No. 86
A. Non-monetary claim only
B. Judicial Review

LA/MJR/18808/2009 (L26)
HCAL 9 /2010

**IN THE HIGH COURT OF**
**THE HONG KONG SPECIAL ADMINISTRATIVE REGION**
**COURT OF FIRST INSTANCE**
**CONSTITUTIONAL AND ADMINISTRATIVE LAW LIST**
**NO. 9 OF 2010**

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IN THE MATTER OF an application for leave to apply for Judicial Review under Order 53 Rule 3 of the Rules of High Court

and

IN THE MATTER OF THE ENVIRONMENTAL IMPACT ASSESSMENT ORDINANCE (Cap. 499)

**CHU YEE WAH** **APPLICANT**

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**NOTICE OF APPLICATION FOR LEAVE**

**TO APPLY FOR JUDICIAL REVIEW**

(Order 53 Rule 3(2), Rules of High Court)

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**To: The Registrar, High Court, Hong Kong Special Administrative Region.**

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| Name, address and description of the Applicant | Applicant<br><br>**CHU Yee Wah**, aged 65 years old, local resident of Fu Tung Estate in Tung Chung, Lantau Island, Hong Kong SAR. |
| Name and description of Proposed Respondent | **Director of Environmental Protection** |
| Judgment, order, decision or other proceedings in respect of which relief is sought | (i) the Decision of the Director on 23 October 2009 in granting approval for the Environmental Impact Assessment Report ("**EIA Report**") relating to the Hong Kong-Zhuhai-Macau Bridge Hong Kong Boundary Crossing Facilities pursuant to s. 8(3) of the Environmental Impact Assessment Ordinance (Cap. 499) (the "**EIAO**");<br><br>(ii) the Decision of the Director on 23 October 2009 in granting approval |

| | |
|---|---|
| | for the EIA Report relating to the Hong Kong-Zhuhai-Macau Bridge Hong Kong Link Road pursuant to s. 8(3) of the EIAO;<br><br>(iii) the Decision of the Director on 4 November 2009 in granting an environmental permit to construct and operate a designated project (i.e. the Hong Kong-Zhuhai-Macau Bridge Hong Kong Boundary Crossing Facilities) pursuant to s. 10 of the EIAO;<br><br>(iv) the Decision of the Director on 4 November 2009 in granting an environmental permit to construct and operate a designated project (i.e. the Hong Kong-Zhuhia-Macau Bridge Hong Kong Link Road) pursuant to s. 10 of the EIAO; and<br><br>(the "**Decisions**") |

**Relief Sought**

1. an order of certiorari quashing the Decisions of the Director of Environmental Protection; and

2. should certiorari be granted, an order under O. 53 r. 9(4); and

3. a hearing of this application under O. 53 r. 3(3) if leave is not granted on the papers; and

4. an order for costs.

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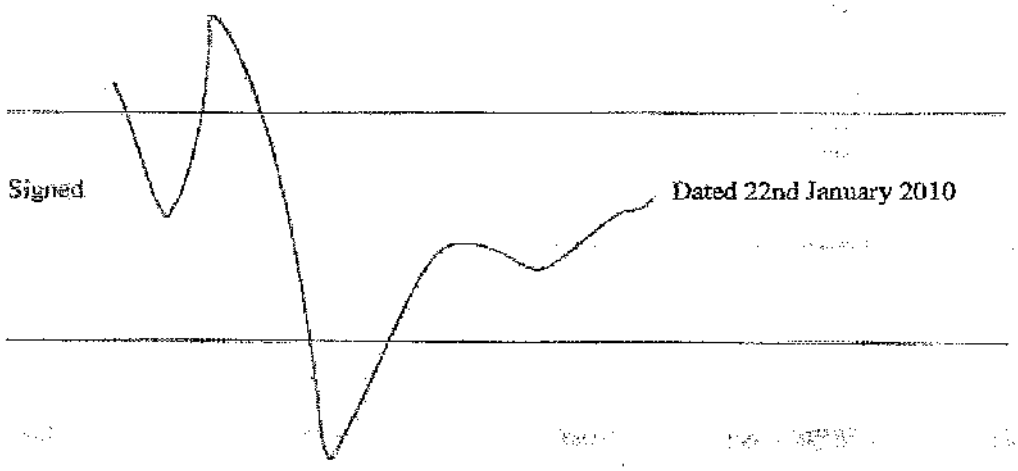


Signed

Dated 22nd January 2010

## GROUNDS ON WHICH RELIEF IS SOUGHT

### SUMMARY OF APPLICANT'S CASE

The Applicant lives close to the site of a proposed construction of a part of a very large projected transport project, namely the construction of a bridge linking Hong Kong with the western side of the Pearl River together with associated infrastructure. The aim of the project is to integrate road transport links to and from the Macao SAR and Guangdong province. Before it can go ahead the Director of Environmental Protection (the "**Director**") is required to consider and act upon a number of different EIA reports that have been prepared for the individual segments of the project. Only then can he issue permits under the EIAO for the construction works to begin. The Director issued permits for the individual segments of the infrastructure project in early November 2009.

Permits are issued under the EIAO and the scheme of the EIAO requires the EIA report to deal with environmental issues associated with a project in a certain way. If an EIA report fails to deal with an issue in the manner prescribed, or fails to deal with it at all, the Director cannot make a lawful decision to issue an environmental permit. (See: Shiu Wing Steel Limited v. Director of Environmental Protection and Airport Authority [2006] 3 HKLRD 487.)

The Applicant maintains that the EIA reports do not comply with some of the technical requirements imposed on the maker of the reports. The non-compliance is not trivial or inconsequential and that, accordingly, the Decisions to approve the EIA reports and to issue the permits are liable to be quashed. However, the Applicant's challenge is limited to the Decisions made by the Director after considering the EIA report dealing with the projects near to her home.

The Applicant relies on a detailed criticism of the EIA report provided by experts in the field of public health and medicine. The relevant parts of the experts' critique are summarized or reproduced below. The main deficiencies are:

(i) the failure of the EIA Studies to comply with the requirements and specifications as required by the Technical Memorandum and the Study Brief for the projects;

(ii) the EIA report contains many unscientific assumptions and problematic methodologies which ignore some of the latest and best scientific data available;

(iii) there was no comprehensive quantitative analysis of the air quality impact on public health; and

(iv) the EIA report erroneously concluded that one of the largest infrastructure projects in Hong Kong SAR would have no residual adverse impact on air quality.

## I. THE FACTUAL BACKGROUND

### The HZMB Projects

1. In January 2003, the PRC National Development and Reform Commission and the HKSAR Government jointly commissioned the Institute of Comprehensive Transportation to conduct a study on transport links between Hong Kong and the Pearl River West area. The study was completed in July 2003 and concluded that there was a need for a land transport link connecting Hong Kong and the Pearl River West area.

2. The Highways Department of the Hong Kong SAR Government plans to construct a Hong Kong - Zhuhai - Macau Bridge ("**HZMB**") will cross the waters of Lingdingyang in the Pearl River Estuary. The bridge will connect the Hong Kong

SAR, Zhuhai City in Guangdong Province and the Macau SAR. It will also be included as part of the transport construction project known as the "National High Speed Road Network Planning".

3. The Hong Kong SAR section of the HZMB is basically divided into 3 main projects:

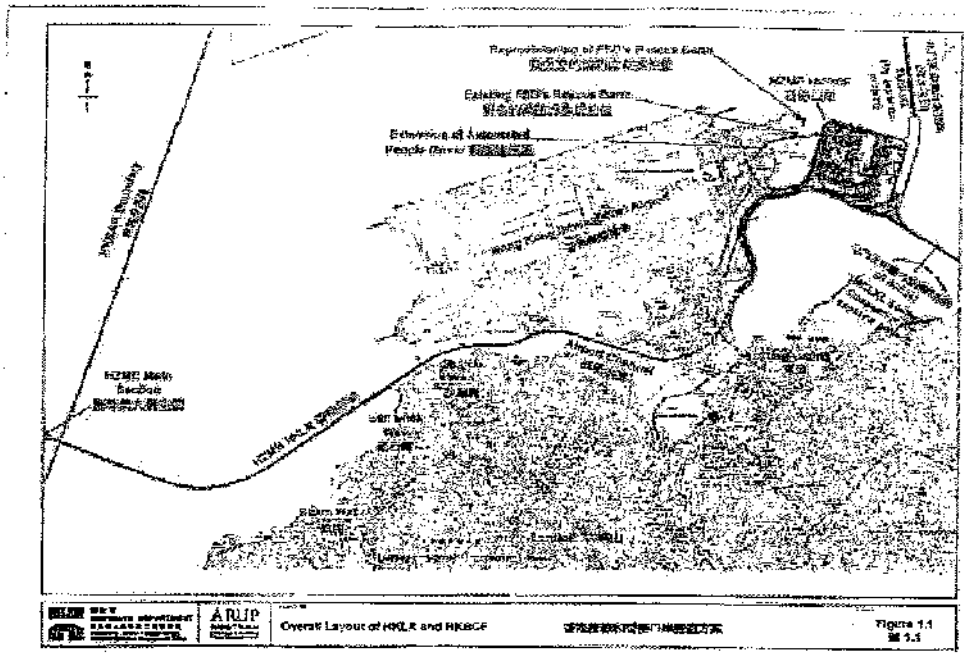
(a) The Hong Kong – Zhuhai – Macau Bridge Hong Kong Boundary Crossing Facilities ("**HKBCF**");

(b) The Hong Kong – Zhuhai – Macau Bridge Hong Kong section and North Lantau Highway Connection (also referred to as the "Hong Kong Link Road") ("**HKLR**");

(c) The Tuen Mun – Chek Lap Kok Link Road. This is a two-lane highway connecting the proposed Tuen Mun Bypass at the southern coast of Tuen Mun Area 40 in the north with the Hong Kong International Airport and Tung Chung in the south. ("**TM-CLKL**").

(The 3 projects are known as the "**HZMB projects**")

See the map below for the various geographic locations of the above-mentioned projects:




4. In accordance with the agreement made between the three governments, the HZMB requires the establishment of separate boundary crossing facilities. This means that the HKSAR Government has to set up the Hong Kong boundary crossing facilities (i.e. the HKBCF) within Hong Kong. It is proposed to locate the facilities at a reclaimed site in the northeast waters off the Airport Island near Chek Lap Kok. Construction of the HKBCF will start in the 3rd quarter of 2010.

5. The HKLR is required so as to provide the necessary linkage between the HZMB and the HKBCF for the completion of the HZMB project. Construction of the HKLR will start in 2011.

6. The TM-CLKL, if combined with the Tuen Mun Bypass, will provide a direct route linking the Northwest New Territories Traffic and North Lantau, from north to south, the Kong Sham Western Highway, port back-up areas in Northwest New Territories, Tuen Mun River Trade Terminal, the existing EcoPark in Tuen Mun Area 38, the

Airport, the proposed Lantau Logistics Park, HZMB and North Lantau developments.

7. Aspects of these projects are within the ministerial remit of the Environmental Protection Department ("**EPD**").

**The EIAO Statutory Procedures**

**EIA Study Brief**

8. The HKBCF, HKLR, and the TM-CLKL are designated projects within the meaning of s. 4 EIAO. Accordingly, the relevant procedures under the EIAO must be followed and an environmental permit will be required for each project before construction can start. These procedures normally require a person who is planning a designated project to carry out an environmental impact assessment study (the "**EIA study**") of any adverse environmental consequences that are likely to arise as a result of the proposed project.

9. In accordance with s. 5(1)(a) of the EIAO a person who is planning a designated project is required to apply to the Director for an Environmental Impact Assessment Study Brief ("**EIA SB**" or "**SB**") allowing it to proceed with an EIA study for the project. The application must include a project profile that complies with the Technical Memorandum ("**TM**") issued by the Secretary for the Environment pursuant to s. 16 of the EIAO. The main purpose of the project profile is to enable the Director to determine the scope of the environmental issues that are to be addressed in the EIA study and to set out specific technical and procedural requirements for carrying out the study.

10. Pursuant to the applications made by the Highways Department, the Director issued 3 EIASBs for each for the 3 HZMB projects. These SBs were issued at different

times – the EIA SB for the HKLR was issued as long ago as 2003 whilst those for the TM – CLKL and the HKBCF were issued in 2007 and 2008 respectively. They nonetheless impose substantially the same requirements.

11. The purpose of the EIA studies is to provide information on the nature and extent of the environmental impact arising from the construction and operation of the project and related activities taking place at the same time. This information will contribute to decisions by the Director on:

(i) the overall acceptability of any adverse environmental consequences that are likely to arise as a result of the proposed project;

(ii) the conditions and requirements for the detailed design, construction and operation of the Project to mitigate against adverse environmental consequences wherever practicable; and

(iii) the acceptability of residual impact after the proposed mitigation measures are implemented.

(§ 1.6 of HKBCF SB)

12. According to the EIA SBs, the objectives of the EIA study are as follows:

"(i) to describe the Project and associated works together with the requirements for carrying out the Project;

(ii) to identify and describe the elements of the community and environment likely to be affected by the Project and/or likely to cause adverse impacts to the project, including both the natural and man-made environment;

(iii) to provide information on the consideration of alternatives/options for

site locations and layouts of the Project to avoid and minimise potential environmental impacts to environmentally sensitive areas and other sensitive uses; to compare the environmental benefits and dis-benefits of each of the different options; to provide reasons for selecting the preferred option(s) and to describe the part of environmental factors played in the selection of the preferred option(s);

(iv) to identify and assess air quality impact, noise impact, water quality impact, waste management implication, marine ecological impact, fisheries impact, cultural heritage impact and landscape and visual impact; and determine the significance of impacts on sensitive receivers and potential affected uses;

(v) to propose the provision of infrastructure or mitigation measures so as to minimize pollution, environmental disturbance and nuisance during construction and operation of the Project;

(vi) to identify, predict and evaluate the residual (i.e. after practicable mitigation) environmental impacts and the cumulative effects expected to arise during the construction and operation phases of the Project in relation to the sensitive receivers and potential affected uses;

(vii) to identify, assesses and specify methods, measures and standards, to be included in the detailed design, construction and operation of the Project which are necessary to mitigate these environmental impacts and reducing them to acceptable levels;

(viii) to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures, and to identify constraints associated with the mitigation measures recommended in the EIA study as well as the provision of any necessary modification;

(ix) to identify any individual project element(s) and associated works of the Project that fall under Schedule 2 of the EIAO; to ascertain whether the findings of this EIA study have adequately addressed the environmental impacts of those projects; and, where necessary, to identify the outstanding issues that need to be addressed in any further detailed EIA study; and

(x) to design and specify the environmental monitoring and audit requirements to ensure the effective implementation of the recommended environmental protection and pollution control measures."

