EXECUTIVE SUMMARY

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INTRODUCTION

1. The primary objective of the Territorial Development Strategy (TDS) Review is to formulate a long term development strategy for Hong Kong which will keep apace with the developments and maintain its position as a leader within the South China Region (the Region). To this end, a comprehensive screening process encompassing detailed evaluations and sectoral studies were undertaken and many components and development strategies were considered. Ultimately, two basic development strategies (reflecting different growth characteristics) for two different time horizons will be formulated. The long term development strategy is based on the year 2011, with medium term proposals developed for the year 2006.

2. Using guidelines derived from the assessment of the Hybrid Options, a series of principles were developed for use in the compilation of the Preferred Options, as follows:

   (a) scale and type of developments to be commensurate with various environmental and infrastructure thresholds;
   (b) optimising the utilisation of planned/committed infrastructure;
   (c) preference for high density concentrated development in the Greater Metro Area due to efficiency in servicing;
   (d) emphasis on rail-based developments to facilitate movements of people and goods;
   (e) creating new employment foci to achieve a better job distribution;
   (f) providing opportunities for upgrading and cleaning up uncoordinated developments in areas of urban transition;
   (g) choice of locations and broad range of land uses to produce a strategy that can satisfy housing, office, industrial needs, as well as providing opportunities for port back-up facilities and an emerging North - South technology corridor; and
   (h) enhancing the role of each sub-region in a territorial development context.

3. The components of each long term strategy will comprise:

   (a) a broad development pattern and the associated land use components;
   (b) a set of broad sectoral land development principles relating to major land uses including industrial, commercial/office and housing land;
   (c) an outline of the strategic role and functions of each sub-region in the territorial context; and
   (d) an assessment of the land use, transport and environmental implications of the postulated growth pattern.

4. Elements of the medium term strategy will include :

   (a) a list of key strategic growth components and common elements of the two Long Term Development Options to be recommended for action in the medium term;
   (b) a proposed broad programme and phasing of each of the growth areas identified in (a), including associated key infrastructure and environmental mitigation measures;

(c) an assessment of the broad financial implications and rough order of costs for (b); and

(d) an outline sequence of works for all identified strategic growth areas with priorities for implementation.

5. Detailed evaluations at various levels have been carried out in order to generate the Preferred Options which can then be synthesised into the development strategies. One of the basic tenets of the TDS Review is that environmental initiatives and objectives should be fully integrated into the overall planning process. As the TDS Review seeks to provide a long term planning framework which is economically robust as well as being acceptable in terms of land use, transport and environment, stringent testing procedures were developed and many undesirable elements were screened out at each stage of the formulation process.

6. The two Preferred Options of the TDS Review evolved from an iterative evaluation process using a series of performance criteria to screen out undesirable elements, to protect areas of specific conservation value and to focus on areas where development could be achieved in a controlled manner. Account has been taken of the development potential in the Pearl River Delta (PRD) which has provided a regional context for the land use - transport - environment strategies. Although it has not been possible to evaluate the Preferred Options in the wider context of the PRD, due to a lack of available information, this is a key issue which will need to be addressed as part of further studies. Key concerns or issues to be addressed at regional, intra-territorial and district levels include solid and liquid waste disposal, transboundary air pollution and protection of marine, coastal, and inland water quality.

ENVIRONMENTAL OBJECTIVES

7. One of the principal objectives of the TDS Review is to enhance and protect the quality of the environment with regard to air quality, water quality, noise, solid waste disposal and potentially hazardous installations by minimising net environmental impacts to the community and maximising opportunities to improve existing environmental problems.

8. The environmental assessments sought to identify environmental thresholds for individual areas and districts, to determine whether the carrying capacities will be compromised as a result of the developments proposed and to propose the nature and extent of any necessary remedial measures and, as far as possible, this was undertaken within the limits of available resources. At a strategic level, the assessments permitted comparative assessment of the various development options. A critical component of the overall evaluation process is the assessment of the proposed developments at different time horizons and the implications of the proposed phasing. It may be that individual development strategies or components thereof could be made to be more environmentally acceptable if discrete components are brought on stream at different time horizons.

