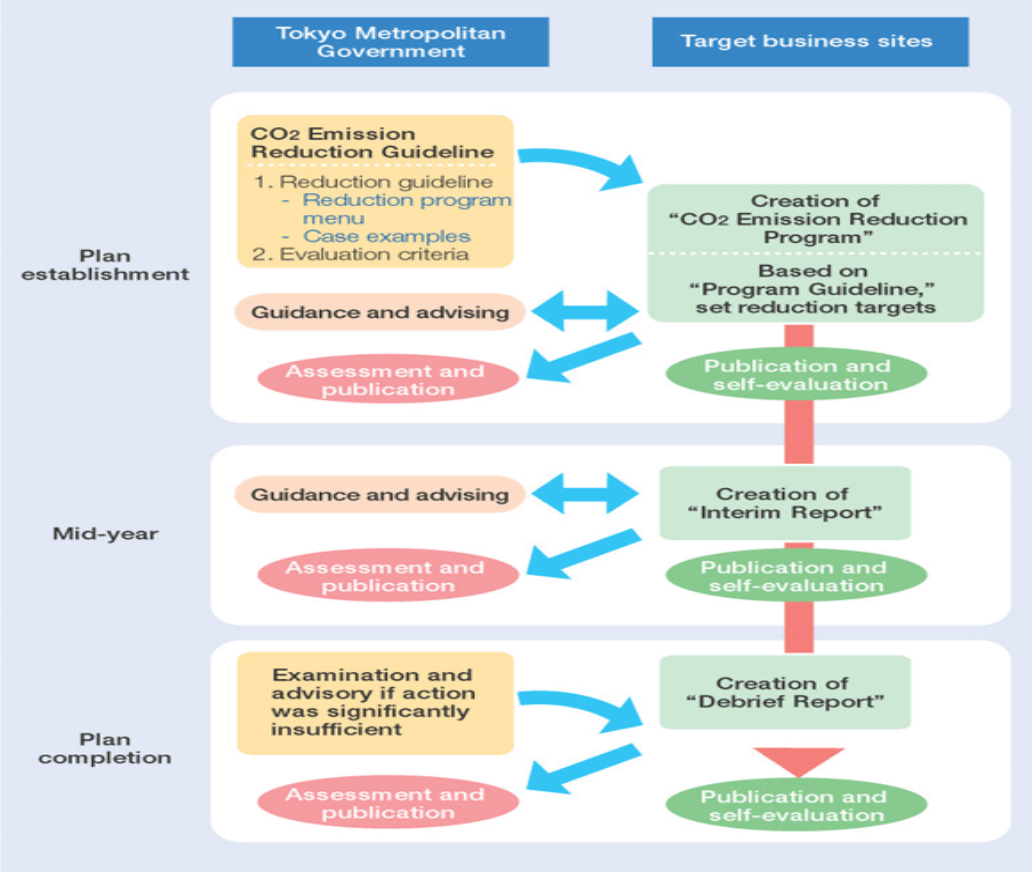
2.10 According to the Meteorological Agency's report on 1999's unusual weather, the temperature has increased by 0.6^{o}C worldwide and 1^{o}C in Japan for the past 100 years. This is mainly attributed to the increase in CO_2 and other greenhouse gases as a result of energy consumption. Total CO_2 emission in Tokyo in 2002 was approximately 16% higher than that in 1990. The increase is particularly obvious in the commercial sector (39%) and the household sector (23%). The rise in the number of vehicles, particularly those of larger size, is also responsible for the marked increase in CO_2 emissions. The following charts show the energy consumption and the changes in CO_2 emissions in Tokyo.





To tackle the global warming phenomenon, TMG sets forth the goal of reducing greenhouse gas emissions in Tokyo by 6% by 2010, using 1990 as the base year, through energy demand management as well as expansion and promotion of renewable energy options.

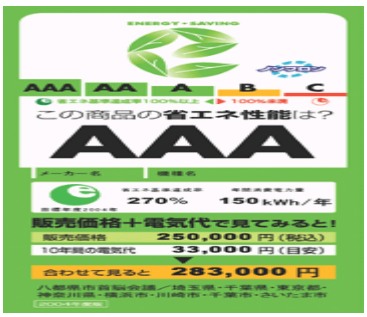
2.11 On ***energy demand management***, TMG has introduced, based on the Ordinance on Environmental Preservation in April 2002, the CO_2 Emission Reduction Program and Green Building Program targeting on business sites with large energy consumption. The CO_2 Emission Reduction Program has a planning period of five years. Enterprises are required to analyze their situation of greenhouse gas emissions and set up a reduction target with measures to achieve the target. An annual progress report will need to be submitted to TMG which will evaluate the report and make a public announcement in the mid-year and upon completion of the plan. The approach aims to promote the reduction of CO_2 emission in large-scale enterprises because their performance will be "evaluated by the society". As a supportive measure, TMG will establish a new Tokyo Global Warming Prevention Network with trade associations to encourage environmental businesses and to promote mitigation measures. A chart showing the operation of the CO_2 Emission Reduction Program is given below –



2.12 Under the Green Building Program, administrators of building construction or expansion project are required to submit their plans of action on energy conservation and other environmental measures. The areas to be covered are listed below. Since April 2005, they are also required to indicate in the advertisements for condominiums the environmental performance so that prospective buyers can make an informed decision.

Area	Specific items
Rationalization of energy use	• Reduction of building heat strain • Utilization of natural energy • Energy conservation systems • Structure for effective facility operations • Regional energy conservation
Appropriate use of resources	• Eco-materials • Protection, etc., of the ozone layer • Promotion of a longer lifespan, etc. • Water circulation (water for miscellaneous use, use of rainwater)
Conservation of the natural environment	• Water circulation (rainwater permeation) • Greening-up
Abatement of the heat island phenomenon	• Actions for artificial exhaust heat from buildings • Actions for covering of grounds and buildings • Consideration for wind environment

2.13 The increasing CO_2 emission from the household sector is mainly attributed to the surge in the number of single households. As the use of electricity comprises 60% of the energy consumption of an average household, of which 60% accounts for the use of electrical appliances, such as air conditioners, refrigerators, lighting apparatus and television etc, there is a need to promote energy-saving awareness among citizens of Tokyo. To this end, TMG has introduced an energy-saving label system for electrical products to enable consumers to select and purchase energy saving products. Apart from classifying the energy-saving performance of products into five levels, the energy label also provides indication on the electricity expenses for 10 years so that consumers are made aware of the running costs when choosing their appliances.



2.14 On ***expansion and promotion of renewable energy options***, TMG has been, in cooperation with private enterprises, implementing the following major projects to expand the use of renewable energy since 2002 –

	Name of facilities	Power, size and others
Solar power	Tokyo Metropolitan Assembly Hall	12kw
	Filter plant	2,123kw
Wind power	Water front wind power generator (Tokyo Kazaguruma)	850kw × 2
Fuel-cell power	Stationed Institute of Environmental Sciences	200kw
	Hydrogen pumping station	One
	Toei Bus	August 2003–December 2004
Biomass (sewage sludge)	Morigasaki Water Reclamation Center	3,200kw

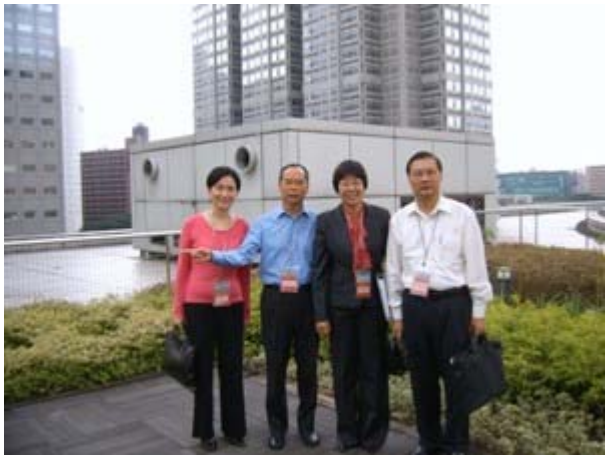
To promote the use of renewable energy on large-scale, TMG has designated "electricity" as a product subject to green purchasing and TMG-owned facilities have been requested to purchase 5% or more electricity from renewable energy sources since November 2004.

