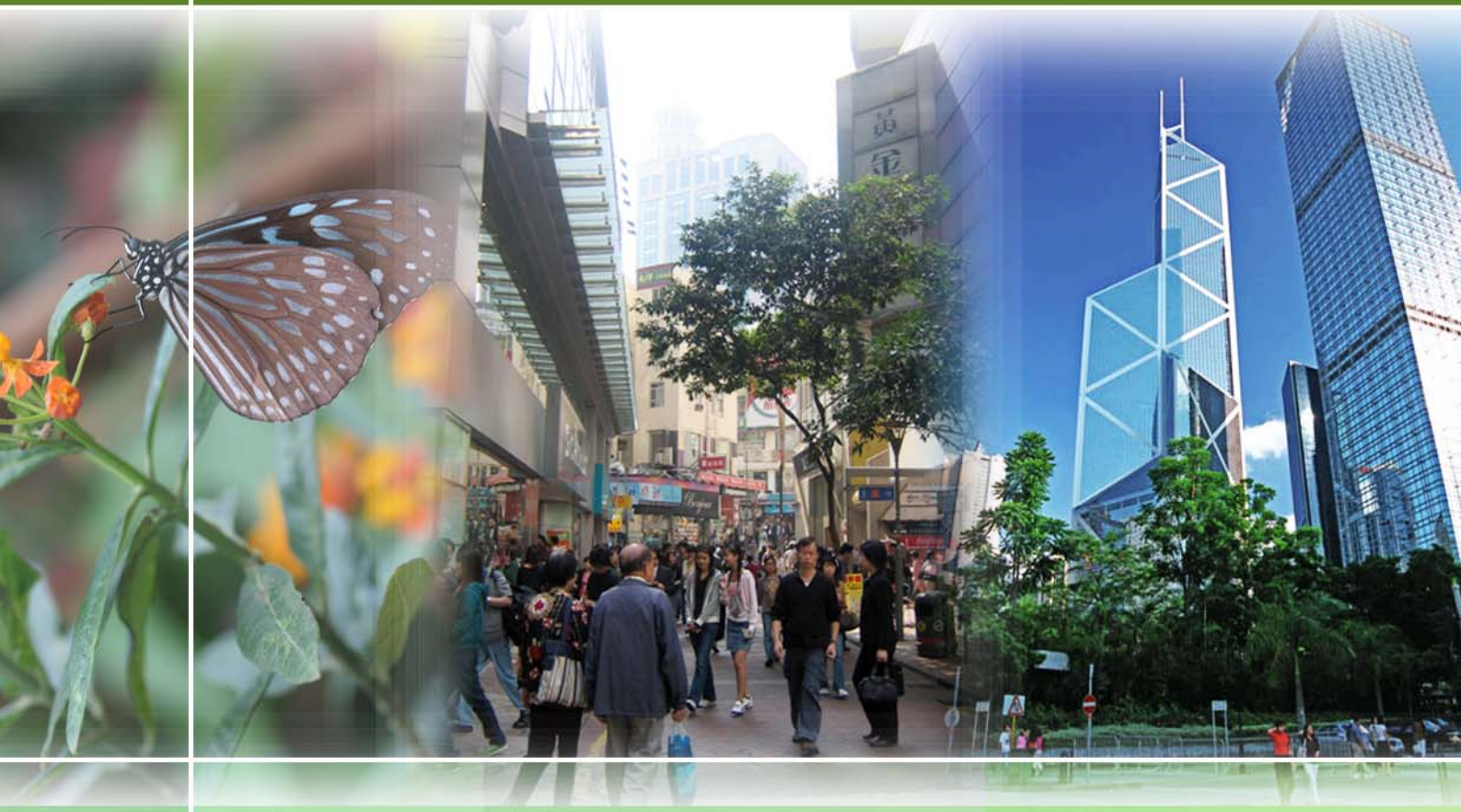

Agreement No. CE 25/2001
Hong Kong 2030: Planning Vision and Strategy
Strategic Environmental Assessment

Final Report

June 2007

規劃署
PLANNING DEPARTMENT

Hyder Consulting

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PLANNING VISION AND STRATEGY
STRATEGIC ENVIRONMENTAL ASSESSMENT

FINAL REPORT

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ABBREVIATIONS

AA	Airport Authority Hong Kong
AAB	Antiquities Advisory Board
AFCD	Agriculture, Fisheries and Conservation Department
ALARP	As Low As Reasonably Practicable
A&MO	Antiquities and Monuments Ordinance
AMO	Antiquities and Monuments Office
APCO	Air Pollution Control Ordinance
API	Air Pollution Index
AQOs	Air Quality Objectives
BCF	Boundary Crossing Facilities
BEC	Business Environmental Council
BIPV	Building-Integrated Photovoltaics
BOD	Biological Oxygen Demand
BSE	Department of Building Services Engineering, Hong Kong Polytechnic University
C&D	Construction and Demolition
C&I	Commercial and Industrial
CA	Conservation Area
CAPs	Criteria Air Pollutants
CASET	Computer Aided Sustainability Evaluation Tool
CBD	Central Business District
CEDD	Civil Engineering and Development Department
CEPT	Chemically Enhanced Primary Treatment
CET	Centre of Environmental Technology (now Business Environmental Council)
CH_4	Methane
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLP	CLP Power Hong Kong Limited
CNG	Compressed Natural Gas
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPA	Coastal Protection Area
CRIII	Central Reclamation Phase III

CRTN	Calculation of Road Traffic Noise
CT	Container Terminal
CWB	Central-Wanchai Bypass
CWTC	Chemical Waste Treatment Centre (at Tsing Yi)
DO	Dissolved Oxygen
EC	European Community
ECC	Environmental Campaign Committee
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EIAO-TM	Technical Memorandum on Environmental Impact Assessment Process
EM&A	Environmental Monitoring and Audit
EMAS	Eco-Management and Audit Scheme
EMS	Environmental Management System
EMSD	Electrical and Mechanical Services Department
EOI	Expression of Interest
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
EPI	Environmental Performance Indicator
EQS	Environmental Quality Standard
EST	Environmentally Sound Technology
ETWB	Environment, Transport and Works Bureau
EU	European Union
FCA	Frontier Closed Area
FER	Final Energy Requirements
FMO	Fish Marketing Organization
GB	Green Belt
GDP	Gross Domestic Product
GFA	Gross Floor Area
GGECS	Greenhouse Gas Emission Control Study
GHG	Greenhouse Gas
GIC	Government, Institution and Community
GIS	Geographic Information System
GLA	Greater London Authority
GQA	General Quality Assessment
ha	Hectare

HAB	Home Affairs Bureau
HATS	Harbour Area Treatment Scheme
HEC	Hongkong Electric Company Limited
HFCs	Hydrofluorocarbons
HGV	Heavy Goods Vehicle
HK2030	Hong Kong 2030: Planning Vision and Strategy
HK-BEAM	Hong Kong Building Environmental Assessment Method
HKIA	Hong Kong International Airport
HKP2020	Study on Hong Kong Port – Master Plan 2020
HKPSG	Hong Kong Planning Standards and Guidelines
HKSAR	Hong Kong Special Administrative Region
HKSARG	Government of the Hong Kong Special Administrative Region
HPGS	High Population Growth and High Economic Growth Scenario
HZMB	Hong Kong-Zhuhai-Macao Bridge
ICOMOS	International Council on Monuments and Sites
ISO	International Organization for Standardization
IUCN	International Union for the Conservation of Nature and Natural Resources (also known as the World Conservation Union since 1990)
IWMFs	Integrated Waste Management Facilities
JEMU	Joint Environment Markets Unit
KCRC	Kowloon-Canton Railway Corporation
KTD	Kai Tak Development
LCSD	Leisure and Cultural Services Department
LegCo	Legislative Council
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MARPOL	Marine Pollution Waste
MSW	Municipal Solid Waste
MSW Policy Framework	Policy Framework for the Management of Municipal Solid Waste (2005 to 2014)
MTRC	MTR Corporation
MW	Megawatt
N_2O	Nitrous Oxide
NAAQS	National Ambient Air Quality Standards
NCO	Noise Control Ordinance

NDAs	New Development Areas
NENT	North East New Territories
NH_3	Ammonia
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NSW	New South Wales
NW Lantau container terminal option under the Reference Scenario	North West Lantau container terminal option under the Reference Scenario
O_3	Ozone
OD	Origin-Destination
OEB	Overall Energy Balance
ospp	Open Space Per Person
OVT	Old and Valuable Trees
OZP	Outline Zoning Plan
PATH	Pollutants in the Atmosphere and their Transport over Hong Kong
Pb	Lead
PBU	Port Back-Up
PER	Primary Energy Requirements
PFCs	Perfluorocarbons
PHI	Potentially Hazardous Installation
PlanD	Planning Department
PME	Powered Mechanical Equipment
PPP	Public-private Partnership
PR	Public Relations
PRD	Pearl River Delta
PRD Study	Study of Air Quality in the Pearl River Delta Region
PRDEZ	Pearl River Delta Economic Zone
PRH	Public Rental Housing
PRS	Producer Responsibility Scheme
PSA	Public Service Announcement
PV	Photovoltaic
R&D	Research & Development

RCP	Refuse Collection Point
RE	Renewable Energy
RS	Reference Scenario
RSP	Respirable Suspended Particulates
RTS	Refuse Transfer Station
SAQM	SARMAP Air Quality Model
SARS	Severe Acute Respiratory Syndrome
SCI STW	Stonecutters Island Sewage Treatment Works
SDU	Sustainable Development Unit
SEA	Strategic Environmental Assessment
SEM&A	Strategic Environmental Monitoring and Audit
SENT	South East New Territories
SF_6	Sulphur Hexafluoride
SLF	Significant Landscape Feature
SMP	Sewerage Master Plan
SO_2	Sulphur Dioxide
SPM&A	Sustainable Project Monitoring and Audit
SS	Suspended Solid
SSSI	Site of Special Scientific Interest
STT	Short-Term Tenancy
SUSDEV 21	Study on Sustainable Development for the 21st Century in Hong Kong
SW Tsing Yi container terminal option under the Reference Scenario	South West Tsing Yi container terminal option under the Reference Scenario
TAPs	Toxic Air Pollutants
TDS	Territorial Development Strategy
TEU	Twenty-foot Equivalent Units
THMR	Terrestrial Habitat Mapping and Ranking Based on Conservation Value
TIN	Total Inorganic Nitrogen
TJ	Terajoule
TKO	Tseung Kwan O
TPB	Town Planning Board
tpd	Tonnes Per Day

TPO	Town Planning Ordinance
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
UK	United Kingdom
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
URA	Urban Renewal Authority
USA	United States of America
VKT	Vehicle-Kilometre-Travelled
VOC	Volatile Organic Compound
WA	Western Australia
WBA	Wetland Buffer Area
WCA	Wetland Conservation Area
WCED	World Commission on Environment and Development
WCZ	Water Control Zone
WDII	Wanchai Development Phase II
WEEE	Waste Electrical & Electronic Equipment
WENT	West New Territories
WHO	World Health Organization
WPCO	Water Pollution Control Ordinance
WQI	Water Quality Index
WQOs	Water Quality Objectives
WSA	Welsh School of Architecture, University of Cardiff
WSD	Water Supplies Department
WTO	World Trade Organisation
WTW	Water Treatment Works

PART A : ENVIRONMENTAL CONTEXT

1 INTRODUCTION

1.1 PREAMBLE

1.1.1 Hong Kong like many major cities around the world has its share of environmental concerns and pollution problems to contend with. The issues which are particularly at the forefront of attention are reflections of the urban environment in which we live and work. These have changed over recent years and decades. In strategic terms key environmental concerns affecting Hong Kong include:

- Air pollution problems which are caused by power plants, mobile (including marine vessels and aircraft) and stationary sources with the street level air quality mainly affected by vehicle emissions.
- Noise pollution due to high density living in the metropolitan areas. The extent of vehicle traffic, the congestion on the roadways and the close proximity of residential developments to roads especially in the older areas and also the effects of the ever changing landscape and the associated construction works are major contributors to the increasing noise climate.
- Water pollution due to the discharge of domestic and industrial effluents into the marine waters, rivers and other freshwater habitats in Hong Kong.
- Waste generation and the fast dwindling disposal site capacity coupled with the problem of siting new facilities in diminishing rural areas.
- Nature conservation and the juxtaposition of increasing development areas with the pressures of retaining the ecological resources and biodiversity.
- Landscape resources, both in the urban area and in the countryside, have been eroding at an alarming rate as a result of rapid development in the last few decades.
- The stock of cultural heritage resources is so diminished and endangered and thus the aim must be to preserve as many significant examples as possible.

1.1.2 In addition to local environmental effects clear recognition must be given to the anthropogenically influenced trans-boundary effects and in particular those “mobile” pollution sources such as water and air quality.

1.1.3 Without appropriate management and planning, the environmental ‘carrying capacity’ (the number of individuals which can be supported in a given area without degradation to the natural, social and economic environment), could easily be exceeded or overwhelmed by internal and external pressures including development pressures such as population migration and shifts in economic development which can have a knock-on effect on traffic and transport systems. As such, these influences must be given due regard in the development of objectives and sustainable solutions. Strategic indicators of heritage sustainability as developed for the Study on Sustainable Development for the 21st Century in Hong Kong

(SUSDEV 21) fall short of requirements; they include only two categories: archaeological sites and buildings of cultural heritage, ignoring a wide range of other important resources. The proposed indicators equate the number of recorded sites with cultural vibrancy, the heritage significance and social memory of the sites, their rarity and condition, their group values, the quality of their cultural settings and buffer zones, public accessibility and other important criteria are less emphasised. The definition of indicators for cultural heritage is the subject of considerable international as well as local debates at present. Hong Kong should monitor and participate in this discussion and devise a set of indicators in line with international standards but appropriate for local needs and circumstances.

1.1.4 The ultimate vision is for Hong Kong to be recognised as a 'World City' with a lifestyle, environmental quality and city planning of an internationally recognised standard. Various types of action are required to achieve this goal. A review of the present environmental baseline conditions is one such measure. Another action involves formulating a clear statement as to the nature and degree of changes resulting from currently implemented policies and practices, in the past, present and future. Furthermore, the Hong Kong Special Administration Region's (HKSAR's) current situation needs to be examined in the context of "think globally, act locally". This involves a review and comparison of Hong Kong's environmental standards, objectives and targets against a broad set of international benchmarks, and making adjustments to these standards where appropriate. Measures could then be devised to facilitate the application of this international framework at a local level.

1.1.5 In addition to setting objectives targets or standards it is also important to appreciate the effects of development that will affect the achievement of these objectives. The purpose of the Strategic Environmental Assessment (SEA) for the Hong Kong 2030: Planning Vision and Strategy (HK2030 Study) is to assess and evaluate the development strategies in terms of their effects on the environment in the short, medium and longer term. The setting of environmental objectives as well as the key environmental issues and concerns form an integral component of the SEA. In addition to which it is imperative to assess and evaluate the implications of the development strategies in qualitative terms and wherever possible to determine whether these strategies or components thereof are sustainable or not.

1.2 STUDY BACKGROUND

1.2.1 The first Territorial Development Strategy (TDS) was produced in 1984 to establish a broad land use-transport-environment framework to guide the physical development of Hong Kong into the 1990s. Although it had been updated twice in 1986 and 1988 to take account of the changing circumstances, it was not until 1990 that a comprehensive review of the TDS was undertaken. The technical work of the TDS Review was completed in late 1996 and the report, including a SEA, was published in 1998.

1.2.2 Since the completion of the TDS Review in late 1996, some of the fundamental assumptions underlying the review have become outdated (such as population projections and economic growth rates) and some new influencing factors having strategic planning implications, which include China's entry into the World Trade Organisation, and the increasing socio-economic interactions between Hong Kong and the Mainland, have emerged.

1.2.3 The intention of the “Hong Kong 2030: Planning Vision and Strategy” or "HK2030 Study", is to provides a planning framework that will guide the future development of Hong Kong and provides a basis for allocating land for various land uses and investment in infrastructure, and to update the TDS.

1.2.4 On the other hand, increases in future population, would undoubtedly create additional pressure on our sensitive environment. Without a healthy environment, the long-term vision for Hong Kong to become an “Asia’s World City” as well as one of the major cities in China may be under threat. This factor could also affect investment by major international companies in Hong Kong.

1.2.5 Furthermore, given the long time frame of the Study (up to year 2030), it is evident that significant changes and improvements in the environment through various measures and application of new technologies will take place both in Hong Kong and our neighbouring regions. Changes of particular concern include the applications of new technologies although other areas such as changes in lifestyles and modes of working (from home, shorter weeks, different types of activities, etc.) are also important as these would affect the environment in which we live.

1.2.6 There may also be uncertainties in the projection over a period of 20 to 30 years, such as changes in population, transportation, housing and the provision of key infrastructure. It is, however, an exciting challenge to formulate a framework for land-use planning and for the protection of our environment and resources while ensuring it is robust enough to withstand both external and internal influences. Opportunities should also be taken to examine innovative ideas, options and measures which could be adopted in the future to bring about continuous and sustainable improvements to Hong Kong’s living environment.

1.3 STUDY OBJECTIVES

1.3.1 Under the overarching goal of adhering to the principle of sustainable development, the planning objective of the HK2030 Study is to, inter alia, provide a good quality living environment. As an integral part of the HK2030 Study, a consultancy for the carrying out of a SEA was commissioned in October 2001.

1.3.2 The aims of HK2030 SEA are to address the issues of land-use planning in the context of sustainable development and in terms of minimising the cumulative environmental impacts arising from the development options. The stated objectives of the SEA in the Study Brief are to:

- Establish the environmental baseline;
- Assess environmental and related infrastructures’ carrying capacity;
- Integrate environmental factors together with other considerations in the building of scenarios, development, evaluation and refinement of options, and formulation of response plans;
- Identify the environmentally preferred option(s) and provide environmental input into the options refinement and selection process; and

- Evaluate at a strategic level the impacts and sustainability implications of the preferred option(s), and identify environmental mitigations measures and follow-up actions.

1.4 SCOPE OF WORK

1.4.1 The fundamental building block for Hong Kong to maintain and enhance its status as a World City in Asia (which is founded on its role as the gateway to the mainland of China and a hub for business in the Asia-Pacific region) is environmental responsibility. Responsibilities include the provision of a 'healthy environment', protection of existing resources as well as identifying opportunities for expanding our natural resource stocks and carrying capacity in local, regional and global terms.

1.4.2 The HK2030 SEA is an integral part of the overall HK2030 Study, which provides strategic environmental information and suggestions to facilitate the formulation, development, and identification of scenarios and options which could meet the environmental targets of a World City in Asia. The HK2030 Study has been undertaken in four stages:

- Stage 1: Agenda Setting, Baseline Review and Identification of Key Issues;
- Stage 2: Examination of Key Issues;
- Stage 3: Formulation and Evaluation of Scenarios and Options; and
- Stage 4: Formulation of Development Strategies and Response Plans

1.4.3 Throughout the process of the HK2030 Study, the various tasks of the SEA have contributed to each stage of the HK2030 Study taking note of the comments raised during the public consultation process which was held at the end of each stage:

- During Stage 1 of the HK2030 Study, the SEA provided an environmental baseline review taking cognisance of the Environmental Review Report and the four Environmental Survey Reports of SUSDEV 21 Study, and setting up environmental targets.
- For Stage 2 of the HK2030 Study, the SEA examined the key issues and evaluation criteria and highlighted the most important issues for further analyses in the subsequent stages of study.
- During Stage 3 of the HK2030 Study, two development options (i.e. Consolidation Pattern vs. Decentralisation Pattern) were put forth for public consultation. The SEA provided a broad-brush and qualitative assessment and compared the environmental performance of these two development options. The assessments contributed to identifying the key areas of concern, which would be taken into account in the formulation of the preferred option(s) at the next stage of the Study.
- In formulating the development strategies and response plans during Stage 4 of the HK2030 Study, the SEA carried out a more detailed performance evaluation of the Preferred Development Option formulated on the basis of the

Reference Scenario and suggested refinements, and drew up strategic environmental action plan and programme for implementation of the development strategies. A sustainable project monitoring and auditing plan has also been recommended. The High Population Growth and High Economic Growth Scenario (HPGS) of the "What If" Scenarios is also evaluated for sensitivity test in this Stage with a view to facilitating the formulation of response plans under the HK2030 Study.

1.4.4 This Study process is illustrated on **Figure 1-1**.

1.5 STRUCTURE OF THE SEA FINAL REPORT

1.5.1 The purpose of this report is to consolidate the findings of the four stages of the SEA and to derive a series of implementation strategies for environmental protection and enhancement. The strategies also need to address the issues of monitoring to identify changes to the environment, which may require intervention such as deteriorating air quality etc. The structure of this Final Report is as follows:

Section 1 : provides an introduction to the SEA.

Section 2 : describes baseline conditions.

Section 3 : discusses capital stock and environmental carrying capacity.

Section 4 : discusses constraints and opportunities for development.

Section 5 : introduces the environmental objectives.

Section 6 : describes the development of the options.

Section 7 : evaluates the Preferred Development Option formulated on the basis of the Reference Scenario in terms of air quality, noise, water resources and water quality, waste, energy and natural resources, land use and landscape, risk, ecology and cultural heritage. The HPGS "What If" Scenario is also assessed and evaluated in this Stage of SEA as a sensitivity test.

Section 8 : evaluates the components of the Preferred Development Option formulated on the basis of the Reference Scenario and discusses the sustainable project monitoring and auditing.

Section 9 : discusses initiatives and implementation strategies for environmental improvement and strategies.

Section 10 : summarises the findings and recommendations of the SEA.

2 BASELINE CONDITIONS

2.1 GENERAL

2.1.1 In order to assess the implications of the development strategies up till 2030 it is important to define the baseline against which these strategies or components thereof are being compared. Environmental baselines have been defined for aspects such as air quality, noise and water quality, as well as for those aspects which are integral to the fabric of society and the natural environment, such as cultural heritage and energy consumption.

2.1.2 To achieve sustainability, natural capital stock which cannot be replaced or substituted, must be protected and enhanced where possible. Pollution levels in Hong Kong are placing a significant stress on present conditions, and in turn upon the ability of Hong Kong's environment – our "natural capital" – to maintain itself and continue to absorb and neutralise pollution from human activities. This not only raises local sustainability issues but also regional and global concerns. It is particularly the case for air quality in Hong Kong, which in recent years has been increasingly influenced by cross-boundary pollution regionally. Threats to globally endangered species and marine pollution similarly reflect the international importance of these issues.

2.2 AIR QUALITY

2.2.1 The review of air quality within SUSDEV 21 described Hong Kong's atmosphere as subject to a number of characteristic air streams, with north-easterly prevailing winds for approximately 70% of the year. Winds from the north are particularly prevalent during the winter months, when they carry significant levels of pollutants from industrial sources, motor vehicles and power station emissions in the Pearl River Delta (PRD) to Hong Kong. In addition many urban areas of Hong Kong have limited air circulation due to the density of high rise buildings.

2.2.2 Air pollutants in Hong Kong are mainly classified as Criteria Air Pollutants (CAPs) and Toxic Air Pollutants (TAPs). CAPs are those pollutants for which Air Quality Objectives (AQOs) have been established. The established AQOs are presented in **Appendix A Table A2-1** (note all subsequent tables in this Section are presented in **Appendix A**).

Criteria Air Pollutants (CAPs)

2.2.3 CAPs include sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), lead (Pb), Total Suspended Particulates (TSP) and Respirable Suspended Particulates (RSP).

2.2.4 Since June 1995, the Air Pollution Index (API) has been reported daily by Environmental Protection Department (EPD), who monitor air pollution at a series of fixed monitoring stations, and also forecast the API for the following day.

2.2.5 **Table A2-2** and **Table A2-3** summarize the compliance status of Roadside Stations (1991-2005) and General Stations (1986-2005) respectively against the Air Quality Objectives. The ozone levels have demonstrated non-compliance since 1999.

2.2.6 To illustrate the trends in Hong Kong's air pollution levels, **Figure 2-1** to **Figure 2-11** show the annual average concentrations of numerous pollutants which are monitored at each station and averaged for the territory overall. The ambient sulphur dioxide levels have improved greatly since 1990 when further legislative controls came into effect. However, an increasing trend has been shown over the past few years after several years of low readings. The NO_2 data indicate that Hong Kong's overall annual average (ambient) concentrations for NO_2 have remained both steady and below the AQO over the past few years. The ambient levels of particulates (both TSP and RSP) have remained roughly around their permissible AQO limits across Hong Kong as a whole. The annual average concentrations of ozone dropped in 2005, ending in a very gradual but noticeable increase over the preceding decade. For roadside monitoring stations in Central and Mong Kok, NO_2, RSP and TSP levels consistently exceed the permissible limit.

2.2.7 Roadside concentrations of TSP, RSP and NO_2 remain noticeably higher than the territory-wide average. A review of the trends for long-term air quality reveals that roadside nitrogen oxides (NO_x) and RSP levels have decreased compared with those of 1999 – a result of vehicle emission control measures implemented in recent years. Roadside NO_2 levels have remained roughly steady during this period.

Toxic Air Pollutants (TAPs)

2.2.8 TAPs can affect health at substantially lower concentrations in the ambient environment and their health effects are typically carcinogenic in nature. Average concentration readings for the TAPs are presented in **Table A2-4** and **Figure 2-12** to **Figure 2-21**. Heavy metals include cadmium and hexavalent chromium concentrations show a decreasing trend while nickel concentration shows an increasing trend and lead concentration remained roughly steady. Organic substances include 1,3-butadiene and formaldehyde show a decreasing trend, benzo[a]pyrene shows fluctuate and benzene, perchloroethylene and dioxins shows an increasing trend. In general, the toxic air pollutants in Tsuen Wan show relative higher concentration in Central/ Western except perchloroethylene.

Greenhouse Gases (GHGs)

2.2.9 GHGs constitute carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6). The emissions of these gases, in terms of their CO_2 equivalent, for the period 1990-2004 are detailed in **Table A2-5**. CO_2 is the most significant greenhouse gas emitted in Hong Kong. Using the Global Warming Potential system, which is a means for comparing different greenhouse gases based on their relative atmospheric heating, CO_2 emissions constituted 83-88% of the total emissions of GHG between 1990 and 2004. Other contributors include methane (CH_4, 10-14%), nitrous oxide (N_2O, 1-2%) and a combination of HFCs, PFCs and SF_6 comprising around 1.5% (which has been steadily increasing over this period).

2.2.10 Despite a reduction in annual GHG emissions during the late 1990s, projections undertaken for the Greenhouse Gas Emission Control Study (GGECS) (ERM, 2000) suggested that such emissions are likely to resume increasing more rapidly between 2000 and 2010. These were based principally upon projected increases in energy consumption through demand for power generation and increased total transport. This has turned out to be true for the period from 2000 to 2004, with total GHG emissions for each year trending towards the upper range of GGECS forecasts, even though Hong Kong's economic recovery took longer than predicted. The GGECS forecasts that in 2010, total GHG emissions would reach 52 Mt under a "Probable Business as Usual Scenario" and over 60 Mt assuming high economic growth.

2.2.11 These projections are based on implicit assumptions in the modelling that historical trends in energy consumption are an acceptable representation of likely future patterns of consumption, and on assumptions relating to data use, principally that projections of economic and social development in Hong Kong are accurate and that the latest data on actual fuel combustion are representative of future fuel use (ERM, 2000).

2.3 NOISE CONDITIONS

2.3.1 Noise is somewhat unusual in that it is an invisible pollutant and, being invisible, is less tangible than many other pollutants. It has long been an issue of concern in Hong Kong, due to its large population for a limited amount of usable land area and the consequent proximity of residential areas to significant noise sources. The major noise sources come from transportation such as aircraft operations, road traffic and railways as well as construction, and commercial/industrial operations. While the volume of road traffic between 1998 and 2005 has remained relatively steady after almost doubling in the decade up to 1997 (according to Transport Department statistics), the noise generated from this source remains a pressing issue. Many noise sources have been eliminated or brought under greater control. However, an estimated 1 million people are still affected by road traffic noise. Since the late 1980s, various steps have been taken to reduce the noise exposure. Some highlights of the steps taken include:

- School insulation programme introduced to protect against road, aircraft and rail noise – 1987-1999
- Percussive piling limited to three to five hours a day in developed areas – 1989
- Programme begun to resurface highways with low-noise material – 1990
- Screening structures introduced to reduce traffic noise from new roads – 1990
- Tung Chung New Town designed to reduce noise impact through integrated planning – mid 1990s
- Noise standards for industrial/commercial premises tightened – 1992
- Two commonly used pieces of noisy construction equipment (hand-held percussive breaker and air compressor) required to comply with international standards – 1992

- Vehicle noise controlled in line with international standards – 1996
- Controls introduced on noisy manual construction activities at night and on public holidays – 1996
- Noisy diesel, steam and pneumatic pile-drivers phased out in developed areas – 1999
- Noise Control Designated Areas and the use of specified powered mechanical equipment introduced, within which stricter construction noise controls apply – Establish through the Noise Control (Construction Work Designated Areas) Notice in 1996 and subsequent reviewed in 2001
- Directors and management of companies violating noise limits made liable for repeated offences – 2002
- Vehicle noise regulations on noise emission standards tightened – 2002
- Noise barrier installation on some existing main roads introduced – 2000

2.3.2 EPD estimated in 2000 that 655 existing roads generate noise louder than L_{10}(1 hour) 70 decibels. Direct noise mitigation in the form of noise barriers and enclosures is being introduced. About 26,000 flats will benefit from reduced noise levels of between 1 and 19 decibels, and among these 70 percent of residents will have noise lowered to below the limit of 70 decibels. Barriers have also been continuing to be installed for new roads since 1990, with 173,000 people benefiting from the 45 kilometres of installed barriers. In addition, low noise surfacing materials are being used to resurface 72 existing road sections, from which some 40,000 flats will benefit. The low noise road surfacing trial programme for low speed roads will be completed by 2010.

2.3.3 Apart from erection of noise barriers and low-noise surfacing, a trial scheme to ban heavy goods vehicles (HGVs) in Tsing Fung Street in January 2000 at night time and the ban of franchised buses on Texaco Road at night time in July 2005 were implemented. Pedestrianisation of designated streets – beginning in Mong Kok and Causeway Bay in 2000 and subsequently extended to Central, Jordan, Tsim Sha Tsui, Sham Shui Po, Sheung Shui, Stanley and a section of Tai Yuen Street in Wan Chai – have also helped reduce noise, but some streets will still continue to be noisy.

2.4 GEOLOGY, SOILS AND CONTAMINATED LAND

Geology

2.4.1 The Hong Kong Special Administrative Region (HKSAR) encompasses the Kowloon Peninsula, the New Territories, two large islands, namely Hong Kong Island and Lantau Island and a total of 261 smaller islands with a total land area of about 1104km^2. The topography is rugged, comprising steep mountainous areas, and deeply dissected valleys. Over 6% of the land area is reclaimed land, with the earliest reclamation dating back to the mid-1800s. The Protection of the Harbour Ordinance, enacted and amended in 1997 and 1999 respectively, was established as a presumption against reclamation in Victoria Harbour, and the Court of Final

Appeal's decision in January 2004 further ruled that the presumption against reclamation could only be rebutted by establishing an 'overriding public need' for reclamation under the Ordinance.

Soils

2.4.2 The quaternary superficial deposits and deeper soils commonly occur in flat valley bottoms and across plains where they form fertile land that was extensively cultivated in the past. More recently these flatter areas have been increasingly developed for housing and infrastructure, and now only about 7% of Hong Kong's land surface is agricultural land.

Contaminated Land

2.4.3 The presence of contaminated land provides both constraints and opportunities for managing nearby ecological resources. Constraints may arise because contaminated land may not support a diverse range of species, and at worst may migrate offsite and harm neighbouring ecological resources. Opportunities may consist of the potential for careful redevelopment on such land in order to prevent further encroachment into natural areas.

2.4.4 Although historically the industrial processes present in Hong Kong were predominantly manufacturing and assembly, these had largely been relocated since the 1980s. A number of potentially contaminating processes still take place including, but not limited to petrol stations and fuel tank farms, airport activities, vehicle maintenance yards and storage areas, waste management facilities (e.g. landfills, transfer stations).

2.4.5 There is no mandate to cleanup a contaminated site once operations have ceased, and it is thus possible that contamination from leaks or residual materials from operations may remain on site.

2.4.6 Under current guidelines, land is classified as contaminated if soil samples exceed the "Dutch B Limits". To remediate contaminated sites, a range of options are available, including encapsulation, excavate-and-dispose, in-situ treatment and ex-situ treatment. For the latter two options, there are many individual methods and technologies. Each approach has environmental and financial costs and benefits. EPD is currently looking to change the contaminated land guidelines from reliance on Dutch B Levels to Risk-based Remediation Goals – consultation is now ongoing. Hopefully, the result of this will be the remediation of contaminated land to a level appropriate to its future use.

2.4.7 Contaminated marine sediment is also an issue in Hong Kong, particularly with respect to its disposal. A new set of controls to test and treat excavated marine mud came into force on 1 January 2002; these are now incorporated into Environment, Transport and Works Bureau (ETWB) Technical Circular (Works) No. 34/2002 (*Management of Dredged/Excavated Sediment*), which came into effect on 15 August 2002. These controls will provide specific management and disposal requirements, based on a defined testing regime based on a range of chemical and biological parameters. Unlike other countries such as the United Kingdom (UK), there is no contaminated land register in Hong Kong.

2.5 WATER RESOURCES AND WATER QUALITY

2.5.1 The water environment in HKSAR primarily comprises inland waters (including rivers and freshwater resources), bathing waters and marine waters. All are regulated by Water Quality Objectives (WQOs) established under the Water Pollution Control Ordinance (WPCO), which was enacted in 1980. The baseline conditions for each of the waters are described below.

River Waters

2.5.2 The major inland watercourses in Hong Kong and location of water quality monitoring stations in 2004 are shown in **Figure 2-22**. The water quality in the rivers is routinely monitored by EPD to keep track of compliance with WQOs. According to the published monitoring results for 2004, the overall compliance rate of the rivers with the key WQOs is 82% (a level which has been maintained since 2000), while 77% of the monitoring stations attained a Water Quality Index (WQI) of "good" or "excellent" status (**Figure 2-23**).

2.5.3 Since the late 1980s, the river water quality has improved steadily with a significant increase in dissolved oxygen content and return of fish and aquatic life to some previously heavily polluted inland waters. Suspended solids, aggregate organics, nutrients and metals have also been greatly reduced. With effective pollution control measures and progressive provision of sewers, improvements in WQO compliance were observed in Sam Dip Tam Stream and many larger rivers in the Deep Bay Water Control Zone (WCZ). Furthermore, the bacterial levels remain high in many of the rivers in particular those impacted by livestock waste and unsewered villages' discharges, especially those in the North Western New Territories. Between 2000 and 2004, water quality continually improved at only one monitoring station: at Pak Shek Wo in the Tseng Lan Shue Stream.

2.5.4 EPD monitors riverbed sediment on a half-yearly basis at 8 locations in Shing Mun Main Channel, Lower Lam Tsuen River, River Indus, Lower River Beas, Lower River Ganges, Yuen Long Creek, Kam Tin River and Lower Tuen Mun River. It is known that the riverbed sediment in some rivers are polluted, such as Shing Mun River and Kai Tak Nullah. However, completion of Phase I of the Stage III Extension Works at Sha Tin Sewage Treatment Works has resulted in an improved effluent quality, which has been attributed with the Kai Tak Nullah showing a noticeable improvement in water quality in recent years. The contaminated sediment, when disturbed for instance during maintenance dredging and during storm events, will be released into the water column, thus posing a potential risk to the river water quality and to the downstream marine waters.

Freshwater Resources

2.5.5 The HKSAR has scarce freshwater resources of its own and therefore the majority of its freshwater supply (about 70-80%) is imported from Dongjiang in Guangdong Province. The remaining supplies are from the catchments and local reservoirs. Groundwater resources are not heavily exploited for their water supply, although some remote villages in the New Territories and outlying islands still depend on wells for irrigation and domestic consumption. Freshwater supply from desalination of seawater is currently under pilot trials by the Water Supplies Department (WSD).

2.5.6 The local water gathering grounds cover approximately one third of the land area of Hong Kong. The catchwater drainage systems, in total, extend for approximately 120 km and drain into WSD's 17 impounding reservoirs. The water gathering grounds are designated and are well protected and there have been no significant pollution problems reported in the recent years.

2.5.7 Since 2000, the growth rate in Hong Kong's overall fresh water demand has returned to the levels in the years leading up to 1994 – about 1.0% per annum. This trend was interrupted between 1994 and 1999, during which the total amount consumed actually fell slightly. A major factor may have been a marked decrease in industrial water consumption, the result of many local industries moving away from the territory. Hong Kong's fresh water demand is detailed in **Table A2-6**.

2.5.8 In 2004-5, about 260 million cubic metres of seawater were supplied for domestic flushing purposes. Approximately 80% of the population of Hong Kong use seawater for flushing. This extensive use has greatly helped reduce the demand on fresh water.

Bathing Waters

2.5.9 Hong Kong currently has 41 gazetted beaches (**Figure 2-24**) and numerous non-gazetted beaches. A beach is "gazetted" as a bathing beach through an announcement in the government gazette; it is managed by the Leisure and Cultural Services Department (LCSD) for the benefit of public use. Beaches not classified as bathing beaches are "non-gazetted". The EPD regularly monitors the bathing water quality of all gazetted and selected non-gazetted beaches. The World Health Organization (WHO) has recently launched the "Guidelines for Safe Recreational Water Environments - Vol. I: Coastal and Fresh Waters, 2003

2.5.10 After pollution levels at a significant proportion of beaches peaked between 1995 and 1997, the overall beach water quality has shown steadily improvement ever since. For example, the Beach Water Quality Report for 2004 stated that 23 of the 41 gazetted beaches were in "good" condition, 11 were "fair", 1 were "poor" and 6 were "very poor" (**Figure 2-25**). The percentage of gazetted beaches meeting WQOs has remained at over 80% since 1999.

2.5.11 Beaches on the south of Hong Kong Island, Sai Kung District and Islands District generally have "Good" or "Fair" water quality. The pollution affecting beaches in the Tuen Mun area is primarily caused by background sources, rather than local discharges. The most polluted beaches are located in Tsuen Wan District, due to the concentrated sewage discharge from Harbour Area Treatment Scheme (HATS) Stage 1 outfall and the local sewage discharges from septic tank and soak away pit systems in their unsewered hinterland.

2.5.12 According to the Beach Pollution Reduction Study (CE 34/98), such greater pollution levels are most pronounced in areas where septic tank and soak away systems are still in use, such as Rocky Bay, Shek O, Big Wave Bay and Silvermine Bay.

Marine Waters

2.5.13 Under the WPCO, the HKSAR marine waters are divided into 10 WCZs as shown in **Figure 2-26**: Tolo Harbour and Channel, Southern, Port Shelter, Junk Bay, Deep Bay, Mirs Bay, North Western, Western Buffer, Eastern Buffer and Victoria Harbour. There are also four Supplementary WCZs. Specific WQOs have been set up for each of the WCZs based on ecological, fisheries and recreational considerations. A routine monitoring programme has been in place since 1986 for monitoring the water quality of these WCZs.

2.5.14 According to the 2004 monitoring data, the overall dissolved oxygen (DO) compliance rate for that year was 89%, which was slightly higher than in 2003 (87%) and the same as in 2002. Similar to 2003, five WCZs (Mirs Bay, Port Shelter, Junk Bay, Eastern Buffer and Western Buffer) fully met the total inorganic nitrogen (TIN) objective. The un-ionised ammonia (NH_3) objective was achieved in all WCZs except Deep Bay.

2.5.15 The overall compliance rate in 2004 was 87%. The following waters are where non-compliance with the WQOs has been consistently observed: Deep Bay WCZ on DO, TIN and NH_3 (the situation there had worsened since 2002), Southern and North Western WCZs on TIN, and the Tolo Harbour and Channel WCZ on DO. The overall DO, TIN and NH_3 compliance rates remained consistent between 2002 and 2004. Following the commissioning of Stage 1 of the HATS in 2002, there have been some sustained improvements in water quality, namely an increase in DO and reduction in nutrients and bacteria in the eastern Victoria Harbour, Junk Bay and Eastern Buffer WCZs. Higher bacterial levels persisted in the central and western Victoria Harbour and Western Buffer WCZs. While some non-compliance in overall DO and TIN were still detected in the Victoria Harbour WCZ, the situation had improved since 2002.

2.5.16 A total of 709 cases of red tides have been reported in Hong Kong waters from 1980 to 2004. Most have occurred in the eastern and southern waters including Tolo Harbour and Channel, Port Shelter, Mirs Bay and Southern. About 40% of those red tides took place in Tolo Harbour and Channel WCZ, but they have been present in every WCZ at some stage during the period. However, their numbers have been declining since 1988 despite some increases in Mirs Bay and other eastern waters. There were 34 reported red tides in 2004. It is noted that the number of red tide species varied across different WCZs. Red tides affect bathing beaches and some species have been associated with fish deaths in the past, although no such deaths occurred in 2004.

2.5.17 Some of the red tides were closely linked to the nutrient pollution in the marine waters. However, it is known that other physical factors such as sunlight, temperature, tidal currents and wind speeds also have strong influence on the algal bloom.

2.6 WASTE

2.6.1 The Hong Kong SAR Government employs a classification system that defines five categories of solid waste:

- Municipal Solid Waste (MSW), comprises waste arising from the daily activities of domestic, commercial and industrial sources. Most MSW from domestic sources is collected by the Food and Environmental Hygiene Department, or its contractors, whereas most commercial and industrial waste is collected by private waste collectors;
- Construction Waste is defined as a material arising from demolition, excavation, renovation works, road works, etc.;
- Chemical Waste arises from processes or trade activities that contain chemicals likely to cause environmental pollution or pose a health risk;
- Special Waste includes abattoir waste, animal carcasses, asbestos, clinical waste, condemned goods, livestock waste, sludge and screenings and stabilised residues from the Chemical Waste Treatment Centre (CWTC); and
- Other solid waste including dredged mud, excavated materials furnace bottom ash and pulverised fuel ash.

2.6.2 Underpinning the current solid waste management activities in Hong Kong is the *Policy Framework for the Management of Municipal Solid Waste (2005 to 2014)* (the "*MSW Policy Framework*") in which three targets have been set:

- **Target 1.** To reduce the amount of MSW generated in Hong Kong by 1% per annum up to the year 2014.
- **Target 2.** To increase the overall recovery rate of MSW to 45% by 2009 and 50% by 2014.
- **Target 3.** To reduce the total MSW disposed of in landfills to less than 25% by 2014.

2.6.3 **Table A2-7** shows the daily quantities of MSW and Construction Waste disposed of at the three landfills, together with the corresponding population, from 1986 to 2005. From this table it can be seen that the disposal of MSW has fallen year-on-year since 1999 (with the exception of 2002 – the year of SARS (Severe Acute Respiratory Syndrome)), as has the disposal construction waste. This has occurred despite an increase in population because of a reduction in per capita MSW and construction waste disposal rates. Overall landfill disposal has decreased year-on-year since 1999 (with the exception of 2002) and in 2005 fell to 6.45 million tonnes. **Figure 2-27** shows the total quantities of waste disposed of in landfills from 1991 to 2005.

Chemical Waste and the Chemical Waste Treatment Centre

2.6.4 There has been a general reduction in the volumes of chemical wastes produced since the early 1990s, principally due to the relocation of many industries producing chemical waste to the Mainland. However, the resultant shortfall in waste for the CWTC at Tsing Yi (which can provide treatment for up to 100,000 tonnes per year of chemical waste) has been topped up with MARPOL waste (Maritime waste such as oil and water). In 2005, the CWTC treated some 17,038 tonnes of chemical waste and 20,386 tonnes of MARPOL waste and so utilised 37.4% of its design capacity.

MSW and Landfills

2.6.5 After materials from within MSW have been recovered for reuse or recycling, the

remaining MSW are collected by the existing waste management system and disposed of at the three strategic landfills. Hong Kong has three strategic landfill sites located at Nim Wan in the West New Territories (WENT), at Tseung Kwan O in the South East New Territories (SENT) and at Ta Kwu Ling in the North East New Territories (NENT). The waste intake and capacity of the three strategic landfills are shown in **Table A2-8** and **Table A2-9** respectively.

2.6.6 From the Refuse Collection Points (RCPs), waste is collected in rounds and delivered to one of the seven existing refuse transfer stations (at Island West, Island East, West Kowloon, Kowloon Bay, Sha Tin, North Lantau, North West New Territories) or to the Outlying Islands Refuse Transfer Facilities, where waste is containerised and dispatched by ship or road to the landfill sites. Some MSW is delivered directly to landfill. Commercial and industrial waste is collected by both private and public contractors and either delivered to the refuse transfer stations or directly to landfill. The total quantities of waste disposed to landfill between 1986 and 2005 and the quantity of waste requiring final disposal per year are shown in **Table A2-10**.

2.6.7 The three landfills (WENT, SENT and NENT) (shown in **Figure 2-28**) were constructed in the 1990s and expected to provide disposal capacity until at least 2020, however, population growth (leading to greater MSW generation) and disposal of construction waste have caused the landfills to fill more quickly than expected. It is now anticipated that the three landfills will reach full capacity between 2011 and 2015.

2.6.8 Recognising the future capacity problem, Government commissioned a study on the *Extension of Existing Landfills and Identification of Potential New Waste Disposal Sites*, which was completed in 2003. This study recommended that WENT and NENT landfills should be extended to provide additional capacity. The WENT extension could be between 6 Mm^3 and 65 Mm^3 and the NENT extension in the region of 19 Mm^3. The extension of SENT Landfill is also being considered, and could provide additional capacity of some 15 Mm^3. Preliminary environmental and engineering studies for NENT have been completed, for SENT are underway and for WENT will commence soon. The anticipated timelines for commissioning of the new extensions are 2011 for SENT and NENT and 2014 for WENT.

Landfill Restoration

2.6.9 Hong Kong has 13 closed and restored landfills that collectively occupy about 300 ha of land (1.6% of the urban area). The restoration works have added leachate collection and treatment as well as passive/active landfill gas control, all of which will be operated throughout an aftercare period of up to 30 years. Landscaping has been provided and a number of the restored landfills are now being used as community recreation facilities. For example, there has been a golf driving range on Shuen Wan Landfill since April 1999 and in April 2004 the 2 ha Sai Tso Wan Recreation Ground was commissioned, comprising a multi-purpose grass pitch for baseball or football, a children's playground, a jogging track, changing rooms, etc. A variety of other afteruses are planned for a number of the other restored landfills.

Recovery and Recycling

2.6.10 In 2005 some 2.59 million tonnes of MSW was recovered for recycling, representing 43% of the total waste arisings. However, the majority of this recovery was in the commercial/industrial sector and the recovery rate for domestic waste was much lower at only 14%. The low recovery rate for domestic waste is a result of lack of incentives and facilities for the public to segregate waste, as well as a generally low level of awareness regarding the need for waste reduction, recovery and recycling. In addition to the provision of the three-colour recycling bins, Government launched a number of waste reduction initiatives including Source Separation of Domestic Waste, the Recycle to Clean, Making New Year Green campaign, the recycling of rechargeable batteries and the Voluntary Agreement on Plastic Bag Reduction. Green groups have also introduced schemes such as "no plastic bag day" campaigns.

2.6.11 Of the 2.59 million tonnes of MSW recovered in 2005, just 160,000 tonnes (6%) was recycled locally, with the remainder exported for recycling, as shown in **Figure 2-29**. The total value of exported recyclables exceeded HK$4.5B in 2005. To promote recovery and recycling of waste in Hong Kong, there are currently some 30 Short-term Tenancies (STTs) in operation around the territory, mainly involved in the collection, bailing and export of metals, plastics, paper, tyres and wood. To encourage value-added manufacturing and to kick-start the circular economy, the EcoPark is currently being constructed in Tuen Mun Area 38 and the first tenants are expected to move in during the first half of 2007.

Construction Waste and Public Fill Reception Facilities

2.6.12 Prior to 2002, construction waste (public fill) was fully reused as fill material for reclamation projects. However, owing to the suspension of almost all reclamation projects there is now little demand for fill material and since October 2002 it has had to be stockpiled at temporary fill banks in Tuen Mun Area 38 and Tseung Kwan O Area 137 for later reuse. **Figure 2-27** shows the annual quantities of construction waste. Of the 21.5M tonnes of construction waste generated in 2005, 89% was stockpiled at the fill banks.

2.6.13 In addition to the fill banks, there are a number of conveniently located barging points for the marine transport of construction waste and also two sorting facilities, located at the fill bank sites. To encourage further waste reduction, in 2006 Government implemented the Construction Waste Disposal Charging Scheme. Under this scheme, disposal of construction waste at a landfill or refuse transfer station (RTS) (containing <50% inert material) is charged at $125 per tonne, at the sorting facilities $100 per tonne and at the public fill reception facilities only $27 per tonne.

2.6.14 In June 2005, Government signed an agreement with the State Oceanic Administration on the delivery of reclamation materials to the Mainland. In November 2006 a HK$768M contract was awarded to operate the existing public fill reception facilities and to transport material from the fill banks to designated projects in the Mainland.

2.7 ENERGY AND NATURAL RESOURCES

Energy

2.7.1 Hong Kong had a total installed electricity generating capacity of 12,644 Megawatt (MW) as of December 2006 (including 70% of the capacity of units 1 and 2 of the Mainland's Guangdong Nuclear Power Station at Daya Bay and 50% of Phase I of the Guangzhou Pumped Storage Power Station, which are imported through CLP Power transmission connections to Guangdong provincial grid). The sources of generation in Hong Kong are predominantly thermal, with a small amount of energy coming from wind power. Fuel gas is supplied for domestic, commercial and industrial uses. Two main types of fuel gas are available: town gas, distributed by the Hong Kong and China Gas Company Limited, and liquefied petroleum gas, supplied by oil companies.

2.7.2 With virtually no indigenous fossil resources, Hong Kong is totally dependent on imported fuels for energy generation. The current energy scene in Hong Kong is dominated by coal and oil products from other countries. Coal and fuel oil used for electricity generation represent about 91% of the total primary energy requirements in 2005 (Hong Kong Energy Statistics Annual Report 2005), compared to 95% in 1995. The input of coal products for electricity generation dropped in 2000 and increase to 1995 level in 2005, while that of the oil products increased significantly in 2000 and experienced a 25% decrease in 2005 compare to 2000. This was partly due to the introduction of natural gas to substitute some of the coal products for electricity generation since late 1995. Diversification and cleanliness of generation technologies are becoming more and more important in the energy industry.

2.7.3 Energy demand in Hong Kong can be classified as arising from the residential, commercial, industrial and transport sectors. The two principal energy carriers for supply to residential, commercial and industrial users in Hong Kong are electricity and town gas. The transport sector currently relies heavily on diesel for trucks and buses, LPG for most taxis and petrol for private vehicles. A relatively small amount of electricity is used in rail transport.

2.7.4 The overall energy balance (OEB) for Hong Kong provides an account of energy supply and demand and shows the origin and uses of all forms of energy. The Final Energy Requirements for 2005 was about 331,558 terajoules (TJ). The electricity used in Hong Kong is supplied by two government-regulated, investor-owned companies, Hongkong Electric Company Limited (HEC) and CLP Power Hong Kong Limited (CLP) from three major power stations in Hong Kong:

- Lamma Power Station (HEC) - coal fired steam plant 3,755 MW
- Black Point Power Station (CLP) – combined cycle gas turbines 2,500 MW
- Castle Peak Power Station (CLP) – coal fired steam plant* 4,108 MW

Note: * two units have natural gas burners retrofitted to the boilers.

(Source: SUSDEV 21 and web sites of HEC and CLP accessed in May 2007)

2.7.5 In addition, under an arrangement with the Guangdong Nuclear Investment Company, CLP purchases approximately 70% of the electricity produced by the Daya Bay Nuclear Power Station in Guangdong.

2.7.6 The two sources of gas supply in Hong Kong are Towngas (manufactured at two sites in Hong Kong) and liquefied petroleum gas (LPG) transported by sea. The Hong Kong Energy Statistics Annual Report 2005 states that energy consumption can be represented in two ways, which are described below.

2.7.7 Firstly, the Final Energy Requirements (FER) represent the amount of energy consumed by users for all energy purposes, such as air conditioning, lighting, cooking, and using machinery, but excludes non-energy uses, such as the use of kerosene as a solvent. By comparison, the Primary Energy Requirements (PER) refer to the overall energy consumption within a geographic territory and includes the energy accounted for in the FER, plus all energy used or lost in the energy conversion and distribution process.

2.7.8 The Hong Kong Energy Statistics Annual Report's figures show that the final energy requirement has increased from 222,640 TJ in 1990, to 290,764 TJ in 1995 and reaching a peak of 464,528 TJ in 1999, before decreasing to 331,558 TJ in 2005. The energy requirements for Hong Kong are shown in **Table A2-11**.

2.7.9 The 2000 report shows that while gas consumption has increased significantly over the last decade, the pattern for the increase in use by the commercial, domestic and industrial users was rather stable. Between 1990 and 2000, however electricity consumption by industrial users dropped whereas with increased consumption from commercial and domestic users. Moreover, the FER peaked in 1999 and gradually decreased from 2000 to 2005.

2.7.10 In the year 2000 Hong Kong Eco-Business awards were expanded to encourage the public and private sectors to publish environmental reports and implement green office practices and green property management. The aim is that this will give companies a clear idea of the energy consumed, which is the first step in identifying methods to reduce consumption.

Renewable Energy

2.7.11 In the United Nations system, renewable energy refers to large and small scale hyrdropower, modern and traditional biomass energy, solar energy, wind energy, ocean energy, urban and rural organic waste and geothermal energy. Large hydropower and traditional biomass are, by far the most important among them. The new and emerging renewable energy technologies such as solar, wind, modern biomass and geothermal, contribute only a small portion at present.

2.7.12 The use of renewable energy in Hong Kong presently is very limited, there is limited information available to assess how much renewable energy is being utilised. However the study undertaken by the Electrical and Mechanical Services Department (EMSD) to identify the use and potential for use of renewable energy concluded that there are opportunities for inclusion of renewable energy into the built environment. It is recognised that there are limitations in terms of the area and spatial constraints for solar energy and wind generated energy. It is however noted

that there are an increasing number of projects in Hong Kong that have adopted some form of renewable energy scheme, such as solar panels for hot water heating. Both HEC and CLP have also committed to investments in wind energy pilot projects, designed to assist in the commercial viability of any larger-scale wind power generation. HEC commissioned a wind turbine on Lamma Island in February 2006, and is undertaking a study for constructing a wind farm in the waters near the Ninepin Islands, east of Sai Kung. A similar project by CLP is scheduled for commissioning in 2008.

2.7.13 Land-use and space restrictions are important constraints since Hong Kong has a high population and building density. Large hydropower, traditional biomass energy and geothermal energy are not feasible in Hong Kong because of the limited local conditions.

2.8 NATURAL RESOURCES

2.8.1 Three quarries, Shek O on Hong Kong Island, Lam Tei in Yuen Long and Anderson Road in Kowloon East, supply over half the requirements for building materials in Hong Kong in 2006. The remainder comes from quarries in Guangdong and the offshore islands south of Hong Kong. It is anticipated that Hong Kong will be faced with a shortage of quarry stone by 2014 or earlier when the three quarries in Hong Kong would cease operation although a serious shortfall would not emerge until 2017 when supplies from most Mainland quarries would also be exhausted. However, it is difficult to project the life of the remaining quarries in the Mainland. In ensuring reliable sources of supply of aggregates, it is necessary for the Government to formulate a long-term strategy on the supply of aggregates from local quarries to meet with the future demands from construction industry in order to keep pace with the economic growth of Hong Kong.

2.9 LANDSCAPE

General

2.9.1 The meaning and definition of "landscape" has a number of interpretations. Originally, the term was used by scientists to refer to objectively-defined entities such as geographic regions, areas and diverse tracts of land. However, during the 19th and 20th centuries the word "landscape" began to be used more widely and subjectively, in other words to include designed and built environments and the complex element which generated reactions and emotions in humans to nature and aesthetics. For the purposes of this report, the term "landscape" refers to this wider definition, embracing physical, cultural/historic and aesthetic elements which combine to create specific patterns and features that are distinctive to particular localities encompassing the whole of the external environment, whether within villages, new towns, dense urban areas or in rural areas. It also includes the patterns and textures of buildings, streets, open spaces and trees, and their interrelationship within the built environment.

2.9.2 In his 1999 Policy Address, the then Chief Executive emphasised the need to improve the environment and quality of life in Hong Kong and also agreed to devote more concerted efforts to promote landscaping/greening in his 2000 Policy Address. The reason for this policy direction was a response, in part, to both the public

perception and the professional opinion of experts in the fields of urban design and landscape conservation and planning that the area provision of Hong Kong's non-designated rural and urban landscapes (i.e. rural and urban landscapes other than Country Parks/ Special Areas and several natural landscape related zones including CA, CPA, GB) was low, especially in comparison to other Asian and Mainland cities. In recent years there has been concerted effort to improve the landscape and streetscape especially in the urban areas to provide "green lungs" and enhanced aesthetic quality. The importance of these non-designated rural and urban landscapes, such as woodlands, forests, private parks and gardens, civic spaces, waterfront areas, roads and street corridors is closely related to the following functions:

- Protecting and conserving rural ecological and landscape resources;
- Improving urban micro-climate;
- Providing passive and active leisure and recreation opportunities; and
- Avoiding rural and urban blight leading and the corollary adverse effects on environment and economic conditions.

2.9.3 These functions are also provided by statutory-designated Country Parks and Special Area, which comprise about 38% of the land area of Hong Kong. However, the main shortcoming of this statistics is that it gives the false impression that Hong Kong residents live day-to-day in a green rural setting, whereas in reality the overwhelming majority of people live in urban landscapes with little or no greenspace. Although the provision of the open space is planned in accordance with the Hong Kong Planning Standards and Guidelines (HKPSG), the level of provision is comparatively low by comparison to other South-East Asian cities. According to Dr Charlie Q.L. Xue, Mr Kevin Manual, and Mr Rex Chung from the Division of Building Science and Technology at the City University of Hong Kong, public open space is an important index of living quality. For example the HKPSG recommend 1.5m² of open space per person (ospp) compared to 6m²ospp in Tokyo, 4m²ospp in Singapore, 3m²ospp in Guangzhou, and 2m²ospp in Taipei and Shenzhen. In some parts of urban Hong Kong (e.g. Mong Kok), there is only 0.5m²ospp (source: International Conference on Megacities 2000, 8th-10th February 2000). Country Parks have proved extremely successful in conserving important ecological and landscape resources, and providing recreation space and enhancing visual amenity, but they do not fulfil the needs of the majority of people on a day-to-day basis.

Underlying Influences Affecting Hong Kong's Urban and Rural Landscapes

2.9.4 The underlying causes for the current situation can be summarised from a landscape conservation and planning standpoint as follows:

Historical Factors

- infrastructure and building development are progressively eroding the natural and cultural landscapes and ecological resources, especially in urban fringe areas;

- the environment of some streets and roads is hostile to pedestrians, with low levels of physical comfort (noise / air pollution, lack of shade and shelter etc.), and highly constrained pedestrian movement. Conversely, every effort is made to accommodate the requirements of road traffic and underground utilities;

Physical and Geographical Factors

- insufficient provision has been made for open space in all urban districts of Hong Kong, and there is a lack of variety in the provision made (e.g. few civic open spaces);
- inadequate or little landscape treatment of areas outside designated open spaces / sitting out areas, e.g. street corridors, waterfront areas, and other shared use spaces; and

Economic Factor

- the design of public urban landscapes is overwhelmingly driven by the need for minimal initial cost and maintenance liability.

2.9.5 Hong Kong has no cohesive territory-wide landscape conservation and planning policy for non-designated landscapes. Historically, landscape and visual issues have been given low priority in the planning of public works, resulting in the loss of significant areas of natural but non-designated landscapes.

2.10 RISK

2.10.1 Government imposes special controls on industrial installations, which use hazardous materials in quantities exceeding specified threshold values. The industrial installations are designated as Potentially Hazardous Installations (PHIs) which include LPG and oil terminals, housing estate LPG stores, gas production plants, explosive depots, and chlorine stores at water treatment works (WTWs), and there are currently 32 existing PHIs as shown on **Figure 2-30**.

2.10.2 The number of people exposed to risk above the individual risk guideline level (10^{-5} per year) (reference made under Figure 1 in Annex 4 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM), included in **Appendix A** from PHIs has been greatly reduced from over 80,000 in 1987 to less than 1,000 in 2000, to zero in 2005. The major events which have affected the numbers of people exposed include:

- Relocation of oil depots at Ap Lei Chau, Kwun Tong and Tsing Yi
- General improvements to chlorine equipment and operational procedures for many water treatment plants
- Decommissioning of oil and explosives depots
- Increasing chlorine usage at water treatment works offset by new safety systems and procedures (e.g. scrubber systems)

2.11 ECOLOGICAL CONDITIONS

2.11.1 Despite its small size of Hong Kong, it supports a wide range of habitats which provide homes for a variety of species. The habitat map (**Figure 2-31**) shows the distribution and extent of each habitat which will be described in the sections below.

Overview

2.11.2 The ecological baseline conditions of Hong Kong can be described using a wide array of attributes and descriptors. The first, and perhaps the most obvious and useful attribute, is biodiversity or biological diversity. The latter term, as defined by the Convention of Biological Diversity, is "the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems".

2.11.3 Another major descriptor used is habitat type and size and the spatial and temporal distribution patterns of habitats (habitat diversity). Ecosystems can also be used to describe ecological baseline conditions, however the plasticity of the term (e.g. an aquarium can be defined as an ecosystem) and its complexity (involves both the physical and biological realms) renders it an awkward tool to use at the level of countries or regions.

2.11.4 If these attributes (distribution and abundance of species and habitats) are the currency and capital of ecology then descriptors such as "naturalness", "rarity", "vulnerability to extinction", form the basis by which the ecological currency and capital can be valued. If the description is considered to be the first important component, this valuation is then the second one that forms the understanding of baseline conditions.

2.11.5 SUSDEV 21 (ERM, 2000) and The Biodiversity Survey of Hong Kong (University of Hong Kong, 2002) have provided such an assessment of the baseline ecological conditions of Hong Kong, albeit from differing perspectives. The Biodiversity Survey focused on describing terrestrial and freshwater biodiversity of Hong Kong and identifying sites and species of special conservation value, while SUSDEV 21 concentrated on describing and valuing the habitat diversity. The recent study of 2004 Update of Terrestrial Habitat Mapping and Ranking Based on Conservation Value commissioned by the Sustainable Development Unit (SDU) (Scott *et al.* 2005), series of field guides to Hong Kong fauna and flora and the Hong Kong Biodiversity Newsletter published by the Agriculture, Fisheries and Conservation Department (AFCD) are also reviewed to provide up-to-date information on the baseline ecological conditions. The Consultancy Study on Marine Benthic Communities in Hong Kong commissioned by AFCD (CityU Professional Services Limited, 2002) not only provides the updated marine ecological baseline on local benthic communities in the sub-tidal region, it also assists the identification of sensitive areas or areas with higher ecological importance that are worthwhile for conservation for benefit of long-term protection and sustainability of the marine ecological resources in Hong Kong. Together, these documents are the primary source of understanding the terrestrial ecological baseline conditions of Hong Kong and all are reviewed here.

2.11.6 Hong Kong's ecological baseline conditions can only be properly understood within a regional and global context. These frames of reference are becoming increasingly available and are significant for any long-term plans of resource use. In this section a review of the global context of Hong Kong's ecology is also included.

Global Context

2.11.7 There are several sources available that map ecological attributes on a global scale. Ten Biomes are used to delineate the world's terrestrial ecology by Cox, C.B. and Moore, P.D. (1993), while 14 realms and provinces and 26 ecoregions are used by Udvardy, M.D.F. 1975 and Bailey, R.G. and Hogg, H.C. 1986, respectively. Perhaps the most detailed attempt has been made most recently by The National Geographic Society and The World Wildlife Organisation which recognizes 867 land-based ecoregions.

2.11.8 Based on the National Geographic Society ecoregion profile, Hong Kong is described as lying within the 'South China-Vietnam Subtropical evergreen forest' (http://www.nationalgeographic.com/wildworld/terrestrial.html). This ecoregion forms a transitional zone between the tropical forests of Vietnam to the south and subtropical and mixed forests of southern China. The special features of this ecoregion are that it is rich in species from both the more tropical southern regions of Indochina and the subtropical forests of southern China. This ecoregion is subject to pressure from removal, and large areas of tropical broadleaf forest have been cleared to date. These tropical and subtropical moist broadleaf forests are described as critical/endangered within the national geographic ranking system.

2.11.9 Some important habitats being threatened in Hong Kong include the coastal wetlands and mangroves. The area covered by coastal mangroves, mudflats and seagrass beds in the world has gradually diminished over time due to the increase in coastal development, and the associated species have been put under stress as a result of habitat degradation and increase in pollution loads. Of particular importance globally is the Mai Po Inner Deep Bay region in the North West New Territories. During December 2005 to February 2006, a peak count of 59,469 birds comprising 71 species was recorded in the Deep Bay region (Anon, 2006). The wetland habitats at Mai Po Inner Deep Bay comprises of mangroves, *gei wais*, fishponds, inter-tidal mudflat, reedbeds, freshwater marshes and rivers which supports around 70% (some 300 species) of all the bird species recorded in Hong Kong, and holds internationally important numbers of certain bird species, some of which are classified as endangered or being threatened globally. For example it is the second largest wintering site for around 346 individuals of the endangered (as defined on the red list category of the International Union for the Conservation of Nature and Natural Resources (IUCN), also known as the World Conservation Union) Black-faced Spoonbill *Platalea minor* from an estimated total global population of 1,679 individuals (figures recorded on 6 to 8 January 2006 during the International Black-faced Spoonbill Census (Yu and Wong, 2006)). The site also supports more than 1% of the world population of endangered Oriental Stork *Ciconia boyciana,* Nordmann's Greenshank *Tringa guttifer* and vulnerable Saunder's Gull *Larus saundersi* and more than 1% of the bio-geographical population of another 13 bird species including ardeids, ducks and shorebirds of species of conservation concern (Tsim and Lock, 2002).

2.11.10 The Mai Po and Inner Deep Bay wetland is the largest remaining wetland in Hong Kong. It is of international importance due to the tens of thousands of migratory birds, including rare, endangered and vulnerable species which use the wetland and provides valuable habitat for species of international importance. The area also supports a diverse community of flora and fauna, including over a dozen endemic invertebrate species. As such the HKSAR Government is committed to the conservation of this wetland. In September 1995, 1,500ha of the Mai Po and Inner Deep Bay wetland were listed as a Wetland of International Importance under the **Ramsar Convention.**

2.11.11 Under the Ramsar Convention, the conservation of this Ramsar Site should be promoted to protect plants and animals in the area and prevent environmental damage caused by incompatible development. Accordingly, those responsible for the management of the Ramsar Site are obliged to: formulate and implement a planning strategy to promote the conservation of the Ramsar Site; develop a management plan and provide adequate wardening for the area; and inform the Secretariat at the earliest possible time if the ecological character of the site has changed, is changing or is likely to change as the result of technological development, pollution or other human interference.

2.11.12 An ecological monitoring programme for the Mai Po Inner Deep Bay Ramsar Site has been implemented by AFCD since 2001 which covers monitoring of aspects such as water quality, mudflat quality (sediment quality and particle size), benthic infauna and epifauna, habitat extent and mangle and fishpond conditions.

2.11.13 Despite the small size of Hong Kong, the territory is very rich in species. Among the diverse fauna and flora species, a number of them are endemic i.e. species found from nowhere else in the world but only in Hong Kong. For examples, Hong Kong Paradise Fish (*Macropodus hongkongensis*), Romer's Tree Frog (*Philautus romeri*), Bogadek's Burrowing Lizard (*Dibamus bogadeki*) are endemic species of fish, amphibian and reptile respectively. The Hong Kong Asarum *Asarum hongkongense* is an endemic perennial herb which is the only representative of the genus *Asarum* in Hong Kong. Sometimes due to the updating of the species inventory of the surrounding areas, some species previously identified as endemic may need to be reviewed, such as Hong Kong Newt which was once believed to be endemic but records showed that this species also occur in coastal Guangdong province.

2.11.14 The estimates Chinese White Dolphin *Sousa chinensis* in Hong Kong waters range from 91 in spring to 207 in autumn (Hung, 2006). It is listed as data deficient under the IUCN red list indicates that more information and scientific research are required to acknowledge the status of threatened (IUCN, 2006). However, these dolphins are being threatened in Hong Kong by incidental catches in fishing gear (most likely pair trawls) and vessel collisions. There is also concern on the health of the dolphins as a result of habitat loss from reclamation projects and pollution from development activities. These dolphins had previously been recorded up the Shenzhen River as far as Lok Ma Chau, however, its presence in Shenzhen Bay is now doubtful due to heavy boat traffic and pollution.