SCENARIOS GENERATION

9. Two broad strategies were formulated on the basis of the foregoing evaluations taking account of the overall development programme for the next two decades. Essentially, Scenario A was conceived as the low growth scenario which perceives the PRD to be the major economic hinterland for Hong Kong. This is a trend based scenario which takes account of the interaction between growth and development in Hong Kong and the PRD. Scenario B was formulated on the basis that the Guangdong Province and the inner provinces of China will be the major economic hinterland of Hong Kong. It is important to stress that the two scenarios are not necessarily mutually exclusive, but can be seen to be the responses to growth as the linkages in the region strengthen.

10. Components of the two Preferred Options include:

(a) new cross-border road transport links;
(b) new cross-border rail links;
(c) new rail freight distribution centres;
(d) additional border crossing points;
(e) development of high technology corridors;
(f) provision of river trade freight distributing facilities; and
(g) new residential developments.

11. Major Growth Areas proposed include Kai Tak, Kowloon Bay Phases 2 and 3, Green Island, Tseung Kwan O Phase 3, Tung Chung Phases 2, 3 and 4, Tai Ho, and Hong Kong South. Minor Growth Areas include Lok Ma Chau/San Tin, Kam Tin, Yuen Long South and Fanling North. Low density residential areas have been identified in Rural NWNT, Tuen Mun East, and Whitehead. Some additional solution spaces have been identified as potential development areas after 2011 including North Lantau Extension, Border Zone, Metro Area Intensification and the intensification of the Yuen Long - Tuen Mun Corridor.

ENVIRONMENTAL ASSESSMENTS

12. Sectoral assessments were initially carried out to identify components of the proposed development scenarios which could have adverse impacts on their surroundings in terms of water quality and sewage disposal, air quality, noise, waste disposal, PHI consultation zones and ecology. Components or development strategies (industrial, transport, residential and strategic growth areas) were then evaluated and any components requiring mitigation measures or detailed study were identified.

STRATEGIC DEVELOPMENT AREAS

13. Strategic development areas are essentially potential growth areas with a core residential element, although additional components such as offices, hotels, port facilities are included in certain options. The environmental assessments of these strategic development areas indicated that provided that adequate resources are applied at the appropriate stage of the development process, in particular to expand the existing sewerage infrastructure, most of the anticipated impacts can probably be mitigated and all of the major growth areas can be accommodated in the medium term. Green Island is contingent on the development of later stages of the SSDS. Major growth areas, especially in the NWNT and NENT, require detailed consideration to be given to the appropriate development of the sewage collection, treatment and disposal systems taking environmental constraints such as receiving water quality and the maintenance of strategic wetland ecosystems into account.

TRANSPORT LINKS

14. Functional differences between the two Scenarios are essentially the addition of a North-South Highway between the Border and Metro by 2011 under Scenario B and the provision of a D3 or D2 connection for Green Island under Scenarios A and B respectively. The possibility for a second Shatin to Urban Link, a new line in South East Kowloon and a possible fourth harbour crossing are proposed for Scenario B for testing purposes. Other alignments such as the Zhuhai Bridge were not specified, although the traffic forecast was included in the transport testing, which could have extremely serious environmental consequences including the increase in air pollution and noise at or near the proposed landing points at Tuen Mun and/or Lantau Island and the serious consequences on water quality if the connection is made by other than a totally submerged tunnel. These issues require detailed environmental/

engineering/economic assessments to be carried out before the development concept is further advanced.

15. A series of pollution control measures will need to be adopted (such as Euro I and Euro II) to reduce the estimated NO_2 concentrations as far as practicable. Even with all assumed pollution control measures in place, the NO_2 trigger level will be exceeded in Tuen Mun by 2011 under scenario B, due strictly to traffic emissions and not taking industrial emissions into account. In the Harbour and Tuen Mun Air Control Zones (ACZs), further reductions in emissions will be necessary with emphasis on the reduction in emissions from goods vehicles.