Measures against the heat island phenomena

2.15 "Heat Island" is a local high-temperature zone in a city caused by increase in energy consumption by urban activities, such as use of air-conditioning as temperature rises and increase in traffic volume, and artificiality of ground coating like concrete and asphalt which release large amount of radiant heat. Measures, including suppression of energy consumption through the use of more energy-efficient equipment, greening of rooftops and wall surfaces as well as use of materials that do not hold heat on the ground or surfaces of buildings, are being taken to abate the problem.

2.16 As the increase in greenery above ground, rooftops and wall surfaces has the advantageous effect of lowering the surface temperature of buildings, TMG, based on the Nature Conservation Ordinance, has required greening rooftops and wall surfaces for new grounds and buildings that have a ground surface area of over 1 000 square metres (m^2) (250 m^2 for public facilities) since April 2001. The greening area should be proportionate to the ground surface area. As at January 2005, over 54.5 hectares (ha) of rooftops have been greened.

However, such requirement is not applicable to existing buildings. The delegation also visited the green rooftop at the TMG Building and the Tokyo Big Sight.



Green rooftop at the TMG Building

Green rooftop at the Tokyo Big Sight

According to TMG, the set up cost for the green rooftop at the TMG Building is about JPY 30 million while the annual maintenance and management cost is about JPY 1 million. Using recycled materials for the flower beds and compost of 15 centimeters in thickness as soil, the greenery can prevent leakage and retain moisture up to three days without the need for watering. While the effectiveness of green rooftop in reducing indoor temperature and saving energy has yet to be assessed, there is evidence showing that the greenery is able to reduce the temperature of the floor below by $1^{o}C$.

2.17 In addition, TMG also issued guidelines to encourage enterprises to use air-conditioning only when outdoor temperature is above 28°C in summer or below 18°C in winter. To adapt to such a change, dress code for the working class has been relaxed such that gentlemen need not wear neckties to work in summer. While these guidelines are not mandatory, many large enterprises are willing to participate given the financial incentives as a result of savings from reduction in energy consumption.

Observations

2.18 The delegation appreciates the commitment of TMG in combating air pollution, which is an arduous problem requiring not only effective measures but also concerted efforts from all stakeholders. Despite the various measures taken by TMG, members note that not much progress has been made in improving the quality of air in Tokyo. This may be due to the fact that many of these measures are voluntary in nature and their success would very much depend on public participation. Notwithstanding, the delegation considers that these measures would provide useful reference for Hong Kong in tackling air pollution, particularly the implementation of green roofing to reduce indoor room temperature. Given the low start-up and maintenance cost, members consider that green roofing might be suitable for Hong Kong. However, there may be a need to address the concern about possible water seepage before green roofing can be applied on a large scale. Attention is also drawn to the need for the Administration to formulate an established policy and mechanism to allow exemption from counting Gross Floor Area and bonus Gross Floor Area which may be granted to encourage the provision of green rooftops.

Chapter III : Management of municipal solid waste

3.1 The amount of municipal solid waste (MSW) (which comprises domestic, commercial and industrial waste) in Hong Kong has been rising as the population and economic activities continue to grow. The overall volume of waste has been increasing at an annual rate of 3.5%. For domestic waste alone, the average increase is 4% which is significantly higher than the average population growth of 0.9%.

3.2 To tackle the increasing waste problem, the Administration published "A Policy Framework for the Management of Municipal Waste (2005-2014)" in December 2005 setting out the way forward on MSW management for the next decade from 2005 to 2014. The emphases of the Policy Framework are on community participation and the "polluter-pays" principle. It sets out a comprehensive strategy consisting of a series of policy tools and measures to achieve the targets of reducing the amount of MSW generated in Hong Kong by 1% per annum by 2014, increasing the overall recovery rate of MSW to 45% by 2009 and 50% by 2014 and reducing the total MSW disposed of in landfills to less than 25% by 2014. These measures include expediting the roll-out of territory-wide waste recovery programmes to increase the amount of local recyclables, introducing mandatory producer responsibility schemes (PRSs) through new legislation upon completion of detailed studies on product-specific measures, examining ways of introducing charging for MSW, continuing the development of EcoPark for the environmental industry, introducing landfill disposal bans to complement PRSs and extending the existing strategic landfills etc.

3.3 While agreeing that the Policy Framework is a step in the right direction, the Panel holds the view that the target of reducing the amount of MSW generated in Hong Kong by 1% per annum up to the year 2014 is far too low. More efforts should also be made to promote recovery, recycling and reuse because the processes of collection, turning recovered materials into useable products and the sale of these products would not only add values to the recovered materials but can also create a circular economy that brings business and job opportunities. To facilitate a better understanding on the latest development on waste management, the delegation has selected Tokyo and Sapporo as the places for study on account of their advanced technology on waste treatment and recycling respectively.

Overseas experience

3.4 In Tokyo, local municipalities (i.e. wards) are responsible for collecting and treating MSW generated within their jurisdiction for final disposal or recycling while TMG provides technical and financial support to the 23 wards for the disposal of treated MSW in the Outer Central Breakwater Landfill Site Area in conjunction with the New Sea Surface Disposal Site. The former has a total area of 199 ha and has been filled up since October 1997 while the latter has a total area of 480 ha of which 319 ha have been filled. With the increase in the amount of waste coupled with inadequate supply of intermediate waste treatment facilities and depleting landfill capacity, Tokyo is facing serious waste problems which need to be urgently attended to.

3.5 To maintain the growth and vitality of the city while minimizing the burden of MSW, TMG has, based on the Basic Law for Promotion of a Recycling-based Society enacted in May 2000, worked aggressively to organize a new recycling system, build related mechanisms and establish rapport with municipal governments. Citizens are required to accept their responsibility as a waste producer and take appropriate action in everyday life to reduce waste production through recycling and reuse. Founded on the policy on extended producer responsibility, TMG has introduced mechanisms for self-collection by manufacturers and vendors to enhance awareness on waste reduction from product design to manufacturing. There are also separate laws governing the recycling of specified products, including the Specified Household Appliance Recycling Law for air-conditioners, televisions, refrigerators and washing machines as well as the Law for Promotion of Effective Utilization of Resources for personal computers and compact rechargeable batteries. As a result of these efforts, the total amount of MSW generated in the 23 wards of Tokyo remains steady over the past few years despite the rise of the total amount of MSW generated nationwide.

Segregation of MSW

3.6 In general, MSW in Tokyo is classified and separately collected in four categories, namely large-size waste (e.g. furniture), combustible waste (e.g. paper, kitchen waste), incombustible waste (e.g. leather) and recyclables (e.g. aluminum cans). Households are required to properly separate recyclables from regular garbage. Depending on the practices of individual wards, recyclables are either collected by contractors or taken to recyclable garbage stations in person at designated days and times. Large-size waste items have to be collected subject

to a charge. Combustible waste is to be put in garbage bags which can be bought from convenience stores. Waste not properly separated will not be accepted. While there is no penalty for non-compliance, education and monitoring will be stepped up at places where there is an increased trend for non-compliance.

Treatment of MSW

3.7 Incineration is used in Tokyo to treat combustible waste not only for sanitary purpose but to reduce the volume of waste (to about one-twentieth) before disposal so as to prolong the life span of the remaining New Sea Surface Disposal Site. There are totally 21 incineration facilities distributed across Tokyo. As gaining public acceptance of incineration facilities is very important, incineration facilities must adopt the best practice and safe technologies, have pleasing aesthetic design that is harmonious to the vicinity area as well as provide return and benefits to the residents.

3.8 Refuse is usually collected by garbage trucks. In addition, some municipalities have developed a pipeline system for the collection of refuse with a view to conserving the environment and promoting users' convenience. For instance, Tokyo Area 23 has developed a pneumatic pipeline collection system for combustible refuse, which comprises users' facilities, refuse collection pipelines, a substation and a collection plant installed in the Ariake Incineration Plant. Refuse is stored in the users' facilities placed in individual buildings and collected through the pipelines, installed in the common conduits together with other infrastructural facilities, to the collection plant with a stream of air generated by blowers installed in the collection plant and finally stored in a refuse bunker.