(§ 2.1 of the HKBCF SB / HKLR SB / TM – CLKL SB)

13. This Application is concerned primarily with the manner in which the Highways Department (i.e. the applicant for the environmental permits) conducted the air quality assessment relating to the operational phase of the 3 projects.

**Air Quality Impact Assessment required by the SB**

14. The air quality impact assessment for the 3 projects was required to address the following issues:

(i) the potential air quality impacts from the construction and operation of the project to sensitive receivers near the project, taking into account the cumulative impact from the construction and operation of existing and planned/committed projects in the vicinity of the project, in particular the HZMB, HKLR, TM - CLKL, Lantau Logistics Park, Tung Chung East and West Future Development and major existing and planned/committed air pollutant emission sources within North West New Territories and North West Lantau including Black Point Power Station, Castle Peak Power Station, industrial uses in and around Tuen Mun Area 38, the proposed Sludge

Treatment Facility, the proposed Integrated Waste Management Facility and the Chek Lap Kok Airport; and

(ii) the potential off-site air quality impacts on sensitive receivers including Tung Chung New Town during operation of the project.

(§ 3.2(ii) and (iii) of HKBCF SB)

15. Pursuant to § 3.4.1 of the HKBCF SB, the Highways Department was required to follow the criteria and guidelines for evaluating and assessing air quality impact as stated in Annexes 4 and 12 of the TM.

16. Such assessment should be based on the best available information at the time of the assessment. § 3.4.1.4 of the SBs for all 3 projects require the air quality impact assessments to include the following:

(a) Background and Analysis of Activities (e.g. description of the types of activities of the project that may affect air quality during construction and operation stages);

(i) provide background information relating to air quality issues relevant to the project;

(ii) give an account of the considerations/measures that had been taken into consideration in the planning of the project to abate the air pollution impact (e.g. alternative construction methods etc.);

(iii) present the background air quality levels in the assessment area for the purpose of evaluating the cumulative air quality impacts during construction and operation stages of the project.

(b) Identification of Air Sensitive Receivers ("ASRs") and Examination of Emission / Dispersion Characteristics;

(i) identify and describe existing and planned / committed ASRs that would likely be affected by the project;

(ii) provide a list of air pollutant emission sources, including any nearby emission sources which are likely to have impact related to the project based on the analysis of the activities during construction and operation stages of the project.

(c) Construction Phase Air Quality Impact;

(i) the requirements stipulated under the Air Pollution Control (Construction Dust) Regulation to ensure that construction dust impacts are controlled within the relevant standards.

(d) Operational Phase Air Quality Impact;

(i) calculate the expected air pollutant concentrations at the identified ASRs based on an assumed reasonably worst-case scenario under normal operating conditions;

(ii) the air pollution impacts of future road traffic shall be calculated based on the highest emissions strength from the road within the next 15 years upon commencement of operation of the proposed

road. The applicant shall demonstrate that the selected year of assessment represents the highest emission scenario given the combination of vehicular emission factors and traffic flow for the selected year.

(e) Quantitative Assessment Methodology;

(i) The Applicant shall apply the general principles enunciated in the modelling guidelines in Appendices B-1 to B-3 while making allowance for the specific characteristic of the Project. This specific methodology must be documented in such level of details, preferably assisted with tables and diagrams, to allow the readers of the EIA report to grasp how the model has been set up to simulate the situation under study without referring to the model input files. Detailed calculations of air pollutants emission rates for input to the modelling and a map showing all the road links shall be presented in the EIA report. The Applicant must ensure consistency between the text description and the model files at every stage of submissions for review. In case of doubt, prior agreement between the Applicant and the Director on the specific modelling details should be sought.

(ii) The Applicant shall identify the key/representative air pollutant parameters (types of pollutants and the averaging time concentrations) to be evaluated and provide explanation for selecting such parameters for assessing the impact from the Project. Ozone

Limiting Method (OLM) or Discrete Parcel Method (DPM) or other method to be agreed with the Director shall be used to estimate the conversion ratio of $NO_x$ to $NO_2$ if $NO_2$ has been identified as a key/representative air pollutant.

(iii) The Applicant shall calculate the cumulative air quality impact at the ASRs identified under sub-section 3.4.1.4 (ii) above and compare these results against the criteria set out in section 1 of Annex 4 in the TM. The predicted air quality impacts (both unmitigated and mitigated) shall be presented in the form of summary table(s) and pollution contours, to be evaluated against the relevant air quality standards and on any effect they may have on the land use implications. Plans of a suitable scale should be used to present pollution contours to allow buffer distance requirements to be determined properly.

(iv) If there are any direct technical noise remedies recommended in the study, the air quality implication due to these technical remedies shall be assessed. For instance, if barriers that may affect dispersion of air pollutants are proposed, then the implications of such remedies on air quality impact shall be assessed. If noise enclosure is proposed, then portal emissions of the enclosed road section and air quality inside the enclosed road section shall also be addressed. The Applicant shall highlight clearly the locations and types of agreed noise mitigating measures (where applicable), be they

noise barriers, road enclosures and their portals, and affected ASR's, on contour maps for easy reference.

(f) Mitigation Measures for Non-compliance;

(i) The Applicant shall propose remedies and mitigating measures where the predicted air quality impact exceeds the criteria set in section 1 of Annex 4 in the TM.

(g) Submission of model files.

(§ 3.4.1.4 of HKBCF SB)

**Technical Memorandum**

17. An EIA report comprises a document or a series of documents providing detailed assessment in quantitative terms, wherever possible, and in qualitative terms of the likely environmental impacts and environmental benefits of the project. The requirements for the EIA report shall be set out in accordance with the TM. The EIA report shall be produced in accordance with the EIA study brief issued by the Director to the applicant.

(§ 4.1 of TM)

18. The TM sets out in general terms:

(a) Objectives and Contents of an EIA Report (§ 4.2 of TM);

(b) General Approaches and Methodologies for Assessment (§4.3 of TM);

(c) The requirement that EIA report shall be reviewed by the Director with reference to the compliance of the requirements as stated in the SB and TM, and its evaluation of the residual environmental impacts (§4.4 of TM). When evaluating the residual environmental impacts, the following factors, amongst others, must be considered:

(i) the quality of the EIA Report (§4.4.2 of TM)

(ii) effect on public health and health of biota or risk of life. If the impacts may cause adverse public health effects and/or adverse impacts to the health of rare and/or endangered species or pose an unacceptable risk to life and/or survival of a wildlife species, they are considered as key concerns (§ 4.4.3 (a)(i) of TM)

(iii) the likely size of the community or the environment that may be affected by the adverse impacts (§4.4.3 (a)(v) of TM)

(d) The procedure for the approval of the EIA report by the Director (§ 4.5 of TM).

19. The EIA assessment must be based on the 'best available information at the time of the assessment'. Such information shall be that which the applicant has access to or is as provided or referred to by the Director in the EIA SB. (§ 3.4 of TM)

20. Annex 4 §1 of the TM sets out the criteria for evaluating air quality impact. The criteria for evaluating air quality impact include the following:

(a) meet the Air Quality Objectives and other standards established under the Air Pollution Control Ordinance (Cap. 311) (the "**APC Ordinance**");

(b) meet hourly Total Suspended Particulate concentration of 500 microgrammes per cubic metre measured at 298 K° (25 C°) and 101.325 kPa (one atmosphere) for construction dust impact assessment;

(c) meet 5 odour units based on an averaging time of 5 seconds for odour prediction assessment; and

(d) *for air pollutants not established under the APC Ordinance nor above*: meet the standards or criteria adopted by recognised international organisations such as WHO or USEPA as to be agreed with the Director of Environmental Protection.

21. Annex 12 of TM describes the commonly adopted approaches and methodologies for assessment of air quality impact arising from designated projects. Any domestic premises, temporary housing accommodation etc. shall be considered to be an air sensitive receiver (i.e. ASR).

22. The air quality assessment must take into consideration the following aspects:

(i) Identification of emission characteristics;

(ii) Description of Study Area;

(iii) Description of Sensitive Receivers;

(iv) *Baseline Study – it involves the description of the existing air quality based on, but not limited to, existing air quality monitoring on-site* or quality assured measured data which can be obtained from government agencies, companies or instructions. The baseline study involves a discussion of background air quality value due to uninventoried sources and contributions from outside the study are and description of the method used for determining this value.

(§ 3.4 Annex 12 of TM)

(v) Meteorological Conditions; and

(vi) Impact Prediction and Assessment:

a. assessment results shall provide information on the worst case meterology; areas of maximum impacts in the study area and cumulative impacts due to the background and identified sources;

b. presentation of assessment results shall be assisted by summary tables and contour map of pollutant concentration;

c. assessment results shall be compared with acceptable air quality standards as defined according to Annex 4.
(§ 3.6 Annex 12 of TM)

Air Quality Objectives ("AQOs")

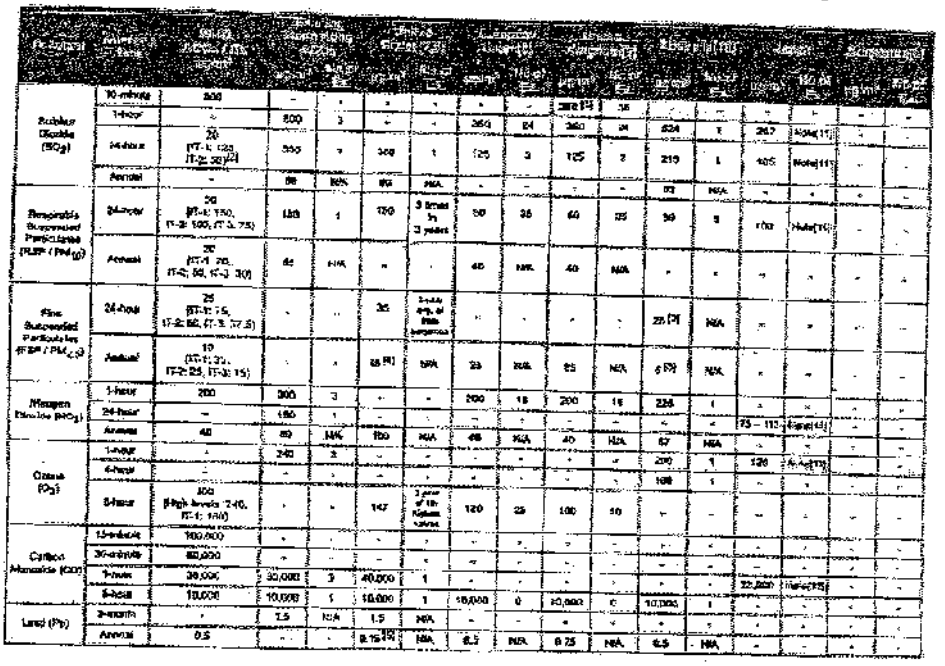
23. Hong Kong's AQOs are set out in a technical memorandum issued under the APC Ordinance (Cap. 311). Pursuant to s. 8 of the APC Ordinance, it imposes on the Director (the authority for the purposes of the APC Ordinance) a duty to aim to achieve the relevant AQOs as soon as is reasonably practicable and thereafter to maintain the air quality so achieved.

24. The existing AQOs were established in 1987, largely with reference to the health protection criteria established by the United States Environmental Protection Agency at the time.

25. In October 2006, the World Health Organisation released a new set of ("**Air Quality Guidelines**") AQGs. The European Union and Australia have also updated their AQOs or air quality standards in the light of new scientific evidence and data on health effects of air pollution. The diagram below sets out a comparison between Hong Kong's existing AQOs, the air quality standards of certain other developed countries / economies and the latest AQGs issued by the WHO:

# Annex C

**Comparison of Hong Kong's Existing Air Quality Objectives with those Adopted by Other Countries / Economies and World Health Organisation Air Quality Guidelines / Interim Targets**



26. The current AQOs in Hong Kong lag seriously behind those being pursued by other developed countries / economies in at least the following aspects:

(a) they allow for much higher concentration levels of key pollutants such as $NO_2$ and RSP/PM that are particularly damaging to public health; and

(b) they do not provide for fine suspended particulars ("**FSP** or **$PM_{2.5}$**"), which has been scientifically proven to have greater adverse impact on human health than even $PM_{10}$. (See: § 3.5 of Government Consultation Paper on Air Quality Objectives Review)

27. The Hong Kong Government recognises that the current AQOs are in urgent need of updating. In the scientific field, it is generally accepted by all that the current AQOs are obsolete in that they do not provide an accurate assessment of the likely impact of deteriorating air quality on public health, and they are long overdue for revision.

28. The Government commissioned a consultancy study in 2007 to review the AQOs; taking into account the WHO AQGs and the practices of other advanced countries / economies. The consultant has completed the study, which recommended a new set of AQOs for Hong Kong and a host of emission control measures. In mid-2009, the Government launched a public consultation for the review of the existing AQOs.

29. The consultant appointed to conduct the government consultancy study of AQOs in 2007, Ove Arup Partners Hong Kong Ltd., is the same consultant hired by the Highways Department to conduct the EIA study for the HKBCF / HKLR. Ove Arup Partners is also the consultant engineering firm awarded the design and site investigation contracts in relation to the HKBCF / HKLR projects.