16. In accordance with the aim of formulating sustainable transport policies, the following issues have been given priority in the development of the TDS Preferred Options:

(a) integration of the land use - transport - environment planning as promulgated by the TDS;

(b) minimising the need for transport and increasing the number of trips made on the least harmful (environmental) modes;

(c) to aim for air quality standards which will prevent damage to health, including reduction in dusts, NO_2, and SO_2 through the control of emissions;

(d) increasing the amount of personal travel and freight transport by less environmentally damaging routes; and

(e) preservation of conservation, scenic and amenity areas has been built into the land use -transport-environment scenarios, and wherever possible new infrastructure should avoid encroachment on such areas.

17. Other strategies which aim to make the transport strategies sustainable include the reduction in noise nuisance from all modes of transport and the minimisation of demands placed by transport and industry on non-renewable resources. In addition, the following recommendations were also made in connection with future transport policies:

(a) investment in public transport should be enhanced over the next decade, and the measures in place to restrict private car ownership should be strengthened to ensure public transport is embraced;

(b) recycled materials should be used wherever possible in road building schemes, noise reducing materials should be applied to road surfaces which should be maintained in peak condition;

(c) early investment in light rail schemes is desirable from an environmental standpoint. However, any proposals would also need to be evaluated in terms of, inter alia, construction costs, easement of land and feasibility of construction and operation;

(d) profits from any tolls or revenues collected by Government should be reinvested in developing a sustainable transport policy;

(e) if strategic roads have to cut through built up areas, the feasibility of putting them in tunnel or underpass should be carefully considered taking into account such factors as financial viability, technical feasibility, structural safety and possible flooding. Notwithstanding the foregoing, the benefits in terms of air quality and noise could be

significant if these facilities are designed properly. Such environmental considerations need to be included in the overall cost-benefit analysis for any new scheme;

(f) wherever practicable, through traffic should be diverted from roads passing through densely populated areas to bypass routes to reduce traffic flows in those areas;

(g) in the cost comparison between environmentally friendly options (such as well planned underground railways or expressways) and their open road equivalent, external costs such as the loss of land premium due to the constraints imposed by an open road option, the capital and maintenance costs of the mitigation measures associated with the open road option, visual impacts should all be considered;

(h) practicable technology should be fully exploited to reduce the tail pipe emissions from vehicles. Evolving technology such as low or zero emissions modes of transport (eg electric cars) which requires the establishment of special infrastructure should be investigated;

(i) porous asphalt or whisper concrete should be used wherever practicable in the resurfacing of existing roads, and should be mandatory for all new road construction;

(j) all new development proposals should be examined in the wider context rather than in terms of the territorial impacts as the development of the linkages between Hong Kong and the Pearl River Delta will undoubtedly strengthen;

(k) in recognition of the existing concerns regarding air quality, and recognising the limitations of the present modelling study, it is imperative that a regional air quality model and a GIS database are developed for use in planning for the protection of the environment. This model should, inter alia, be integrated with the transport models currently in use to allow a proactive environment - transport strategy to be developed.

PORT RELATED ACTIVITIES

18. Port back-up areas are assumed to be container sites used for parking, vehicle repair, parking with repair services and container storage. These are primarily located on Lantau (CT10, 11, 12) and in San Tin with long term proposals to utilise West Tuen Mun-Shekou area (or Neilingding Islands) being contingent on the concept of dredging a deep channel between south west Lantau and Black Point.

19. The San Tin site requires detailed study to minimise the impacts on local traffic (congestion, noise and air pollution), protect water quality from chronic pollution from runoff, minimise the loss of wetland habitat due to filling of fish ponds, and to avoid creating new interface problems with residential developments.

20. The West Tuen Mun - Shekou proposals also require detailed study to determine the extent of the potential impacts or benefits accrued in terms of air pollution and elevation noise levels (especially through Tuen Mun and Metro area) and to identify any changes in the hydrodynamic regime as a result of dredging a deep channel in connection with the development of this area. Off-site impacts associated with port-related activities and open storage areas also require detailed study.

INDUSTRIAL AND OTHER COMMERCIAL DEVELOPMENTS

21. The changing nature of industry in Hong Kong has been reflected in the land uses proposed in the Preferred Options. These include the expansion of the high technology corridors and the working towards the provision of clean industries rather than traditional heavy polluted manufacturing industries. Detailed environmental impact assessments will be required for all of the proposed industrial developments even those referred to as "clean technologies" to ensure such developments can be sustained within the allocated areas.