Ariake Incineration Plant

3.9 The delegation has visited the Ariake Incineration Plant which is a conventional incineration plant located at the water front area in southern Tokyo. The Plant is designed to achieve harmony with the nearby landscape. Its stack is in a sharp-edged triangular shape instead of conventional circular shape. It has two lines of incineration unit with a total capacity of 400 tonnes per day (tpd). Dioxin emission from the stack is monitored twice per day, and the average level is about 0.0005 ng-TE/cum which is considerably lower than the Japanese national standard requirement of 0.1 ng-TEQ/cum. Heat generated from the incinerator is recovered for district heating and cooling at various community

facilities, such as the Koto city Ariake sport centre. The outline of the Plant is given in **Appendix V**.

Ariake Incineration Plant

Asahi Clean Centre

3.10 Apart from the conventional Ariake Incineration Plant, the delegation has also visited a gasification plant in the Kawaguchi City in the proximity of Tokyo. The Asahi Clean Centre occupies some 3.1 ha and comprises a recycling plaza, a MSW gasification plant with capacity of 420 tpd and also a number of education and community facilities, including bathrooms, swimming pool, exhibition hall, video library and lecture room. All these facilities are housed inside a well-designed building.

Asahi Clean Centre

3.11 The recycling plaza of the Asahi Clean Centre receives recyclables, such as bottles, cardboard and cans for processing and packaging before these materials are sent to other dedicated plants for resource recycling. It also serves as an educational facility to promote public awareness of recycling and environmental issues. It is estimated that there are about 110 000 people visiting the Centre per year.

Different kinds of recyclables

3.12 The Centre employs a "fluidized bed gasification melting furnace" to treat combustible MSW. Waste fed to the gasification furnace is dried and gasified at 550^{o}C to 600^{o}C (the temperature of fluidized bed is relatively low such that aluminum and ferrous materials remain un-oxidized for collection and reuse). Pyrolysis gas is then rotated with combustion air and burnt at 1300^{o}C to reduce the generation of dioxins and melt the ash to slag. The dioxin level in the emission is 0.000097 to 0.015 ng-TEQ/cum, which is far below the standard of 0.05 ng-TEQ/cum. Apart from MSW, the Centre also receives ash from other stoker type MSW incinerators for treatment. The resultant slag can be recycled effectively as supplementary asphalt for road paving work etc.

3.13 Thermal energy of the flue gas generated in the gasifier and ash melting furnace is used to generate high-pressure steam for the steam turbine generator to produce electricity. About 80% of the power generated is used by the plant, while the remaining 20% surplus power is sold to an electricity company. The steam is also used for hot water supply systems for other facilities, such bathrooms, lounge as well as kiosk within the Centre attracting an average patronage of about 1500 per day. The outline of the Centre is given in **Appendix VI**.

Kiosk within the Asahi Clean Centre

Recycling of MSW

3.14 Recycling is an integral part of waste reduction. Besides, the processes of collection, turning recovered materials into useable products and the sale of these products add values to the recovered materials and can create a circular economy that brings business and job opportunities. The delegation has visited the Sapporo Recycling Complex which is established by the Sapporo Government as a focal point for the collection, processing and recycling of waste from local businesses. It is responsible for identifying the suitable site for and gaining acceptance of the complex from residents. There are three types of entities in the complex, namely private firms, third-sector companies and the city itself. As an incentive, land within the complex is leased to enterprises at a discount of 50% of the market price for a period of 30 years and subject to renewal. There are totally 10 companies in the complex and each one is unique in dealing with a specific type of waste with a view to complementing each other and avoiding competition. Four of them are selected for the visit on account of their relevancy to the situation in Hong Kong.

Sapporo Recycling Complex

KOSEI KIGYO Corporation

3.15 This is an industrial waste treatment centre with a total area of 26 029 m^2 and different facilities to treat different wastes. These include –

(a) Waste oil recycling facility (recovery capacity: 18 kilolitres/day) where waste engine oil is distilled into a product equivalent to type-A heavy fuel oil;

(b) Organic sludge treatment facility (capacity: 80 m^3/day) where organic sludge from say food factories is heat-dried and compressed;

(c) Inorganic sludge treatment facility (capacity: 300 m^3/day) where inorganic sludge from construction sites is compressed and dehydrated to reduce volume; and

(d) Special incineration facility (capacity: 30 tpd) where oil drums, plastic and medical waste are incinerated.

Waste is separated before treatment

Tire Recycle Hokkaido Co., Ltd

3.16 This is a waste tire recycling facility with a total area of 9 900 m^2 and a capacity of 8 000 tonnes/year. Waste tires are press-cut into 32 or 64 pieces for easy loading and unloading during transportation. The products will be sent to cement plants where they are used as fuel or raw materials.

Cut-up pieces of waste tires

Hokkaido PET Bottle Recycling Co., Ltd

3.17 With a total area of 5 744 m^2, this facility has a capacity to treat 10 000 tonnes of PET bottles per year. Bales of PET bottles are first broken down into pieces by the disjointing machine. Labels removed during the process

are separated by air and stored. The bottles then go through the vibrating screen for residual removal and the vinyl cycle to sort out vinyl chloride bottles. Foreign subjects, such as labels or metals, are removed by hand. Bottles are then cut by cutting machine into flakes not exceeding eight millimeters and put into the first water tank for washing by the turbo washer. Re-washing in the second water tank is required for removal of residues before the flakes are dried by a centrifuge. About 8 700 tonnes of flakes are produced each year. The flakes are sold to the adjacent company which will convert the flakes into PET sheets for manufacturing of egg cartons, packaging for fruits, sweets etc.

Bales of PET bottles

Final product – PET sheets

Sanzo Organic Recycle Co., Ltd

3.18 This is a food waste recycling centre with a total area of 5 500 m^2 and a capacity of 60 tpd. The capital cost of the centre is JPY 55 million. It collects food scraps from schools and commercial kitchens in Sapporo for processing. The materials are first mixed with edible oil and heated before putting in a centrifuge for dehydration and recovery of oil for reuse. The product is ground before packaging for sale as animal feed and fertilizer. About 10 tpd of end product are produced.

Food waste

Final product – animal feed and fertilizer

Recycle Peer Co., Limited

3.19 Apart from MSW, the delegation also took the opportunity to visit a recycling plant for construction and demolition (C&D) materials in Tokyo. Under the Construction Material Recycling Law which aims at promoting reduction and recycling of C&D materials with a view to preserving the environment, TMG requires all project owners to report construction works of a designated scale in advance. The project contractor is required to sort, disassemble and recycle designated C&D materials and report to the owner upon completion of the recycling process. There are four types of designated C&D materials, namely concrete, asphalt, waste timber and others.

3.20 The Recycle Peer Co., Limited is part of TMG's super eco-town project to handle mixed C&D materials for sorting and recycling. It is a private firm operated under a licence issued by TMG for five years subject to renewal upon satisfactory performance. The plant has a total area of about 9 000 m^2 and a capacity of 960 tpd. Mixed C&D materials entering the plant are weighed and charged before sorting by both machine and hand. The materials, including dust, are washed, dried and recycled into road bed material, wood chips and gypsum etc. The target of the company is to recycle 94% of C&D materials with the residual being disposed of at landfill at a cost to be payable by the company itself. Last year, the company has achieved a recycling rate of 85%.

Introduction to the treatment process and display of recyclables

Observations

3.21 Like other places, Tokyo adopts the "3Rs" principle (i.e. reduce, reuse and recycle) in the management of MSW. The delegation however notes that public participation is what makes recycling so successful in Tokyo. Recycling in Tokyo starts at the community level where residents take the lead in separating recyclables from domestic waste. Non-recyclable waste is collected and treated at local incineration facilities. The distributed approach ensures that each ward is responsible for its own MSW. Given the concern about incinerators, particularly dioxin emission, extensive public consultation has to be carried out to solicit support from residents in the vicinity of the incineration facilities. By way of illustration, seven years have been taken to reach a consensus on the setting up of the Asahi Clean Centre in the Kawaguchi-city. Apart from discussions with the ward government and various political parties, meetings with residents were also held to gauge their views and allay their concerns about incineration. After extensive consultation, it was agreed that a community hall and a number of parks would be built along with the incineration facilities for the betterment of the community. As part of the community, the design of the Centre blends well with the surrounding and contains facilities, such as a health spa, men and women's baths, a relaxation lounge and other amenities, for the enjoyment of the residents. Members consider that this has illustrated the importance of consultation with stakeholders before the implementation of policies that have wide implications on the livelihood of the general public.