2.11.15 There is one species of amphibian endemic to Hong Kong with restricted range, the Romer's Tree Frog (*Philautus romeri*), the Chek Lap Kok population was being translocated to various sites in the New Territories and Hong Kong Island due to the

construction of the Hong Kong International Airport (Chan *et al.* , 2005).

2.11.16 Bats are important mammals and components of the biodiversity in Hong Kong. They comprise over 50% of all local mammal species (Shek, 2006), and are all protected under the Wild Animals Protection Ordinance (Cap.170). There are twenty-six bat species known to occur in Hong Kong, the majority of which have a wide distribution (Shek, 2006). Five species are listed in the IUCN and China Red Data Book as near threatened or rare, they include the Common Bent-winged Bat *Miniopterus schreibersii*, Lesser Bamboo Bat *Tylonycteris pachypus,* Rickett's Big-footed Bat *Myotis ricketti,* Chenese Myotis *Myotis chinensis* and the Short-nosed Fruit Bat *Cynopterus sphinx* (Shek, 2006). There is limited information available on bat species in Hong Kong in the previous years, the baseline surveys of bat species conducted by the mammal working group of AFCD during 2003 to 2005 made four new bat species records for Hong Kong, the Whiskered Myotis *Myotis muricola,* Least Pipistrelle *Pipistrellus tenius*, Greater Bamboo Bat *Tylonycteris robustula* and an unidentified bat (Shek and Chan, 2006).

2.11.17 Research on mammals in Hong Kong is limited. New species are still being found, one of which is the Javan Mongoos *Herpestes javanicus*, which was first recorded in Mai Po in 1989. The Red Muntjac *Muntiacus muntjak* recorded in Hong Kong was thought to be Chinese Munjac *Muntiacus reevesi* due to lack of information on this species, has been under question in early 2000 by the skull measurements of captive and dead specimens and the mammal surveys conducted by AFCD since 2000 to 2005, have suggested that the Red Muntjac is the only Muntjac recorded in Hong Kong.

2.11.18 Insect studies conducted by AFCD Biodiversity Working Groups commenced in 2002 and so far have recorded 112 dragonfly species and over 230 butterfly species in Hong Kong. Of these, 5 dragonfly species and 3 butterfly species were recorded as new to Hong Kong. They include the dragonflies *Anax nigrofasciatus nigrofasciatus*, *Cephalaeschna klotsi*, *Pseudagrion pruinosum frasei*, *Trithemis pallidinervis* and *Fukienogomphus choifongae* which is also new to science (Tam *et al.* 2004); and butterflies *Acraea issoria*, *Chilasa agestor restricta* and *Thoressa monastyrskyi* (Lo, Y. F., 2002; Wong, *et al.*, 2002).

2.11.19 There are around 9,966 valid freshwater fish species recorded in the world, in which around 160 species were recorded in Hong Kong (Lee *et al.,* 2004). Seventy-one species from 21 families are primary freshwater fish (42.5%), 44 species are brackish species, 46 species are marine vagrants and 3.6% are diadromous fish. (Lee *et al.,* 2004; *Acta Hydrobiological Sinica* 30(6): 660-666). Seven species were identified as species of conservation concern, including *Acrossocheilus beijiangensis, Acrossocheilus parallens, Macropodus hongkongensis, Pseudobagrus trilineatus, Oryzias curvinotus, Rhodeus ocellatus* and *Rasbora steineri* (Lee, L.F., 2003), some of which are easily mis-identified by their similar appearances with other common fish species.

2.11.20 It is clear that there is still a lot to be learned about the species present in Hong Kong. As populations increase throughout Asia, it is anticipated that the pressures on the remaining habitats will increase, not only through encroachment, but also through increased pollution loads. Hong Kong's statutory protection mechanism under various ordinances – such as designation as Country Parks and Special Areas

under the Country Parks Ordinance, and zoning as Sites of Special Scientific Interest (SSSIs), Conservation Areas (CAs) and Coastal Protection Areas (CPAs) under the Town Planning Ordinance (TPO) – enables the protection of certain areas from human intrusion. However, the habitats which are more threatened are those associated with the flatter areas, where the soil is deeper, or near wetlands or the coast.

2.11.21 Scientists today have described 1.4 million species of plants and animals, with estimates that the total number of species is between 5 to 30 million. However, it is also thought that 17,500 of these species will become extinct every year, (http://www.wwf.org.hk/eng/conservation/spe_cons/endangered_species.html) many of which had taken millions of years to evolve. As with natural areas throughout the planet, conservation of remaining natural areas (i.e. natural areas that have not been destructed by urbanisation) is considered to be a priority. Furthermore, it is anticipated that hotspots i.e. areas of high species diversity are likely to be responded more rapidly to the biggest threat to global ecology, which is predicted to be human induced global climate change. As these hotspots occupy <2% of land area but hold 44% of plant and 35% of vertebrate species, the predicted potential loss is therefore more significant. (Jay R. Malcolm, 2003).

Biological Diversity

2.11.22 Hong Kong supports a wide diversity of ecological habitat, with shrubby grassland and grassland being the most dominant type, covering approximately 41.2% of the total terrestrial area of Hong Kong (Scott *et al.*, 2005).

2.11.23 The Biodiversity Survey of Hong Kong funded by the Environment and Conservation Fund was conducted by the University of Hong Kong in late 90s and the Biodiversity Database was updated in 2002 to identify sites and species of conservation importance in Hong Kong terrestrial and freshwater habitats. This survey identified that Hong Kong's flora is incredibly diverse for its small land area, with 2135 species of vascular plants recorded. Of these species, 19 % of which (57 *pteridophytes*, 4 *gymnosperms* and 339 *angiosperms*), are either locally extinct or very rare. Another 15% are considered rare (Corlett *et al.*, 2000). This plant diversity is not uniformly distributed over Hong Kong and the majority of species are confined to sites which probably amount to less than 10% of the land area. The richest areas are small patches of montane forest above 400-500m, which have been protected from fire by remoteness, dampness and inaccessibility (Corlett et al, 2004). The Check List of Hong Kong Plants 2004 has updated the names of vascular plants recorded growing in Hong Kong, based on specimen records in the Hong Kong Herbarium and other related references. There were 3,164 species and varieties recorded including 2,121 native species and 1,043 exotic species (Hong Kong Herbarium, 2004).

2.11.24 In Hong Kong terrestrial habitats are protected by designation as Country Parks, Special Areas, Restricted Areas and SSSIs. There are 23 Country Parks in Hong Kong, 17 Special Areas (11 of which lie inside Country Parks) and 65 SSSIs. Together these protected areas cover 38% of the land area of Hong Kong. Country Parks are designated to serve both recreation and nature conservation purposes, Special Areas and SSSIs are designated for the importance of flora, fauna, geological, cultural or archaeological features. Although concerns are often raised, if

visitor numbers are high, there should be no conflict of interest between these functions if appropriate zoning and management controls are exerted.

2.11.25 The designation of SSSIs is an administrative device, aimed at protecting areas of scientific interest, such as areas with rare fauna or flora species or representative habitats, in Hong Kong. In total, 65 sites have been designated as SSSIs. Of these SSSIs, some have statutory status by virtue of their designation on town plans made under the TPO. SSSIs inside Country Parks, Special Areas, Marine Parks and Marine Reserve are managed as part of the country/marine park management programme of AFCD. In addition, AFCD has been providing active management to those SSSIs falling outside Country Parks, Special Areas, Marine Parks, Marine Reserves and Restricted Areas on an "as needs" basis.

Habitat Diversity

2.11.26 Under the SUSDEV 21 Study's baseline survey of terrestrial habitats, the entire land area of Hong Kong has been mapped into 24 categories of habitat/land cover and an ecological value of high, medium, low or negligible has been assigned (**Figure 2-31**). Both vegetated inland areas (e.g. wetlands, ponds and inland watercourses) and coastal fringe areas (e.g. mangroves, seagrass beds, intertidal mudflats, and rocky and sandy shores) are included in the map. Three consultancy studies were commissioned by the Planning Department (PlanD) in 1998, and by SDU in 2002 and 2004, to update the Terrestrial Habitat Mapping and Ranking Based on Conservation Value (THMR), and were completed in 2000, 2003 and 2005 respectively. Each update involved the use of the latest remote sensing data (including satellite images and aerial photographs) and geospatial data. Based on the recommendation in the last of the three above-mentioned studies that regular updates should be conducted every 2 years, there is at present an ongoing study aimed at revising the status and trend of terrestrial habitats and the associated ranking based on conservation values. This will be completed by 2007.

2.11.27 As part of the habitat mapping exercise, area and percent cover for each of the habitat/land cover categories was provided. In the study completed in 2005, the definition of "shrubby grassland" was revised to include "baeckea shrubland" and reduce the habitat/land cover categories from 25 (derived from SUSDEV 21 Study) to 24 (see **Table A2-12**). These figures are based on satellite imagery, aerial photographs and other geospatial data, the results of the field surveys and other relevant information. A detailed description of the habitat mapping and conservation ranking study is provided in the Final Environmental Baseline Report of SUSDEV 21 and the THMR update completed in 2005.

2.11.28 Out of the total habitat area mapped, 35,683 ha were classified in the study as being of high ecological value, representing 32.1% of the total land cover. The high ecological value areas were mainly identified as forest and shrubland habitats (including fung shui forest, montane forest, lowland forest and mixed shrubland) and inland water habitats (including freshwater / brackish wetland, mangrove and natural watercourse). Some areas of cultivation, plantation or plantation/mixed forest, shrubby grassland (including baeckia shrubland), fishpond/gei wai, sandy shore and rocky shore have been identified as medium ecological value habitats. Areas of spatial habitats by ecological values are summarised in **Table A2-13** and illustrated in **Figure 2-32**.

2.12 CULTURAL HERITAGE CONDITIONS

2.12.1 The Antiquities and Monuments Ordinance (Cap. 53) (A&MO) was enacted in 1976. It defines a monument as a 'place, building, site or structure which is declared to be a monument, historical building or archaeological or palaeontological site or structure under section 3, and further defines a relic as: (a) a movable object made, shaped, painted, carved inscribed or otherwise created, manufactured, produced or modified by human agency before the year 1800, whether or not it has been modified, added to or restored after the year 1799; and (b) fossil remains or impressions'.

2.12.2 The Ordinance provides full protection of identified antiquities and monuments by declaration and gazettal. As of April 2007, there were 81 such declared monuments throughout the territory, comprising primarily historical buildings, with rock carvings, archaeological sites etc.

2.12.3 Grading of historical buildings is to help the Government set priorities when pursuing preservation of the built heritage under the Ordinance. Although grading carries no legal effects, the graded historic buildings are protected by administrative measures as far as possible. Grading system does guide the decision making of the Government in dealing with redevelopment projects which might affect built heritage. It has also been used as a lever, in many cases successfully, to persuade developers (public and private alike) to reconsider and even revise their development proposals to accommodate the retention of graded buildings, such as the integration of the former London Mission Building (Grade III) into the residential development at Robinson Road, Central. The Antiquities Advisory Board undertakes the grading of buildings and structures and to date has identified over 496 graded historic buildings, with each grade indicated as follows:

Grade I buildings of outstanding merit of which every effort should be made to preserve if possible.

Grade II buildings of special merit; efforts should be made to selectively preserve.

Grade III buildings of some merit; but not yet qualified for consideration as possible monuments. These are to be recorded and used as a pool for future selection.

2.12.4 The 1996-2000 historical buildings and structures survey undertaken by the Antiquities and Monuments Office (AMO) has identified several thousand items of heritage interest, including but not limited to shrines, temples, residential buildings, traditional village settlements, shop-houses and schools.

2.12.5 The bulk of the identified buildings and structures are recorded in AMO archives, and are not afforded legal protection. They, regarded as local cultural heritage resources, shall be taken into consideration in the local development for conservation and adaptive re-use as far as practicable.

2.12.6 The Territory-wide Archaeological Survey carried out in 1997-8 identified a large number of archaeological sites in Hong Kong. This represents a large and valuable

record of the occupation of the area for over 6000 years, from the prehistoric period through the Qing Dynasty. All archaeological sites recorded by AMO are under administrative protection while several of which have been declared under Cap. 53.

2.12.7 The policy for built heritage conservation is currently under government review. The resulting Built Heritage Conservation Policy will make a difference in the approach to conserving the architectural heritage of Hong Kong. Government is considering various improvement measures, i.e. to formulate a holistic mechanism to assess built heritage and draw up various conservation methods; to establish a heritage fund to enable adaptive re-use of built heritage to be carried out in a sustainable manner; to provide suitable incentives to encourage private owners to conserve their built heritage; and to enhance heritage education and publicity. The current standard for heritage preservation can be found under the Antiquities and Monuments Ordinance (Cap. 53) and the Environmental Impact Assessment Ordinance (EIAO, Cap. 499), in particular under Technical Memorandum-Annex 10 *Criteria for evaluating visual and landscape impacts, and Impact on Sites of cultural heritage*; and Annex 19 *Guidelines for assessment of impact on sites of cultural heritage and other impacts.* A presumption for preservation of all sites of cultural heritage in-situ shall be assumed, with total demolition of built heritage after no objection by AMO and other relevant authorities and followed by full recordings or archaeological heritage by rescue excavation taken as the very last resort.

2.12.8 On the other hand, the Culture and Heritage Commission was established in April 2000 for advising the Government on the policies as well as funding priorities on culture and the arts. The key responsibility of the Commission is to formulate a set of principles and strategies to promote the long-term development of culture (including heritage) in Hong Kong. The Urban Renewal Authority (URA) has also been established and charged with amongst other functions, to conserve historic buildings in its urban renewal projects.

2.12.9 Apart from buildings and archaeological sites, old trees are also a type of cultural heritage for the locals. The Environment, Transport and Works Bureau Technical Circular (Works) No. 29/2004 – *Registration of Old and Valuable Trees, and Guidelines for their Preservation* aims to protect any old and valuable trees (OVTs) in Hong Kong which also cover the trees of cultural and /or historical significance. The technical circular sets out a set of criteria to determine whether a tree is an OVT. In accordance with this technical circular, removal of an OVT is prohibited unless strong justification can be provided.

2.13 CONCLUSIONS

2.13.1 The baseline review is an important component of the SEA process as it determines the range of environmental issues which need to be addressed, and highlights aspects for which targets will need to be developed to manage potential adverse environmental impacts. The following paragraphs summarises the findings of the baseline review.

Air Quality

2.13.2 The air quality over Hong Kong is considered to be an issue of concern. The air pollutants have generally been classified into two categories. The first category is

CAPs for which AQOs have been established. These include SO_2, NO_2, CO, O_3, Pb, TSP and RSP. The second category is TAPs which include known carcinogens.

2.13.3 The data analysed showed increasing annual average ambient concentrations for NO_2. Also, for SO_2 the long-term concentrations at new town stations have also followed an upward trend, while corresponding levels in urban areas reached a low in 1998 before gradually increasing over the past few years. Ambient levels of particulates have remained consistently high over the last 10 years and remain close to their respective AQO limits, and annual average ozone concentrations have risen slightly, raising concerns in particular over the formation of photochemical smog. Among the various TAPs (including heavy metals and organic substances) monitored the concentration levels of TAPs in Hong Kong are comparable to those observed in other major cities such as Tokyo and New York. GHG emissions are anticipated to increase over the next decade as a result of increasing energy consumption and transport.

Noise

2.13.4 The key noise sources in Hong Kong are predominantly from transportation and construction and this is significant due to the scarcity of usable land leading to the noise sources being located in close proximity to the noise sensitive receptors.

2.13.5 Various noise reduction programmes were first introduced in the 1980s and continue to control, maintain and constantly improve the noise environment. These programmes together with the existing statutory noise control requirements under the Noise Control Ordinance (NCO, Cap. 400) and EIAO as well as the guidelines in the HKPSG all contributed to better noise planning and redressing of the noise environment.

Geology, Soils and Contaminated Land

2.13.6 Numerous sites in Hong Kong have historically supported industrial development; as a result there is the potential for both inorganic and mobile organic pollution to remain within the ground. Sites which are particularly at risk from pollution include petrol stations and fuel tank farms, shipyards, tanneries, landfills etc. A number of sites, namely shipyards, have been remediated and redeveloped to date. As suitable space for development becomes more limited in the future it is anticipated that the regeneration of such 'brownfield' sites will increase. Furthermore, it is anticipated that government policy will encourage urban regeneration, following the lead of other countries with limited development space such as the UK. Investigations on a site by site basis are required to identify site specific environmental risks, with a contaminated land register providing information on the quantity of potentially contaminated sites.

Water Resources and Water Quality

2.13.7 Both the river water quality and bathing water quality have been improving over recent years. With the completion of the on-going implementation of sewerage master plans (SMPs) and livestock waste control strategies, this trend is expected to continue in the coming years.

2.13.8 The marine waters, particularly those in Deep Bay, North-western, Victoria Harbour and Tolo Harbour and Channels WCZs are still suffering from pollution strains. This is reflected in the increasing nutrient levels, bacterial levels, decreasing DO levels and frequent occurrence of red tides.

2.13.9 The majority of Hong Kong's freshwater supply is imported from Dongjiang in Guangdong Province. The growth rate in freshwater consumption has decreased to about 1% per annum primarily due to relocation of many industries outside HKSAR. There have been no significant pollution problems in local freshwater resources in the recent years.

Waste

2.13.10 The three existing landfill sites (WENT, SENT and NENT) only have capacity for another 10-15 years, and it will take nearly as long to develop and build new ones. Immediate action is required to reduce waste loads to prolong the life of these landfills. Household and municipal waste loads have risen steadily in line with the growth in population and wealth of the community. Construction and demolition materials exert a great strain on the landfills, short-term solutions associated with diversion of this inert material have had immediate impacts, however, opportunities for re-use, recycling of this material are required. In response, the Construction Waste Disposal Charging Scheme came into operation in January 2006 with the aim of reducing the amount of construction waste ending up in landfills.

Energy and Natural Resources

2.13.11 Although there has been a reduction in commercial energy consumption in recent years as a result of relocation of industries to the Mainland, there has been a gradual increase in Hong Kong's energy requirement over the last decade. Hong Kong's main fuel sources for electricity generation are fossil fuels, which are all imported. There are numerous opportunities for the integration of renewable energy technologies into the urban environment. More recently there have been efforts to increase the use of renewable energy, to promote the use of water-cooled air conditioning systems and to use the energy produced more efficiently, through encouragement of green building design, and energy conservation measures.

Landscape

2.13.12 The majority of Hong Kong residents live in urban environments with little or no greenspace. The landscape conservation and planning quality of Hong Kong's non-designated rural and urban landscapes is considered to be low in comparison to other Asian and Mainland cities. These landscapes are important for providing leisure and recreational opportunities as well as for ecological conservation and visual enhancement. Hong Kong has inherited this urban environment as a result of years of infrastructure development eroding natural landscapes, and insufficient provision of open space, as the design of urban landscapes is overwhelmingly driven by the need for minimal initial cost and maintenance liability, and historically landscape and visual issues have been given a low priority in planning and public works.

Risk

2.13.13 There are currently 32 PHIs present within HKSAR, however in future new sites could be added to the register. These sites are used for the storage of potentially hazardous materials above a certain threshold quantity. The location of these PHIs and the associated consultation zones can pose constraints in terms of future planning.

Ecology

2.13.14 Hong Kong supports a surprisingly high biological diversity for its land area, with 2135 species of native and naturalized vascular plants recorded during a recent survey. The sites which support the greatest diversity probably cover about 10% of the land area, the richest patches being small patches of montane forest about 400-500m, which have been protected from hill fires and harvesting by remoteness, dampness and inaccessibility. Terrestrial habitats are protected through a series of designations, which include Country Parks, Special Areas and Restricted Areas. There are currently 23 Country Parks and 17 Special Areas which cover 38% of the land area. Included among these are sites of particular ecological importance and other special scientific interest; for example, one of the 65 designated SSSIs is defined as a geological site.

2.13.15 The Marine Reserve and Marine Parks are protected and managed by AFCD, and many of these designated sites are not only considered to be of local and regional importance, but also international importance with respect to biodiversity as Hong Kong's waters support some marine species of global importance such as Chinese White Dolphin.

2.13.16 The increasing human population and associated pollution has exerted increasing pressure on the ecological resource. However, the rugged topography and statutory protection of terrestrial areas has reduced the impacts and limited encroachment into the more sensitive areas. Marine habitats and biota have not yet been subject to a coordinated inventory study in Hong Kong. However, the data available identifies that there is a range of hard and soft marine habitats, and biota frequenting these waters include Chinese white dolphins, finless porpoise, green turtle, horseshoe crabs etc.

2.13.17 Marine and coastal habitats are particularly vulnerable to development and have suffered considerably from pollution as a result of increasing human disturbance, previous industrial and ongoing sewage discharges, particularly sensitive are the Hong Kong seagrass beds. Mangroves have also been cleared for reclamation and for coastal developments. Despite this the remaining mangrove and wetland areas provide an important habitat for wildlife, in particular Mai Po marshes and Inner Deep Bay, an internationally important wetland designated as a Ramsar site, which supports thousands of wintering waterbirds.

2.13.18 Awareness among local residents of the natural environment and its value is a key to conservation in the future. Management of this resource is required to maintain its biodiversity, restrictions on emissions to air and water are required to prevent any further damage to the ecological resource. Monitoring is required to provide a species list from which changes over time including the impacts of human induced

global warming can be better observed. Potential parameters to be provided in the species list could include: species diversity, abundance, distribution, and / or change of conservation status etc.

2.13.19 Monitoring on the construction and operation of some ecological restoration / enhancement programme would also provide information which could be usefully applied in the future, for example, providing experience of restoration of mangrove habitats.

Cultural Heritage

2.13.20 As of 30 April 2007, there were 81 declared monuments and one proposed monument that are protected under the Antiquities and Monuments Ordinance.

2.13.21 In addition to the declared and proposed monuments, there are 496 graded historic buildings which are classified into Grade I, II or III to indicate their relative importance, as well as a further 236 archaeological sites. However, only declared monuments and proposed monuments are protected from damage or destruction under the Antiquities and Monuments Ordinance.

2.13.22 Although there is a broad consensus that cultural heritage must be preserved as far as possible, policy and practice must balance the needs of conservation and economic development. Ways must be found to save the best, most meaningful and representative examples of our heritage while progressing into the 21st century. Similarly, care will need to be taken to ensure that individual property rights are respected and acknowledged as equal in importance to conservation.

3 ENVIRONMENTAL CAPITAL STOCK AND CARRYING CAPACITY

3.1 ENVIRONMENTAL CAPITAL VALUE

3.1.1 The capital value of an asset is the present value of the stream of services it generates over its lifetime. The stock of this capital can be used in a sustainable or unsustainable manner. This Section focuses on natural capital, or the stock of natural assets that yields a flow of valuable goods and services into the future. The natural stock is particularly important since it provides both a resource input (or 'source') functions and waste assimilation (or 'sink') function. There are eight discrete elements of natural stock (SUSDEV 21), as follows:

Primary Components

- Natural resources – harvestable products or useable assets derived from naturally occurring or human managed environmental features (e.g. land supply, capture and culture fisheries, crops and livestock, potable water, flushing water).
- Ecological resources – are resources that have functional value to ecosystems, defined species, flora/faunal groups, or habitats which act or are likely to act as key structuring components of the ecosystem (e.g. mangrove stands, natural woodland, seagrass bed, egretries, corals, wetlands).
- Heritage resources – defined as those sites of cultural heritage value which contain archaeological heritage (terrestrial and marine), palaeontological sites and built heritage such as historical buildings and structures, cultural landscape as well as cultural features (e.g. fung shui landscape / woodlands / ponds, old paths / trackways, historical shrines and tombs / graves, old streetscape, old street furniture, and etc.).
- Assimilation capacity – defined as environmental self-purification or equilibration processes (e.g. absorption and degradation of contamination in soils/sediments, air/water, landfill capacity, biological breakdown of contaminants) as well as man-made environmental infrastructure that reduce or modify pollutant loadings to the environment (e.g. sewage treatment works, landfills, incinerators).

Secondary Components

- Scientific values – environmental features which are being researched or are regarded as potential subjects for research (e.g. areas of biodiversity, geological SSSIs).
- Existence values – environmental or natural resource features which are appreciated by society irrespective of any other natural capital stock functions they may offer (e.g. dolphins, corals, Victoria Harbour).
- Landscape values – defined as those environmental features which provide scenic or aesthetic values (e.g. vegetated areas, islands, natural coastline, peaks).
- Recreational values – those sites which serve as amenity areas for human

beings (e.g. beaches, trails and walkways, picnic/barbecue sites).

Source: SUSDEV 21

3.1.2 The areas identified in previous sections e.g. noise, air quality, cultural heritage, geology, water, waste, ecology and natural resources, may belong to more than one of the above categories. For ease of reference however the same divisions are maintained throughout the following section.

Air Quality

3.1.3 The environmental capital value of air quality can be defined as the acceptable environment in terms of providing air which we breathe of good quality, and minimising the risks from potentially harmful pollutants and release of potentially climate changing gases in the air. Air quality will also include the ability to observe landscapes, without view being inhibited by dense photochemical smog or smoke. Key indicators of air quality are provided by the AQOs.

3.1.4 There are significant concerns about the quality of air over Hong Kong, which is generated by both stationary sources such as power plants and mobile sources. The mobile sources, which predominantly result from exhaust emissions from diesel fuelled vehicles as the greatest contributor, are being tackled by Government initiatives which include programmes to replace diesel vehicles with practicable alternative-fuelled vehicles, to retrofit older vehicles with emission reduction devices, and to impose the most stringent fuel and emission standards for vehicles. Additional mitigation measures include retrofitting older franchised buses with catalytic converters and rationalizing to help reduce pollution in blackspot areas.

3.1.5 Under the Third Comprehensive Transport Study and Second Railway Development Study completed in 1999 and 2000, respectively, new approaches to transport planning (including coordination of different transport modes, timely provision of transport infrastructure, and new technologies in traffic management) were developed to promote more environmentally efficient transport systems. Besides which, energy policy would be developed to control over emissions from power generation. Programmes to reduce emission from all sectors of Hong Kong industry and commerce e.g. construction, would be extended. China is a signatory to the Kyoto Protocol and is taking part in global effort to control the release of greenhouse gases. The recommendations from the Study of Air Quality in the Pearl River Delta Region (PRD Study) on new emission control strategies are currently under consideration. Such recommendations include the use of cleaner fuel for power generation, the control on Volatile Organic Compound (VOC) emissions from printing and service station refuelling processes, the continuous expansion of environmentally friendly measures on transport strategic plan, etc.

3.1.6 Previous air pollution issues associated with sulphur dioxide releases were dealt with through the implementation policies to ensure manufacturers transfer to low sulphur fuels and remove quantities of sulphur prior to release to the atmosphere. The result was a sizeable drop in SO_2 levels from the previously high levels.

Noise

3.1.7 The environmental capital value in terms of noise can be defined as the acceptable noise environment provided to noise sensitive receivers through the implementation of legislation control, Hong Kong Planning Standards and Guidelines (HKPSG) and improvement programmes.

3.1.8 The Noise Control Ordinance (NCO) stipulates stringent noise limits for construction works carried out during restricted hours, especially in Designated Areas. As such the noise sensitive receivers are protected from the noise impacts due to construction activities in their vicinity.

3.1.9 A trial programme to resurface a range of existing local road sections with low noise surfacing material continues to be implemented in stages. As of February 2006, resurfacing works had been completed for 25 of the 72 road sections deemed suitable for the programme. When this programme is fully completed – by 2010, according to the current timetable – about 40,000 dwellings will experience tangible reductions in their noise levels.

3.1.10 Noise barriers and enclosures are common noise control measures for both mobile and fixed noise sources. For instance the roadside barrier erected along the West Kowloon Expressway protects over 3,000 flats.

3.1.11 Urban planning plays a vital part in noise control. For example, the zoning system can effectively avoid the interface problems between industrial operations and noise sensitive receivers. Through the relocation of industrial operations to less populated areas, the residents in the vicinity of the original site can be benefited for example, the relocation of the shipyard at Tsing Yi North benefits some 10,000 residents.

Geology, Soils and Contaminated Land

3.1.12 One of the capital values of geology and soils, in addition to their function in providing aggregates for construction which is addressed in the natural resources section, is their assimilation capacity in terms of ability to (with reference to biodegradable organic pollution in particular) degrade contamination, through the action of weathering and microbial breakdown. If managed effectively the energy produced from this degradation in the form of landfill gas could become a useful and sustainable energy source.

Water Resources

3.1.13 In terms of water resources, 70 to 80% of all drinking water consumed in Hong Kong comes from the Mainland. The remaining 20 to 30% comes from the surface water collected from the catchment within Hong Kong. Significant improvement in Dongjiang water quality has been observed after the operation of the dedicated aqueduct system from the Dongjiang intake to Shenzhen Reservoir in June 2003 and the implementation of a series of pollution prevention and control measures undertaken by the Guangdong authorities along the supply route of Dongjiang water.

3.1.14 Under the Government's Total Water Management programme, new water resources and water reclamation are being examined and tested, including seawater

desalination as an alternative source of the water supply and reuse of treated sewage effluent for non-potable purposes.

Waste

3.1.15 Construction and Demolition (C&D) materials which are non-inert are disposed of at landfill along with MSW and other wastes. In order to address the depletion of landfills inert C&D material should be used on reclamation projects, wherever possible. However, with very few reclamation projects in progress at the moment, this has become more difficult. Landfill space of the three operational landfill sites are becoming extremely restricted and under present conditions it appears that optimistically these three landfills will be full between 2010 and 2017. In an effort to prolong the landfill life, waste reduction initiatives under the Waste Reduction Framework Plan are being implemented, in an attempt to reduce the volume of MSW going to landfill. The implementation of the Waste Disposal (Charges for Disposal of Construction Waste) Regulation in December 2005 is one such initiative.

3.1.16 In terms of other waste management infrastructure, the operating Refuse Transfer Stations have a handling capacity of 3.1million tonnes per year, which is sufficient to handle the anticipated waste arisings and the Chemical Waste Treatment Centre is currently operating at 37% of its design throughput. The Low-level Radioactive Waste Storage Facility on Siu A Chau has sufficient storage capacity for more than 120 years.

3.1.17 In future it will be necessary to consider alternative waste treatments and technologies. Wherever possible these should include encourage re-use and recovery in the waste stream, which will require new infrastructure for collection of recyclable waste, for source separation and material recovery, and for increased treatment capacity through for example a waste-to-energy plant.

Natural Resources

3.1.18 Production of quarry aggregates from three sites in Hong Kong is currently around 6 million tonnes per annum (2006). No sand borrowing activities have taken place in Hong Kong waters since late 2003. Future land based mining has been effectively prevented due to the development pressure and competing land uses. Therefore the existing aggregate capital stock for Hong Kong is reducing whilst pressure for raw materials for development will continue.

Land Use - Agriculture and Fisheries

3.1.19 According to the Hong Kong 2030 Study, the area of cultivated land in Hong Kong has declined by more than 50% between 1954 and 2000. The latest figures from AFCD (2005) indicate that 1870 hectares of agricultural lands and fishponds were under active cultivation, of which 55% (1030 ha) was fishpond and 28% (520 ha) for market gardening uses. Local marine fisheries are also in decline, catches landed have reduced by over 40% since 1976 and a decline in commercially valuable demersal inshore fish species.

3.1.20 Hong Kong is dependent upon imports of agricultural products and fish. Hong

Kong's large demand for live marine fish is also thought to be perpetuating the use of destructive fishing techniques in countries which catch and supply these fish (SUSDEV 21). In recent years, over fishing and coastal developments have resulted in a drastic decline in fisheries resources in Hong Kong waters. According to the baseline data of SUSDEV 21 Study, quantities landed in Hong Kong had declined from a peak of just over 90,000 tonnes in 1976 to just over 50,000 tonnes in 1996 and 41,703 tonnes of marine fish were sold through the Fish Marketing Organization in 2004-2005.

3.1.21 In order to enhance fisheries and promote biodiversity in Hong Kong's marine environment AFCD has been implementing the artificial reef programme since 1996. The four existing artificial reef deployment sites are located at Hoi Ha Wan, Yan Chau Tong, Sha Chau and Chek Lap Kok. The effectiveness of the artificial reefs is encouraging that biodiversity and abundance of commercial fishes found around the artificial reefs is higher than those observed in nearby natural rocky shore areas. In 2002, the fishing industry in Hong Kong produced an estimated 169,790 tonnes of fresh marine fish, with about 90% of the total catch coming from waters outside Hong Kong. In 2005 Hong Kong waters produced an estimated 162,000 tonnes of fisheries.

3.1.22 Increasing production in agriculture and fisheries would increase the area's self sufficiency, providing an increased area for birds, open space aesthetic value, and may offer some benefit to non commercial species through increased habitat size. In addition, it could provide angling and diving opportunities. However, improper agriculture and fisheries produce unwanted by-products including pesticide residues, nutrient enrichment and seabed disturbance from trawling.

Landscape

3.1.23 The environmental capital value in terms of landscape can be defined as the acceptable use and exploitation of the physical, cultural/historic and aesthetic properties of natural, conserved or designed environments for the support of the mental and physical well-being of the individual and the community as a whole; and the support of the protection and conservation of landscape diversity and value.

Ecology

3.1.24 Hong Kong has extensive undeveloped tracts of natural landscapes which contain diverse habitats that support numerous native plant species and a variety of wildlife, both resident and migratory. Large areas of these natural landscapes are designated as Country Parks and Special Areas under the Country Parks Ordinance and managed by the Agriculture, Fisheries and Conservation Department on the advice of the Country and Marine Parks Board. At present there are 23 Country Parks, 17 Special Areas (11 of which lie within Country Parks) in Hong Kong, with a total area of 44,644 ha, amounting to around 38% of the total land area of Hong Kong.

3.1.25 The environmental capital value in terms of ecology can be assessed to determine the acceptable harvesting/use or exploitation that can be tolerated without adversely impacting on the species richness and value. Continued protection and management of these ecological resources, preventing excessive disturbance, pollution or human encroachment is required to ensure that the resource and its carrying capacity are

maintained.

Cultural Heritage

3.1.26 Heritage resources provide an essential, finite and irreplaceable link between the past, the present and the future. They are points of reference and help develop the cultural identity of a city. Heritage functions are defined as those sites which contain archaeological, historical or religious value although the source of heritage functions is essentially anthropogenic. The resource may be treated in the context of natural capital stock due to the significant link between heritage and natural capital stock. Heritage capital stock also serves a function in terms of existence, recreational and landscape values. As of 30 April 2007, there are 81 declared monuments, one proposed monument, 496 graded historical buildings, and a further 236 archaeological sites, along with several thousands pre-1950 buildings and structures identified during the 1996-2000 territory-wide historic building and structure survey undertaken by AMO.

3.1.27 Despite the massive scale of development in Hong Kong there are still many other fine examples of historic interest, such as temples, traditional villages, ancestral halls, shop-houses, Western style buildings, cultural landscape, old streetscape, historic quarry sites, former military sites, traditional cultural activities and associated ritual areas etc. The resource is also set to increase as more surveys and studies are made. The total extent of heritage resource has been assessed by the territory-wide archaeological survey and historic building and structure survey undertaken in 1996-2000 by AMO. Further research is required in order to adequately study the significance of the current environmental baseline.

3.1.28 Urban regeneration and development schemes could enhance the cultural and aesthetic benefits through integrated conservation and adaptive reuse of historical buildings and monuments, as well as enhancement of cultural environment. The current stock of historic buildings is a shrinking resource in urban areas and proposal for future renewal in long established areas such as Wan Chai and many parts of Kowloon should take account of the few remaining heritage resources. Similarly, development pressures in rural and country areas pose a significant threat to the integrity of archaeological resources, built heritage together with the associated cultural landscape and their aesthetic value, whilst reclamation projects continue to sterilise areas which have high potential archaeological value.

3.2 PRESSURE GENERATED FROM THE FUTURE DEVELOPMENTS

3.2.1 There could be environmental pressure and pressure on heritage conservation generated from the future developments such as new development areas (NDAs), cross-boundary infrastructure, future airport, port developments, etc, which may have implications on environment. Evaluation of the strategies included under the Preferred Development Option of the HK2030 Study has been provided in Section 8.

Air Quality

3.2.2 As the population of Hong Kong increases, the traffic volumes and rates of consumption of resources including electricity will also increase. Without appropriate management strategies, this has the potential to have a significant

adverse impact on air quality particularly in urban areas, which will have a knock on impact on health. The trends in air pollution patterns suggest that significant action will be needed to prevent further loss of assimilative capacity. Switching to cleaner alternative fuel from diesel will have some benefits.

3.2.3 Without an appropriate strategic response to the long-term threat to air quality, a continued increase in the incident of respiratory illness and other health effects is likely, together with worsening visibility form photochemical pollution. These effects increase the social and economic burden of pollution and as air quality declines and receives further media attention, it is possible that tourism will decline and Hong Kong will become less attractive to companies and individuals seeking to locate and invest in the SAR. Ever-tighter emission controls may place a financial burden on companies operating in the region.

Noise

3.2.4 With the increasing business and social correlations between the Mainland and Hong Kong, and China's entry into the World Trade Organisation (WTO), the cross-boundary transportation will be under pressure. The increased demand will require additional transport facilities which may be likely noise pollution source.

3.2.5 In order to accommodate the increasing population, redevelopment of previously developed urban areas can make use of the land more efficiently. The Urban Renewal Authority (URA) will have to deal with over 200 projects in the coming 20 years. However there will be construction noise problems during the redevelopment period. The construction activities may cause nuisance to the surrounding land users. Moreover, during the transition period, interface problems between industrial and residential developments will potentially be a noise issue. The operation of factories may create noise impacts on the new residential development.

Geology, Soils and Contaminated Land

3.2.6 Future development may have a positive impact on contaminated land in particular. Due to the small land area available for development it is probable that there will be further government initiatives to redevelop brownfield sites. This will require the remediation of sites which have been contaminated as a result of previous industrial/commercial activity.

Water Resources and Water Quality

3.2.7 The Water Supplies Department (WSD) compiles various data on the supply and consumption of freshwater in Hong Kong. Since 1990, the growth rate of the overall water demand has dropped to approximately 0.6% per annum. The reduction in growth rate may be due to the significant decrease in industrial water consumption as a result of the relocation of many industries outside Hong Kong. It is forecast that further reduction in the industrial demand for water will occur as a result of stricter pollution control policies and the availability of cheaper land and labour elsewhere prompting more industries to relocate outside Hong Kong. In 2005, 263 million m^3 of seawater was supplied for flushing purposes. Approximately 80% of the population of Hong Kong uses seawater for flushing. This extensive use of seawater has helped to reduce the demand on freshwater for flushing.

3.2.8 Reclamation of sites from the sea should only be undertaken with extreme caution as this disrupts the water flows and currents in the area, impacting on the assimilative capacity of the receiving water (e.g. the same volumes of sewage are entering a reduced amount of water). In addition removal of coastal habitats for example mangroves, reduces the area available for birds and spawning/juvenile fish. There have also been concerns raised in certain quarters as to the impact of reclamation projects on the harbour, and on water quality, ecology and landscape quality (http://www.epd.gov.hk).

Waste

3.2.9 Per capita Municipal Solid Waste (MSW) generation has decreased over recent years to 1.36 kg per person per day in 2005. The *MSW Policy Framework* has targeted to reduce MSW arisings by 1% per year (based on 2003 figures), irrespective of any increase in population. Thus, as the population is assumed to increase this means that the per capita waste generation rate must continue to decrease. This will be achieved by increasing source separation, implementing producer responsibility schemes and landfill bans and by introducing legislation in 2007 to allow for MSW charging. In parallel with this, the EcoPark is being constructed in Tuen Mun Area 38 to provide facilities for MSW recycling and there are plans to implement Integrated Waste Management Facilities for non-recyclable waste. However, within any waste management system, landfill is always required and so plans are underway to extend the three strategic landfills.

3.2.10 The generation of construction waste is more closely linked with Gross Domestic Product (GDP) and property value than with population growth. As such, construction waste arisings will likely remain high, given the rate of development and redevelopment requiring demolition rather than renovation and refurbishment. However, measures are in place to export demolition material and construction waste to the Mainland for reuse as fill in reclamation projects and the implementation in 2006 of the Construction Waste Disposal Charging Scheme should result in a significant reduction in the quantities of construction waste arising.

Energy and Natural Resources

3.2.11 Anticipated future population increases will put increasing pressure on the requirement for energy (currently predominantly supplied by the combustion of fossil fuels) and natural resources, as additional buildings and infrastructure will be needed to cope with the increasing population.

3.2.12 However, efforts to minimise energy requirements, including an increase in energy efficiency and incorporation of renewable energy sources should minimise the requirements for energy from fossil fuels. New construction projects could incorporate green design features where possible, and in an effort to prevent the filling of landfill sites, any energy-from-waste facilities which may be developed will produce some fuel without requiring fossil energy.

3.2.13 Notable energy developments which may help to counteract the demand from the increased population include the energy building codes, which are implemented via ‘The Hong Kong Energy Efficiency Registration Scheme for Buildings’. The scheme covers lighting, air conditioning, electrical and lift/escalator installations.

There is also energy efficiency labelling scheme which is a voluntary scheme covering refrigerators, room coolers, washing machines, clothes dryers and electric water heaters.

3.2.14 Demand Side Management policies are being implemented. From mid 2000 power companies have implemented rebate as well as information programmes for non-residential customers. Energy audits have been conducted on public buildings to identify energy savings potential. There is also an energy end-use database, which provides useful insights into energy consumption patterns in the main end-use sectors and sub-sectors in Hong Kong.

3.2.15 Hong Kong is also working closely with local electricity and oil supply companies to examine the feasibility of introducing electric and gas-powered vehicles. The University of Hong Kong conducted two researches on photovoltaic systems, one research is to monitor the electricity generated from solar energy captured by photovoltaic panels when used as cladding and / or sunshading to windows through the full cycle of Hong Kong seasons which is completed in 1999, the other research is to set-up an outdoor IV-curve measuring system for photovoltaic modules in Hong Kong and results from collaborative overseas research and a transfer of technology which is completed in 2003.

3.2.16 It is considered vital that Hong Kong looks to renewable energy and improved energy conservation measures to ensure a more sustainable energy supply in the future. The Electrical and Mechanical Services Department (EMSD) commissioned a two-stage consultancy study in November 2000 to investigate the feasibility of wider application of new and renewable energy technologies in Hong Kong. The First Stage was completed in 2003 and the Second Stage was completed in 2004. The First Stage concluded that there is potential for wide-scale application of solar power, wind power, fuel cells and energy from waste in Hong Kong.

Land Use – Agriculture and Fisheries

3.2.17 The marine fishing industry is facing great pressure as a result of intensive fishing pressure combined with rapid infrastructure development and increased marine pollution. The loss of important habitats such as mangroves, which provide a nursery for many commercial fish species, and pollution pressure on the Hong Kong's seagrass beds reduces viable habitats for such fish species. Without appropriate urban redevelopment initiatives and with the anticipated population increases, the development pressure is likely to result in loss of any remaining lowland agricultural areas.

Landscape

3.2.18 Hong Kong currently lacks an explicit or cohesive territory-wide landscape conservation and planning policy. Historically, landscape and visual issues have been given low priority in the planning process, resulting in the loss of significant areas of landscape particularly to urban development and major infrastructure projects. In addition, the value of designated landscapes is partly derived from their quality and extent, but exerting simultaneously increasing pressure on these landscapes will inevitably in turn reduce their function. The continued sustainability of these landscapes in the future will depend on balancing the demands of recreation

with the needs of landscape conservation. There is a clear and urgent need for a co-ordinated landscape conservation and planning policy with objectives including the use of designated landscapes, the conservation of non-designated landscapes and the quality of the whole living environment rather than on the component parts.

Ecology

3.2.19 Without appropriate management the increasing human population will exert pressure on the ecological resource through direct pressure of land take as increased areas of land will be required for housing, either encroaching on terrestrial areas, or reclaiming coastal environments. Pressure on low lying and coastal areas is anticipated to be the greatest. Indirect pressure, increased volumes of traffic and increased activity (despite the relocation of manufacturing industries to the Mainland) may increase air pollution, and as such will impact on sensitive species, reducing their health or restrict their growth. Increased populations will mean increased sewage and wastewater effluent contributing to water pollution both marine and potentially freshwater as well as increase in waste which will require appropriate disposal.

Cultural Heritage

3.2.20 Cultural heritage is under significant threat from new development, particularly in urban areas where older buildings with no statutory protection have been demolished to make way for new schemes rather than being incorporated into urban redevelopment programmes. The areas of highest potential for heritage resources are often old settlements or coastal regions where the pressure for new development is the greatest and significant reclamation has already been conducted in coastal areas. Rural areas are also under increasing threat from encroachment of developments, particularly in growth areas such as in the new towns and where the lack of development controls on private land is threatening many traditional village buildings and other cultural features in the New Territories (SUSDEV 21). The proposed opening of the Frontier Closed Areas (FCAs) would likely pose substantial alterations to the cultural landscape, heritage, traditional practices and pre-historic sites which remain intact for a long period of time.

3.2.21 In addition to the threat of loss or destruction of heritage resources as a result of development, there are also other dangers. These include tourism-blight and over-use without planning; retention of a resource but destruction of its immediate environment; loss of the integrity of a heritage resource as a result of inappropriate reconstruction and re-use and the threat of natural erosion to archaeological sites.

3.3 ENVIRONMENTAL CARRYING CAPACITY AND STRATEGIC INDICATORS

3.3.1 Carrying capacity refers to the number of individuals who can be supported in a given area within natural resource limits, and without degrading the natural social, cultural and economic environment for present and future generations. The carrying capacity for any given area is not fixed. It can be altered by improved technology, but mostly it is changed for the worse by pressures, which accompany a population increase. As the environment is degraded, carrying capacity reduces; leaving the environment no longer able to support even the number of people who could formerly lived in the area on a sustainable basis.

3.3.2 The adoption of sustainable development principles offers a number of potential benefits including environmental benefits resulting from reduced wastage through energy savings, economic benefits arising from improved health and reduced economic burden as well as social benefits due to the improved amenity from natural and open areas by efficient land use.

Air Quality

3.3.3 Air quality cannot be thought of in terms of its ability to support, but rather in its ability to assimilate various environmental pollutants. The 'assimilative capacity' of the territory's air is limited by a number of topographic and meteorological factors such as the prevailing north-easterly winds (70% of the year), confined air sheds that restrict dispersion of pollutants, and limited air circulation in urban areas due to the density of high rise buildings, which creates a 'street canyon effect'.

Noise

3.3.4 Determining the environmental carrying capacity requires reference to certain criteria or standards to enable comparisons to be made. The increasing awareness of noise pollution has accompanied the development of noise assessment and acceptable noise criteria and standards, for example the noise standards stipulated in the NCO and the HKPSG.

3.3.5 Hong Kong has been described as a crowded, noisy city in the Environment Hong Kong 2000 by EPD. The sources are heavily trafficked road networks which take heavy, noisy vehicles through cramped residential areas and numerous construction sites within close proximity to residents.

3.3.6 With the relocation of the airport from Kai Tak in Kowloon to Chek Lap Kok on Lantau in 1998, the dominant noise problem in the urban area has changed from air traffic to road traffic. EPD estimated that in 2000 around 1.14 million people were affected by excessive road traffic noise. In view of this situation, it is likely that there is not much room in terms of noise carrying capacity.

3.3.7 The percentage of residential units exposed to high noise levels could be a strategic indicator for the noise carrying capacity. Taking traffic noise as an example, although the HKPSG should be followed in designing residential developments against traffic noise, it is recognized that not all developments can achieve full compliance with the standard. As such, there would be a continued increase in the total population being affected when more developments proceed.

3.3.8 The number of prosecutions and complaints received could be used as a strategic indicator. In 2000, there were 404 prosecutions for construction noise, 65 for industrial and commercial noise, 50 for neighbourhood noise and 3 for intruder alarms. The number of complaints received by EPD may be a useful indicator for incidences of noise from construction activities which are difficult to monitor on a territory wide basis. In 2005 a total of 8,444 noise complaints were received by EPD including the police cases relating to seven categories of noise nuisance: construction (1,294 complaints), industrial and commercial (3,185), neighbourhood (2,764), transport (319), product noise (6), intruder alarm (728) and other (148). This compares with figures of 9,428 noise complaints in 2004, 9,708 in 2003 and

12,487 in 2002.

Geology, Soils and Contaminated Land

3.3.9 The issues associated with geology, soils and contaminated land in terms of carrying capacity are discussed within the ecology and water resources sections.

Water Resources and Water Quality

3.3.10 The WQI is an indicator of the extent of organic pollution in a river and its ability to support aquatic life. The potential impact of future developments on the freshwater resources is represented by the annual water consumption per capita. The number of beaches rated as "good or fair" and the number of beaches rated as "poor or very poor" is the indicator for bathing waters. The compliance frequency with the WQOs in each of the WCZs is the strategic indictor for the marine water in relation to the future developments.

Waste

3.3.11 In terms of carrying capacity, the only sustainable approach to waste management is to have zero landfill disposal, since areas designated for landfill disposal have limited use thereafter. Hong Kong's three strategic landfills occupy an area of 273ha and the closed landfills occupy an additional 300ha. The closed landfills generate landfill gas and leachate and while these emissions are now controlled under 30-year restoration and aftercare contracts, there are still environmental impacts, which are discussed under the sections on ecology and water resources. For the three strategic landfills, which have been constructed and operated to state-of-the-art standards, their future use is still limited to mainly passive or active recreation – high-density development is unlikely.

Natural Resources

3.3.12 The natural resources carrying capacity can be described as the amount of use and harvesting which can be conducted without adversely affecting the environment to replenish itself within a reasonable timescale.

Land Use - Agriculture and Fisheries

3.3.13 In common with many other major world cities, Hong Kong's agriculture and fisheries natural capital stock does not fully support the local demand for fresh foodstuffs, and alternative sources have already been identified to meet demand. The wealth and yield from agriculture and fisheries can be used as an indicator of carrying capacity.

Landscape

3.3.14 The landscape carrying capacity can be described as the amount of natural and designed landscape resource which is needed to support the well-being of individuals and the community as well as to protect and conserve landscape diversity and value. Landscape carrying capacity strategic indicators could include:

- The area of protected landscape per 100,000 of population

- The volume of visitors to protected landscapes per year
- The area of urban greenspace per square kilometre
- The ratio of developed land to land covered by natural forest, scrubland and grassland. For example, Hong Kong has a developed land area of 230 km², while approximately 741 km² are covered with forest, scrub and grass, a ratio of 1 to 3.2

3.3.15 The Study on Landscape Value Mapping of Hong Kong commissioned by the PlanD was completed in 2005 and two types of Landscape Indicator have been established:

(1) Percentage change to area of Area-based Significant Landscape Features (area-based SLFs); and

(2) Percentage change to number of Point-based Significant Landscape Features (point-based SLFs).

3.3.16 According to the Study, area-based SLFs generally include natural features such as woodland, scrub, stream etc but exclude built structures while point-based SLFs include edifices, structures or built landscape features such as monuments, bridges, landmark geological or physiographic features and hydrological features with limited horizontal extent such as waterfalls etc.

3.3.17 Each Indicator can express landscape change as a positive or negative change in the total area/number of each type of SLF to allow quantification of potential impact arising from development proposals.

Ecology

3.3.18 The ecological carrying capacity has been commonly defined as "the population of a given species that can be supported indefinitely in a defined habitat without permanently damaging the ecosystem upon which it is dependent" (The International Society for Ecological Economics, 1994). It is also resources which are required to process carbon dioxide, provide goods and services, and habitats, without the health of the resource being adversely affected which equally apply to diverse ecological resources.

3.3.19 Determining the ecological carrying capacity requires analysis of natural population dynamics and the disturbance in terms of building or infrastructure an area can support or the concentration of contaminants an environment can absorb/ or be exposed to without adversely disrupting the existing species diversity and population numbers. For example, different species will colonise different environments, and disturbance/encroachment or fragmentation may mean that more common disturbance resistant and ruderal species will replace potentially more established and more sensitive communities.

3.3.20 The assimilative capacity is the ability of a "system" to absorb waste materials, the process of environmental self-purification or equilibration. Assimilative capacity enhancers are therefore systems which reverse problems of pollution, public health or resource depletion. These systems are defined as man-made environmental infrastructure that enhances natural processes so as to reduce or modify pollutant

loading to the environment. Assimilative capacity can also be increased through appropriate management, removal of dead/decaying vegetation to make way for new growth, or use of specific species to assist in the removal of organic compounds from water, or the introduction of microbes to assist in the breakdown of organic compounds in contaminated land or landfill sites.

3.3.21 The findings of the Biodiversity Survey of Hong Kong (The University of Hong Kong, 2002) have provided useful ecological baseline. From these surveys a set of indicators can be developed. These indicators could include: distribution of species, abundance of species, and conservation status of species / habitats. These can be used to determine the health of the environment. Periodic surveys will be required to update the conservation status of species / habitats, information gained from these will be used to determine any improvements or reductions in the ecological carrying capacity. These indicators can express ecological change as a positive or negative to allow quantification of potential impact and immediate reaction to these changes.

Cultural Heritage

3.3.22 Carrying capacity is a concept with limited applicability to cultural heritage. The stock of heritage resources is so precious and being endangered and that the aim must be to preserve as much heritage resources and cultural landscape as possible. In terms of heritage conservation and management, carrying capacity can be viewed as the integration of the maximum resources into the wider development plans for the community.

3.3.23 Strategic indicators of heritage sustainability as developed for SUSDEV 21 fall short of requirements; they include only two categories: archaeological sites and buildings of cultural heritage, ignoring a wide range of other important resources like cultural setting and landscape, intangible cultural heritage etc. The proposed indicators equate the number of recorded sites with cultural vibrancy, the heritage significance of the sites, their group value, rarity and condition, the quality of their cultural environment and buffer zones, public accessibility and other important criteria are less emphasised. The definition of indicators for cultural heritage is the subject of considerable international as well as local debates at present. Hong Kong should monitor and participate in this discussion and devise a set of indicators in line with international standards but appropriate for local needs and circumstances.

3.4 ENVIRONMENTAL EFFICIENCIES

3.4.1 To avoid continued environmental decline, future development must embrace concepts of resource efficiency, social equity, environmental protection and restoration and recognition of limits to growth. The key response to the current condition of the natural capital stock in Hong Kong thus lies in the development of holistic and integrated policies and strategies to address the pressures acting upon the environment.

3.4.2 Overall, sustainable development in Hong Kong will need to involve all sectors across society for it to be successful. This means involving groups such as the public, business, industry, transport operators, legislators and district council(s), some of which may have been unreceptive to previous environmental messages or changes. There is therefore a need for action so that such groups are actively

engaged in a constructive discussion to appreciate the environmental, social and economic interrelationships, which are vital to sustainable development.

3.4.3 Urban planning is an efficient way to achieve protection of the environment. Through the planning process, the potential environmental issues are identified and addressed before commencement of the development. The allocation of land uses over the SAR and the design of development to minimise the environmental impacts can be investigated. For instance the positioning of potentially polluting processes away from sensitive receptors. Positioning of wastewater treatment facilities, in areas where there is space to develop man made reedbeds to remove organic matter, or the orientation of buildings can protect the dwelling from direct noise exposure to traffic noise and the zoning of residential and industrial land uses at different locations can avoid their interface problem. Thus the installation of additional mitigation measures can be minimised. Furthermore, the construction and operation cost for maintenance can be saved.

3.4.4 Control at source is always a better solution than passively isolating the receivers from environmental impacts. This is more cost effective than adding on end-of-pipe technologies, or mitigation facilities.

3.5 CONCLUSIONS AND RECOMMENDATIONS

3.5.1 Hong Kong has a significant capital stock of resources which includes large areas of protected land. However, the intense development in areas of Hong Kong has put pressure on the natural resources through direct land take, or through improved access to land (through infrastructure projects), or through the release of contaminants into the environment. The anticipated population increases will put further pressure on the environment as more space, resources and energy are required to maintain the population. There are likely to be further pressures as a result of global environmental issues such as the human enhanced greenhouse effect.

3.5.2 It is clear that without appropriate planning and control of future development, and without improvements in energy efficiency and reductions in the volume of solid and liquid waste and other pollutants, the environment will be seriously compromised. If this continues uncontrolled it will lead to a reduced enjoyment of the environment and its resources, and will compromise the environment's capacity to assimilate waste products. This will also reduce the resources left for future generations to meet their own needs.

3.5.3 A holistic approach to environmental management is required to take into consideration all of the environmental aspects mentioned throughout this section. Regeneration of run-down or disused areas is recommended, maintaining important landscape character features (such as waterfront and fung shui woods) and reusing materials where possible. This will reduce impacts of creeping incrementalism of the disused landscapes and / or materials which have been noted in other world cities such as Tokyo and London. Methods of working with natural processes (e.g. biochemical purification for waste treatment) to enhance their assimilation and recycling functions are required. This can be achieved through research leading to technological advances, or ensuring the easy transfer of knowledge and techniques which have already been tried and tested through the implementation of effective environmental management systems which promote active environmental

communication.

3.5.4 Environmental considerations must be at the forefront of planning and development to ensure that resource use, emissions and waste are made as low as possible. The standards and objectives set require periodic review to ensure that they are ambitious enough based on emerging technologies and techniques. Putting environmental issues at the top of the agenda is necessary to raise public awareness. Education is the key, strict legislative controls and economic incentives for non-polluting or environmentally conscientious management and operation, and penalties or 'green taxes' for polluting companies, can provide effective tools for improving environmental performance.

3.5.5 Cultural heritage resources in Hong Kong are diminishing by development. Cultural heritage resources not only provide an essential, finite and irreplaceable link between the past, the present and the future, and also are testimonies of different historic stages of development and evolution of our city. They help to develop the cultural identity of a city and sense of belonging of the community and must be preserved and respected. Heritage may act as a constraint on development in some instances, however, it can also provide opportunities. These include the creative re-use of historical buildings, the development of cultural tourism in historic areas and their associated cultural landscape, the preservation of archaeological sites as education centres, and building up of quality living space for the community.

4 ENVIRONMENTAL CONSTRAINTS AND OPPORTUNITIES

4.1 INTRODUCTION

4.1.1 This Section identifies the major environmental constraints and key issues that would have an influence on the sustainability of Hong Kong. For example, on land the existing buildings will act as a constraint, reducing air flow, resulting in stagnation and potentially high levels of air pollution. However, there are also a number of opportunities for environmental enhancement and improvement through new and up coming environmental technology. Increased global environmental awareness has also helped to push forward a number of major environmental initiatives as well as providing opportunities for worldwide co-operation in environmental protection.

4.2 INCREASED GLOBAL ENVIRONMENTAL AWARENESS

4.2.1 The idea of sustainable development was first formally discussed in 1972 at the United Nations (UN) Conference on the Human Environment in Stockholm. The issues raised lead to the establishment of the World Commission on Environment and Development (WCED) by the UN General Assembly. The Commission was supported by the UN but it was an independent body outside the control of governments and the UN itself. The WCED summarised its findings in the following terms: *'We came to see that a new development path was required, one that sustained human progress not just in a few places for a few years, but for the entire planet into the distant future. This 'Sustainable Development' becomes a goal not just for the developing nations, but for the industrialised ones as well' (WCED, 1987)*

4.2.2 The WCED in its 1987 publication 'Our Common Future' defined the concept of sustainable development as follows:

> *'Sustainable Development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs'*

4.2.3 The WCED or Brundtland definition is widely used as a starting point for sustainable development strategies at national, regional and municipal levels. It is common for governments to re-phrase or expand on this definition when setting out their goals. At the United Nations Conference for Environment and Development (known as Rio Earth Summit) in 1992 international negotiations, the Brundtland definition was adopted and the conference resulted in a number of initiatives of particular importance for sustainable development. In particular, Agenda 21 - adopted at the Conference, names the key fields of action for sustainable development, required all countries to define and implement the programme areas according to local situations, capacities and priorities.

4.3 ENVIRONMENTAL CONSTRAINTS

Air Quality

4.3.1 In terms of air pollution, the existing infrastructure and prevalence of high-rise buildings restrict air movement within many urban areas. In the future, planning

must take into consideration the requirements for free and easy movement of air to prevent the canyon effect which is currently experienced in many urban areas of Hong Kong. Trans-boundary air pollution from the Mainland and other regions also affects Hong Kong's air quality, as does marine traffic, aircraft movements and power generation.

Noise

4.3.2 As the availability of suitable land for development is limited and with the increasing transportation pressure between Hong Kong and the Mainland, traffic noise will still be a dominant noise source in the future. Due to a lack of integrated land-use planning in the past, industrial areas are located in close proximity to the residential areas, and the airport was located in what became (through urban growth) one of the town centres. Heavy trucks and busy traffic networks also pass by the noise sensitive areas such as residential developments, education institutes and hospitals. As a result of such a combination, environmental noise problems have created.

4.3.3 For existing urban areas, there are not many immediate solutions available regarding noise reduction. It is particularly problematic where flyovers pass through high-rise residential neighbourhoods. Comprehensive urban renewal could be most effective in reducing noise pollution but may not be feasible due to multiple ownership. Better land use planning and good building design should be considered.

Geology, Soils and Contaminated Land

4.3.4 The costs associated with compensation for relocating privately owned PHIs and other facilities which may cause land contamination may prove a constraint to freeing up land for development.

Water Quality

4.3.5 The Pearl River is a significant source of nitrogen for Hong Kong's North Western WCZ in the wet season. It is estimated that the contribution from the Pearl River could amount to 60% of the nitrogen level in the North Western WCZ (Hyder, 2000). The influence of the Pearl River decreases as you move further away. However, the extensive reclamation downstream of the river in recent years has altered the influence of the fresh flow from the river on the HKSAR waters. There is evidence to suggest that the extensive reclamation has led to more freshwater flow from the river being diverted to the west of the Pearl River Estuary.

4.3.6 In addition to the Pearl River, the pollution discharges from Hong Kong's neighbouring area also affect the water quality of HKSAR waters, particularly in the Deep Bay WCZ. These are significant constraints as they are outside the control of the HKSAR Government.

4.3.7 It is economically attractive for many "zhens" and "xiangs" in the Mainland to exploit their forests for the wood export and for tourism development. Without the concept of sustainable development, these may lead to deterioration of water resources for themselves and for Hong Kong in the long-term.

4.3.8 The increasing urban population within the Guangdong Province will result in increases in the volumes of waste water produced, which will act as a constraint if lacks of appropriate treatment and management. Proper wastewater treatment is essential to improve water quality in the rivers and the sea. However, there is limited land space available for such installations. Underground and cavern options will probably be more acceptable to the general public. Special design requirements may be required for above ground treatment plants in more sensitive locations.

Waste

4.3.9 To achieve sustainable waste management in Hong Kong, the waste management hierarchy must be fully embraced. This defines, in order of preference, the waste management approaches that should be adopted to achieve sustainable waste management. These are (from most preferred to least preferred) avoidance, reuse, recycling, treatment and disposal. The waste management hierarchy applies to both MSW, which comprises domestic waste, commercial waste and industrial waste, and to non-MSW, such as construction waste, chemical waste and special waste.

4.3.10 In Hong Kong, however, the disposal-led approach that formed the basis of our current waste management infrastructure has meant that the quantities of waste have not been significantly reduced by avoidance, reuse or recycling initiatives. However, this set to change with the adoption of new principles set out in the *MSW Policy Framework*, in which three targets have been set:

- **Target 1.** To reduce the amount of MSW generated in Hong Kong by 1% per annum up to the year 2014.
- **Target 2.** To increase the overall recovery rate of MSW to 45% by 2009 and 50% by 2014.
- **Target 3.** To reduce the total MSW disposed of in landfills to less than 25% by 2014.

4.3.11 These targets are certainly a step towards sustainable waste management, but constraints still exist, not least of which is the current lack of any user charge for MSW disposal. However, this is set to change with the introduction of legislation in 2007 to enable MSW charging, which complements the legislation introduced in 2005 to enable charging for disposal of construction waste. The constraints to achieving sustainable waste management are largely institutional, administrative and educational and so will require a range of solutions appropriate to each.

Energy and Natural Resources

4.3.12 Further investigation is required into the options for use of renewable energy. Space for facilities for creation of wind energy, biomass, wave or hydroelectric power is a major constraint when identifying viable options for Hong Kong.

Greenhouse Gas

4.3.13 The potential impacts of the human enhanced greenhouse effect may act as a constraint on the ecological resources, building/ planning design, transport infrastructure and energy production and use within Hong Kong. Changes to seasonal ambient temperature, ambient CO_2 and alterations to rainfall patterns and

intensity may put pressure on some of Hong Kong's native species, reducing the ecosystems ability to respond to the predicted environmental change. All opportunities to maintain biodiversity, increase vegetated areas, how building/ planning design, transport infrastructure, energy production and use, and minimise the release of greenhouse gases must be considered.

Risk

4.3.14 PHIs are a contentious yet indispensable part of any major city's essential services network. A larger population means increased water consumption, for example, in turn placing heavier demands on the water treatment works which typically require chlorine storage facilities. Similar patterns can also be found for fuel and gas consumption, except that the affected areas would increase not only because of the pipes transporting such chemicals to the development areas, but also petrol stations. Consequently, potential new development zones may lead to the expansion or development of existing PHIs and certain other potentially hazardous linear infrastructure (such as high-pressure gas pipeline networks to the new towns), or even new such installations to be built in the future. Such facilities may act as a constraint in terms of the location of future development; one such example is on any population increase within the Consultation Zone of a PHI. This and other related constraints need to be taken into account in the overall land use plans, when considering components of the development options.

Ecology

4.3.15 There is potential erosion or reduction of the ecological resource through increased development, efforts will need to be paid to avoid and minimise the impacts to the important habitats and wildlife. However, there are always competing demands for land with our natural environment to meet economic and social needs. It is a challenge to the Government to strike a proper balance to ensure that the development needs are met without cause unacceptable damage to the natural environment.

Cultural Heritage

4.3.16 Cultural heritage can in some cases act as a constraint on planning intentions when development proposals impact on heritage resources. Often the impacts can be mitigated to an acceptable degree through alteration of the detailed design or the resources integrated into the plan to mutual benefit. However, there will always be cases where the interests of heritage conservation and development planning are incompatible. It is important that heritage resources could be clearly identified and ranked in terms of significance so that the planning process can accommodate them and engage them at early stage as to their role in future development.

4.4 ENVIRONMENTAL OPPORTUNITIES

Air Quality

4.4.1 The air pollution on street level comes from road traffic, as such any efforts to reduce emissions from vehicular road traffic would have a beneficial effect on the air quality. In terms of planning for new development areas and urban renewal

projects, breezeways could be planned to allow better air circulation in the town. Obsolete industrial buildings could be considered for conversion into other non-polluting uses instead of wholesale redevelopment. On one hand, this would minimise air pollution from industrial uses, and on the other hand, it could minimise production of demolition wastes. Marine traffic, aircraft movements and point source emissions also need to be considered in terms of reducing emissions from these sources through technological advances. Co-operation in regional planning may help to reduce cross-boundary air pollution. Although it may not bring about immediate effect, the air pollution problem in Hong Kong cannot be wholly resolved without the co-operation of Guangdong.

Noise

4.4.2 The relocation of Hong Kong International Airport from Kowloon City to Chek Lap Kok in Lantau brought about tremendous environmental improvement to the residents in Central and South East Kowloon. However, Hong Kong International Airport will steadily increase its passenger and cargo throughput in the next 30 years and will need to expand to meet the demands. A key part of this Study will be to examine how the different growth scenarios will affect the environmental quality of various possible development areas including Tung Chung and Tai Ho.

4.4.3 Road traffic noise is a significant source of noise in Hong Kong. For new development areas, there are opportunities for noise mitigation and reduction available through better planning for different hierarchy of roads, submerging major roads, provision of mitigation at source, and protecting noise sensitive uses by non-noise sensitive uses are all applicable to ensure a good living environment. To avoid traffic noise impacts, the direction of integrated land-use planning can be focused on the zoning of the whole territory, the alignment of road networks and the mode of transportation. For instance in the Kai Tak Development (KTD), efforts have been spent at the planning stage in avoiding trunk roads inside new towns, considering environmentally friendly mode of transport and considering user-friendly pedestrian walkways.

4.4.4 The use of trains can be encouraged by designing high-density developments within walking distance of railway stations. This will effectively reduce private car trips on the roads, and would have to be facilitated by the provision of park and ride facilities at the fringe of the town, and the provision of comfortable and convenient pedestrian linkages to the stations. Restriction of car-parking provisions at congested areas and at convenient locations could also be considered.