22. Although the trigger levels for SO_2 are not exceeded for the industrial strategies proposed, it is pertinent to note that due to the relative increases in SO_2 between 2001 and 2011, in the Harbour and Tuen Mun ACZ's, the situation will need to be reviewed via, inter alia, monitoring and audit of air quality to provide an indication of any remedial action which may need to be taken.

REGIONAL CONTEXT

23. As it is a fundamental precept that the TDS will incorporate the Pearl River Delta as the economic hinterland, detailed consideration needs to be given to the prevailing environmental conditions and the environmental implications of implementing development on the scale proposed. While it would be desirable to incorporate an environmental baseline of conditions in the Pearl River Delta within the present Study, it was recognised that the undertaking of such a task would require considerable effort in terms of data collection and interpretation and was beyond the scope of this Study.

24. If the TDS is to be put into the wider regional context however, it will be imperative to establish a mechanism to assimilate existing data, to collect new data and to interpret the results to provide an understanding of the overall carrying capacities of airsheds, water bodies and the noise climate both within the territory and in the economic hinterland. This will provide a better understanding of the development opportunities, the constraints imposed for environmental reasons and the strategic and comprehensive development within the region which will be for the betterment of all its citizens.

25. Environmental consequences of the rapid development of Guangdong Province have the potential to limit the carrying capacities of the Region itself as well as within Hong Kong. This issue needs to be addressed as it could have a consequential impact on the achievable development threshold for Hong Kong. Environmental consequences of the regional development opportunities, especially the increasing transport linkages between Hong Kong and its hinterland, could include:

(a) residential development pressure in the New Territories for workers in Shenzhen or further north. The standard of living offered in Hong Kong, the family connections and the improved transport networks may result in more people living in the NT or Border Area and working in Shenzhen or further afield which has implications on the sewage collection, treatment and disposal systems;

(b) increase in demand for water resulting in increased volumes of wastewater to be disposed of. The disparity in the standards for discharge of effluent in different parts of Guangdong Province compared to Hong Kong is a major issue to be addressed at a strategic level;

(c) increase in the demand for energy to keep apace with developments. This needs to be considered especially in terms of air pollution and waste disposal of by-products;

(d) strategies to improve the quality of Shenzhen River and Deep Bay could be nullified if the Lower Pearl River Crossing is permitted to go ahead. Major impacts include possible changes in the inter-tidal regime, possible reduction in flushing capacity of Deep Bay, potential for major adverse impacts during the construction phase, air quality impacts from the ventilation shafts and tunnel portals (if the crossing is in tunnel);

(e) potential threat to Mirs Bay and Tolo Harbour from the chronic pollution problems associated with development of Yantian Port. Potential sources of chronic pollution include surface water runoff which can be charged with oil, grease and sediments, effluent discharge from vessels (although this is illegal under the MARPOL Convention it is difficult to control) and the land based workforce, and the insidious leakage of oils from vessels calling into the port. Strategic planning and the implementation of a comprehensive sewerage master plan for Hong Kong and Shenzhen should be a primary aim, as well as the implementation of comprehensive pollution control measures at all of the port facilities in the Region;

(f) reduction of stationary sources of emissions from industrial developments in Hong Kong may be reflected by an increase in transboundary pollution effects as the industries relocate elsewhere. The forecast increases in the transport corridors and road development taking place in the Region in concert with potential increases in industrial emissions could have a serious impact in terms of transboundary effects;

(g) disposal of domestic and industrial wastes from the forecast population of about 94.2 million for Guangdong Province and the increasing difficulty in finding new sites for the disposal of solid wastes; and

(h) potential loss of habitat or destruction of fragile ecosystems. Although the TDS has incorporated conservation strategies for Hong Kong, it has not considered the impacts of burgeoning development in terms of the threat to ecology. Areas which are most vulnerable include the Deep Bay ecosystems, the Mai Po Marshes and the Futian Nature Reserve, Mirs Bay, Tolo Harbour and the marine parks. In order to protect these and similar areas, a concerted effort will be required by the authorities in Hong Kong and the rest of the region by, inter alia, establishing ecological baseline and conservation strategies especially in areas such as Deep Bay and Mirs Bay which have common borders. The role of established Non-Government Organizations (NGO's) can facilitate this cause and should be encouraged to focus on specific concerns relating to individual areas such as Deep Bay and Mirs Bay.