3.22 The delegation is also impressed by the success of the Sapporo Recycling Complex in fostering the development of recycling industries. The turning of waste into useful materials has not only helped preserve valuable resources but also created business opportunities for enterprises. By way of illustration, the demand for PET-bottle flakes has become so great that the Hokkaido PET Bottle Recycling Co., Ltd. has to buy used PET bottles, instead of being paid, for recycling nowadays. Notwithstanding, the enterprise is still able to make a profit. Members consider that the successful experience of the Sapporo Recycling Complex can set a good example for the Eco Park in Hong Kong.

Chapter IV : Renewable energy

4.1 Power plants are the largest emission source within Hong Kong. To tackle the problem, the Administration has proposed in the Consultation Paper on Future Development of the Electricity Market in Hong Kong – Stage II Consultation published in December 2005 a package of measures to reduce emissions from power plants, including the development of renewable energy. According to findings of the "Study on the Potential Applications of Renewable Energy in Hong Kong", there are four types of renewable energy, namely solar power, wind power, building integrated fuel cell and energy from waste, which are considered potentially feasible for wide-scale application in Hong Kong. The recommended targets of contribution from renewable energy to annual electricity demand are 1% in 2012, 2% in 2017 and 3% in 2022.

4.2 The Panel supports the development of renewable energy in Hong Kong and considers the recommended targets of contribution from renewable energy too conservative given the successful overseas experience. As the Administration has launched a pilot scheme on the application of renewable energy on a commercial scale, the delegation has selected Denmark, one of the world's forerunners in the development of renewable energy, as a place of study such that members would be in a better position to advise and monitor the formulation and implementation of policy on renewable energy in Hong Kong.

Overseas experience

4.3 The global energy crisis in the middle of the 1970s has prompted the Danish Government to formulate long-term energy plans with a view to reducing the dependence on fossil fuels and securing the domestic supply of energy. Since then, energy production from renewable sources has become an important pillar of energy supply in Denmark. Renewable energy includes wind power, biomass and solar power etc. The use of renewable energy not only contributes to the security supply of energy but also protects the environment as renewable energy does not increase the concentration of greenhouse gases in the atmosphere. Today, renewable energy accounts for approximately 28% of electricity produced in Denmark. The share of renewable energy is expected to rise to 29% by 2010 in line with the European Union (EU)'s requirement. The application of renewable energy in Denmark is so successful that exportation of surplus power to other European countries is made possible.

Wind power

4.4 Denmark is one of world leaders in the use of wind power. Since 1980, more than 6 000 wind turbines have been established on land. Following the two re-powering programmes implemented by the Danish Government during the period from 2001 to 2003, the total number of wind turbines has been reduced as smaller wind turbines are replaced by larger and more powerful ones, which have tripled the capacity. In 2005, there were about 5 300 wind turbines operating in the country with a total installed capacity of 3 100 megawatt (MW). Wind power now accounts for 19% of Danish electricity supply. The delegation has met representatives of the Danish Energy Authority, an executive arm of the Ministry of Transport and Energy responsible for planning and overseeing the production, supply and consumption of energy in Denmark, to exchange views on the development of renewable energy in Denmark, particularly wind power.

Meeting with representatives of the Danish Energy Authority

4.5 It is noted that the expansion of wind power in Denmark is based on the political understanding that renewable energy technologies, being new on the market, require special support in order to gain a foot-hold. Up till 1990, subsidies were provided for 30% of the installation costs. A fixed electricity production feed-in tariff was also made available until the electricity reform, which was part of the liberalization of the electricity market in 1999, where the fixed feed-in tariff was replaced by a feed-in tariff paid by electricity consumers. The support is equally applied across the country, irrespective of wind conditions. Electricity production from wind turbines is also given priority for access to the electricity grid. It is therefore economically advantageous for the private sector to establish wind turbines at the best onshore locations.

4.6 While wind power produces no emission and is an excellent alternative source of energy from an environmental perspective, wind turbines on land have adverse visual and sound effect on their surroundings. As such, there was an increased interest in locating wind turbines offshore because wind resources are better and with less turbulence/low roughness in the offshore environment. There are also more choices of unexploited and larger sites imposing no "physical limits" on the size and weight of wind turbines. Besides, less resistance from local inhabitants is expected. The first pilot projects with offshore wind turbines were carried out in the 1990s which had demonstrated that the economy of offshore wind power was better than expected, and that the environmental impacts were less than feared. However, the cost of offshore wind farms is about two times higher than that of onshore wind farms. The installation and maintenance of the offshore wind farms are also more complicated and expensive.

4.7 The delegation has taken the opportunity to meet with representatives from Vesta, one of the world leading companies in Denmark in the manufacture of wind turbines, the DONG Energy and Wind Power Academy to exchange views on the application of wind power. Members have also visited the Rodby Sand and the Nysted Offshore projects.

Nysted Offshore Project

Solar power

4.8 Apart from wind power, solar energy is another source of renewable energy. The use of solar energy in Denmark is voluntary and usually applied on a small scale in private buildings and new schools. The solar cell panels are installed in such a way that they integrate into the design of a building and sometimes even create an artistic impression. Given the relatively low efficiency of solar cells, the production cost of electricity is about four times higher than that generated from conventional fuels. To encourage the wider use of solar energy, the Copenhagen Solar City assists interested parties to draw up pilot schemes and helps them to overcome the barriers in the start-up of these schemes. The delegation has visited the Copenhagen Solar City and exchanged views with its representative on the development of solar energy in Denmark.

Solar cells installed outside the wall of a residential building

4.9 To enable households and enterprises to have a free choice on how their need for energy can be met and pave way for lower prices and a more efficient and diversified supply of energy, the Danish Government, with the support of political parties in the Danish Parliament, has implemented a number of energy reforms, inter alia, the liberalization of the electricity sector in 1990s to enhance competition and flexibility. Since then, the electricity grid and its operation are subject to public price regulation and all users have equal access to the infrastructure. This plays a crucial role in encouraging the emergence of new companies, including renewable energy producers from both the commercial and household sectors. System operators of household wind turbines can sell excess electricity to the national grid to provide financial assistance for the purchase and installation of wind turbines. Other measures include subsidization, tax exemption for renewable energy, taxation on fossil fuels, research and development support as well as financing by electricity tariff.

Control of pollution

4.10 The delegation has also taken the opportunity to exchange views with a representative of the Danish Environmental Protection Agency on measures to tackle air pollution. Members note that similar to Hong Kong, the problem of vehicular emissions is also prevalent in Denmark. To this end, the Danish Government has put in place legislation to regulate pollutants, including CO_2,

NO_x, hydrogen carbons, lead, sulphur, benzene, aromatics and olefins etc. There are also discussions on the standard of PM to be adopted.

Meeting with representative of the Danish Environmental Protection Agency

Observations

4.11 Based on the experience of Denmark, the delegation holds the view that wind power may be applied to Hong Kong on a larger scale, and that offshore wind farm may be a feasible option. Members however note that there are concerns about the potential effects of wind turbines on the marine environment, birds and fishing trades etc. In this connection, there is a need for the Government to conduct extensive research studies before a decision on the feasibility of offshore wind farm is made. As regards solar energy, the delegation agrees that this may not be suitable for commercial application given the relatively high cost. Nevertheless, the Government should endeavour to use solar energy in public facilities, such as schools, hospitals and government buildings, as an illustration of its commitment to improving the air quality in Hong Kong. Large corporations should also be encouraged to use renewable energy as part of their corporate responsibility. To foster the development of renewable energy in Hong Kong, consideration should be given to liberalizing the electricity market and allowing access to the grid by new companies to enhance competition as in the case of Denmark. The delegation is well aware that renewable energy is more expensive than energy from conventional fuels, but this is a price worth paying to protect the environment.

