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

BETWEEN

CHU YEE WAH	Applicant
and	
DIRECTOR OF ENVIRONMENTAL PROTECTION	Respondent

Before: Hon Fok JA (sitting as an additional Judge of the Court of First Instance) in Court

Date of Hearing: 22 – 24 February 2011

Date of Handing Down Judgment: 18 April 2011

J U D G M E N T

Introduction

1. This case is concerned with whether the Director of Environmental Protection ("the Director") has properly discharged her statutory duties and functions under the Environmental Impact Assessment Ordinance, Cap. 499 ("the EIAO"), in respect of part of the works forming the proposed Hong Kong-Zhuhai-Macau Bridge ("the HKZM Bridge") project.
2. Specifically, the case raises the question of whether the air quality impact of two of the projects connected with the HKZM Bridge was properly assessed in the environmental impact assessment reports for those projects. The applicant, who is a resident of Fu Tung Estate in Tung Chung where one of the air sensitive receivers for the air quality impact assessment in respect of the two projects in question is located, contends that it was not.

The decisions challenged

1. The applicant seeks an order of certiorari to quash the decisions of the Director granting approval for (a) the Environmental Impact Assessment Report relating to the HKZM Bridge Hong Kong Boundary Crossing Facilities and (b) the Environmental Impact Assessment Report relating to the HKZM Bridge Hong Kong Link Road. Both of those decisions were made on 23 October 2009 pursuant to s.8(3) of the EIAO.
2. She also seeks an order of certiorari to quash the decisions of the Director granting an environmental permit to construct and operate (a) the HKZM Bridge Hong Kong Boundary

Crossing Facilities and (b) the HKZM Bridge Hong Kong Link Road. Both of those decisions were made on 4 November 2009 pursuant to s.10 of the EIAO.

The projects

1. In July 2003, a study jointly commissioned by the PRC National Development and Reform Commission and the Government of the Hong Kong Special Administrative Region ("the Government" and "the HKSAR" respectively) concluded that there was a need for a land transport link between Hong Kong and the Pearl River West area. The intention is to construct the HKZM Bridge across the waters of the Lingdingyang in the Pearl River Estuary. The HKZM Bridge will connect the HKSAR, Zhuhai City in Guangdong Province and the Macau Special Administrative Region and will be included as part of the construction project known as the "National High Speed Road Network Planning".
2. The Hong Kong section of the HKZM Bridge project consists of three main parts, namely (i) the HKZM Bridge Hong Kong Boundary Crossing Facilities ("the Boundary Crossing Facilities"), (ii) the HKZM Bridge Hong Kong section and North Lantau Highway Connection (also known as the HKZM Bridge Hong Kong Link Road) ("the Link Road"), and (iii) the Tuen Mun – Chek Lap Kok Link Road ("the TM-CLK Link").
3. The Boundary Crossing Facilities, construction of which was due to commence in the 3rd quarter of 2010 but which has not yet in fact commenced, are to be located on a reclaimed site in the northeastern waters of the Airport Island near Chek Lap Kok. The Link Road, construction of which has not yet commenced but which is due to commence this year (2011), is to approach the Boundary Crossing Facilities from the HKZM Bridge from the western boundary of the HKSAR via the Airport Channel between Chek Lap Kok and the northern shore of Lantau Island.
4. The TM-CLK Link, when combined with the existing Tuen Mun Bypass, is to provide a direct route linking the Northwest New Territories and North Lantau from north to south, as well as various other locations including the Kong Sham Western Highway, the port back-up areas in the Northwest New Territories, the Tuen Mun River Trade Terminal, the existing EcoPark in Tuen Mun Area 38, the Hong Kong International Airport, the proposed Lantau Logistics Park, the HKZM Bridge and developments in North Lantau.

The EIAO statutory procedure

1. The Boundary Crossing Facilities, Link Road and TM-CLK Link are all designated projects within the meaning of s.4 of the EIAO. The statutory procedure requires that an environmental permit be issued before construction of each project commences. Save for certain designated projects for which direct applications can be made to the Director for an environmental permit, an applicant who is planning a designated project (whom I shall refer to as the project proponent) must prepare an environmental impact assessment report containing an analysis of the likely environmental impact of the proposed project.
2. From a project proponent's perspective, the process begins with the project proponent applying to the Director for an environmental impact assessment study brief (s.5(1)(a) of the EIAO). To do so, the project proponent must submit an application form accompanied by a project profile that complies with the technical memorandum and must also advertise the project profile to the public (s.5(2)).
3. The technical memorandum, entitled Technical Memorandum on Environmental Impact Assessment Process, is a document issued by the Secretary for the Environment pursuant to s.16 of the EIAO ("TM"). The current TM issued under that s.16, which was also applicable at

the time of the HKZM projects in question, was published in the Gazette on 16 May 1997. The TM is not subsidiary legislation (s.16(12)) but the Director shall be guided by it when deciding on matters under, amongst other sections, ss.8 and 10 (s.16(4)).