4.4.5 In existing urban areas, there are many sites with industrial / residential interface problems. Designation of “Residential (Group E)” land use zoning is one means which can be used to phase out the industrial uses. However, this has to be implemented with caution and careful assessment so as not to create new industrial/residential interface problems.

Geology, Soils and Contaminated Land

4.4.6 Regeneration of obsolete industrial areas, restoration of old landfill sites to free up land for potential development or recreational use would increase development potential within the existing urban areas. The existing PHIs can be considered as

areas of opportunity if it is possible to reduce them through various means such as the application of new technology or alternative processing technology or relocation to outlying island. This has been considered in the Key Issues Report and in the SEA Study in general.

Water Quality

4.4.7 Similar to cross-boundary air pollution problem, close co-operation between Hong Kong and the Pearl River Delta region in appropriate land use planning and waste water treatment provides opportunities for improving quality of the water resources.

4.4.8 It has been the Government's long-term objective to provide sewerage connections for remote areas. SMPs covering most of the territories have been produced although some are currently undergoing review. Implementation of the SMPs is underway, which is expected to benefit the water quality across the territories.

4.4.9 The Harbour Area Treatment Scheme (HATS) is currently being implemented. It is expected that the implementation of HATS would alleviate considerably the pollution level in and around Victoria Harbour. With the planned improvement in Hong Kong's sewage treatment system in the harbour areas and other water control zones, the potential exists to exploit opportunities for water recreation activities for the general public and tourists. Opportunities however depend on a number of factors including marine traffic, available facilities, suitability of the site etc.

Waste

4.4.10 The *MSW Policy Framework* has provided numerous opportunities to improve the waste management system. Ongoing campaigns to introduce source separation are essential and together with plans for producer responsibility schemes, landfill bans and Integrated Waste Management Facilities, Hong Kong is now moving closer towards sustainable waste management than ever before.

Energy and Natural Resources

4.4.11 The previously mentioned measures to encourage use of trains and discourage use of private cars are also helpful methods for reducing natural resource consumption. Vehicles which run on renewable energy is a possibility in the future, however, the resources must be available at affordable prices and comparable efficiency to make this a viable option.

4.4.12 Waste incineration could provide a potential heat source which could be used for purposes such as energy production, whilst smaller alterations to techniques and processes such as the use of water-cooled air-conditioning system provides an energy efficient method of air conditioning. Adequate land has to be reserved for central chiller plants in addition to pump houses and water tanks.

4.4.13 Introducing appropriate environmental management provides significant opportunities for resources conservation (fuel, waste recycling, re-use of inert material from demolished buildings etc), through the minimisation of the use of resources, and through the use of new technologies, and the investigation and incorporation of renewable energy.

Landscape

4.4.14 Opportunities for enhancing the landscape value of existing urban areas includes, greening of roofs, streets and man-made slopes. In redevelopment or new development areas, the requirement for the preparation of master landscape plans and creation of different types of open space will also provide an opportunity for enhancing landscape value.

Risk

4.4.15 Opportunities exist for the reduction in PHIs over time with the introduction of new technologies or the provision of new strategically located facilities. Examples of such opportunities include the potential reduction in chlorine storage at water treatment works which could reduce the consultation zone or even the change from chlorine to ozone in the disinfection process which could effect a declassification of the PHI. Other examples include the relocation of oil terminals or fuel stores to other parts of Southern China, or the alternative use of non-petroleum based fuels. This could reduce the number of PHIs in Hong Kong.

Ecology

4.4.16 Current popular opinion in Hong Kong tends towards a more stringent approach to environmental conservation, including the conservation of our natural heritage through the preservation of ecologically valuable areas. Natural heritage can play an important role in achieving these conservation objectives, particularly if a wider range of ecological resources is identified and exploited as having value and appeal to the community.

4.4.17 The public must be involved in the setting of priorities for nature conservation. The most important priority areas could be protected, and the less sensitive areas could be allowed to be developed at an agreed scale with an appropriate portion of the site managed for nature conservation. A similar approach (called public-private partnership, PPP) has been proposed in the new Nature Conservation Policy. Under PPP, developments at an agreed scale will be allowed at the ecologically less sensitive portion of sites provided that the developer undertakes to conserve and manage the rest of the site that is ecologically more sensitive on a long-term basis. A pilot PPP scheme will be implemented.

4.4.18 Prompted by the increasing public concern on the development pressure on the wetlands within the Deep Bay Area, Wetland Conservation Area (WCA) and Wetland Buffer Area (WBA) were established under the Town Planning Board (TPB) Guidelines (TPB PG-NO. 12B) for Application for Developments within Deep Bay Area under Section 16 of the Town Planning Ordinance (TPO). Within these zonings, the principle of No-Net-Loss in Wetland (either in terms of area, function or both) is adopted by the TPB for considering development proposals.

4.4.19 The planning intention of the WCA is to conserve the ecological value of the major wetland habitat (fishpond) of the region. All these fishpond habitats should be conserved and new development proposals are generally not allowed unless it is required to support the ecological conservation of the area or the development is an essential infrastructural project with overriding public interest.

4.4.20 The WBA was established to protect the ecological integrity of the wetlands in WCA. Within the WBA, wetland restoration proposals are encouraged and residential / recreational developments proposed on degraded sites to remove / replace existing open storage or container back-up uses and/or restore lost wetlands may be considered by the TPB if the ecological impact assessment can demonstrate that no net loss of wetlands will be resulted from the proposed project. As such, the zoning system of the WBA could be considered as an ecological opportunity for restoration of lost wetlands in Hong Kong.

Cultural Heritage

4.4.21 The Hong Kong community, while wanting to preserve its heritage, is basically supportive of the need to strike a balance between heritage conservation and economic development. Ways must be found to save the best, most meaningful and representative examples of our heritage while progressing into the 21st century. Similarly, care will need to be taken to ensure that individual property rights are respected and acknowledged as equally important to conservation.

4.4.22 Heritage resources are positive social and cultural assets and there are many opportunities for integration of heritage into progressive and sustainable development strategies. At the same time, these same resources are often under threat from development as there is no doubt that in some cases heritage resources can act as constraints on certain types of development.

4.4.23 It is imperative that, in planning for the future, heritage should be viewed as an affordable constraint that can be transformed into an opportunity with expert input and guidance as well as community participation so that aspects of traditional village life, urban history and social memory can be integrated into the planning process to present a full and fascinating picture of Hong Kong. This also applies to natural heritage, including much of the coastline and island areas and the scenic rural areas.

4.4.24 Opportunities for incorporation of cultural heritage features into urban settings and rural development will require the provision of a list of objective assessment criteria to evaluate the heritage values of both building and archaeological sites as well as intangible cultural heritage. The evaluation and setting of priorities should be conducted in a comprehensive and transparent manner with the involvement of both experts and the community as well. Heritage sites that have been evaluated as high priority would require incentives and governmental commitment for their protection, for example through resumption, and modifying the land premium system for government land to give development proposals that score highly on heritage grounds more flexibility with financial incentives.

4.4.25 Land use planning and economic incentives to incorporate heritage conservation mechanisms could be encouraged in both public and private developments for adopting different methods for conservation, e.g. in-situ preservation, rehabilitation, partial retention and preservation or a combination of them. Private partnership particularly in the existing urban areas could also play an important role. There are many historical buildings in Hong Kong that could be renovated and put to an adaptive reuse that would not only enhance the heritage value of the site, but provide a venue for the public to enjoy and learn about the history of Hong Kong. The adaptive reuse of Bethanie and the old Dairy Farm sheds in Pok Fu Lam on Hong

Kong Island show how successful such venues can be.

4.4.26 Finally, there are opportunities for cultural heritage tourism, like introducing our cultural and natural resources through eco-heritage tours which could be explored, especially in the relatively unspoilt districts and in the development of the Frontier Closed Areas. However, this would require careful and sensible integrated planning and management.

4.5 REVIEW OF NEW TECHNOLOGIES

4.5.1 There is great potential for environmental advancement through the use of new technology. However, new technological features with limited distribution are often expensive, which acts as a deterrent to their uptake. Prices tend to remain high until their use becomes wider. This will act as a constraint initially.

4.5.2 As populations and industries increase, the greatest opportunity for controlling environmental impacts is through the application of new technologies which provide systems for increasing efficiency and minimising environmental impacts. In addition to industry, the rapid economic development in the last decade has meant our urban areas have inevitably expanded. Infrastructure has developed and new highways and roads have been built to support the increasing volumes of traffic. All this has exerted tremendous pressure on the environment. As the pressures continue to increase more attention must be focused on the operations conducted. Preference must be given to the uptake of Environmentally Sound Technologies (ESTs). ESTs protect the environment, are less polluting, use resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more acceptable manner than the technologies for which they were substitutes. ESTs in the context of pollution are “process and product technologies” that generate low or no waste, for the prevention of pollution. They also cover "end of the pipe" technologies for treatment of pollution after it has been generated.

4.5.3 Opportunities for implementation of initiatives such as ‘The Joint Environment Markets Unit’ (JEMU) should be investigated. This is a mechanism which has been established in the UK involving co-operation between the government, private sector and Research and Development facilities, to increase firms’ awareness of the large and growing market for environmental goods and services, and to assist and encourage UK firms to utilise such opportunities. This ensures the best possible results from the transfer of technology. In order for this system to be fully effective, information must be made freely available on the environmental risks and benefits of technologies in question to allow informed choices to be made. JEMU is also in the process of establishing a database of UK suppliers of environmental technology.

4.5.4 The organisation of Hong Kong’s environmental information can be greatly improved by the use of a Geographic Information System (GIS). More and more data systems in the government will include a GIS component. GIS is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, i.e. data identified according to their locations. The way maps and other data have been stored or filed as layers of information in a GIS makes it possible to perform complex analyses. This has proved to be a very effective tool for organising, displaying and using data, and has a wide range of applications and uses in terms of environmental data. Although GIS is not a

particularly new technology, the system can be continually improved by updating with more detailed or a greater range of data.

Environmental Management (General)

4.5.5 Appropriate and efficient environmental management is the key to ensuring that the environmental advantages afforded by advances in technology are fully realised. Implementation of an effective Environmental Management System (EMS) is a vital tool for ensuring that channels for communication are opened and that opportunities for bringing on board new technology in terms of pollution prevention devices and energy saving features are taken up. Environmental management and accreditation to EMAS (Eco-Management and Audit Scheme) or the internationally recognised environmental management standard, ISO 14001 should be supported, this would be particularly attractive to businesses due to the potential long-term money saving opportunities.

4.5.6 An EMS is a tool that can be adopted on a company/organisation level basis. Essentially an EMS will guide organisations in ways in which they can conduct their daily activities in an environmentally sustainable manner. Through such a system, the impacts of organisations' activities are monitored and assessed on a continuous basis.

4.5.7 The most widely recognised and accepted format and structure for an EMS is the International Organization for Standardization (ISO) standard ISO14001: 1996 EMS specification with Guidance for use. Organisations do not have to implement ISO14001 to bring on board sustainable development initiatives, however, the benefit is that such accreditation schemes provide an internationally recognised standard and provide a tried and tested method for incorporation of sustainable development initiatives.

Environmentally Friendly Construction Methods

4.5.8 The Hong Kong Building Environmental Assessment Method (HK-BEAM) was developed through the HK-BEAM Steering Committee including the Department of Building Services Engineering, the Hong Kong Polytechnic University (BSE), the Welsh School of Architecture, University of Cardiff (WSA) and the then Centre of Environmental Technology (CET) which is now the Business Environmental Council (BEC), provides authoritative guidance to developers, consultants, owners, operators and users of practices which minimise the adverse effects of buildings on the global and local environments, whilst promoting a healthy indoor environment. A set of criteria has been developed for good environmental performances in building's performance that would be recognised through an independently issued certificate. Developers and creditors can use the guidance to inform themselves on building procurement. Prospective purchasers and tenants can obtain independent assessment of building performance to inform themselves or obtain advice on purchase or leasing decisions. More than 100 buildings have now been certified under this scheme which demonstrates its value in terms of differentiating buildings in terms of the sustainable designs.

4.5.9 HK-BEAM defines good practice criteria for a range of environmental issues relating to the design, operation, maintenance and management of buildings. The

HK-BEAM scheme currently embraces both new and existing air-conditioned office premises, and new residential buildings. All of the criteria in the HK-BEAM scheme documents, and assessment criteria are updated periodically as new information becomes available and as legal requirements evolve.

Performance Indicators for Sustainable Construction

4.5.10 The UK Sustainability Working Group, a collaboration of clients, industry and government working together to develop sustainable working practices in the UK, has developed a report 'Rethinking Construction -The Movement for Innovation' detailing environmental performance indicators (EPIs) for sustainable construction.

4.5.11 This document proposes a set of six EPIs to include: operational and embodied carbon dioxide, water, waste, biodiversity and transport. For each of the EPIs the aim is to develop benchmarks for a range of construction types, from offices, through to infrastructure projects. The EPIs should allow the establishment of reasonable emissions, consumption levels and waste production to provide a benchmark against which the requirements of each construction type can be measured.

Air Quality

4.5.12 Reduction of annual emissions of carbon dioxide and other GHGs can be achieved through reducing energy consumption. Since power plants are the most significant sources of CO_2 in HKSAR, use of cleaner fuel for power generation is identified as the most effective measure in reducing GHG. Other mitigation measures include use of renewable energy, promoting energy efficiency and demand side management, and renewable energy research and development. Gases such as carbon dioxide, carbon monoxide, volatile organic compounds and oxides of nitrogen can be reduced by cutting vehicle emissions, or the use of alternative sources of fuel. Environmentally Sustainable Technologies which minimise the release of GHGs or provide an alternative to the combustion of fossil fuel should be favoured when replacing equipment. The Government is seen to take effort to reduce GHG in Hong Kong. In the EPD consultancy study: Report of Greenhouse Gas Emission Control Study in Year 2000, the condition in Hong Kong was studied and recommendations were made. The Greenhouse Gas Emission Control Study can also be referred to for detail of recommendation and implementation associated with the control of GHG.

4.5.13 The Air Quality model, PATH (Pollutants in the Atmosphere and their Transport over Hong Kong) was developed by EPD to study air pollution in Hong Kong. The system includes an emission modelling system (EMS-95) coupled with a comprehensive emission inventory, a multi-scale, non-hydrostatic numerical meteorological model (MM5) and a multi-scale, multi-species air quality model (SAQM or SARMAP Air Quality Model).

4.5.14 Emission reductions can be achieved in various ways including the use of compressed natural gas (CNG) vehicles in replacing diesel vehicles. CNG vehicles can have a driving range of around 200km (suitable for locations such as Singapore, Macao and Hong Kong) and there are purpose built CNG vehicles which have been constructed in the UK. Other practical examples of reduction in emissions involve the use of gas emissions from the Shuen Wan landfill site for use in the production

of gas at the Tai Po gas production plant. The Hong Kong and China Gas Company has also built a dry ice plant at Tai Po to reduce emissions of carbon dioxide, a major contributor to global warming.

Noise

4.5.15 With the advancement in computer technology, computer software has become a useful aid in noise assessment especially during the planning stage as noise mapping or predicted impacts can assist in the formulation of development plans. Environmental noise from roads in particular is one of the major environmental problems in Hong Kong. For this SEA, the GIS system has been manipulated and noise-modelling software has been developed for the collation of noise information throughout Hong Kong, and to identify and quantify the scale of noise problems, and evaluate the effectiveness of mitigation measures.

4.5.16 Transportation related noise is a key environmental issue. With the advancement of technologies, the modification of transportation facilities can help to reduce noise emissions. For instance the advancement can be on the modification of vehicle design, the reduction on structural borne noise, such as the design of floating slab track, and the resurfacing of roads.

4.5.17 Low-noise porous road surfaces can reduce the generation and propagation of noise. According to the European Commission's Green Paper *(Future Noise Policy, European Commission, Green Paper, Brussels 1996)*, results have shown that the emission noise levels can be reduced from levels generated on equivalent non-porous road surfaces by between 3 to 5 dB(A) on average and by optimising the surface design larger noise reductions are feasible. In order to reduce the road traffic noise in a cost-effective way, the European Commission will take action to promote the use of low noise surfacing.

4.5.18 In Hong Kong, road resurfacing has been ongoing for over 10 years. The Highways Department has conducted a number of trials and made reference to other countries' research on noise reduction and durability on the materials. Research and trials have been conducted to investigate the noise reduction performance of different surfacing materials. Further investigations and trials are on the way to determine their suitability for use in Hong Kong. (*Guidance Notes on Noise Reducing Road Surfacing, Highways Department, HKSAR, July 2001*).

4.5.19 Railways are currently a major transportation mode and the stated intention is for even greater use of railways as a means of public transport in the future. New technologies can facilitate the noise reduction to minimize the noise impacts when planning considerations have been exhausted. The current technologies on railway system such as the multi-plenum system and floating slab track could be useful paradigm for further improvement in the future.

4.5.20 The use of quiet equipment is becoming prevalent among industrial sectors. Installation of sound absorption materials, isolators and acoustic louvers alleviates noise emissions.

4.5.21 In order to minimise construction noise impacts, the use of pre-casting façades is a common construction method in many housing developments. This building method

can shorten the construction period and reduce the number of powered mechanical equipment (PME) needed during the construction of superstructure. Quiet PME and working methods have also been developed. For instance super quiet generator for providing electricity to construction works and electric driven vibratory poker are much quieter than traditional ones.

Geology, Soils and Contaminated Land

4.5.22 Due to the limited space available for development in Hong Kong, redevelopment of existing urban areas will be required to provide shelters for the growing population. Typically areas which have been subject to previous development have a higher risk of contamination than would be the case if developing on a greenfield site. As a result remediation of areas of identified contamination will be required. Techniques for remediation in this growth area are continually advancing. The most suitable remediation technique will depend on the nature and location of identified contamination. Accepted and new techniques for remediation include:

- Excavate and dispose off site – this is effective for all contaminants, but will require disposal to landfill. Opportunities to remediate contamination on site would reduce the volumes taking up landfill space.

- Contain and cover – material is contained in situ. However, this is not effective for all contaminants, particularly mobile organic substances.

- Contain and isolate – opportunities for this method depend on the site in question. At present there are still uncertainties about the long-term performance.

- Dilute and reapply – only works for immobile substances.

- Treat and destroy – this is a relatively new technique, some studies are being undertaken to determine the effectiveness, cost implication, etc.

- Treat and immobilise –this is a relatively new technique, again there are issues associated with potential changes in standards after completion

4.5.23 It is clear that as environmental legislative demands increase and landfill space becomes a greater issue, techniques based on 'treatment' rather than retention or disposal will achieve wider market application. Currently biopiling has been used effectively for remediation of sites subject to organic contamination. The use of biotechnology is set to increase in the future in terms of the use of living organisms as an alternative to chemicals in clean up of contaminated land and water, current accepted and new techniques for bioremediation include:

- Bio Treatment – In situ technologies include bio-venting, in situ land treatment, air sparging and addition of nutrients, oxygen, and hydrogen peroxide. Ex situ land treatment includes land treatment, soil piles and composting.

- Phytoremediation – This technique involves the use of green plants to clean up or control hazardous wastes. Types of phytoremediation include phytoaccumulation, phytoextraction, hyperaccumulation (metal accumulating

plants to remove toxic metals from soil), phytostabilization (contaminant-tolerant plants to reduce mobility and prevent further contamination of organics) and phytodegradation or phototransformation (direct metabolism or degradation of organics) etc.

4.5.24 Policy initiatives for environmentally sound management of technology are required, regulatory authorities and expert advisory committees must be set up to ensure appropriate management to minimise environmental risk.

Water Quality

4.5.25 A "Total Water Management" Strategic Study, being undertaken by the Government, covers the key areas of water conservation, water resource protection and management, new water resources and water reclamation. The study examines the applicability of various water resources including seawater desalination and reclaimed water to Hong Kong, their cost effectiveness and their share of the total local water consumption in the long-term. As a part of the Total Water Management programme, two pilot schemes on the use of reclaimed water for non-potable uses are being implemented at Ngong Ping and Shek Wu Hui respectively. Ngong Ping Sewage Treatment Works, the first tertiary treatment works in Hong Kong, uses advanced biological, filtering and disinfections process to treat sewage. It can treat about 3,000 cubic metres of sewage every day. The tertiary treated water becomes reclaimed water after chlorination, and the reclaimed water produced is used for toilet flushing, controlled irrigation and fishpond usage. Another pilot scheme in Shek Wu Hui commenced operation in late 2006. The scheme is being undertaken to investigate the technical feasibility and cost-effectiveness of adopting the wider use of reclaimed water in the future as another source of water in Hong Kong.

Water Resources

4.5.26 Freshwater supply from desalination of seawater is currently under trials at different sites to evaluate its cost-effectiveness and suitability under local conditions. Desalination technology has been widely adopted in the Middle East. Whilst this technology can potentially generate a major additional freshwater supply, its costs as compared to the other supply sources and environmental concerns have to be considered prior to its large-scale application in Hong Kong.

Waste

4.5.27 The key to achieving sustainable waste management is the adoption of new technologies in the context of a sustainable waste management policy. The *MSW Policy Framework* is a step in the right direction as it seeks to lead Hong Kong from a disposal-led solution to one that promotes avoidance, reduction, reuse and recycling. To achieve this, new technology will be required.

4.5.28 In April 2002 Government issued an invitation for Expressions of Interest (EOIs) to suppliers and organisations world-wide to propose innovative and proven technologies for the development of Integrated Waste Management Facilities (IWMFs). The driving force behind the EOI invitation was the realisation that Hong Kong's existing landfills are running out of capacity and that landfilling is fundamentally a non-sustainable solution to waste management. At the close of the

EOI exercise, 59 EOIs had been received from 16 countries. Following assessment, a number of technologies were recommended for consideration as part of the future IWMF. These were anaerobic digestion, composting (source-separated waste), co-combustion (in a cement kiln, with coal), mechanical-biological treatment, gasification and incineration (moving grate and fluidised bed). With the exception of moving grate incineration, none of these technologies have been used before in Hong Kong for MSW treatment.

Energy and Natural Resources

4.5.29 There are a number of technologies which can be integrated into the urban environment which could be used in Hong Kong, such as building-integrated photovoltaics (BIPV). Countryside and new towns in Hong Kong are potential candidates for small renewable energy systems, such as solar thermal, biomass and wind. Technologies involving the conversion of waste to energy may be used to help alleviate the problems associated with waste treatment and disposal while producing useful energy. **Table 4-1** below provides a list of renewable energy technologies that could be applicable to Hong Kong:

Table 4-1 Renewable Energy Technologies Potentially Applicable to Hong Kong

A.	Technologies that can be readily applied:
	1 passive solar design (and energy efficient building design)
	2 solar photovoltaics (building-integrated and standalone on highways)
	3 solar thermal (for water heating and absorption air-conditioning)
	4 municipal waste to energy (incineration and digestion)
	5 landfill gas
B.	Technologies requiring further investigation and study:
	6 small hydropower (river based) considered to be limited in application
	7 wind energy (onshore and on islands) currently the subject of trials by CLP and HEC
	8 wave, tidal and ocean thermal considered to be limited in application

Source: Hui, 1997b.

4.5.30 There are also opportunities for partnership between Hong Kong and the Mainland, which has abundant sources of renewable energy. Many issues would need to be worked out at a local level but from a strategic perspective there may be opportunities to examine ways to provide more interconnection for the long-term.

4.5.31 In addition to the current research into potential applications for renewable energy in Hong Kong, notable recent developments in energy conservation include: Comprehensive Building Energy Codes, which is a set of codes implemented via 'the Hong Kong Energy Efficiency Scheme for Buildings'. The scheme covers lighting, air conditioning, electrical and lift/escalator installations.

4.5.32 The Hong Kong SAR Government (i.e. Government's Building Innovation Unit) is currently encouraging developers to employ "green building" features in residential projects. Some of the energy saving features of a "green building" include (i) Automated refuse collection system: Centralised compaction chamber which not

only saves petrol of waste transfer vehicles but also frees up more landfill space; (ii) Photovoltaic panels: Rooftop converting sunlight into electricity, providing power to light indoor areas; (iii) Solar panels: water running through tubes inside the panels and is heated for domestic use.

4.5.33 In addition to the reduction in greenhouse gases it is notable that the cost of solar powered technology has decreased considerably in the last decade, and is likely to decrease further in the future. In combination this makes the technology more attractive.

Natural Resources

4.5.34 As development advances the pressure on the reservoir of natural resources will increase. Technological advancement will focus on the use of renewable and environmentally friendly resources such as renewable energy sources over the use of finite resources. Again, appropriate environmental management which keeps organisations in touch with technological advances will allow the transfer of information relating to more environmentally sound technology.

Risk

4.5.35 New technologies for the reduction of PHIs or at least consultation zones include the potential change from chlorine to ozone in the disinfection process for water quality. This would result in a declassification of works where such changes take place, thereby reducing the number of PHIs. Other ideas include the use of new fuel sources, rather than carbon based fuels, which would reduce the need for petroleum based fuel stores in Hong Kong. The relocation of petroleum based fuel stores to other parts of Southern China would also reduce the number of PHIs in Hong Kong.

Ecology

4.5.36 Currently the Country Parks Division of AFCD uses GIS to store site specific information relating to country parks and recreational facilities. This system allows efficient editing and retrieval of information, and the system has been used to produce specific country park maps, for display on country park information boards. The GIS could be further expanded to identify and map sensitive environments such as wetlands and areas supporting high biodiversity or protected species, which require additional management or protection, or to identify areas suitable for the transplanting or translocation of protected species as part of any species re-introduction/ habitat restoration programmes.

4.5.37 ***Control of Invasive Species*** : Mikania, *Mikania micrantha* is recognised as an invasive climber affecting a number of ecologically sensitive areas including some SSSIs and fung shui woods. Apart from the traditional method by physical control, AFCD also introduces chemical control for Mikania removal. Many herbicides such as Glyphosate and Sulfometuron-methyl are found quite effective to kill the plants.

4.5.38 ***Afforestation*** : Afforestation is one of the major duties of AFCD. In order to further enhance the effectiveness, the department carried out experiment to investigate the use of tree guards in enhancing survival and growth of native seedlings planted for afforestation. In their trial, the tree guard was made of tough UV-resistant and

transparent polyethylene in form of a sleeve with openings at the top and bottom. The guards were installed with support of bamboo sticks forming an equilateral triangle enclosing the planted seedlings. The results clearly showed that the establishment, survival, early growth of the seedlings on exposed hillsides was enhanced.

4.5.39 ***Wetland Restoration***: Efforts were made to increase suitable habitats for wildlife in order to increase the species diversity by restoring the wetland functions of abandoned and degraded wetlands. The trial wetland restoration project carried out in 2003 by the AFCD targeted an abandoned agricultural land of 600 m^2 that was overgrown with vegetation in the Lions Nature Education Centre and aimed at collecting information and experience in wetland restoration. The restored wetland, designed for providing diversified habitats for lowland wetland wildlife including various species of dragonflies, freshwater fishes, amphibians and reptiles, required excavation work, creation of an artificial stream and a short board walk. The works were mostly completed in early 2005 while wetland plant species of known ecological value were planted at a later phase. In this project, a new technology of using a specially designed concrete tube sunk has been applied to act as a micro-habitat / refuge for some target fish species during extreme cold and hot weather.

4.5.40 ***Animal Crossing***: Construction of linear transport infrastructure across important ecological habitats always implies an adverse impact on wildlife. The habitat quality will become degrade due to fragmentation, edge effect and barrier effect that avoid non-flying terrestrial animals (e.g. mammals, amphibians and reptiles) from migrating to other habitats for food, refuge or breed. The mammal working group of AFCD conducted a survey using Camera Trapping from September 2002 to March 2003 to understand the effectiveness of the Animal Crossing at Route 3 in mitigating the barrier effects. Two Masked Palm Civets (*Paguma larvata*) were recorded using the animal crossing while its Occurrence Index was similar to that in nearby environment. The survey together with overseas studies concluded that wildlife crossing structures have been useful in reducing roadkill and enhancing habitat connectivity. It was found that the distribution, abundance, and ecological and behavioural needs of the species in the area were of great importance for building animal crossing. The crossing should be placed at known migration routes or possible path of wildlife, and preferably away from human disturbance. Fencing should be carefully designed to guide the targeted wildlife. Intensive monitoring is also recommended before and after the construction of the structure. From the review of these new impact mitigation measure which applying new method / technology identified that placement, size, floor materials and types of guiding fence/ vegetation were important parameters for the success of the animal crossing. All these parameters should be adjusted to fit the specific requirement of the target animals.

4.5.41 Environmental considerations have been adopted in river channel design in the last decade, which minimizes the ecological impacts due to river training works. Common engineering solutions based on the avoidance approach include provision of distant flood banks, two-stage (or multi-stage) channels, relief or by-pass channels and flood storage. These approaches mainly leaving the river bed and meandering sections undisturbed, which provide natural substratums for aquatic fauna to inhabit. For example the preservation and enhancement of abandoned meander in Ng Tung River by wetland creation successfully provided low lying

freshwater habitats for the affected wildlife, and increase the biodiversity of the region.

Cultural Heritage

4.5.42 Regarding the possible role of technological solutions, the use of information technology would substantially improve the management of cultural heritage in Hong Kong for the future. Networks of data bases, GIS mapping and computerised heritage inventories are used widely overseas to quantify, manage, categorise and preserve the heritage resource database. This will provide efficient identification of known sites of archaeological interest, or archaeologically sensitive areas.

4.5.43 As time passes more recent structures displaying unique or revolutionary architectural designs, or buildings which supported historically significant practices or events should be protected or preserved during redevelopment of urban areas or renovation of those sites. Records of these features should be maintained in addition to information relating to their structure and history. Over the past few decades, technological advances have made it possible to relocate heritage structures whilst successfully maintaining their architectural integrity.

4.5.44 It must be noted, however, that the first priority in the conservation of any heritage structure should be preservation in-situ, as the original location of a building is an integral part of its history and setting. Relocation of a structure, such as Murray House in Stanley, should only be considered as a very last resort when its in-situ preservation could not be achieved in view of reasons of paramount importance to the whole community. Integration of portions of an original building in a new construction can also be considered, where, parts of a building have been destroyed or are in a condition deteriorated to a level beyond repair. Modern engineering techniques should be used in conjunction with conservation techniques to determine the best design and in turn how to implement it, for the creation of a successfully integrated heritage resource.

4.6 CONCLUSIONS AND RECOMMENDATIONS

Air Quality

4.6.1 As the Hong Kong population increases, energy and transport demands will also increase. Further methods of reducing pollution emissions are required such as cleaner technology, cleaner fuels, and better integration of environmental protection into transport and energy policies and planning. Moreover, further co-operation is required with Hong Kong's neighbours to develop policies and practices to reduce trans-boundary air pollution.

Noise

4.6.2 Hong Kong is such a densely populated city with limited developable land. Integrated land use / transport / environmental planning and policy play a vital role in improvement of noise environment. In addition, noise control at source through the incorporation of new technologies engineering design to minimize the noise problems should be applied whenever possible.

Geology, Soils and Contaminated Land

4.6.3 Due to the limited space available for development in the territory, redevelopment of existing urban areas will increase. Remediation of land contaminated from the site's previous use will be required to minimise risks to buildings, people, wildlife and water resources. The use of in-situ treatment and in particular bio-remediation techniques are likely to increase and will minimise the volumes of contaminated material being disposed of in landfill.

4.6.4 Introduction of a contamination register is recommended to provide information on sites where there is a real risk of contamination. This will provide valuable information for use during redevelopment.

Water Resources

4.6.5 There is a wealth of opportunities for environmental enhancement in terms of water resources. Higher level of sewage treatment prior to discharge to the sea will improve the quality of coastal waters, whilst soft engineering techniques for use on inland waterbodies and wetlands will maximise pollution control, and enhance recreational enjoyment of the area whilst minimising the costs.

Waste

4.6.6 The *MSW Policy Framework* has provided Hong Kong with a new direction in waste management, one that moves away from a disposal-led solution to one that embraces waste avoidance, reduction, reuse and recycling. While there is sufficient capacity in the entire existing waste management infrastructure for 6 to 10 years (longer if the landfills are extended), the adoption of new technology, in the form of Integrated Waste Management Facilities, to reduce reliance on landfill disposal is essential to achieving more sustainable waste management.

Energy

4.6.7 Current and future initiatives to encourage developers to construct environmentally friendly buildings will have benefits in terms of cost savings to the owner/occupier, in addition to reduced emissions from energy production. In addition to long-term planning, good housekeeping is the easiest method for reducing energy consumption, and government led awareness campaigns will provide the simplest energy saving opportunities.

4.6.8 To seize the opportunities, Hong Kong should establish a renewable energy market and gradually build up the experience with the technologies. The barriers and constraints to the diffusion of renewable should be removed. The legal, administrative and financing procedures should be established to facilitate planning and application of renewable energy projects. The Government could play a useful role in promoting renewable energy technologies by initiating surveys and studies to establish their potential in both urban and rural areas. For instance, the Government is actively studying the implementation of water-cooled air conditioning systems in Hong Kong. EMSD has also undertaken pilot schemes for wider use of fresh water for cooling towers for energy-efficient air conditioning in 79 areas in Hong Kong.

Natural Resources

4.6.9 The search for alternatives to the use of finite natural resources will increase in the future as the volumes of finite resources decrease (and due to supply and demand economics prices will be likely to increase). Opportunities for the use of renewable resources must be investigated and encouraged.

Risk

4.6.10 Opportunities to reduce the number and/or influence of PHIs, for example by utilisation of new technology, alternative processes relocation will be considered when evaluating the development options or components thereof. New technologies could include the use of ozonation rather than chlorination in the disinfection process for water treatment works, or the use of alternative fuel such as solar energy which could reduce fuel storage areas both at the central depots/stores and at the local storage areas. Relocation to alternative sites for PHIs in say Southern China would also reduce the number of PHIs, as indeed would be the change from carbon based fuel to alternative energy (solar, wind etc).

Ecology

4.6.11 Competing demands for land with our natural environment to meet economic and social needs will continue to be a key ecological constraint. However at the same time opportunities come from the application of some new approach for nature conservation such as the New Nature Conservation Policy and new technologies for ecological resource enhancement such as the application of tree guards for afforestation and animal crossing structures for mitigation of habitat isolation. Increase in ecological baseline information, regarding individual species requirements and lifecycle will be necessary to ensure the effectiveness of habitat conservation, restoration or re-creation projects.

Cultural Heritage

4.6.12 The use of advanced and heritage friendly information technology in heritage management is recommended. Innovative methods will be required to measure developmental and other pressures on our heritage capital in the years between now and 2030. This should be based on the wide body of international information regarding computerisation and data graphics in the cataloguing and maintenance of heritage resources and in the presentation of these resources to the public.

4.6.13 The application of such technologies will allow assessment of the capacity of this capital to not only withstand such pressures, but also to influence their scale and design for mutual benefit.

5 ENVIRONMENTAL OBJECTIVES

5.1 INTRODUCTION

5.1.1 In the early stages of the SEA Study for HK2030, the term objective was defined as "an objective or result to be aimed at". This remains the definition to be adopted for this SEA Study. The inclusion of objectives in the planning process and especially in a strategic sense serves various purposes. For example with the definition of objectives:

- environmental legislation can be enacted and enforced;
- mechanisms and procedures for reviewing and updating legislation and standards in response to rising expectations, changes in technology, new data or information on effects on health can be implemented. This is especially true in today's Hong Kong where the public expectations relating to noise and air quality continue to rise;
- savings can be made in environmental resources for example water or energy consumption;
- reductions can be achieved in for example carbon dioxide emissions; and
- opportunities exist to enhance efforts in waste reduction, recycling and reuse.

5.1.2 The objectives and standards currently in force in Hong Kong include existing legislative controls and regulations which are set out in the multifaceted Pollution Control Ordinances in the form of Water Quality Objectives, Air Quality Objectives, Noise criteria etc. These form the basis of the environmental standards.

5.1.3 Supplementing these are a suite of guidelines issued by the Government which provide practical guides to limit pollution during construction works (dust guidelines, runoff from site or discharge of wastes from toilets, canteens etc) or during the operation of facilities such as CO levels in carparks. In fact, many of the strategic objectives as well as local objectives currently will continue to guide our development policies.

5.1.4 However as the expectations of the general public increases, and environmental pressures grow these objectives need to be reviewed and revised to reflect the aspirations for the future. They also need to provide incentives to continue to strive to improve.

5.1.5 It is also important to remember that the development options are being targeted for the year 2030. Even though the objectives may not be met in the short-term there must be a drive to achieve a higher performance in the future.

5.1.6 Throughout the HK2030 Study a guiding principle has been to benchmark Hong Kong's performance against international standards. It is also recognised that such a process is helpful in cases where there is a lack of local information or current standards.

5.2 OVERSEAS SETS OF OBJECTIVES

5.2.1 There is no definitive set of international objectives for air quality, water quality and noise etc. In many cases World Health Organization (WHO) guidelines are used to assist in the preparation of specific objectives which reflect a country's underlying baseline conditions in terms of size, topography, infrastructure and population etc. The environmental standards and objectives of other World Cities, to include London, Singapore and Tokyo have been investigated, the details have been compared with Hong Kong and used to assist in the preparation of Hong Kong's environmental objectives.

5.2.2 For air quality, there are directly comparable and measurable objectives for compliance. Water quality standards generally refer to the quality of the drinking water, water courses/bodies and groundwater, the relevance of which is the area's reliance on the locality of these resources. Noise objectives and renewable energy objectives will also be reviewed within this Section.

5.2.3 Improving the amount of green space and the aesthetic value of the urban environment is an aim for all of the world cities discussed in this Section. The means by which this is achieved will be subject to land use planning direction and the environmental baseline, in particular available space. It is recognised internationally that managed open spaces set aside for recreational purposes are an important resource. Efforts being made within Hong Kong to rehabilitate landfill sites for recreational purposes, and regeneration of derelict or contaminated urban environments is a necessity to create open space in urban areas where land is in short supply are excellent examples of improving capital stock.

5.2.4 There are a number of international treaties and conventions which provide for international co-operation for the protection of specific resources.

5.2.5 **Table 5-1** provides details of the environmental issues on which London, Singapore and Tokyo have signed international agreements.

Table 5-1 London, Singapore and Tokyo are party to International Agreements on Environmental Issues

Country / City	International Agreement
England – London	Air Pollution, Air Pollution-Nitrogen Oxides, Air Pollution-Sulphur 94, Air Pollution-Volatile Organic Compounds, Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Seals, Antarctic Treaty, Biodiversity, Climate Change, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Marine Dumping, Marine Life Conservation, Nuclear Test Ban, Ozone Layer Protection, Ship Pollution (Marpol Conventions), Tropical Timber 83, Tropical Timber 94, Wetlands, Whaling. *signed, but not ratified:* Air Pollution-Persistent Organic Pollutants, Climate Change-Kyoto Protocol
Singapore	Biodiversity, Climate Change, Desertification, Endangered Species, Hazardous Wastes, Law of the Sea, Nuclear Test Ban, Ozone Layer Protection, Ship Pollution

Country / City	International Agreement
Japan and as such Tokyo	Antarctic-Environmental Protocol, Antarctic-Marine Living Resources, Antarctic Seals, Antarctic Treaty, Biodiversity, Climate Change, Desertification, Endangered Species, Environmental Modification, Hazardous Wastes, Law of the Sea, Marine Dumping, Nuclear Test Ban, Ozone Layer Protection, Ship Pollution, Tropical Timber 83, Tropical Timber 94, Wetlands, Whaling. *signed, but not ratified:* Climate Change-Kyoto Protocol

Noise

5.2.6 The WHO has developed a set of guidelines for noise exposure in urban environments.

5.2.7 Details of the approach of different countries/cities to noise are provided in **Table 5-2**.

5.2.8 The European Community is aware of the environmental noise problems in Europe and the increase in the number of complaints received from the public. Green Paper on Future Noise Policy (COM (96) 540) was adopted and published by the Commission in November 1996. This Green Paper is the first step in the development of such a programme and aims to stimulate public discussion on the future approach to noise policy. It aims at giving noise abatement a higher priority in policy making and reviews the overall noise situation in the Community and national action taken to date. It also includes the outline of a framework for action covering the improvement of information and its comparability and future options for the noise from different sources.

5.2.9 The new framework for noise policy outlines options for future action including a proposal for a directive providing for the harmonisation of methods of assessment of noise exposure and the mutual exchange of information. Actions to reduce road traffic noise will address tyre noise and investigate the possibility of integrating noise costs into fiscal instruments, amending Community legislation on road worthiness tests to include noise and the promotion of low noise surfaces through Community funding. Other issues addressed include the noise problem due to the expansion of rail capacity, noise from air transportation and simplification of the existing legislation setting emission limits for outdoor equipment including construction and garden machinery. (Ref: Noise – The Green Paper, http//europa.eu.int/comm./environment/noise/greenpap.htm).

Table 5-2 Table of Comparative Approach to Noise Impacts

Country / City	Policies and Regulations
London	The Mayor of London and the Greater London Authority (GLA) have developed a strategy for tackling ambient noise in London. The draft ambient noise strategy was available for consultation in May 2002, and published on 31/7/2003.
United States of America	Noise Control Act was implemented in 1972. The Act was supposed to protect health and well-being with an adequate margin of safety. This was accomplished in 1974 with the publication of the US Environmental Protection Agency (EPA) "Levels Document". Subsequently guidelines for conducting environmental impact analysis were developed. (Ref: Guidelines for Community Noise, Geneva, WHO, 1999)

Country / City	Policies and Regulations
Singapore	There is no noise policy, however permissible noise levels are set through the Environmental Pollution Control Regulations 1999.
Republic of Korea	The Environmental Pollution Prevention Act was first established in 1963 and was revised as the Environment Preservation Act in 1977. The Government found that the control on various aspects of noise and vibration was ineffective. In 1990 the Act was subdivided into different categories including Noise and Vibration Control Act.
Japan and as such Tokyo	No strategic noise policy. The Noise Control Law was enacted in 1968. It is intended to regulate the noise generated by the operation of factories and other types of work sites, including construction work, and to set maximum permissible levels of motor vehicle noise. Stipulated in the Basic Pollution Control Law of 1971, environmental control standards on noise were established based on requirements on noise control to preserve the living environment and protect human health. Different noise standards for different types of region and time periods were established. They have more specific control requirements on construction works at different areas, such as the type of construction activity, allowable duration, and allowable working hours during the day. In 1998 Japan reviewed the Environmental Quality Standards for Noise and revised the type of region from 3 types to 4 types. However the noise standards have been relaxed as for instance in major residential areas, the daytime standard value has been increased from 50dB(A) to 55dB(A).
Taiwan	Noise Pollution Control Act was promulgated in 1983 and later amended in 1992. Draft amendments were approved by the Executive Yuan on 19 January 2000 and are under review by the Legislative Yuan. The revisions strengthen controls on all types of sites including noise from residential areas. The revisions include new controls on low-frequency noise pollution sources such as water cooling towers, air coolers, and air conditioning systems, as well as on bothersome noise sources such as firecrackers and indoor remodelling.
European Union	The European Community has been aware of the noise emission problems for more than 30 years. Certain categories of noise emissions from products are already covered by Community legislation, such as Council Directive 70/157/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the permissible sound level and the exhaust system of motor vehicles. Their active approaches on the improvement of the noise environment includes periodic review of their current noise exposure in the region and the suitability of the established noise policy, the enactment of Council Directives, the investigation on the economic costs on the implementation of mitigation measures and assessment methodology. The European Commission has a very clear objective to reduce the community noise levels in the coming 20 years. For instance, for 2005 the proposed EU noise standard is L_{den} 65dB(A) and L_{night} 55dB(A), that means 12% of people affected by noise from aircraft will be sleep disturbed. For the year 2020, the proposed EU standard is L_{den} 49dB(A) and L_{night} 40dB(A). That means 5% of the affected people highly disturbed and 4% sleep disturbed by aircraft noise will occur.

Air Quality

5.2.10 **Table 5-3** below details the comparative approach of three countries/cities to air quality.

Table 5-3 Comparative Air Quality Regulations and Guidelines

Country / City	Air Quality Regulations and Guidelines
England – London	The most significant source of air pollution in London is from traffic. As a result of concerns regarding air quality, the National Air Quality Strategy was introduced in March 1997, under the Environment Act 1995. This legislation brought about sets of objectives for eight different air pollutants which have to be met by 2005. The objectives are used as a bench mark to see if air pollution is getting better or worse. Areas where it is considered unlikely that these objectives will be met are designated as air quality management areas. In these areas the Local Authority puts together a plan to improve the air quality - a Local Air Quality Action Plan.
Singapore	Singapore currently uses US EPA National Ambient Air Quality Standards (NAAQS) and the Long Term Goals for Ambient Air Quality of the WHO.
Japan – Tokyo	Automobile traffic is a major cause of urban air pollution in Tokyo. The Japanese government has several environmental protection laws in effect relating to automobiles, including the Law Concerning Special Measures for Total Emission Reduction of Nitrogen Oxides from Automobiles (Automobile NO_x Law), and the Air Pollution Control Law, aimed at solving congestion and pollution. The Air Pollution Control Law provides for stations in several parts of the country for a range of typical air pollutants. The Japanese Environment Agency continues its efforts to reduce urban air pollution by strengthening measures to cut emissions from factories and businesses, enforcing regulations for automobile exhaust gases, and promoting low-emission vehicles. However, an increase in diesel freight transport vehicles may have an adverse effect on air pollution control measures. In June 2001, air quality emission controls were further tightened, and the Tokyo metropolitan assembly approved an ordinance banning diesel powered commercial vehicles from Tokyo streets if they exceed a limit on emissions of dangerous particles. The plan started in December 2000, and is scheduled to take full effect by October 2003.

5.2.11 At a conference held on 1 - 11 December 1997, in Kyoto, Japan, the Parties to the United Nations Framework Convention on Climate Change agreed to an historic Protocol to reduce greenhouse gas emissions by harnessing the forces of the global marketplace to protect the environment. The Kyoto Protocol in key respects – including emissions objectives and timetables for industrialized nations and market-based measures for meeting those objectives. A central feature of the Protocol is a set of binding emissions objectives for developed nations. The specific limits vary from country to country. The overall objectives adopted for greenhouse gas emissions by 2008-12 are an 8% cut from 1990 levels for the European Union (EU), 7% for the USA, and 6% for Japan and Canada. Australia is allowed an 8% increase, while Russia has an objective of 0% (i.e. 1990 levels).

Cultural Heritage

5.2.12 International experience of heritage conservation in Singapore, Sydney (New South Wales) and New York may offer insights into the planning related issues such as the provision of planning and financial incentives and the designation of heritage precincts. The concept of heritage precinct in Singapore and Sydney may provide

inspiration to our approach to conservation.

5.2.13 Incentive to heritage conservation can be provided through planning instrument such as concessions, transfer of plot ratio and wavier of use or bulk requirements.

5.2.14 Transfer of plot ratio means transfer of development potential of one site to another. In the City of Sydney, the potential floor space (development potential) from the listed heritage sites can be transferred to a receiving site, and such transferred development potential can be sold. In New York City, development rights of landmarks can be transferred to receiving site.

5.2.15 Planning concession is available in Singapore and New South Wales. In Singapore, concessions include waiving of car park provision, development charge, and car park deficiency charge. In New South Wales, concessions to building site ratio and parking provision are offered.

5.2.16 Waiver of use/bulk requirements is available in New York City. Individual landmark buildings in historic districts are eligible for waiver of zoning restrictions, provisions regulating the use, and built form control.

Water Quality

5.2.17 The means by which water quality is assessed varies between the comparison countries/cities, details are provided in **Table 5-4** below:

Table 5-4 Comparative Water Quality Regulations and Guidelines

Country / City	Water Quality Regulations and Guidelines
England - London	In the UK water quality is the responsibility of the Environment Agency. The Agency uses a General Quality Assessment (GQA) scheme to classify river quality into six grades from Grade A (very good) to Grade F (bad). The GQA scheme is the Agency's national method for classifying water quality in rivers and canals. The scheme provides a way of comparing river quality from one river to another and for looking at changes through time, based on chemistry, biology and nutrient parameters and aesthetics. The quality of bathing waters in England and Wales is monitored against standards set down in the bathing water regulations (SI 1991/1597), which comes from the EC Bathing Water Directive (76/160/EEC). The Bathing Water Directive was created to protect public health and to improve or maintain water quality.
Singapore	The water bodies within Singapore comprise of catchment areas where water is collected for the production of drinking water, and non-catchment areas. These bodies are monitored for parameters including pH, dissolved oxygen (DO), Biochemical Oxygen Demand (BOD), total suspended solid (TSS), ammoniacal nitrogen and sulphide, and coastal waters are subject to physical, chemical and bacteriological examinations.
Japan - Tokyo	Japan's water quality is regulated by the Environment Agency, who established the Environmental Quality Standards (EQS) for groundwater in March 1997, aiming at further promotion of comprehensive conservation of groundwater environment. This EQS is applied to all groundwater, and the same standard values are established as the standard for protecting human health with the 23 substances of the EQS for public water resources. Japan has a range of legislative mechanisms and objectives for the control of water.

Country / City	Water Quality Regulations and Guidelines
United States	Regulation, protection and improvement of water resources and supplies in the United States are the responsibility of the EPA. The Office of Water protects public health by ensuring safe drinking water and protecting ground water; regulates the nation's water discharges into surface waters such as wetlands, lakes, rivers, estuaries, bays and oceans; and protect the nation's water resources on a watershed basis. The quality of drinking water in the states is monitored against standards set down in the Safe Drinking Water Act.

Energy and Natural Resources

5.2.18 A comparative study of worldwide policies regarding uptake of renewable energy resources was conducted by Moore and Ihle in 1999. A summary of the report findings is contained in **Table 5-5**.

Table 5-5 Policies and/or Statutory Requirements of Selected Countries on the Use of Non-fossil Fuel/Renewable Energy Sources

Country	Policies/Statutory Requirements
Mainland China	In 1995, the People's Government voiced new commitment to renewable energy, as outlined in the New and Renewable Energy Development Program, 1996-2010, developed by the State Economic and Trade Commission and the former State Planning Commission and State Science and Technology Commission. The project comprises the installation of 190 MW wind farms and 10 MW photovoltaic (PV) system from 1999 to 2004. Of which, Shanghai will install 20 MW wind turbines.
Australia	Set mandatory objective of additional 2% of their power generation from renewable energy. This will move up the share of renewables to 11% by 2010.
Japan	The Law concerning the Promoting of the Development and Introduction of Alternative Energy requires waste to energy to be encouraged, via subsidisation, policy incentives and government funded research and development (R&D). The New Energy Law of 1997 focuses on the technology deployment so that renewables will supply 3.1% of Japan's primary energy use by 2010.
	Triple its use of renewable energy by 2010. Japan also has pledged to generate 5,000 MW of electricity using waste-to-energy technology by 2010.
Republic of Korea	An objective has been set to supply 2% of total energy demand by new and renewable energy in 2006.

Country	Policies/Statutory Requirements
European Union	The Communication from the Commission entitled "Energy for the future: Renewable Energy Sources - White Paper for a Community Strategy and Action Plan (COM(97) 599 final)" and the European Council Resolution of 8 June 1998 on renewable sources of energy (OJ C 198, 24.6.1998) stipulates an objective to double the share of renewable energies in gross domestic energy consumption across the EU from the present 6% to 12% by 2010. All member states are required to set national (non-binding) objectives for renewables to be consistent with the EU's objective. Achieving this gross energy consumption objective of 12% would result in a 22.1% share of electricity produced from renewable energy sources. Current contribution of renewable energy sources to electricity supply in fifteen EU member states range from 3 to 71% (overall 16%).
United Kingdom	Under the UK's Non-Fossil Fuel Obligation Orders, more than 2% of its electricity (about 1,177 MW) is generated from renewable sources. The UK aims to increase renewable output to 5% by 2003 and 10% by 2010. The UK would be required to generate 10% of electricity by renewables by 2010 under EU's objective. The UK Government is also seriously considering the increase in nuclear energy following intensive debates and wide ranging public opinion.
Ireland	In 1996, 2% of power was from renewable energy. Share of renewable energy in total energy supply to be increased to 5% by 2010. Ireland would be required to generate 13.2% of electricity by renewables by 2010 under EU's objective.
Denmark	20% of electricity consumption from renewable energy by 2003. Use of 1.4 million tonnes of biomass for production of electricity and heat and installation of 750 MW offshore wind power capacity by 2005 and 2008, respectively. Denmark would be required to generate 29% of electricity by renewables by 2010 under EU's objective.
Netherlands	An objective of 10% renewables in 2020. Netherlands would be required to generate 12% of electricity by renewables by 2010 under EU's objective.
United States	Non-hydro renewables and alternative energy currently accounts for 2% of electricity needs. Hydropower provides about 7% of electricity supplies. The New York State requires, through an executive order, the purchase of no less than 10% and 20% of the overall State facility energy requirements from renewables by 2005 and 2010, respectively.

Source: Moore & Ihle 1999.

Risk Management

5.2.19 There are a number of internationally applied risk acceptability criteria used in various states. Risk criteria are expressed in terms of Individual Risk which is a measure of the incremental increase in the probability of death of an individual working on, or living near a PHI; or Societal Risk which expresses the risk to whole population in the vicinity of the PHI.

5.2.20 Risk criteria are most commonly given for Individual Risk. Risk criteria are often expressed in terms of an upper (intolerable) limit and a lower (negligible) limit, with the risks lying between these limits subject to demonstration of acceptability. A

selection of some of these limits is given in **Table 5-6**.

Table 5-6 Selected National Individual Risk Criteria

Country / Region	Upper (Intolerable) Risk Criteria	Lower (Negligible) Risk Criteria
Netherlands	1×10^{-6}	
United Kingdom	1×10^{-3} (workers) 1×10^{-4} (Public)	1×10^{-6}
Australia (NSW & WA)	5×10^{-5} to 5×10^{-7}	
Canada	1×10^{-4} to 1×10^{-6}	
USA (Santa Barbara, Calif.)	1×10^{-5}	1×10^{-6}
Hong Kong	1×10^{-5}	

Note: Many countries reduce their risk criteria when dealing with vulnerable population groups (i.e. children, the elderly and hospital patients).

5.2.21 The criteria for Societal Risk are usually expressed in graphical format. Examples of these are shown in **Figures 5-1** and **5-2**. Hong Kong applies an upper societal risk criteria of 1 fatality every 10^3 years to 1,000 fatalities every 10^6 years and a lower risk criteria of 1 fatality every 10^5 years to 1,000 fatalities every 10^8 years. The ALARP principle is applied to activities operating within these limits. The aversion to major disasters sets an upper limit of 1,000 fatalities irrespective of the likelihood.

5.3 PROPOSED ENVIRONMENTAL OBJECTIVES FOR HONG KONG

5.3.1 A wide variety of standards and objectives could be applied globally, each tailored to a country's prevailing environmental conditions to include infrastructure, geography, population, sensitive receptors and baseline conditions. Country specific objectives are necessary to ensure that achievable objectives are provided which can be improved/advanced over time, while recognising international trends and aspirations.

5.3.2 Some objectives already exist for Hong Kong. These have been reviewed and remain the cornerstone of the SEA. Some new or additional objectives are also needed which can be revised periodically to reflect changes in environmental conditions. To ensure ongoing environmental improvement, the standards and objectives of London are deemed to be particularly relevant due to it being recognised as a World City, the relatively high population densities, the mixture of old and new buildings and facilities, mobile/transient populations and the high reliance on buses, etc which create emissions problems (along with other sources). The intention is not to adopt objectives from another city but rather the use of these as a basis for enhancing the prevailing objectives for Hong Kong. It should be noted that the proposed environmental objectives in the following paragraphs are not the committed objectives in Hong Kong.

5.3.3 In his 1999 Policy Address, the then Chief Executive stated his vision is to make Hong Kong an ideal home and to start working in partnership to achieve what is known as "sustainable development". Therefore a key objective would be to

achieve this vision.

Air Quality

5.3.4 The baseline conditions with respect to air quality in Hong Kong are of concern. The future situation regarding air quality is closely linked with future strategies for the use of energy and natural resources as well as transport policies. Regarding the use of energy and natural resources, regulations are in place to control the emissions from the Specified Processes such as power plants, incinerators and batching plants. To reduce sulphur dioxide emissions, the Fuel Restriction Regulations prohibit the use of solid and liquid fuel in Shatin and restrict the sulphur content of fuel in other districts. The Open Burning Regulation and the Construction Dust Regulation were introduced in 1996 and 1997 respectively to help reduce the particulate emissions. On the other hand, a major cause of air quality problem is emissions generated from vehicular traffic. Policies to convert diesel taxis to LPG have had some success with respect to improving air quality. Further emission reductions can be achieved through reducing the use of private transport and adopting new technologies. Air Quality Objectives were established in 1987 under the Air Pollution Control Ordinance (APCO). These objectives are to be reviewed from time to time. Future land use planning must take into consideration the effects of buildings in restricting air movement. Co-operation is required with the Guangdong Provincial Government to provide a strategy for managing trans-boundary air pollution.

5.3.5 Potential objectives for Hong Kong include:

- Reduction in emissions generated by energy producers.
- Encourage the use of more environmentally sustainable fuels especially for vehicle traffic, construction activities and commercial uses.
- Encourage the use of urban design guidelines to enhance air ventilation and air flow around buildings.
- Decrease reliance on vehicular transport.
- Increase the use of public transport.
- Reduction in the effect of trans-boundary air pollution, for example, through continuous co-operation with the Guangdong Provincial Government.
- Reviewing overseas policies and practices which are at improving air quality, to see if these are applicable to Hong Kong.

Noise

5.3.6 Noise is a particular concern in Hong Kong because of the close proximity of source to sensitive receptors. The Noise Control Ordinance stipulates noise limits for a range of activities. Noise planning is becoming increasingly important in Hong Kong to reduce noise exposure, and objectives need to be set for Hong Kong to reduce the number of people exposed to excessive noise. EPD has already mapped out the current road traffic noise level for the entire territories of Hong Kong and a

"Draft Comprehensive Plan to Tackle Road Traffic Noise" has been drawn up and under active consideration. An ambient noise strategy similar to the proposed strategy in London would complement the existing approach to noise management, allowing progressively more stringent noise objectives above and beyond guideline values proposed by the WHO. The purpose of the comparison with other world class cities and benchmarking is to identify existing and planned best practice. Of those cities chosen, London is preparing a noise strategy which is likely to represent the most proactive and best practice. The HK2030 SEA is intended to identify the appropriate individual environmental standards and objectives for the future in broad directions. We believe a strategic noise policy would complement the existing noise control mechanisms. Such a policy would allow for (but not necessarily mandate) progressively more stringent noise objectives. This is considered worthwhile to meet perceived public desires for a quieter environment (as evidenced by public consultation and noise complaints) and the expectation that future objectives should go beyond legislation and be better than levels set purely for health reasons.

5.3.7 Potential objectives for Hong Kong include:

- No increase in the percentage of people exposed to excessive noise with proper land use planning, conscientious planning of new roads, abatement of existing noise sources, improved vehicular noise standard and proper building layout design.

- Use of quiet construction equipment.

Geology, Soils and Contaminated Land

5.3.8 There is no list/register of potentially contaminated sites, and presently contamination issues are generally addressed during site redevelopment when a range of international standards are used to identify contaminated land. Investigation and mapping of potentially contaminated sites will be required in order to plan for reuse. A contaminated land register would be beneficial to provide information on sites which have an environmental risk, particularly in light of the likely future increase in the use of brownfield sites for redevelopment.

5.3.9 Potential objectives for Hong Kong include:

- Reduction in the development pressure on greenfield sites by means of, for example, regeneration of derelict sites, ex-industrial areas, landfill sites, and PHI sites etc.

- Enhancement of information on the potential environmental risk associated with development of brownfield sites through the provision of a contaminated land register.

Water Resources and Water Quality

5.3.10 Freshwater and marine water suffer to a greater or lesser extent from pollution from domestic, commercial, industrial and agricultural wastes. EPD aims to achieve marine and freshwater quality objectives that will safeguard the health and welfare of the community and meet various conservation needs. Under the Water Pollution

Control Ordinance, 10 Water Control Zones have been set up. WQOs have been set for the water control zones and sewerage master plans have been developed which provide a blueprint for sewerage infrastructure required to collect sewage on a catchment by catchment basis and direct to treatment facilities. Depending on the existing water quality of the Water Control Zone, addition of higher treatment (e.g. Chemically Enhanced Primary Treatment (CEPT), secondary and tertiary) of sewage prior to discharge should be an objective, which will require the installation of additional pollution prevention infrastructure and sewerage facilities. Soft engineering practices could also be incorporated which will have the benefit of reducing treatment costs, while providing additional wetland habitats.

5.3.11 Currently, about 70-80% of the fresh water supply in Hong Kong comes from raw water imported from Dongjiang in Guangdong Province. The demand for fresh water is likely to increase with the growing population. Various measures shall continue to be considered for meeting the increasing freshwater demand such as alternative water resources (e.g. seawater desalination), water conservation, increase of Dongjiang water supply etc. An important issue will therefore be the potential for pollution of the freshwater supply, particularly of the Dongjiang Basin given the significant economic developments in this area. Apart from a series of pollution prevention and control measures implemented by the Guangdong authorities, significant improvement in the quality of Dongjiang water supply to Hong Kong has been observed after the operation of the dedicated aqueduct for the supply of Dongjiang water from the Dongjiang intake to Shenzhen Reservoir in June 2003. On the other hand, WSD is currently conducting a consultancy study to map out the long-term strategies and formulate the implementation plan for Total Water Management in Hong Kong. Water consumption forecasts and water conservation targets are key areas being examined under the Total Water Management Study.

5.3.12 Potential objectives for Hong Kong include:

- Reduction in trans-boundary pollution, for example, through continuous co-operation with Guangdong.
- Proper/adequate sewage treatment level prior to discharge through the timely implementation of the sewerage master plans.
- Management of riparian vegetation for enhancement of organic matter removal.
- Implementation of Total Water Management for sustainable development.
- Review of international practices to improve water quality to attain the WQO.
- Achieve the WQO as soon as is reasonably practicable and thereafter maintain the quality so achieved.

Waste

5.3.13 Quantities of different types of solid waste disposed of are monitored by Civil Engineering and Development Department (CEDD) and EPD, and waste reduction and recycling is encouraged. The initiatives for future waste management are contained within the *MSW Policy Framework.*

5.3.14 Potential objectives for Hong Kong include:

- Enhancing source separation of waste, as envisioned in the *MSW Policy Framework* :
  - to increase the domestic waste recovery rate from 14% in 2004 to 20% in 2007 and 26% in 2012. The aim is for housing estates to achieve a 50% increase in recovered quantities after the first year of implementation;
  - to have 80% of the population in Hong Kong taking part by 2010. The aim is to gradually increase the number of estates under the programme to 180, 700, 1,140 and 1,360 by the end of 2005, 2007, 2009 and 2010 respectively; and
  - to gradually increase the number of Public Rental Housing (PRH) estates under the programme from 30 PRH estates in 2005 to all PRH estates by 2012.
- Minimise excessive packaging and end-of-life goods wherever possible through the introduction of Producer Responsibility Schemes (PRSs). The Policy Framework proposes individual PRSs for Waste Electrical & Electronic Equipment (WEEE), vehicle tyres and plastic shopping bags by 2007; for packing materials and beverage containers by 2008; and for batteries by 2009.
- Increase the amount of waste separation and recovery through, e.g. provision of necessary services and facilities, support to the development of the recycling sector, sustained effort in education and publicity in waste reduction, and development of Integrated Waste Management Facilities (IWMF) for handling non-recyclable wastes. The EcoPark in Tuen Mun Area 38, designed to support the development of the recycling sector, is already under construction. Tender invitations for the tenancies of the first batch of lots for recycling of designated materials in Phase I closed on 26 January 2007 and the tender submissions were being assessed as of February 2007. Along with continuing public education, the Policy Framework also proposed the adoption of IWMF by 2014.
- With the Construction Waste Disposal Charging Scheme already in place, the next aim is to introduce charging for MSW, with legislation presented to the Legislative Council (LegCo) targeted in 2007.

Energy and Natural Resources

5.3.15 Various methods have been employed by the government to improve energy efficiency in buildings and various schemes have been implemented by the private sector. There are aims to increase the use of renewable resources and improve energy efficiency, such as implementation of water-cooled air conditioning systems in Hong Kong. However, specific objectives are required regarding reduction in energy use and the associated atmospheric emissions. China is a signatory to the Kyoto Protocol and will be taking part in global effort to abate global warming. This can be achieved through the use of sustainable energy sources, using cleaner fuel rather than fossil fuel for power generation and the incorporation of energy

saving features.

5.3.16 Potential objectives for Hong Kong include:

- Encourage the practice of energy reduction as soon as possible.
- Control greenhouse gas emissions through joint international and trans-boundary effort, more use of public transport.
- Reduce the use of non-renewable energy through, e.g. use of energy-from-waste installations, increase the use of renewable energy; and incorporation of energy saving features in buildings.

Land Use and Landscape

5.3.17 To enhance the value and interest of the urban environment, culturally significant features must be incorporated into urban redevelopment projects. Opportunities for reuse of existing and historic buildings should be considered to increase the diversity of the urban environment; this will also reduce the volume of building materials which will require disposal to landfill. A number of cities and city-regions have developed specific policies and statutory instruments that put landscape conservation and planning issues at the very centre of the development process, rather than relying on the creation of green spaces through left-over fragments remaining once all the roads, railways, housing estates, drainage channels, utility services etc. have been built. There is a clear and urgent need for co-ordinated landscape conservation and planning policy with objectives including conservation of non-designated landscapes and the quality of the whole living environment rather than on the component parts.

5.3.18 There are various methods of improving the aesthetic value of the urban landscape, whilst conservation efforts for natural landscapes and heritage features should ensure the continuing existence of valuable natural landscapes.

5.3.19 Potential objectives for Hong Kong include:

- Further enhancement in the protection of landscape through:
  - adopting a fully co-ordinated approach to design, implementation and maintenance of public landscape works where emphasis is on all three stages rather than solely on maintenance; and
  - devising planning procedures for validating design proposals and implemented projects against statutory landscape conservation and planning objectives.
- Active greening of urban areas through tree planting and use of soft landscape materials.

Risk Management

5.3.20 Plant safety improvement works have been progressively implemented and now all non-fuel gas PHIs are within the risk guidelines. However, the risk management of

PHI sites is an ongoing process due to changes in plant inventories and population development near PHI sites. In addition to PHI sites, the risk guidelines are now used as assessment criteria under the Environmental Impact Assessment Ordinance for projects which manufacture, store, use or transport dangerous goods.

5.3.21 Potential objective for Hong Kong include:

- Review declassification opportunities respect of rezoning of industrial land

Ecology

5.3.22 Much of Hong Kong's remaining natural areas are protected, either by their inaccessible location or through designation as Country Parks etc. Review on the Nature Conservation Policy has been completed and two options were proposed as practicable measures to better protect and manage the identified ecologically important sites. The two options are: management agreements with landowners and private-public partnership. Objectives are required to maintain existing nature conservation areas and to manage and enhance other natural areas for the benefit of local people and wildlife. To alleviate the development stress on lands in countryside and other rural areas of recognised ecological importance such as those priority sites identified in the New Nature Conservation Policy, the government could promote the reuse of brownfield sites (as EPD are currently doing for example through the restoration of landfills for recreational uses).

5.3.23 Potential objectives for Hong Kong include:

- Continue to apply the existing statutory measures on protection of the important ecological resources e.g. designation of appropriate conservation zones through the preparation of Outline Zoning Plans (OZPs) under the TPO.

- Further enhancement in the protection of ecological resources on both government and private lands through the implementation of the New Nature Conservation Policy through two improvement options viz. management agreements with landowners and private-public partnership.

Cultural Heritage

5.3.24 The policy for built heritage conservation is currently under government review and will ultimately result in a set of objectives for conserving the architectural heritage of Hong Kong. Similar initiatives will then be needed to set policy definitions on objectives for conserving other types of cultural heritage such as archaeological sites, cultural landscapes, early industrial sites, intangible cultural heritage, historic villages and urban enclaves etc. There should be a presumption for conserving all sites of cultural heritage in-situ, re-location or total demolition of those sites after no objection by relevant authorities and followed by full recordings for built heritage or archaeological heritage by rescue excavation being taken at the very last resort. This standard should be subject to review in view of the time scale adopted by the current study. A new policy is required which reflects the current heritage conservation concerns and the need for cultural heritage conservation in the future.