30. As a result of the AQOs study, the Government has proposed a set of new AQOs. However, the proposed new AQOs still fall far short of the targets recommended by the WHO. In most cases, they reflect interim targets that the WHO recommends for developing countries that cannot afford the measures necessary to achieve the WHO AQGs. The Government has carried a public consultation exercise in respect of the proposed new AQOs but they have not yet been adopted under the APC Ordinance.

31. In the opinion of local experts in the public health field, the proposed new AQOs will not improve air quality in Hong Kong even halfway towards the level of air quality that would be achieved through compliance with WHO AQGs. Experts have estimated that the total numbers of young children with respiratory health problems and the number of deaths attributable to air pollution would still be up to two and a

half times higher than it would be if the Government were committed to achieving the WHO AQGs.

WHO AQGs

32. The new WHO AQGs are based on a comprehensive review of the extensive scientific literature on air pollution and health effects, amounting to several hundred scientific papers from authors on five continents. The WHO AQGs represent the best evidence currently available on the benefits of cleaner air. The guidelines indicate the minimum levels of air quality control needed for the protection of public health given the current state of the most advance scientific knowledge and data available.

**HKBCF / HKLR EIA**

33. The EIA report for the HKBCF and HKLR was prepared by the consultant, Ove Arup Partners Hong Kong Ltd, and were delivered to the Director pursuant to s. 6(2) of the EIAO on 31 July 2009. Due to the inter-relation and proximity between the two projects, the same EIA study was commissioned for both projects (the "**HKLR / HKBCF EIA**"). Some of the relevant parts of the EIA report are set out herein.

34. The HKBCF / HKLR EIA made references to the Hong Kong Planning Standards and Guidelines ("**HKPSG**"), the APC Ordinance, and Annex 4 of TM. Chapter 9 of the HKPSH refers to the Government's policy objectives of limiting the contamination of air in Hong Kong through land use planning and through the

enforcement of the APC Ordinance to safeguard the health and well-being of the community to ensure that the AQOs are met as soon as possible.

35. At § 5.1.3, the report states that currently, the AQOs stipulate limits on concentrations for 7 pollutants including sulphur dioxide (SO2), Total Suspended Particulates (TSP), Respirable Suspended Particulates ("RSP" or otherwise known as $PM_{10}$) Nitrogen Dioxide (NO2), Carbon Monoxide (CO), photochemical oxidants, and lead (Pb).

36. At § 5.1.4, the report states that the key air emission source from HKLR and HKBCF is obviously the road traffic (i.e. vehicular emission). In this regard, air pollutants of concern would include nitrogen dioxide (NO2) and respirable suspended particulates (RSP), and they have been assessed in the EIA study. The emissions as regards other pollutants such as CO etc from road traffic are insignificant.

37. At § 5.2.2, the EIA report sets out the data for the 5 most recent years of air quality monitoring data (i.e. 2004 to 2008) at the Tung Chung Monitoring Station operated by the EPD. These data show that average concentrations of RSP over the 5 year period exceeded the AQOs and the highest hourly and daily concentrations of $NO_2$ were at 88% and 97% respectively of the applicable AQOs.

38. At §5.2.5, it states that the proposed projects will not generate any Ozone / $O_3$. Hence, $O_3$ is *not* assessed in the EIA.

39. At § 5.3.1.3, it lists the representative ASRs used in the EIA study. The SBs required ASRs within a distance of 500m of the project boundary (including the proposed alignment, reclamation and the associated facilities) to be identified, but some ASRs located outside the 500m range were also included in the assessment.

40. At § 5.3.1.7, the EIA report included the Fu Tung Estate (i.e. the Applicant's residence) as one of the relevant locations of the representative ASRs for air quality assessment during the implementation of the project.

41. At § 5.3.2.1, the report states that when the HZMB comes into operation, the main source of air pollution would be vehicular emissions from road traffic. At § 5.6.2.2 the EIA report acknowledges that $NO_2$ is the pollutant of primary concern during the operational phase of these projects and its air quality assessment of vehicular emission takes particular account of both $NO_x$ (the main precursors of $NO_2$) and RSP (see: § 5.6.10.7).

42. Section 5.6 of the report deals with the operational phase of air quality assessment. The EIA study assumed that the air pollution control measures recommended in the Pearl River Delta Regional Air Quality Management Plan, which was been jointly drawn up by the governments of the HKSAR and Guangdong in 2003 would be achieved and the following models were used to calculate the effect of these measures on air quality in the study area after the bridge is opened to traffic:

    (i) a regional model viz. Pollutants in the Atmosphere and the Transport over Hong Kong (PATH, a regional air quality prediction model developed by the Environmental Protection Department) is used to quantify the impacts from various sources including those in Pearl River Delta Economic Zone (PRDEZ), the Hong Kong International Airport, power plants in HKSAR and roads beyond North Lantau etc.

    (ii) a near-field dispersion model is used i.e. CALINE4 for line sources to quantify the air quality impacts at local scale from open road emission and idling emission at HKBCF. Another near-field model ISCST3 is used to assess point and volume sources to quantify the air quality impacts at local scale from portals and ventilation buildings.

43. § 5.6.2.1 of the report states that in accordance with the EIA Study Brief, year 2031 was chosen as the assessment year for the air pollution impacts since it is expected to be the year of the highest emissions for HKLR and other proposed roads under the HKBCF, falling within 15 years after the opening of the HZMB bridge.

44. § 5.6.2.3 of the report states that traffic forecast for 2015, 2016, 2021 and 2031 have been conducted, and have been submitted to the Transport Department without any adverse comments. The results of the 4 scenarios are set out in Table 5-9.

45. Section 5.6.3 states that data from a mid-term review of regional air quality by the HKSAR Government and the Guangdong Environmental Protection Bureau published in November 2006 forms the basis of the projection of emissions in the Pearl River Delta Economic Zone (PRDEZ) that were used in the EIA. The consultant also took into account the air quality control measures made by the Guangdong Province Government's plan to control and reduce their emission up to 2020. With such measures in place, the report states (§ 5.6.3.3) that the resulted 2020 PRDEZ emission data are significantly lower than the 2010 PRDEZ emission data from the Mid-term Review Study.

46. § 5.6.5.1 states that about 28% of the Hong Kong SAR's current electricity supply is generated from natural gas by Hong Kong power stations. It is also noted from the annual reports published by power companies in Hong Kong that they have plans to increase utilisation of natural gas to 50% in the next decade. It is therefore considered reasonable by the consultant to assume that by the time of 2015, the utilisation rate of natural gas within Hong Kong SAR should have reached 50%.

47. Section 5.6.8 deals with vehicular emissions within HKSAR beyond those on Lantau. It concludes that any impacts from these "beyond-Lantau roads" on the sensitive receivers relevant to the EIAs of HKLR & HKBCF ought to be relatively minor.

48. § 5.6.10.3 states that according to the latest implementation programme of the emission standards for diesel vehicles, the following emission standards should be adopted for calculation of emissions from diesel vehicles registered in Hong Kong irrespective of whether they need to travel to/from Macau and Mainland China:

a) Diesel vehicles < 3.5 tonnes: Euro IV by 2007;

b) Diesel vehicles > 3.5 tonnes: Euro IV by 2007, Euro V by 2010

*(Euro - European emissions standard)*

49. § 5.6.10.4 states that in addition Mainland China Authorities announced to implement Euro IV and V standards (for diesel fuel) by 2010 and 2012 respectively. § 5.6.10.5 further states that accordingly, it should be reasonable to assume that cross-boundary vehicles will perform in a manner similar to Hong Kong vehicles in terms of pollutant emission.

50. Section 5.6.17 deals with the prediction of cumulative air quality impacts. The cumulative pollutant concentrations are computed by combining the predicted concentration from PATH, CALINE4 and ISCST on an hourly basis. All the predictions including maximum 1 hour, 24 hour average and annual average for $NO_2$ and RSP from 1.5m to 20m above local ground or higher level for some ASRs are set in Appendix 5J to the report.

51. § 5.6.17.2 states that the predicted pollutant concentrations at all the representative ASRs satisfy the AQOs.

52. § 5.6.17.3 states that for the ASRs on the eastern coast of Tung Chung East Future Development, LLP and MTR Siu Ho Wan Depot, the EIA report for the TM-CLKL has confirmed that all the existing and planned receivers would comply with the relevant criteria and there are no residual air quality impacts.

Conclusion of the EIA study on air quality impact

53. § 5.7.1 states that an air quality impact assessment has been conducted for both the construction and operational phases. The fugitive dust assessment for the construction phase has concluded that 8 times per day watering in all works areas would be required to control the fugitive dust impact.

54. § 5.7.2 states that for the assessment of operational phase air quality, a combination of regional wide model (PATH) and near field dispersion models (CALINE4 and ISCST3) has been used. This approach allows a more realistic prediction taking into consideration of the regional meteorological patterns, terrain effect and complex photochemical reactions. The PATH model also takes into account the Pearl River Delta Regional Air Quality Management Plan drawn up by the HKSAR and the Guangdong Provincial Government.

55. § 5.7.3 states that sensitivity tests have been undertaken to identify the highest emission scenario from this Project, given the combination of vehicular emission factors and the projected traffic flow. It is concluded that the worst case assessment scenario is Year 2031. Emissions for various pollutant sources have therefore been updated for the assessment year.

56. § 5.7.4 states that for the dispersion of open road emissions within North Lantau was modelled by using CALINE4. The EmFAC-HK model was used to calculate vehicular tailpipe emissions taking into account the latest plans for implementing emission standards for diesel vehicles and fuel quality in Macau and Mainland China.

57. § 5.7.5 states that the effect of emissions for portals and ventilation buildings has been modelled using ISCST, taking the length of each tunnel and its ventilation scheme into account.

58. § 5.7.6 states that the results show that the predicted cumulative pollution concentrations at all identified ASRs will comply with the AQOs. There will be no land use constraints. Hence, it is concluded that 'there will not be any residual air quality impacts'.

**TM – CLKL EIA**

59. The EIA report for the TM – CLKL was done by another consultant firm AECOM and was issued in August 2009. Chapter 4 of the EIA report for TM – CLKL sets out the air quality impact assessment. It has adopted a very similar methodology as the EIA study done for HKLR and HKBCF. It has arrived at the same conclusion as the HKLR / HKBCF EIA in that the project would have no adverse residual impacts during the operational phase. For the construction phase, it is concluded that there will be marginal dust excesses. However, the dust impacts are, amongst other factors, not predicted to significantly affect health or cause loss of life. The residual impacts associated with the annual dust excesses for the TM – CLKL in Tuen Mun would be considered minor and acceptable (§ 4.10 of the EIA report for TM – CLKL). In other words, the EIA report for TM – CLKL suffers from the same problems and deficiencies as the HKLR / HKBCF EIA. However, since the HZMB projects are all inter-connected, the Applicant does not intend to challenge the EIA report and environmental permit for the TM – CLKL project in order to avoid unnecessary complications in the present application.

**Approval of EIAs by Director and the Issuance of Environmental Permits**

60. The EIA reports for the HKLR / HKBCF and TM – CLKL projects were approved by the Director on 23 October 2009. The Director issued environmental permits for the 3 projects on 4 November 2009 pursuant to s. 10 of EIAO.

Expert views on the EIA reports

61. The Applicant's Solicitors have consulted experts from the Department of Community Medicine, at the School of Public Health in the University of Hong Kong in relation to the HKLR / HKBCF EIA studies in question. The following comments were made by the experts:

No assessment of impact on public health

a) The EIA studies did not provide a quantitative risk assessment related to public health based on the assessment of the air quality impact resulting from the HZMB projects.

b) The assessment of air quality was conducted only with reference to the 1987 HKSAR AQOs which are universally accepted in the scientific field as obsolete and long overdue for revision. The EIA report is therefore not based on the best scientific knowledge and evidence that is available now dealing with the impact of air pollutants on the health of the public.

c) Compliance with the HKSAR AQOs alone does not mean that there will be no adverse impact to public health resulting from the HZMB projects. The consultant's analysis has no relevance whatsoever to the likely adverse impact on public health, and the current and long term public health consequences caused as a result of the HZMB projects; especially with references to air pollution induced diseases of lungs, heart and blood vessels.

d) The Director should therefore not accept analyses based on the current HKSAR AQOs without at least considering accompanying sensitivity analyses based on both the newly proposed HKSAR AQOs and the WHO AQGs. The WHO AQGs represent the latest scientific evidence on the impact on health of air pollutants and are based on evidence which demonstrates that population health is harmed at levels well below the 1987 HKSAR AQOs and most of the proposed new AQOs.