4. In the present case, the Highways Department ("the HD"), as project proponent, submitted the project profile for the Link Road in October 2003, the project profile for the TM-CLK Link in November 2007 and the project profile for the Boundary Crossing Facilities in March 2008.
5. The Director must inform the Advisory Council on the Environment ("ACE") about the project profile for its comments (s.5(3) of the EIAO) and may call for further information from the project proponent concerning the project profile (s.5(4)). The ACE or any person may comment on the project profile (s.5(6)). The Director shall then, within the stipulated time limit, issue to the project proponent an environmental impact assessment study brief for the particular project (s.5(7)).
6. In the present case, the Director issued the respective study briefs for the Link Road in November 2003, the TM-CLK Link in December 2007 and the Boundary Crossing Facilities in April 2008. Since the content of the study briefs in respect of the Link Road and Boundary Crossing Facilities are materially the same for the purposes of this case, I shall refer to them singly as "the SB" and collectively as "the SBs".
7. Once a study brief is issued by the Director, the next stage of the process is the preparation by the project proponent of an environmental impact assessment report (s.6(1) of the EIAO). This is an assessment of the environmental impact of the proposed project and must be prepared in accordance with the requirements of the applicable study brief for the project and the TM. The project proponent then delivers the environmental impact assessment report to the Director for approval (s.6(2)).
8. In the present case, the environmental impact assessment report for the Boundary Crossing Facilities ("the BCF EIA Report") and the environmental impact assessment report for the Link Road ("the Link Road EIA Report") (collectively "the EIA Reports") were both prepared by the consultant retained by the HD, namely Ove Arup Partners Hong Kong Ltd. ("Ove Arup"), and were delivered to the Director on 15 June 2009. The EIA Report for the TM-CLK Link ("the TM-CLK Link EIA Report") was prepared by another consultant, namely AECOM, and was delivered to the Director in August 2009.
9. Upon receipt of the environmental impact assessment report, the Director must, within 60 days, decide if it meets the requirements of the relevant study brief and TM or not (s.6(3) of the EIAO). If he decides it does meet those requirements, the Director will advise the project proponent as to the publication of the environmental impact assessment report (s.6(4)). A decision under s.6(3) of the EIAO is necessarily provisional and will be subsumed in the subsequent decision whether or not to approve an environmental impact assessment report under s.8(3) of the EIAO (see below): *Shiu Wing Steel Ltd v Director of Environmental Protection & Anor. (No. 2)* (2006) 9 HKCFAR 478 at §21.
10. In the present case, the Director advised the HD that the BCF EIA Report and the Link Road EIA Report were suitable for public inspection on 13 August 2009.
11. A period of public inspection of the environmental impact assessment report then follows during which members of the public or the ACE may comment on the environmental impact assessment report (s.7 of the EIAO).
12. In the present case, during the consultation period for the BCF EIA Report and the Link Road EIA Report from 14 August 2009 to 12 September 2009, the Director received a total of 1,353 sets of public comments on the former and 1,362 sets of public comments on the latter. As for the ACE, following a meeting on 21 September 2009, the Environmental Impact Assessment Sub-committee ("the EIA Sub-committee") of the ACE requested further information on various

aspects of the air quality assessment in the EIA Reports, which was provided by the HD.[1] At its meeting on 12 October 2009, the ACE considered the report of the EIA Sub-committee and endorsed the EIA Reports with conditions.

13. The Director may call for further information on an environmental impact assessment report if comments have been submitted to her as a result of the public consultation on the environmental impact assessment report or from the ACE (s.8(1) of the EIAO).
14. In the present case, the Director did ask the HD to submit further information on the BCF EIA Report and the Link Road EIA Report on, amongst other things, the issue of the regional air quality assessment.[2] The HD then submitted further information, including a paper entitled "Supplementary Information on Further Elaboration of the Key Assumptions for Regional Air Quality Emission Inventory."[3]
15. Once the Director has received such information, the Director must, within the stipulated time, approve, approve with conditions or reject an environmental impact assessment report for the designated project (pursuant to s.8(3) of the EIAO). Whether an environmental impact assessment report meets the requirements of the TM and relevant study brief is a question of law for the court if the Director's decision is being judicially reviewed: *Shiu Wing Steel* at §23. The court must find the meaning of the TM and relevant study brief and the procedure they prescribe in order to determine the scope of the Director's power to approve the EIA Report: *ibid.* at §25.
16. In the present case, the Director approved the BCF EIA Report, the Link Road EIA Report and the TM-CLK Link EIA Report on 23 October 2009. In doing so, she necessarily concluded that the BCF EIA Report and the Link Road EIA Report both complied with the TM and the SBs.
17. The final stage of the process is the application for an environmental permit to permit the construction of a designated project (s.10(1) of the EIAO). The Director is required to have regard to certain particular matters in granting or refusing an environmental permit (s.10(2)) and may issue an environmental permit subject to any conditions she thinks fit and specifies in the permit (s.10(5)).
18. In the present case, the Director then issued environmental permits for the three projects on 4 November 2009.