5.3.25 Potential objectives for Hong Kong include:

- Further enhancement in the conservation of heritage resources through, e.g. developing a set of objective and transparent assessment criteria for evaluating heritage value, implementing a comprehensive cultural heritage conservation strategy, and incorporating culturally interesting features into planning, etc.

5.4 CONCLUSIONS

5.4.1 Establishment of objectives or benchmarks can be very subjective especially when environment, health and economic development are intrinsically linked. Although the economics of development options or setting of objectives is outside the scope of this Study, it is important to recognise the dilemmas to be faced, challenges to be overcome and practicalities of the issue to be addressed. As the economics of setting of objectives is considered in this Study, the proposed objectives set out in the preceding paragraphs must be subject to further assessment and public debate prior to their adoption.

5.4.2 Public participation will be vital to improving environmental standards and reaching environmental objectives. One of the key methods of ensuring public involvement is to increase awareness of environmental concerns, and provide education and facilities for the public to 'do their bit'. The Environmental Campaign Committee (ECC), which was set up in 1990, aims to promote public awareness of environmental issues and encourage the public to contribute actively towards a better environment.

5.4.3 The current means of ensuring public and private companies consider the environment during planning is through the planning mechanism to protect the environment include the Town Planning Ordinance for which the HKPSG provides guidance for including environmental considerations in the planning of both public and private developments. The EIAO, which was introduced in 1998 requires that all designated projects, unless exempted, go through the statutory Environmental Impact Assessment (EIA) process to assess their impacts. Even exempted projects are required to take cognisance of environmental concerns through the implementation of environmental management plans or systems (during design, construction and operations). According to ETWB Technical Circulars (Works) No. 13/2003, projects which are not designated projects under the EIAO may also need to conduct a preliminary environmental review to confirm their environmental acceptability.

5.4.4 A summary of the environmental objectives proposed for Hong Kong is given in **Table 5-7** below.

Table 5-7 Summary of Potential Environmental Objectives

Air Quality	• Reduction in emissions generated by energy producers. • Encourage the use of more environmentally sustainable fuels especially for vehicle traffic, construction activities and commercial uses. • Encourage the use of urban design guidelines to enhance air ventilation and air flow around buildings. • Decrease reliance on vehicular transport. • Increased the use of public transport. • Reduction in the effect of trans-boundary air pollution, for example,

	through continuous co-operation with the Guangdong Provincial Government. • Reviewing overseas policies and practices which are at improving air quality, to see if these are applicable to Hong Kong.
Noise	• No increase in the percentage of people exposed to excessive noise with proper land use planning, conscientious planning of new roads, abatement of existing noise sources, improved vehicular noise standard and proper building layout design. • Use of quiet construction equipment.
Geology, Soils and Contaminated Land	• Reduction in the development pressure on greenfield sites by means of, for example, regeneration of derelict sites, ex-industrial areas, landfill sites, and PHI sites etc. • Enhancement of information on the potential environmental risk associated with development of brownfield sites through the provision of a contaminated land register.
Water	• Reduction in trans-boundary pollution, for example, through continuous co-operation with Guangdong. • Proper/adequate sewage treatment level prior to discharge through the timely implementation of the sewerage master plans. • Management of riparian vegetation for enhancement of organic matter removal. • Implementation of Total Water Management for sustainable development. • Review of international practices to improve water quality to attain the WQO. • Achieve the WQO as soon as is reasonably practicable and thereafter maintain the quality so achieved.
Solid Waste Management	• Reduce the amount of MSW generated • Increase the MSW recovery rate • Reduce the total MSW disposed of to landfill
Energy and Natural Resources	• Encourage the practice of energy reduction as soon as possible • Control greenhouse gas emissions through joint international effort and trans-boundary effort, more use of public transport. • Reduce the use of non-renewable energy through, e.g. use of energy-from-waste installations, increase the use of renewable energy; and the incorporation of energy saving features in buildings.
Land Use and Landscape	• Further enhancement in the protection of landscape through: - adopting a fully co-ordinated approach to design, implementation and maintenance of public landscape works where emphasis is on all three stages rather than solely on maintenance; and - devising planning procedures for validating design proposals and implemented projects against statutory landscape conservation and planning objectives. • Active greening of urban areas through tree planting and use of soft landscape materials.
Risk Management	• Review declassification opportunities in respect of rezoning of industrial land.
Ecology	• Continue to apply the existing statutory measures on protection of the important ecological resources e.g. designation of appropriate conservation zones through the preparation of OZPs under the TPO. • Further enhancement in the protection of ecological resources on both

	government and private lands through the implementation of the New Nature Conservation Policy through two improvement options viz. management agreements with land owners and private-public partnership.
Cultural Heritage	• Further enhancement in the conservation of cultural heritage resources through, e.g. developing a set of objective and transparent assessment criteria for evaluating heritage value, implementing a comprehensive cultural heritage conservation strategy, and incorporating culturally interesting features into planning, etc.

PART B : THE OPTIONS AND EVALUATION

6 THE DEVELOPMENT OF THE OPTIONS

6.1 INTRODUCTION

6.1.1 Having established the baseline and identified the environmental issues and carrying capacities in the early stages of the Study, Stage 3 of the SEA compared and evaluated the development options formulated under the HK2030 Study. The fourth and final stage of the SEA was charged with carrying out (a) technical evaluations of the Preferred Development Option [1] formulated on the basis of the Reference Scenario and (b) sensitivity tests on a possible higher population and economic growth scenario (i.e. HPGS "What If" Scenario) with a view to confirming the environmental sustainability and environmental feasibility of the Preferred Development Option. Potential environment impacts were identified and evaluated, mitigation measures and follow-up investigations were proposed, with response plans formulated to cater for the unexpected circumstances as under the HK2030 Study process.

6.2 VISION-BASED APPROACH OF THE HK2030 STUDY

6.2.1 The HK2030 Study adopts a vision-based approach based on which a future development scenario, known as 'Reference Scenario', is devised. Under the HK2030 Study, the Reference Scenario has been set out as what we envisage the future will be like based on the broad trends and vision targets, and by taking into account existing policies and known commitments. The key assumptions and considerations used in deriving the Reference Scenario include population, employment, land requirements for various types of use such as housing, economic, transport and key infrastructures, based on which the Preferred Development Option is then formulated.

6.2.2 On the other hand, to ensure that our recommended development strategy is robust enough to cater for different circumstances, a set of "What If" Scenarios have also been developed to help visualise some of the possible changes which may affect our planning strategy. These "What If" Scenarios have been developed by varying key planning parameters under the Reference Scenario. The HK2030 Study has focused on the assumptions, which have direct and significant implications for the planning strategy and those that are more likely to happen in future. Two key components, population and economic growth, have been selected to derive alternative scenarios for further assessment under the HK2030 Study. For the purpose of the HK2030 SEA, only the scenario of "high population growth – high economic growth", viz. the HPGS "What If" Scenario[2], with the future container terminal location assumed at North West Lantau has been selected for "sensitivity" test as it represents the "worst-case" situation from the strategic environmental assessment points of view.

1 Preferred Development Option, under the HK2030 Study, concerns about the future spatial development pattern, outlining where, what type and how much development would take place at different planning horizons.

2 For the purpose of the HK2030 SEA, it is termed as the "What If" Scenario in the remaining sections of the SEA Final Report.

6.3 SCENARIOS FOR FORMULATING DEVELOPMENT OPTIONS

6.3.1 The key planning assumptions adopted under the Reference Scenario and the "What If" Scenario and the major development proposals assumed under the Preferred Development Option of Stage 4 is summarised in Appendix B. The information includes the population and employment assumptions, housing land requirements, economic land requirements as well as the requirements for various transport and key infrastructures. .

6.3.2 Under the "What If" Scenario, we have assumed a 0.5% GDP growth rate higher than that assumed under the Reference Scenario for the medium and long-term. More jobs will be created in view of a higher economic growth, resulting in a higher job creation ratio for the medium and long-term as compared with the Reference Scenario. A greater number of talent and skilled workers have been assumed to sustain our working population to cope with employment growth while the number of cross-boundary workers will be similar to the Reference Scenario. The key development parameters and planning assumptions adopted under the "What If" Scenario are summarized in **Appendix B**.

6.4 ENVIRONMENTAL ASSESSMENT OF DEVELOPMENT OPTIONS IN STAGE 3

6.4.1 The results of the broad-brush environmental assessment of the development options formulated under the Stage 3 of the HK2030 Study are contained in the Options Evaluation Report, which has been submitted as one of the study deliverables. The results are comparative and qualitative in nature and form only part of the SEA. Further detailed assessment of the Preferred Development Option would be carried out in Stage 4 of the HK2030 Study.

6.4.2 Taking into account the vision targets for Hong Kong and current broad trends as well as existing policies and known commitments, the Reference Scenario has been formulated so as to identify the key elements of development and their corresponding land requirements based on which the long-term spatial development patterns could be formulated and assessed. Having examined the implications of various planning choices, the core components are consolidated under two broad development patterns, i.e. Consolidation and Decentralization Patterns. Under this Stage, only two of the four possible container terminal locations, i.e. North West Lantau and South West Tsing Yi recommended under the Port Development Strategy Review, have been considered with two broad development patterns. In this regard, the objective of evaluations was to provide an indicative comparison of the four possible development options.[3]

6.4.3 Performance indicators were selected for use in the comparative evaluations covering a broad range of environmental aspects. The evaluations were qualitative and based on the likely performance when judged against the other development options. Nevertheless, in view of the broad-bush nature of the assessment at Stage 4

3 These four development options are 'Consolidation with South West Tsing Yi Port', 'Decentralisation with South West Tsing Yi Port', 'Consolidation with North West Lantau Port' and 'Decentralisation with North West Lantau Port' options.

of the SEA Study, the Study results are based on a lot of assumptions and subject to uncertainty. It should be noted that further detailed environmental studies are required for individual projects to determine their environmental acceptability.

6.4.4 In summary, it is concluded that impacts of the development in the short-term include the potential air and noise problems associated with the predicted increase in cross-boundary vehicle trips. The effects of such have also been examined in the Stage 4 SEA. It is important to note that in the short-term the components of the development options are committed or planned projects, i.e. there are no novel components. In the medium to long-term, the key issues identified relate to vehicle emissions, wastewater disposal (include the timely implementation of the HATS) as well as the generation solid wastes and disposal thereof. There would likely be cumulative environmental impact including the ecology, air, noise, sewerage infrastructure and water, etc. due to the developments of various infrastructures.

6.5 ENVIRONMENTAL ASSESSMENT OF DEVELOPMENT OPTIONS IN STAGE 4

6.5.1 The Reference Scenario, under the HK2030 Study, has been revised in the Stage 4 taking on board views / comments collected in the previous stages of public consultation, latest Government policy initiatives and commitments as well as the findings of various technical and impact assessments conducted during the study process. In this regard, the Preferred Development Option formulated on the basis of the Reference Scenario was evaluated again, together with the worst-case "What If" Scenario as sensitivity test, in the Stage 4 of the SEA. Moreover, in view of the availability of and rising public aspirations on the use of quantitative modelling technique in undertaking the assessments, two major aspects of the SEA have been selected for broad-brush modelling under additional services, i.e. the air quality and road traffic noise assessments. With respect to the strategic water quality assessment, it has been undertaken using modelling information from other ongoing and recently completed consultancies and / or Government projects, which have addressed proposed new developments.

6.5.2 In addition to the broad-brush modelling and assessment, the final stage of the SEA would also reconsider aspects and issues such as the ecological implications of the scenarios, landscape, cultural heritage, waste management, energy and natural resources and risk management issues before the final recommendations / conclusions were drawn. Results of the evaluations and assessments as well as the recommendations / suggestions made under the Stage 4 SEA are presented in the ensuing sections of the Report.

6.5.3 Essentially, the Preferred Development Option (**Figures 6-1** to **3** refer) has the following key components:

- It is a hybrid of the Consolidation and Decentralisation options which is attained through optimizing development opportunities in the existing built-up areas, with only modest-scale new developments in the New Territories, allowing the preservation of most of our rural areas, thereby creating a sustainable form of development.
- The population and employment assumptions are 8.4 million and 4.0 million respectively.

- Of the 1.6 million increase in population from now to 2030 as assumed, priority is given to the utilization of the available development potential of the Metro Area to accommodate about 600,000 (i.e. 35 to 40%) people, mainly at redevelopment/infilling sites, at West Kowloon and Kai Tak.
- Undeveloped parts of the existing new towns, especially Tseung Kwan O and Tung Chung would take in about 500,000 more people (or about one-third of the population increase from now to 2030).
- New Development Areas (NDAs) with housing development at Kwu Tung North NDA and Fanling North NDA (part of the Three-in-One Scheme) and Hung Shui Kiu NDA could accommodate 350,000 people (or about 22% of the population increase from now to 2030).
- There will be a total requirement of employment floorspace of about 11.0 million m^2 in gross floor area (GFA) up to 2030 with central business district (CBD)[4] Grade A offices, general business and special industries accounts for 2.7, 5.4 and 2.9 million m^2 GFA respectively.
- CBD Grade A office requirement would be accommodated by utilizing (a) the existing opportunities in the CBD including remaining undeveloped office sites, vacated Government, Institution and Community (GIC) sites, space or land currently occupied by government offices, private-sector redevelopments etc.; (b) area located at an important transportation hub such as the West Kowloon Reclamation to serve as another high-grade office cluster; and (c) new office node at the former Kai Tak Airport site in the medium to longer term.
- General business uses requirement would mainly be met by making use of the unrealised development potential arising from the redevelopment of existing industrial areas.
- Special industries involving high value-added, high-tech production and logistics activities, which are less reliant on agglomeration economies, would be more ready to decentralise to the New Territories. The Ping Che/Ta Kwu Ling NDA and part of the Hung Shui Kiu NDA could be considered for a long-term reservation for special industrial uses.
- There are two options being studied for the location of the new container port i.e. one at North West Lantau and one at South West Tsing Yi.
- Strengthening the linkages with the PRD region will continue.

4 For the purpose of the HK2030 Study, the CBD is defined as the business zones within Central, Wan Chai, Sheung Wan, Causeway Bay, Tsim Sha Tsui and the West Kowloon Reclamation.

7 STRATEGIC ENVIRONMENTAL ASSESSMENT

7.1 THE STRATEGIC ENVIRONMENTAL ASSESSMENT PROCESS

7.1.1 When reviewing the assessments for the Hong Kong 2030 Study it is important to bear in mind that the Strategic Environmental Assessment (SEA) process is unlike the Environmental Impact Assessment (EIA) process. Whereas the EIA is an assessment tool which examines the impacts and assesses the acceptability or otherwise of developments, the SEA assists in the formulation and selection of options and strategies. The SEA is thus a systematic process which assists in making rational decisions on the development strategies and proposals contained within the development framework for the HK2030 Study.

7.1.2 The SEA has an important role to play in the development and planning process and is intended, in this case, to assist in considering the cumulative impacts of the recommended strategies to ultimately derive a Preferred Development Option to take forward. The purpose of this SEA is also to examine the environmental performance of the strategies which comprise the Preferred Development Option to test these at a strategic level before the decision is taken to proceed with site specific projects.

7.1.3 As described in the foregoing sections the SEA Study has established baselines, established targets and identified key issues associated with the components of the development options. The development options were assessed as part of the third stage of the Study to allow a refinement of the scenarios and options. At this stage in the SEA the assessment tools were limited by the amount of information available. It should also be noted that this is a common feature of the SEA process and as such the assessments used a rational basis for screening and comparing and evaluating the environmental performance of the development options. The evaluation of the options included a process whereby a series of environmental indicators were established and the options were comparatively evaluated. Quantifiable information was used wherever possible although it was recognized that in some cases qualitative evaluations were only possible.

7.1.4 As part of the fourth and final stage of the Study, the Preferred Development Option formulated on the basis of the Reference Scenario was assessed. The SEA utilized modelling tools to assist in the evaluation of the air quality, noise and water quality impacts associated with the options, combined with qualitative evaluations for the other environmental aspects such as ecology, risk, cultural heritage and landscaping.

7.1.5 The Reference Scenario has been assessed on the basis of considering the environmental impacts in holistic terms, and by using the targets and objectives set forth in the earlier stages of the study for guidance. Having examined the Reference Scenario and the “What If” Scenario as a whole the next step in the assessment was to consider the environmental implications of the component strategies as described in Section 8. It should be noted that the assessment results and findings in this Study are only valid for the set of assumptions adopted and any change in these basic parameters would yield different results.

7.2 SEA METHODOLOGY

Environmental Aspects Considered

7.2.1 The environmental criteria which have been considered in this SEA include :

- Air Quality
- Noise
- Water Resources and Water Quality
- Waste
- Energy and Natural Resources
- Land Use and Landscape
- Risk
- Ecology
- Cultural Heritage

7.2.2 Two specific aspects have been selected for modelling as follows: air pollution problems which are caused by both mobile and stationary sources with the street level air quality mainly affected by vehicle emissions; and noise pollution due to high density living in the metropolitan areas, the extent of vehicle traffic, the congestion on the roadways and the close proximity of residential developments to roads especially in the older areas and also the effects of the ever changing landscape and the associated construction works. Water quality assessments were undertaken using modelling data from other ongoing and recently completed projects which have addressed new developments.

7.3 AIR QUALITY

Model Inputs

7.3.1 For the assessment of the air quality implications of the Preferred Development Option formulated on the basis of the Reference Scenario, recourse was made to the PATH model. The Reference Scenario has been derived on the basis of certain key planning parameters / assumptions, the main difference being the possible location of the new container terminal which has yet to be determined by the Government. Two locations have been considered viz. North West Lantau and South West Tsing Yi. The air quality assessment has been undertaken using a comparative evaluation of the performance of the two different container terminal locations as well as comparative evaluations against a “baseline”. It is very important to note that the model output does not provide definitive numerical values but rather is intended to compare the relative performance of the model scenario with different container terminal locations. In this Section of the Report the overall performance is described from a holistic perspective. The relative performance or issues associated with the individual strategies, i.e. transport or new development areas or cross-boundary issues are described in Section 8.

7.3.2 Having ascertained the performance of the overall options (with the two different container terminal locations) the models were rerun for the “What If” Scenario. The

"What If" Scenario which was selected was designed to consider the implications of "high population growth-high economic growth" situation, with the future container terminal location assumed at North West Lantau. The purpose of testing this "What If" Scenario was to determine whether such a change in population and economic growth could be considered to be sustainable in the longer term. A summary of the model input data and assumptions are given in the following sections.

Assumptions

7.3.3 The basic assumptions and data input for the 2003 Baseline Scenario and the Reference Scenarios have been developed using available information wherever possible. Reference to assumptions adopted in other relevant published study reports have also been considered in the development of the emissions inventories and methodologies and assumptions adopted for this part of the SEA. Key input data include, for each emission source and each pollutant considered include annual mass emission, spatial and temporal repartition.

7.3.4 It should be noted that the 2030 emission inventories are projected based on many assumptions and uncertainties, the assessment is broad-brush in nature are considering; the future development of the proposed NDAs, cross-boundary infrastructure, possible uses of the Closed Area and the future airport and port developments which may have territory-wide implications and would likely worsen the air quality. The predicted trend of air quality may only be achieved if many effective improvement measures materialize. Given the uncertainties in the projection, there is a chance that air quality will deteriorate in future. Detailed environmental studies for the proposed infrastructure and developments are recommended to determine their environmental acceptability.

2003 Baseline Scenario

7.3.5 Most of the HKSAR 2003 base year emissions inventory has been prepared based on the 2003 Hong Kong air pollutant emissions inventory for total emissions of the various source sectors available from the EPD website. Further work has however been necessary, including projection and spatial allocation of data from the Study on Hong Kong Port - Master Plan 2020 (HKP2020 Study). Traffic data input has been estimated based on the peak-hour data of the major road networks provided by the PlanD. The general assumptions made for the 2003 emissions inventory are:

- a 3.3% GDP growth in economy;
- private car and motorcycle fleet size of 367,700;
- goods vehicle fleet size of 110,000;
- at the airport the daily origin-destination (OD) air passengers[5] totalled 63,900;

5 Aircraft movement was used in the air quality assessment instead of air passengers and it is considered more appropriate for estimating the aircraft emissions. Nevertheless, for the purpose of assessing future airport related traffic, the preliminary forecasts on air passenger and cargo which exclude transfer / transit passengers and transhipment cargo have been adopted in the HK2030

- at the airport the daily OD air cargo handled amounted to 6,300 tonnes;
- at the container terminals the total throughput[6] amounted to 12.8 million TEUs; and
- the number of vehicle kilometres travelled on an annual basis was 11,190 million

7.3.6 A Pearl River Delta Economic Zone (PRDEZ) 2003 base year emission inventory was updated based on the best available information for example from the Guangdong Statistical Year Books for projections from the current available data to 2003. Projections were based on best available information: direct data have been used where applicable while other projections were based on secondary information such as economic indicators from the Guangdong Statistical Year Books.

2030 Reference Scenario

7.3.7 The 2030 emission inventory has been mainly developed using projections from available data, although available data from external sources have also been used. HKSAR motor vehicle emissions have been computed based on the 2030 information provided by the PlanD. For other emission sources including point sources and area sources, in the absence of any reliable emission predictions to 2030 and/or committed emission control measures for year 2030 in HKSAR and PRDEZ, the projections based on the committed control measures in the region by the HKSAR Government and Guangdong Provincial Government to be achieved by 2010 were adopted. This is consistent with the 2010 control scenario adopted in the Study of Air Quality in PRD Region and the control measures mentioned are in line with the Government commitments. The general assumptions made for the (HKSAR) 2030 emissions inventory are:

- economic growth rate is assumed to grow at 3% GDP annually from 2021 to 2030;
- private car and motorcycle fleet size is assumed to be 575,400;
- goods vehicle fleet size is assumed to be 125,600;
- at the airport the daily OD air passengers is assumed to be 156,500[7];

Study, which are developed by the PlanD based on discussions with the Airport Authority Hong Kong, and are for preliminary review of vehicular flows on major roads only.

6 Terminal capacity with 13.1 million TEUs was used in the air quality assessment instead of the container throughput. They are more conservative figures, which can cater for situation when the container terminals are fully utilized, and hence are considered more appropriate for the purpose of the HK2030 SEA.

7 Aircraft movement was used in the air quality assessment instead of air passengers and it is considered more appropriate for estimating the aircraft emissions. Only 2020 forecast data for the aircraft movement was provided by Airport Authority Hong Kong and it is assumed that the existing the two runways will be saturated in 2020. It is assumed that no further runway and runway capacity will reach its maximum and figures in 2020 was adopted as 2030 since this was the best available information when the strategic air quality assessment was carried out in 2006.

- at the airport daily OD air cargoes handled is assumed to be 21,200 tonnes;
- at the container terminals the total throughput[8] is assumed to be 34.5 million TEUs; and
- the number of vehicle kilometres travelled on an annual basis is assumed to be 17,636 million for NW Lantau container terminal option under the Reference Scenario, 17,178 million for SW Tsing Yi container terminal option under the Reference Scenario.

Summary of Results

Emissions

7.3.8 Analysis of the emissions inventory shows that power generation remains the main contributor to NO_x, RSP and SO_2 emissions, although the share of the emissions of the power sector is expected to reduce, especially for SO_2. Motor vehicles remain by far the main contributor to CO emissions and a significant contributor to NO_x and RSP emissions. It is noted that there is few developed control measure regarding the emissions from aircraft and marine vessel and the emissions from aircraft and marine vessels are forecast to significantly increase with the increase in the aircraft movement and marine vessels activity. In 2030, the contribution of marine emissions includes NO_x, RSP and SO_2 to total emission in HKSAR is expected to increase. VOCs are emitted mainly by motor vehicles and VOC containing products (paints, solvents etc.), followed by aircraft and industry. For industry, the contribution of VOC in 2003 is about 17% while that in 2030 is about 9%. For aircraft, the contribution of VOC in 2003 is about 1% while that in 2030 is about 9%. Although this is still single digit, it illustrates the shift in balance of these pollutants between 2003 and 2030. It should be noted that NH_3 emissions are almost entirely due to "other sources" (including biogenic, wastes and agriculture related sources). The spread of emissions across sectors is very little affected by the scenario considered.

7.3.9 The modelling results indicate some improvement in air quality for all parameters by the year 2030. However, the concentration of air pollutants, except O_3 and CO, in some areas in 2030 would be worsened. It must be stressed that the results should be considered in terms of relative improvements or deterioration and not actual values and not conclusive and definite as explained in Section 7.3.4.

Reference Scenario Performance

Short Term (2010)

7.3.10 The implications of the development scenario with different container terminal location options at year 2010 have been qualitatively assessed. Based on the current assumptions, a number of new railways will be completed by 2010, and many of the

8 Terminal capacity with 34.6 million TEUs was used in the air quality assessment instead of the container throughput. They are more conservative figures, which can cater for situation when the container terminals are fully utilized, and hence are considered more appropriate for the purpose of the HK2030 SEA.

policy measures will be partly implemented. Air quality improvements will therefore begin to be perceptible. A certain inertia can however be expected (for example replacement of the old vehicle fleet) and full benefits of the strategy would not be achieved, while general growth in the various sectors would have negative impacts.

Medium Term (2020)

7.3.11 By 2020, most important works currently planned would be completed, while most policies would be fully implemented. Based on the current assumptions, the current strategy and other measures/technological development/planned works would have little impact beyond 2020 (further than those already achieved), while development is still ongoing between 2020 and 2030. It is therefore expected that 2020 estimations would show lower concentrations than the modeled values for 2030. The strategy would have the maximum effects on the medium-term. Further measures would be required to build on the benefits gained by 2020.

Long Term (2030)

7.3.12 The assessment undertaken for the year 2030 provides better indications of the implications of the strategy on air quality. The modelling results indicate general improvements in air quality by the year 2030. However, the concentration of air pollutants, except O_3 and CO, in some areas in 2030 would worsen. It must be stressed that the results should be considered in terms of relative improvements or deterioration and not conclusive and definite as explained in Section 7.3.4. In addition, the predicted trend of air quality may only be achieved if many effective improvement measures materialize.

7.3.13 Maximum hourly SO_2 concentrations are predicted to reduce by up to >60% in some areas. However, it should be noted that the relative percentage change in annual concentrations is high whilst the actual relative concentration change is, in many cases, relatively small. Annual average concentrations are expected to decrease significantly (by nearly 40% in some areas such as Tung Chung). The increase in Central/ Western and Sham Shui Po is due to the increase in marine SO_2 emissions. This however indicates considerable improvements compared to a hypothetical "do-minimum" situation where no control measures would have been implemented by 2030. These improvements are mainly a result of tightened standards for fuel and caps on emissions from the power sector. In most places, implementation of these measures, in combination with others and other influencing factors, lead to sufficient reductions in emissions to offset negative impacts from growth (increased number/size of pollution sources) and yield benefits on air quality. As mentioned above, in some areas, these improvements have less impact, due to, for example, growth and current emission control standards being already high, and SO_2 concentrations are predicted to increase in the long-term.

7.3.14 Maximum O_3 concentrations over the study area are predicted to decrease significantly by 2030.

7.3.15 Ozone is not a direct pollutant: no ozone is emitted directly in noticeable quantities from anthropogenic or natural sources. Ozone is the result of photo-oxidation of oxygen in the atmosphere in the presence of other pollutants, referred to as ozone precursors. The main tropospheric ozone (as opposed to stratospheric ozone – the

ozone layer) cycle involves two primary pollutants, NO_x and VOCs. Changes in ozone concentrations can therefore, to a certain extent, be correlated to changes in NO_X and VOCs emissions. Thus, measures in the strategy aimed at reducing emissions of these two pollutants are partly responsible for predicted reductions in ozone concentrations. It should be noted that relationships between the pollutants concentrations are very complex and, in particular, not linear. As a consequence, no direct comparison can be undertaken between NO_2 and O_3 variations in concentration.

7.3.16 For NO_2 and RSP concentrations, results of the modelling assessment illustrate some improvements and some deterioration. The results for CO concentrations are forecast to remain unchanged or improved. Based on the above observations, it can be concluded that the strategy is effective at reducing pollution from what would be the situation without measures in place, but is not sufficient to entirely balance the negative impacts of population increase, development of the traffic network, growth of urban areas, boom of aviation etc. In particular, comparison of annual average NO_2, RSP and SO_2 concentrations contour plots clearly show the impacts of the Hong Kong International Airport in Lantau.

7.3.17 The location of the container terminal is highlighted in the contour plots by areas where air quality is expected to deteriorate as compared with the 2003 scenario. This is the main difference between the part of North West Lantau or South West Tsing Yi.

Planned Policies / Government Commitments

7.3.18 With reference to the Pearl River Delta Regional Air Quality Management Plan drawn up by Hong Kong SAR Government and Guangdong Provincial Government in December 2003, the enhanced control measures of HKSAR Government are listed in **Table 7-1**. It should be noted that many measures and assumptions laid down in this table are subject to change in future and may or may not materialize. The results under this SEA hence may not be conclusive and certain.

Table 7-1 Implementation Programme of the Pearl River Delta Regional Air Quality Management Plan

Measures	Implementation Programme	Progress (Up to 30.11.2006)
Encourage the replacement of diesel light buses with ones using clean fuel (already commenced)	Since 2002, the Government has offered incentives to diesel light bus owners to encourage replacement of diesel light buses with liquefied petroleum gas (LPG) or electric ones.	The incentive scheme was introduced in August 2002 and completed by 31December 2005. Up to end of October 2006, there were a total of 2,436 public LPG light buses, 151 private LPG light buses and one electric light bus. Between January 2006 and the end of October 2006, around 80% of the newly registered public buses were LPG models.
Require the retrofitting of particulate removal devices on pre-Euro diesel vehicles (already commenced)	Since 2002, financial assistance has been provided for retrofitting pre-Euro heavy diesel vehicles with particulate removal devices	Financial assistance was provided in phases from December 2002 to December 2005 to retrofit pre-Euro heavy diesel vehicles with catalytic converters. All together, about 36,600 eligible vehicles were installed with catalytic converters.

Measures	Implementation Programme	Progress (Up to 30.11.2006)
		Since April 2006, all pre-Euro heavy diesel vehicles (including franchised buses), except long-idling ones were required to be installed with approved emission reduction devices. Legislative amendments will be introduced to require emission reduction devices to be installed on pre-euro heavy diesel vehicles under cranes mounted, concrete mixers, pressure tankers and gully emptiers with effect from April 2007.
Encourage vehicle owners to replace pre-Euro I commercial diesel vehicles with Euro IV models	(New item included in December 2006) A Financial incentive scheme will be introduced in the second quarter of 2007.	Preparation work underway.
Encourage members of the public to use environmentally friendly vehicles	(New item included in December 2006) With effect from 1 April 2007, a 30% reduction in the First Registration Tax will be offered, subject to a cap of $50,000 per vehicle.	Preparation work underway.
Enhance the vapour recovery systems in petrol filing stations	To introduce legislation requiring the recovery of petrol vapour emitted during vehicle refuelling at petrol filling stations was in 2003/04.	The Regulation came into effect on 31 March 2005.
Tighten motor fuel standard	Motor fuel standard will be tightened to Euro IV standard by 2005 (motor diesel standard has already been tightened to Euro IV standard since 2002).	Euro IV petrol standard came into effect on 1 January 2005.
Tighten tailpipe emission standards	To adopt Euro IV standard for tailpipe emissions from 2006.	Euro IV tailpipe emission standard was introduced on 1 January and 1 October 2006 respectively for light-duty vehicles not exceeding 2.5 tonnes and heavy-duty vehicles exceeding 3.5 tonnes.
	(New item included in December 2005) To be in line with EU in adopting Euro V motor vehicles standard for tailpipe emissions.	Planned to be in line with EU to adopt Euro V standard for tailpipe emissions.
Reduce VOC emissions from the printing process, paints and consumer products	To introduce legislation in 2004 or 2005 to require labelling of VOC content in VOC products. Legislation will then be introduced in phases to reduce the use of products with high VOC contents and to impose emission standards for the printing process.	During the public consultation held in September 2004 and subsequent discussions with stakeholders, members of the trade generally agreed to advance Phase II measure and impose limits and technical requirements on the VOC content of VOC products at an earlier date. The Government tabled the legislation at LegCo in November 2006, which started the enactment of the regulation on controlling VOC-containing products. It is expected that all VOC-containing products under control will be subject to the statutory limits in phases with effect from April 2007 onwards.

Measures	Implementation Programme	Progress (Up to 30.11.2006)
		Emission control devices must be properly installed on lithographic heatset printing machines starting from 1 January 2009, to meet the new requirements.
Reduce emissions from power stations	Effective and flexible mechanisms (which may include emissions trading) will be set up to control the total emissions of SO_2, NO_x and RSP from power station to achieve respective reduction targets by 2010.	The Government approved the emissions reduction options set out in the financial plans of the two power companies in June 2005. CLP Power Hong Kong Limited will provide desulphurization and de-NO_x systems for four of its coal-fired generating units each of 677MW. Hong Kong Electric Co. Ltd. will provide low-NO_x burners and desulphurization system for two of its coal-fired generating units each of 350MW. CLP has been increasing the use of ultra low sulphur coal and is seeking to increase natural gas supply through the development of liquefied natural gas reception facilities. HEC has formally commissioned its first natural gas generation unit of 335MW in October 2006. The first commercial scale wind turbine power generation unit of 800kW was also commissioned in Hong Kong in February 2006.
	New item included in December 2005) Control total emission from power plants.	Emission caps have been included in the SPLs granted to CLP's Castle Peak Power Station and Black Point Power Station as well as HEC's Lamma Power Station. Emission caps will gradually be tightened, with a view to reducing emission to the practical minimum and achieving the 2010 reduction targets.

Source: EPD, Implementation Progress of PRD Regional Air Quality Management Plan (as at Nov 2006).

Areas of Concern and Improvements

7.3.19 The Reference Scenario generally demonstrates the ability to improve air quality in HKSAR to a certain extent, but several areas are expected to experience increases in concentrations of one or more pollutants. Nevertheless, it should be noted that the 2030 emission inventories are projected based on a lot of assumptions and uncertainties; and the future development of the proposed NDAs, cross-boundary infrastructure, possible uses of the Closed Area and the future airport and port developments which may have territory-wide implications and would likely worsen the air quality. The predicted trend of air quality may only be achieved if many effective improvement measures materialize. Given the uncertainties in the projection, there is a chance that the air quality will deteriorate in future. In addition, the PATH modelling results only predict the district-wise air quality; it is not surprising that the modelled air quality may be different from the monitored air quality. It is important to note that the intention of the modelling is to determine trends not numerical values. Detailed environmental studies for the proposed infrastructure and developments are recommended to determine their environmental acceptability. It is therefore recommended that the components of the strategies which make up the Reference Scenario are reviewed in the future to implement more stringent measures in the future to cope with continuous development both in terms

of land use planning and technological developments. Such measures could include widening the field of application of current measures, tightening standards and supporting new technologies. Detailed measures should also be determined at the environmental assessment stage of projects.

7.3.20 In addition to further mitigating emissions from the currently dominant sources, specific actions should be considered in order to tackle rising emission sources such as aircraft movements / emissions from the airport and ship movements / emissions from the port, such as slow down ships when approaching and leaving port and switch fuel to ultra low sulphur diesel.

7.3.21 Finally, it should be noted that this assessment focuses on air quality, and no assessment of greenhouse gases emissions has been undertaken. Whilst most impacts on air quality can be partly mitigated through fuel control, technology improvement, appropriate dispersion etc., greenhouse gases emissions, in particular CO_2 emissions, are inevitably associated with all combustion sources and require more radical measures to be controlled.

7.4 NOISE

7.4.1 Aircraft noise impact is expected to increase as a result of the projected increase in the air traffic volume. The population exposure due to aircraft noise will be increased as a result. However, as most of the residential areas are remote from the existing and planned runways, the population exposure due to aircraft noise will be limited.

7.4.2 Although railway noise is also expected to increase due to the proposed new rail links such as the Hong Kong Section of Guangzhou-Shenzhen-HK Express Rail Link and Northern Link, the environmental impacts including the noise impact of any new rail links are strictly under the suitable selection of alignments and implementation of appropriate effective mitigation measures. Any unacceptable noise impact from the new rail links is not expected.

7.4.3 There will be a continual improvement to the industrial noise environment in the future, especially at the existing industrial and residential interface areas as a result of the continual decrease in industrial activities and economic transformation in Hong Kong.

7.4.4 Compared to the road traffic noise, the impact from other noise sources is insignificant. As the noise environment in Hong Kong is dominated by the road traffic noise, further quantitative assessment of the road traffic noise environment was carried out and the results are summarised in the following.

Model Inputs

7.4.5 As with the air quality assessment the assessment of the performance of the development options was assessed using a strategic model. A noise model, LIMA, was used to evaluate the noise impact over the whole territory of Hong Kong based on the existing information available for population, traffic, land uses, etc. The LIMA model was run for the same baseline, Reference Scenario and “What If” Scenario as for air quality and the interpretation of the strategies per se was

undertaken to determine any areas for improvement or enhancement of the development options.

7.4.6 The traffic data for the major distributor roads was obtained from the strategic transport model of the PlanD. As the strategic transport model does not contain secondary distributors and local roads (hereafter referred as "other local roads"), the traffic data for the other local roads was based on the Year 2000 data, the best available information for both the Baseline Scenario and Reference Scenario. As such, the predicted population exposure from this study, whilst it is reliable in a broad and comparative sense, should not be treated as a precise prediction for the future years.

7.4.7 Traffic forecasts are made with reference to the strategic transport model, which focuses on movement along major corridors between districts. Large-scale residential buildings such as those proposed in NDAs to be built after Year 2003 were included in the Year 2030 Scenario.

Assumptions

7.4.8 The noise assessment was conducted at the District Council districts level. The traffic analysis was designed for studying the overall changes in traffic in each district and not for assessing any traffic change on a particular road.

7.4.9 The basic assumptions and data input for the 2003 Baseline Scenario and the Reference Scenario have been developed using available information wherever possible. The calculation method adopted has made reference to Calculation of Road Traffic Noise (CRTN), Department of Transport, UK, 1988, which is widely adopted in other relevant published study reports.

7.4.10 Total population was evenly assigned to all residential buildings within each district, as such, a general picture can be provided. However, there is a limitation that the noise implication on new large residential developments within each district would be levelled out, potentially leading to an underestimate of the population exposure in some buildings and an overestimate in some other buildings.

7.4.11 Apart from Kwai Tsing and Islands district, there is a less than 2% difference in the traffic volume of all remaining district between SW Tsing Yi and NW Lantau container terminal options under the Reference Scenario. Based on the acoustic principle, it is generally recognised that a change of 2% or less in traffic volume would not cause significant impacts on the predicted traffic noise level. Therefore, Kwai Tsing and Islands districts were selected for noise assessment for both possible container terminal options of the Reference Scenario, whereas for the remaining districts, noise assessment were conducted in NW Lantau container terminal option under the Reference Scenario only and the population exposure level for SW Tsing Yi container terminal option under the Reference Scenario in these districts were assessed based on the modelling results obtained under the NW Lantau container terminal option of the Reference Scenario.

7.4.12 Most of the large scale residential buildings built after Year 2003 and the proposed residential buildings in NDAs were included in the Reference and "What If" Scenarios.

Summary of Results

7.4.13 The population exposed to the excessive noise environment will depend on the size of the population and the traffic volume. Under the baseline condition, the current population exposed to excessive noise level is around 1.15 million. With the projected increase in future population and traffic, the total population exposed to excessive noise level is expected to increase to some 1.40 million under both possible container terminal options of the Reference Scenario by Year 2030. However, there will be some local differences in the noise level resulting from the difference in the traffic flow between the two possible container terminal options of the Reference Scenario. Under the "What If" Scenario, the total population exposed to excessive noise level will be further increased to some 1.47 million by 2030.

7.4.14 Given this estimated high increase of overall population to high noise level, careful and early consideration to minimize the noise problems should be carefully adopted through the existing planning systems to ensure proper land use planning. Due consideration should be given to depressed roads and environmentally friendly transport systems.

Reference Scenario Performance

Short Term (2010)

7.4.15 The traffic volume is the major factor affecting traffic noise exposure levels. The larger the traffic volume, the higher would be the road noise level at the sensitive receivers. The total forecasted peak-hour traffic volume in PM peak hour of Year 2010 is about 1.8 million vehicle km which is a slight increase of 6.2% compared to the Baseline Scenario. If there is an increase in the total population and traffic volume, the population exposed to the road traffic noise impact will increase. Therefore, it is anticipated that the population exposed to road traffic noise impact will increase as both the total population and traffic volume increase by Year 2010.

7.4.16 For some districts, such as Central & Western, Islands, Kwai Tsing, Southern, Sai Kung and Tai Po, there will be an increase in traffic volume ranging from 1.8% to 25.0%. The development scenario would cause significant increase in traffic volume (an increase of about 20%) in Islands, Kwai Tsing and Southern districts. The traffic noise levels within those districts are anticipated to increase. However, it should be noted that the changes in traffic flow pattern and so the traffic noise levels at nearby residential developments will vary road by road between the baseline year and design year 2010.

Medium Term (2020)

7.4.17 The total forecast peak-hour traffic volume for the NW Lantau and SW Tsing Yi container terminal options under the Reference Scenario is expected to increase by 35% and 33% respectively compared to the baseline scenario.

7.4.18 All the districts will have an increase in traffic volume compared with the baseline year, ranging from 9% to 143%. Therefore, the total population exposed to the road traffic noise impact is anticipated to increase due to the increased traffic volume in Year 2020.

7.4.19 The different container terminal development options will lead to some noticeable differences (>2%) in traffic volume in Islands, Kwai Tsing and Tsuen Wan districts between the two possible container terminal options under the Reference Scenario. According to the modelling results, the increase of traffic noise impacts would be more pronounced in Tsuen Wan and Islands districts for the NW Lantau container terminal option under the Reference Scenario while the traffic noise impact would be most noticeable in Kwai Tsing district for the SW Tsing Yi container terminal option under the Reference Scenario. The traffic noise impacts on the remaining districts would be similar between the two container terminal development options.

Long Term (2030)

7.4.20 In the NW Lantau container terminal option under the Reference Scenario, compared to the Baseline Scenario, there will be an increase in the population exposed to a road traffic noise level of >70 dB(A) in Central and Western (0.3%), Islands (12.6%), Kwai Tsing (3.7%), Sham Shui Po (0.5%), Southern (0.7%), Tsuen Wan (0.7%), Wong Tai Sin (7.6%) and Yau Tsim Mong (1.4%) districts. A reduction in the population exposure to excessive noise level has been predicted for Eastern (0.7%), Kowloon City (3.8%), Kwun Tong (2.0%), North (3.6%), Sai Kung (2.4%), Sha Tin (0.6%), Tai Po (1.1%), Tuen Mun (3.4%), Wan Chai (1.5%) and Yuen Long (0.6%) districts.

7.4.21 The traffic volume differences between the two possible container terminal options under the Reference Scenario are only seen in Islands and Kwai Tsing districts (pending the decision on the container terminal location) where the new container terminal is to be located. According to the noise modelling results, for Islands district, the population exposed to a road traffic noise level of > 70dB(A) under the SW Tsing Yi container terminal option of the Reference Scenario is 5 % of the district population whilst it is 13% under the NW Lantau container terminal option of the Reference Scenario. For Kwai Tsing district, the population exposed to a road traffic noise level of > 70dB(A) is similar under both possible container terminal options under the Reference Scenario, at around 23 % of the population in the district.

7.4.22 The total population exposed to a road traffic noise level exceeding 70 dB(A) will be similar under both possible container terminal options of the Reference Scenario (i.e. 23.9% and 22.7% for SW Tsing Yi and NW Lantau container terminal options respectively) and the “What If” Scenario, at about 1.40 million, or 17% of the total projected population.

7.4.23 Preliminary noise assessment was conducted for the NDAs to identify major noise sources and allow the planners to refine the layout plans to reduce the potential traffic noise impact. However, the proposed development plans of the NDAs are preliminary at this stage and the predicted noise levels are indicative only. The traffic forecast of some of the local access roads is not available at this stage and thus not included in the noise model. Detailed noise assessment for these developments will be required to quantify the traffic noise impact and to identify necessary noise mitigation measures when the development plans are finalised and the planning details become known.

Planned Polices / Government Commitments

7.4.24 A number of noise abatement programmes were assumed to be committed/planned, including:

- Highway Resurfacing Programme
- Retrofitting Noise Barrier Programme
- Low Noise Material Resurfacing

Areas of Concern and Improvements

7.4.25 Due to the port development, the traffic volumes are expected to increase dramatically at some roads serving the port activities. As some of the residential buildings are located in the vicinity of these roads, the population exposed to excessive traffic noise impact would increase significantly compared to the Baseline Scenario.

7.4.26 It is recommended to pay special attention to the road segments below:

- North side of North Lantau Highway near Coastal Skyline, Caribbean Coast, Monterey Cove, North Lantau New Town (East); and
- North Lantau Highway Connection of Hong Kong-Zhuhai-Macao Bridge (HZMB) near North Lantau New Town (East).

7.4.27 While the noise impact arising from new road sections will be assessed and noise mitigation measures implemented to reduce the traffic noise impact, the feasibility of retrofitting barriers on existing roads should be separately considered but it should be noted that there may be difficulties due to on site technical constraints. For new residential developments, appropriate detailed design of the layout and adoption of effective direct noise mitigations should be explored and determined.

7.5 WATER RESOURCES AND WATER QUALITY

Assumptions

7.5.1 It is important to note that there is no new reclamation has been assumed under HK2030 and thus no major changes to the coastline or geometry is anticipated[9]. In addition, the proposals for the new container terminal location have been subject to a detailed assessment in the Study on Hong Kong Port – Master Plan 2020. Other major committed or planned coastal developments have been assessed under Update on Cumulative Water Quality and Hydrological Effect of Coastal Developments,

9 The Governments of Guangdong, Hong Kong and Macao have commissioned a consultant to conduct a study on the locations and arrangements of the Boundary Crossing Facilities (BCF) under the mode of "Separate Location of BCF" for the HZMB. In addition, Highways Department has commissioned studies for the proposed highway infrastructure projects proposed under the Northwest New Territories Traffic and Infrastructure Review. Some of the NWNT proposed infrastructures and the Hong Kong BCF of the HZMB, if finally decided to be located in Hong Kong waters, may involve reclamation.

Hong Kong Section of Hong Kong – Zhuhai – Macao Bridge and Connection with North Lantau Highway – Investigation. The future changes in the sewage and treatment levels were also assessed under Update on Cumulative Water Quality and Hydrological Effect of Coastal Developments and the major further changes are currently the subject of relevant detailed EIAs. The water quality assessment therefore reviewed the findings of existing studies and existing modelling assessments, collated the information and interpolated the findings assuming the Reference Scenario were to be adopted. No "What If" Scenario was considered in this case. As detailed EIAs of some relevant strategic developments were not available at the time of this Study, the potential impact of those developments was not fully addressed in this Study. Most of the existing strategic studies dealt with more than one pollution sources. Mainly by means of interpolation and extrapolation of the findings of those existing studies meant that this strategic water quality assessment could only be qualitative in most aspects.

Short Term (2010)

7.5.2 The bacterial level in Victoria Harbour WCZ and Western Buffer WCZ are expected to decrease significantly due to the provision of the disinfection facilities at Stonecutters Island Sewage Treatment Works (SCI STW), which, combined with the implementation of the local sewerage schemes, would enable the re-opening of the bathing beaches in the Tsuen Wan area.

7.5.3 The greatest proportion of the population increase up to 2010 would be experienced in Western Buffer WCZ, with an additional 0.2 million people recorded in the catchment area. In spite of the additional pollution load, the advanced disinfection facility at SCI STW would lead to a significant improvement in the water quality in this WCZ in terms of the bacterial level. North Western WCZ would have a growth of about 0.1 million (11.5%) people in this time period, leading to additional water quality stress in this WCZ. The population changes in the other WCZ catchments are minor and are not expected to have noticeable water quality changes.

7.5.4 Central Reclamation Phase III (CRIII) will reduce the tidal current speeds through Victoria Harbour, but has no noticeable effect on the water quality. The scaled down reclamation for Wanchai Development Phase II (WDII) and Central-Wanchai Bypass (CWB) will have been partially completed.

7.5.5 The Hong Kong – Shenzhen Western Corridor would lead to some minor reduction in the average flushing capacities of Deep Bay, but its impact on the water quality is believed to be negligible.

7.5.6 A new container terminal is being planned and the construction work is scheduled to start during this planning horizon. The selection of the new container terminal at North West Lantau involves reclamation, dredging of approach channels and construction of port facilities and could expand over a long time period. During the construction stage, the NW Lantau container terminal option under the Reference Scenario would lead to elevated Suspended Solid (SS) levels in North Western WCZ, resulting from the dredging and filling for the reclamation programme. The physical presence of the new container terminal would have the potential to disrupt the sewage outfall at Tai O STW.

7.5.7 On the other hand, the selection of the new container terminal at SW Tsing Yi under the Reference Scenario would adversely impact upon Victoria Harbour, Western Buffer and Southern WCZs as it would involve elevated SS levels due to dredging and filling for land reclamation. The physical presence of the container terminal will alter the tidal flow patterns in the Western Buffer WCZ and hence would adversely affect the dispersion of the pollution discharged from the SCI STW. The container terminal facilities should be carefully designed to minimise the impact on the dispersion of the HATS effluent.

Medium Term (2020)

7.5.8 Generally, there is expected to be an improvement in overall water quality within HKSAR in 2020, compared with the baseline condition and Year 2010. The local pollution load discharged from HKSAR to Deep Bay, North Western and Southern WCZs will be significantly reduced. As a result, the background pollution level from the Pearl River and the Shenzhen catchment is expected to be more influential to the water quality in those WCZs, particularly in terms of the nitrogen level.

7.5.9 An 80 per cent increase of population growth is assumed within the catchment of North Western WCZ by receiving the sewage effluent transfer from Deep Bay WCZ. It has been proposed to disinfect the treated effluent of Yuen Long STW, currently discharged into Deep Bay WCZ, at San Wai STW. The effluent of San Wai STW discharges to Urmston Road (North Western WCZ) via the NWNT effluent tunnel. As such, this water body will have significant additional sewage flows. However, as the upgrading of Pillar Point STW and San Wai STW will have been completed, and the treatment increased from preliminary to CEPT, the total pollution load discharged into North Western WCZ is expected to decrease as a result.

7.5.10 In the medium-term, HATS Stage 2A will have been completed and provision of the disinfection facility at SCI STW and the completion of the sewage transfer from the Hong Kong Island to SCI STW for a higher treatment would substantially reduce the pollution load discharged into Victoria Harbour and the bacterial load into Western Buffer WCZ. As a result, the water quality in Victoria Harbour, Western Buffer, Southern and North Western WCZs will all benefit from HATS Stage 2A.[10]

7.5.11 The corresponding reduction in population in the HKSAR catchment of Deep Bay WCZ will reduce the pollution load discharged into Deep Bay WCZ, but its effect on the Deep Bay water quality will much depend on the pollution contribution from the Shenzhen catchment.

7.5.12 The population changes in the other WCZ catchments are minor and are not expected to have noticeable water quality effect.

7.5.13 The scaled down reclamation for WDII and CWB, which is not expected to have

10 HATS Stage 2B will add biological treatment to the facilities at Stonecutters Island STW, although its timing will depend upon a review of water quality trends, population increases and sewage flow build up, to be undertaken in 2010-2011. Implementation of HATS Stage 2B would further improve the water quality, particularly in terms of the organic pollutants and nitrogen level in those WCZs.

significant water quality impact, will have been completed. Development at Kai Tak will have been partially completed.

7.5.14 It is assumed that the construction of the port facilities will have been partially completed within this timeframe. During the container terminal construction stage, the NW Lantau container terminal option would lead to an elevated SS levels in North Western WCZ, resulting from the dredging and filling for the reclamation programme. The physical presence of the new container terminal would have the potential disruption to the existing sewage outfall of Tai O STW and will require the re-provision of the outfall.

7.5.15 During the container terminal construction stage, the SW Tsing Yi container terminal option would lead to elevated SS levels in the Western Buffer WCZ, resulting from dredging and backfilling activities. The physical presence of the container terminal will alter the tidal flow patterns in the Western Buffer WCZ and hence adversely affect the dispersion of the pollution discharged from the SCI STW. The port facilities should be carefully designed to minimise the impact on the dispersion of the HATS effluent.

Long Term (2030)

7.5.16 The local pollution load discharged from Hong Kong to Deep Bay, North Western and Southern WCZs will be significantly reduced. As a result, the background pollution level from the Pearl River and the Shenzhen catchment will, relatively speaking, become more influential to the water quality in those WCZs, particularly in terms of the nitrogen level.

7.5.17 Western Buffer WCZ catchment would experience the greatest growth in population, with an increase of about 1.3 million in this catchment. About 37% of this population growth is associated with sewage transfer from Hong Kong Island to SCI STW under the HATS Stage 2A. The water quality in Victoria Harbour, Western Buffer, Southern and North Western WCZs will all benefit significantly from HATS Stage 2A. In particular, the bacterial level in Victoria Harbour WCZ and Western Buffer WCZ is expected to decrease significantly from the provision of the disinfection facilities at SCI STW, which, combined with the implementation of the local village sewerage schemes, would lead to the re-opening of the bathing beaches in the Tsuen Wan area.

7.5.18 There is expected to be a 98% growth in population within the catchment for North Western WCZ by receiving the sewage effluent transfer from Deep Bay WCZ. As such, this water body will have significant additional sewage flows. It is expected that the majority of these would receive CEPT or higher level treatment at San Wai STW or Pillar point STW before discharge. The total pollution load discharged into North Western WCZ is expected to decrease as a result. There should be continued programmes for upgrading the treatment facilities in terms of capacity, and treatment level so as to cater for population growth, and any water quality needs. The corresponding reduction in population in the Deep Bay WCZ will reduce the pollution load discharged from the HKSAR catchment into Deep Bay WCZ, but its effect on the Deep Bay water quality will be much dependent on the pollution contribution from the Shenzhen catchment.

7.5.19 The population changes in the other WCZ catchments are minor and are not expected to have noticeable water quality effect.

7.5.20 The scaled down reclamation for WDII and CWB, which is not expected to have significant water quality impact, will have been completed. KTD will have been completed, but is not expected to cause any adverse water quality impact according to the latest development concept.

7.5.21 The construction of the new container terminal will have been completed. The selection of the new container terminal at North West Lantau, due to the physical presence, would have the potential to cause disruption to the existing sewage outfall of Tai O STW and will require the re-provision of the outfall. It has little impact on the marine water quality in HKSAR.

7.5.22 The selection of the Tsing Yi container terminal option, on the other hand, is expected to result in some adverse impact on the dispersion of the pollution discharged from the SCI STW due to the physical presence of the container terminal. The port facilities should be carefully designed to minimize the impact on the dispersion of the HATS effluent.

Planned Polices / Government Commitments

7.5.23 The HKSAR Government aim to ensure that the quality of the marine and freshwater is such that the various conservation goals for them can be met, and that plans are formulated and implemented to ensure Hong Kong's sewage systems can operate safely and effectively both now and with future urban development. These include:

- HATS Stage 2A is to be completed by around 2014 to transfer the sewage from Hong Kong Island North and Northwest to SCI STW for treatment before discharge.
- A disinfection facility at SCI STW will be in place by 2009 to reduce the bacterial level in Victoria Harbour and in Tsuen Wan beaches.
- A review will be conducted in 2010/11 to determine the timing of HATS Stage 2B. It will take into account the then population growth, sewage flow build-up, and harbour water quality. Implementation of HATS Stage 2B will be subject to acceptance by the community that the full recurrent costs of the scheme should be recovered through sewage charges.
- SMPs and village sewerage schemes are being implemented.
- The EPD is working with the Shenzhen Environmental Protection Bureau to control the Deep Bay Water Pollution.
- The “Total Water Management” policy has been launched to reduce water consumption, to minimise water wastage and to explore alternative water resources.

Areas of Concern and Improvements

7.5.24 Hong Kong currently heavily relies on importing Dongjiang River for its water supply. Some 80% of the water supply is from Dongjiang River. As other cities in

Guangdong are also fighting for more and more water supply from Dongjiang River, there is likely to come a time when greater demand management is invoked in Hong Kong to reduce per capita consumption.

7.5.25 The marine water quality in Deep Bay, North Western and Southern WCZs is subject to the influence of cross-boundary pollution. In addition to Hong Kong's own effort needed in reducing the pollution load discharged into those WCZs, the water quality improvement in those WCZs will also require a close liaison with the mainland authorities.

7.5.26 There should be continued programmes for upgrading the treatment facilities in terms of capacity and treatment level so as to cater for population growth and any water quality needs. The effort would help Hong Kong to achieve the status as a World City in Asia.

7.6 WASTE

Short Term (2010)

7.6.1 The quantity of MSW generated is proportional to the population and its affluence. The population assumed for year 2010 is 7.2 million, which is about 5.7% increase as compared to those of baseline year (6.8 million). Per capita waste generation has levelled off in recent years but is unlikely to fall until avoidance, reduction, reuse and recycling of domestic waste are practiced by the majority of the population. It can therefore be assumed that the quantity of MSW generated will continue to rise in line with increases in population as a minimum.

7.6.2 Notwithstanding, the *MSW Policy Framework* has set a target to reduce the amount of MSW generated by 1% per annum (based on 2003 levels) up to 2014. To achieve a proportion of this target in the short-term (up to 2010) is not considered likely unless a charging scheme for MSW can be implemented – current planning is for this legislation to be put before LegCo in 2007.

7.6.3 Construction waste continues to form a significant part of the total solid waste generated in Hong Kong, however, the recent introduction of the Construction Waste Charging Scheme has resulted in a noticeable reduction in the quantity of such waste being disposed at landfill. The export of construction waste to the Mainland for reuse as reclamation fill has commenced and it is anticipated that the existing Fill Banks (stockpiles of construction waste in Hong Kong) will be emptied by 2010.

7.6.4 In terms of infrastructure, EcoPark Phase I is expected to be opened in early 2007 with Phase II scheduled for 2009 or earlier. The North New Territories RTS is scheduled for 2008 but it is likely that this will slip to 2010, or later, since the feasibility studies have not commenced and funding has not yet been secured. The availability and capacity of the existing waste management infrastructure to deal with the assumed increase in waste generation is sufficient in the short-term and no problems are foreseen.

7.6.5 To complement the expansion of waste management infrastructure, institutional arrangements will be in place. These include MSW charging after 2007 and

Producer Responsibility Schemes (PRS) for Waste Electrical and Electronic Equipment, vehicle tyres, plastic shopping bags, packaging materials, beverage containers and recyclable batteries from 2007 to 2009.

7.6.6 The construction of the new container terminal at Lantau if selected involves significant initial dredging of approach channels and significant maintenance dredging throughout the operation life of the container terminal. The disposal of such large quantities of dredged material will cause significant impact to the limited capacity of the existing mud disposal areas.

7.6.7 The construction of the new container terminal at Tsing Yi if selected involves less significant initial dredging of approach channels and less significant maintenance dredging throughout the operation life of the container terminal. As such, the disposal of smaller quantities of dredged material will cause less impact to the limited capacity of the existing mud disposal areas.

Medium Term (2020)

7.6.8 Population is assumed to continue to increase in the medium-term. Even with a fall in the per capita waste generation (brought about by successful adoption of avoidance, reduction, reuse and recycling of domestic waste by the majority of the population) it is still likely that the quantity of MSW generated will continue to rise.

7.6.9 The *MSW Policy Framework* extends only to 2014 and further policy will need to be prepared thereafter. Notwithstanding, the *MSW Policy Framework* anticipates the implementation of significant new waste management infrastructure before the end of the medium-term. This will include the South East Kowloon RTS in 2012, or later, extension of the three existing landfills (SENT and NENT in 2011 and WENT in 2014) and new Integrated Waste Management Facilities from 2014 onwards.

7.6.10 To complement the expansion of waste management infrastructure, further institutional arrangements will be in place. These may include PRS for additional waste types and landfill bans for those materials already subject to PRS.

7.6.11 Construction waste will continue to form a significant part of the total solid waste generated in Hong Kong, particularly as buildings age and are demolished instead of being refurbished. The export of C&D material to the Mainland for reuse as reclamation fill will continue and therefore disposal within Hong Kong is likely to be less of an issue.

7.6.12 The operation of the new container terminal at North West Lantau, if selected, will involve significant maintenance dredging. The disposal of such large quantities of dredged material will continue to cause significant impacts to the limited capacity of the existing mud disposal areas, which may have to be extended or replaced during the medium-term.

7.6.13 On the other hand, the operation of the new container terminal at South West Tsing Yi, if selected, will involve less significant maintenance dredging. Nevertheless, the disposal of smaller quantities of dredged material will still impact on the limited capacity of the existing mud disposal areas, although these may not need to be extended/ replaced during the medium-term.

Long Term (2030)

7.6.14 Population is assumed to continue to increase in the long-term. With the continuing fall in the per capita waste generation (brought about by successful adoption of avoidance, reduction, reuse and recycling of domestic waste by the entire population) it is anticipated that the quantity of MSW generated will have stabilised or even begun to decrease.

7.6.15 The *MSW Policy Framework* extends only to 2014 and further policy will need to be prepared thereafter. There is no current plan for development of further waste management infrastructure in the long-term, however, it is anticipated that all waste management infrastructure existing at that time will be in use.

7.6.16 It is likely that further institutional arrangements will be in place to manage waste. These may include PRS for a wider range of waste types, escalating waste charging and the extension of landfill bans to all organic waste.

7.6.17 Construction waste will continue to form a significant part of the total solid waste generated in Hong Kong, although less so as new technology and community expectations will lead to more old buildings being refurbished instead of being demolished. It is further anticipated that construction waste recycling facilities will be widely available to reduce the need to export construction waste to the Mainland to be reused as reclamation fill.

7.6.18 The operation of the container terminal at North West Lantau, if selected, will involve significant maintenance dredging. The disposal of such large quantities of dredged material will continue to cause significant impacts to the limited capacity of the existing mud disposal areas, which may have to be further extended/replaced during the long-term.

7.6.19 On the other hand, the operation of the new container terminal at South West Tsing Yi, if selected, will involve less significant maintenance dredging throughout the operation life of the container terminal. Nevertheless, the disposal of smaller quantities of dredged material will still impact on the limited capacity of the existing mud disposal areas, which may have to be extended/replaced during the long-term.

7.7 ENERGY AND NATURAL RESOURCES

Renewable Energy

7.7.1 The renewable energy refers to the energy resources other than the traditional fossil fuels and atomic energy. Compare to 5% total electricity produced by renewable sources in the UK, Hong Kong's less than 0.2% is far lagged behind partly due to the limited land and natural resources. The various forms of renewable energy are being explored by the Government, electricity companies, educational institutions, and different green groups. With the target to reduce the reliance on fossil fuels, the effective use of renewable energy resources will also help to reduce greenhouse gas emissions arising from the burning of coal, gas and oil.

7.7.2 In the first Sustainable Development Strategy for Hong Kong promulgated by the Government in May 2005, the Government set down the target of having 1-2% of

Hong Kong's total electricity supply met by renewable energy by 2012. The commencement of the first commercial-scale wind turbine in 2005 marked a milestone in the use of renewable energy in Hong Kong. Studies and tests were carried onward to investigate the future prospect of the clean energy, including the feasibility and environmental impacts of on-shore and off-shore wind farm.

7.7.3 The development of the NDAs creates opportunities for promoting the use of renewable energies and new energy technologies, green-building designs and energy-saving features incorporated into the design of new housing estates. The building integrated solar PV system advocated by the EMSD could also have potential development in the NDAs. It is recommended that specific energy reduction target be set at the planning stage of the NDAs with reference to the available energy-saving technologies and types of renewable energies.

Energy Consumption and Climate Change

7.7.4 The burning of fossil fuels is closely linked to the climate change because of the generation of the greenhouse gas – CO_2. Hong Kong ranked 66th in the world in 2003 in terms of the total fossil fuel CO_2 emission according the Carbon Dioxide Information Analysis Centre of the US Department of Energy. The population and economic growth will continue to add pressure to the ultimate target of reduction of CO_2 emission. Exploration of energy efficiency and conservation will play important roles apart from the renewable energy sources; meanwhile, the balance between energy security and tackling climate change will be a great challenge for the Government and the energy companies in the medium and long-term.

7.7.5 The effect of the town planning on the use of energy could be significant. The development of the NDAs in the New Territories potentially boosts energy consumption in view of the increased traffic requirement. The relocation of population to the NDAs means that more people will travel a longer distance everyday to satisfy their needs. Transport planning will be of particular importance in this regard. A comprehensive plan for the mass transport taking consideration of the traffic, transport, land, environmental, sustainability, political, social, and economic factors could possibly reduce the use of fuels and energy in transport and should be part of a comprehensive energy strategy.

7.7.6 From the estimations of vehicle-kilometre-travelled (VKT) data of the NW Lantau and SW Tsing Yi container terminal options under the Reference Scenario and the "What If" Scenario, the scenarios differ only by less than 2% (NW Lantau container terminal option has larger VKT since the container terminal is more distant to the metropolitan area). The two scenarios are therefore similar in terms of energy consumption.

7.7.7 Regarding the fuel use of marine and aircraft, with the increase in the container throughput and Container Terminal 10 in place, marine traffic activity will be increased subsequently, it implies the fuel use in marine traffic will be increased and more air pollutants will be emitted. Apart from the growth of marine traffic activity, aircraft activity will also increase and it implies that the fuel use in aircraft will be increased and more air pollutants are likely to be emitted. It is recommended that more control measures should be explored such as the control of fuel quality in terms of sulphur content used in marine vessels; and investigate the opportunity for

the further improvement of the combustion process of both marine vessel and aircraft.

7.8 LAND USE AND LANDSCAPE

7.8.1 Hong Kong has no cohesive territory-wide landscape conservation and planning policy for non-designated landscapes. Historically, landscape and visual issues have been given low priority in the planning of public works, resulting in the loss of significant areas of natural but non-designated landscapes. Some legislations are in place to enable the prediction and judgement of the magnitude and significance of the impacts that new development/redevelopment may have on landscape resources/characters and visual amenities.

7.8.2 Lantau Island is described as one of the underlying landscape character areas in Hong Kong. The west of the island is characterised by the high exposed peaks (such as Lantau Peak) and dramatic coasts. For the part west of Tung Chung Road, approximately over 70% of the area is covered by the two country parks viz. Lantau North and Lantau South Country Parks. The former fishing village Tai O at the western end is also a key landscape character of this geographical region. Its extensive stilted houses built above tidal waters are one of the distinctive features in Hong Kong either in terms of landscape or cultural heritage. This western end portion other than some areas in SENT and NENT is recognised as one of the last significant areas of relatively untouched countryside in the territory.

7.8.3 In terms of landscape resources, about 300ha of open water north of Fu Shan, Tai O will be lost under the container terminal development option in North West Lantau. Open water is not rare throughout Hong Kong and also not ranked as important landscape resource in this region. However, as the NW Lantau container terminal option under the Reference Scenario is located in the area of relatively untouched countryside, the impact on the regional landscape character is thus to be highly negative.

7.8.4 Apart from the steep upland along the ridgelines, the north-eastern part and the fringe of Tsing Yi Island are classified as Urban and Urban Fringe Landscapes respectively in the Study on Landscape Value Mapping of Hong Kong. The SW Tsing Yi container terminal option under the Reference Scenario will wholly lie on the existing industrialised areas. The change of land use from the current oil depot to the proposed port facilities will not have significant alteration to the landscape character of this geographical region and thus the impact is evaluated as neutral.

7.9 RISK

Introduction

7.9.1 It is essential that the risks associated with any present or future Potentially Hazardous Installation (PHI) are fully evaluated at the project level in the EIA process. For the planning process it is important to note that such facilities may impose severe constraints on the location, design and composition of nearby developments, such as a New Development Area (NDA). The reason is that a newly-developed zone, whether residential, industrial or commercial, or a combination of these, will have its own demands for essential facilities and services. Examples of

these include utilities (such as water, gas and electricity), transport links, employment opportunities and community facilities.

7.9.2 In this section, future PHIs which are proposed or planned to be built between now and 2030 will be identified. Their potential risks to the surrounding environment, including any proposed NDAs, will be outlined. Conversely, the impact of any future NDAs on existing PHIs will also be looked at. There will also be a brief overview of some PHIs which are due to be downgraded.

2003 Baseline Scenario

7.9.3 There were 33 PHIs located in Hong Kong in 2003. This number has since been reduced to 32 following the closure of a chlorine storage plant in South West New Territories.