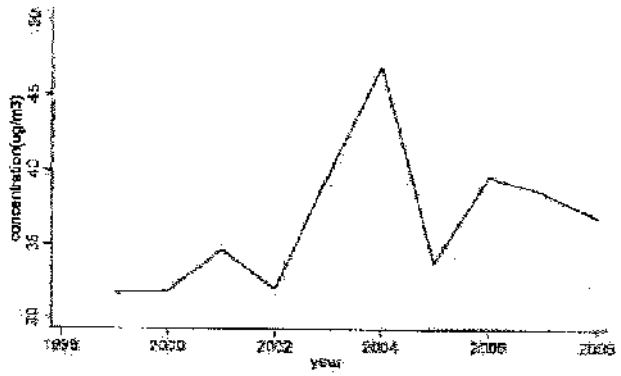
FSP or $PM_{2.5}$

e) A major omission in the EIA report is the lack of information on Fine Suspended Particulates (FSP or $PM_{2.5}$). $PM_{2.5}$ is considered to be even more harmful to human health than the coarser fraction of RSP ($PM_{10}$) / ($PM_{2.5}$ – $PM_{10}$) because of the ability of fine particles to penetrate the lung airways, enter the blood circulation and invade organs such as the brain and the liver. $PM_{2.5}$ is an important signature of traffic emissions. Although $PM_{2.5}$ is not listed in the current HKSAR AQOs it is included in the WHO AQGs and United States National Ambient Air Quality Standards (NAAQS) as well as the proposed revisions of the HKSAR AQOs. The 2008 annual average level of $PM_{2.5}$ recorded in Tung Chung (data obtained from the EPD monitoring station) stood at 37.2 $\mu g/m^3$. This had exceeded the WHO AQGs standard of 10 $\mu g/m^3$ by 270%. Similar levels were recorded at Tsuen Wan (37.1), and Yuen Long (40.7). The maximum levels observed in 2008 ranged from 99 to 112, with Tung Chung at 110 $\mu g/m^3$. While background regional levels may account for a large proportion of ambient $PM_{2.5}$, the roadside levels will predictably be much higher, as is the case for $PM_{10}$.

f) If consideration were given to the annual levels of $PM_{2.5}$ from 1999 to 2008, there are indications of an increasing trend that is consistent with the satellite remote sensing data reported by the Hong Kong University of Science and Technology (Figure 1). The rising trend needs to be specifically addressed in the context of the HZMB projects and traffic sources of pollutants.

g) The use of 2004 as the starting year for the consultant's analysis could be highly misleading because air pollution in 2004 was unusually high. Figure 1 shows the level of air pollutants in Tung Chung from 1999 to 2008 and its gradual increase (2004 was an exceptional year of unusually high air pollution):

**Figure 1: $PM_{2.5}$ levels in Tung Chung 1999-2008 at the general monitoring station (Source: EPD)**




h) § 5.2.3 of the HKLR / HKBCF EIA report notes the gradual decrease in $NO_2$ and RSP since 2004. This interpretation is misleading. 2004 was a very high pollutant period so any subsequent data may create

the false impression of a decline. Appropriate statistical models should have been used to take into account random or other sources of variation. A preliminary analysis of associations between $PM_{2.5}$ and health outcomes in Hong Kong was conducted in 2002. This showed strong association between $PM_{2.5}$ and hospital admissions for respiratory disease at all ages and the elderly 65+; and cardiovascular disease including specific heart conditions.

i) The consultant addressed the problem of Total Respirable Suspended Particulates (TSP) generated by the HKLR / HKBCF projects. They began by indicating what proportion of TSP consists of Respirable Suspended Particulates (RSP) (Table 5-6). RSP are particulate matter with an "aerodynamic diameter" of less than 10 microns (millionths of a metre); so they are usually referred to as $PM_{10}$. They are regarded as an important fraction of particulates because they can penetrate deeply into the lungs through the airways, and from there into the blood circulation and all tissues and organs of the body. Even smaller fractions of RSP are considered to be highly damaging pollutants because they evade the body's defence mechanisms. They include particles of <2.5 microns, even as small as 1 or 0.1 microns. The latter are comparable in size to viruses.

Particle class sizes

j) The SB, Appendix B-I § 3.6, states that information on particle size should be provided for fractions <30 μm and <10 μm. The EIA report failed to do this. Instead on page 5-12, it provides secondary information from a USA Environmental Protection Agency (USEPA) document which only partitions the average value of particle size in TSP into the range 1.25 μm – 3.75 μm – 7.5 μm – 12.5 μm – 22.5

μm. This misses the critical cut off of 10 μm which is relevant to a Quantitative Risk Assessment (QRA). The apparent minimum RSP proportion (ie ≤7.5 μm) is 47% but may be much higher if 7.6 – 9.9 μm is included. A normative figure for RSP in ambient TSP in Hong Kong is about 65%, which is much higher than the estimate implicit in the EIA report but consistent with the range of 50% up to 80% found in other developed urban areas. What is the RSP fraction of the anticipated TSP levels caused by construction activities? If this is different from the expected ambient levels in Hong Kong then this should be measured in comparable local projects and then used in formal risk assessment calculations. It is not clear whether the speculative figures for "mitigated" annual average TSP given in Table 5-8 are additional to the background TSP or the total resultant TSP after mitigation. This part of the report lacks clarity but is relevant.

No roadside data collected

k) The baseline air pollutant figures as set out in Table 5-2 of the HKLR / HKBCF EIA report were taken from the air quality monitoring data that were obtained from the Tung Chung *general* monitoring station from 2004 to 2008. Given that the principal focus of the EIA report is on vehicular emission and the impact of the HZMB projects, roadside pollution data collected from *roadside-level* monitoring stations (as opposed to general monitoring stations) should have been used to measure and assess the likely impact on public health. The general monitoring station data does not adequately reflect levels of roadside pollution. The data collected from general monitoring stations are most likely to understate the seriousness of the current air quality problem in the study area;

especially for $PM_{10}$, $SO_2$ and NO2. The Tung Chung general monitoring station is 21 metres above ground and will not provide a valid measure of roadside pollution as it cannot accurately measure pollution at road level, and these are where most ASRs are located and where pollution has a greater impact on public health. Since the principal focus of the air quality impact assessment is vehicular emissions, data from roadside monitoring stations should have been used to measure and assess the projects' impact on air quality. Roadside pollution and its health effects are known to extend through a wide radius from the sources and will have an impact on a wide spectrum of sensitive receivers. Recent studies have shown that respiratory health risks to children extend at least up to 1500 metres from highways. On the basis of government data one can say that a large proportion of population time, more than 50% to 60%, is spent on the roadside level (i.e. below the height of the general monitoring stations) in activities of daily living. This is important for everyone exposed and especially for groups such as the elderly, the sick and school children and infants in kindergartens and roadside domestic and commercial premises.

l) A major omission in the EIA report is the absence of any focus on one of Hong Kong's worst roadside pollution problems related to nitrogen oxides and traffic emissions, in the context of the HZMB project construction and its operation.

m) Average nitrogen dioxide $NO_2$ levels at the roadside in 2008 ranged from 97 to 103 $\mu g/m^3$ in Central, Causeway Bay and Mongkok. These levels are 140% to 150% above the WHO AQG of 40 $\mu g/m^3$. (The WHO AQG for $NO_2$ is the only single limit WHO value adopted by government for the proposed new HKSAR AQO). The upper 25% of monitored values for $NO_2$ ranged from 119 to 127 $\mu g/m^3$ and the maximum values were 180 to 208 $\mu g/m^3$. Virtually

all of the observed pollution from $NO_2$ is generated within the HKSAR by Hong Kong traffic. It is inconceivable that urban nitrogen dioxide levels will not be influenced by the construction of new major roadways associated with the HZMB.

n) If there were no roadside-level monitoring stations available in Tung Chung, one should have been installed on a temporary or portable basis to measure and gather roadside pollution data in that area, rather than simply relying on the general monitoring station alone. There should have been ample time and resources to obtain roadside pollution data for an EIA study of this scale and magnitude.

o) The EIA SB § 3.4.1.4 (iv)(a) states that calculations for expected air pollutant concentrations at the identified Air Sensitive Receivers (ASRs) are based on an assumed reasonably worst case scenario under normal operating conditions. From the perspective of assessing the impact on public health, one would need to assess the *average daily exposures* and for this one would require relevant roadside pollution data in relation to all the ASRs listed. For the purpose of assessing intense exposure periods the consultant should also have taken into account the differences of air pollutant levels between warm season and cold season. Based on available data in Hong Kong, the differences could reach up to 50% higher in cold seasons.

p) Roadside pollution data should be used to conduct the assessment of the likely impact on public health which ever model the consultant wishes to use. This is so as the EIA SB Appendix B-1 § 3.7 states that "*the conversion of $NO_x$ to $NO_2$ is a result of a series of complex photochemical reactions and has implications on the prediction of near field impacts of traffic emissions*". [emphasis added]

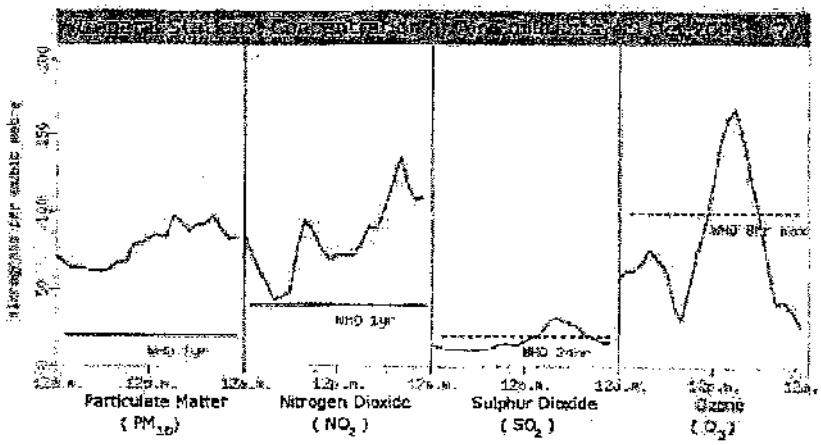
Ozone impact

q) § 5.2.5 of the HKLR / HKBCF EIA report states that the proposed project will not generate Ozone / $O_3$ hence the same is not a pollutant to be assessed in the EIA study. This is an invalid and unscientific assumption made by the consultant. Ozone / $O_3$ is a secondary pollutant formed by a complex series of reactions between nitrogen oxides and volatile organic compounds in the presence of sunlight (ultraviolet). Ozone is established by scientific research to be a public health hazard and is one of the four criteria pollutants in the WHO AQGs. Both the construction phase and the operation of the bridges will generate a substrate for Ozone formation (i.e. $NO_x$ and VOCs). Ozone levels have been rising in Hong Kong over many years. Ozone is also a regional pollutant and the regional impact of the projects in question and the operation of the HZMB bridge on air quality should be measured and assessed against the likely impact on public health and must form an integral part of the EIA study.

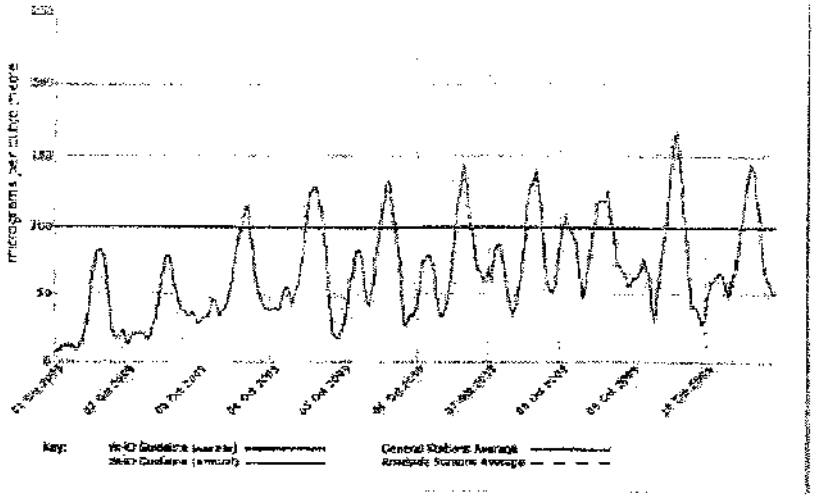
r) There is no question that Ozone, as a pollutant will be generated from the nitrogen oxides and volatile organic compounds emitted from road vehicles and construction equipment involved in this project and from traffic during the operation of the bridge. Under the influence of sunlight, photochemical reactions lead to the conversion of organic compounds (i.e. Volatile Organic Compounds (VOCs)) and oxides of nitrogen in to photochemical oxidants, particularly ozone. See US EPA's website: http://www.epa.gov/groundlevelozone/basic.html

s) In Hong Kong the usual diurnal pattern of local ozone production which peaks in the early afternoon, especially in the cool season

when there is less cloud cover and more sunlight. This pattern results from the daily emissions of $NO_x$ and VOCs from traffic and other sources as seen in the pattern on 9 Oct 2009 at urban monitoring stations. At Tap Mun in the absence of traffic (so no depletion by freshly emitted $NO_x$) the levels are higher on average than in urban areas.




**Daily ozone patterns in early cool season (Hong Kong general (urban) stations) Source: Hedley Index**



Source: Hedley Index

i) Hong Kong's "local" and "background" levels of ozone are increasing as indicated by published studies on levels at an eastern coastal site (Hok Tsui) outside of the urban area. The authors demonstrated linearly increasing background ozone levels 1994-2007 (Figure 2 from Wang et al. Atmospheric Chemistry and Physics 2009; 9:6217-6227).

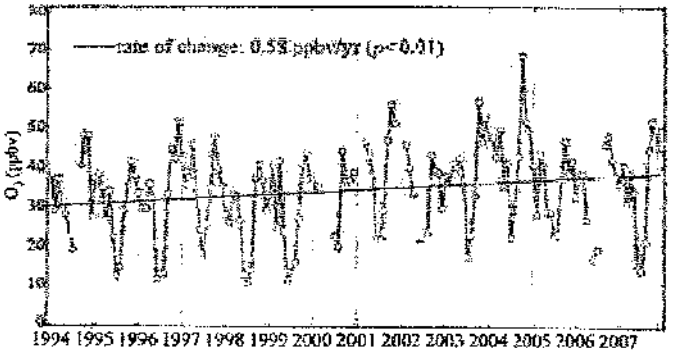



**Fig. 2.** Monthly mean ozone mixing ratios and the linear fit line at Hok Tsui, Hong Kong, during 1994–2007.

u) The baseline data in § 5.2.2 of the EIA report show that Ozone levels have been well over the AQOs for the past 5 years. This pollutant should have been included in the air quality impact assessment.

Sulphur Dioxide - $SO_2$

v) § 5.2.6 states that since $SO_2$ pollutant level is relatively low therefore it would not be assessed in the EIA study. $SO_2$ generated from the burning of certain sulphur rich fuels is a major health hazard and is strongly associated with mortality from cardiopulmonary disease in adults and chronic respiratory symptoms in children in Hong Kong SAR. The sources of $SO_2$ emission in the PRD currently include road traffic (especially vehicles using mainland diesel), power generation, manufacturing activities, lifting and construction equipment and marine traffic. As an indicator of $SO_2$ pollution level in Hong Kong, the 2004 to 2008 data from the Tung Chung monitoring station on the 24 hour highest daily average is 355% to 500% above the WHO AQG. The annual average figure for Tung Chung in 2008 is about 200% above the level in London. Across the Hong Kong SAR, $SO_2$ levels measured at both the general and roadside levels have been rising since 2003 to 2008. The possible decline in 2009 is likely to be temporary (which was due to a decline in economic activities). Given the importance of $SO_2$ as a pollutant associated with health effects, the consultant has not provided a clear and sufficient basis for not assessing the level of $SO_2$ in the EIA study.