Chapter V : Total water management

5.1 Water is a scarce resource in Hong Kong. The renewable water reserve in Hong Kong is only sufficient to meet 20% to 30% of the demand for potable water from its people and the rest has to be made up by the supply of Dongjiang water from the Mainland. Hence, there is a need to protect the existing water resources and explore new resources. In this connection, the Administration has implemented various measures to manage and protect water gathering grounds. Other programmes, such as the pilot desalination plant study at Tuen Mun and Ap Lei Chau and the pilot scheme at Ngong Ping on the use of reclaimed water, have also been launched. In addition, public education and promotional activities have been stepped up to encourage the public to conserve water and protect water resources.

5.2 While acknowledging the efforts being made by the Administration, the Panel remains of the view that there is a lack of a total water management policy to protect and conserve water resources as well as preserve inland and coastal water quality which has suffered badly as a result of increasing pollution loads arising from population growth and human activity. As Finland tops the world in water management, it has been selected as a place for study by the delegation.

Overseas experience

5.3 Finland is a land rich in water, including 187 888 lakes and 647 rivers which comprise about 10% of its total area. It also lies on the Baltic Sea and has a shoreline of 314 000 kilometres. According to the water poverty index devised by the World Water Council and the British Centre of Ecology and Hydrology, Finland is the richest of the 147 countries assessed, in terms of capacity, water resources, access, use and ecological sustainability. Its renewable fresh water reserves are estimated at 21 268 cubic metres (m^3) per inhabitant, whereas the threshold for water poverty has been set at 1 700 m^3 per person.

Water policies

5.4 Despite the abundant water resources in Finland, an integrated water resource management has been adopted by the Finnish Government back in the 1970s to protect the water resources since water bodies are highly vulnerable to environmental changes. Three national water protection programmes have been issued since then. These programmes specify quantitative water protection targets for priority sectors, including agriculture, industry and municipalities. Progress towards reaching these targets is closely monitored.

5.5 As Finland borders on three other countries, namely Russia, Sweden and Norway, and rivers run along many stretches of these frontiers, close cooperation with the neighbouring countries is necessary to coordinate the management of the trans-boundary water resources to ensure that these are properly used and duly protected. Finland has entered into agreements with its neighbouring countries during the period from 1964 to 1980. It is also a party to the Convention on the Protection of the Marine Environment of the Baltic Sea.

5.6 The delegation has met with representatives from the Ministry of the Environment to exchange views on the policies on water protection. It is noted that Finland has put in place a comprehensive legislative framework for total water management. Finnish regulations and laws relating to water and sewerage services can be divided into four main areas –

(a) Water services legislation governing the supply and distribution of water as well as the collection and treatment of waste water;

(b) Health protection legislation governing the quality of drinking water;

(c) Water and environmental protection legislation preventing pollution and controlling the use of water resources and structures built along waterways; and

(d) Legislative directives issued by EU on total water management.

Under Finland's environmental protection legislation, permits are required for activities that may lead to pollution of the air and contamination of water and soil. Environmental permits are issued based on case-by-case assessment and the use of best available technologies by the applicants to prevent or reduce environmental impacts. Disputes regarding permit applications are dealt with by courts to ensure impartiality.

Meeting with representatives of the Ministry of the Environment, Finland

5.7 Extensive institutional structures have been established at the central, regional and local levels for total water management. At the central level, the Ministry of the Environment is responsible for water protection and environmental protection policies, whereas the Ministry of Agriculture and Forestry is in charge of managing water resources. These two ministries also supervise the Finnish Environment Institute, a national advisory body established to provide information and solutions to support ecologically sustainable development in Finland. At the regional level, water and sewerage utilities are regulated and monitored by 13 regional environmental centres. These regional centres are also responsible for planning, monitoring and providing guidance on water issues within their jurisdictions. At the local level, municipalities are tasked with the provision of water and sewerage services in their respective administrative areas in accordance with the relevant legislation.

5.8 Most waterworks in Finnish towns and cities are owned by the local authorities. Users pay charges for water to cover the costs incurred in supplying clean tap water and treating wastewater. With the increased charges and new efficient technologies, the specific consumption of water from waterworks has decreased considerably in recent years. In addition to the “user pays principle”, the Finnish Government has also introduced economic instruments to encourage industries to reduce pollution loads in wastewater. By way of illustration, environmental subsidies have been provided to farmers for implementing measures that can reduce phosphorous and nitrogen loads on watercourses.

5.9 The delegation has also taken the opportunity to meet with the Environment Committee of the Finnish Parliament. Members note that environmental policies and legislation could not have been successfully implemented in Finland without the support of the Finnish Parliament. Parliamentarians play an important role in the formulation of environmental policies and legislation. Not only do they have to solicit consensus from the people and non-governmental organizations, they also have to strike a balance between environmental protection and economic development.

Meeting with representatives of the Environment Committee of the Finnish Parliament

Helsinki Water

5.10 The Helsinki Water is responsible for both the supply of high-quality drinking water for and treatment of wastewater from the Helsinki Metropolitan Area. The delegation has met with representatives of the Helsinki Water to exchange views on water management. Members note that the Helsinki Water has evolved from a municipal administrative department into a commercial enterprise owned by the City of Helsinki. Its operating costs are covered by water and wastewater charges collected from consumers.

Introduction to Helsinki Water

5.11 As part of the Helsinki Water, the Viikinmaki Wastewater Treatment Plant treats all wastewater from Helsinki and runoff water from the downtown area. The treatment process consists of three stages, namely mechanical, biological treatment combined with chemical treatment and biological secondary filtration process. Firstly, mechanical treatment is used to separate solid wastes by screening and sedimentation. Biological treatment based on the activated sludge process is then applied to remove finely divided organic matter. Ferrous sulphate is also used as a coagulation agent to remove phosphorous from the waste water. To remove nitrogen, a nitrification/denitrification process has been added to the biological stage since 1998. The remaining sludge is digested at a temperature of 36^{o}C to 37^{o}C over a three-week period before this is decanted and dewatered in a centrifuge. The dewatered sludge has to go through a composting process which takes about one year. Various minerals and nutrients are added to the mixture as needed. The final mixture is then screened and marketed for gardening and landscaping purposes.

Top view of the underground wastewater treatment facilities

Lake Tuusulanjarvi

5.12 Diffuse pollution from agriculture and forestry as well as sparsely populated areas beyond centralized sewerage systems has resulted in eutrophication of watercourses. An example is the huge outbreaks of floating blue-green algae in Lake Tuusulanjarvi. The delegation has taken the opportunity to visit the Keski-Uusimaa Municipal Board to exchange views with lake experts on the restoration project and toured around Lake Tuusulanjarvi. The restoration project aims to improve the water quality of the lake so that swimming is possible throughout the summer. It is noted that the eutrophication is mainly due to the increase in nutrient loading. About half of the total phosphorous loading is thought to originate from agricultural areas. To encourage farmers to reduce the phosphorous loading, free planning and additional bonus have been offered as a token of appreciation. As a result, over 10 sedimentation basins or wetlands have been built to the drainage basin and several others will be implemented. The wetland has not only stopped approximately 24% of incoming suspended solids, 15% of total phosphorous and 5% of total nitrogen, it has also increased the number of birds and bird species in the area. To maintain a continuous water flow, six circulation oxygenators have been operating during summer and one/two during winters to ensure a high content of oxygen in deep water. Low-nutrient water from Lake Rusutjarvi is also pumped through the Paijanne Tunnel to Lake Tuusulanjarvi to prevent the water levels from falling too low during dry spells.