2030 Reference Scenario

7.9.4 With the further growth of Hong Kong comes the potential for new PHIs with resulting planning issues. Ideally, a PHI should be located away from any present or planned NDAs or populated area in order to reduce the risks associated with any possible catastrophic event, such as an explosion. Apart from such facilities themselves, potential hazard issues may also arise from exposure of their respective local distribution networks to the surrounding environment, particularly populated areas. Other facilities which are to be in place by 2030 include the Liquefied Natural Gas Plant proposed by China Light and Power. This had been approved with conditions in April 2007 under the EIAO process. All other potential PHIs will similarly have to be addressed in detail under the EIA and associated ordinances.

7.9.5 In addition to any new PHIs, some existing PHIs are also planned to be downgraded or even declassified or decommissioned, resulting in a reduction or elimination of hazardous chemical risks and providing opportunities for development in the nearby areas.

7.9.6 One example of a proposed future PHI is the Liquefied Natural Gas (LNG) plant by CLP. Two potential sites have been proposed, one on the South Soko Islands off Lantau Island and another at Black Point in the North West New Territories. Of the two options, CLP has expressed its preference for South Soko Islands. The installation is scheduled to commence operation in the early 2010s. Possible planning constraints may concern not only the surrounding area near the proposed location of the facility, but also CLP's existing power plant at Black Point, which would use the LNG for power generation, and the distribution network which would pipe the LNG between these two plants. Such constraints, regardless of their significance, should nevertheless be raised and examined in future detailed assessments.

7.9.7 In addition, land for future PHI sites has been identified at Tseung Kwan O (TKO) Area 137 and Tuen Mun Port. However, both areas, in particular TKO Area 137, have competing land uses and extra attention would be required regarding the size, location and type of PHI intended. Furthermore, an aviation fuel depot at Tuen Mun Area 38 is under consideration.

7.9.8 A biological treatment facility is also planned at the Stonecutters Island Sewage Treatment Works. Various types of treatment are being considered, although the precise type is not yet confirmed and most treatments do not specifically require hazardous materials to be stored on-site. At this stage, the potential need for such storage should not be ruled out, particularly where such a treatment facility would form part of the existing treatment works where chlorine is already stored.

7.9.9 Issues regarding PHIs are not confined to fixed plants, nor the distribution network of fuel and natural gas between such locations and developed areas. A further consideration is the extent to which the delivery of hazardous chemicals via major transport networks to the appropriate PHI passes through existing urban/developed areas.

7.9.10 The SW Tsing Yi container terminal option under the Reference Scenario has the more significant consequences with regard to hazardous materials, requiring the relocation and re-provisioning of PHIs such as LPG and oil depots and the remediation of oil terminal facilities (a major waste management issue).

7.9.11 The NW Lantau container terminal option under the Reference Scenario also has potential future issues with PHIs. One major issue would be the building of new storage facilities for dangerous chemicals, even if this would be only a transient measure. Another point is the need to transport such chemicals through densely-populated urban areas to more permanent storage locations.

7.10 ECOLOGY

Terrestrial Ecology

7.10.1 According to the footprint of the NW Lantau container terminal option under the Reference Scenario, there will be no planned development on the landmass of the Lantau Island. All the terrestrial habitats zoned in Conservation Area (CA), Coastal Protection Area (CPA) and Green Belt (GB) under the recommended Outline Development Plan of Tai O will thus not be directly impacted by the proposed scenario. Other important habitat in the vicinity also includes the mangal habitat in Yi O. As the potential North West Lantau container terminal is proposed to be constructed entirely as an offshore island, no ecological impacts on the terrestrial habitats / species are therefore anticipated.

7.10.2 For the SW Tsing Yi container terminal option under the Reference Scenario, the container terminal is proposed to be built along the existing industrial areas on the southern coast of the island. According to the SEA of the Study on Hong Kong Port – Master Plan 2020, no issue of terrestrial ecological concern was identified. However part of the GB in South Tsing Yi was rezoned to SSSI in 2005 to recognise the importance of the site for a rare plant species *Croton hancei*. Reported in Issue No. 12 of AFCD's Newsletter Hong Kong Biodiversity, this SSSI in Tsing Yi is the only known site with living individuals of this endemic rare species. The SSSI is located at least 500m away from the proposed container terminal location and buffered by an area of Green Belt. No adverse impact was anticipated from this scenario. However impact assessment on this SSSI is recommended for the special ecological importance of the site.

7.10.3 According to the Reference Scenario presented in **Appendix B**, some infrastructure proposals and NDAs would have impact on some areas of conservation concern. For instance, Kwu Tung North NDA is not far from the freshwater habitat in Long Valley. Furthermore, the substantial strengthening of linkages between Hong Kong SAR and the Mainland especially Shenzhen, and the associated proposal of the opening of the Frontier Closed Area (FCA) would inevitably affect the previously untouched habitats along the cross-boundary. The New Nature Conservation Policy also introduced a new pilot scheme for two new measures, viz. the management agreements and private-public partnership, to enhance the conservation of ecologically important sites under private ownership.

Marine Ecology

7.10.4 As the NW Lantau container terminal option under the Reference Scenario would be offshore, impact on the marine ecology was anticipated to be more direct and significant. Waters north and west of Lantau are areas where the Chinese White Dolphin (*Sousa chinensis*) regularly occurs. The dolphins are protected in Hong Kong by the Wild Animals Protection Ordinance (Cap.170). The species is listed as "Insufficiently Known" in the IUCN Red Data Book, and is listed in Appendix I (i.e. highest protection) of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). In China, it is listed as a "Grade 1 National Key Protected Species".

7.10.5 The dolphins heavily use the waters around Sha Chau, Lung Kwu Chau and north Lantau. Water around Tai O is also part of their home range. These animals feed on several species of demersal and pelagic fish and associate with a number of types of fishing vessels particularly pair trawlers. According to the Port Survey 2001/2002 conducted by AFCD, waters around Tai O have a medium fisheries production. Reclamation required for the construction of the proposed container terminal will permanently convert this area of coastal waters into a piece of land, which will result in a permanent loss of these animals' habitats and feeding grounds.

7.10.6 Indirect impact on the dolphins includes disturbance from increased vessel traffic. After the completion of the proposed container terminal in North West Lantau (if selected), the vessel traffic passing through the North Lantau would be inevitably increased. Higher rate of competition of navigation and collision with vessel is likely to cause more stress to the animals. Another significant operational impact would be the disturbance during conducting maintenance dredging.

7.10.7 Although sensitive ecological resources of Lantau marine also comprise Finless Porpoise *Neophocaena phocaenoides*, Horseshoe Crab *Tachypleus* sp. and seagrass beds, these ecological receivers are located far away from the proposed area of the port facilities. Therefore the key ecological issue would be the potential adverse impact on the Chinese White Dolphins.

7.10.8 Under the SW Tsing Yi container terminal option of the Reference Scenario, over half of the port facilities will be constructed on the existing industrial land use i.e. oil depot while the remaining will be built on the sub-tidal waters to be reclaimed.

7.10.9 Distribution of ecological sensitive receivers including Chinese White Dolphin, Finless Porpoise and coral communities was reviewed. All of them were found

located far away from the Project areas. The closest home range of Chinese White Dolphin is located at least 1km away from the proposed port development site and that of Finless Porpoise is much further. One hard coral community is located at Kau Yi Chau. As coral is sensitive to elevated suspended solids (SS), impact level will depend on the effectiveness of the mitigation measures and control of the water quality during the construction and operational stages of the proposed port development. However taking into the account of the large separation distance between the proposed port and Kau Yi Chau, the impact is not likely to be significant.

7.11 CULTURAL HERITAGE

7.11.1 The heritage resources are under significant threat from new development, particularly in urban areas where older buildings with no statutory protection have been demolished to make way for new schemes rather than being incorporated into urban redevelopment programmes. In addition, the areas of highest potential for heritage resources are often in coastal regions where the pressure for new developments and reclamation is greatest. Rural areas are also under increasing threat from encroachment of developments, particularly in growth areas where the lack of development controls on private land is threatening many traditional village buildings and other cultural features.

7.11.2 The problems encountered in the conservation of cultural heritage resources are multi-faceted, interwoven with issues like development pressure due to shortage of land; inadequate resources to restore and maintain a historical building; lack of financial or planning incentives to compensate the owner's loss if the resources are under private ownership; and absence of an integrated policy to facilitate a better co-ordination for declaration of monuments etc.

7.11.3 Broadly speaking, the development proposals included under the Preferred Development Option formulated on the basis of the Reference Scenario are considered acceptable subject to further cultural and heritage impact assessments be undertaken to ensure the heritage conservation acceptability of the affected heritage sites in the planning and implementation stage.

7.12 "WHAT IF" SCENARIO

7.12.1 The "What If" Scenario, with the future container terminal locations assumed at northwest Lantau, was modelled to ascertain the implications of a "worst case" situation as "sensitivity" test under the HK2030 SEA.

7.12.2 The implication on air quality under the "What If" Scenario exhibits a general small increase in SO_2 concentration in Kowloon, New Territories and NW Lantau. It is due to the increase in road traffic emissions and marine vessel emissions. For NO_2, an increase in NW Lantau is expected; it is the results of increase in marine traffic activities. For O_3, a decrease in North West Lantau is anticipated; this can be explained by the increase in NO_x concentrations in NW Lantau container terminal option under the Reference Scenario as the increase in marine NO_x emissions which lead to lower ozone level. In general, model results of the "What If" Scenario show similar pattern as NW Lantau container terminal option under the Reference Scenario.

7.12.3 As for noise impact, the total population exposed to a road traffic noise level exceeding 70 dB(A) will be similar under both possible container terminal options of the Reference Scenario and the "What If" Scenario, at about 1.40 million, or 17% of the total projected population.

7.12.4 It is also observed that the population exposed to a road traffic noise level of exceeding 70 dB(A) is similar between the two scenarios. For Central and Western, North, Tai Po, Tuen Mun and Yuen Long districts, the differences are less than 0.5%. The number of population exposed to excessive traffic noise impact would slightly increase in Central and Western, Tuen Mun and Yuen Long districts due to the increase in traffic volume.

7.12.5 For Tai Po district, the population exposed to excessive traffic noise impact is expected to decrease slightly. This is due to the changes in the traffic flow pattern in "What If" Scenario. The traffic flow of the roads within the town centre would decrease slightly whereas the traffic flow of Tolo Highway would increase compared to the NW Lantau container terminal option under the Reference Scenario, resulting a reduction in the number of population exposed to excessive traffic noise impact. For Islands district, the population exposed to a road traffic noise level of > 70 dB (A) in "What If" Scenario is 4.9 % higher than those of the NW Lantau container terminal option under the Reference Scenario. This is mainly due to the increase in both traffic volume and population.

7.12.6 Compared to the road traffic noise, the noise situation of the other noise sources is similar although the impact of the railway noise and aircraft noise is expected to increase as a result of the proposed new rail links and projected increase in the air traffic volume.

7.12.7 An increased population under the "What If" Scenario would put increased demand and pressure on the sewage treatment facilities. Water quality is likely to deteriorate if the discharge quantity exceeded the treatment capacity of the STWs. An increased population would increase the demand upon water supplies. Greater demand management would have to be invoked in Hong Kong to reduce per capita consumption through programmes such as the Government's "Total Water Management" Programme.

7.12.8 As for landscape implication, the adverse impact on the western end of Lantau will remain the same to the NW Lantau container terminal option under the Reference Scenario. The additional population growth will be confined within the urbanised areas. All developments which relate to the increased population will be assessed according to TPO.

7.13 EVALUATION OF THE REFERENCE SCENARIO AND THE "WHAT IF" SCENARIO

7.13.1 The overall evaluation of the Reference Scenario and the "What If" Scenario has been undertaken. In this section, it is to summarize the SEA results and echo the potential environmental objectives identified in Section 5.

Table 7-2 Evaluation of the Reference Scenario and "What If" Scenario

Parameter	Potential Environmental Objectives	Relevance to HK2030
Air Quality	• Reduction in emissions generated by energy producers	Emissions increase/ reduce in 2030 relative to base year: Reference Scenario: CO (15%), NO_x (-37%), PM_{10} (-38%), SO_2 (-66%), VOC (-46%) "What If" Scenario: CO (20%), NO_x (-37%), PM_{10} (-38%), SO_2 (-66%), VOC (-46%) It should be noted that NO_x, PM_{10}, SO_2 and VOC are adopted the emission cap in the 2010 Control Scenario in the Study of Air Quality in the Pearl River Delta Region while CO emissions is projected based on projected electricity consumption by population, so "What If" Scenario reflects the increase in population and the commensurate energy demand.
	• Encourage the use of more environmentally sustainable fuels especially for vehicle traffic, construction activities and commercial uses	This objective will be recommended as a control measures for dealing with the emissions from power generation and vehicular emission and is considered to be a long-term policy issue to be considered.
	• Encourage the use of urban design guidelines to enhance air ventilation and air flow around buildings	The strategic air quality assessment results indicate air quality improvements in some locations such as Tung Chung, Yuen Long and Sha Tin and it provides an indication for land use planning in terms of population density.
	• Decrease reliance on vehicular transport	This objective will be recommended as a control measure for dealing with the vehicular emission and is considered as a policy issue.
	• Increase the use of public transport	This objective will be recommended as a control measure for dealing with the vehicular emissions and is part of the long-term objective built into the HK2030 plans.
	• Reduction in the effect of trans-boundary air pollution, for example, through continuous co-operation with the Guangdong Provincial Government	The majority of the air pollutants are from PRDEZ which will affect the air quality in Hong Kong to a certain extent. Continue co-operation with the Guangdong Provincial Government to deal with the reduction of the emissions is recommended.
	• Reviewing overseas policies and practices which are at improving air quality, to see if these are applicable to Hong Kong	Although there are improvements in air quality in some locations, it is necessary to have a benchmark to check whether it is acceptable or not in terms of health issues, environmental and social issues. Results of strategic air quality assessment show the air quality in 2030 with committed control measures and business as usual. The results indicate that more control measures should be explored in order to comply with the existing/ new standards.
Noise	• No increase in the percentage of people exposed to excessive noise with proper land use planning, conscientious planning of new roads, abatement of existing noise sources, improved vehicular noise standard and proper building layout design.	The existing, committed and planned noise abatement programmes will further reduce the magnitude of noise source.
	• Use of quiet construction equipment.	Wide use of quiet Powered Mechanical Equipment is recommended.

Parameter	Potential Environmental Objectives	Relevance to HK2030
Geology, Soils and Contaminated Land	• Reduction in the development pressure on Greenfield sites by means of, for example, regeneration of derelict sites, ex-industrial areas, landfill sites, and PHI sites etc.	This is built into the HK2030 planning intent.
	• Enhancement of information on the potential environmental risk associated with development of brownfield sites through the provision of a contaminated land register.	This objective is provided as a long-term policy objective.
Water	• Reduction in trans-boundary pollution, for example, through continuous co-operation with Guangdong	With the improvement of the sewage treatment levels in HKSAR, the background pollution will become relatively more influential to the water quality in North Western, Deep Bay and Southern WCZs. Close inter-government cooperation between HKSAR and Guangdong Province will be important in order to reduce the trans-boundary pollution.
	• Proper/adequate sewage treatment level prior to discharge through the timely implementation of the sewerage master plans	There should be continued programmes for upgrading the treatment facilities in terms of capacity and treatment level so as to cater for population growth and any water quality needs. The effort would help Hong Kong to achieve the status as a World City in Asia.
	• Management of riparian vegetation for enhancement of organic matter removal	Organic matter could be absorbed by riparian vegetation. The water quality treatment will enhance in an energy-saved way.
	• Implementation of Total Water Management for sustainable development	Since the majority of Hong Kong's water is imported from Guangdong, supply is not sustainable from within Hong Kong itself. Due to a water shortage problem in the Mainland China, other cities in Guangdong are fighting for more and more water supply from Dongjiang River. There is likely to come a time when greater demand management is invoked in Hong Kong to reduce per capita consumption. The Government's "Total Water Management" Programme that looks to further manage water demand and improve the quality and efficiency of freshwater supply is encouraged.
	• Review of international practices to improve water quality to attain the WQO	Review the WQO from time to time with a view to promoting the conservation and best use of our waters in the public interest.
	• Achieve the WQO as soon as is reasonably practicable and thereafter maintain the quality so achieved	Concentration of population in the Metro Area during the short to medium-term may exacerbate WQO non-compliance if the treatment facilities under the HATS project could not be in place at the time. Upon the full implementation of HATS, the water quality in the Victoria Harbour WCZ is expected to improve significantly. Any significant fluctuation of the quality of discharges is not expected unless the discharge quantity exceeds the designed treatment capacity. However, the marine water quality within

Parameter	Potential Environmental Objectives	Relevance to HK2030
		Hong Kong is still under the influence of Pearl River Delta. Establishment of NDAs in the NWNT has the potential to further impact Deep Bay WCZ for which consistent non-compliance with DO, TIN and NH_3 WQOs has been observed. Within the NDAs new sewerage systems would be required, treatment levels at existing STWs would need upgrading and further mitigation measures would be necessary to reduce the risk of untreated discharges.
Solid Waste Manage-ment	• Reduce the amount of MSW	A charging scheme for MSW is being implemented. Assuming that domestic waste generation is reduced by 1% per year (as per the MSW Policy Framework) and this is extended to 2030, the total waste generation will be 1.91m tonnes. Assuming that C&D generation is reduced by 1% per year (as per the MSW Policy Framework) and this is extended to 2030, the total waste generation will be 714,500 tonnes.
	• Increase the MSW recovery rate	Public education and incentive schemes to promote waste recycling industries are recommended to move towards achieving this objective.
	• Reduce the total MSW disposed of to landfill	Assuming that the landfill disposal reduction of 25% (domestic waste) by 2014 is achieved (as per the MSW Policy Framework) and this is maintained to 2030, then the total waste disposal will be 1.43M tonnes. Assuming that the landfill disposal reduction of 25% (C&I waste) by 2014 is achieved (as per the MSW Policy Framework) and this is maintained to 2030, then the total waste disposal will be 535,900 tonnes.
Energy and Natural Resources	• Encourage the practice of energy reduction as soon as possible	There is no specific target of energy reduction in the future. However, it is recommended that targets are set for new developments in the NDAs.
	• Control greenhouse gas emissions through joint international effort and trans-boundary effort, more use of public transport.	The development of the NDAs in the New Territories is potentially a threat in this aspect due to the energy consumption from the increased traffic requirement. Transport planning will be of particular importance in this regard. It is recommended that a comprehensive planning on the mass transport taking consideration of the traffic, transport, land, environmental, sustainability, political, social, and economic factors be taken to reduce the use of fuels and energy in transport.
	• Reduce the use of non-renewable energy through, e.g. use of energy-from-waste installations, increase the use of renewable energy; and incorporation of energy saving features in buildings.	The Government set down targets of 1% to 2% of total electricity supply met by power generated from renewable sources by 2012. The development of NDAs provides great opportunities for the use of renewable energies such as solar panels and energy saving technologies in buildings. It is recommended that green-building designs and energy-saving features are incorporated into the design of new housing estates to further enhance the reduction of energy consumption.

Parameter	Potential Environmental Objectives	Relevance to HK2030
Land use and Landscape	• Further enhancement in the protection of landscape through: - adopting a fully co-ordinated approach to design, implementation and maintenance of public landscape works where emphasis is on all three stages rather than solely on maintenance; and - devising planning procedures for validating design proposals and implemented projects against statutory landscape conservation and planning objectives.	Ensure present high quality landscapes, landscape resources and views are protected. Ensure the implementation of higher quality landscapes in future.
	• Active greening of urban areas, through tree planting etc.	Improvement of the comfort level and aesthetic appearance of urban environments
Risk Manage-ment	• Review declassification opportunities with respect to re-zoning of industrial land.	Reducing or removing the hazards associated would make the land as a whole more attractive for development. A more balanced planning system would provide more sustainable prospects in such areas in the longer term.
Ecology	• Continue to apply the existing statutory measures on protection of the important ecological resources e.g. designation of appropriate conservation zones through the preparation of OZPs under the TPO. • Further enhancement in the protection of ecological resources on both government and private lands through the implementation of the New Nature Conservation Policy through two improvement options viz. management agreements with land owners and private-public partnership	Statutory measures are already in place or in draft to protect resources such as : • EIAO to protect the ecological resources by checking all potential adverse impacts arising from designated projects and identify mitigation measures to avoid, minimise or compensate the impacts to acceptable level; • TPO to protect the ecological resources located within the statutory town plan by control the land uses and developments on the conservation related zonings such as SSSI, CA and CPA. • New Nature Conservation Policy to protect the priority sites on private land through the introduction of two options viz. management agreements with landowners and private-public partnership. • Other relevant legislations include: Country Parks Ordinance, Wild Animals Protection Ordinance, Forests and Countryside Ordinance, Protection of Endangered Species of Animals and Plants Ordinance, Fisheries Protection Ordinance, and Marine Parks Ordinance.
Cultural Heritage	• Further enhancement in the conservation of cultural heritage resources through, e.g. developing a set of objective and transparent assessment criteria for evaluating heritage value, implementing a comprehensive cultural heritage conservation strategy, and incorporating culturally interesting features into planning, etc.	Heritage resources are under significant threat in new developments, coastal regions and rural area, it is recommended to develop a new integrated policy to facilitate a better conservation of cultural heritage. Public consultation on the issue is recommended. As heritage resources in new development areas are known, culturally interesting features can be incorporated into the planning process to enable better protection, enhancement and enjoyment. Public consultation is also recommended on this aspect.

7.14 CONCLUSIONS

7.14.1 The Preferred Development Option formulated on the basis of the Reference Scenario demonstrates that there are general improvements in the air quality in HKSAR with the implementation of the committed control measures. However, the concentration of some air pollutants in some areas would worsen. It implies that more air pollution control measures should be explored. Nevertheless, it should be noted that the 2030 emission inventories are projected based on a lot of assumptions and uncertainties. The predicted trend of air quality may only be achieved if many effective improvement measures materialize. Given the uncertainties in the projection, there is a chance that air quality will deteriorate in future. In addition, the PATH modelling results only predict the district-wise air quality. Detailed environmental studies for the proposed infrastructure and developments are recommended to determine their environmental acceptability.

7.14.2 The population exposed to the excessive noise environment will much depend on the size of the population and the traffic volume. Under the baseline condition, the current population exposed to excessive noise level is around 1.15 million. With the projected increase in future population and traffic, the total population exposed to excessive noise level is expected to increase to some 1.40 million under both possible container terminal options of the Reference Scenario by Year 2030. However, there will be some local differences in the noise level resulting from the difference in the traffic flow between the two possible container terminal options of the Reference Scenario. Under the "What If" Scenario, the total population exposed to excessive noise level will be further increased to some 1.47 million by 2030.

7.14.3 The water quality in Hong Kong is expected to improve with the implementation of the committed and planned facilities. However, the physical presence of the container terminal will have some local water quality impact pending decision on the locality of the container terminal. The cross-boundary pollution is expected to become, relatively speaking, more influential on the marine water quality in Deep Bay, Northwestern and Southern WCZs in the future.

7.14.4 The construction waste will continue to form a significant part of the total solid waste generated in Hong Kong. Additional waste management facilities will be required in the long-term. The planned port development will involve significant maintenance dredging, which will add further pressure to the limited capacity of the existing mud disposal grounds.

7.14.5 In general, the implications of "What If" Scenario and NW Lantau container terminal option under the Reference Scenario are comparable.

8 EVALUATION OF THE STRATEGIES

8.1 INTRODUCTION

8.1.1 Having examined the Reference Scenario as a whole the SEA has to also examine the sustainability and environmental performance of the component strategies.

8.2 INFRASTRUCTURE AND TRANSPORT STRATEGIES

Road Based Vehicles

8.2.1 The transport strategy aims at providing reliable, efficient and diversified ways of transport for HKSAR. As such, it has both positive and negative impacts on air quality.

8.2.2 Development and upgrading of public transport links will continue to provide people with a realistic alternative to private car ownership. As, on a per individual basis, emissions to air are generally lower when using public transport, improvements of the public transport network would result in improved air quality and reduced CO_2 emissions. As far as buses are concerned, this assumes a minimum number of passengers are present in the bus (which depends on the bus characteristics and on the car referred to). The bus routes and incentives to use the bus will therefore need to be sufficient. This should be achieved anyway due to economic factors. New/improved MTRC/KCRC lines would, during the operational phase, yield more benefit than bus lines. However, impacts during construction phase due to energy use, vehicle machinery and dust rising, should be carefully considered and mitigation measures should be in place for each project.

8.2.3 Improvements, reconstruction, widening etc. of roads of the existing network will "ease" traffic in some areas. Areas concerned are often congested areas with a high density of activities, which are also the areas prone to poor air quality. Reduced congestion implies higher speed, which, up to a stage, implies reductions in emissions. Easier access may also reduce the need to use smaller side roads, again resulting in localized improvements in air quality.

8.2.4 However, improvement of the existing network and development of future links imply large increases in road traffic movement. These increases would come along with localized deterioration of air quality along the improved/new built links in already polluted areas, but would also impact on currently unaffected areas with good air quality.

8.2.5 The infrastructure and transport planning will affect the traffic flow pattern as well as the traffic flow resulting in a change to the existing traffic noise condition. The noise impact at some areas will be improved while some will be degraded. Due to the location of the container terminal development, it was found that more people would experience adverse road traffic noise on Lantau Island under the NW Lantau container terminal option under the Reference Scenario when compared to the SW Tsing Yi container terminal option under the Reference Scenario. However, the noise impact on Tsing Yi districts is similar to each other under the two possible container terminal options of the Reference Scenario. This reveals that the infrastructure and transport planning will affect the noise environment depending on

the nature and location of the project.

8.2.6 Planned railways such as the Northern Link and the Hong Kong Section of the Guangzhou-Shenzhen-HK Express Rail Link will require land take and may affect ecologically sensitive areas in the new territories unless detailed assessments are carried out including the use of tunnels rather than above ground options for sensitive sections of alignments.

Aviation

8.2.7 There are no committed control measures for aircraft movements. Aircraft emissions have fewer technological opportunities for reducing pollution potential compared to road based vehicles, and as such the predicted increase in cargo and passenger forecasts will only serve to enhance the significance of this source of pollution in the medium to long-term. The implications of increased passenger and cargo forecasts (to 2020 but not including the Third Runway) have been included in the strategic air quality modelling assessment, but should not be underestimated in terms of their significance.

8.2.8 The projected increase in the air traffic volume will lead to an increase in population exposed to the aircraft noise. As most of the residential areas are remote from the existing runways, the population exposure due to aircraft noise will unlikely be significant. However, the provision of a third runway will need to be further assessed in detail in future studies and the noise exposure of which would have territorial wide implications.

8.2.9 The Airport Authority Hong Kong (AA) had, in December 2006, released an update of the Master Plan (known as HKIA 2025) which recommends, among others, the carrying out of engineering and environmental feasibility studies on the construction of a third runway at the Hong Kong International Airport. It is believed that the third airport runway, together with the final decision on the new container terminal, may have immense implications for the overall development pattern for Hong Kong, in particular from the strategic environmental assessment perspective. In addition, the cumulative effects of reclamation for construction of the third runway in relatively close proximity to the possible new container terminal at NW Lantau (if selected) will need to be carefully assessed in terms of the effects on marine water quality, flows and marine ecology.

8.2.10 Whilst both locational options for the new container terminal under the HK2030 SEA have been taken into consideration, details on the third runway are not adequate at the time when the SEA was undertaken. Nevertheless, it is advised that the Government should wait until the outcome of AA's studies are available and consider, at that stage, the need for updating the planning strategy of the HK2030 Study.

Marine Traffic

8.2.11 With more than 100,000 trading companies and one of the world's busiest container ports and international air cargo operation, Hong Kong ranks 11th largest in the world both as a trading economy and exporter of commercial services. Much of the goods traffic wares around the Region and World by water and the increases in

goods production movements is reflected in the increase in marine emissions. In addition to which the proposed new container terminal requires new shipping lanes as shown in the Study on Hong Kong Port – Master Plan 2020, new approach lanes are proposed from Mainland's waters west of Soko Islands towards NW Lantau, and from Western Harbour to Tsing Yi for the NW Lantau Reference Scenario and SW Tsing Yi Reference Scenario. The location of Container Terminal 10 (CT10) at NW Lantau is also assumed in the "What If" Scenario for sensitivity test.

8.2.12 SW Tsing Yi container terminal option is likely to have major impact on waste management, re-provisioning of potentially hazardous installations and possible impact on the HATS discharge.

8.2.13 The growth of the marine traffic will have an implication on air quality. Not only will marine traffic increase the air pollutants emissions, but this will also be reflected in the land-based activities at container terminal such as container stackers, lorries, and vehicles moving goods off-site and around site. CO, NO_x, PM_{10}, SO_2 and VOC will be emitted, and as there is few proven control measures for marine vessel emissions this will become a significant emission sources in Hong Kong. Control measures such as the use of ultra lower sulphur diesel, retrofitting of engines of local craft, shore-side power and speed control when approaching and leaving port are recommended for feasibility study in respect of the degree of implications to the environment and its effectiveness.

8.2.14 From the ecological point of view, the growth of the marine traffic arising from the NW Lantau container terminal option under the Reference Scenario, the potential airport expansion and the proposed Liquefied Natural Gas (LNG) Receiving Terminal and Associated Facilities will have certain level of impact act on the marine ecology. Apart from the operation, the construction of these facilities may cause significant cumulative impact on the water quality and ecology due to the massive construction scale including dredging and reclamation. Detailed EIA through the EIAO process would be required to check the ecological acceptability of the affected regions.

8.3 NEW DEVELOPMENT AREAS

8.3.1 Despite slower population growth, the HK2030 Study has demonstrated that NDAs may be required in the longer term to meet the needs of the population (if it is to grow as currently assumed), in particular the requirement for public housing land (under the prevalent public housing policy), and to address the socio-economic needs. Potential NDAs which have been considered by previous planning studies and the HK2030 Study include the following:

- Fanling North
- Hung Shui Kiu
- Hung Shui Kiu North
- Kam Tin/Au Tau
- Kwu Tung North
- Lung Yeuk Tau (Fanling)

- Ping Che/Ta Kwu Ling
- Ping Kong (Fanling/Sheung Shui)
- San Tin/Ngau Tam Mei

8.3.2 Development areas with heritage potential including but not limited to the following sites. Further cultural heritage impact assessment should be required to ensure the heritage conservation acceptability of the affected heritage should development of these areas be considered further in the future.

- Lung Yeuk Tau (historical villages, Declared Monuments include entrance tower and enclosing walls at Lo Wai, Tang Chung Ling Ancestral Hall, Tin Hau Temple, enclosing walls and corner watchtowers at Kun Lung Wai and the Entrance tower at Ma Wat Wai). The area is also the site of a "Heritage Trail" which starts at Siu Hang Tsuen, runs through San Wai, San Uk Tsuen, Wing Ning Wai and Wing Ning Tsuen, Tung Kok Wai, Lo Wai, Ma Wat Wai and Tsung Kyam Tong.

- Kam Tin, historical villages; Shui Tau Tsuen (which comprises Yi Tai Study Hall, a Declared Monument, Cheung Chun Yuen and Tang Kwong U Ancestral Hall), Shui Mei Tsuen, Wing Lung Wai and Kat Hing Wai.

- San Tin, historical villages like San Lung Tsuen, Fan Tin Tsuen which comprises Man Lun Fung Ancestral Hall, a Declared Monument, On Lung Tsuen and Wing Ping Tsuen, which comprises Tai Fu Tai, a Declared Monument.

8.3.3 Out of a number of NDAs in the New Territories identified in previous planning studies, the HK2030 Study has shortlisted Kwu Tung North, Fanling North and Ping Che/Ta Kwu Ling (the "Three-in-One Scheme") and Hung Shui Kiu as a priority. Medium-density development has been proposed as most suitable. Kwu Tung North, Fanling North and Hung Shui Kiu would presumably provide an appropriate mix of various land use requirements, given their strategic proximity to existing railway and other transport infrastructure. In particular, Kwu Tung North has been identified as a trade exhibition hub and provisionally as a possible location for new tertiary education facilities, although this is only an initial concept with details yet to be articulated. Meanwhile, Ping Che/Ta Kwu Ling and a part of the Hung Shui Kiu NDA would be primarily for special industries.

8.3.4 Changes in lifestyle and behavior of the population will to a certain extent impact on our environment. For example, increased private car ownership will cause noise and air pollution problems. A more affluent population will have a greater demand for consumer products which may in turn generate more wastage. Increasing demand for improvement in living conditions may drive some people to move away from city centres for more living space which may increase traveling distances of work journeys.

8.3.5 Environmental issues have caught much public attention in the past few decades. Apart from the conventional areas of concern such as air quality, noise and water quality, a new movement towards sustainable development has emerged in many developed countries which recognize the importance of long-term sustainability. As

such, environmental concerns have been brought upfront instead of being left at the end of the pipeline as in the past.

8.3.6 Recent observed population figures have differed significantly from previously projected trends. The factors affecting population growth and movement have been examined, and the current and likely future trends have been reviewed to determine the potential effect that will have on Hong Kong's environmental resources. Primary concerns to be addressed include the residential infrastructure required (water and waste water impacts), transport (air and noise) and employment (air, noise, water and waste).

8.3.7 The transformation of Hong Kong's economic structure would both have positive and negative impacts on Hong Kong's economic and social development, which in turn will have direct or indirect impacts on our environmental resources. For instance, the development of high-tech industries may have special land requirements, and the increase in popularity of home-based offices may greatly reduce work journeys and thus have positive impact on traffic noise and air quality problems.

8.3.8 From an air quality aspect, the change in land use from wild/rural areas to developed and densely populated areas in the NDAs may have adverse impacts on the air quality. Largely increased density of anthropogenic sources of pollution, such as road and off-road vehicles, employment related activities, various combustion facilities or residential emissions will result in increased concentrations of pollutants. These pollutants will, in turn, impact on local population's health, ecological receptors and amenities.

8.3.9 Impacts on air quality are however expected to be localised to the NDA as most emission sources will be at ground level and transport of pollutants will be limited. The development of NDAs will however imply further development of the connecting transport network, thus impacting air quality on the transport corridors as well. In addition to local air quality impacts, carbon dioxide and other greenhouse gases are also emitted along with "local" pollutants. Greenhouse gases induce climate change at a global level and the NDA would therefore have impacts on a much wider level than just the vicinity of the proposed areas. Also, there would likely be cumulative air quality impact from Pearl River Delta region.

8.3.10 Although some extent of adverse impacts is unavoidable, the development of whole new areas provides the opportunity for action at various levels in order to minimise impacts. Adequate siting of residential, commercial and working areas could reduce the need for transport and car ownership. This would be further enhanced by development of an extensive, environmentally friendly, public transport network as is already the case in some parts of HKSAR.

8.3.11 The noise assessment was undertaken and the potential traffic noise impact on the NDAs was studied. With very broad-brush assumptions and preliminary layouts in the NDAs, the assessment results indicate that there may be potential road traffic noise impact on the proposed NDAs. However, this is not conclusive as more definitive layouts of the NDAs and the internal road networks are not available for assessment at the stage when the SEA was undertaken. The overall cumulative environmental implications that may arise from NDAs would still need to be studied

with considerations of environmental friendly transport such as depressed roads, pedestrian network and environmentally friendly public transport vehicles. During the detailed planning and implementation stage, EIAs should be conducted for the NDAs as part of the implementation programme to further address detailed environmental issues and determine the necessary environmental measures to be employed. Noise mitigation measures should be considered at the detailed design stage to ensure the noise compliance and enhance the living condition within the NDAs.

8.3.12 Establishment and development of NDAs will be accompanied by construction of additional sewage treatment facilities, for example, the expansion/ upgrading of Shek Wu Hui STW. The aim would be to achieve full sewerage connection for all NDAs and for their development to not have a negative impact upon water quality in the receiving waters.

8.3.13 Wastewater infrastructure development resulting in improved treatment and quantities of wastewater would reduce the impact of sewage discharge into the surrounding waters. This would lead to an improvement in water quality (increased compliance with WQOs). HATS Stage 2A would substantially reduce the pollution load discharged into Victoria Harbour and the bacterial load into Western Buffer WCZ. The upgrading of Pillar Point STW and San Wai STW will reduce the total pollution load discharged into North Western WCZ.

8.3.14 Infrastructure development, depending on the location, can have an impact on water conditions. Generally through planning and mitigation measures negative impacts could be avoided, however this is not always possible. The WDII may lead to some reduction in the flushing conditions of Victoria Harbour, and hence may result in decrease in water quality. The selection of the location of the new container terminal would impact upon different water bodies and water quality impacts will depend on the option chosen. This reveals that the infrastructure and transport planning will affect the water environment depending on the nature of the project.

8.3.15 The effect of the town planning on the use of energy could be significant. The development of the NDAs in the New Territories potentially boosts energy consumption in view of the increased traffic requirement. It is because the relocation of population to the NDAs means that more people are going to travel a longer distance everyday to satisfy their needs. Transport planning will be of particular importance in this regard. A comprehensive planning on the mass transport taking consideration of the traffic, transport, land, environmental, sustainability, political, social, and economic factors could possibly reduce the use of fuels and energy in transport.

8.3.16 As the Government continues to explore renewable energy in Hong Kong, the development of the NDAs creates opportunities for the use of renewable energies and new energy technologies. The building integrated solar PV system advocated by the EMSD and green/energy-efficient building design could have potential in the development.

8.3.17 It is inevitable that the continued growth of Hong Kong up to 2030, and indeed beyond, will influence the demand for increased capacity in essential services, and may have implications in terms of power generation, water supply and disposal of

waste water and solid waste. All of these could have potential implications in terms of PHIs. The location of PHIs away from developed areas should remain the ultimate aim in the planning process.

8.3.18 The existing water treatment works (WTW) installation at Ngau Tam Mei, with its chlorine delivery, storage and handling facilities, will have a major bearing on the planning and zoning implications of any proposed NDA in that area. Residential or commercial developments planned would need to be a minimum distance, and preferably well away, from the WTW. Road users passing by the facility may also be subject to potential risk. Likewise, the Au Tau WTW would have similar implications for the Kam Tin/Au Tau NDA. A further consideration for the San Tin/Ngau Tam Mei and Kam Tin/Au Tau NDAs is their closeness to the Wetland Conservation Buffer Area.

8.3.19 Expansion of the Hung Shui Kiu NDA would lead to increased demand on energy and sewage facilities but these would be ideally facilitated by the WTW at Tuen Mun when the NDA is implemented by 2030.

8.3.20 Planning of land use for the Three-in-One Scheme may require a balance between competing needs. For example, the Sheung Shui WTW may act as a constraint on developments surrounding the facility. However, at the same time, growth in the Three-in-One Scheme area would lead to increased volumes of sewage requiring treatment, as part of a higher overall demand on essential services. As the major treatment facility in the northern New Territories, Sheung Shui WTW would likely be responsible for this additional load. In that situation, consideration may then be required for a possible expansion of the existing WTW or the provision of a new WTW, which would raise further planning and environmental considerations.

8.3.21 Assuming that the relevant planning processes are initiated now and smoothly implemented, the first intake of residents in the new NDAs could be underway by 2020.

8.3.22 It should be noted that the Sheung Shui WTW may have implications on planning land use requirements for the Three-in-One Scheme. At the same time, development there may also increase demand for utility and wastewater treatment facilities, placing further demands on the provision of sewerage facilities, such as Sheung Shui WTW. Expansion of the Hung Shui Kiu NDA would lead to increased demand on energy and sewage facilities but these would be ideally facilitated by the WTW at Tuen Mun.

8.3.23 The priority areas for NDAs are located in North-western New Territories, Northern New Territories and North-eastern New Territories. These areas are currently dominated by rural areas. The change of land uses of these rural areas to developed areas may cause impact on the local cultural heritage and ecology. The associated infrastructures would also increase the fragmentation of the existing cultural and natural landscape. Three ecologically important sites i.e. Ramsar Site, Deep Bay Wetland outside Ramsar Site and Long Valley & Ho Sheung Heung were identified in these regions under the New Nature Conservation Policy for enhanced conservation. Development pressure on these sites may have considerable ecological significance as these sites support diverse species and are important habitat for some species of conservation concern. Mudflats, fish ponds and *Gei Wai* in Deep Bay are

important feeding habitats of Black-faced Spoonbill which is a globally threatened species listed as Endangered by Birdlife International (2000). Greater Painted-snipe and Jacana are another two species of conservation concern depends on these identified ecologically important sites as breeding and feeding grounds. Detailed studies and environmental assessments should be undertaken to determine the ecological acceptability of the affected areas and identify, if necessary, the ecological enhancement measures for those ecologically important sites should they be considered further.

8.4 CROSS-BOUNDARY ISSUES

8.4.1 Within the PRD region, rising human populations, increasing use of natural resources and a steady reduction in the area of agricultural land has led to increasing environmental pollution and adverse ecological impacts. These activities not only have a severe impact on the sustainability of the PRD, but also because Hong Kong is affected by these activities, they will act as a considerable environmental constraint on Hong Kong as well.

8.4.2 The PRD has in the past two decades experienced a rapid growth in its economy and urbanisation rate. By the year 2000, the degree of urbanisation reached 45%, and the population density was up to 872 people/km^2, and it is fast becoming one of the most densely populated areas of the Mainland. The volumes of municipal domestic wastewater is increasing year on year. In spite of the significant effort in increasing the wastewater treatment, the water pollution level within cities in the PRD will likely remain high in the foreseeable future and will have impact on the Pearl River and therefore HKSAR waters. In addition to the water pollution problems, there are also problems associated with acid rain particularly from industrial and vehicle emissions, and issues associated with solid waste disposal.

8.4.3 Cross-boundary issues have various impacts on HKSAR air quality. First, cross-boundary transport – road, rail and marine transport but also internal flights - is rapidly increasing, with consequent increased pollutants concentrations along the routes. In particular, as the number of routes is still limited, heavy, congested road traffic is to be expected on the main axes from HKSAR to the Mainland. Second, transport of pollutants from the Mainland to HKSAR (and vice versa) is to be taken into account. This mainly concerns point sources, where pollutants are discharged at a high concentration, at an elevated point and with a high temperature. Discharge points such as stack are meant to provide optimum dispersion of the pollutants, but this also implies that a wider area, which can be cross-boundary, is affected. Although pollutants emitted at ground level from, for example, road traffic, are not transported to a great distance, cumulative impacts would lead to elevated “ambient” concentrations, which would not be strictly limited to the area where the emissions take place.

8.4.4 Cross-boundary issues may have an impact on the effectiveness of the strategy, by generating additional traffic or by introducing non-compliant vehicles/fuels for example. As stated above, coordination between authorities is vital to adequately tackle air pollution in the PRD region.

8.4.5 Whilst it is widely recognised that environmental protection should be taken from a regional perspective, unlike many other countries where regional environmental

protection authorities could be set up to ensure co-ordinated efforts across a broader geographical coverage, Hong Kong's unique situation does not allow such kind of set up. Under 'one country, two systems', Hong Kong SAR has no jurisdiction over the development and planning of areas across the boundary and vice versa. Therefore, close co-operation between the governments on both sides is necessary, and further effort is required to ensure that there is an efficient two-way flow of information on the environment and planning issues in the PRD, allowing authorities on both sides of the boundary to formulate separate but mutually beneficial plans.

8.4.6 It is anticipated that there could be cumulative on-site and off-site impacts due to the cross-boundary activities, the proposed infrastructure such as the Hong Kong-Zhuhai-Macao Bridge, or the provision of additional container terminal and airport facilities. For example, the provision of a container terminal in North West Lantau or South West Tsing Yi, or development of the third runway will increase the volume of traffic.

8.4.7 As there is no committed control measures regarding aircraft and marine vessel, it is recommended that more control measures should be explored such as the control of fuel quality in terms of sulphur content used in marine vessels; and investigate the opportunity for the improvement of the combustion process of both marine vessel and aircraft. Detailed assessments and EIAs are being and will need to be undertaken, for example for the third runway, the Hong Kong-Zhuhai-Macao Bridge (HZMB)[11] to determine their environmental acceptability.

8.4.8 It is no doubt that the cross-boundary traffic will increase rapidly in future due to the regional development in the PRD. People will travel more frequently between PRD and HKSAR, causing traffic noise impacts at the areas close to the boundary area. For good planning, residential uses should be planned away from those areas where excessive traffic noise is anticipated. Environmental considerations for any new developments should be considered to provide a good living environment for the residents.

8.4.9 It is envisaged that with the completion of upgrading of Stonecutters Island STW, Pillar Point STW, the background pollution will become, relatively speaking, more influential to the water quality in North Western, Deep Bay and Southern WCZs. Close inter-government cooperation between HKSAR and Guangdong Province will be important in order to reduce the trans-boundary pollution.

8.4.10 Ecological impacts may be arisen due to the construction and upgrading works of boundary crossing facilities and associated structures, particularly when these facilities are located close to some ecologically sensitive areas such as the Deep Bay region, Long Valley and Lin Ma Hang SSSI. In addition, the Lok Ma Chau Loop and opening up of Frontier Closed Area will involve the construction works and vehicle traffic movements which could have potential impact to the environment such as contaminated material, sewerage infrastructure, ecology, water quality of Deep Bay, air quality, noise, fishponds, etc. Planned railways such as the Northern

11 The Governments of Guangdong, Hong Kong and Macao have commissioned a consultant to conduct a study on the locations and arrangements of the Boundary Crossing Facilities (BCF) under the mode of "Separate Location of BCF" for the HZMB.

Link and the Express Rail Link that pass through ecologically valuable land in the northern region may lead to habitat loss. Proper alignment selection and underground options should be duly considered, where appropriate, at the early planning stage. Detailed environmental assessments should be undertaken to determine ecological acceptability.

8.5 SUMMARY

8.5.1 There would likely be cumulative on-site and off-site environmental issues including water, air quality, aircraft noise and traffic noise, sewerage infrastructure, ecology, visual impact, hazard, landscape and cultural heritage effects due to the implementation of various major developments such as the NDAs, cross-boundary infrastructure, possible uses of the Closed Area and the future airport and port developments. Some of these cumulative environmental issues would have territory-wide implications and might also affect the long-term environmental sustainability of Hong Kong. For example, the cumulative impacts of the future container terminal and airport developments may present environmental problems. At present, the feasibility studies and environmental assessments of the proposed development projects are yet to be completed. Detailed environmental studies are necessary to determine their environmental acceptability. There are proposals of tourism and organic farming, the implementation details should be worked out in such a way to minimize the adverse environmental impact. Strategies to address the problem of proliferation of Port Back Up uses in rural area are required.

8.6 SUSTAINABLE PROJECT MONITORING AND AUDIT

8.6.1 To ensure that the key potential impacts or benefits that have been identified are addressed at the correct stage of the future strategic development of Hong Kong, a process has been identified for capturing and following-up of any potential negative and positive environmental consequences and issues, previously termed Strategic Environmental Monitoring and Audit (SEM&A).

8.6.2 Further, the HK2030 infrastructure and transport strategy recommends provision of new infrastructure to Hong Kong and increases in connectivity both within Hong Kong and from outside Hong Kong. Such future changes will also have the potential to directly or indirectly impact upon environmentally sensitive receivers. In addition, the proposed HK2030 establishment of NDAs will introduce new residential development in selected, and previously undeveloped areas and will increase densities in traditional urban areas, which will introduce new environmentally sensitive receivers to potential impact. Finally, increases in cross-boundary flows detailed in the HK2030 recommendations will also increase development pressures and potential impacts to Hong Kong's fragile environment.

8.6.3 Potential negative impacts may comprises environmental impacts (e.g. increased air, water or noise pollution arising from scenarios and strategic developments), whereas positive environmental consequence, or environmental benefits, could comprise a reduction in number of population impacted by, for example, noise pollution or improvements of air quality.

8.6.4 Importantly, SEM&A is considered not a higher-level version of the project Environmental Monitoring and Audit (EM&A), which assesses actual changes in the

physical environment as a result of the construction (and operation) of a project. Rather, it is considered that SEM&A in the HK2030 context should be referred to as Sustainable Project Monitoring and Audit (SPM&A), since it identifies strategic-level actions to facilitate the development of a preferred strategy project or component option in a sustainable manner.

8.6.5 By consideration of key environmental issues during the early 'gestation' stages of a strategic plan, in particular during early stages of location/site or route selection, there exists sufficient flexibility in the design process to maximise opportunities for adverse environmental impact avoidance, such that the need for later stage or 'retrofit' impact mitigation may be significantly reduced and limited to areas where it was impossible to mitigate by strategic avoidance and prudent facility, infrastructure, development site, routing or location/ selection.

8.6.6 SPM&A, thus defined, identifies the key areas that should be addressed and investigated further, during the subsequent stages, in the development of the overall strategy. SPM&A comprises a strategic environmental planning tool to proactively identify, capture and maximise both HK2030's potential environmental benefits and also to prevent, control, and minimise the environmental impacts of HK2030's recommendations.

8.6.7 **Table 8-1** below identifies the key design issues that need to be addressed as the strategy develops and aims to identify any strategic follow-up actions to facilitate environmentally beneficially development, using the following four matrix headings:

- Issue – This comprises the particular issue that would yield environmental benefit or prevent environmental impact e.g. Further increase in public transport network and patronage.
- Action – This comprises the recommended action that should be undertaken to deliver environmental benefit or prevent environmental impact e.g. Confirm viability of alternative development opportunities and construction methods to reduce impacts.
- Means of Implementation – This suggests how the action should be implemented and identifies which would be the most appropriate mechanism and party e.g. Consultant and / or project proponent to ascertain the feasibility, acceptability and sustainability of the proposal(s) through consultancy studies and / or preliminary design / detailed design.
- Interface / Coordination and Other Considerations – e.g. explore and identify interface with other projects forecast to be implemented concurrently, coordination requirements, if interfaces, above, are identified, and whether a co-ordinated approach should be investigated to maximise the strategic environmental benefits of utilising a certain design alternative or combined action.

8.6.8 It should be noted that the following issues comprise suggestions only for initial consideration and are not committed items. In addition, it is important to note that there is a need to objectively consider and analyse in detail, outside the HK2030 Study, the various related limitations and factors such as technical practicality, public consensus, resources and political implications, cross-boundary recognitions

before taking forth suggestions to their next stage.

Table 8-1 Sustainable Project Monitoring and Audit of HK2030 Strategy

Issue	Action	Means of Implementation	Interface / Coordination and Other Considerations
Further increase in public transport network and patronage	Confirm economic, commercial viability and sustainability of public transport network expansion and environmentally friendly transportation schemes before implementation	As part of ETWB's on-going effort in transport planning	• Environmental impact/cost benefit of rail and road networks • Unified consideration of road and rail network expansion • High cost of alternative considerations, economic viability, willingness to pay • Consideration of concurrent and interface projects and cumulative impacts
	Provide economic incentives to promote usage of public transport	As part of ETWB's on-going effort in transport planning	• Unified consideration of road and rail • Interface between rail and road network charging
	Create seamless interface between rail and road networks	As part of ETWB's on-going effort in transport planning	• Objective consideration of road and rail interface. • Improvement in connectivity of road and rail public transport interchange • Consideration of concurrent and interface projects and cumulative impacts
Alleviation of road congestion in areas of poor air quality	Create smooth traffic flow and alleviate traffic congestion	As part of ETWB's on-going effort in transport planning	• Consider benefits and disbenefits of solutions to alleviate traffic congestion • Objective comparison of economic instruments • Consideration of concurrent and interface projects and cumulative impacts
Port expansion location consequences	Minimise likely environmental impacts	Consultancy study to ascertain the environmental acceptability, sustainability and feasibility of all potential different container terminal sites	• Consideration of environmental benefits and disbenefits of different options
Increase in air cargo and passenger numbers	Confirm viability and the location of a third runway for Hong Kong International Airport	- Aviation expansion study to consider the need for Hong Kong airport capacity expansion in Hong Kong's regional context before any consideration of 'in Hong Kong' alternatives - If appropriate, follow-on consultancy study to ascertain the environmental acceptability, sustainability and feasibility of all potential different airport sites in Hong Kong	• Consideration of commercial, construction and operational benefits and disbenefits and trade-off of location options • Consideration of air, noise, water movement/ quality, and ecology benefits and disbenefits • Consideration of concurrent and interface projects and cumulative impacts of the area of proposed development

Issue	Action	Means of Implementation	Interface / Coordination and Other Considerations
Redevelopment of infilling sites in urban areas	Confirm sustainability of density of redevelopment sites versus carrying capacities	- Consultancy study to ascertain the environmental acceptability, sustainability, and planning and engineering feasibility of the proposal(s)	• Consider the impacts on air, noise, water quality, liquid (effluent) and solid waste generation /infrastructure, hazard installations, ecology, and the benefits and disbenefits • Consideration of construction impacts on adjacent sensitive receivers from the urban redevelopment and infilling sites
Development of NDAs in the N.T.	Confirm sustainability of density of NDAs versus carrying capacities	- Consultancy study to ascertain the environmental acceptability, sustainability, and planning and engineering feasibility of the proposal(s)	• Consider the impacts on air, noise, water quality, liquid and solid waste generation /infrastructure, hazard installations, ecology, and the benefits and disbenefits • Objective consideration of concurrent project and developments, and external interface projects to ascertain their cumulative impacts • In addition, NDA development comprises an opportunity to introduce and incorporate environmentally friendly transport options such as submerged and depressed roads, comprehensive pedestrian network, use of environmentally friendly public transport vehicles and rail-based transport
Introduction of enhanced sewage treatment facilities	Confirm sustainability and receiving water quality	- Consultancy study to ascertain the environmental acceptability, sustainability and feasibility of the proposal(s)	• Consideration of benefits and disbenefits • Acute consideration of concurrent infrastructure developments and external interface projects and cumulative impacts
Increase in journey times to work from NDAs	Confirm sustainability and energy use implications of decentralized travel pattern	- Consultancy study to ascertain the environmental acceptability, sustainability, and planning and engineering feasibility of the proposal(s) - Cradle-to-grave/lifecycle energy assessments to be conducted to assess benefits of the proposal(s)	• Consideration of benefits and disbenefits
Increases in per capita energy use	Confirm opportunities for increased Energy Conservation and Demand Side Management	- Consultancy study to ascertain the environmental acceptability, sustainability and feasibility of the proposal(s) - Cradle-to-grave/lifecycle energy assessments to be conducted to assess benefits and disbenefits	• Consideration of benefits and disbenefits

Issue	Action	Means of Implementation	Interface / Coordination and Other Considerations
Increases in cross-boundary travel	Confirm opportunities to widen PRD use of low sulphur HGV diesel	- Consultancy study to ascertain the environmental acceptability, sustainability and feasibility of the proposal(s) - Liaison with international and national oil companies to provide cleaner diesel fuels for HGV use	• Interface with PRD environmental officials • Consideration of benefits and disbenefits and trade-off (air and noise impacts) • Reconsideration of the proposed Port Rail Line or alternative haulage means for freight transportation based on updated forecast volume of goods • Acute consideration of concurrent developments and external interface projects and cumulative impacts
Impact of PRD emissions on Hong Kong air quality and visibility	Confirm opportunities to reduce emissions in PRD manufacturing	- Review of HKSARG/EPD 1997 regional air quality study to update conditions - Review the local contribution and expedite measures to reduce the local component to the lowest level by immediate recommendations and actions - Consultancy study to ascertain and attribute meaningful costs with the environmental acceptability, sustainability and feasibility of various proposals for air quality improvement	• Interface with PRD environmental officials • Complex multi-jurisdictional legal considerations • Consideration of innovative mutually beneficial pollutant emission trading for Hong Kong and the wider PRD region • Acute consideration of manufacturing and external interface projects and cumulative impacts
Impact of PRD effluent discharges on Hong Kong waters	Confirm opportunities to reduce effluent discharges from PRD's manufacturing industries by Mainland parties supported by Hong Kong authorities	- Review of HKSARG/EPD regional effluent discharge studies to update conditions - Review the local contribution to Hong Kong water quality and expedite measures to reduce the local component to the lowest level by immediate recommendations and actions - Consultancy study to ascertain and attribute meaningful clean-up costs with the environmental acceptability, sustainability and feasibility of various proposals for PRD and Hong Kong water quality improvement	• Interface with PRD environmental officials • Complex multi-jurisdictional legal considerations • Consideration of innovative mutually beneficial plans between Hong Kong and the wider PRD region • Acute consideration of concurrent developments and external interface projects and cumulative impacts

Issue	Action	Means of Implementation	Interface / Coordination and Other Considerations
Increase in PRD connectivity through PRD's bridge links	Confirm sustainability of Hong Kong – Zhuhai – Macao Bridge (HZMB)	- Detailed studies and / or EIAs currently being / to be undertaken by the Hong Kong and Guangdong sides	• Consideration of construction and operational benefits and disbenefits and trade-offs • Consideration of air, noise, water movement/ quality, and ecology benefits and disbenefits and trade-offs • Acute consideration of concurrent component developments (e.g. new road connections) and external interface projects and cumulative impacts

PART C : THE WAY FORWARD

9 INITIATIVES AND THEIR IMPLEMENTATION

9.1 A WAY FORWARD

9.1.1 The HK2030 Study is a strategic land use planning study, which aims to introduce sustainable development up to 2030 and concomitantly aims to improve the quality of the living environment in Hong Kong. Through these strategic aims it is considered that the HK2030 Study should also contribute materially towards supporting Hong Kong's aspirations as Asia's world city, with a good quality living environment. Section 5 describes Hong Kong's environmental objectives and this Section is formulated to fulfil these objectives. For ease of reference, the proposed environmental objectives are summarized in **Table 5-7**.

9.1.2 This Initiatives and Implementation Section aims to provide a way forward and to describe the solutions and mechanisms that are, either already in place, or that need to be recommended for implementation to make their contribution towards the improvement of Hong Kong's overall living environment.

9.1.3 Importantly, additional temporal considerations must be taken into account. Such temporal dimensions must be appreciated and enunciated to ensure that both the objectives and community and stakeholders' expectations in terms of scale, extent and timing of the realised improvements are managed. For example, existing cross-jurisdictional mechanisms are already in place to respond to the air quality challenges arising from the burgeoning manufacturing and associated emissions north of the Hong Kong boundary in the Pearl River Delta region. However, although such mechanisms are already in place, they will take considerable time to yield apparent, visible results in Hong Kong and, thus, community expectations must be actively managed to avoid undue criticism.

9.1.4 Additionally, all policy recommendations must be managed and communicated as long-term initiatives with long lead times necessary to gain Legislative and Executive Council approvals to gain future environmental benefits. Whereas 'non policy' based mechanisms and government actions such as the encouragement of the introduction of lower sulphur fuels in the early 1990s or LPG taxis may be introduced more promptly and yield significantly environmental benefits and improvements to existing conditions in the short or medium-term.

Solutions and Mechanisms

9.1.5 The solutions and mechanisms can be classified in the following ways:

- Quick Wins: Existing and Recommended Short Term Mechanisms Yielding Benefits to Existing Environmental Conditions;
- Slow Burners: Existing and Recommended Medium Term Mechanisms Yielding Benefits to Future Environmental Conditions; and
- Long Termers: Existing and Recommended Future Long Term Mechanisms Yielding Benefits to Future Environmental Conditions.

9.1.6 Importantly, the above classification indicates the expected speed of environmental benefit, with quick wins yielding benefits before slow burners and long termers.

9.1.7 It will be apparent that several issues are cross-cutting, such as waste-to-energy, which is intrinsic to the 'silo nature' of environment issues consideration and, long-term recommendations will aim to include recommendations and mechanisms to respond to such specific challenges.

9.1.8 The intention of these recommended mechanisms are to provide guidance and a road map for policy makers and the administration to advance new mechanisms and also to seize environmental benefits that can accrue from strategic development options.

9.1.9 The mechanisms and recommendations are deliberately intended to be non-conservative and air fresh ideas for a fresh way forward to challenge palliative 'motherhood statements' with creative solutions to fulfil the environmental objectives of Section 5 to face complex problems that challenge Hong Kong's environmental advancement towards a world city status.

9.1.10 The following **Table 9-1** comprises a listing of the mechanisms and recommendations. For each of the category and discipline, the table indicates the timing of implementation (e.g. immediate, medium-term etc.) and the nature and estimated scale of challenges and difficulties expected plus existing or future policy implications.

9.1.11 Importantly, the following mechanisms comprise suggestions for initial consideration and are not committed items. In addition, it is important to note that there is a need to objectively consider and analyse in detail, outside the HK2030 Study, the various related limitations and factors such as technical practicality, public consensus, resources implications and political/cross border recognitions before taking forth suggestions to their next stage.

Table 9-1 Implementation Initiatives

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
Q	*Air*	1. Emission cap targets for power generation.	Immediate. Implement under APCO. Administrative challenges.	Administrative	✓	
		2. Accelerate permitting of low emission fuel (LNG) projects.	Immediate. Streamlining of non-statutory approvals. Little challenge.	Administrative	✓	
		3. Restrict coal-fired generation in Hong Kong to ultra low sulphur coals.	Immediate. Implement under APCO. Administrative challenges.	Administrative		✓

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		4. Institute public education and debate on Greenhouse Gas (GHG) and climatic change and consequence for inaction to Hong Kong sea levels and area in case of no action.	Immediate. Implement via Public Service Announcements (PSA), Public Relations (PR), advertising. Little challenge.	Educational		✓
		5. Reconsideration of introduction of modern forms of environmentally friendly public transport vehicles for use in new reclamation areas or NDAs.	Immediate. Possible implementation under new development. Little challenge.	Technological	✓	
		6. Encourage the use of more environmentally friendly vehicles passing through areas such as Causeway Bay and Mid Levels.	Immediate. Implement subject to results of public consultation. Moderate challenges expected from Transport Functional Constituency.	Administrative	✓	
		7. Consider voluntary expansion of Action Blue Sky Campaign linked with a wider dissemination of HKSARG's signature of the Clean Air Charter to Hong Kong-owned industrial businesses manufacturing within the Pearl River Delta to engender a 'ripple effect'.	Immediate. Implement via PSA, PR, advertising. Consultation with the trade would be necessary. Little challenge as this is a 'voluntary basis' recommendation.	Educational	✓ (Polluter Pays)	
Q	*Noise*	1. Introduction of low noise surfaces to highly impacted, high density areas.	Immediate. Following priority area identification. Little challenge.	Technological	✓	
		2. Prioritized introduction of noise mitigation and noise barriers to highly impacted, high density areas.	Immediate. Following priority area identification. Little challenge.	Technological	✓	

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		3. Specification of benchmark quiet construction plant.	Immediate. Mandate. Industry resistance expected to be reduced by allowing the construction industry to continue to use old 'noisy' plant and thus amortize and get value from their existing plant. However, for new plant this should be of a new 'quiet' specification. Ultimately, this will lead to a gradual transition from older 'noisy' plant to quieter plant with associated benefit.	Technological		✓
Q	*Water Resources and Water Quality*	1. Timely implementation of sewerage master plans and elimination of expedient connections.	Immediate. Following priority area identification. Technical challenges only.	Technological	✓	
		2. Launch community education campaign to promote water conservation.	Immediate. Implement via PSA, PR, advertising. Little challenge.	Educational	✓	
Q	*Waste*	1. Active promotion of Hong Kong 'Eco Park' and local recycling industry.	Immediate. Implement via PSA, PR, advertising. Little challenge.	Educational	✓	
		2. Government to take the lead in green procurement and use of recycled products.	Immediate specification possible. Minimal challenges.	Administrative	✓	
		3. Provision of adequate waste separation facilities in new public housing estates.	Immediate specification possible. Minimal challenges.	Administrative	✓	
		4. Ban wasteful and excessive packaging.	Immediate. Widen Producer Responsibility Schemes. Administrative challenges and industry acceptance issues.	Administrative	✓	

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		5. Urban renewal should give priority to building reuse/recycling rather than demolition and redevelopment, i.e. urban renewal should based upon the principle of reuse and recycling the old building first and only if this is proven non feasible should demolition and redevelopment be considered.	Immediate. Cost benefit analysis on all urban renewal projects. Mindset, administrative and developer challenges.	Administrative		✓
Q	*Energy and Natural Resources*	1. Electricity grid interconnection, urgent reconsideration by consultancy study.	Planning for increased interconnection between CLP and HEC electricity grids. Immediate reconsideration by consultancy.	Technological	✓	
		2. The Government should give priority to environmentally friendly vehicles that meet EPD's specified qualifying standards for tax incentives when government vehicles are due for replacement, subject to operational requirements and the rational utilisation of resources. In the short-term (Q) this could, for example, comprise replacement of certain existing petrol or diesel-based vehicles in the HKSARG fleet with hybrid vehicles.	Immediate. Progressive replacement of fleet renewals. Technological challenges.	Technological	✓	
		3. Institute vigorous energy conservation campaign.	Immediate. Implement via PSA, PR, advertising. Little challenge.	Educational	✓	
		4. Government lead energy reduction scheme with a 20% target, overarching aim being a 20% reduction in Government energy consumptions.	Immediate. Government to publicly announce the target. Technical challenge.	Administrative	✓	

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		5. Classify waste-to-energy as Renewable Energy.	Immediate. Initiative would spur waste-to-energy projects and assist achievement of Government and power companies' renewable energy targets. Little challenge.	Administrative		✓
		6. Introduce waste separation at source schemes.	Immediate. Implement via PSA, PR, advertising. Challenges largely 'social'.	Educational	✓	
Q	*Land Use and Landscape*	1. Redevelop vacant factory buildings for other uses such as 'loft' type development.	Immediate. Implement following priority area identification and incompatible industrial / residential interface screening. Administrative and technical challenges envisaged.	Administrative	✓	
		2. Introduce planning / design competitions for key planning areas and / or buildings.	Immediate for 'signature' projects. Little challenge.	Administrative	✓	
		3. Establishment of 'Green Links' between harbourfront area and urban hinterland areas.	Immediate. Implement following area identification. Little challenge.	Administrative	✓	
		4. Improve harbourfront by greening and natural shading.	Immediate. Implement following area identification. Little challenge.	Administrative	✓	
		5. Implement or further expand the pedestrianisation areas in Central, Causeway Bay and Tsim Sha Tsui to other urban districts and NDAs.	Immediate. Project proponent to implement after public consultation. Some challenges may be expected from the community about street management issues of full and part-time pedestrianisation schemes. Major challenges expected from Transport Functional Constituency.	Administrative	✓	
		6. Seize opportunities for increasing width of street canyons through urban renewal and redevelopment projects.	Immediate. Implement following priority area identification. Major physical challenges and may affect developer's interests.	Technological and Administrative	✓	

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		7. Increase landscape recurrent cost / budget to engender a good quality urban environment through creative means.	Immediate. Government to announce pledge for greening of Hong Kong. Economic / fiscal challenge.	Administrative		✓
		8. Establishment of 'Green Corridors' such as parks and open space connectors to provide links for people to enhance access between urban and hinterland areas.	Immediate. Implement following area identification. Physical challenges.	Administrative	✓	
Q	*Ecology*	1. Implementation of the New Nature Conservation Policy	Immediate. Implement following the new policy statement and objectives.	Administrative		✓
		2. Implement the pilot scheme on management agreement and private public partnership promulgated under the new nature conservation policy for the enhanced conservation of ecologically sensitive private land at the priority sites.	Immediate review whether any of the private sector schemes, which were requested by the ETWB, might be advanced or fast-tracked in the short-term. Administrative challenge.	Administrative	✓	
		3. Consider designation of the ecologically important parts of the Frontier Closed Area as new 'Country Parks' and / or conservation zone.	Immediate. Subject to outcome of ongoing consultancy study. Administrative challenges.	Administrative	✓	
		4. Adoption of international best practices and ecologically sensitive drainage schemes.	Immediate. Specifications in project / study briefs. Competition with site constraints is anticipated.	Administrative		✓
		5. Consider habitat restoration of channelized streams.	Immediate. Implement following area identification. Physical challenges.	Technological		✓
Q	*Cultural Heritage*	1. Immediate integration of conservation of cultural heritage resources into the planning mechanism to achieve gains for the community.	Immediate. Implement following area identification. Administrative challenges.	Administrative	✓	

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		2. Consideration of partially retention of marginal cultural resources, e.g. facadeism.	Immediate. Review international and regional experience.	Administrative	✓	
Q	*Others*	1. Consideration of a 'green tax' or electricity tax to implement the "polluter-pays" principle in order to induce behavioural changes among the public and encourage reduction and recycling through direct economic incentives.	Immediate. Implement following public consultation. Opposition from the public may be expected.	Educational and Administrative	✓	
		2. Government to take the lead in the advancement of environmentally-friendly building design.	Ongoing and immediate. Little challenge.	Technological	✓	
		3. Update codes for environmental protection, energy efficiency and materials conservation.	Immediate review and revisions. Administrative and technical challenges.	Technological and Administrative	✓	
S	*Air*	1. SO_x, NO_x and Particulate emission trading schemes for Hong Kong and PRD coal-fired power stations.	Immediate consideration. Moderate administrative challenges.	Technological	✓	
		2. Cooperate with State Development and Reform Commission to introduce low sulphur diesel to road transportation fleets to PRD.	Immediate. Moderate cross-boundary challenges.	Technological and Administrative		✓
		3. CO_2 emission trading schemes for Hong Kong and PRD coal-fired power stations.	Immediate. Moderate cross-boundary challenges.	Technological and Administrative		✓
		4. Review of bus network to minimise route duplication and rationalise bus network.	On-going work. Moderate challenge.	Administrative		✓

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
S	*Noise*	1. Introduction and incorporation of environmentally friendly transport options such as submerged and depressed roads, comprehensive pedestrian network, use of environmentally friendly public transport vehicles and rail-based transport to NDAs and highly impacted, high density areas.	Immediate. Implement following area identification. Physical / technical challenges.	Technological	✓	
S	*Water Resources and Water Quality*	1. Conclude HATS waste water treatment schemes.	Ongoing. Moderate technical challenges.	Technological	✓	
		2. Action on marine shipping pollution and oil spills.	Immediate. Implement following review of international best practice. Major challenges from industry.	Technological		✓
		3. Increase sewerage charges to more fairly represent actual cost of sewage treatment and sewerage infrastructure.	Initiate public education of real costs of provision via PSA/ PR campaign. Maybe less opposition if bundled into 'green tax'. Medium-term implementation.	Educational	✓	
		4. Explore the feasibility of further increase in water charges to reduce water consumption and eliminate wasteful water practices.	Moderate to high challenges mitigated by prior PR campaign. Strong opposition form the public is anticipated. Maybe less opposition if bundled into 'green tax'. Medium-term implementation.	Educational		✓
		5. Explore alternatives in terms of imported water resources, such as desalination and wastewater reuse.	Immediate consideration by consultancy to reduce high dependence of Hong Kong on water resources in Guangdong and cost benefit analysis and in-parallel sustainability assessment required.	Technological		✓

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		6. Cooperate with Guangdong and Shenzhen Governments in tackling the trans-boundary pollution in Deep Bay and from the Pearl River.	Medium-term. Joint cross-jurisdictional action. Significant challenges at a local and regional level.	Administrative	✓	
		7. Review the WQOs to match the vision for a world city in Asia.	Medium-term implementation.	Administrative	✓	
S	*Waste*	1. Advance consideration of waste incineration and waste-to-energy projects for 'triple (waste reduction, CO_2 reductions and energy productions) wins'.	International tendering of projects. Medium-term. Significant technical challenges and vociferous and well-articulated opposition from NGOs to waste incineration.	Technological and Educational		✓
		2. Introduce domestic waste charging schemes.	Medium-term implementation. Moderate to high challenges mitigated by prior PR campaign. Strong opposition from the public is anticipated. May be less opposition if bundled into 'green tax'.	Educational		✓
		3. Penalise failure to separate waste at source.	Medium-term implementation. Can only be implemented after public education campaign.	Educational		✓
S	*Energy and Natural Resources*	1. Electricity grid interconnection physical implementation following consultancy study (see Q: Energy and Natural Resources. 1) findings.	Medium-term implementation. Significant technical challenges.	Technological		✓
		2. Establishment of Integrated Energy and Transportation Policy (refer to the UK's Energy Challenge report issued in July 2006).	Immediate action in commissioning of the integrated study and target policy.	Administrative		✓
		3. Increase targets for renewable energy use.	Medium-term implementation.	Administrative		✓

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		4. Possibility of establishing area-wide district cooling for new reclamation areas or NDAs.	Medium-term implementation. Subject to policy support and engineering feasibility studies. Moderate technological challenges.	Technological		✓
S	*Land Use and Landscape*	1. Establishment of "Conservation Area" and "Coastal Protection Area" on Outline Zoning Plans as "no-go" areas for development.	Immediate consideration and adoption. Challenges in terms of land sales and property rights.	Administrative	✓	
S	*Ecology*	1. Explore the establishment of a nature conservation trust.	Immediate consideration and medium-term implementation.	Administrative		✓
		2. Explore the feasibility of Wetland Mitigation Banking.	Immediate consideration and medium-term implementation.	Administrative		✓
S	*Others*	1. Incentives environmental technology sector, using the Eco Park model, to catalyse a vibrant sector and export capability of environmental products and services.	Significant advances in 'seed' financial incentivisation by HKSARG that encourages support of recycled products. Administrative challenges.	Administrative	✓	
		2. Objective consideration of a centralized government agency that embraces economic, social and environmental considerations. Objective in-parallel, consideration of a more transparent and statutory Sustainability Assessment mechanism that, in tandem, can plan and assess the sustainability of future development options. Alternatively a sustainability assessment could be considered in parallel with the statutory EIA process.	Immediate consideration including appropriate implementation timeframe. Administrative challenges.	Administrative		✓

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		3. Government to maintain 'rail' as the backbone transport policy and expedite railway development in urban areas.	Significant capital cost and uncertainty with future patronage.	Administrative	✓	
L	*Air*	1. Cross-boundary cooperation in response to the air quality challenges arising from the burgeoning manufacturing and associated emissions north of the Hong Kong boundary in the PRD region.	Immediate and ongoing. Major challenges and the Expert Group under the Guangdong - Hong Kong Cooperation Joint Conference plus Mainland China's state level support is essential.	Administrative	✓	
		2. Consideration / establishment of Greater PRD Air Shed Management Authority to ensure holistic consideration and management of the region's air quality.	Immediate consideration, potentially through the Expert Group - Guangdong - Hong Kong Cooperation Joint Conference. Medium - long-term implementation. Major challenges and regional plus state level support essential.	Administrative		✓
		3. Take the lead to work with the International Maritime Organisation to introduce low sulphur fuel content or MARPOL VI requirements for vessels entering the territory or emission control technologies for maritime industry.	Major administrative challenges. Immediate consideration. Medium to long-term implementation.	Administrative		✓

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		4. Government should give priority to environmentally friendly vehicles that meet EPD's specified qualifying standards for tax incentives when government vehicles are due for replacement, subject to operational requirements and the rational utilisation of resources. In the longer term (L) this could, for example, comprise replacement of certain hybrid vehicles in the HKSARG fleet with fuel cell- based vehicles.	Progressive replacement with environmentally friendly vehicles. Technical and resources challenges. Medium to long-term implementation.	Administrative		✓
		5. Consideration of wider use of Renewable Energy (RE) – solar, hydro, wave and geothermal power etc.	Immediate consideration. Technical challenges. Long-term implementation.	Technological	✓	
		6. Mandate the need for all marine vessels berthed in Hong Kong to use shoreside power and not on board power.	Long-term implementation. Minimal challenges.	Technological		✓
L	*Water Resources and Water Quality*	1. There should be continued programme for upgrading the treatment facilities in terms of capacity, and treatment level so as to cater for population growth, and any water quality needs.	Proactively in advance of any NDA or population introduction as part of HK2030 strategies.	Technological	✓	
L	*Energy and Natural Resources*	1. Explore the need for establishment of an "Energy Bureau".	Immediate consideration. Medium to long-term implementation subject to policy decision. Administrative challenges.	Administrative		✓

Classification Quick Wins, Slow Burners, Long Termers	Discipline	Possible Solutions/Mechanisms	Timing / Implementation Challenges/Difficulties	Technological / Educational/ Administrative	Existing Policy	Future Policy
		2. Consideration of wider use of renewable / nuclear energy.	Link with PSA / PR for nuclear energy and announcement by the Government. Medium to long-term implementation subject to policy decision. Social challenges / perception issues surrounding safety of nuclear / legacy impacts.	Administrative and Educational		✓
L	*Cultural Heritage*	1. Advancement of NDA and adaptive re-use and integration of cultural resources in development options.	Immediate consideration. Long-term implementation. Challenges largely on economic aspect.	Administrative	✓	
L	*Others*	1. Reconsideration of Port Rail Line or alternative haulage means for freight transportation based on updated forecast volume of goods.	Long-term implementation. Technical challenges.	Administrative		✓

9.2 OTHER INITIATIVES AND THEIR IMPLEMENTATION

Environmentally Sound Technology (EST)

9.2.1 Technological features which could be effectively incorporated into planning, and the likely future direction of environmental technology will need to be studied in detail in future assessments as these are often specific to projects or plans and need detailed cost benefit analyses to be undertaken, which is outside the scope of the current Assignment.