An overview of the legal issues

1. The judicial review challenge in the present case is directed at the Director's decisions to approve the BCF EIA Report and the Link Road EIA Report respectively pursuant to s.8(3) of the EIAO and her subsequent decisions, based on the earlier approval of the EIA Reports, to issue environmental permits for those two projects pursuant to s.10 of the EIAO.[4] The applicant's complaints relate to the adequacy of the air quality assessment of the operational phases of those projects in the EIA Reports.
2. It is important to bear in mind the ambit of the grounds of challenge for which leave to apply for judicial review has been granted, since this establishes the parameters of the issues between the parties. I will address the applicant's particular challenges below but, for present purposes, they may be categorised under two broad grounds. First, there are challenges based on the contention that the EIA Reports did not comply with the requirements of the TM and the SBs. Secondly, there are challenges based on the alleged irrationality or *Wednesbury* unreasonableness of the Director in approving the EIA Reports and issuing the environmental permits.
3. So far as the challenge is made on the ground that the EIA Reports did not meet the requirements of the TM and the SBs, the key issue is the proper construction of the TM and

SBs. If the applicant is right, the Director could not lawfully approve the EIA Reports under s.8 of the EIAO or grant the environmental permits in respect of the Boundary Crossing Facilities and Link Road projects under s.10 of the EIAO: *Shiu Wing Steel* at §29. The question of the EIA Reports meeting the requirements of the TM and SBs is for the court to determine: it is a question of construction, albeit the TM and the SBs are to be construed not as legislative instruments but as they would be understood by an expert risk assessor: *Shiu Wing Steel* at §30.

4. It is also important to note what this judicial review is *not* about. The applicant acknowledges that this judicial review does not concern matters of procedural fairness or the lawful exercise of discretion by the Director.[5] In addition, this judicial review does not concern a debate about the wisdom of the decision to construct the HKZM Bridge and the related projects including the Boundary Crossing Facilities and the Link Road. Nor is it a debate about the adequacy of the criteria laid down in the TM and SBs to protect public health. Neither the TM nor the SBs are the subject of challenge in this judicial review. So far as the SBs are concerned, they were promulgated in accordance with the statutory scheme under the EIAO which provides for their preparation after receipt of the project profile and after a period for the ACE and the public to comment on the former. The SBs have, since their issue, been available to the public but have not been the subject of any legal challenge.
5. Nor is this case a debate about the adequacy of the air quality objectives ("AQOs") currently in force in Hong Kong under the Air Pollution Control Ordinance, Cap. 311 ("APCO"). That is a matter of policy and, so long as lawfully determined and executed, policy is not a matter for the courts. No one can seriously question that air quality in Hong Kong is a matter of concern. But, as Reyes J said in *Ng Ngau Chai v The Town Planning Board*, HCAL 64/2007, unrep., 4.7.07 (§28):

"I fully sympathise with Mr Ng's concerns about the deteriorating quality of the environment around Tai Kok Tsui, where he lives. But the Court can only apply law. The Judiciary cannot manage the environment. That is the role of the Executive. …"

The seven main issues

1. The particular respects in which the applicant says the EIA Reports fall short of the EIAO requirements are seven-fold. I shall first summarise the seven main issues and then deal with each of them in greater detail.
2. First, the applicant contends that the TM and SBs require the EIA Reports to provide a quantitative 'stand-alone' analysis of the projected environmental conditions without the Boundary Crossing Facilities and Link Road projects but the EIA Reports fail to do so and erroneously conclude that these projects would have no cumulative residual air quality impact.
3. Secondly, the applicant contends that the TM and SBs require the EIA Reports to explain how the input data used in the PATH model used in the assessment of air quality was compiled and verified and to disclose the results generated by it but this is not done in the EIA Reports.
4. Thirdly, the applicant contends that the assessment year selected by Ove Arup in the EIA Reports, namely 2031, does not represent the reasonably worst-case scenario for background air quality as required by the SBs and has failed to demonstrate how the AQOs will not be breached as a result of the HKZM projects going into operation before 2031.
5. Fourthly, the applicant contends that the EIA Reports failed properly to assess ozone as required by the TM and SBs.