Visit to the Lake Tuusulanjarvi

Observations

5.13 Despite the fact that Finland has abundant water resources, the delegation is impressed by the commitment of the Finnish Government in the protection of such valuable resources. Its effort in protecting trans-boundary watercourses with the neighbouring countries should set a good example for Hong Kong in establishing close rapport with the Guangdong Provincial Government in protecting the water resources in the Pearl River Delta Region, particularly when 70% to 80% of potable water in Hong Kong come from Dongjiang. Members are also impressed with the design of the Viikinmaki Wastewater Treatment Plant and the Paijanne Tunnel, both of which were built underground in rock cavern to minimize the possible impacts on the immediate environment. The experience may be applicable to Hong Kong given that many mountains in Hong Kong are capable of housing these treatment facilities. They further emphasize the importance for the Government to consult the political parties of the Legislative Council before putting forward any environmental policies and legislation because these could not be successfully implemented without the support of the latter as evidenced in the case of Finland.

Chapter VI : Acknowledgements

6.1 The delegation wishes to thank the Economic and Trade Offices (ETO) of the Hong Kong Government in Tokyo and London for their kind assistance in organizing the visits to Japan, Denmark and Finland. Members are particularly grateful to the Principal Representative (Tokyo) who has arranged a dinner reception for the delegation to meet prominent politicians in Japan to exchange views on issues of mutual concern. They would also like to express their sincere gratitude to the Director-General of ETO (London) who has personally escorted the delegation during their visit to Denmark. The delegation is deeply grateful to all persons and organizations, both in Hong Kong and overseas, for providing valuable information for the study. Members would also like to thank the staff of the Legislative Council Secretariat for their assistance in undertaking the study.

Legislative Council Secretariat
February 2007

Appendix I

Panel on Environmental Affairs

Terms of Reference

1. To monitor and examine Government policies and issues of public concern relating to environmental and conservation matters.

2. To provide a forum for the exchange and dissemination of views on the above policy matters.

3. To receive briefings and to formulate views on any major legislative or financial proposals in respect of the above policy areas prior to their formal introduction to the Council or Finance Committee.

4. To monitor and examine, to the extent it considers necessary, the above policy matters referred to it by a member of the Panel or by the House Committee.

5. To make reports to the Council or to the House Committee as required by the Rules of Procedure.

Panel on Environmental Affairs

Membership List for the 2005-2006 Session

Chairman	Hon CHOY So-yuk, JP
Deputy Chairman	Hon Emily LAU Wai-hing, JP
Members	Hon Martin LEE Chu-ming, SC, JP Hon CHEUNG Man-kwong Hon SIN Chung-kai, JP Hon WONG Yung-kan, JP Hon LAU Kong-wah, JP Hon Miriam LAU Kin-yee, GBS, JP Hon Albert CHAN Wai-yip Hon Audrey EU Yuet-mee, SC, JP Hon LEE Wing-tat Hon Jeffrey LAM Kin-fung, SBS, JP (Total : 12 Members)
Clerk	Miss Becky YU
Legal Adviser	Miss Monna LAI

Appendix II

Panel on Environmental Affairs

Programme for the Overseas duty visit
from 22 August to 1 September 2006

Date	Time	Programme
Tokyo		
23 August 2006 (Wed)	10:00 - 12:00	Meeting with the Director, Planning Division, Administration Department, Environment Bureau, Tokyo Metropolitan Government (TMG)
	14:00 - 15:30	Visit to TMG's Ariake Incineration Plant
	16:00 - 17:00	Visit to TMG's super eco town project run by a private company, Recycle Peer Co. Ltd
	19:00 - 21:00	Dinner with the Hong Kong Economic and Trade Office (Tokyo) and members of the Japan Hong Kong Parliamentarians League
24 August 2006 (Thu)	10:00 - 12:00	Visit to Asahi Clean Center of Kawaguchi City
Sapporo		
25 August 2006 (Fri)	13:00 - 13:50	Visit to KOSEI KIGYO Corporation (Nakanuma Industrial Waste Treatment Centre) in the Sapporo Recycling Complex
	14:00 - 14:50	Visit to Tire Recycle Hokkaido Co. Ltd. (Waste Tire Recycling Facility) in the Sapporo Recycling Complex
	15:00 - 15:50	Visit to Hokkaido PET-Bottle Recycling Co. Ltd. in the Sapporo Recycling Complex
	16:00 - 16:50	Visit to Sanzo Organic Recycle Co. Ltd. (Sapporo Garbage Recycle Centre) in the Sapporo Recycling Complex
26 - 27 August 2006 (Sat – Sun)	No official programme	

Date	Time	Programme
Copenhagen		
28 August 2006 (Mon)	09:00 - 10:45	Meeting with Danish Energy Authority
	13:30 - 16:00	Visit to wind turbines
29 August 2006 (Tue)	09:00 - 10:00	Meeting with the Danish Environmental Protection Agency
	10:15 - 13:00	Visit to the Copenhagen Solar City
Helsinki		
30 August 2006 (Wed)	10:00 - 12:00	Meeting with the Ministry of the Environment
	12:30 - 14:00	Lunch meeting with the Environment Committee of the Parliament of Finland
	14:45 - 16:45	Visit to Viikinmäki Wastewater Treatment Plant
	19:00	Dinner with the Ministry of the Environment
31 August 2006 (Thu)	08:30 - 10:30	Visit to Keski-Uudenmaan vesiensuojelun kuntayhtymä (municipalities co-operation project in water protection) lake and river Tuusula conservation project

Appendix III

List of persons/organizations
visited by the delegation during the tour

Date / City	List of persons/organizations
Wednesday, 23 August 2006 Tokyo	**Tokyo Metropolitan Government** Mr Makoto MOCHIZUKI Director of International Affairs Section Ms Reiko KOBAYASHI Assistant Team Leader of International Affairs Section Mr Tanigami YUTAKA Director, Planning and Coordination Section General Affairs Division Bureau of Environment 斎藤ひろみ先生 環境局　總務部 企画調整課　　広報広聴係長 Mr Fujiharu SANO Super Eco-Town Bureau of Environment Waste Management Division Management and Planning section **Ariake Incineration Plant** Mr Shigeo AMI Senior Chemist **Recycle Peer Co. Ltd** 梅村真二郎先生 企画室

Date / City	List of persons/organizations
Wednesday, 23 August 2006 Tokyo	Mr Tsutomu HATA Former Prime Minister Supreme Advisor, DPJ Member of the House Representatives Mr Yasushi KANEKO Member of House of Representatives Parliamentary Secretary for Agriculture Forestry and Fisheries Mr Hiroyuki NAGAHAMA Director, Committee on Environment Member of the House of Representatives Mr Shigeyuki TOMITA Director, Committee on Environment Member of the House of Representatives **Hong Kong Economic and Trade Office (Tokyo)** Mrs Jennie CHOK, JP Principal Representative Ms Anita CHAN Representative Mr Gilford LAW Deputy Representative Ms Setsuko OKAWA Executive Officer Ms Elena TSUCIDA Personal & Administrative Assistant
Thursday, 24 August 2006 Kawaguchi City	**Asahi Clean Center** 矢部弘先生 川口市環境部長

Date / City	List of persons/organizations
Friday, 25 August 2006 Sapporo	**KOSEI KIGYO Corporation** 原田利明先生 専務理事 **Tire Recycle Hokkaido Co. Ltd.** **Hokkaido PET-Bottle Recycling Co. Ltd.** Mr Kosaku OZAKI Director Factory Superintendent **Sanzo Organic Recycle Co. Ltd.** 佐藤正夫先生 工場長
Monday, 28 August 2006 Copenhagen	**Danish Energy Authority** Mr Anders HASSELAGER, M. Sc. Programme Manager Bilateral Co-operation Mr Steffen R. NIELSEN, Ph. D. Head of Section **Vestas** Mr Peter C BRUN Vice President, Governmental Relations Mr Kim HOUGAARD Senior Sales Manager, Offshore Sales Mr Ole Møller SØRENSEN Head of Quality, Quality Engineer Blade Factory