Conservation of Energy Resources

9.2.2 Future trends in energy consumption and potential energy requirements for Hong Kong will need to be examined. Opportunities for the conservation of resources as well as the benefits in terms of air quality will also need to be considered.

Building Construction and Design

9.2.3 The impact of energy conservation features and potential for the use of renewable energy and the use of recycled materials in building construction will need to be reviewed. The impact of effective planning will need to be investigated to examine methods of increasing air movement in and around buildings, and waste reducing features etc. will also need to be documented.

Institutional Mechanisms

9.2.4 Existing institutional mechanisms within the Government relating to environmental aspects will need to be reviewed. Methods of increasing the effectiveness to meet the environmental objectives, such as to provide better research support and incentives as well as establish a community network to increase public awareness, will also need to be examined. Moreover, the possibility of better engaging the private sector through partnership schemes in the conservation and management of habitats, cultural and landscape features or characteristic environments will need to be discussed.

Cultural Heritage Policy

9.2.5 A comprehensive and integrated policy would enhance the long-term conservation of Hong Kong's heritage. The policy would help define the principles and values of heritage resources to be preserved and interpreted. Reference could be made to standards set out by UNESCO, ICOMOS and used widely as part of conservation policies and strategies internationally. The policy could also set out the steps to be taken, giving priorities and methodologies and setting out the responsibilities of all parties, both public and private.

Establish a Dedicated Cultural Heritage Conservation Authority

9.2.6 A dedicated cultural heritage conservation authority is suggested at the highest decision making level to implement the policy on conservation of cultural heritage. It would need to comprise all parties involved in heritage conservation, monitor actions and works of bodies potentially impacting on heritage, procure funds and decide on their expenditure and ensure that Hong Kong's cultural resources are preserved in accordance with the criteria set out in the Policy.

Design and Implementation of a Focused Legal and Administrative Framework for Cultural Heritage Conservation

9.2.7 A review is recommended on the working relationship between the various ordinances which play a part in cultural heritage conservation including the main ordinance, the Antiquities and Monuments Ordinance, Buildings Ordinance, the Town Planning Ordinance, and the work of the Urban Renewal Authority. All of these processes play a part in interpreting and implementing measures that impact directly on heritage in Hong Kong. Integration at this level would benefit the overall process. Similarly, the works of the relevant government departments and agencies need to be more effectively co-ordinated.

Changes to Existing Ordinances and Legislation

9.2.8 A review of existing planning legislation is recommended as a long-term target. Such a review would look at how heritage conservation can be better incorporated into the planning process, e.g. designation of "heritage conservation areas" and cultural heritage buffer zones to protect from unauthorized destruction and development. Provisions can be made in the Notes for sensitive zones to require planning permission for building work or redevelopment proposal which may affect historic structures or areas. The inclusion of heritage conservation as a "public

purpose" and, in particular, radical revision of the New Territories Small House Policy to allow for conservation of selected heritage properties and assemblages would also be desirable long-term goals.

Define the Nature and Extent of Our Cultural Heritage

9.2.9 The database of heritage resources must include more than just archaeological sites, graded buildings and declared monuments. AMO has commenced to assess in-depth the historic buildings recorded by the territory-wide survey. Similar initiatives are needed for other forms of tangible and intangible cultural heritage; otherwise problems will inevitably occur at a later stage when some of the many other historical resources are potentially impacted by options designed with insufficient heritage input. As a result, reference to other varied and dispersed sources will be required to augment the limited database and to identify potential constraints on development which are not in the available files.

9.2.10 A valuable initiative has been made by the Antiquities Advisory Board (AAB) in terms of enhancing the criteria and documentation of historic buildings. Apart from monuments and graded buildings, AAB has kept stock of buildings which may have historical/conservation value. From March 2005, an expert panel under AAB has been conducting an assessment of 1,440 historic buildings selected from around 8,800 buildings of more than 50 years of age in Hong Kong recorded from a territory-wide survey. These built heritage will form a pool for Government to further consider their conservation. A system has also been set up by the AMO to monitor development proposals which may affect these buildings.

9.2.11 The use of advanced and heritage friendly information technology would substantially improve the management of cultural heritages in Hong Kong. Networks of database, GIS mapping and computerised heritage inventories are used widely overseas to quantify, manage, categorize and record heritage. . The use of Cultural Mapping methodology to simultaneously map, assess significance and evaluate risk to heritage resources from development scenarios is being spearheaded in the region by UNESCO. Its use is highly recommended. Most importantly, it would enable implementation of a more comprehensive system of advance notification to inform planners of the presence of important heritage resources in an area. Planning can only help preserve heritage if it knows where and what and how valuable it is. Programmes used in best practice cases overseas should be considered and, if appropriate, recommendations should be made to improve this situation. Development of such a database system would involve initial capital cost as well as resource implications to keep the data up to date. However, these costs are considered minimal in comparison to the costs of delay, redesign and mitigation which result when major projects are designed with incomplete or inaccurate heritage data.

Design a System of Relative Significance

9.2.12 It is necessary to accord a relative ranking to both built heritage and archaeological sites. The present grading system applies only to historical buildings and does not state the extent of protection. At present, comment on the conservation requirements of each individual case has to be sought from the AMO. A new system based on overseas experiences and incorporated local background and needs is required. The

system would incorporate a statement of cultural significance of the heritage item drawn up based on the unique heritage value of the item, and a conservation plan on how the heritage item could be conserved suitably through the planning and other relevant mechanism and other means. Effective standards for assessing the significance of a wide range of heritage resources employed in Canada, Britain, Australia, Europe and Asia will need to be considered and if appropriate incorporated in the assessment of development proposals.

Expand Indicators of Sustainability

9.2.13 The issue of defining effective indicators to measure the sustainability of heritage resources is receiving wide attention within the heritage resource management. The nature of the resource makes quantification difficult. It is important that Hong Kong, through liaison with the AMO and other parties, participates in this international dialogue and that a refined set of indicators be developed based on the CASET indicators generated by SUSDEV 21.

Criteria for Adaptive Re-use of Heritage Resources

9.2.14 Suitable modification of heritage buildings to suit compatible uses is to be encouraged as it can give them new life and help finance their conservation and maintenance of the buildings. However, too often with lack of proper monitoring, this process would result in unacceptable changes to significant fabric, irreversible modifications and loss of heritage value. A set of professional guidelines based on international best practice is needed to present best practice for adaptive re-use of a wide range of built heritage, e.g. traditional Chinese domestic, communal, religious and commercial buildings, traditional village settlements and their cultural landscape, colonial buildings, historic urban landscape, Western residences etc. These guidelines then need to be enforced by the relevant authorities.

Design a Cultural Heritage Tourism Policy

9.2.15 Heritage tourism to date suffers from fragmentation and lack of a strategy for the identification of heritage resources with potential for tourism development and for their protection and continuing management. It is recommended that the agencies tasked with development of cultural heritage tourism should maintain a close working relationship with the authorities responsible for heritage conservation and make reference to the UNESCO-Asia-Pacific initiative, *Culture, Heritage Management and Tourism: Models for co-operation among stakeholders.* This programme provides detailed and useful models which could be successfully applied to local situation.

Private Development Sector Involvement in Heritage Conservation

9.2.16 The long-term success of cultural heritage conservation plans will depend ultimately on the degree of support they receive from members of the public and from the private sector. Public education and awareness must be promoted and mechanisms developed which will enable and encourage involvement by the local community and current owners of historic sites and private sector to invest in conservation as good business, effective public relations and community building. Many relevant initiatives have been adopted throughout Asia and further afield, with varying

degrees of success.

9.2.17 Mechanisms are needed to enlist private sector support for heritage conservation initiatives. These mechanisms must recognize existing economic forces in order to develop tools which promote sensitive land development and protection of heritage assets. Mechanism to be explored include but are not limited to the following:

- Land swaps on adjacent sites in return for commitments to conserve and maintain heritage assets;
- Reduction of land premium in return for conservation of heritage;
- Conservation easements in exchange for cash compensation; and
- Designation of "heritage conservation areas" and "heritage conservation buffer zones".

Support of Community Activism for Conservation of Heritage

9.2.18 Experience in many countries has shown that heritage conservation will only be successful in the long-term when community involvement is an active and major component. Present efforts on heritage education should be enhanced, and support be given to heritage activists working outside the government system. These groups are proving particularly successful at the district and community level, as seen in Wanchai, Tai O and Peng Chau. Such successful initiatives should be studied and ways found to replicate their success by creating links between heritage groups in different communities.

9.2.19 During the public consultation of the last round of review of heritage policy in 2004, many respondents were in favour of setting up a statutory heritage trust fund so as to tap resources from the community as well as to cultivate the public's sense of belonging and commitment in heritage conservation work. This proposal is also one of the focal points in Home Affairs Bureau's current review. The membership and operational mode of the AAB have also been revamped to better represent wider public opinion and to provide access and transparency to the conservation process.

10 SUMMARY REMARKS

10.1 OPTIONS DEVELOPMENT

10.1.1 Based on the analysis of the baseline environmental conditions, established environmental capital stock, identified environmental constraints and review of international standards, environmental objectives for Hong Kong have been proposed. A broad–brush strategic environmental assessment was then conducted to examine the environmental performance for a range of development options for the entire territory. The findings of the broad-brush assessment were then fed into the HK2030 Study for option refinement and further development. In the final stage of the HK2030 Study, the Preferred Development Option formulated on the basis of the Reference Scenario, with the possible container terminal location assumed at either the NW Lantau or SW Tsing Yi, was derived for further assessment under the HK2030 SEA.

10.2 EVALUATION OF DEVELOPMENT OPTIONS

10.2.1 Following the evaluation of the baseline scenario, both the NW Lantau and SW Tsing Yi container terminal options under the Reference Scenario have been evaluated in terms of their strategic environmental performance for Years 2010, 2020 and 2030. In order to test the environmental performance of the Reference Scenario to the high population growth and high economic growth assumptions, a further assessment has been conducted using the "What If" Scenario for sensitivity test.

10.2.2 There are many ways to tackle environmental problems. Good physical planning can contribute substantially to environmental enhancement, but it requires a comprehensive environmental strategy to fully address the identified problems. The following summarises environmental aspects, which will have positive environmental outcomes.

Table 10-1 Summary of Environmental Aspects of Various Environmental Discipline

Environmental Discipline	Environmental Aspects
Air Quality	The spatial development pattern of housing and employment land has taken into account the concept of "jobs closer to home" thereby enabling reduction in work trips as well as travelling time. The transport network has incorporated the provision for additional railways in the short, medium and long-term, which is considered beneficial in improving the air quality (otherwise an increase in diesel-powered vehicles will further exacerbate the air pollution problem). Major NDAs in the New Territories are planned along railway lines (e.g. Hung Shui Kiu, Fanling North, Kwu Tung North) as these are more environmentally friendly than road-based transport modes. Development of new areas allows the incorporation of environmentally friendly transport options, such as comprehensively planned pedestrian network, use of environmentally friendly public transport vehicles, etc., which can ensure better air quality for the communities concerned.

Environmental Discipline	Environmental Aspects
	MARPOL VI requirements and shore-side power supply for marine vessels should be explored. More stringent vehicle emission controls should be considered.
Noise	Similar to the air quality aspect above, the environmental considerations could also improve the noise environment.
Water Quality	While further port development would require reclamation, the extent of new reclamations will be limited to the scale required to accommodate essential infrastructure or other uses expected to generate an over-riding improvement to the economy, functioning of the area concerned or quality of life.
Waste	Construction/maintenance dredging of the container terminals will continue to reduce the capacity of the mud disposal areas, more for the North West Lantau container terminal option and less so for the South West Tsing Yi container terminal option under the Reference Scenario, unless an alternative use for the dredged mud could be found.
Hazard	Reduction of existing proposed population in the PHI consultation zones is of benefit in terms of societal risks.
Ecology	Ecologically important areas in Hong Kong will be protected and avoided. Considering the significance in conservation value, no major developments have been proposed at the rural parts of Sai Kung and Lantau under the HK2030 strategy.
Energy and Natural Resources	New development areas provide an opportunity to incorporate environmentally friendly initiatives such as District Cooling System for Seawater Air-conditioning and utilisation of solar energy. Reduction in work trips and travelling distances help to save energy.
Cultural Heritage	Development of NDAs in Northern New Territories will improve the accessibility of certain sites with cultural heritage significance; hence provide incentives for enhancement of these sites which may otherwise be just left “unattended”.
Landscape and Visual	Development of NDAs in Northern New Territories will provide an opportunity to “tidy up” the scattered port backup and open storage sites and relocate them to properly designed designated areas. Planning of NDAs will take full account of landscape and visual concerns.

10.2.3 The Preferred Development Option formulated on the basis of the Reference Scenario and its associated development strategy demonstrates that there are general improvements in the air quality in HKSAR with the implementation of the committed control measures. However, the concentration of some air pollutants in some areas would worsen. It implies that more air pollution control measures should be explored. It should be noted that the 2030 emission inventories are projected based on a lot of assumptions and uncertainties. The predicted trend of air quality may only be achieved if many effective improvement measures materialize. Given the uncertainties in the projection, there is a chance that air quality will deteriorate in future. In addition, the PATH modelling results only predict the district-wise air quality. Detailed environmental studies for the proposed infrastructure and developments are recommended to determine their environmental acceptability.

10.2.4 The population exposed to the excessive noise environment will much depend on the size of the population and the traffic volume. Under the baseline condition, the current population exposed to excessive noise level is around 1.15 million. With the projected increase in future population and traffic, the total population exposed to excessive noise level is expected to increase to some 1.40 million under both possible container terminal options of the Reference Scenario by Year 2030. However, there will be some local differences in the noise level resulting from the difference in the traffic flow between the two possible container terminal options of the Reference Scenario. Under the "What If" Scenario, the total population exposed to excessive noise level will be further increased to some 1.47 million by 2030.

10.2.5 The water quality in Hong Kong is expected to improve with the implementation of the committed and planned facilities. However, the physical presence of the container terminal will have some local water quality impact pending the decision on the locality of the future container terminal. The cross-boundary pollution is expected to become, relatively speaking, more influential on the marine water quality in Deep Bay, Northwestern and Southern WCZs in the future as a result of the reduction of the pollution discharges from Hong Kong.

10.2.6 The construction waste will continue to form a significant part of the total solid waste generated in Hong Kong. Additional waste management facilities will be required in the long-term. The planned container terminal development will involve significant maintenance dredging, which will add further pressure to the limited capacity of the existing mud disposal grounds.

10.2.7 Overall, the proposed development aims to seek common ground among competing social, economic and environmental values with a view for a sustainable development of Hong Kong for the next 30 years. The potential key environmental issues and challenges related to the proposed development have been highlighted and strategic actions recommended from this SEA exercise. Those key issues should be regularly revisited and strategic actions adjusted based on the changing environment, economic and social circumstances and advance of technology, to ensure the sustainability of the future development.

10.3 EVALUATION OF STRATEGIES

Infrastructure and Transport Strategies

10.3.1 In addition to the above evaluation specifically focused on the port related development options, the SEA also assessed the environmental performance of other development strategies.

10.3.2 Development and upgrading of public transport link will continue to provide people with a realistic alternative to private car ownership, which would result in a reduction in overall exhaust emissions and improved air quality.

10.3.3 Improvements, reconstruction, widening etc. of the existing road network will "ease" traffic in some areas, thus leading to improvement in both air quality and noise environment in the currently congested areas with a high density of activities. However, improvement of the existing network and development of future links imply large increases in road traffic movement. These increases would come along

with localized deterioration of air quality and noise environment along the improved/new built links in already polluted areas, but would also impact on currently unaffected areas with good air quality and noise environment.

10.3.4 Planned railways such as the Northern Link and the Hong Kong Section of the Guangzhou-Shenzhen-HK Express Rail Link will require land take and may affect ecologically sensitive areas in the New Territories unless detailed assessments are carried out including the use of tunnels rather than above ground options for sensitive sections of alignments.

10.3.5 The projected increase in passenger and cargo will increase NO_x emission as well as population exposure to excessive noise. The reclamation for the third runway may have impacts on marine water quality and ecology. The cumulative effect of the airport expansion, the North West Lantau container terminal option under the Reference Scenario (if selected) and the proposed HZMB should be thoroughly assessed and properly mitigated in the future.

10.3.6 Hong Kong currently heavily relies on importing Dongjiang River for its water supply. Some 80% of the water supply is from Dongjiang River. As other cities in Guangdong are also fighting for more and more water supply from Dongjiang River, the Total Water Management strategy should be fully implemented to reduce water consumption, to minimise wastage, to encourage wastewater reuse and to explore alternative water resources.

10.3.7 There should be continued programmes for upgrading the treatment facilities in terms of capacity and treatment level so as to cater for population growth and any water quality needs. The effort would help Hong Kong to achieve the status as a World City in Asia.

10.3.8 The routing of marine traffic will need to be well planned in order to prevent overlapping and cumulative oil spill from vessels.

New Development Areas (NDAs)

10.3.9 NDAs have to be matched with adequate utilities including water supplies, wastewater collection and treatment systems, electricity supplies and efficient transport infrastructure etc. All those facilities could have potential implications in terms of PHIs, which should be properly addressed during the implementation stage. The development of NDAs and associated facilities should take careful consideration of cultural heritage and ecological conservation and protection.

10.3.10 Relocating population from the traffic congested built up metro area to the NDAs provides opportunities to reduce the population exposing to excessive noise and air pollution. The future noise and air quality environment of the NDAs has been assessed on a broad-brush basis. Further detailed assessment should be conducted during the project implementation stage to mitigate any noise exceedance or air pollution by planning and design.

Cross-Boundary Issues

10.3.11 Within the PRD region, rising human populations, increasing use of natural

resources and a steady reduction in the area of agricultural land has led to increasing environmental pollution and adverse ecological impacts. These activities not only have a severe impact on the sustainability of the PRD, but also because Hong Kong is affected by these activities, they will act as a considerable environmental constraint on Hong Kong as well.

10.3.12 The water quality in Deep Bay, Northwestern and Southern WCZs are subject to cross-boundary pollution. With the continuing implementation of the wastewater schemes in Hong Kong, cross-boundary pollution is expected to become, relatively speaking, more influential in those waters.

10.3.13 Cross-boundary air pollution is a major environmental issue facing Hong Kong. Whilst the emission trading mechanism provides a means for Hong Kong to assist in reducing the pollution load generated from the PRD region, persistent and concerted effort will be required from both Hong Kong and Guangdong Governments in order to significantly improve the air quality in the region.

10.3.14 The cross-boundary transport including air flights, marine, rail and road is all expected to continue to grow in the foreseeable future, and will add additional pressure to the air quality and noise environment in Hong Kong as well in Guangdong. It will require a thorough study and a careful planning for any new cross-boundary transport infrastructure.

10.4 MITIGATION MEASURES

Air

- Implementation of more stringent measures in the future to cope with continuous development of the area. Such measures could include widening the field of application of current measures, tightening standards, supporting new technologies;

- Further mitigation of emissions from the currently dominant sources, specific actions should be included in the strategy in order to tackle rising emission sources such as plane movements / emissions from the airport and ship movements / emissions from the port; and

- Mitigation through fuel control, technology improvement, appropriate dispersion, greenhouse gases emissions, in particular CO_2 emissions, are inevitably associated with all combustion sources and require more radical measures to be controlled.

Noise

- Erection of noise barriers on high noise impact roads due to infrastructure developments;

- Noise protection design such as self-protecting building design, integrated building-noise source design, increase in the buffer distance between the noise source and residential buildings and use of podium for NDAs;

- Adoption of depressed road design wherever possible for new roads;
- Environmentally friendly road-based transport mode for NDAs and cross-boundary transport; and
- Suitable land use planning to avoid placing noise sensitive uses in proximity to roads with potential high noise impact.

Water

- The nitrogen level in Southern and North Western WCZs will remain high through to Year 2030 due to the influence of the Pearl River. In order to ensure the compliance of the WQOs the following additional treatment facilities will be essential:
  - The treatment capacity of Pillar Point STW and SCI STW should be reviewed in due course to ensure adequate provision of treatment capacity for future population increase;
  - With the completion of upgrading of Stonecutters Island STW, Pillar Point STW, the background pollution will become relatively more influential to the water quality in North Western, Deep Bay and Southern WCZs. Close inter-government cooperation between HKSAR and Guangdong Province will be important in order to reduce the trans-boundary pollution; and
  - Although the pollution levels in Mirs Bay are low, it is prone to frequent occurrence of red tides due to its poor flushing condition. Any development with significant increase in pollution discharge into this WCZ should be avoided.
- The current statutory WQOs should be achieved as soon as is reasonably practicable to match the status for a World City in Asia.

Waste

- Minimising waste production and maximising waste recycling by education;
- Continuing implementing waste disposal charging scheme;
- Introducing incentives to recycling industries;
- Exploring alternative waste disposal technology to landfill, such as waste to energy and waste incineration; and
- Exploring alternative use for the dredged mud.

10.5 SUSTAINABLE PROJECT MONITORING AND AUDITING AND FURTHER IMPLEMENTATION

10.5.1 To ensure that the key potential impacts or benefits that have been identified are addressed at the correct stage of the future strategic development of Hong Kong, a

process has been identified for capturing and following-up of any potential negative and positive environmental consequences and issues, termed Sustainable Project Monitoring and Audit (SPM&A), since it identifies strategic-level actions to facilitate the development of a preferred strategy project or component option in a sustainable manner.

10.5.2 SPM&A, thus defined, identifies the key areas that should be addressed and investigated further, during the subsequent stages, in the development of the overall strategy to identify any strategic follow-up actions to facilitate environmentally beneficially development.

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APPENDIX A ENVIRONMENTAL BASELINES

Table A2-1 Hong Kong Air Quality Objectives (μg/m^3)

	Averaging Time				
Pollutant	**1 hr (2)**	**8 hr (3)**	**24 hr (3)**	**3 month (4)**	**1 year (4)**
Sulphur Dioxide	800	-	350	-	80
Total Suspended Particulates	-	-	260	-	80
Respirable Suspended Particulates (5)	-	-	180	-	55
Nitrogen Dioxide	300	-	150	-	80
Carbon Monoxide	30000	10000	-	-	-
Photochemical oxidants (as ozone) (6)	240	-	-	-	-
Lead	-	-	-	1.5	-

(1) Measured at 298K (25^{o}C) and 101.325kPa (one atmosphere)
(2) Not to be exceeded more than three times per year
(3) Not to be exceeded more than once per year
(4) Arithmetic mean
(5) Respirable suspended particulates means suspended particles in air with a nominal aerodynamic diameter of 10 micrometres or smaller
(6) Photochemical oxidants one determined by measurement of ozone only

Table A2-2 Compliance Status of Roadside Stations against Hong Kong's Air Quality Objectives, 1991-2005

Pollutant	AQO	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05
Total suspended particulates	24 hour *	✓	x	✓	x	x	x	✓	✓	✓	x	✓	✓	✓	✓	✓
	Annual	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Respirable suspended particulates	24 hour ^	✓	✓	✓	✓	x	✓	✓	x	x	x	x	x	x	x	x
	Annual	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Sulphur dioxide	1 hour	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	24 hour	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Annual	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen dioxide	1 hour ^	✓	✓	✓	✓	✓	x	x	✓	x	x	x	x	x	x	x
	24 hour	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Annual	✓	✓	✓	x	✓	✓	x	x	x	x	x	x	x	x	x
Carbon monoxide	1 hour	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	8 hour	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Note: ✓ = air quality objective was achieved for all monitoring stations.
x = air quality objectives for that particular parameter at all monitoring stations were not achieved in that year; non-achievement is defined as when at least one AQO exceedance is recorded in any one of the monitoring stations.
* = information available for Mong Kok station only.
^ = information for Central and Causeway Bay stations only available from 1998.
n/a = information not available.

Source: Air Quality in Hong Kong, EPD, 1991-2005.

Table A2-3 Compliance Status of General Stations against Hong Kong's Air Quality Objectives, 1986-2005

Pollutant	AQO	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05
Total suspended particulates	24 hour	x	x	x	x	x	✓	x	✓	x	x	x	x	✓	x	x	✓	✓	x	x	x
	Annual	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Respirable suspended particulates	24 hour	✓	x	x	x	✓	✓	✓	✓	✓	x	✓	x	✓	x	x	✓	✓	x	x	x
	Annual	x	x	x	x	✓	✓	✓	✓	✓	x	x	x	x	x	x	x	✓	x	x	x
Sulphur dioxide	1 hour	x	x	x	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	24 hour	✓	x	x	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Annual	✓	✓	x	x	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Nitrogen dioxide	1 hour	x	x	x	x	x	✓	✓	✓	✓	✓	✓	✓	✓	x	x	x	x	x	x	x
	24 hour	x	x	x	x	x	x	x	x	x	x	x	x	✓	x	x	x	x	x	x	x
	Annual	✓	✓	x	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓	x	✓	✓	✓	✓	✓
Carbon monoxide	1 hour	✓	✓	✓	✓	n/a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	8 hour	✓	✓	✓	✓	n/a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ozone	1 hour	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	x	✓	✓	x	x	x	x	x	x	x
Lead	3 month	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	n/a

Note: ✓ = air quality objective was achieved for all monitoring stations.
x = air quality objectives for that particular parameter at all monitoring stations were not achieved in that year; non-achievement is defined as when at least one AQO exceedance is recorded in any one of the monitoring stations.
n/a = information not available.
Source: Air Quality in Hong Kong, EPD, 1986-2005.

Table A2-4 Average Concentration Levels of Toxic Air Pollutants in Hong Kong, 1997-2005

Pollutant	Location	1997	1998	1999	2000	2001	2002	2003	2004	2005
Heavy Metals										
Cadmium (ng/m^3)	**Tsuen Wan**	1.21	1.48	1.83	2.20	1.72	1.43	-	-	-
	Central/ Western	1.63	1.56	1.66	1.56	1.35	1.23	-	-	-
Hexavalent chromium (ng/m^3)	**Tsuen Wan**	0.34	0.33	0.27	0.25	0.24	0.28	0.18	0.19	0.13
	Central/ Western	0.59	0.52	0.26	0.22	0.21	0.26	0.19	0.21	0.17
Lead (ng/m^3)	**Tsuen Wan**	59	68	80	64	71	56	n/a	86	69
	Central/ Western	60	61	67	51	52	43	70	78	63
Nickel (ng/m^3)	**Tsuen Wan**	5.5	4.3	5.2	5.0	7.4	7.7	-	-	-
	Central/ Western	5.4	3.5	3.9	4.6	7.6	7.7	-	-	-
Organic Substances										
Benzene (μg/m^3)	**Tsuen Wan**	2.90	2.60	2.79	2.44	2.40	2.10	2.11	1.46	3.34

Pollutant	Location	1997	1998	1999	2000	2001	2002	2003	2004	2005
Heavy Metals										
	Central/ Western	2.40	2.10	2.11	1.46	2.11	1.84	1.33	2.22	2.68
Benzo[a]pyrene (ng/m^3)	**Tsuen Wan**	0.35	0.41	0.21	0.32	0.54	0.36	0.45	0.24	0.42
	Central/ Western	0.21	0.29	0.15	0.21	0.37	0.20	0.26	0.21	0.24
1,3-Butadiene ($\mu g/m^3$)	**Tsuen Wan**	0.52	0.20	0.30	0.22	0.44	0.33	0.26	0.23	0.24
	Central/ Western	0.53	0.20	0.23	0.16	0.27	0.23	0.17	0.18	0.20
Formaldehyde ($\mu g/m^3$)	**Tsuen Wan**	18.40	4.47	4.98	4.84	5.57	4.55	6.92	6.29	5.62
	Central/ Western	21.00	5.28	4.66	4.46	5.71	5.25	6.10	5.78	4.92
Perchloroethylene ($\mu g/m^3$)	**Tsuen Wan**	0.80	1.60	1.22	0.79	0.93	0.94	0.74	0.87	1.09
	Central/ Western	1.50	3.50	3.40	2.67	2.71	1.97	1.33	1.61	2.12
Dioxins ($pgI\text{-}TEQ/m^3$)	**Tsuen Wan**	0.022	0.097	0.143	0.061	0.055	0.063	0.071	0.055	0.071
	Central/ Western	0.024	0.080	0.096	0.051	0.046	0.057	0.066	0.073	0.082

Source: Air Quality in Hong Kong, EPD, 1997 – 2005.

Table A2-5 Total Greenhouse Gas Emissions in Hong Kong, 1990-2004 (Thousand tonnes CO_2 equivalent and percentage of total GHG emissions)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
CO_2	34,200	37,600	41,600	42,000	34,600	35,300	34,000	32,300	34,100	32,400	33,900	33,900	35,200	37,500	37,600
	87.4%	*87.9%*	*88.4%*	*88.1%*	*85.4%*	*84.8%*	*84.1%*	*83.6%*	*84.5%*	*85.4%*	*85.7%*	*85.5%*	*85.7%*	*86.0%*	*85.8%*
CH_4	4,390	4,600	4,840	5,100	5,330	5,460	5,550	5,440	5,350	4,560	4,550	4,610	4,760	4,930	4,950
	11.2%	*10.8%*	*10.3%*	*10.7%*	*13.2%*	*13.1%*	*13.7%*	*14.1%*	*13.3%*	*12.0%*	*11.5%*	*11.6%*	*11.6%*	*11.3%*	*11.3%*
N_2O	561	578	612	598	564	608	603	571	578	593	630	627	607	621	617
	1.43%	*1.35%*	*1.30%*	*1.25%*	*1.39%*	*1.46%*	*1.49%*	*1.48%*	*1.43%*	*1.56%*	*1.59%*	*1.58%*	*1.48%*	*1.42%*	*1.41%*
HFCs, PFCs & SF_6	-	-	-	-	-	238	286	339	349	394	482	499	532	540	668
	-	-	-	-	-	*0.57%*	*0.71%*	*0.88%*	*0.86%*	*1.0%*	*1.22%*	*1.26%*	*1.29%*	*1.24%*	*1.52%*
Total	**39,151**	**42,778**	**47,052**	**47,698**	**40,494**	**41,606**	**40,439**	**38,650**	**40,377**	**37,947**	**39,562**	**39,636**	**41,099**	**43,591**	**43,835**

Source: Air Quality in Hong Kong, EPD, 1997 – 2005.

Table A2-6 Annual Fresh Water Consumption in Hong Kong, 1990–2005

Year	Population (mid-year) (million)	Total Volume (million m^3/year)	Consumption per Capita (m^3/year)
1990	5.7	873.2	153.1
1991	5.8	883.6	153.6
1992	5.8	889.3	153.3
1993	5.9	915.2	155.1
1994	6.0	922.7	152.9
1995	6.2	919.0	149.3
1996	6.4	927.9	144.2
1997	6.5	913.4	140.8
1998	6.5	915.6	139.9
1999	6.6	910.7	137.9
2000	6.7	924.1	138.7
2001	6.7	939.6	139.7
2002	6.8	948.7	139.8
2003	6.8	973.8	143.2
2004	6.9	955.3	138.8
2005	6.9	967.7	139.5

Note: The methodology for estimating the population after 1995 changed from 'extended de facto' to 'resident population' approach.

Source: Water Supplies Department, 'Key Facts' (August 2005); Hong Kong Government, 'Hong Kong Yearbook' (2000-2004); Census and Statistics Department.

Table A2-7 Waste Arisings (Tonnes Per Day), 1986-2005

Year	Mid Year Population (million)	Total Waste Arising[(1)]	Quantity of Waste Requiring Final Disposal Per Capita	MSW	C&D Waste (landfilled)	Total Quantity of Waste Landfilled[(2)]
1986	5.5	24,500	0.0044	5,870	2,850	8,960
1987	5.6	23,590	0.0042	6,300	4,220	10,770
1988	5.7	26,250	0.0047	6,410	6,520	13,190
1989	5.7	24,990	0.0044	6,580	5,580	12,480
1990	5.7	24,460	0.0043	7,100	8,450	15,920
1991	5.8	28,650	0.0050	7,390	16,380	24,110
1992	5.8	33,060	0.0057	7,930	11,960	20,210
1993	5.9	30,850	0.0052	8,450	11,520	20,220
1994	6.0	32,280	0.0053	8,430	15,480	24,300
1995	6.2	40,190	0.0065	7,790	14,120	22,260
1996	6.4	38,660	0.0061	8,140	7,520	16,160
1997	6.5	37,110	0.0057	8,680	6,480	15,780
1998	6.6	41,440	0.0062	8,730	7,890	16,560
1999	6.6	46,380	0.0070	9,270	7,890	18,040
2000	6.7	47,020	0.0071	9,335	7,480	17,904
2001	6.7	48,140	0.0072	9,300	6,408	16,817
2002	6.8	54,807	0.0081	9,422	10,202	21,158

Year	Mid Year Population (million)	Total Waste Arising[(1)]	Quantity of Waste Requiring Final Disposal Per Capita	MSW	C&D Waste (landfilled)	Total Quantity of Waste Landfilled[(2)]
2003	6.8	61,151	0.0090	9,441	6,728	17,758
2004	6.9	65,281	0.0095	9,288	6,595	17,503
2005	6.9	68,144	0.0098	9,377	6,556	17,678

Notes:

C&D Waste = Construction & Demolition Waste

(1) Waste Arisings = MSW + C&D Material (including public fill)

(2) Quantity Landfilled = MSW + C&D Waste + Special Waste

Consultants' calculations based on data from EPD Annual Monitoring of Solid Waste Reports.

Source: SUSDEV 21 Final Environmental Baseline Report, ERM August 2000; EPD, 'Monitoring of Solid Waste in Hong Kong: Waste Statistics' (2001-2005); Hong Kong Government, 'Hong Kong Yearbook' (2000-2004).

Table A2-8 Waste Intake at Hong Kong's Three Strategic Landfill Sites (WENT, SENT & NENT), 1993-2005

Year	Average Daily Intake (tonnes/day)			Total Tonnage of Waste Received (tonnes/yr)			Total Capacity Occupied (tonnes/yr)
	WENT Landfill	SENT Landfill	NENT Landfill	WENT Landfill	SENT Landfill	NENT Landfill	All Landfills
1993	**1,170***	-	-	50,310	-	-	50,310
1994	2,700	**1,160***	-	985,500	112,520	-	1,098,020
1995	2,810	7,070	**2,620***	1,025,650	2,580,550	560,680	4,166,880
1996	1,970	7,230	3,440	719,050	2,638,950	1,255,600	4,613,600
1997	4,180	7,830	3,500	1,525,700	2,857,950	1,277,500	5,661,150
1998	5,420	7,840	3,300	1,978,300	2,861,600	1,204,500	6,044,400
1999	6,195	8,359	3,490	2,261,175	3,051,035	1,273,850	6,586,060
2000	6,104	8,227	3,573	2,227,960	3,002,855	1,304,145	6,534,960
2001	5,862	7,359	3,596	2,139,630	2,686,035	1,312,540	6,138,205
2002	6,363	11,116	3,679	2,322,495	4,057,340	1,342,855	7,722,670
2003	6,538	7,969	3,250	2,386,370	2,908,685	1,186,250	6,481,305
2004	6,464	8,102	2,936	2,359,360	2,957,230	1,071,640	6,388,230
2005	6,619	8,101	2,959	2,415,935	2,956,865	1,080,035	6,452,835

Note:

* denote Figures shown are average of actual operation days rather than 365 days during the year of commissioning.

(1) Tonnage of waste received by each strategic landfill each year was calculated as follows:
For year of commissioning : Average daily intake (tpd) x No. of actual operation days (i.e. 43 days for WENT, 97 days for SENT & 214 days for NENT)
For other Years: Average daily intake (tpd) x 365 days

(2) The Total Capacity Occupied only reflects the tonnage of waste occupying the three

landfills (WENT, SENT, & NENT) and does note include the waste occupying decommissioned landfills.

Source: Year 1993-1999: EPD, "Monitoring of Solid Waste in Hong Kong: Waste Statistics" (1999)
Year 2000-2005: EPD, "Monitoring of Solid Waste in Hong Kong: Waste Statistics" (2000-2005)

Table A2-9 Commission Dates and Capacities of Hong Kong's Landfill Sites

Landfill	Commission Date	Design Capacity (Mm^3)	Site Area (hectares)
WENT	19-Nov-93	61	110
SENT	26-Sept-94	39	100
NENT	1-Jun-95	35	61

Source: EPD, 'Environment Hong Kong 2006'

Table A2-10 Summary of Major Types of Solid Waste Requiring Final Disposal, 1986-2005

Year	Mid-year Population (million)	Quantity of Waste by Type (tpd)						Total Quantity of Waste LANDFILLED (tpd)
		Municipal Solid Waste (landfilled)			C&D materials		Special Waste	
		Domestic (1) (a)	Commercial (b)	Industrial (c)	Landfilled (d)	Public Fill (2) (e)	Landfilled (f)	i.e. (a)+(b)+(c)+(d)+(f)
1986	5.5	4,420	370	1,089	2,850	15,780	240	8,960
1987	5.9	4,630	430	1,240	4,220	13,070	250	10,770
1988	5.6	4,580	420	1,410	6,520	13,320	260	13,190
1989	5.7	4,870	450	1,270	5,580	12,820	310	12,480
1990	5.7	5,460	380	1,270	8,450	8,900	360	15,920
1991	5.8	5,560	400	1,430	16,380	4,880	340	24,110
1992	5.8	5,760	460	1,710	11,960	13,170	320	20,210
1993	5.9	6,000	570	1,880	11,520	10,880	250	20,220
1994	6.0	6,070	700	1,660	15,480	8,370	390	24,300
1995	6.2	6,210	520	1,060	14,120	18,280	350	22,260
1996	6.4	6,260	1,090	800	7,520	22,990	490	16,160
1997	6.5	6,760	1,220	700	6,480	21,950	620	15,780
1998	6.6	6,820	1,290	620	7,030	25,680	790	16,550
1999	6.6	7,430	1,250	590	7,890	29,220	880	18,040
2000	6.7	7,540	1,151	644	7,475	30,210	1,094	17,904
2001	6.7	7,551	1,187	562	6,408	32,430	1,109	16,817
2002	6.8	7,519	1,342	561	10,202	35,183	1,534	21,158
2003	6.8	7,402	1,428	612	6,728	44,982	1,588	17,758
2004	6.9	7,014	1,673	601	6,595	49,358	1,620	17,503

Year	Mid-year Population (million)	Quantity of Waste by Type (tpd)						Total Quantity of Waste LANDFILLED (tpd)
		Municipal Solid Waste (landfilled)			C&D materials		Special Waste	
		Domestic (1) (a)	Commercial (b)	Industrial (c)	Landfilled (d)	Public Fill(2) (e)	Landfilled (f)	i.e. (a)+(b)+(c)+(d)+(f)
2005	6.9	6,828	1,895	654	6,556	52,211	1,745	17,678

Notes:

(1) Up until May 1997, some domestic waste was disposed of by incineration

(2) Public Fill = inert C&D materials delivered to Public Fill Reception Facilities

(3) Municipal Solid Waste received at disposal facilities = (a)+(b)+(c)

(4) Total quantity of all waste received at solid waste facilities = (a)+(b)+(c)+(d)+(f)

(5) Mid-year population figures from Census and Statistics Department.

(6) Waste Arisings Indicators: {(a)+(b)+(c)+(d)+(e)}/ Estimated mid-year population

Source: Year 1993-1999: EPD, "Monitoring of Solid Waste in Hong Kong: Waste Statistics" (1999)

Year 2000-2005: EPD, "Monitoring of Solid Waste in Hong Kong: Waste Statistics" (2000-2005)

Table A2-11 Hong Kong's Primary Energy Requirements (PER) and Final Energy Requirements (FER), 1989-2005

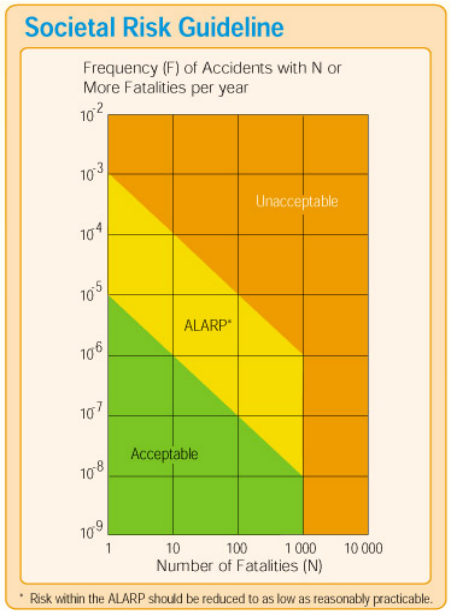
Year	PER (TJ)	FER (TJ)	Year	PER (TJ)	FER (TJ)
1989	389,436	221,870	1998	576,123	390,747
1990	400,825	222,640	1999	635,388	464,528
1991	436,147	238,707	2000	584,015	403,579
1992	471,648	261,022	2001	572,684	375,551
1993	490,850	270,843	2002	552,092	340,787
1994	471,712	300,999	2003	575,974	341,102
1995	467,288	290,764	2004	567,398	329,488
1996	468,762	288,555	2005	588,205	331,558
1997	472,439	294,286			

Source: Census and Statistics Department, HKSAR Government.

1. INDIVIDUAL RISK GUIDELINE FOR ACCEPTABLE RISK LEVELS

   Maximum level of off site individual risk should not exceed 1 in 100000 per year, i.e. 1x 10^{-5} / year

2. SOCIETAL RISK GUIDELINES FOR ACCEPTABLE RISK LEVELS



Source: Figure 1 in Annex 4 of EIAO-TM

Table A2-12 Table Showing Area of Hong Kong's 24 Habitat Categories

Habitat Category	Area (ha)	% cover
Bare Rock or Soil	5101.8	4.6
Quarry	168.6	0.2
Landfill	404.3	0.4
Other (Urban or Other Highly Modified)	12,656.3	11.4
Fung Shui Forest	106.3	0.1
Plantation or Plantation/Mixed Forest	417.0	0.4
Fishpond/Gei Wai	1,031.7	0.9
Natural Watercourse	803.9	0.7
Modified Watercourse	2,384.1	2.1
Rocky Shore	94.2	0.1
Artificial Rocky/Hard Shoreline	315.4	0.3
Intertidal Mudflat	656.1	0.6
Sandy Shore	179.6	0.2
Seagrass Bed	5.4	0.005

Habitat Category	Area (ha)	% cover
Golf Course/Urban Park	1,398.3	1.3
Rural Industrial Storage/Containers	1,379.2	1.3
Cultivation	3,838.3	3.5
Grassland	21,572.7	19.4
Shrubby Grassland	24,674.8	22.2
Mixed Shrubland	15,196.5	13.7
Mangrove	343.1	0.3
Freshwater/Brackish Wetland	130.1	0.1
Montane Forest	123.4	0.1
Lowland Forest	18,318.3	16.5
Total	**111,299.4**	**100.0**

Source: Update of Terrestrial Habitat Mapping and Ranking Based on Conservation Value, completed in 2005.

Table A2-13 Areas of Spatial Habitats by Ecological Values

Ecological Value	Total Area (ha)	Percentage Cover (%)
High	35,683	32.1
Medium	30,236	27.2
Low	30,941	27.8
Negligible	14,440	13.0

Source: Update of Terrestrial Habitat Mapping and Ranking Based on Conservation Value, completed in 2005.

APPENDIX B AN EXPLANATION OF THE REFERENCE SCENARIO AND "WHAT IF" SCENARIO UNDER THE HK2030 STUDY

Reference Scenario

The following is a summary of major planning parameters and development proposals, assumptions on key infrastructure facilities, road network and rail projects assumed under the Reference Scenario of the HK2030 Study:

I. Population and Employment

	Base Year (2003)	2010	2020	2030
Resident Population	6.8	7.2	7.8	8.4
Employment	3.0	3.5	3.7	4.0

(in million)

Note:

Assumes population will grow at a slower rate of about 0.7% per annum.

A steady rate of economic growth (annual GDP growth at 4.0% initially and gradually falling to 3.0%) is assumed.

II. Housing Land Requirement

	Base Year (2003)	2010	2020	2030
Housing Stock	2,394	2,642	2,948	3,319
Accumulative Requirement	-	248	553	924

(in thousand units)

Note:

In the period between 2003 and 2030, a total requirement of about 924,000 units (averaging 34,000 per year) is assumed.

III. Economic Land Requirement

	Base Year (2003)	2010	2020	2030	Demand 2003 – 30	Req't 2003 – 30
CBD Grade A Offices	4.1	5.1	5.8	6.7	2.6	2.7
General Business	33.0	35.5	36.2	38.2	5.2	5.4
Special Industries	4.0	5.5	6.0	6.7	2.7	2.9
Total	41.1	46.2	47.9	51.6	10.5	11.0

(GFA in million m^2)

Note:

'General Business' land use covers private offices (excluding CBD Grade A offices), industrial / office uses, flatted factories and private storages.

'Special Industrial Uses' involve high value-added, high-tech production and logistics activities such as industrial estates, science park and Cyberport, etc.

The floorspace requirement takes into account the existing surplus stock and the need to accommodate a 'natural vacancy' factor, a level of vacancy even under a normal healthy market situation.

IV. Strategic Infrastructure

Port Development

Our assumptions for future container throughput and terminal capacities are as follows:

	Base Year (2003)	2010	2020	2030
Container Throughput	12.8	18.0	28.8	34.5
Terminal Capacity				
CT 1 – 8, CT9 (part)	13.1	-	-	-
CT 1 – 9	-	19.8	21.7	23.0
CT 10	-	-	7.2	11.6
Total	13.1	19.8	28.9	34.6

(in million TEUs)
Source: HKP2020 Study.
Note:
The maximum capacity of the existing container port (CT 1 to 9) is around 18.6 million TEUs, with a potential for further increase by 1.7 million TEUs, and possibly more if additional land and other productivity measures are introduced. If the projected demand is realized, there is likely to be a need for a new container terminal (CT 10) in the first half of the next decade.

To determine the optimum location for the new terminal, two locations, namely North West Lantau and South West Tsing Yi, have been examined under the Study on Hong Kong Port – Master Plan 2020 (HKP2020 Study). Whilst a decision on the preferred location for the new terminal is pending further assessment including the findings of the Ecological, Fisheries and Water Quality Impact Assessment Study for the proposed container terminal development at North West Lantau, the HK2030 Study has taken into account both possible container terminal locations in the Reference Scenario for the purpose of assessment.

Port Back-Up (PBU) Land

The current supply of PBU land is 378 ha in 2003. The HKP2020 Study predicts that the total demand for PBU land will increase with port throughput but the trend for these uses to move over the boundary near the cargo centres in the PRD is expected to continue. If the projected demand of PBU land is to be realized, we would need to identify additional land to address this demand.

	Base Year (2003)	2010	2020	2030
PBU Land				
Demand	260	204	309	398
Supply	378	-	-	-
Known sources	-	439	480	500

(in hectares)
Source: HKP2020 Study and Planning Department's Estimation.

Airport

In 2005, the Hong Kong International Airport (HKIA) provided services to 40.7 million passengers and handled 3.4 million tonnes of cargo. The Airport Authority Hong Kong has recently published an update of the Airport Master Plan (known as the HKIA 2025) to guide the future development of the HKIA up to 2025. It has projected that by 2025, HKIA will

serve 80 million passengers, handle 8 million tones of cargo and 490,000 aircraft movements each year.

Although it has proposed studies on the feasibility for the construction of a third runway at the HKIA, this proposal has not been taken on board under the Preferred Development Option formulated on the basis of the Reference Scenario for assessment or the "What If" Scenario for sensitivity testing for the purpose of the HK2030 SEA in the absence of any details on this proposal at this stage.

V. Strategic Road Network and Railways

List of Committed and Assumed Major Transport Projects

(i) Railway Projects

By 2010 (committed in addition to existing rail network) ● Tseung Kwan O South Station ● Kowloon Southern Link ● Sheung Shui to Lok Ma Chau Spur Line
By 2020 (in addition to 2010 network) ● Shatin to Central Link ● Kwun Tong Line Extension ● Northern Link ● Hong Kong Section of the Guangzhou-Shenzhen-HK Express Rail Link ● West Island Line ● South Island Line (East)
By 2030 (in addition to 2020 network) ● North Hong Kong Island Line ● South Island Line (West)

(ii) Major Road Projects

By 2010 (committed in addition to existing network)
New Territories ● Route 8 (Shatin to Tsing Yi) ● Castle Peak Road Widening (Tsuen Wan Area 2 to Siu Lam) ***Cross-boundary*** ● Hong Kong – Shenzhen Western Corridor ● Deep Bay Link

By 2020 (in addition to 2010 network)
Hong Kong ● Central – Wan Chai Bypass ● Island Eastern Corridor Improvement (Causeway Bay – North Point)

Kowloon
- Gascoigne Road Flyover widening
- Central Kowloon Route
- Trunk Road T2 (Kai Tak – Cha Kwo Ling)

New Territories
- Tolo Highway / Fanling Highway widening (Island House Interchange – Fanling)
- Tseung Kwan O – Lam Tin Tunnel
- Cross Bay Link at Tseung Kwan O
- Hiram's Highway Dualling (Clearwater Bay Road – Sai Kung Town)
- Lantau Road P1 (Tung Chung – Sunny Bay)
- *Strategic North-South Link between NWNT and North Lantau

Cross-boundary
- ^ Hong Kong-Zhuhai-Macao Bridge (HZMB)
- HZMB's North Lantau Highway Connection

By 2030 (in addition to 2020 network)

Hong Kong
- The Fourth Harbour Crossing
- Route 4 (Kennedy Town – Aberdeen) as an alternative to South Island Line (West)

New Territories
- Eastern Highway (NENT to Kowloon)
- Tsing Yi Lantau Link - with Coastal road and Chok Ko Wan Link Road (Pa Tau Kwu Section)

Notes:
1. ****The Strategic North-South Link between NWNT and North Lantau*** stands for the possible alternative options being considered in the NWNT Traffic and Infrastructure Review, which cover candidate projects of Lam Tei Tunnel, Tai Lam Chung Tunnel, Tsing Lung Bridge, Tuen Mun Western Bypass, Tuen Mun-Chek Lap Kok Link, Tuen Mun Eastern Bypass, and Link Options between Tuen Mun and Lantau.
2. It should be noted that projects assumed are purely postulates for strategic transport assessments of the development scenarios under the Study. The need, scope and timing of each of the assumed transport projects would be subject to further review.
3. ^ The Governments of Guangdong, Hong Kong and Macao have commissioned a consultant to conduct a study on the locations and arrangements of the Boundary Crossing Facilities (BCF) under the mode of "Separate Location of BCF" for the HZMB.
4. The proposed Liantang / Heung Yuen Wai control point and the connection to the Shenzhen Eastern Corridor, which is subject to further studies, has not been included in the preferred option for assessment.

VI. Demand for Cross-Boundary Road Traffic

Under the Reference Scenario, the daily cross-boundary (two-way) vehicle traffic on a normal weekday is assumed as follows:

	Car	Bus / Coach	Total
Base Year (2003)	8,200	3,600	11,800
2010	34,900	4,800	39,700
2020	63,000	9,400	72,400
2030	96,400	12,900	109,300

	Goods Vehicle	Container Truck	Total
Base Year (2003)	14,800	12,800	27,600
2010	24,400	23,100	47,500
2020	35,000	35,400	70,400
2030	39,400	39,900	79,300

VII. Other Strategic Infrastructure

WASTE MANAGEMENT	• The capacity of solid waste handling facilities could be enhanced by extension of existing landfills and planning of new landfills as well as development of integrated waste management facilities and the EcoPark.
SEWAGE TREATMENT	• Remaining stages of the HATS and sewage master plan reviews will be completed before 2020.
POWER SUPPLY	• Gradual change from coal to gas power generation, supplemented by other forms of renewable energy such as wind power, solar energy (no major land implications) etc.
WATER SUPPLY / TREATMENT	• Dongjiang water will remain as one of the major sources of raw water and the supply quantity should be commensurate with the demand. • Desalination is one of the possible alternative water sources. Coastal site for such installation may be required subject to further study. • A feasibility study on the engineering strategy for the Total Water Management in Hong Kong is being conducted which will map put the long-term strategy on the distribution of water supply from various sources for meeting the water demand.
TELECOMMUNICATIONS	• Extension of Teleport is envisaged to cater for long-term requirement.

VIII. Major Development Proposals / Projects

The following major development proposals are assumed to take place or completed within the study timeframe of the HK2030 Study:

Development Proposal
Central Reclamation III
Cyberport
Hong Kong Disneyland
Hong Kong International Airport Developments
Kai Tak Development
Lantau Concept Plan proposals
Logistics Park at Siu Ho Wan

Development Proposal
New Development Areas - Kwu Tung North, Fanling North & Ping Che / Ta Kwu Ling (Three-in-One Scheme) and Hung Shui Kiu
Ngong Ping 360
Ocean Park Redevelopment
Recovery Park in Tuen Mun
Science Park at Pak Shek Kok
Tseung Kwan O Further Development
Tung Chung Development
Urban renewal projects (various)
Wanchai Development II
West Kowloon Cultural District

"What If" Scenario

Under the HK2030 Study, we have developed a number of "What If" Scenarios by varying key planning parameters under the Reference Scenario. We have focused on the assumptions, which have direct and significant implications for the planning strategy and those that are more likely to happen in future, i.e. population and economic growth, and a set of Response Plans will be devised to respond to these alternative situations.

For the purpose of sensitivity testing under the HK2030 SEA, the scenario of high population growth and high economic growth (HPGS) with possible container terminal location at North West Lantau has been selected. The following is a summary of key development parameters and planning assumptions under this worst case scenario that are different from that of the Reference Scenario:

I. Population and Employment

	Base Year (2003)	**2010**	**2020**	**2030**
Resident Population	6.8	7.2	8.0	8.8
Employment	3.0	3.5	3.9	4.4

(in million)

Note:

It is assumed that the importation of more talent and professional workers to Hong Kong will make up a larger population, hence an additional increase of 0.4 million up to year 2030 than the Reference Scenario.

We have assumed a 0.5% GDP growth rate higher than that assumed under the Reference Scenario for the mid- and long-term (see table below).

	To 2010	**2011 – 20**	**2021 – 30**
GDP growth per annum (RS)	4.0%	3.5%	3.0%
GDP growth per annum (HPGS)	4.0%	4.0%	3.5%

II. Housing Land Requirement

	Cumulative Housing Requirement		
	2010	**2020**	**2030**
Reference Scenario	248	553	924
HPGS	248	626	1,129
Difference	-	+73	+205

(in thousand units)

Note:

Since the population assumptions under this scenario will only start to deviate from the trend of the Reference Scenario from 2020 onwards, divergence in cumulative housing requirement will start to arise in the similar timeframe. This implies that we need to explore opportunities for providing housing land for the additional of 205,000 units spread across 10 years, i.e. equivalent to around 20,000 units per year.

III. Economic Land Requirement

	Base Year (2003)	**2010**	**2020**	**2030**	**Demand 2003 – 30**	**Req't 2003 – 30**
CBD Grade A Offices	4.1	5.1	6.0	7.4	3.3	3.5
General Business	33.0	35.5	38.0	42.0	9.0	9.6
Special Industries	4.0	5.5	6.3	7.4	3.4	3.6
Total	41.1	46.2	55.7	56.8	15.7	16.7

(GFA in million m^2)

Note:

As a result of the accelerated economic growth, the total economic land requirement will increase to 16.7 million m^2 GFA by 2030, representing an increase of 5.7 million m^2.