PATH model

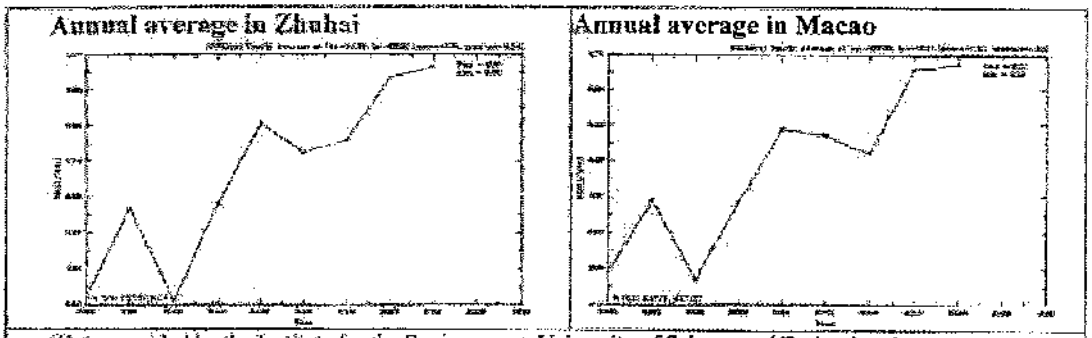
w) The use of the PATH model by the consultant should be subject to rigorous sensitivity analysis and interpretation. In a paper published by the EPD in 2006 titled "The Challenges of Modelling Air Quality in Hong Kong" (author: Mr. Christopher Fung), it is accepted that the PATH model tends to underestimate / under-predict short term and average pollution values, and the annual average RSP, $SO_2$ and $NO_2$ levels. In the opinion of the experts, the PATH model underestimation of air pollutant levels could reach up to 25% - 50%. It is unclear and not apparent from the EIA report that the consultant has taken into account the deficiencies inherent in the PATH model. In the HKLR /HKBCF EIA report, comparisons between PATH predicted results for recent years and the observed data in the same recent years were not shown. These comparisons are essential to ensure the validity of the PATH model results presented by the consultant throughout this EIA report.

Governmental policies on future air quality control measures in PRD etc.

x) At section 5.6.3 of the HKLR / HKBCF EIA report, the consultant has used a regional model by taking into account the Pearl River Delta Regional Air Quality Management Plan and the air quality control and emission measures as proposed by the Hong Kong SAR government and the Guangdong government. The consultant has assumed that emission reduction targets recommended in the Pearl River Delta Regional Air Quality Management Plan will be achieved by 2015 and maintained throughout the assessment period (up to 2031) as a result of measures announced by the Guangdong

government in June 2006. The consultant has ignored data obtained from air monitors from across the PRD region showing the continued rise of levels of air pollutants in a linear fashion from between 2000 to 2008 (Figure 2).

**Figure 2: Surface extinction coefficients from MODIS Satellite indicating trends in RSP in the Pearl River Delta**




There is no evidence showing that the air quality control and emission measures being implemented by the Guangdong government have led to a decline in pollutant concentrations during this period. Optimistic governmental policy statements about the effect of control measures cannot be equated with actual improvement in air quality. The consultant has ignored the evidence of continuing deterioration of air quality in the PRD region. Furthermore, the Hong Kong SAR government has no power to ensure that the emission and air quality control measures would continue to be implemented by the Guangdong government.

y) At § 5.6.5.1 of the HKLR / HKBCF EIA report, the consultant has relied on optimistic and largely unsubstantiated claims made by power companies in Hong Kong in their annual reports regarding

their plans to increase the utilisation of natural gas from the current 28% to 50%. It is on this basis the consultant had predicted that it would be reasonable to assume that, by the time of 2015, the utilisation rate of natural gas within Hong Kong SAR should have reached 50%.

"Beyond Lantau roads"

z) At § 5.6.8.2, the consultant claims that the air quality impacts due to emissions from "beyond Lantau roads" on the sensitive receivers relevant to the HKLR & HKBCF EIA report "ought to be relatively minor". It is unclear on what scientific basis the consultant had made such a claim in the report. Traffic emissions are a major driver of degraded air quality in Hong Kong SAR. There are currently no strategic plans on the part of the Hong Kong government to reduce these signature emissions (RSP and $NO_2$) in the short term to levels compatible with the WHO AQG. The consultant has adduced no scientific evidence or data showing the likely increase in vehicular numbers and volume that would be generated as a result of the HZMB development. It would have been reasonable to predict that the HZMB would generate a higher volume of cross-border vehicular transport that would not only affect the Tung Chung area but would permeate throughout the rest of the Hong Kong SAR affecting the roadside and general air quality. The impact on public health is region wide. The likely increase in the use of commercial transport vehicles (e.g. trucks) as a result of the HZMB as opposed to other forms of transport has not been assessed.

Replacement of obsolete diesel engines

aa) Section 5.6.10 of the HKLR / HKBCF EIA report deals with the issues of the replacement of diesel engines and diesel fuel. Whilst their combined effect is to reduce air pollutants, these two factors must be looked at and assessed separately. Currently, the government has the necessary regulatory and legal means to control the import of diesel fuel into Hong Kong, therefore, of ensuring the quality of such diesel fuel meets acceptable environmental standards. However, it does not address the profile of private, commercial and transportation fleets in terms of engine specification and their rate of conversion. From a public health viewpoint one of the principal causes of traffic related pollution is the high proportion of pre-Euro and Euro I vehicles. The rate of replacement and conversion of these vehicles is too low to make the necessary impact on roadside air quality. The government has based its plan for replacement on *volunteerism* and not *mandatory* requirements. While there may be cleaner fuels in Hong Kong, traffic pollution is high because of obsolete engines. Without the replacement of obsolete engines, cleaner fuel alone will only improve air quality to a limited extent.

bb) At §§ 5.6.10.3 to 5.6.10.5, the consultant has attempted to bundle the two issues of fuel quality and engine specification together whilst ignoring (i) the low rate of conversion and replacement of obsolete engines in Hong Kong. Most commercial vehicles in Hong Kong would not be using Euro V engines in the foreseeable future. According to a report published by The Civic Exchange titled "Paying for a cleaner bus fleet" dated November 2009, only 1% of the commercial bus fleets in Hong Kong are currently using Euro IV engines (about 53 vehicles out of more than 5000). (ii) the Guangdong government too has no policy which requires the

mandatory conversion and replacement of obsolete diesel engines with Euro V engines or equivalent specifications. (iii) § 5.6.10 proposes to assess all diesel vehicles as compliant with the Euro IV standard by 2007 and Euro V by 2010. While this may be true for new vehicles, this is most certainly not the case for the existing Hong Kong fleet, and the projections for the retirement of old Euro engines diesel buses and trucks extend to 2026.

Secondary environmental impact caused by mitigation measures

cc) The HKBCF SB § 2.1 (viii) required the EIA study to investigate the extent of the secondary environmental impacts that may arise from the proposed mitigation measures recommended in the EIA study. At § 5.5.5.1 of the HKLR /HKBCF EIA, the consultant proposed to use watering measures 8 times per day within all construction work sites in order to reduce the dust level throughout the construction phase. The amount of water wastage caused during the construction phase would be enormous and the secondary environmental impact caused as a result of such measures have not been addressed as required by the SB. However frequent heavy watering may not mitigate adequately, as shown in the academic journal by Muleski GE, Cowherd C, Kinsey JS (published in 2005) titled "Particulate emissions from construction activities" (J Air & Waste Management Association 55:722-783) (the "JAWMA paper")

In the JAWMA paper, Figure 2 shows that the efficiency of $PM_{10}$ control falls off sharply after ***surface moisture content*** (SMC) reaches about 8%.

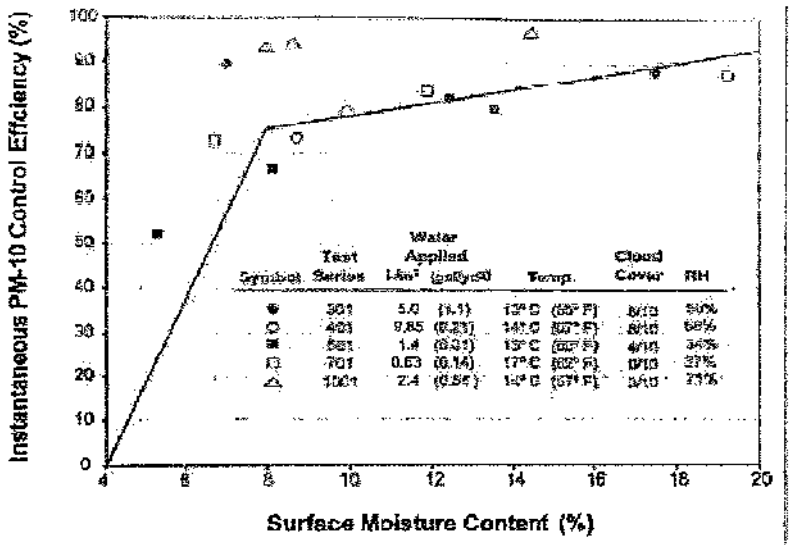
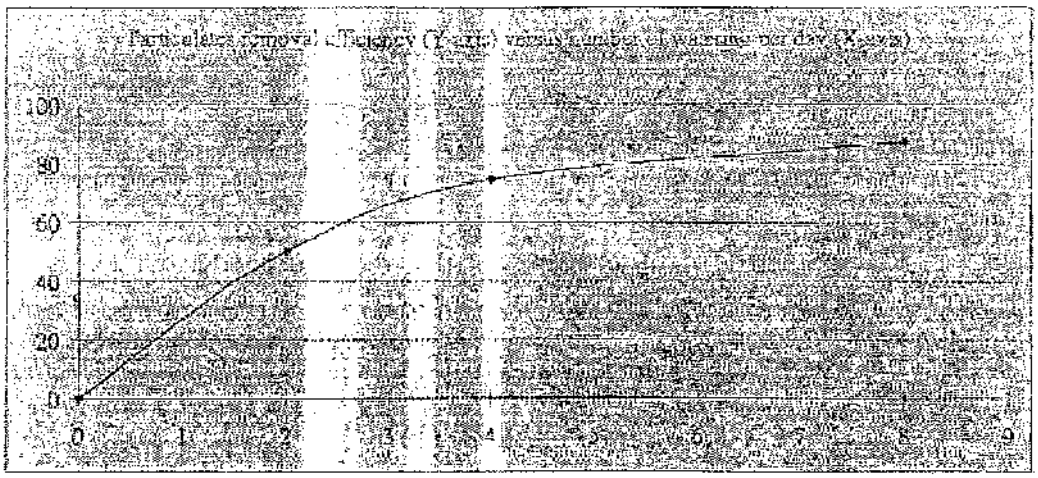



Figure 2. Comparison of test data with bilinear model.

Surface moisture must rise very steeply to achieve additional gains in efficiency, in fact up to 16% to achieve mitigation of 87.5%. This pattern appears to be largely independent of the amount of water applied (e.g. as litres per square metre)

Increasing watering frequency appears to be a highly inefficient and environmentally damaging approach to mitigation. There may be many additional externalities such as the cost of fuel to transport or pump the water, and the environmental impact on water resources etc.

It raises major questions about the feasibility and reliability of achieving efficiency up to 87.5% consistently over the whole duration of project. The consultants are claiming that the amount of watering will be directly related to the efficiency of $PM_{10}$ control. (See below the graph based on the consultant's EIA report para. 5.5.5.1).




The representation of the consultant's claimed PM control efficiency (vertical axis) based on watering up to 8 times daily, but this takes no account of the surface moisture content achieved.

However the consultants are apparently extrapolating by a simple rule-of-thumb approach from the US EPA statement that watering × 2 achieves a 50% reduction. One does not have any empirical data to support extrapolation of watering efficiency in $PM_{10}$ control based on $(1-1/2)$, and $(1-1/4)$ and $(1-1/8)$ respectively to justify the estimate of 87.5%. Furthermore the JAWMA analysis indicates that it is much more closely related to the surface moisture content (SMC) achieved than the amount of water used per square metre.

The JAWMA shows that different site activities give rise to different patterns and magnitudes of emissions. There is undoubtedly considerable uncertainty. However the consultants fail to provide a profile of emissions in terms of particle sizes, quantities of concentrations and dispersions in relation to ASRs at different distances from the site.

There are many unanswered questions and uncertainties in relation to the proposed mitigation measures which themselves will have important environmental impacts.

Conclusion of the EIA study

dd) The conclusion reached by the consultant at section 5.7 of the EIA report that the predicted cumulative pollution concentrations at all identified ASRs will comply with the current AQOs and that "*there will not be any residual air quality impacts*" is highly misleading and unscientific. The Director could not have used the analysis contained in the EIA reports to conduct a rational assessment of the likely air quality impact on public health that would be caused by the HZMB projects.

ee) Road infrastructure projects are designated projects under the EIAO because they have significant impacts on the environment, including air quality. The air quality impact assessment of the HZMB projects during the operational phase simply ignores these impacts because the consultant has determined (on extremely questionable grounds) that air quality will meet the current AQOs. In taking this approach, the EIA reports have denied the Director, the Advisory Council on the Environment and the general public the opportunity to evaluate the acceptability of the projects' impact on air quality.

ff) The use of 2004 as the starting year for the consultant's analysis may mislead readers of the reports into thinking that air quality in the study area is improving. Figure 1 above shows that the level of air pollutants in Tung Chung from 1999 to 2008; the figures for $NO_2$ and RSP follow a similar pattern. Because 2004 was a year of

exceptionally high air pollution, using that year as the starting year for the assessment of existing baseline conditions creates a false impression of steady improvement in air quality. The long term trend, however, is a steady deterioration in air quality.