26. In 1989 the Environmental Protection Law of the PRC was passed which is implemented by the National Environmental Protection Agency (NEPA). In addition to the NEPA, which has an office in Guangzhou, there are numerous sub-regional and district level environmental committees overseeing the protection of water quality, air quality and marine resources. A concerted and comprehensive effort is needed to coordinate these bodies to ensure future development of the Region is considered holistically, to endeavour to exchange pollution control technologies, develop strategic environmental protection measures and resource conservation.

SUSTAINABILITY

27. Although the concept of sustainability and the TDS Review appear to be mutually exclusive, it is pertinent to examine the principal articles of Agenda 21 and review these in the context of the generation of the TDS. A particular point to note in connection with the Preferred Options, especially in terms of sustainability, is that the environmental footprint for Hong

Kong extends much further than its boundaries. The definition of whether the proposed developments can be sustained in terms of the environmental criteria therefore needs to be studied in detail in the wider context of regional development.

CONCLUSIONS

28. The main findings of the analysis indicate a number of potentially serious environmental consequences from both the high growth and low growth scenarios as a direct consequence of the assumed population increases. The primary findings of the assessment are as follows:

(a) Goods vehicle traffic is expected to double between 2001 and 2011 under Scenario A with an even greater increase forecast for Scenario B. Under both scenarios, vehicle related air pollution mainly associated with goods vehicle traffic, is likely to cause exceedance of the Statutory Air Quality Objectives (AQOs) in some parts of the Territory. The situation is particularly severe under Scenario B with AQOs being exceeded in the Harbour and Tuen Mun Areas even with all proposed pollution control measures in place. Under the low growth scenario, provided that all currently proposed pollution control measures are implemented and are effective (including the diesel to petrol programmes), the level of pollution can be reduced such that the AQOs can be achieved in most parts of the Territory. The adoption of Euro I and Euro II vehicle emission controls are necessary if the AQOs are not to be exceeded before 2006.

(b) Dust has been identified as a territory wide issue. Increase in particulates due to the increased vehicle fleets and kilometres travelled will cause further deterioation. Additional port facilities are forecast to have a significant effect on fugitive dust emissions throughout the Territory. This will exacerbate the air pollution problems. Clearly there is a need to study this issue in detail and to define effective measures to minimize man-made problems.

(c) Traffic noise in many areas for both scenarios is expected to exceed the requirements of the Hong Kong Planning Standards and Guidelines. The traffic mode mix and pattern needs to be carefully considered at the strategic and policy level, and action will also need to be taken at the district level. Development proposals for the NWNT are of particular concern because of increased port-related activities and the anticipated growth of associated traffic. Further study is necessary to refine the estimates and to include the cumulative impacts, particularly those associated with off-site port-related impacts. Other traffic and transport related issues include the direct impacts related to additional infrastructure provision, such as the possible Route Y project.

(d) Planned sewerage infrastructure will be overloaded in many areas under both scenarios. The worst affected areas are the NWNT, NENT and Metro areas. All of the major residential growth areas recommended could be accommodated in the overall development strategy in the medium term, provided that it is possible to expand the existing sewerage infrastructure. The development of Green Island would be contingent on implementation of later stages of the Strategic Sewage Disposal Scheme (SSDS) or other means of sewage treatment and disposal. Further investigation of the feasibility and cost implications of sewerage infrastructure provision is required.

(e) Minor growth areas, especially in the NWNT, require further study and detailed design to develop comprehensive sewage collection, treatment and disposal networks. Ecological impacts caused by the proposed developments, even of minor growth

areas, and the associated effluent collection and disposal systems, should also be addressed.

(f) The assimilative capacity of receiving water bodies in the Territory will be overloaded and water quality objectives (WQOs) will probably be unachievable in some areas, under both scenarios, unless existing and planned treatment systems are upgraded. The extent of the water quality impacts is uncertain and requires detailed quantitative study, together with investigation of the feasibility of mitigation measures.