Date / City	List of persons/organizations
Monday, 28 August 2006 Copenhagen	Ms Stella Fang JENSEN Project Assistant, Project Department **Wind Power Academy Lolland** Mr Allan MUNK Employment and Development Consultant Erhvervsraad Lolland – Falster Mr Tom LARSEN Mayor, Rudbjerg Kommune **ENERGI E 2** Mr Hans Lyhne BORG, M. Sc. Civil Engineer **Hong Kong Economic and Trade Office (London)** Miss Sarah WU Director-General Miss Teresa POON Acting Deputy Director-General
Tuesday, 29 August 2006 Copenhagen	**Danish Environmental Protection Agency** Mr Christian Lange FOGH, MSc. PhD. Transport and Air Quality Division **Solar City Copenhagen** Ms Karin KAPPEL, M.a.a. Arcitect
Wednesday, 30 August 2006 Helsinki	**Ministry of the Environment** Ms Aira KALELA Director General, International Affairs Unit

Date / City	List of persons/organizations
Wednesday, 30 August 2006 Helsinki	Ms Hannele NYROOS Counsellor Ms Elise SAHIVIRTA Senior Adviser Ms Riina LOUKOLA Senior Adviser Mr Teemu SEPPÄ Senior Adviser **Environment Committee of the Parliament of Finland** Mr Pentti TIUSANEN Chairman of the Environment Committee Ms Heidi HAUTALA Vice Chair of the Environment Committee Mr Jyrki NISSILÄ Counsellor, Ministry for Foreign Affairs of Finland **Helsinki Water** Mr Esko TIAINEN, M. Sc. Civil Engineer Director of Division Water and Wastewater Treatment Mr Tommi FRED, M. Sc. Plant Manager (Chem. Eng) Viikinmäki Wastewater Treatment Plant
Thursday, 31 August 2006 Helsinki	**Keski-Uusimaa Joint Municipal Board for Water Pollution Control** Mr Mauri PEKKARINEN Managing Director Ms Ilona JOENSUU Project Planner, Biologist

Appendix IV

List of reference materials acquired from the visit and documents which the delegation has considered in drawing up its observations

1. Environment of Tokyo in 2005 published by Tokyo Metropolitan Government

2. Information Ariake Incineration Plant

3. Information on Recycle Peer Co Ltd

4. Video of Asahi Clean Center of Kawaguchi City, Japan

5. Publication on Asahi Clean Center

6. Pamphlet on Sapporo Recycling Complex

7. Information on Kosei Kigyo Corporation

8. Information on Tire Recycle Hokkaido Co Ltd

9. Information on Pet Bottle Flaked Recycling of Hokkaide Pet Bottle Recycling Co Ltd

10. Information on Sanzo Organic Recycle Co Ltd

11. Powerpoint materials provided by Mr Anders HASSELAGER, Danish Energy Authority

12. Powerpoint materials Provided by Mr Steffen NIELSEN, Danish Energy Authority

13. Offshore Wind Power Danish Experiences and Solutions

14. Powerpoint materials provided by Vestas Wind Systems A/S

15. Information on Wind Power Academy, Lolland

16. SOL 1000 of provided by Copenhagen Solar City

17. Powerpoint materials provided by Dr Hannele NYROOS, Ministry of the Environment, Helsinki

18. Powerpoint materials provided by Ms Elise SAHIVIRTA, Legal Adviser, Environmental Protection Department, Helsinki

19. Information on Ministry of the Environment

20. Best Practices from Finland

21. Finland's Natural Resources and the Environment 2005

22. Facts sheet on environmental issues related to the Finnish EU Presidency

23. Information on Helsinki Water

24. Conservation project on River Tuusula

25. Report prepared by the Environmental Protection Department on the Advisory Group's visit to Japan and Korea on municipal solid waste management and treatment technologies in November 2004

Outline of the Ariake incineration plant

(20005 business year version)

1. Facilities

(1) Site area 24, 000㎡

(2) Area of plant building 11, 600㎡

(Subbasement、Six floors on the ground)

Architectural area 32, 738㎡

(3) Incineration plant / completion July, 1994 / The construction costs / 40.8 billion yen

(It is contained of construction cost of collection device in the factory of 10.4 billion yen.)

① Incineration capacity 、400 ton/day(200 ton/day × 2units)

② Power generation capacity 5600kw(maximum)

(4) Collection equipment/The construction costs for the sub-station and the pipe is 19.2 billion yen .

① The collection capacity, 400 ton/day(collection/day for 12 hours)

② The waterfront area has five main pneumatic refuse pipe lines for their aria .

③ Total length of pneumatic refuse pipe lines is 14.56km .

④ The number of user buildings is 43 buildings.(Number of deposit unit is 59)

(5) Heat supply

① Tokyo seaside heat supply Ltd.(104.65GJ/h ,Maximum)

② Koto ward-owned Ariake sports center (17.58GJ/h ,Maximum)

2. The organization and the number of employee.

Plant master

Total of staff	63 people
Full time employee	52 people
reappointment staff	4 people
reemployment staff	7 people

Subsection of the management.	3 people
Subsection of the technology	11 people
Subsection of the pneumatic refuse pipe lines	2 people
Subsection of the maintenance	7 people
The first subsection in the operation	7 people
The second subsection in the operation	7 people
The second subsection in the operation	7 people
The second subsection in the operation	7 people

3. Amount of carried garbage

Unit(t)

business year	carried in-1	pneumatic refuse pipe lines	Drainage dirt etc.	Crushed furniture etc.	Total amount of carried garbage	Total number of the garbage trucks.
2000	111,622	5,347			116,969	61,534
2001	105,137	5,363			110,500	59,544
2002	117,285	5,166			122,451	68,844
2003	97,672	5,108	318	4876	107,974	62,106
2004	92,263	4781	274	15134	112,452	65,970

*1.Business-generated garbage is carried in to the Ariake incineration plant by authorized firms .

4. Amount of garbage processing and ashes .

business year	Processing garbage gross weight (t/y)	The number of operating days-1	Average day amount (t)	Ash	
				Amount of ash (t)	Incidence(%)
2000	121,544	350	347	13,896	11.4
2001	113,961	350	326	12,955	11.4
2002	123,506	350	353	14,306	11.6
2003	106,769	350	305	12,388	11.6
2004	114,932	350	328	13,061	11.4

*1.The day of one incinerator operating days is contained.

5. Amount of power generation and heat supply

business year	Electricity (kwh)			Heat supply (GJ)	
	Total power generation	Total self use	Amount of selling of electricity to a power company	Tokyo seaside heat supply Ltd.	Koto ward-owned Ariake sports center
2001	13,725,280	27,213,840	145,040	332,267	29,966
2002	17,408,770	28,057,810	424,000	373,926	27,570
2003	16,025,210	26,209,510	465,420	271,037	32,451
2004	16,622,262	26,078,182	445,440	346,556	34,305
(Yen)			(¥2,545,213)	(¥99, 464, 498円)	(¥ 0)

6. Amount of water and gas use

business year	Tap water(m3)	Drainage recycling water(m3)	Gas used at the start and stop time-1(m3)
2001	49,742	86,469	30,130
2002	53,168	78,232	34,310
2003	54,315	63,559	32,410
2004	54,457	53,752	22,450

*1.Sometimes , it is used to keep the temperature of the incinerator .