Mortality caused by air pollution in Hong Kong SAR and effect on public health

gg) The HKLR / HKBCF EIA report fail to set out and analyse the empirical evidence available in Hong Kong SAR in relation to the impact of air pollution on public health. There is a substantial and increasing body of evidence that traffic related pollution is an important cause of ill-health in people of all ages. Air pollution is a potent cause of inflammation in body tissues and organs. Everyone is at risk but the young and the old are especially susceptible.

hh) In children pollution impairs the growth and function of the lungs. In susceptible groups there are increased risks of aggravation of asthma with increased need for medication and admission to hospital and symptoms of bronchitis (coughing, accumulation of phlegm and wheezing). In older individuals, there is strong evidence for increased hospitalization and deaths from heart attacks and stroke especially in those with existing disease of heart and blood vessels. Pollution may cause irregularities in heart rhythms, worsening of coronary heart diseases and chronic lung diseases leading to readmission to hospital, and increase the risk of acute lung problems including pneumonia.

ii) Air pollution is now regarded as a potentially important risk factor for the aggravation of diabetes and also that existing diabetes may enhance vulnerability to air pollution effects. In Hong Kong air

pollution is strongly associated with increased health care utilization. It is estimated that for respiratory complaints alone there are about 7 million doctor visits annually, at the primary care level, attributable to pollution. About 60,000 to 80,000 hospital bed days are required each year to treat patients with pollution attributable illness. The strongest association between hospitalization for pollution attributable illness is for nitrogen dioxide and sulphur dioxide. There are two substantial sources of evidence which point to the impact of pollution on mortality. Analyses of the short term impact of daily pollutant levels indicate that all four criteria pollutants ($PM_{10}$ (RSP), $NO_2$, $SO_2$ and $O_3$) are strongly associated with mortality risks. This effect is seen for all causes of mortality and populations of all ages. The effects are stronger for those aged 65+ years. In Hong Kong studies have produced the strongest evidence worldwide for the effect of a single pollutant ($SO_2$) and bad health outcomes. Restrictions on the use of sulphur rich fuels in 1990 led to a territory wide improvement in children's respiratory health and adult (46 years+) mortality from cardiovascular and lung disease. In Dublin a similar effect was observed in the same year attributable to reductions in both $PM_{10}$ and $SO_2$. However, in Hong Kong, the overall air quality has shown marked deterioration since 1990.

jj) The proposed new AQOs will not improve air quality in Hong Kong even halfway towards the level of air quality that would be achieved through compliance with WHO AQGs. It is estimated that the total numbers of young children with respiratory health problems and the number of deaths attributable to air pollution would still be up to two and a half times higher than it would be if the Government were committed to achieving the WHO AQGs.

kk) Mortality associated with air pollution in Hong Kong shows important socio-economic gradients. Those who are socio-

economically deprived, or live in areas with a higher Social Deprivation Index are at increased risk. These mortality outcomes include all natural or non-accidental causes of death and specifically cardiovascular and respiratory causes. This measure of environmental injustice for the socially disadvantage is associated with all four criteria pollutants $PM_{10}$ (RSP), $NO_2$, $SO_2$ and ozone. The experts have estimated that avoidable mortality from air pollution in the HKSAR amounts to between 1,000 and 1,600 deaths each year depending on where the criteria for clean air are set.

## II. THE LEGAL CONTEXT

### THE EIAO

s. 6

s. 6 (1) An applicant shall prepare an environmental impact assessment report in accordance with-

(a) the requirements of the environmental impact assessment study brief; and

(b) the technical memorandum applicable to the assessment.

(2) The applicant shall deliver an environmental impact assessment report to the Director for approval and pay the prescribed application fee. The Director may require the applicant to supply sufficient copies of the report so that the Director is able to circulate copies to relevant parties as defined in the technical memorandum.
(3) The Director shall, within 60 days of receiving the environmental impact assessment report, decide if the assessment-

(a) meets the requirements of the environmental impact assessment study brief and technical memorandum; or

(b) does not meet the requirements of the environmental impact assessment study brief and technical memorandum.

(4) If the Director decides that the environmental impact assessment report meets the requirements of the brief and the technical memorandum, he shall advise the applicant when the report must be exhibited for public inspection, whether the advertisement is to contain any specific material and whether a submission to the Advisory Council on the Environment or its subcommittee is required.

(5) The Director is taken to have decided that the environmental impact assessment report meets the requirements of the environmental impact assessment study brief and the technical memorandum if the Director has not given notice in writing that the report does not meet the requirements of the brief and the technical memorandum within 60 days of receiving the report. The applicant is required to submit the number of copies of the report as set out in the brief.

(6) If the Director decides that the environmental impact assessment report does not meet the requirements of the brief and the technical memorandum, he shall advise the applicant of the reasons why the report is unacceptable.

(7) The applicant shall present his environmental impact assessment report to the Advisory Council on the Environment at the times and places advised by the Director if the applicant is required to submit the report to the Council.

s. 8

s. 8 (1) The Director may, within 14 days of the expiry of the public inspection period or the receipt of comments from the Advisory Council on the Environment, whichever is later, ask an applicant in writing to give him the information he requires to decide whether to approve an environmental impact assessment report. The Director shall supply the applicant with one set of written comments received from members of the public and the Advisory Council on the Environment free of charge where comments have been received.

(2) The Director shall not make a request for further information where comments have not been submitted to him on the report as a result of the public consultation or from the

Advisory Council on the Environment.

(3) The Director shall, within 30 days of-

(a) the expiry of the public inspection period;

(b) the receipt of comments from the Advisory Council on the Environment; or

(c) the receipt of information under subsection (1),

whichever is the later, approve, approve with conditions or reject an environmental impact assessment report for the designated project.

(4) The Director is taken to have approved without conditions an environmental impact assessment report if the Director has not given notice in writing rejecting the report or approving it with conditions within 30 days of the happening of the later of the events set out in subsection (3)(a), (b) or (c).

(5) The Director shall place an approved environmental impact assessment report on the register.

(6) If the Director rejects an environmental impact assessment report, he shall give the applicant the reasons for the rejection

s. 10

s. 10 (1) A person who wishes to have constructed, construct or operate a designated project listed in Part I of Schedule 2 or to decommission a designated project listed in Part II of Schedule 2 shall-

(a) apply to the Director for an environmental permit in the form approved by the Director; and

(b) refer to an environmental impact assessment report on the register in the application for an environmental permit; or

(c) submit an environmental impact assessment report prepared under section 6 with the application; or

(d) refer to the permission under section 5(9), (10) and (11) to apply directly for an environmental permit and the conditions under section 5(12); and

(e) pay the prescribed application fee.

(2) In granting or refusing an environmental permit, the Director shall have regard to-

(a) the approved environmental impact assessment report on the register;

(b) the attainment and maintenance of an acceptable environmental quality;

(c) whether the environmental impact caused or experienced by the designated project is or is likely to be prejudicial to the health or well being of people, flora, fauna or ecosystems;

(d) any relevant technical memorandum;

(e) any environmental impact assessment report approved under this Ordinance or any conditions in an approval; and

(f) the comments, if any, submitted to him under section 7 on the report.

(3) The Director shall advise the applicant and the Advisory Council on the Environment, where it has been consulted under section 6(7), of the grant or refusal of the environmental permit within 30 days of the later of-

(a) the receipt of the application;

(b) the expiry of the public inspection period of the environmental impact assessment report under section 7;

(c) the receipt of comments from the Advisory Council on the Environment on the environmental impact assessment report; or

(d) the receipt of information under section 8(1).

(4) The Director is taken to have granted without conditions an environmental permit if the Director has not given notice in writing rejecting the permit or approving it with conditions within 30 days of the happening of the later of the events set out in subsection (3)(a), (b), (c) or (d).

(5) The Director may issue an environmental permit subject to the conditions, if any, as the Director thinks fit and specifies in the permit.

(6) Without limiting the general nature of conditions which the Director may include in an environmental permit, he may include conditions relating to the matters set out in Schedule 4 but shall be guided by the relevant technical memorandum.

(7) A condition specified in an environmental permit may be subject to a qualification,

restriction or requirement concerning the location, time or period of the condition's application.

(8) The Director shall not specify in an environmental permit conditions that might be included in approval of any nature under another pollution control Ordinance unless-

(a) the conditions are necessary to meet the requirements of the technical memorandum or the environmental impact assessment study brief; and

(b) the environmental impact assessment report approved for the project or the conditions on which the applicant was allowed to apply directly for an environmental permit under section 5 specified expressly that the environmental permit may include the conditions.

(9) If the environmental permit is refused, the Director shall advise the applicant and give the reasons why the permit is refused.

**Air Pollution Control Ordinance (Cap. 311) ("APC Ordinance")**

s. 7

s. 7 (1) The Secretary shall, after consultation with the Advisory Council on the Environment, establish for each air control zone air quality objectives or different objectives for different parts of a zone. (Amended L.N. 165 of 1984; L.N. 57 of 1994)

(1A) The Secretary may publish air quality objectives for an air control zone by issuing a technical memorandum which may specify different objectives for different parts of the zone. (Added 13 of 1993 s. 5)

(2) The air quality objectives for any particular air control zone or part thereof shall be the quality which, in the opinion of the Secretary, should be achieved and maintained in order to promote the conservation and best use of air in the zone in the public interest.

(3) Any air quality objective may be amended from time to time by the Secretary, after consultation with the Advisory Council on the Environment. (Amended L.N. 165 of 1984;

L.N. 57 of 1994)
(4)-(5) (Repealed 13 of 1993 s. 5)

s. 8

s.8 (1) (Repealed 13 of 1993 s. 6)
(2) The Authority shall aim to achieve the relevant air quality objectives as soon as is reasonably practicable and thereafter to maintain the quality so achieved.
(3) If in the opinion of the Secretary the achievement or maintenance of any air quality objective would be better served by the exercise by the Authority in a particular manner of any of his powers under section 15(4), 17 or 22, the Secretary may give directions in writing to the Authority as to the manner in which he shall exercise those powers; and, in the case of a direction which relates to section 15(4), any such direction may be of a general nature or relate to a particular case or particular cases.
(4) The Authority shall comply with any direction given to him under subsection (3) and the discretion conferred on the Authority by section 15(4), 17 or 22 as the case may be, shall not apply to any specified process in respect of which such a direction is in force.

## III. STANDING

65. The Applicant is a resident in the Tung Chung Area, and would be directly affected by the HZMB projects in question. The Applicant currently resides in Fu Tung Estate, this is included as one of the ASRs that is relevant to the HKLR / HKBCF EIA studies. In particular, given her existing medical conditions and long term health issues (i.e. diabetes and heart condition), it is likely that the construction and operation of the HKLR /HKBCF /TM – CLKL projects would further affect her physical health. The Applicant has sufficient interest to apply for judicial review.

## IV. ALTERNATIVE REMEDIES

66. There is no statutory appeal or review mechanism for challenging the Decisions.

## V. DELAY

67. The Applicant is legally aided. Her application for legal aid was made on 25 November 2009 and was granted on 31 December 2009. The Applicant's Solicitors also needed extra time to consult the public health experts' views and opinions on the highly technical EIA process. This application has been made as soon as practicable and in any event within 3 months after the Decisions were made. Alternatively, if there has been any delay, there is good reason for the delay and an extension of time should be granted.

## VI. GROUNDS OF REVIEW

### GROUND I: NON-COMPLIANCE WITH THE TM AND SB

#### (i) Sub-standard EIA report

68. When reviewing the HKLR / HKBCF EIA report, the Director is required to review them against the EIA SB and the guidelines as stated in the TM. In particular, the Director must ensure that the EIA report meets the minimum standards that are required for such a report (§ 4.4.2 of TM). The guidelines include, amongst others, the following requirements:

(i) the report shall be considered as adequate if there are no omissions or deficiencies identified which may affect the results and conclusions of the assessment;

(ii) the information and descriptions in the EIA report are factually correct;

(iii) the evaluation of the predicted impacts are consistent with the criteria listed in Annexes 4 to 10 inclusive;

(iv) identification and descriptions of the potential environmental impacts in the EIA report are complete and whether all applicable criteria in Annexes 4 to 10 inclusive have been considered;

(v) the assumptions and methodologies used are sound and adequate;

(vi) adverse environmental effects are avoided to the maximum practicable extent.

If the above standards are not met, the Director cannot approve the EIA report (§ 4.5.1 of TM)

69. Furthermore, § 3.4 of the TM (and § 3.4.1.2 of SB) requires such environmental assessment to be based on the best available information at the time of the assessment. Such information shall be that which the applicant for a permit has access to or is as provided or referred to by the Director in the EIA SB. § 3.4.1.4 of the SB also requires the EIA study to calculate the expected air pollutant concentrations at the identified ASRs based on an assumed *reasonably worst-case scenario* under normal operating conditions.

70. Due to the errors and deficiencies as mentioned above by the experts for the Applicant at paragraph [61], and given the resultant non-compliance with the

requirements of the TM and SB, it is submitted that the Director could not have lawfully approved the HKLR / HKBCF EIA report in question. The main deficiencies and errors are, amongst others, as follows:

a) the failure to consider the Ozone / $O_3$ and $SO_2$ impact caused by increased traffic emissions;

b) the failure to take into account inherent deficiencies and under-estimation of the PATH model;

c) the failure to differentiate the substantial differences in air pollutant levels during warm and cold seasons;

d) the failure to collect and use roadside pollutant data which differs significantly from data collected from general monitoring station;

e) the failure to follow the requirement for particles size classes as stipulated in § 3.6 of SB Appendix B-1

f) the failure to take into account the low rate of conversion and replacement of engine models in both Hong Kong SAR and Guangdong. Assumptions were based on optimistic governmental policy measures on air quality unsupported by any scientific data for actual improvement of air quality in the PRD since these measures have been in place. The consultant did not present the worst case scenario to the Director as required; and

g) the failure to assess the impact of RSP $PM_{2.5}$, a harmful air pollutant not established under the APC Ordinance but recognised under the WHO AQGs which should have been assessed after agreement with the Director as required by § 1.1(d) of TM Annex 4.

h) the failure to consider the real on site efficiencies of the watering mitigation measures and the secondary environmental impact generated as a result thereof.