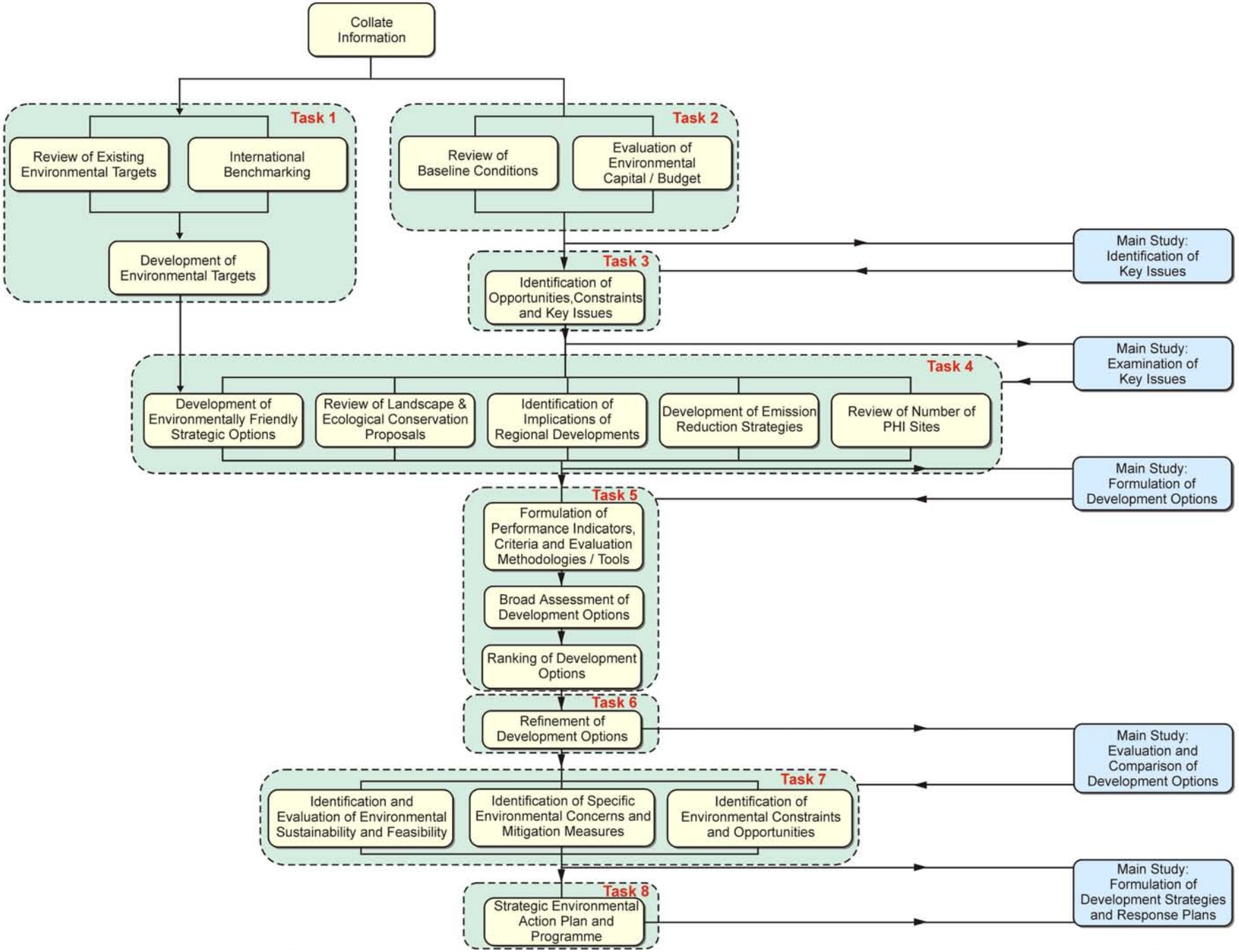
IV. Demand for Cross-Boundary Road Traffic

Under a higher level of economic activity, it may induce more cross-boundary traffic made by private cars for business or travelling purposes. We assume that there will be an additional of 13,800 daily vehicular trips made by private cars by 2030. For the same reason, there will also be a higher volume of cross-boundary traffic made by goods vehicles and container trucks. A comparison of the daily cross-boundary (two-way) vehicle traffic on a normal weekday is shown in the following tables:

	Car	**Bus / Coach**	**Total**
Base Year (2003)	8,200	3,600	11,800
2010	34,900	4,800	39,700
2020	70,400	9,600	80,000
2030	110,200	13,200	123,400

	Goods Vehicle	**Container Truck**	**Total**
Base Year (2003)	14,800	12,800	27,600
2010	24,400	23,100	47,500
2020	37,800	38,300	76,100
2030	42,400	43,000	85,400

FIGURES



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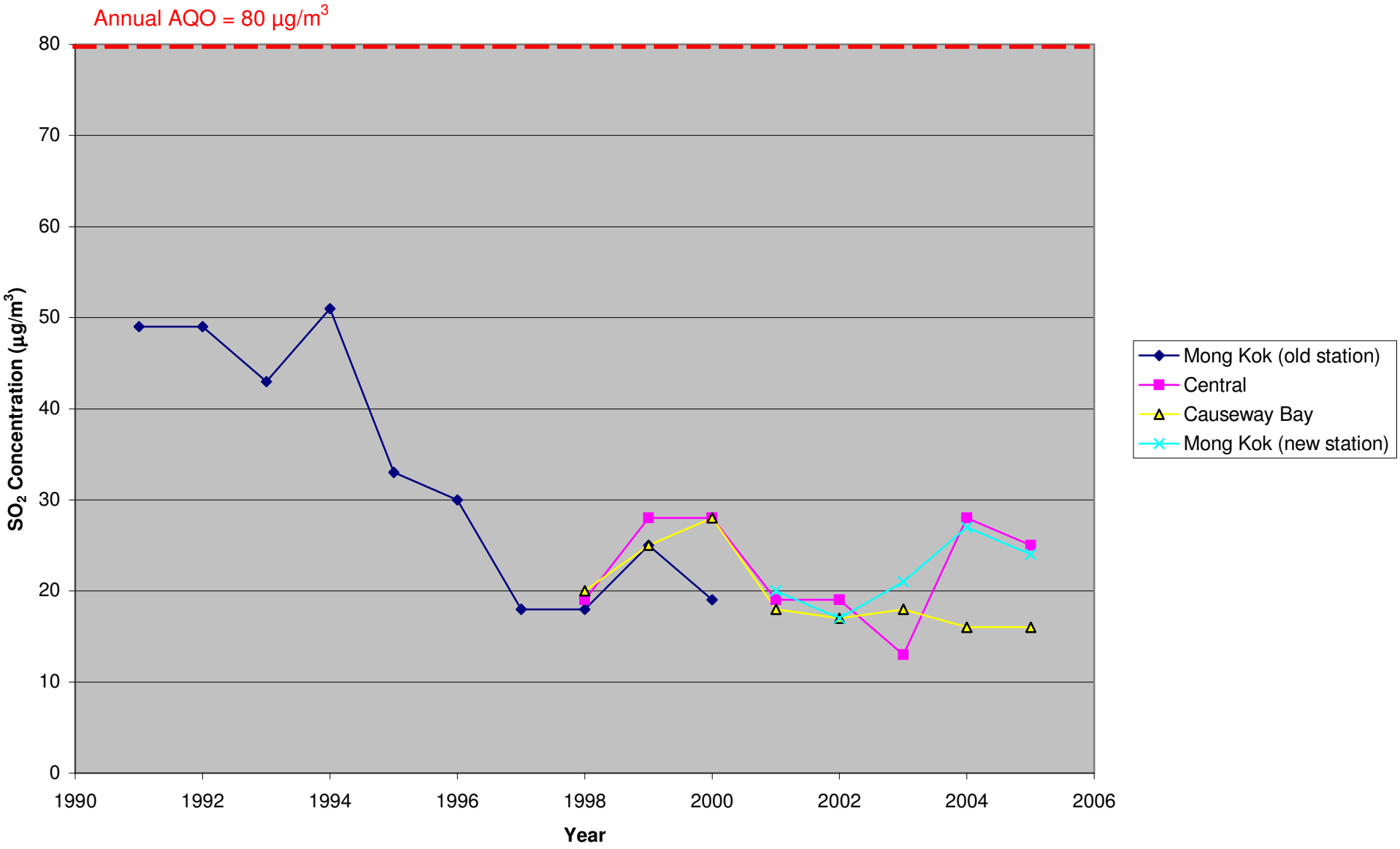
Final Report

Title: Study Process

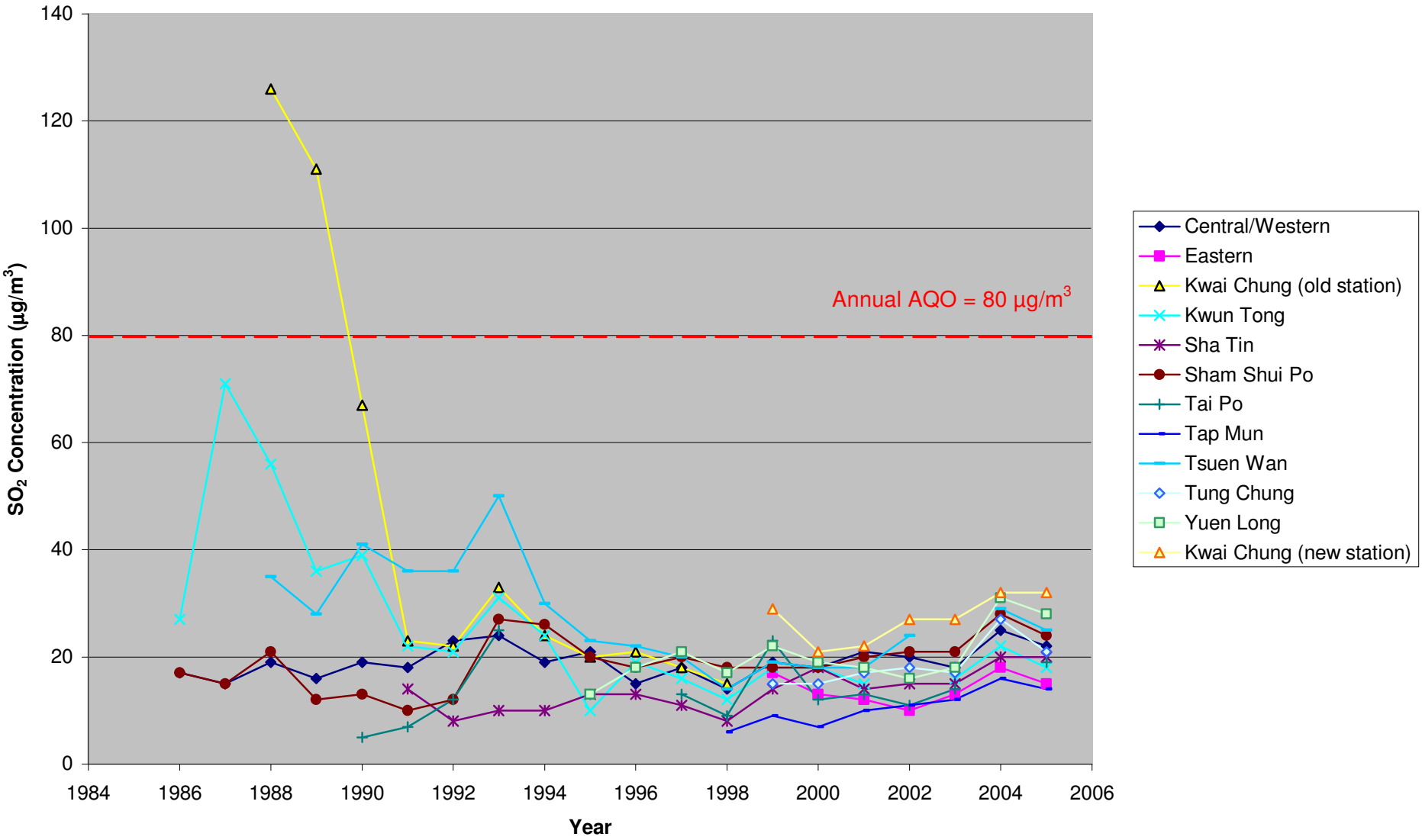
Figure 1-1



Note: Mong Kok roadside station was relocated to an area with heavier traffic in 2001, hence the data between the old and new stations are not comparable.

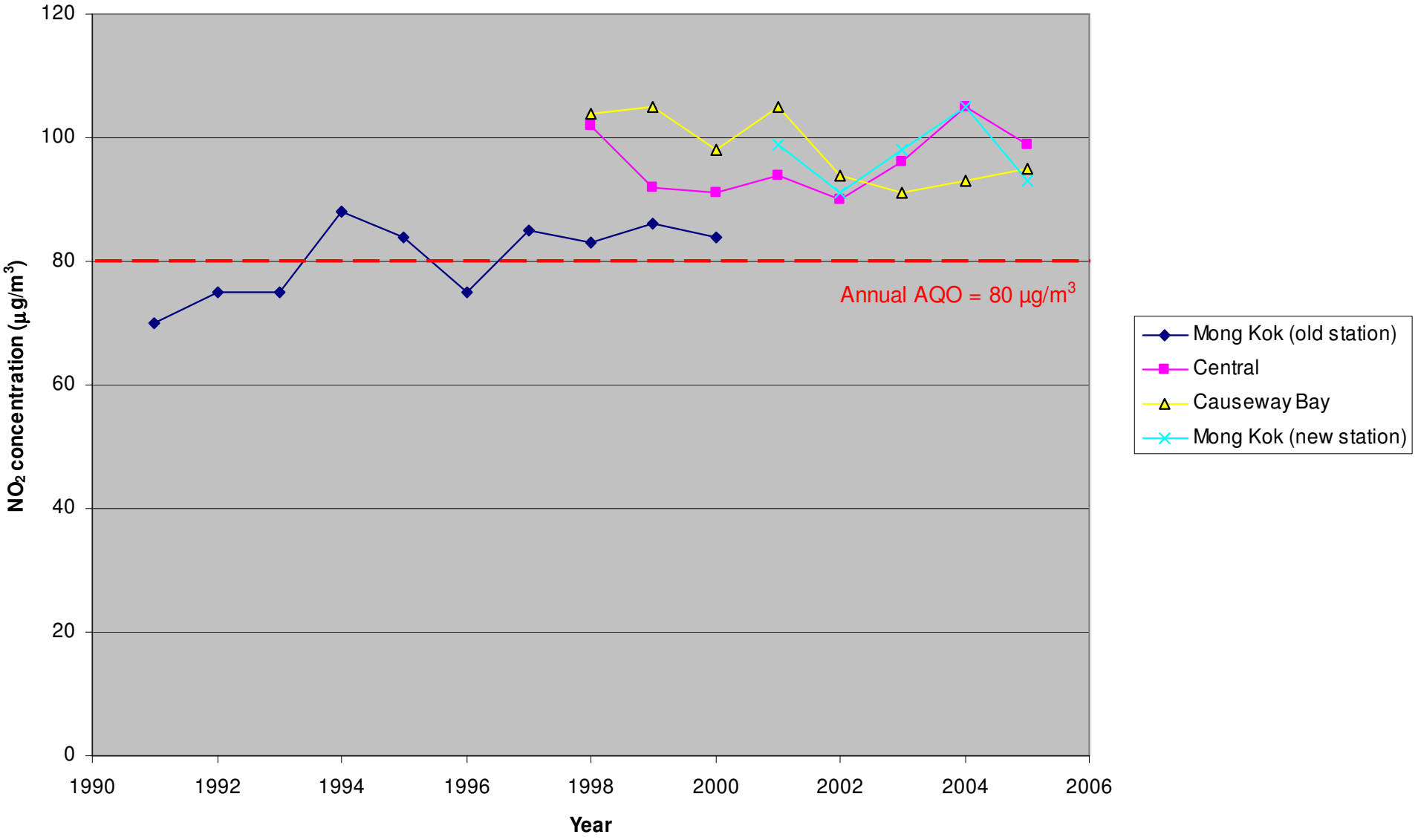
Source: Air Quality in Hong Kong, 1991-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Long Term Trends in Annual Average SO_2 levels in Hong Kong – Roadside Stations, 1991-2005 **Figure 2-1**



Note: Kwai Chung station was relocated to an area with much heavier traffic in 1999, hence the data between the old and new stations are not comparable.

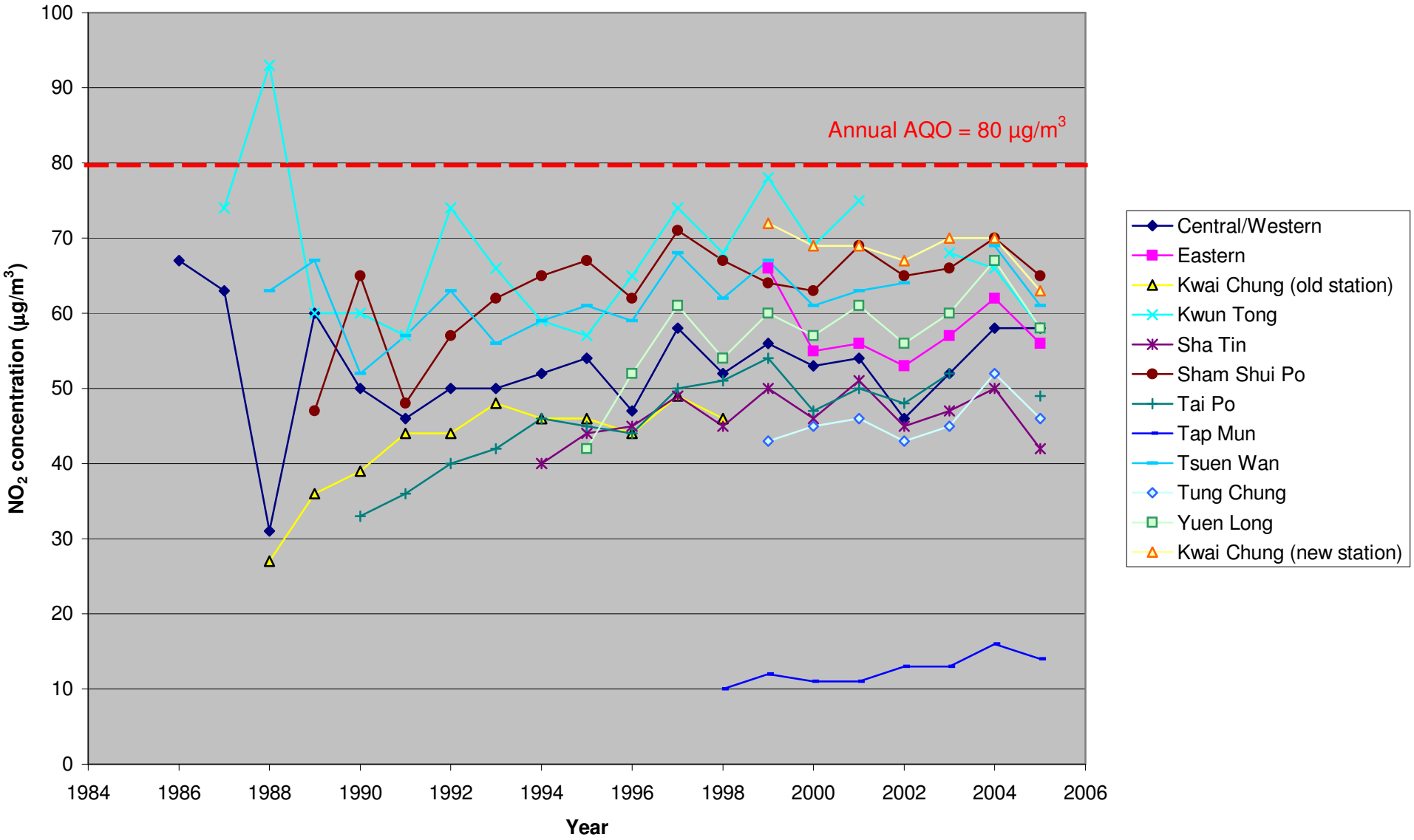
Source: Air Quality in Hong Kong, 1986-2005, EPD.



Note: Mong Kok roadside station was relocated to an area with heavier traffic in 2001, hence the data between the old and new stations are not comparable.

Source: Air Quality in Hong Kong, 1991-2005, EPD.

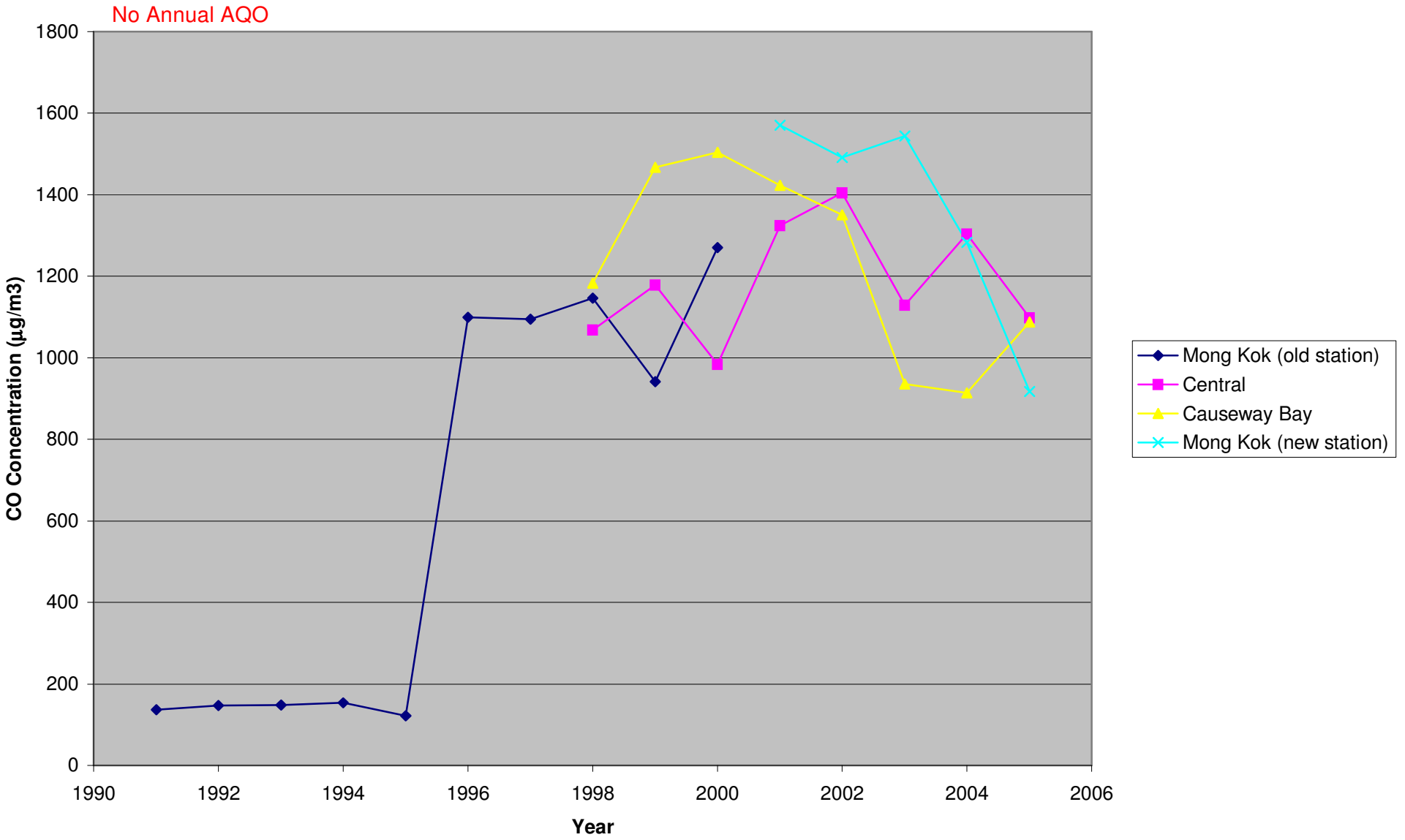
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Long Term Trends in Annual Average NO_2 levels in Hong Kong – Roadside Stations, 1991-2005 **Figure 2-3**



Note: Kwai Chung station was relocated to an area with much heavier traffic in 1999, hence the data between the old and new stations are not comparable.

Source: Air Quality in Hong Kong, 1986-2005, EPD.

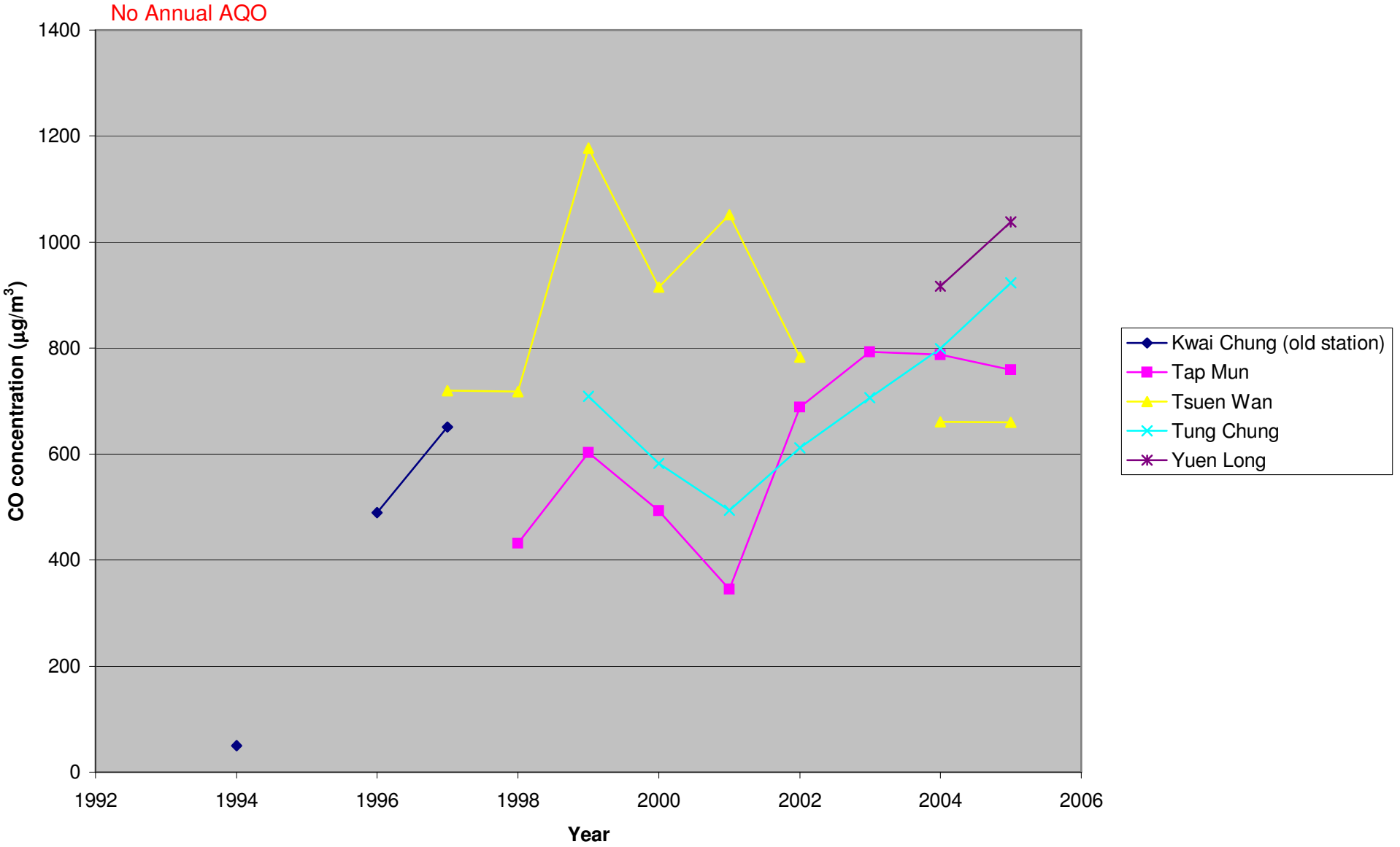
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Long Term Trends in Annual Average NO_2 levels in Hong Kong – General Stations, 1986-2005 **Figure 2-4**



Note: Mong Kok roadside station was relocated to an area with heavier traffic in 2001, hence the data between the old and new stations are not comparable.

Source: Air Quality in Hong Kong, 1991-2005, EPD.

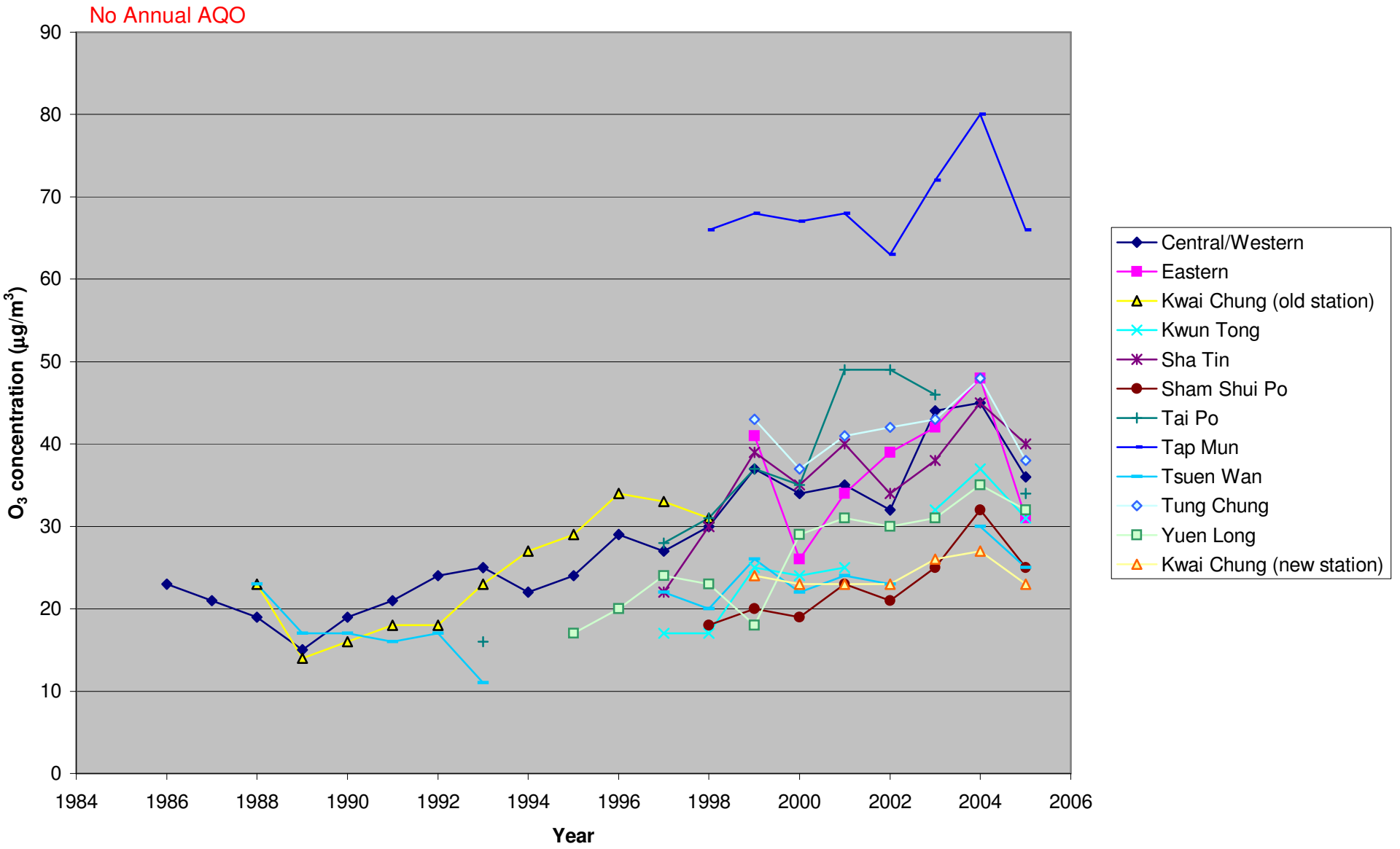
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Long Term Trends in Annual Average CO levels in Hong Kong - Roadside Stations, 1991-2005 **Figure 2-5**



Note: Kwai Chung station was relocated to an area with much heavier traffic in 1999, hence the data between the old and new stations are not comparable.

Source: Air Quality in Hong Kong, 1994-2005, EPD.

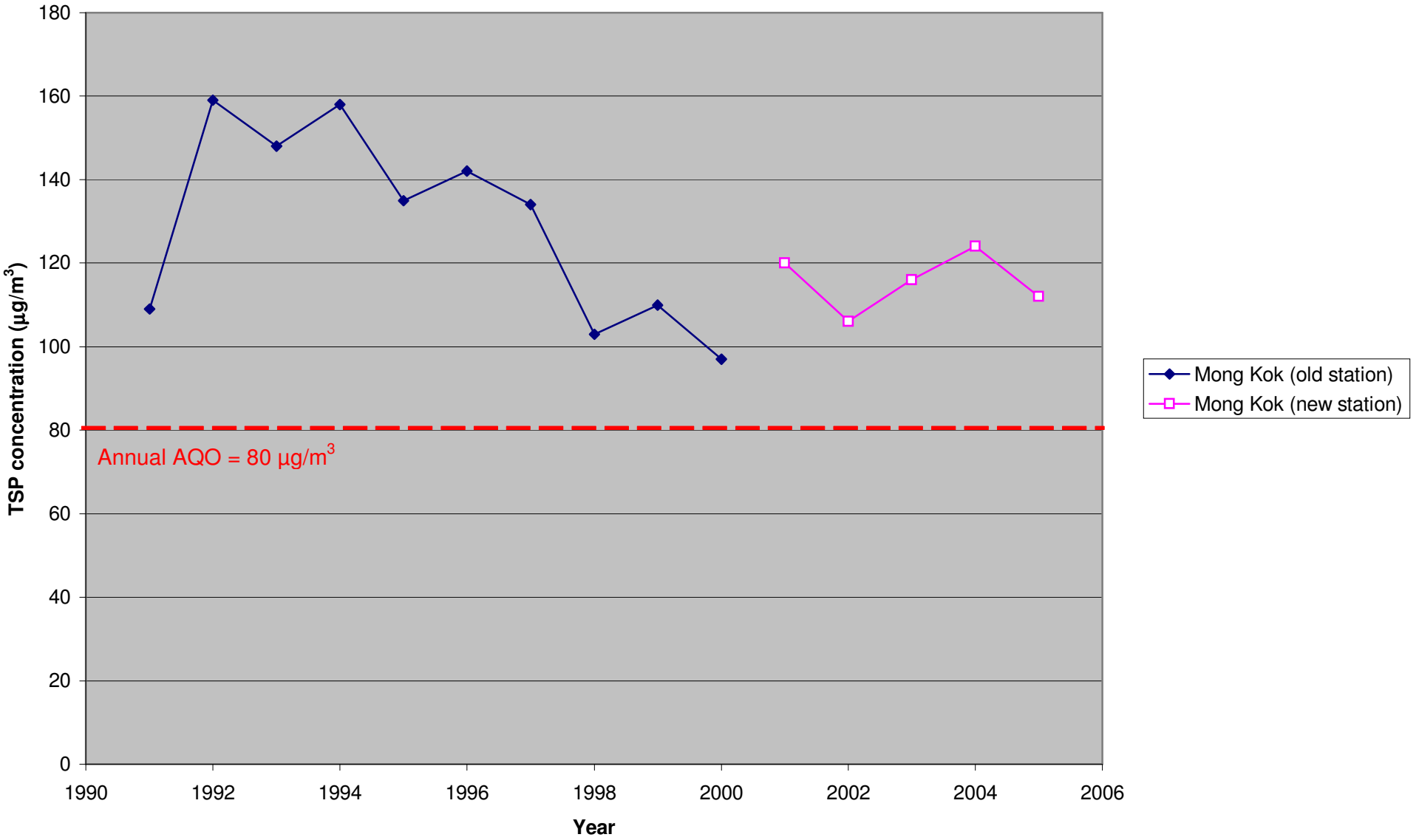
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Long Term Trends in Annual Average CO levels in Hong Kong – General Stations, 1994-2005 **Figure 2-6**



Note: Kwai Chung station was relocated to an area with much heavier traffic in 1999, hence the data between the old and new stations are not comparable.

Source: Air Quality in Hong Kong, 1986-2005, EPD.

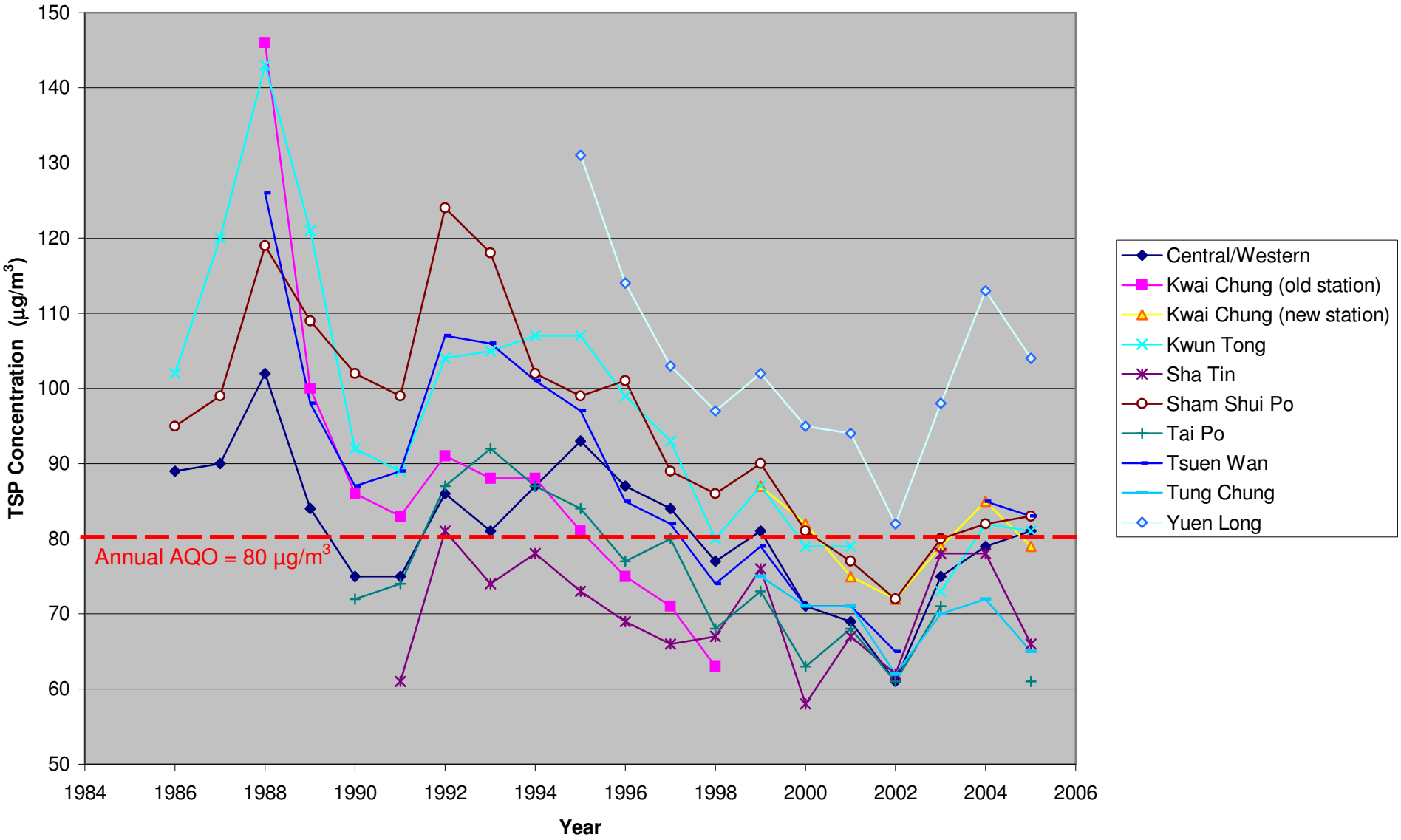
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Long Term Trends in Annual Average O_3 levels in Hong Kong – General Stations, 1986-2005 **Figure 2-7**



Note: Mong Kok roadside station was relocated to an area with heavier traffic in 2001, hence the data between the old and new stations are not comparable.

Source: Air Quality in Hong Kong, 1991-2005, EPD.

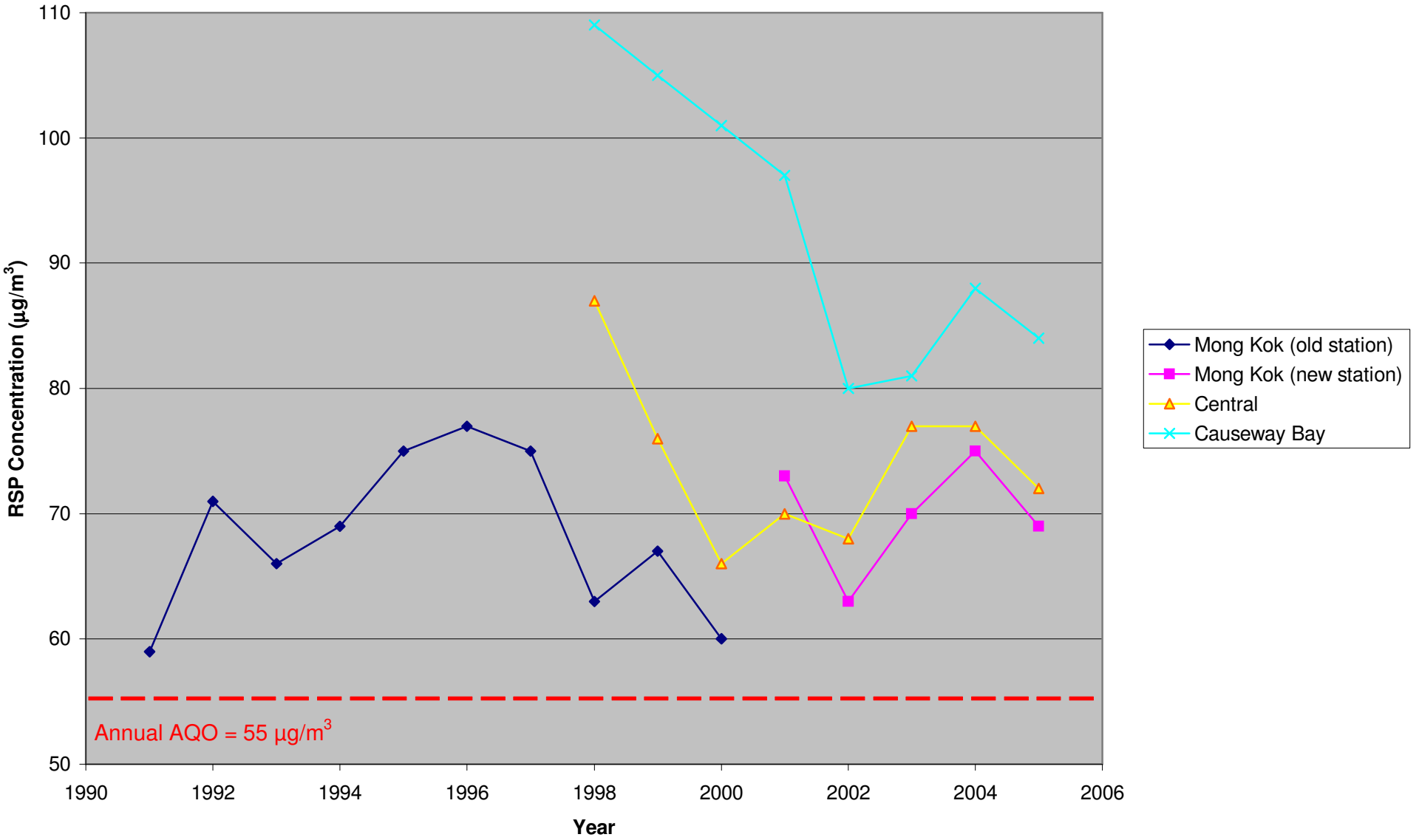
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Long Term Trends in Annual Average TSP levels in Hong Kong – Roadside Stations, 1991-2005 **Figure 2-8**



Note: Kwai Chung station was relocated to an area with much heavier traffic in 1999, hence the data between the old and new stations are not comparable.

Source: Air Quality in Hong Kong, 1986-2005, EPD.

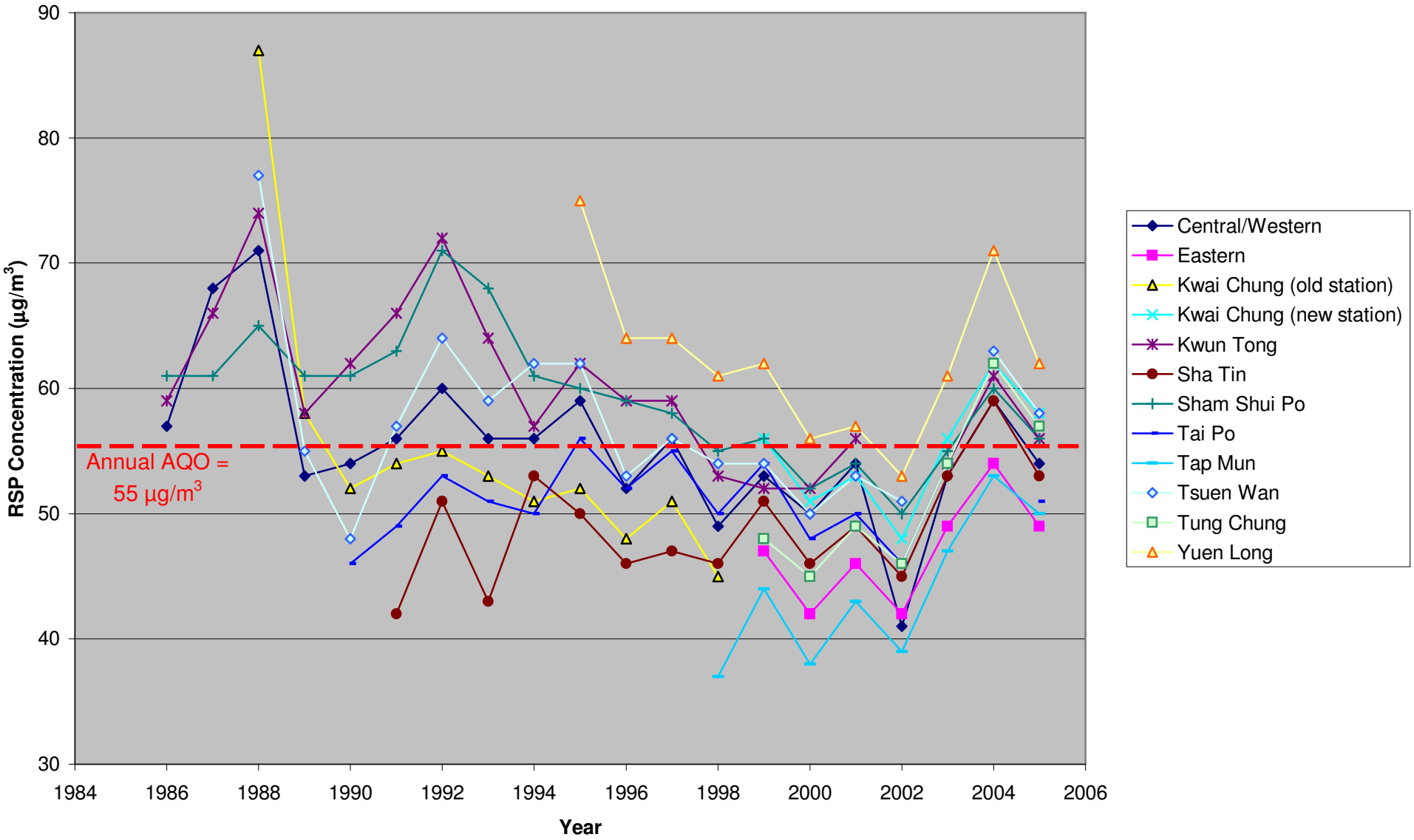
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Long Term Trends in Annual Average TSP levels in Hong Kong – General Stations, 1986-2005 **Figure 2-9**



Note: Mong Kok roadside station was relocated to an area with heavier traffic in 2001, hence the data between the old and new stations are not comparable.

Source: Air Quality in Hong Kong, 1991-2005, EPD.

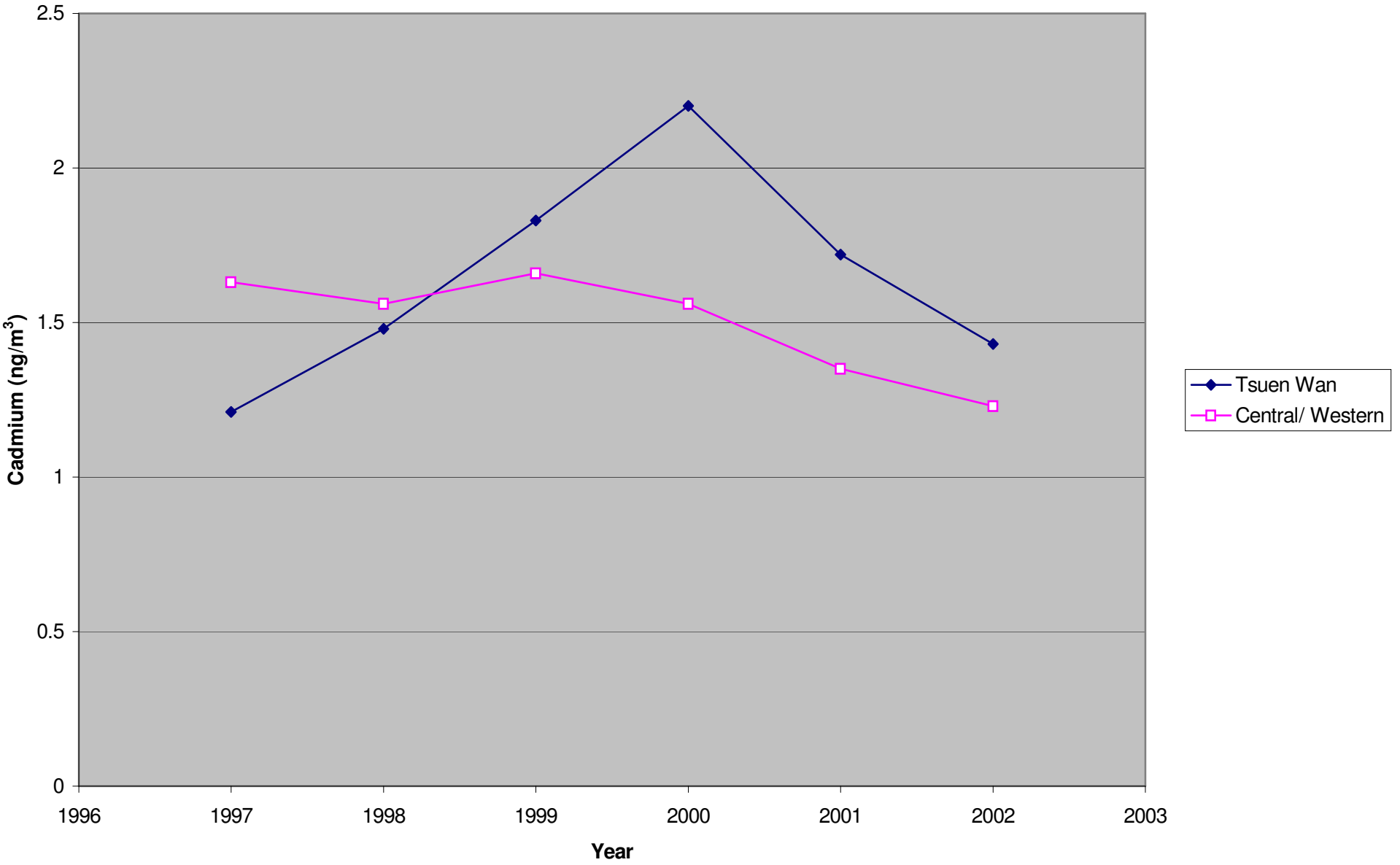
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Long Term Trends in Annual Average RSP levels in Hong Kong – Roadside Stations, 1991-2005 **Figure 2-10**



Note: Kwai Chung station was relocated to an area with much heavier traffic in 1999, hence the data between the old and new stations are not comparable.

Source: Air Quality in Hong Kong, 1986-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Long Term Trends in Annual Average RSP levels in Hong Kong – General Stations, 1986-2005 **Figure 2-11**

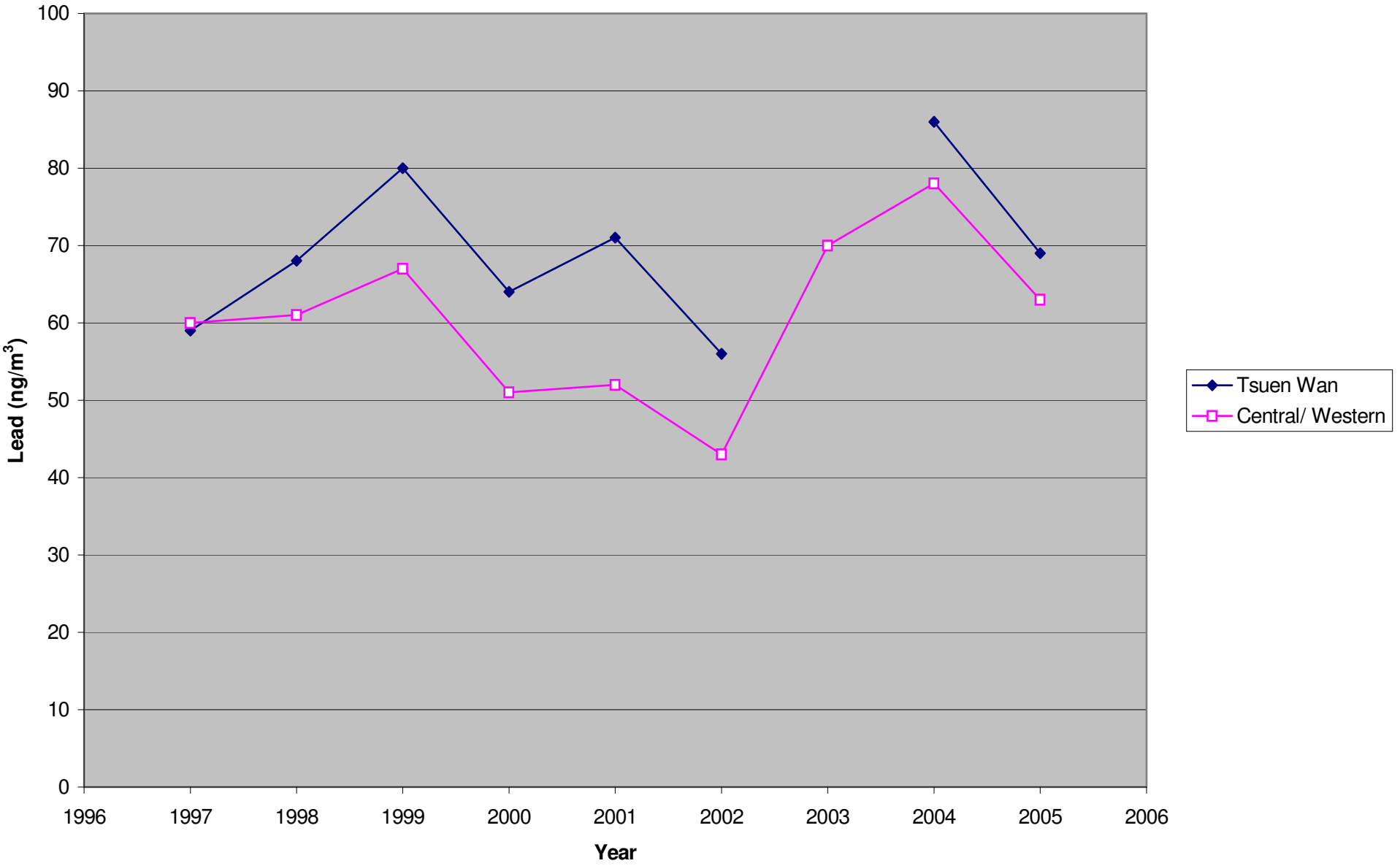


Source: Air Quality in Hong Kong, 1997-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Average Cadmium Concentration Levels in Hong Kong, 1997-2002 **Figure 2-12**

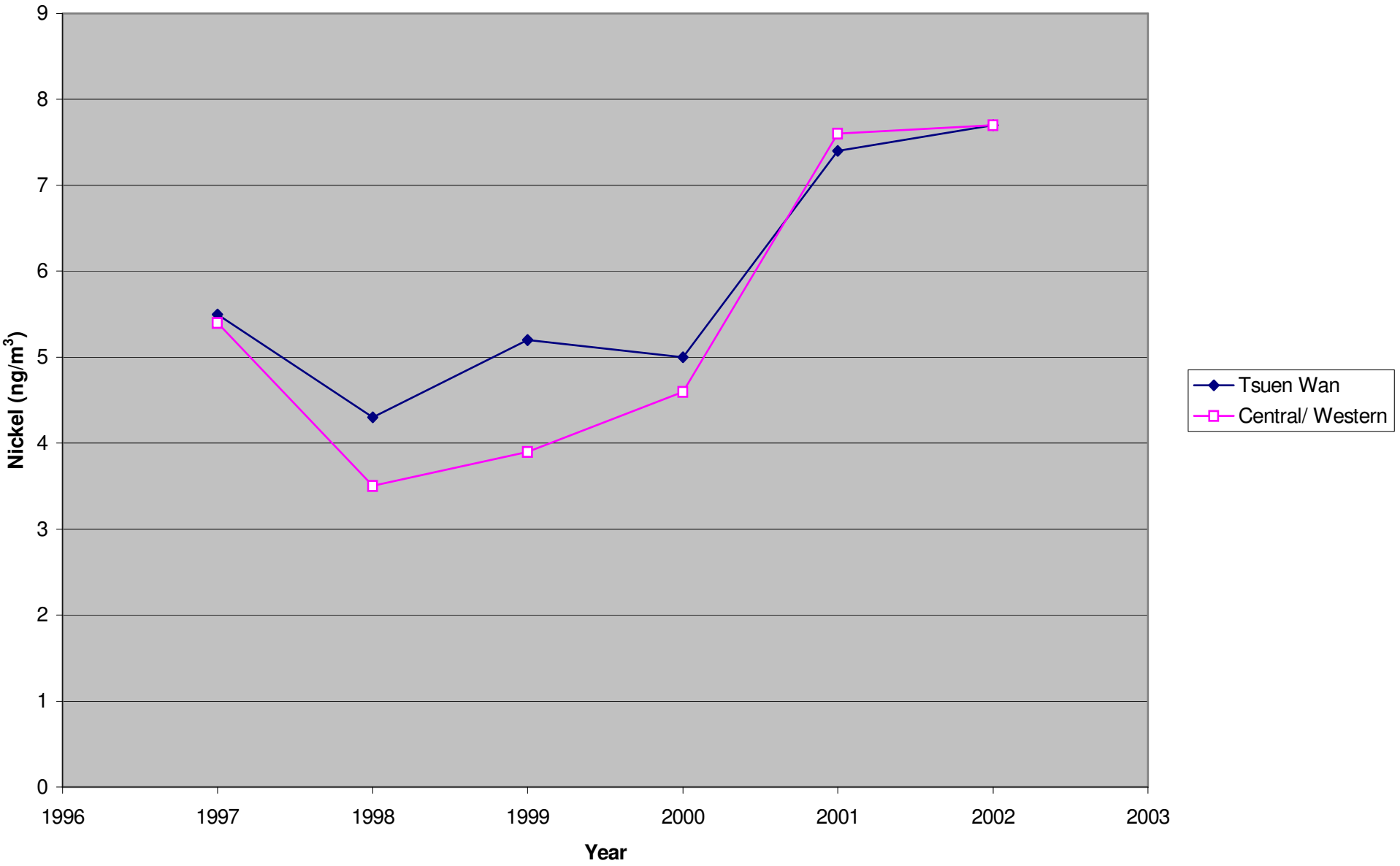
Source: Air Quality in Hong Kong, 1997-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Average Hexavalent Chromium Concentration Levels in Hong Kong, 1997-2005 **Figure 2-13**



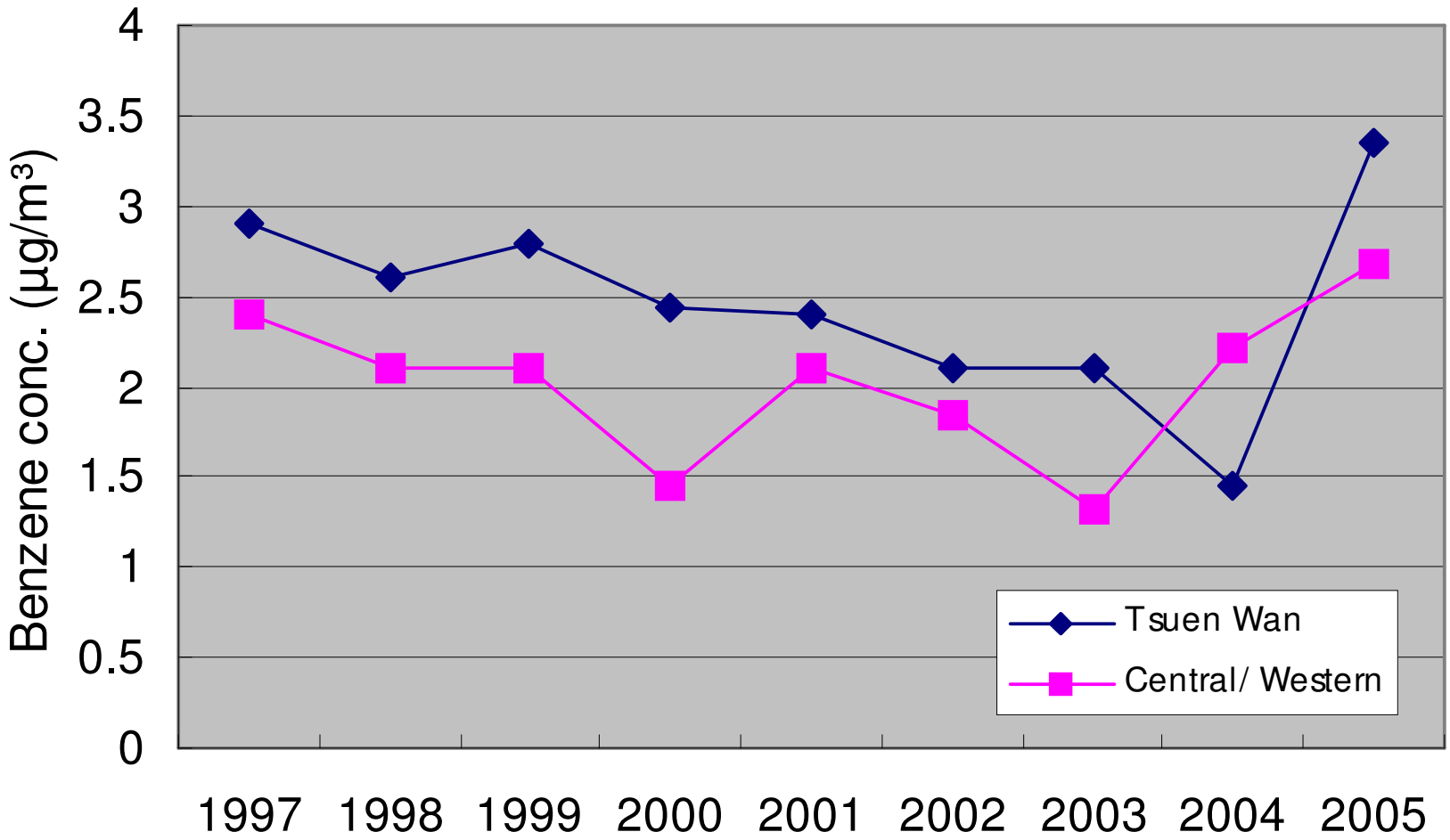
Source: Air Quality in Hong Kong, 1997-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Average Lead Concentration Levels in Hong Kong, 1997-2005 **Figure 2-14**



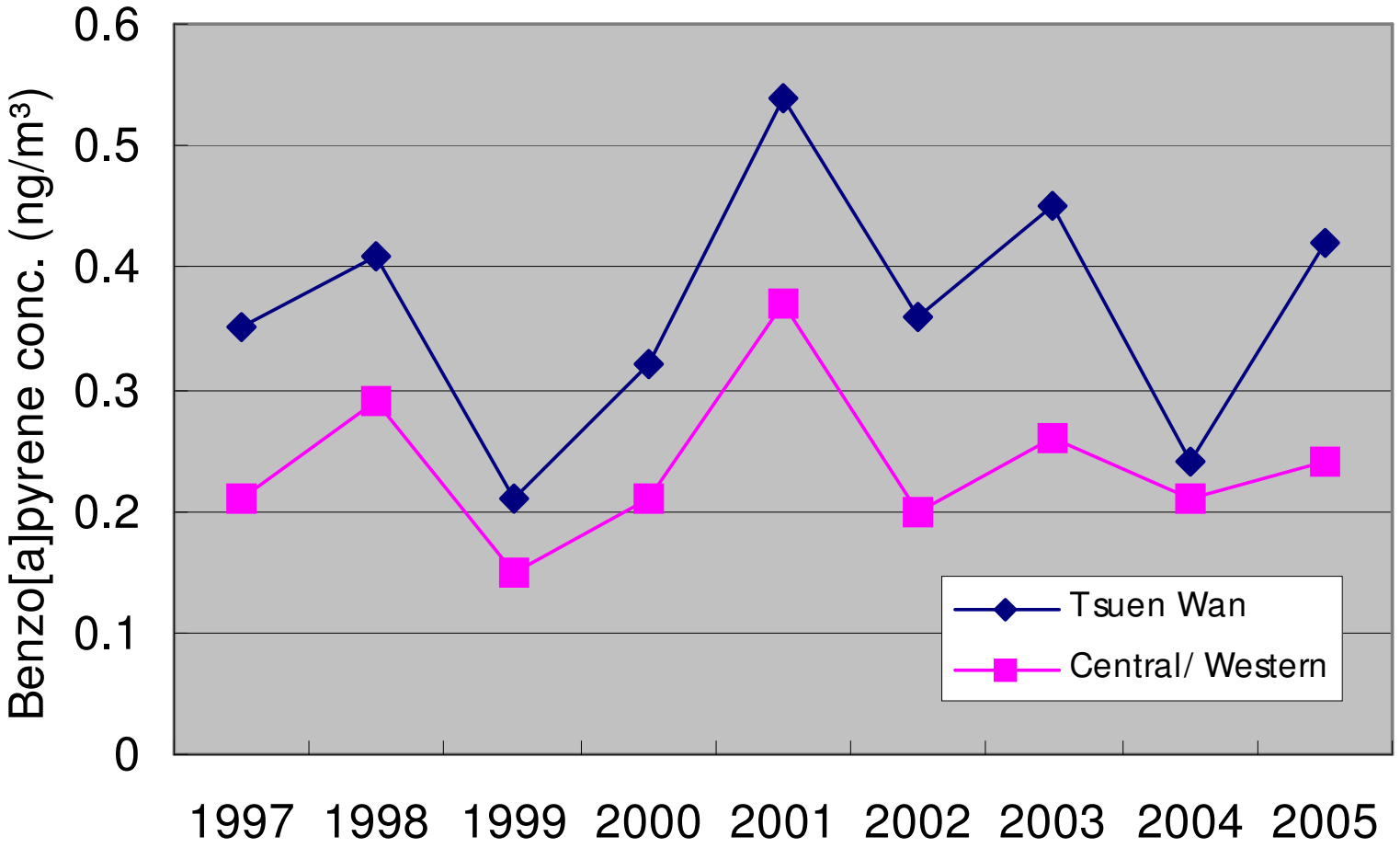
Source: Air Quality in Hong Kong, 1997-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Average Nickel Concentration Levels in Hong Kong, 1997-2002 **Figure 2-15**



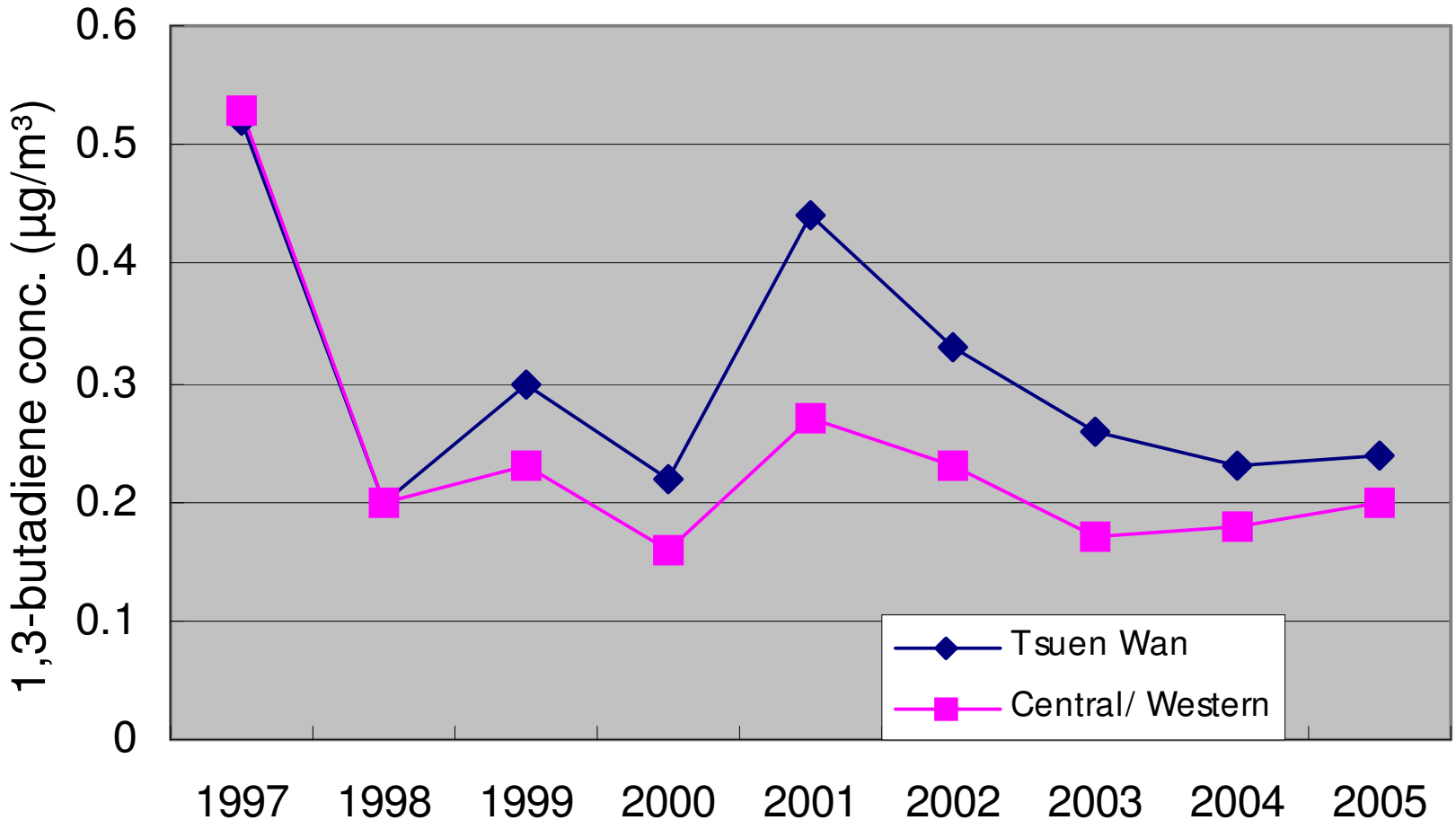
Source: Air Quality in Hong Kong, 1997-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Average Benzene Concentration Levels in Hong Kong, 1997-2005 **Figure 2-16**



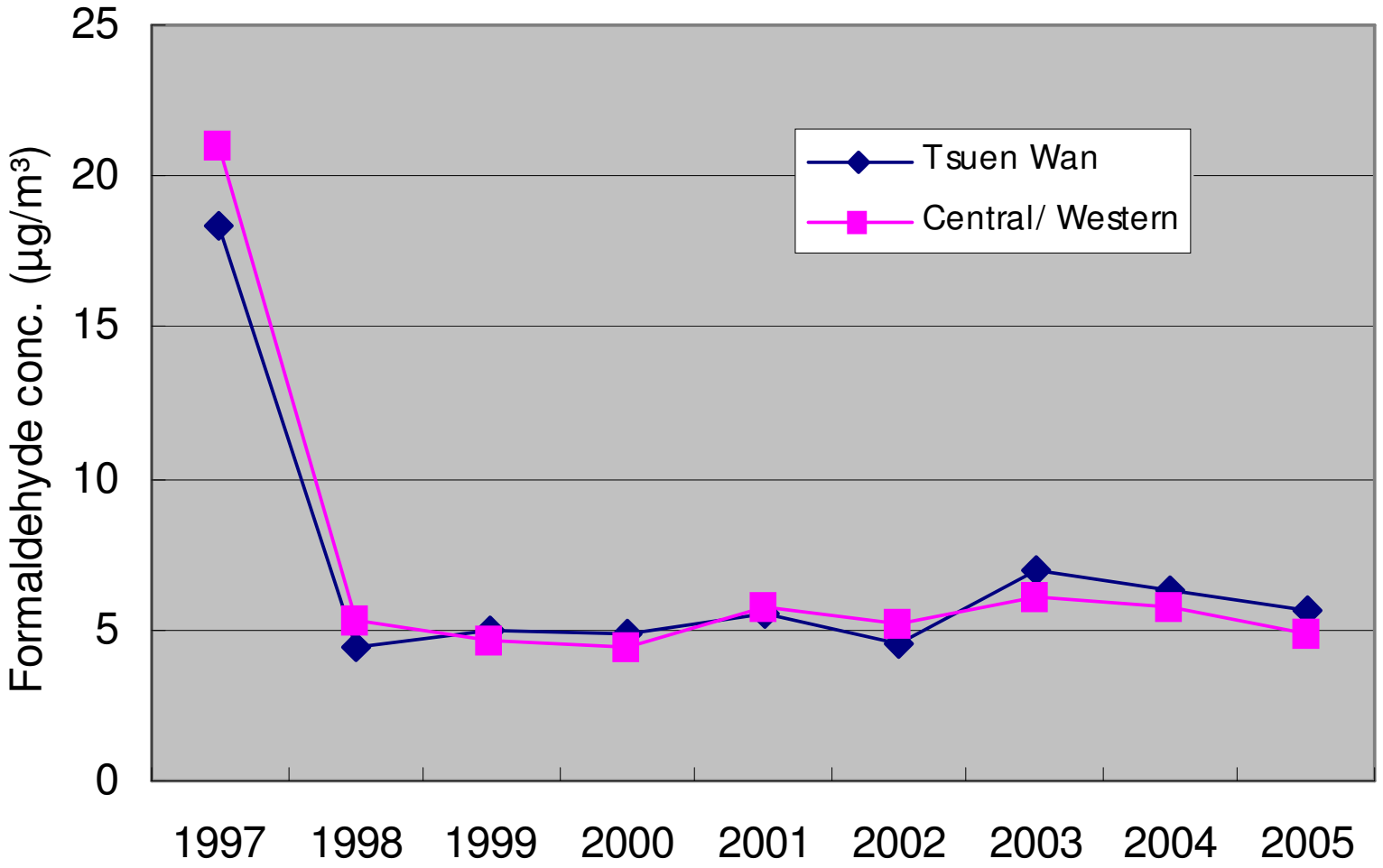
Source: Air Quality in Hong Kong, 1997-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Average Benzo[a]pyrene Concentration Levels in Hong Kong, 1997-2005 **Figure 2-17**