7. Dioxin and exhaust gas measurement result

Dioxin

Measuring object	Unit	Legal regulation	No1 Incinerator	No2 Incinerator
Exhaust gas	ng-TEQ/Nm3	1.0	0.00055 (June 9, 2004)	0.00000031 (June 8, 2004)
			0.0000079 (December 13, 2004)	0.0000079 (December 13, 2004)
fly ash	ng-TEQ/g	3	1.2(June 8, 2004)	
Ash	ng-TEQ/g	3	0.052(June 8, 2004)	
Discharge water	pg-TEQ/ℓ	10	0.38(June 8, 2004)	

Exhaust gas measurement result

Contaminant	Unit	Legal regulation	Self-regulation value	Measurements
Dust	g/m3N	0.08	0.02	0.00
Sox	ppm	44	10.00	<1
Nox	ppm	86	60.00	33.00
Hcl	ppm	430	15.00	<2
Hg	mg/m3N	-	0.05	<0.005

Measurement in February, 2004

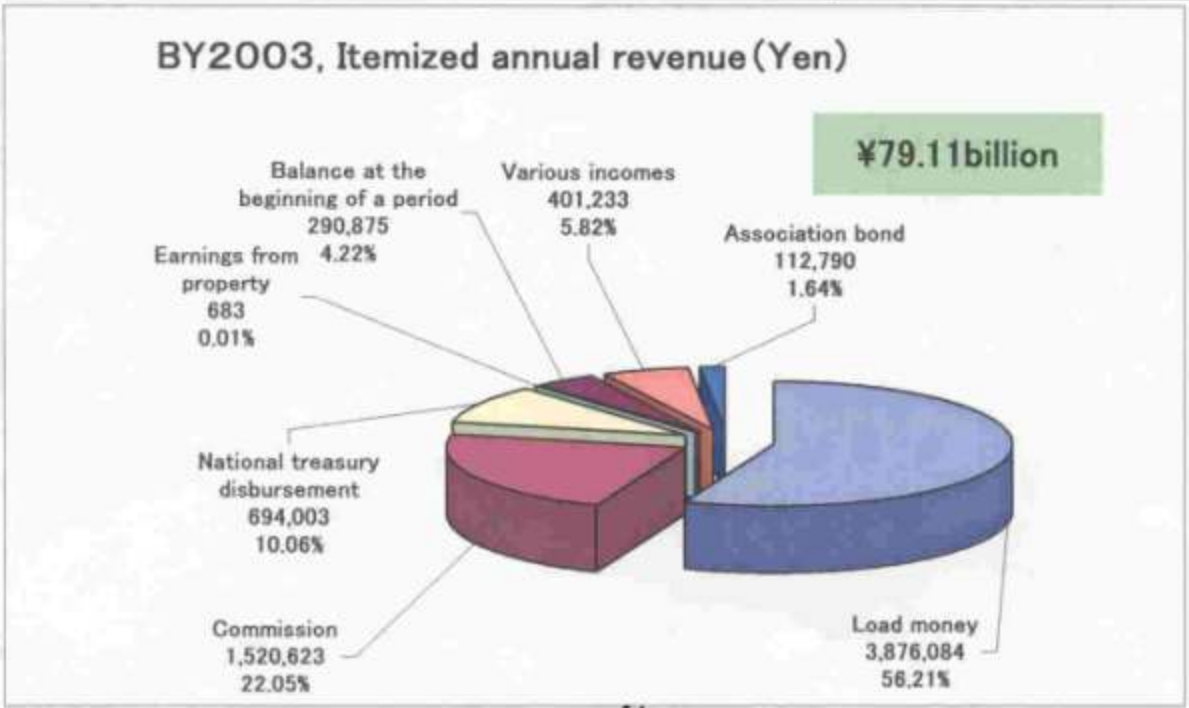
8. The main history

(1) Incineration plant completion in July, 1994
(2) Conduit pneumatic refuse pipe lines completion in December, 1995
(3) Acquisition at ISO14001 certification of November, 2000
(4) Two times measurement system started in February, 2003

9. Financial picture of the clean association of TOKYO23.

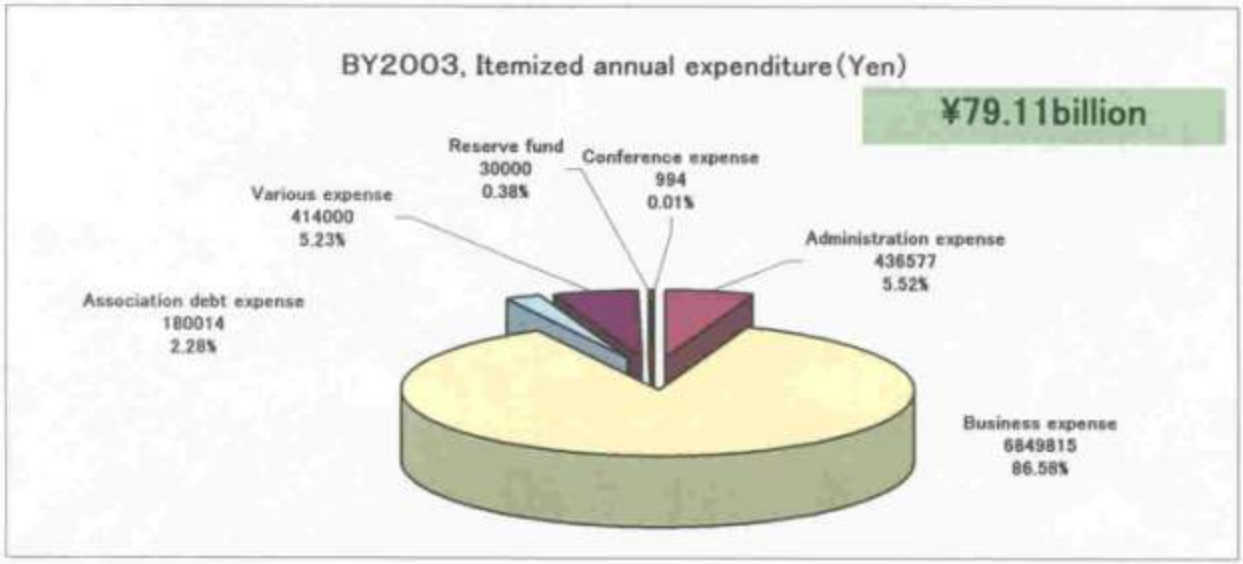
Annual revenue

Division	Amount of budget
Load money(from each ward)	¥38.76billion
Commission(garbage processing commission)	¥15.21billion
National treasury disbursement(subsidy from nation that is related to facilities construction)	¥6.94billion
Earnings from property(clearance income etc. of unnecessary thing generated when constructing it)	¥6.38million
Balance at the beginning of a period(balance at the beginning of a period from the previous year)	¥2.91billion
Various incomes(Electric sales income, etc.)	¥4.01billion
Association bond(It is a debt that requires it in the facilities constructing.)	¥11.28billion



Annual expenditure

Division	Amount of budget
Conference expense(expenditure of conference management)	¥9.44million
Administration expense	¥4.37billion
Business expense(expenditure of management and facilities constructing)	¥68.5billion
Association debt expense(The interest of association debt)	¥1.8billion
Various expense (reserve fund to financial adjustment fund)	¥4.14billion
Reserve fund(contingency fund)	¥0.3billion



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0.041（単位：pg-TEQ/m3）　　環境大気中のダイオキシン類調査結果速報値（平成17年度）

Appendix VI

The outline of the Asahi Incineration Plant

	Asahi Clean Centre	
Date of commencement of construction of plant	6 August 1999	
Date of completion of plant	29 November 2002	
Capital cost - civil works - electrical and mechanical installation - engineering, licensing, etc	JPY13,125,000,000	
Recurrent cost - operational and maintenance costs	JPY1,170,000,000	
Footprint	31 000 m^2	
Capacity	420 tonnes per day	
Population equivalent	川口市 495 639 鳩ヶ谷市 59 147	
Refuse charges	JPY190,000,000	
Incineration process line	See attached	
Content of fumes	Emission	Statutory requirements
- Carbon dioxide	１１％前後	——
- Dust	0.0040 g /m3N 未満	0.04 g /m3N
- Chlorine compounds	0.50～3.4ppm	200mg/m3N
- Sulphur oxides	0.64～1.8ppm	約 344ppm
- Nitrogen oxides	6.5 未満～32ppm	180ppm
- Mercury	0.40 未満～4.7ug/m3N	——
- Cadmium	0.018mg/m3N 未満	——
- total organics	———	——
- dioxins	0.000097～0.015ng-TEQ/m3N	0.1ng-TEQ/m3N

	Asahi Clean Centre
Odour treatment process line (please state the types of scrubbing adopted and the capacity)	When the incinerator is running, air is fed into the refuse pit to help combustion. When the incinerator is not running, activated carbon is used to adsorb and remove the odour
Operation problems encountered and how these were resolved	Some problems with the refuse shredder, conveyor for transporting ashes from other sites, and slag conveyor have been encountered. These problems are being addressed under the five-year warranty provided by the manufacturer
Disposal of by-products from incineration	Non-oxidized iron, non-oxidized aluminum and slag are for sale. Ash cakes (ash which has been chemically treated and solidified with cement) are disposed of in landfills.