71. The methods of assessment and the models used are deficient in many fundamental respects, and as a consequence, the assessment result was incomplete, not objective and unscientific, they also omit much relevant information about the HZMB projects' impact on air quality that is specifically called for by the SBs and TM, including their effects on public health, the magnitude and duration of the adverse effect, the likely size of the communities affected and the extent to which the effects are irreversible (TM § 4.4.3). In many respects, the worst-case scenario was not presented to the Director for consideration.

72. It is submitted that the air quality assessment carried out by the consultants led to the absurd conclusion that there will not be any residual air quality impacts caused by the HZMB projects (EIA Report § 5.7.6). The HKLR / HKBCF EIA report have presented the Director with carefully selected information that tends to support this conclusion. Instead, the HKLR / HKBCF EIA report should have presented the Director with the full picture of the likely environmental impact of the projects.

73. It is submitted that the EIA reports for the HZMB projects do not comply with the SM and TM, and the Director acted unlawfully in approving them. The EIA reports do not include the kind of air quality impact assessment that the SB and TM require in respect of the projects' operational phase, and they could not lawfully be used as a basis for granting environmental permits for the projects.

**(ii) Problems with methodology used in the EIA study**

(a) Project environmental impact must be assessed on a 'stand-alone' basis

74. § 4.2.1 of the TM requires the applicant to conduct a 'project specific study'. The TM also requires that an EIA study must be done in quantitative terms, wherever possible, and in qualitative terms of the likely environmental impacts and environmental benefits of the projects (§ 4.1.1 of TM).

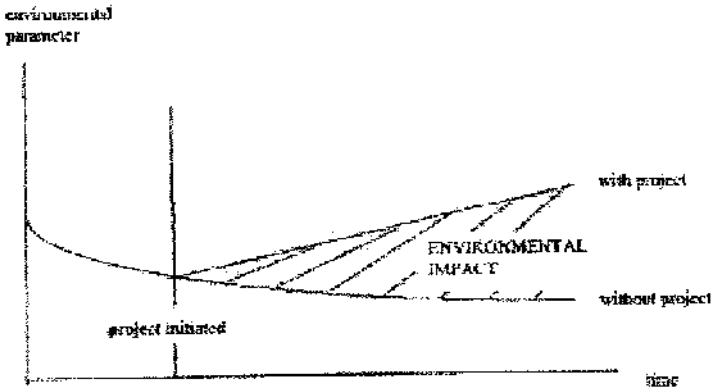
75. § 4.3.1(c) of the TM requires that the methodologies for evaluating the environmental impact should be capable of addressing the following issues:

(i) the existing or projected environmental conditions without the project in place;

(ii) the projected environmental conditions with the project in place and the sum total of the environmental impacts taking into account all relevant existing, committed and planned projects;

(iii) a differentiation between the environmental impact caused by the project and that caused by other projects, and to what extend the project aggravates or improves the existing or projected environmental conditions.

76. The methodology requirement can best be illustrated graphically:




Source : Introduction to Environmental Impact Assessment (Routledge, 3d edition)

77. The methodology adopted by the consultants in the EIA reports does not meet these requirements. The 'stand alone' environmental impact assessment in respect of the projects as required by § 4.3.1(c) of the TM is not found in the EIA report. The EIA report has failed to set out the environmental impact that would be caused to the existing condition as a result of the projects on a 'stand alone' basis.

78. The background existing levels of RSP and $NO_2$ pollutants are already close to or even above the levels allowed by the current AQOs. The EIA report acknowledges that for the Tung Chung area, the daily average concentration level for RSP was already at 113% of the AQOs over the past five years (i.e. the existing RSP level has already exceeded the level that is allowed by the current AQOs) (See: Table at § 5.2.2 of HKLR / HKBCF EIA report).

79. The adverse environmental impact that would be caused by the projects alone is not set out in the EIA report. The central question of what would have been the environmental impact caused by the HZMB projects themselves had not been addressed in the EIA report. Instead, the adverse impacts of the projects are bundled up and consolidated with the predicted beneficial effects of various mitigation strategies and policy measures that are now being implemented by the Hong Kong SAR and Guangdong governments in an effort to try to improve the regional air quality.

80. As pointed out in paragraph [61] above, the governmental measures and policies on air quality have so far failed to bring about any positive improvement to the air quality in the PRD region. As result of this methodology, the HKLR / HKBCF EIA report made an absurd prediction that the predicted RSP level would fall to below the current AQOs after the HZMB projects are in operation (See: Table 5-14B of the HKLR / HKBCF EIA report; p.g. 5-26).

(b) Baseline methodology not used

81. In order to evaluate the environmental impact of the projects, it is necessary to draw a baseline from which to measure environmental conditions in the area likely to be affected by the Projects before they are in place. (TM § 4.3.1(a)). The environmental impact of the projects is quantified by comparing the projected environmental conditions with the projects in place to the results of the baseline study. (TM s. 4.3.1(c))

82. The SB contains detailed guidance on how to draw up a baseline study of background concentrations of air pollutants. (SB Appendix B-2, 3.1)

83. The importance of anchoring the baseline study in verifiable data describing *existing* air quality is reinforced by the TM, which requires a baseline study be *"based on, but not limited to, existing air quality monitoring on-site or quality assured measured data . . ."* (TM Annex 12 § 3.4.)

84. The EIA studies ignore these requirements because the monitored data for the past five years from the nearby Tung Chung Monitoring Station reveal that average background concentrations of RSP level in the study area already exceed the current AQOs, and that concentrations of $NO_2$ level are marginally below (EIA Report § 5.2.2). This does not serve the applicant's (i.e. Highway Department) purpose, which has to show that the AQOs will be met after the projects are commissioned. To overcome this problem, the baseline study has been moved forward to 2015, by which time various measures being taken by regional governments to control and reduce air pollution, the EIA report presume, will have improved background air quality sufficiently to leave enough headroom in the current AQOs to accommodate the HZMB projects. (EIA Report §§ 5.6.1.1, 5.6.3)

85. This approach does not satisfy the requirements of the SB and TM. The baseline study is not indicative of existing background air quality, which can be verified by

available data (SB Appendix B-2 § 3.1, TM §3.4, and TM Annex 12 § 3.4). Instead, the assessment is based on speculation about future air quality for which no scientific justification or quantitative analysis is given in the EIA reports.

86. In summary, an analysis of the EIA report reveals the following deviations from the SBs and TM:

(a) the consultant did not make (or at any rate did not include in the report) any assessment of the existing or projected environmental conditions in the assessment period without the project in place (i.e. the "do nothing" scenario) as required by § 4.3.1(c)(i) of the TM;

(b) the consultant did not differentiate between the environment impact caused by the projects themselves, and the impact of other projects affecting background air quality. Nor did it determine to what extent the projects would aggravate or improve the environmental conditions assessed in the "do nothing" scenario as required by § 4.3.1(c)(iii) of the TM;

(c) the consultant's optimistic assumptions regarding the predicted improvement in regional air quality in §§ 5.6.3 and 5.6.5.1 of the EIA report do not represent a reasonably worst case scenario under normal operating conditions, which is the basis on which § 3.4.1.4(iv)(a) of the SBs requires expected air pollution concentrations at the identified ASRs to be quantified; and

(d) the consultant's operational air quality impact assessment methodology is unscientific and does not meet the requirements of § 4.3.1(b) of the TM - it relies on biased and unverifiable assumptions about future improvements in background air quality by the very party who is seeking approval of the projects and makes no effort to define interactions between the forecast

improvements in background air quality and the level of pollutants at road level, where the pollutants attributable to the projects are produced and most of the ASRs are located.

87. Assessing the projects' environmental impact in the way as required by the TM and SBs would have posed a serious problem for the Highways Department because the historical air quality monitoring data set out in § 5.2.2 of the EIA reports for the HKBCF and TM-CLKL projects show that there is little or no headroom within the current AQOs to accommodate a significant new source of air pollution. One of the criteria that an air quality impact assessment must meet is to demonstrate whether or not air quality will meet the AQOs if the project is implemented. TM § 4.3.1(c); TM Annex 4.

88. Given the Government's failure to achieve the AQOs for RSP and (probably) $NO_2$, the Highways Department may have thought that the Director might be constrained from granting these projects environmental permits by her statutory duty under s. 8 of the APC Ordinance if the EIA reports showed that these projects would increase the concentration of these pollutants in the study area. s. 8 requires the Director to aim to achieve the AQOs as soon as reasonable practicable.

89. The Highways Department's solution to this problem was to focus only on the impact referred to in TM § 4.3.1(c)(ii) (i.e. the cumulative impact of the HZMB projects and all other relevant existing, committed and planned projects), ignoring the other requirements of § 4.3.1(c). By ignoring data showing steadily rising levels of background pollution from the mainland and making some heroic assumptions about the Guangdong Government's ability to achieve the emission reductions recommended in the Pearl River Delta Regional Air Quality Management Plan, the Highways Department's consultant felt able to assert at § 5.6.17.2 of the HKLR/HKBCF EIA report that *"the predicted pollutant concentrations at all the representative ASRs do satisfy the Air Quality Objectives."*

90. In pursuing this approach, however, the consultant failed to satisfy the requirements of the SBs and TM, making it unlawful for the Director to grant the projects an environmental permit.

91. The Highways Department's preoccupation with the AQOs led it into other serious errors. It excluded $PM_{2.5}$ in its assessment, although it is one of the most dangerous air pollutants produced by road traffic. The Hong Kong Government has recognised the severe impact that fine particles have on public health and has proposed to establish an AQO for $PM_{2.5}$. Annex 4 of the TM provides that guidelines recommended by the WHO or other international authorities may be used by agreement with the Director for evaluating the impact of pollutants for which no AQO has been established.

92. The Highways Department also did not assess the amount of $SO_2$ that will be produced by vehicular traffic using the HZMB because it determined *ex ante* that the quantity of $SO_2$ attributable to the projects would be very unlikely to cause the AQO to be exceeded. In other words, the EIA reports assumed an outcome of the EIA that the SB and TM require to be demonstrated by a quantitative assessment.

93. The exclusion of ozone from the assessment is also a serious error. Ozone is implicated in the conversion of NOx to $NO_2$. Including ozone in the assessment is, therefore, essential for ensuring that realistic figures for background concentrations of ozone are used in the calculation of how much $NO_2$ will be generated by the projects.

94. The EIA studies, and the Director in approving them, have wrongly assumed that as long as the predicted cumulative air quality levels in 2015 meet the standards of the current AQOs then they have satisfied the requirements of the SB and TM. However, that is not the assessment required by the SB and TM. They require a baseline assessment of the air quality impact that would be generated by the HZMB projects themselves.

95. Even if the Director agrees that the AQOs will be met after the projects are in operation in 2015 as a result of the efforts of regional governments to improve regional air quality, she cannot grant the HZMB projects an environmental permit unless she also determines that their environmental impact will be acceptable having regard, among other things, to her statutory duty under the APC Ordinance to aim to achieve the AQOs in Hong Kong as soon as is reasonably practicable. To do this, she has to be presented with sufficient information about the HZMB projects' impact on air quality that differentiates their impact from the impact caused by other projects. (TM § 4.3.1(c))

96. Allowing the applicant to roll forward the baseline study to 2015 while using today's AQOs as the measure of acceptable air quality distorts the air quality assessment. The purpose of the assessment is to require the Director to consider what environmental policies should apply to road projects in Hong Kong to achieve today's AQOs as soon as is reasonably practicable and to determine whether those policies have been properly applied to the HZMB projects.

The Consequences of a Defective EIA Report: The *Shiu Wing Steel* case

97. In Shiu Wing Steel Limited v. Director of Environmental Protection and Airport Authority FACV 28 of 2005 (dated 17 July 2006, [2006] 3 HKLRD 487), the CFA held that the Director could not approve an EIA report if it did not comply with the relevant criteria as stipulated by the SB and TM.

> *"The criterion for approval*
>
> *29. It is not a question whether the Director acted reasonably in attributing a given meaning to the TM and SB. The question the Director had to answer under s.6(3) had to be answered objectively. Equally, the condition*

*on which the EIA report could have been lawfully approved had to be objectively determined. The lawfulness of the approval was not dependent on the Director's opinion if that opinion was objectively in error. If the EIA report in fact met the requirements of the SB and the TM, the Director's decision to approve the report is valid; if the EIA report did not in fact meet those requirements, the Director had no power to approve the report. It is immaterial whether the Director thought that the requirements were met. And, as the limits of the Director's power are a matter of law, it is for the Court to determine the meaning and scope of those requirements.*

*30. If the Director, in approving an EIA report, is found to have misunderstood the requirements of the SB and the TM, his misunderstanding may suggest error in his decision that the requirements have been met (cf. Henderson Real Estate Agency Ltd v. Lo Chai Wan (PC) [1997] HKLRD 258 at 267 although in that case and in South Somerset District Council and Secretary of State for the Environment [1993] 1 PLR 80 the misunderstanding of the governing guidelines was itself the ground of invalidity). But the question of the EIA report's meeting the requirements of the SB and TM is for the Court to determine. It is a question of construction, albeit the TM and the SB are to be construed not as legislative instruments but as they would be understood by an expert risk assessor. In other words, the court determines what the TM and the SB require but technical evidence may be needed to show that an EIA report meets or does not meet the requirements so determined. It is one thing to acknowledge that satisfaction of the requirements or proof of satisfaction calls for expertise; it is another to allow the Director or an expert risk assessor to define for himself or herself the requirements to be satisfied. The definition of the legal effect of the TM and the SB is necessarily a matter of law but it is necessary to appreciate any special or technical meaning which experts may attribute to particular terms."*

98. An EIA is a formal process from which decision makers gather environmental information about projects and then take this information into account in the decision making process. The decision-maker is responsible for the assessment and not those who provide reports and other relevant materials to him or her.