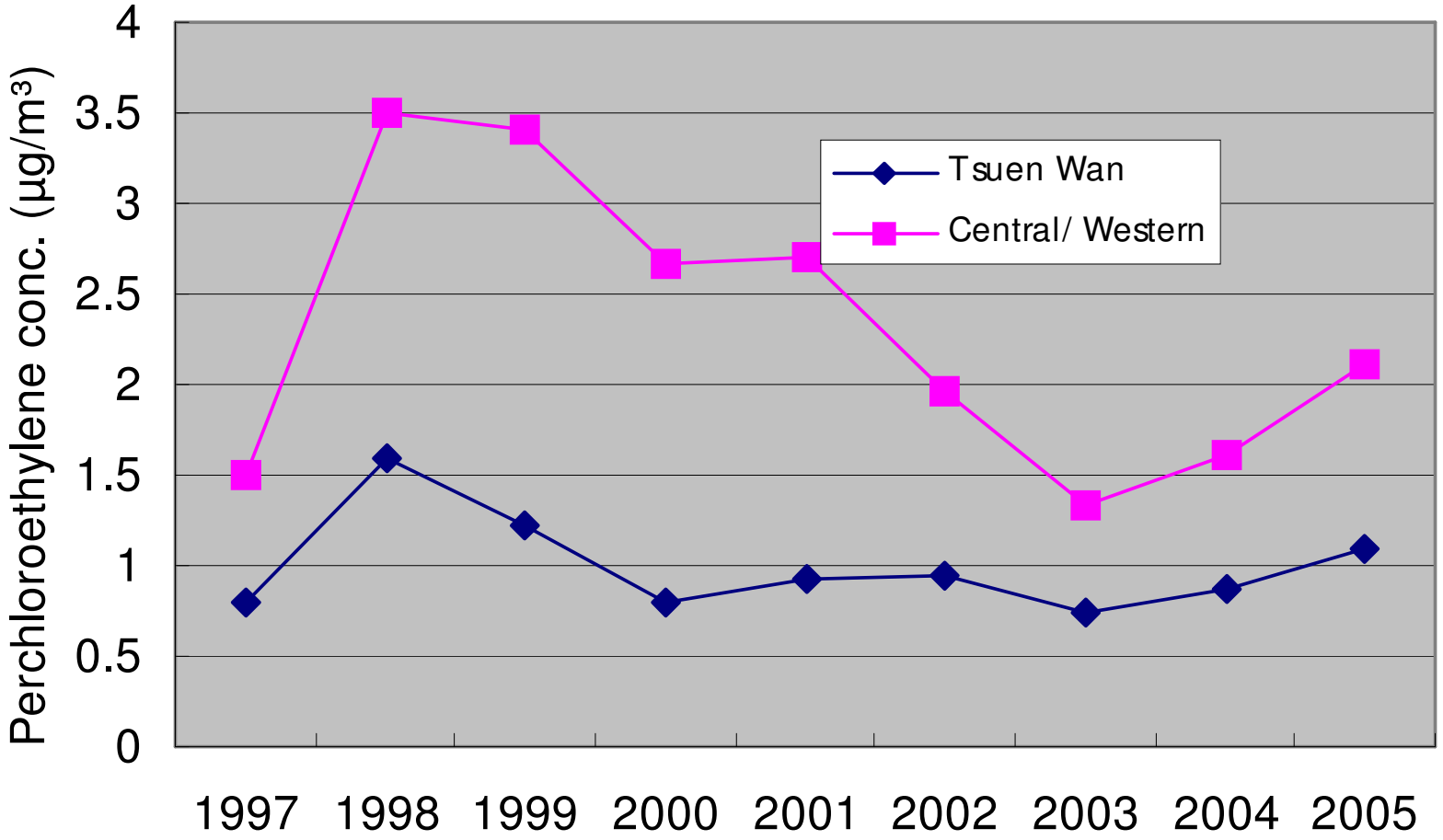
Source: Air Quality in Hong Kong, 1997-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Average 1,3-butadiene Concentration Levels in Hong Kong, 1997-2005 **Figure 2-18**



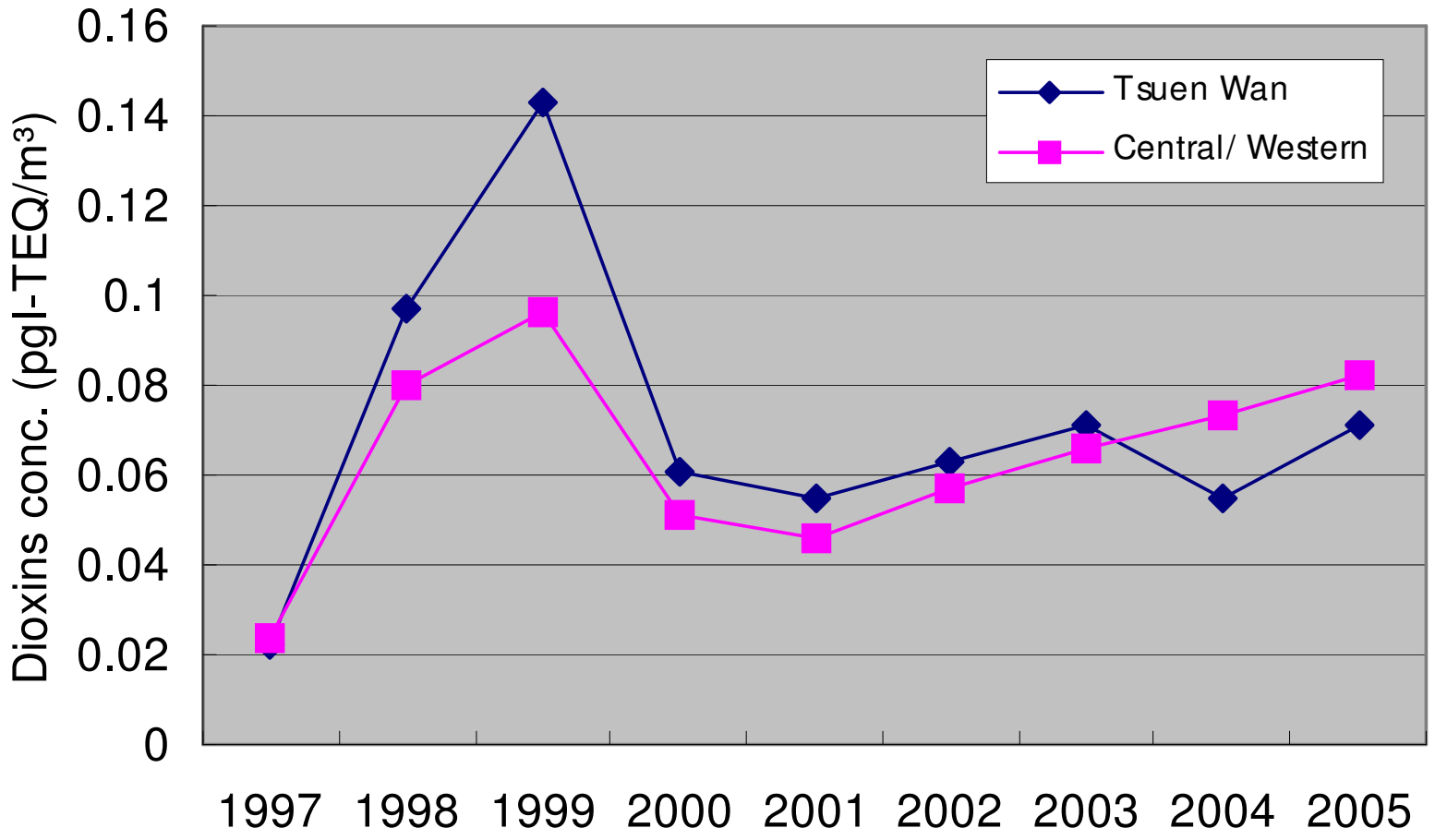
Source: Air Quality in Hong Kong, 1997-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Average Formaldehyde Concentration Levels in Hong Kong, 1997-2005 **Figure 2-19**



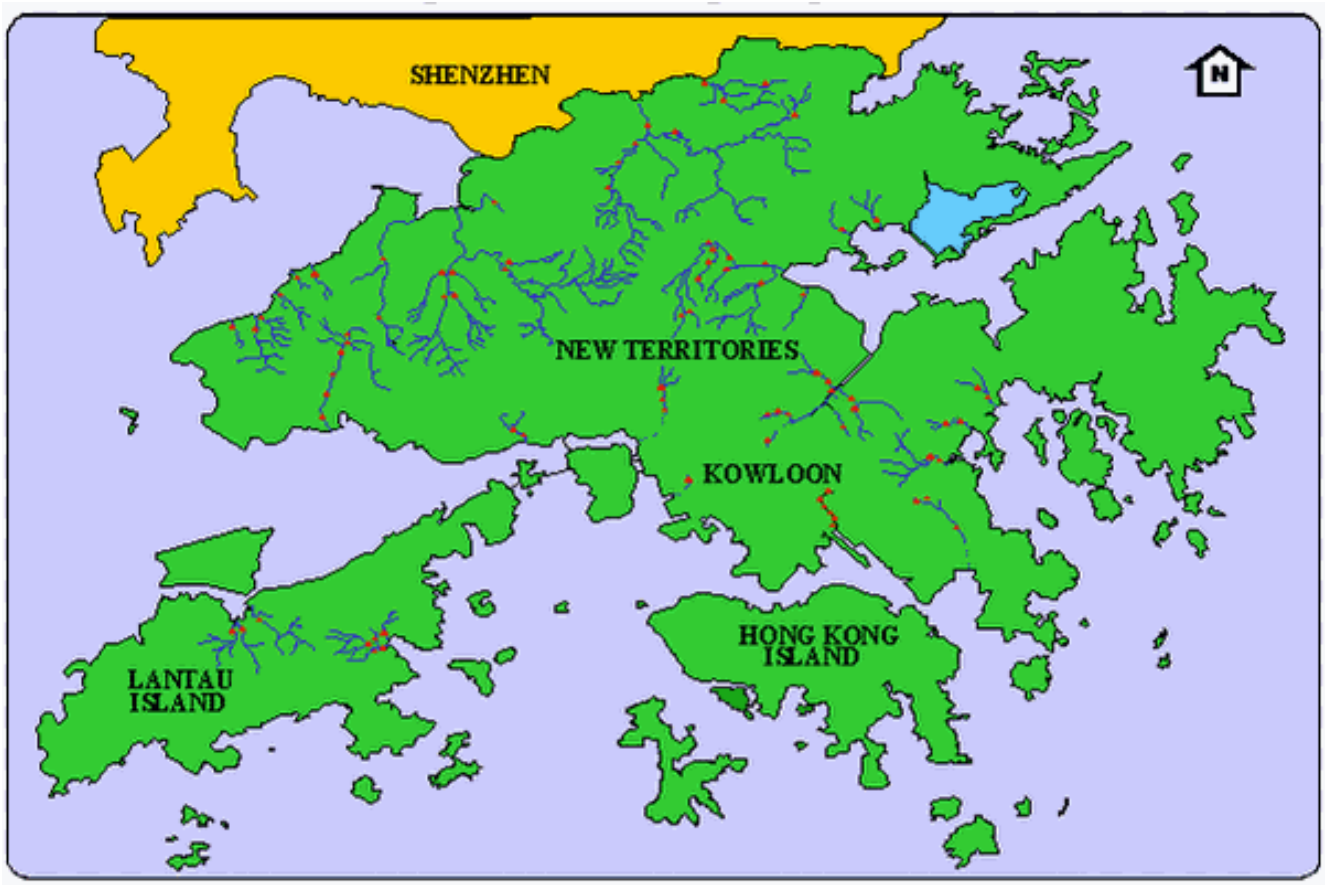
Source: Air Quality in Hong Kong, 1997-2005, EPD.

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Average Perchloroethylene Concentration Levels in Hong Kong, 1997-2005 **Figure 2-20**

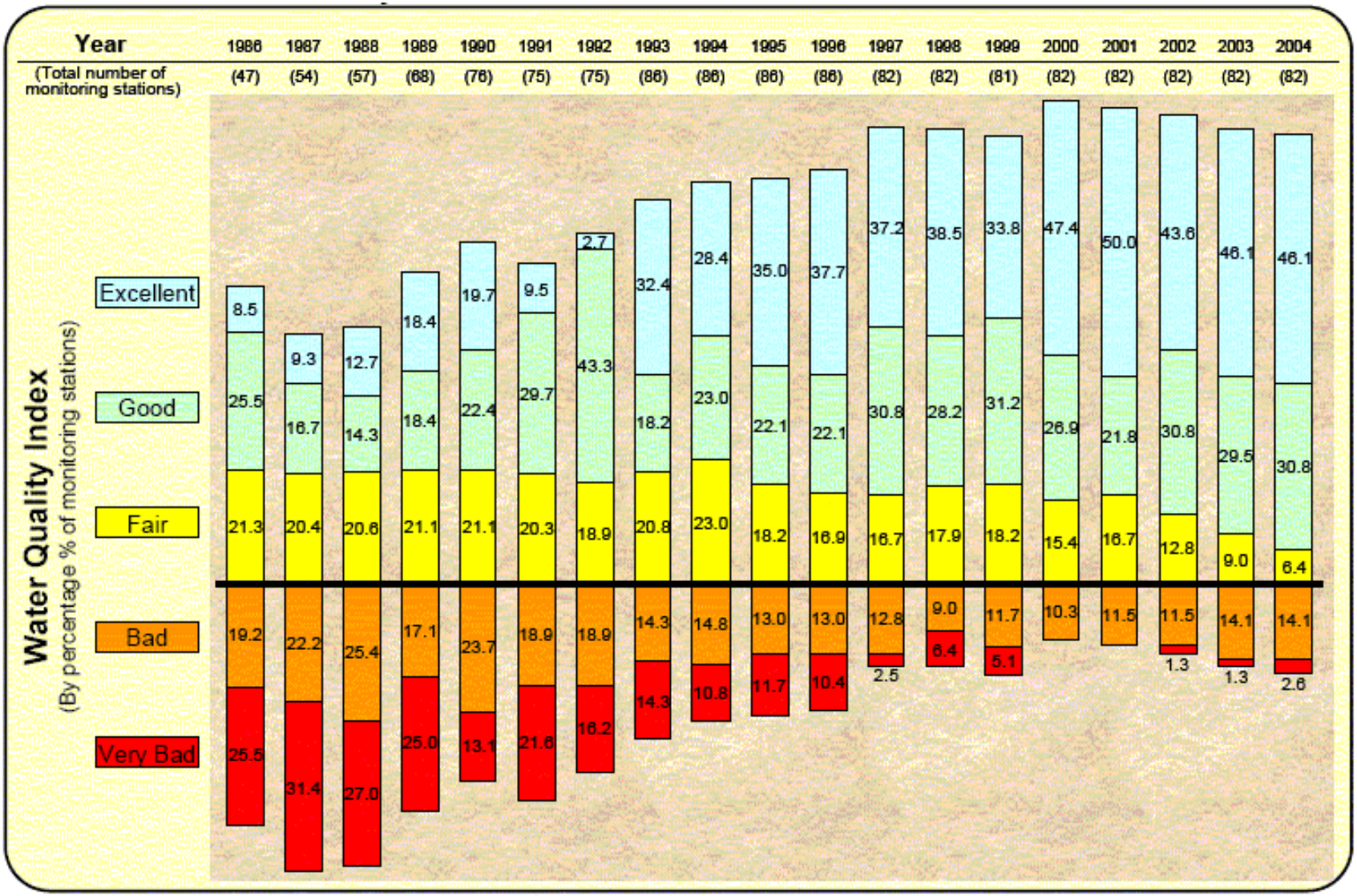


Source: Air Quality in Hong Kong, 1997-2005, EPD.

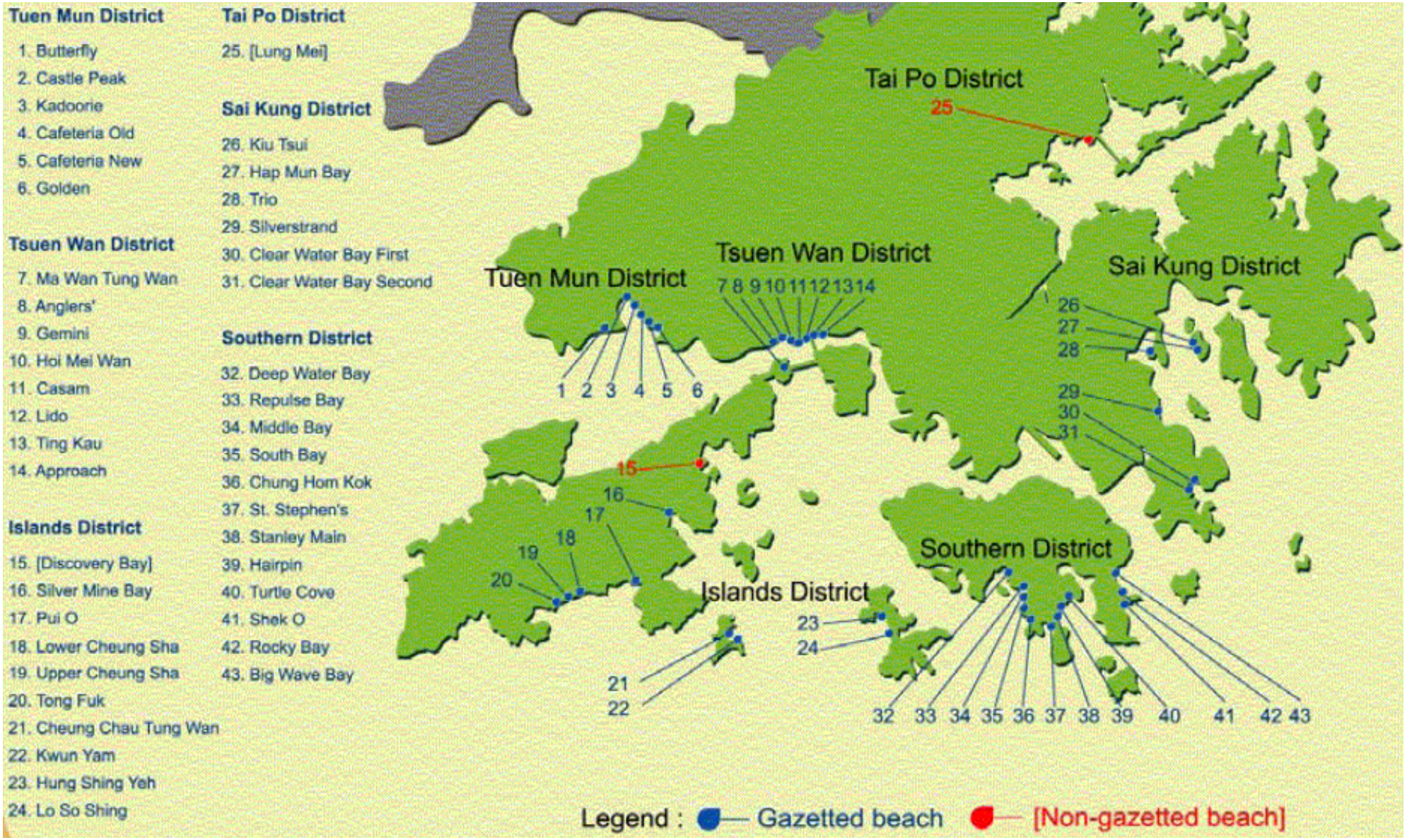
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Average Dioxins Concentration Levels in Hong Kong, 1997-2005 **Figure 2-21**



Source: http://www.epd.gov.hk/epd/english/environmentinhk/water/river_quality/rwq_monitoring.html, EPD

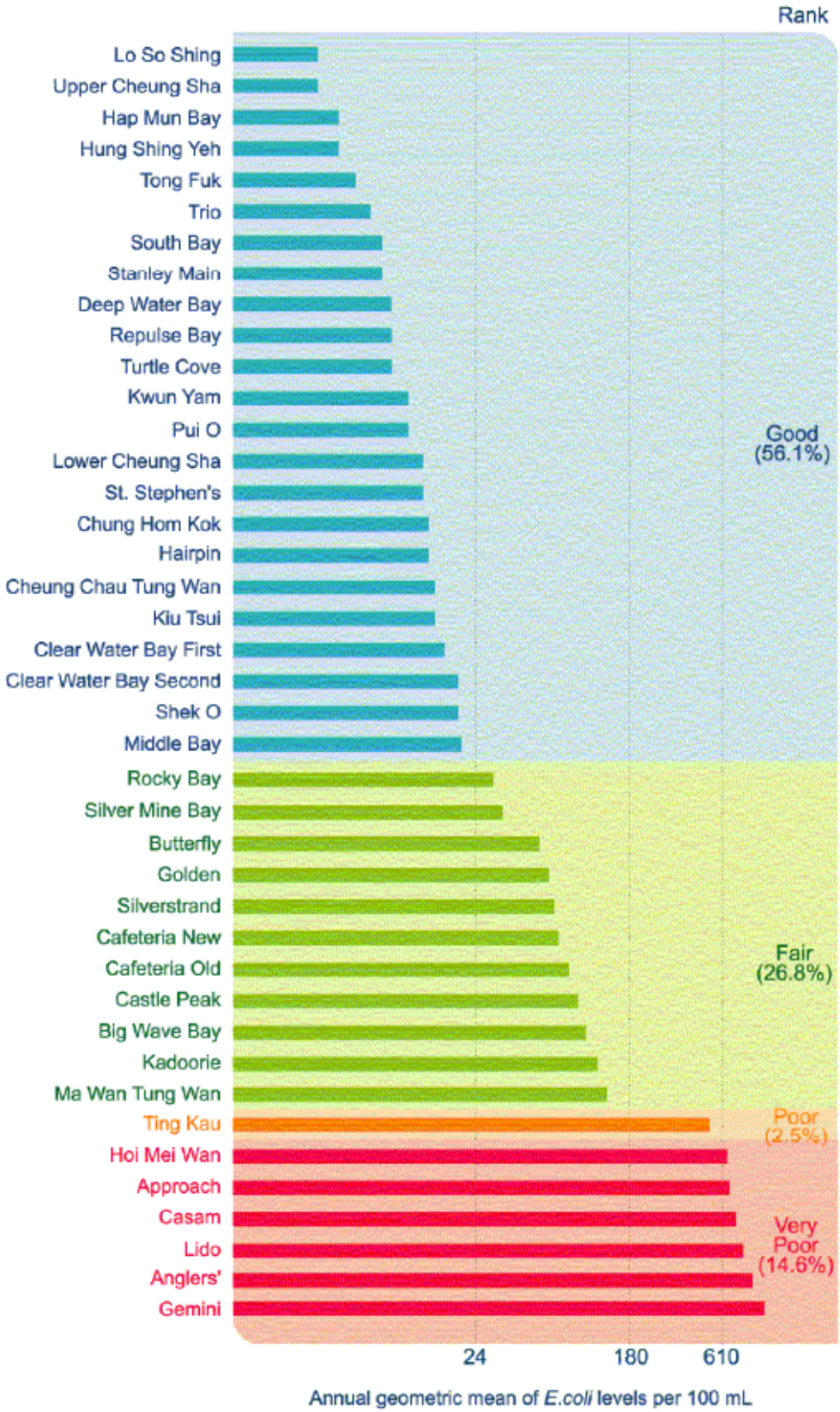


Source: http://www.epd.gov.hk/epd/english/environmentinhk/water/river_quality/files/r04_su.pdf, EPD



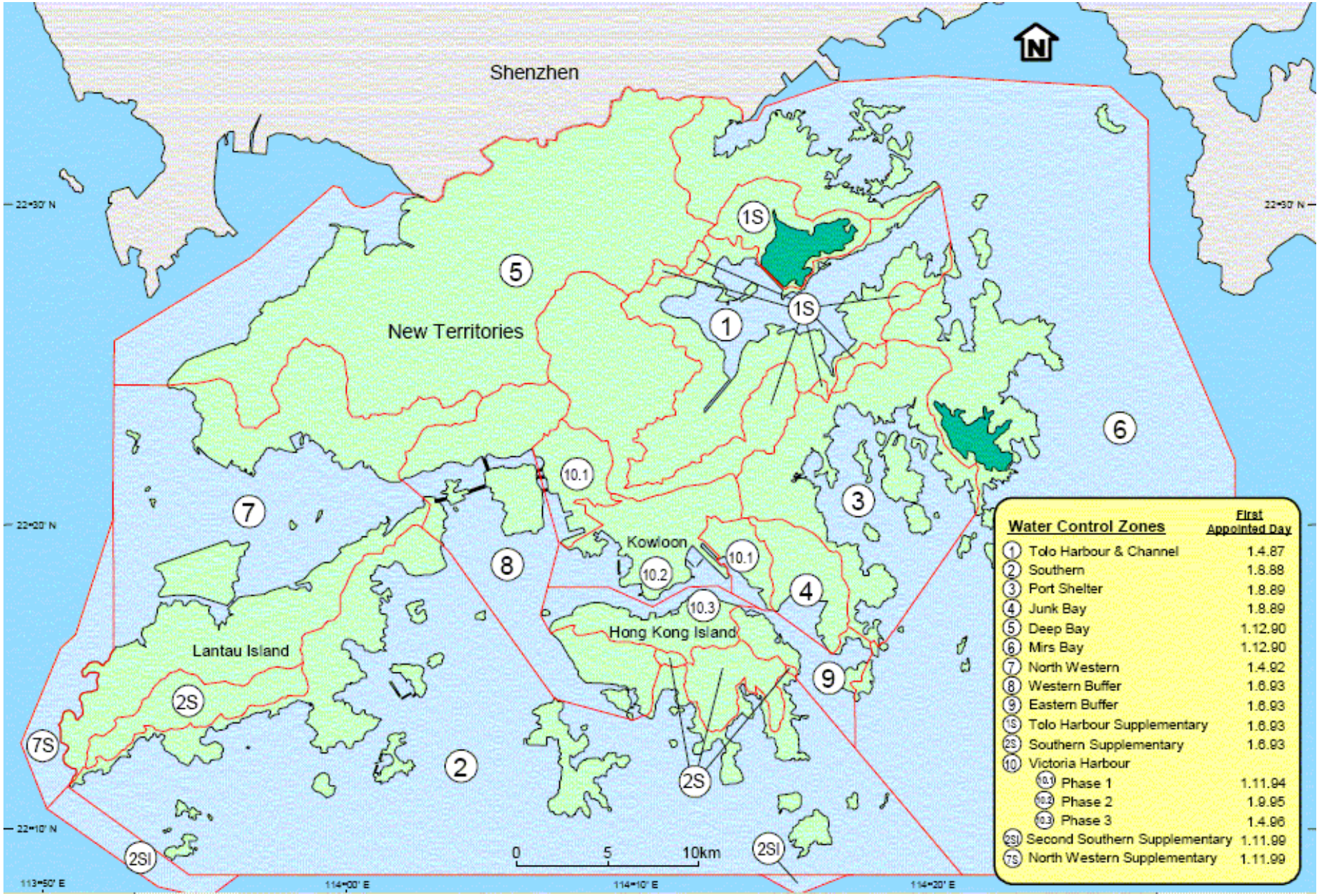
Source: 20 Years of Beach Water Quality Monitoring in Hong Kong (1986 - 2005), EPD website

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Beach Water Quality Monitoring Stations in Hong Kong **Figure 2-24**



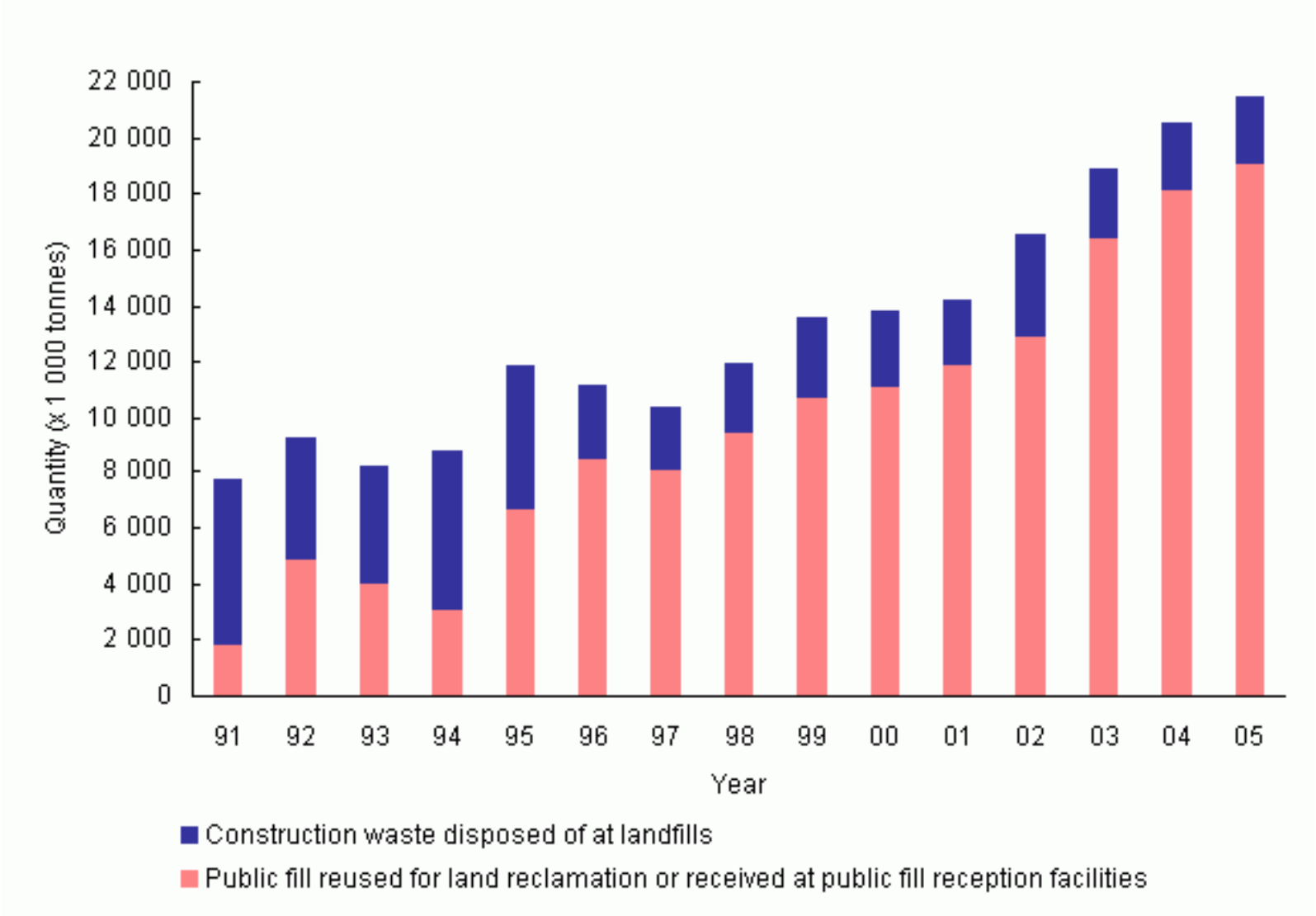
Source: 20 Years of Beach Water Quality Monitoring in Hong Kong (1986 - 2005), EPD website

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: **Beach Rankings for 2005** **Figure 2-25**

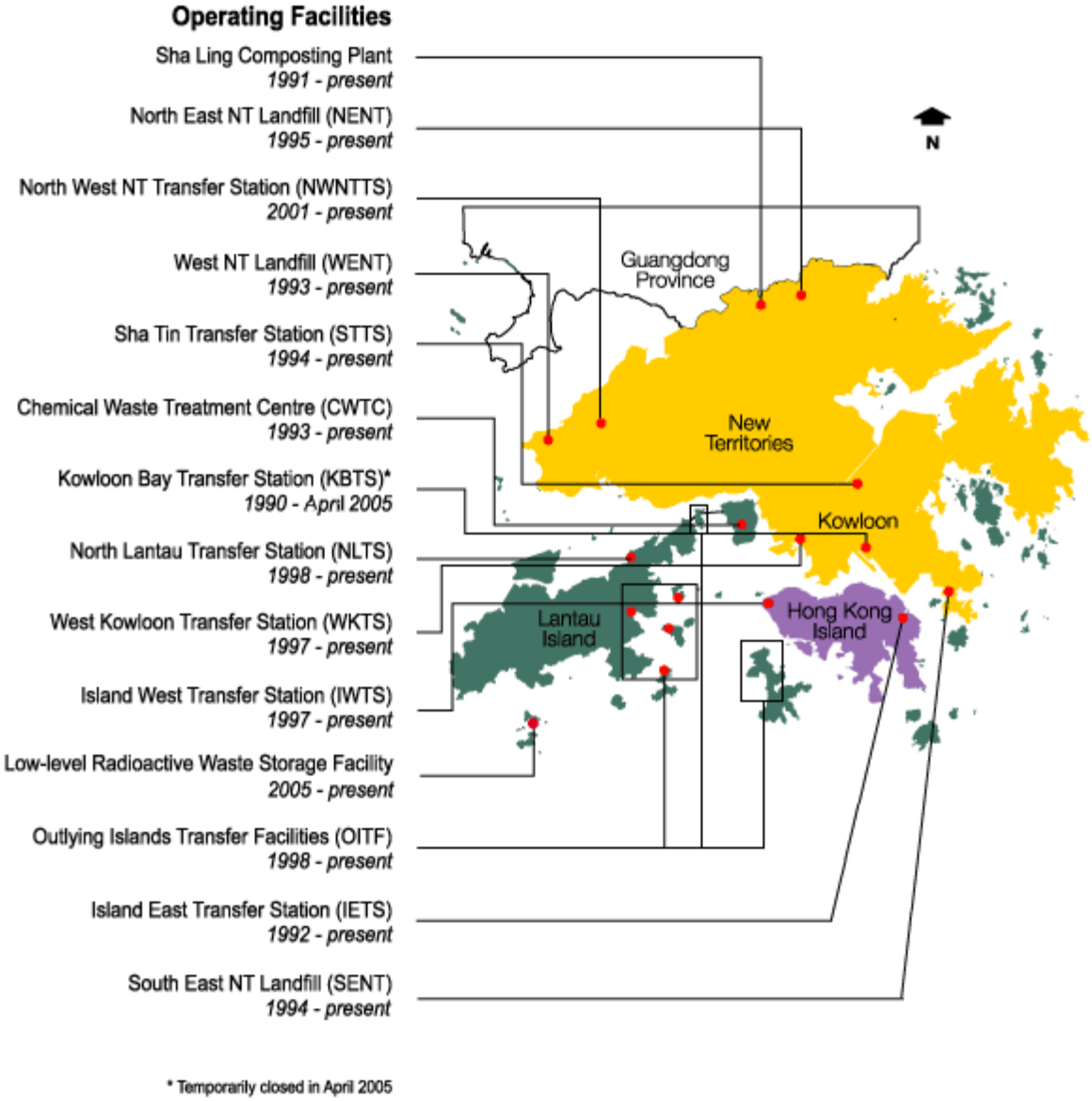


Source: Marine Water Quality in Hong Kong in 2004, EPD website

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Water Control Zones in Hong Kong **Figure 2-26**

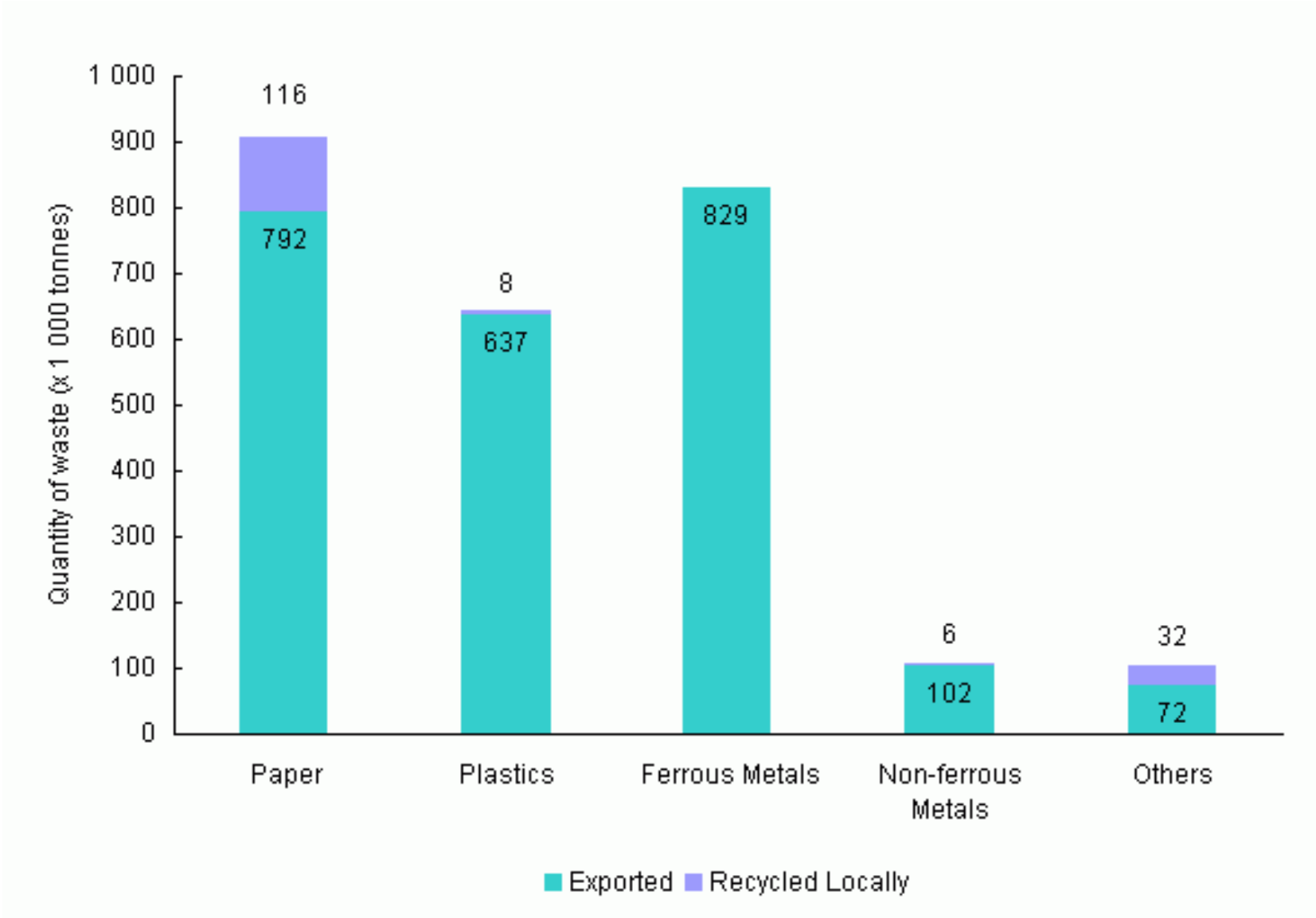


Source: http://www.epd.gov.hk/epd/english/environmentinhk/waste/data/stat_treat.html, EPD



Source: http://www.epd.gov.hk/epd/english/environmentinhk/waste/prob_solutions/iwdp.html, EPD

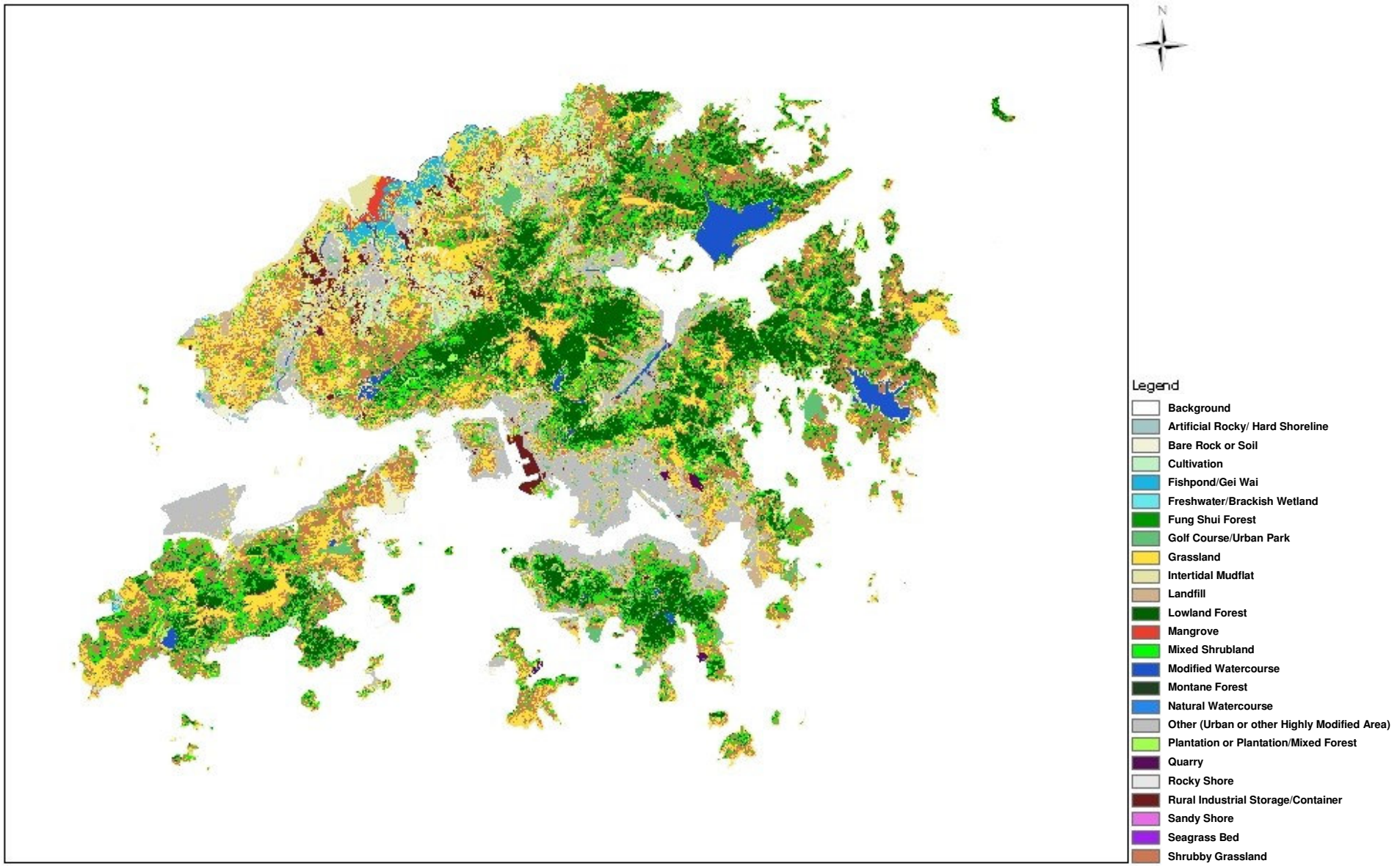
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: **Waste Facilities Serving Hong Kong, 1996-2005** **Figure 2-28**



Source: EPD (2006). (http://www.epd.gov.hk/epd/english/environmentinhk/waste/data/stat_recycle.html)

Note: * Gas Production Plants/ Gas holder

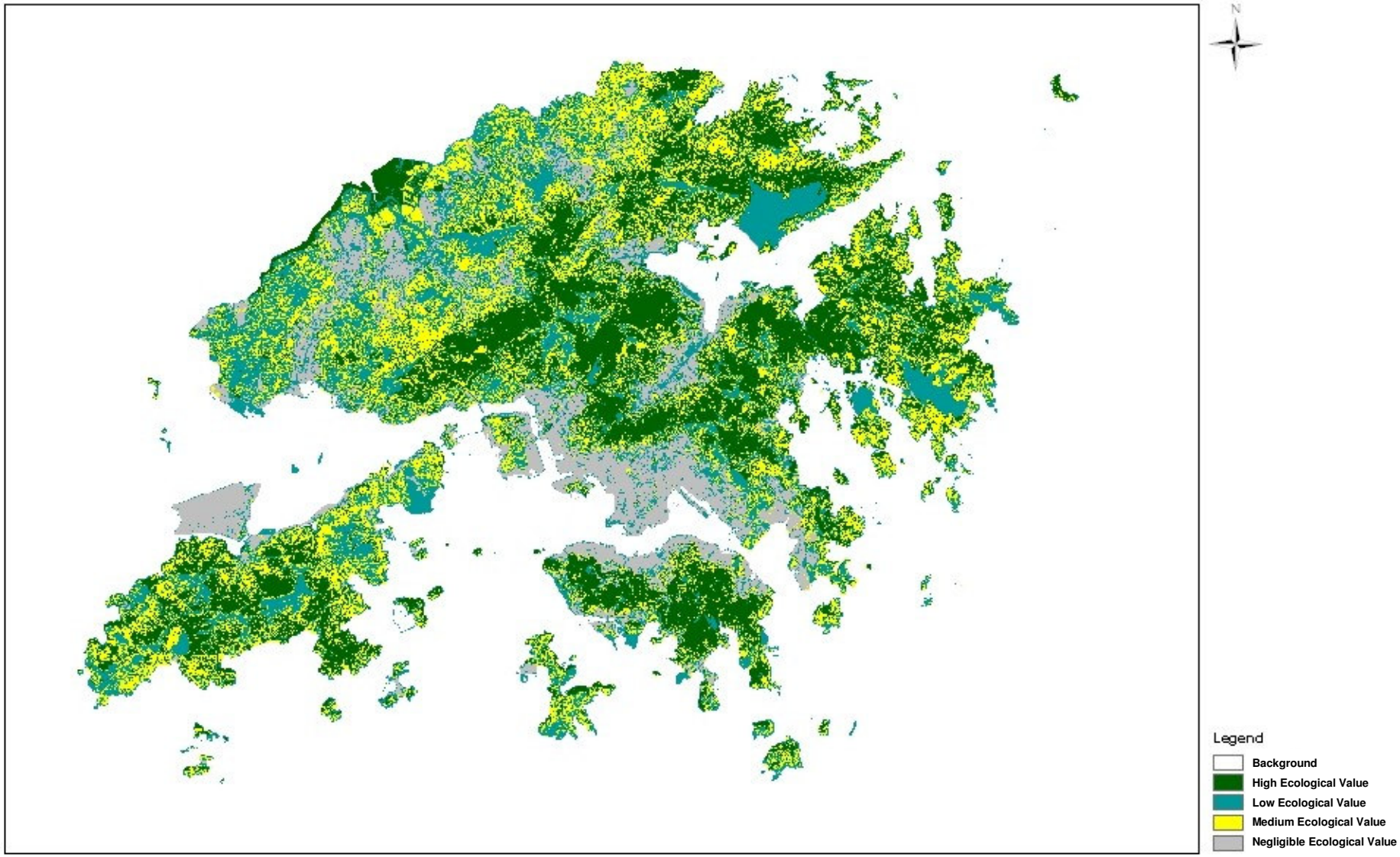
Source: http://www.epd.gov.hk/epd/english/environmentinhk/air/data/risk_mgt.html, EPD



Source: 2004 Update of Terrestrial Habitat Mapping and Ranking Based on Conservation Value

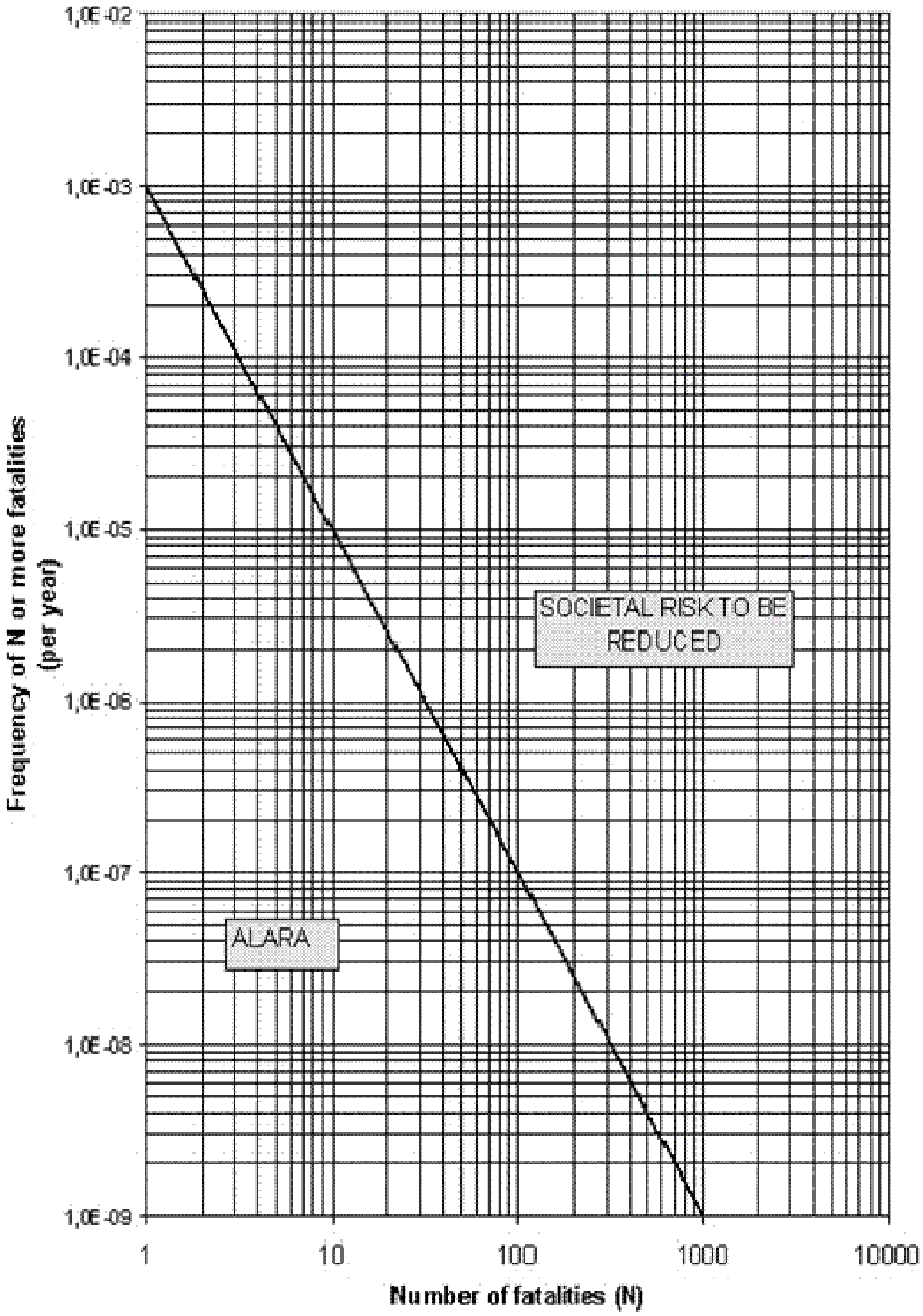
Scott Wilson Ltd. In association with Joint Laboratory for GeoInformation Science (2005) for SDU, HKSAR

PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Terrestrial Habitat Map of Hong Kong 2004 **Figure 2-31**

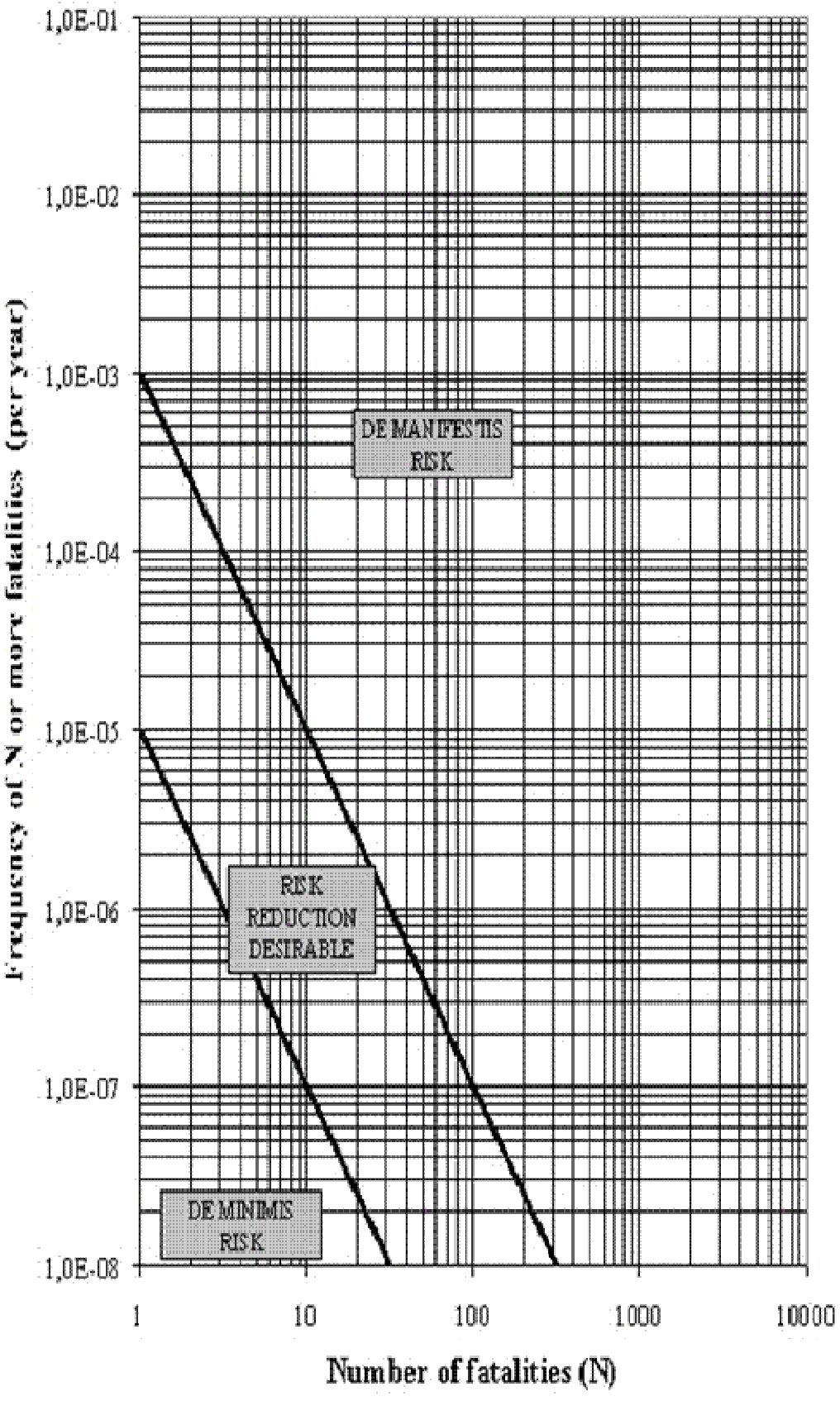


Source: 2004 Update of Terrestrial Habitat Mapping and Ranking Based on Conservation Value
Scott Wilson Ltd. In association with Joint Laboratory for GeoInformation Science (2005) for SDU, HKSAR

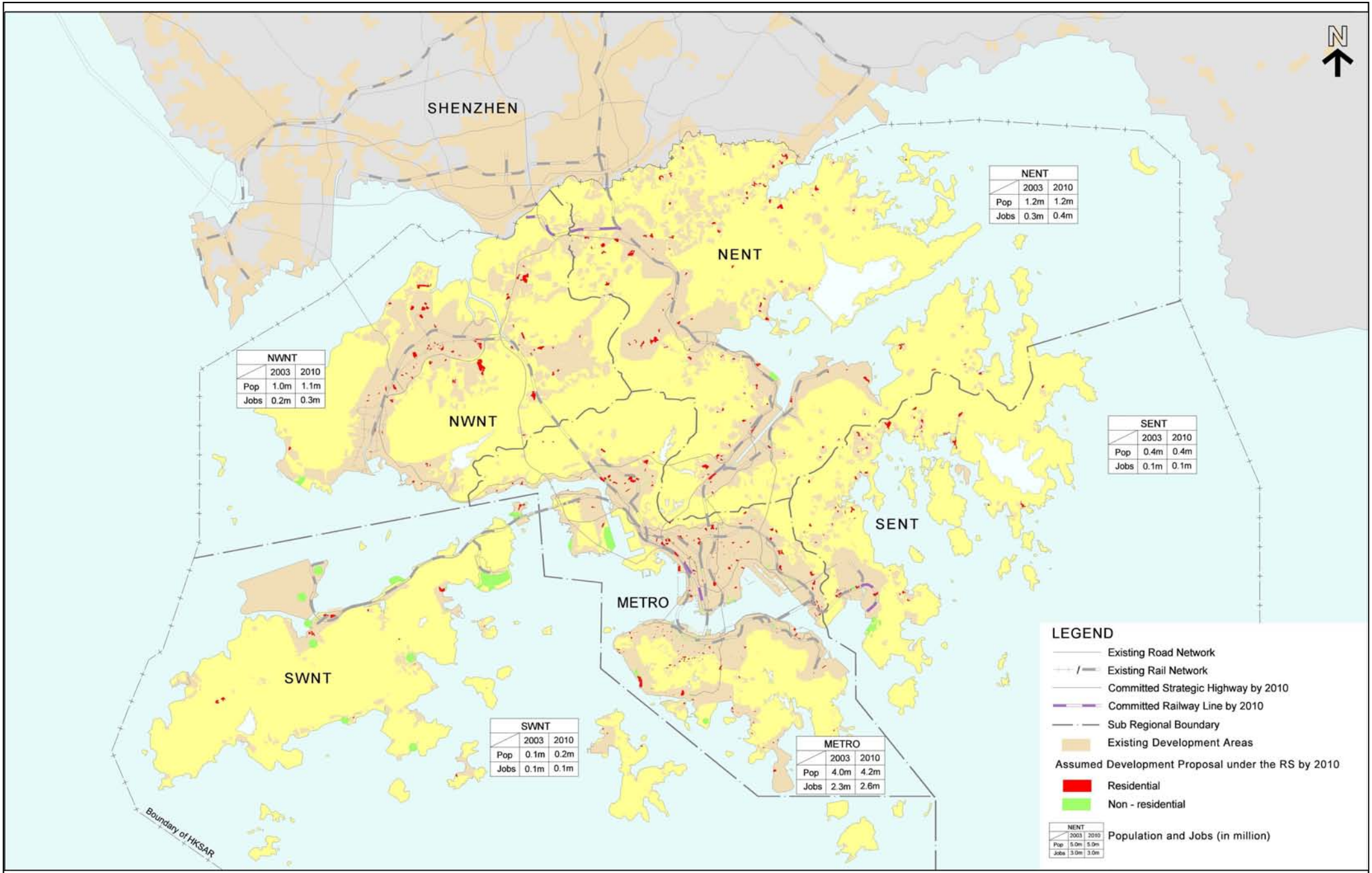
PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	**Hong Kong 2030: Planning Vision and Strategy** **Strategic Environmental Assessment** **Final Report**	Title: Conservation Assessment Map of Hong Kong **Figure 2-32**



PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	Hong Kong 2030: Planning Vision and Strategy Strategic Environmental Assessment Final Report	Title: **Dutch Societal Risk Criteria** **Figure 5-1**



PLANNING DEPARTMENT	Hyder Consulting / Mott Connell	Hong Kong 2030: Planning Vision and Strategy Strategic Environmental Assessment Final Report	Title: USA (Santa Barbara, Calif.) Off-Site Societal Risk Criteria Figure 5-2



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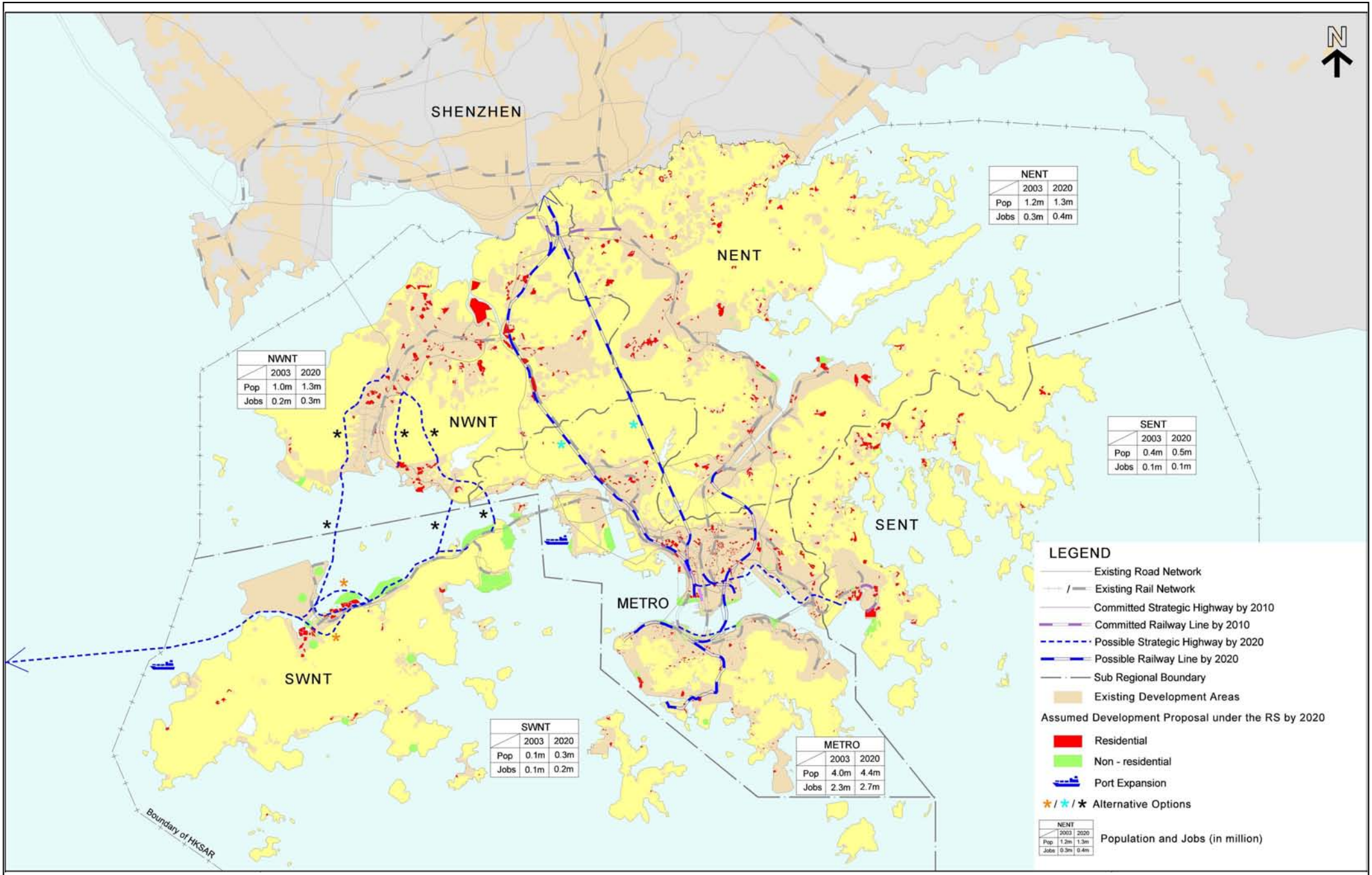
Final Report

Title: Preferred Development Option - 2010

Figure 6-1



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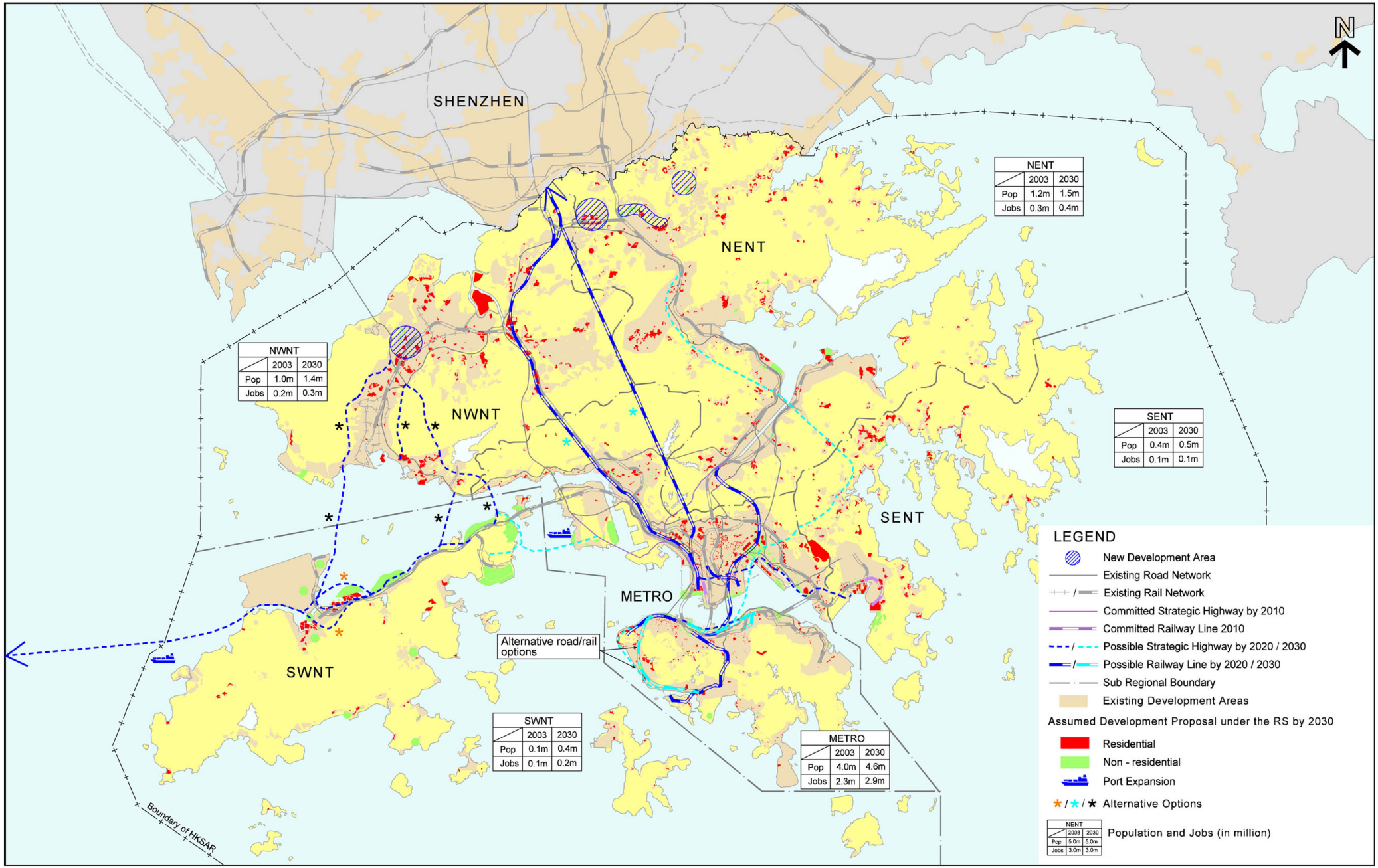
Strategic Environmental Assessment
Final Report

Title: Preferred Development Option - 2020

Figure 6-2



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Strategic Environmental Assessment
Final Report

Title: Preferred Development Option - 2030

Figure 6-3