(g) Provision of about 890 hectares of land under Scenario A and 1,500 hectares for Scenario B, in addition to the 900 hectares for the port facilities, is forecast to have a significant impact on the fugitive dust emissions throughout the Territory, particularly for the NWNT, NENT and Metro. In addition, the proposed scale of development will generate a massive volume of construction wastes which will require disposal.

(h) Solid wastes generation rates are forecast to exceed current estimates for both construction and domestic wastes arisings. In the worst case scenario, the life spans of existing and planned landfills are predicted to be reduced substantially. If the recommendations of the Waste Reduction Study (WRS) are implemented and if controls are extended to construction wastes, the problem can be mitigated to some degree. Consideration should be given to implement the recommendations made in the WRS at the earliest opportunity, and extend such measures to the industrial and commercial sectors and to the construction industry (hitherto exempt from consideration under the aforementioned WRS).

(i) With the redistribution of the industrial land use which incorporates trends towards emission-free manufacturing activities, it has been possible to formulate an industrial land strategy which is acceptable in terms of air quality for both scenarios. Forecasts of industrial wastewater generation indicate that this will contribute 40% of the total volume of liquid wastes to be disposed of on a daily basis. The estimated overall contribution of BOD loading to the total budget is 30% with 17% of the territorial SS and TKN loading generated by the industrial sector. Key areas where the estimated effluent generation would exceeds the existing treatment capacity are the NWNT and NENT.

(j) On the basis of the preliminary estimates, it has been calculated that the capital and treatment costs associated with the disposal of liquid wastes are 30% and 20% higher for Scenario B respectively compared to Scenario A. Other environmental mitigation costs are expected to demonstrate similar variations.

(k) All of the port-related activities, especially at San Tin, Border and West Tuen Mun, will need detailed assessments and inclusion of pollution prevention/reduction mechanisms to be built into the facilities to protect water quality and the ecosystems within Deep Bay, local air quality and the existing and planned residential developments from excessive noise, traffic related air pollution and interface problems.

(l) Open storage sites proposed for areas in the NWNT will need to be harmonised with all other activities planned for this area from an early stage and so are the impacts of traffic in terms of the off-site noise impacts associated with these facilities. (air pollution impacts were included in the overall air quality modelling study). Protection of ecosystems within these areas is another issued to be addressed.

(m) Further consideration needs to be given to the environmental impacts associated with the proposals to provide open storage in former borrow areas proposed for the Refined Preferred Option B.

(n) All of the components of the Refined Preferred Options have been examined not only in the environmental context, but also in terms of planning, transport, and the regional context. Further and detailed consideration will need to be given to individual elements of all of the strategies, as well as to the base growth components (in the immediate future) to ensure the strategic development goals of the Territory as a whole are not compromised.

(o) There clearly exists a need to develop Strategic Environmental Management Plans, define environmental baseline conditions at various levels of detail and develop a strategic environmental monitoring and audit programme (REMAP) which will assist in the decision-making process for the development of the Region.

(p) Integration of environment - transport- landuse models to assist in the decision making and planning processes (i.e. air quality models and GIS and water quality model to simulate long term trends) should be developed and should be multi-functional for their stated purposes. They should also be flexible to allow rapid solutions to problems to be provided as well as determining effects of detailed long term/futuristic scenarios.

(q) Consideration should be given to regionalising institutional mechanisms/policy issues in an attempt to centralise development offices/environmental control bureaux (these could be regionalised although a central committee/office would need to be established) and enforcement agencies.

(r) Even with all of the proposed mitigation measures in place to minimise the environmental effects, there will still be serious residual impacts arising from the Refined Preferred Options. Individual components will need to be subject to the EIA process but even more importantly, the cumulative impacts will require investigation through detailed studies as a basis for future policy decisions. In many cases, the engineering and financial viability of recommended mitigation has not been demonstrated (i.e. sewerage & water quality, waste disposal) and requires further study. Some problems require even more fundamental consideration (ie. air quality and noise impacts from goods vehicles).

(s) The predicted environmental impacts principally summarized above highlight possible concerns on the long-term substainability of some of the TDS proposals. The many environmental issues brought out by the Environmental Assessment of the TDS Review clearly point to the need to develop a territorial and strategic substainability framework which would form the basis for proposing further economic development without depleting the environmental qualities of the Territory.