> *"[E]nvironmental assessment is both a technique and a process. ... The key point is that, strictly, the 'assessment' is undertaken by the decision maker on the basis of environmental information with which it is supplied. This information consists, in part, of an 'environmental statement' prepared by the developer (or, more likely, by hired consultants) which details at least the main environmental impacts of the project and any mitigating measures that are proposed to reduce the impacts. ... So it is worth stressing that the developer does not produce an environmental assessment (a mistake that even some judges still make); the decision maker carries out the assessment on the basis of the information supplied."* Bell and McGillivray, *Environmental Law* (7th edition) p.432.

99. In Hong Kong, the decision maker is the Director and the basic information that she requires to make an environmental assessment of a project is set out in the SB and TM made under the EIAO. In *Shiu Wing Steel*, the CFA quashed the Director's decision to grant an environmental permit because the EIA report failed to provide certain information required by the SB and TM, namely a quantitative risk assessment ("**QRA**") of the hazard to life posed by the project in that case. The CFA ruled: *"As s.6(3) makes clear the legislative intention that an EIA report must meet the requirements of a SB and TM, it would be contrary to the Director's duty to approve a report that did not meet the requirements of the applicable SB and TM. The power to approve an EIA report can be exercised only in respect of a report that meets those requirements . . ."* (at § 19)

100. The CFA in *Shiu Wing Steel* quashed the environmental permit for an aviation fuel tank farm because the project's EIA report did not include a quantitative risk assessment (QRA) of the hazard to life posed by the possibility of catastrophic

tank failure resulting in an instantaneous loss of all of the fuel from a tank. The project's SB required identification of all hazardous scenarios that might result in fatalities and the execution of a QRA in respect of each scenario, but the project's proponent, the Airport Authority, agreed with the Director that the EIA report would include a QRA covering the loss of only 10% of a tank's contents. The risk of any greater loss was characterised by the Airport Authority and the Director as incredibly small. The CFA held that the omission of a QRA for the 100% loss scenario invalidated the entire report. Disagreeing with the Director that the 100% loss scenario was so unlikely to occur—that the Director could reasonably determine without a QRA that it would not pose an unacceptable hazard to life, the CFA insisted on all hazard to life scenarios identified by the SB being assessed in the manner prescribed in the SB and TM, i.e. by way of a QRA.

> *"What the EIA report shows is that the catastrophic instantaneous 100% loss scenario was identified by the ERM team but the decision was taken not to make a QRA. Had such a QRA been undertaken, it would have been necessary not only to assess the frequency of occurrence of the scenario but also – and perhaps primarily – to assess the number of fatalities that might be caused if the scenario occurred. No assessment of fatalities, specifically no assessment of fatalities in the SWS mill, was made. The frequency of a catastrophic instantaneous 100% loss scenario that might cause such fatalities was not assessed on a basis consistent with Annex 4." Shiu Wing Steel*, [at §68].

101. The EIA reports for the HZMB projects suffer from the same fatal defect. The SBs require the air quality impact assessment of the projects to identify *"the potential air quality impacts from the construction and operation of the project to sensitive receivers near the project"*; SBs § 3.2(ii). $PM_{2.5}$, $SO_2$ and ozone are all harmful pollutants that affect sensitive receivers near the project but the Highways Department chose to exclude them from the assessment. No justification was given for excluding $PM_{2.5}$. Ozone was excluded because, its consultant asserted, the projects would not generate ozone but the concentration of ozone in the

atmosphere affects the rate at which Nox generated by the project will be converted to $NO_2$ and is, therefore a pollutant affecting the potential air quality impact from the construction and operation of the project. $SO_2$ was excluded because the consultant carrying out the assessment determined *ex ante* that the quantity of $SO_2$ produced by the projects would not cause the AQOs to be exceeded, thereby pre-empting one of the issues that the air quality impact assessment is intended to address. This is exactly the same error that was made in the *Shiu Wing Steel* case.

## GROUND II: DECISIONS OF THE DIRECTOR IRRATIONAL

102. No sensible person in the position of the Director and who applies his mind to the Director's duty under s. 10 of the EIAO could possibly have accepted an EIA report that concluded there would be no residual air quality impacts whatsoever resulting from the operation of the projects (See § 5.7 of the EIA reports for the HKBCF/HKLR). The sheer improbability of that finding in the context of a major road project suggests that something must have gone seriously wrong with the air quality impact assessment for these projects.

103. Major road projects are designated projects under the EIAO because they have a significant long term impact on the environment, particularly on air quality. That environmental impact must be assessed under the Ordinance before such projects can proceed. The Director has a duty under s. 10 of the EIAO to consider whether all practicable steps have been taken to minimize their environmental impact and whether any residual impact (after practicable mitigation) will be acceptable having regard to, among other things, their effect on public health.

104. A very important aspect of EIA is the involvement of the general public in the evaluation of the acceptability of a project's environmental impacts. EIA reports must be published and made available for public comment before they are

approved. Involving the public in the EIA serves two purposes. It allows the public to point out any deficiencies in the environmental justification for a project put forward by the project's sponsor (which, as in the case of the HZMB projects, is often a Government agency). It also enables the public to judge how well the Director is living up to her legal responsibility to protect the environment in the face of potential pressure from sponsors to get their projects approved as quickly as possible.

105. The finding that the HZMB projects will have no residual air quality impact after they go into operation requires careful justification and explanation. If the HZMB projects (given their scale) raise no operational air quality issues, then no road project is likely to raise such issues. Accepting that finding, and the methodology that led to it, would be tantamount to excluding vehicle emissions as an environmental impact that the Director must have regard to before deciding whether to grant the road projects an environmental permit.

106. A careful reading of the EIA reports reveals that when the reports assert in § 5.7 of the EIA report for the HKBCF/HKLR that the projects will have no residual air quality impact, what is meant is that air quality is not expected to exceed the AQOs after the bridge is open. In Ground I for this application, certain deficiencies in the methodology used to arrive at that conclusion are identified. The Highways Department's view that only air quality impacts that would result in a failure to meet the AQOs need be considered by the Director is wrong in law. The Director's acceptance of that position, as evidenced by her approval of the EIA reports, means that she closed her mind to relevant environmental impacts to which she was required to have regard under s. 10 of the EIA Ordinance and in so doing acted unlawfully.

107. The AQOs reflect the minimum air quality that the Secretary for the Environment, after consulting with the Advisory Council on the Environment, has determined under s. 7 of the APC Ordinance should be achieved and maintained in the public interest. The Director has a duty under s. 8 of the APC Ordinance to seek to

achieve that air quality as soon as is reasonably practicable and thereafter to maintain it. This means that, in carrying out her functions under the EIA Ordinance, the Director must be mindful of the need to accommodate all existing and future planned projects within the AQOs. For this reason, § 4.2.1(f) of the TM requires all EIA reports to propose mitigation measures, whether or not there is any risk that the AQOs will not be met. To do otherwise would either breach the Director's duty to aim to achieve the AQOs as soon as is reasonably practicable or risk putting the Director in a position of having to reject good projects because there is insufficient headroom within the AQOs to accommodate them.

108. The Director cannot perform her statutory duties under the APC and EIA Ordinances unless EIA reports assess all of the significant air quality impacts that a project will have and address the issue of mitigation. In the case of the HZMB projects, for example, § 5.6.10 of the EIA report for the HKBCF/HKLR identified the higher engine emissions produced by older diesel vehicles as an issue but then assumes in § 5.6.10.3 and §5.6.10.5 that all vehicles using the bridge will meet Euro IV standards by 2007 and Euro V by 2010. This implies that all pre-Euro IV and Euro V diesel vehicles will be replaced or converted before the bridge is open, an unrealistic assumption unless vehicle owners are required to do so by mandatory emission standards for used vehicles. Whether the time has now come for such standards as a way of mitigating the impact of major road projects in Hong Kong is a critical issue in the evaluation of those projects but it was not addressed in these EIA reports. The Highways Department and the Director wrongly interpreted the SB and TM as requiring considering of mitigating measures only when the assessment shows that the AQOs will not be met and closed their minds to this issue.

## GROUND III: S. 10(2) OF EIAO - NO QUANTITATIVE ASSESSMENT OF IMPACT ON PUBLIC HEALTH

109. In granting an environmental permit, s. 10 (2) of the EIAO requires that the Director shall have regard to "*(c) whether the environmental impact caused or experienced by the designated project is or is likely to be prejudicial to the health or well being of people, flora, fauna or ecosystems;...*". Based on the information contained in the EIA studies, the Director must have assumed that once the projected air quality impact caused by the HZMB projects could be shown not to exceed the current AQOs (which itself is highly questionable), it is the equivalent of an assessment on whether the environmental impact caused by the designated project is or is likely to be prejudicial to the heath or well being of people, flora, fauna and other ecosystems.

110. Achieving acceptable environmental result via the AQOs is a separate exercise from ascertaining whether the effects of a project are likely to be prejudicial to the health or wellbeing of people, flora, fauna and other ecosystems, and there was no such quantitative assessment of this kind in the EIA reports.

111. This key factor is in turn reflected in § 4.4.3 (a)(i) of the TM. Such assessment of any impact or effect on public health must be done in quantitative terms wherever possible (§ 4.1.1 of TM).

112. All parties concerned, including the HKSAR Government, the Director and the consultant commissioned to conduct the EIA studies, agree that the current AQOs are seriously out of date (based on scientific data gathered circa 1987) and obsolete and they do not provide a fair and up-to-date assessment of air quality impact on public health. This is especially so when the EIA studies are seeking to

apply the current outdated AQOs to assess the future air quality impact up to 2031 (when the current AQOs would have been long replaced).

113. In considering the effect of the AQOs, Hartmann J (as he then was) made the following comments in Clean Air Foundation v. the Government of HKSAR HCAL 35 of 2007 dated 26 July 2007 (§ 35):

> *"Take the first issue, the asserted failure to adopt 'up-to-date' air quality objectives. If Government has the power under s.7 of the Air Pollution Control Ordinance to update air quality objectives, either generally or in respect of particular areas, it is inevitable there will be reasons why – if, in fact, there has been no updating – that it has declined to do so. Those reasons will be based on social and economic factors and, importantly, on an assessment of whether, all matters being taken into account, there is sufficient benefit to be obtained at this time in adopting more stringent objectives."*

114. In other words, decisions setting AQOs are not based on the consideration of public health alone and they may well reflect other economical, social and political factors. Therefore, compliance with the AQOs *per se* cannot be equated with a quantitative risk assessment of the impact on public health as required by s. 10(2) of the EIAO and TM.

115. Without the evidence of a quantitative risk assessment of the impact on public health, the Director could not have lawfully granted an environmental permit under the EIAO. The inadequacies of the current AQOs to be used as a yardstick for the assessment of air quality impact on public health has been raised by numerous interest groups such as the Clean Air Network during the public inspection period of the EIA reports as stipulated by ss. 6 and 8 of the EIAO. In

breach of the requirement as stated in §4.5 of the TM, the Director has failed to properly address these relevant concerns.

116. The HKLR / HKBCF EIA report did not provide the Director with the environmental information of air quality impact on public health required by the SB and TM in order to allow the Director to make an environmental assessment of the HZMB projects.

117. This is the same error that resulted in the EIA report for the Permanent Aviation Fuel Facility ("PAFF") being struck down in the *Shiu Wing Steel* case. In that case, the PAFF project's proponents, the Airport Authority, tried to avoid drawing the public's attention to the possibly serious loss of life that might occur if an aviation fuel tank close to the boundary with a steel mill ruptured, causing an instantaneous loss of its entire contents. The Airport Authority claimed that it was unnecessary to provide a QRA of that scenario. Such a situation was so unlikely to occur, argued the AA, that the Director could determine that the hazard to life that this risk presented was acceptable without a QRA. The CFA disagreed, holding that whether or not the risk was acceptable had to be demonstrated in the manner prescribed by the TM.

> *"The practice of not identifying extremely unlikely scenarios even though they might cause many fatalities is not consistent with the requirements of a methodology that can be accepted in relation to hazards to human life. The practice of omitting scenarios as described by Mr Hui and Mr Sourirajan appears to deny the public, the ACE and ultimately the Director any quantitative assessment of the risks of the omitted scenarios. And Mr Hui's opinion of the requirements of Annex 4 is clearly mistaken as one cannot determine that a risk is in the "acceptable" range of Figure 1 until a QRA is made. Stone J pointed out that:*

*"... it would frustrate the purpose of the Ordinance and the entire EIA regime in Hong Kong if the Director could decide to vary the process of assessment in a manner not provided for in the Ordinance, the technical memorandum or the study brief, and in a manner which would not involve public consultation or public accountability." "* (§ 62 of *Shiu Wing Steel*)

118. Compliance with the current AQOs is not a substitute for the actual QRA on public health as required by the TM and s. 10(2)(c) of the EIAO. The absence of such evidence from the EIA reports does not absolve the Director himself from making a decision that must consider the effects on public health and well-being. In the absence of such evidence, the Director could not have issued the environmental permits.

**Dated 22nd January 2010**

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**Solicitors for the Applicant**

LA/MJR/18808/2009 (L26)
HCAL 9 /2010

**IN THE HIGH COURT OF**
**THE HONG KONG SPECIAL ADMINISTRATIVE REGION**
**COURT OF FIRST INSTANCE**
**CONSTITUTIONAL AND ADMINISTRATIVE LAW LIST**
**NO. 9 OF 2010**

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IN THE MATTER OF an application for leave to apply for Judicial Review under Order 53 Rule 3 of the Rules of High Court

and

IN THE MATTER OF THE ENVIRONMENTAL IMPACT ASSESSMENT ORDINANCE (Cap. 499)

**CHU YEE WAH** **APPLICANT**

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**NOTICE OF APPLICATION FOR LEAVE TO APPLY FOR JUDICIAL REVIEW**

(Order 53 Rule 3(2), Rules of High Court)

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Filed this day of 22 JAN 2010 2010

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