6. Fifthly, the applicant contends that the EIA Reports failed to assess sulphur dioxide (SO_2) as required by the TM and SBs.
7. Sixthly, the applicant contends that the EIA Reports do not provide a quantitative or qualitative assessment of the projects' impact on public health as required by the TM and that the omission of such an assessment means that the Director could not perform her statutory duty under s.10(2)(c) of the EIAO.
8. Seventhly, the applicant contends that the EIA Reports should have but failed to assess the health risk posed by pollutants outside the AQOs, such as toxic air pollutants (TAPs) and fine suspended particulates ($PM_{2.5}$) and hence, the Director did not perform her statutory duty under s.10(2)(c) of the EIAO.
9. The first to fifth contentions summarised above are all allegations of non-compliance of the EIA Reports with the TM and SBs. The sixth and seventh contentions summarised above differ in that they are not solely based on alleged non-compliance with the TM and SBs but instead raise also the issue of whether the Director's decisions to approve the EIA Reports and issue the environmental permits were irrational or *Wednesbury* unreasonable.

Approach to construction of the TM and SBs

1. Since the proper construction of the TM and SBs is a central issue in this case, it is appropriate to consider the approach to construction of those documents.
2. The purpose of the EIAO as declared in its long title is "to provide for assessing the impact on the environment of certain projects and proposals, for protecting the environment and for incidental matters" and this purpose so declared governs the interpretation of the EIAO: *Shiu Wing Steel* at §7. In interpreting the TM and the SBs, the EIAO's purpose of protecting the environment must inform the meaning attributed to the instruments created under the EIAO's authority: *Shiu Wing Steel* §25. This is reinforced by section 1.3.1 of the TM which deals with interpretation of the TM and provides that, where the EIAO defines a term, that term applies.
3. In *Shiu Wing Steel*, the Court of Final Appeal also held (at §30) that:

"… 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."

1. That the TM and SBs are not to be construed as legislative instruments but should be read in a "practical down-to-earth way" is supported by the observations of Sir Thomas Bingham MR (as he then was) in *R v Director of Passenger Rail Franchising, ex p. Save Our Railways* [1996] CLC 589 at p. 601, cited with approval by the Court of Final Appeal in *Shiu Wing Steel* (at §23).
2. As is apparent from the statutory procedure laid down by the EIAO, the TM is a document which applies generally to all designated projects. In summary, it describes: certain preliminary matters (section 1); the purpose and information to be contained in the project profile (section 2); the study brief and scope of issues to be addressed in a study brief (section 3); the objectives and contents of the environmental impact assessment report, the Director's general approaches and methodologies for assessment of that report and the steps to be taken in

reviewing the report (section 4); and other matters leading to the issuing of an environmental permit (sections 5 *et seq.*).

3. A study brief, on the other hand, is project-specific. As noted in the preceding paragraph, the scope of issues to be addressed in a study brief is set according to the guidelines laid down in section 3 of the TM. It sets out the particular requirements of the environmental impact assessment report to be prepared by the project proponent. In *Kowloon-Canton Railway Corporation v Director of Environmental Protection*, EIA Appeal Board Appeal No. 2/2000, unrep., 20.7.01, the Environmental Impact Assessment Appeal Board described the stage of the drafting of the study brief in the following terms (p. 15):

"The drafting of the Study Brief

This follows the exhibiting of the project profile and the receipt of comments from the public and ACE. The drafting of the Study Brief then reflects the relevant concerns of the public and ACE. These concerns and any further matters which the Director requires to be studied should be particularized in it. Where possible the terms should be specific rather than general. The drafting is essential to what follows. Mr. Lindblom Q.C. submits that it sets the agenda for the rest of the process. We agree. Where clarification is required this should be readily requested and helpfully provided."

1. It is also relevant to note that the statutory scheme under the EIAO seeks to strike a balance between two interests. In *Kowloon-Canton Railway Corporation v Director of Environmental Protection*, EIA Appeal Board Appeal No. 2/2000, unrep., 20.7.01, the Environmental Impact Assessment Appeal Board noted:

"There are two main matters of public interest involved. Both are important. The first is the public interest in the protection of the environment upon which the quality of life in Hong Kong will increasingly depend. The second is the public interest in ensuring that major designated projects are brought to fruition in a timely and efficient manner. The time constraints put upon the Director for steps in the process and for his decisions show that the Ordinance aims to satisfy both interests. It is necessary in the implementation of the process that both should be kept in mind. This is so especially when major infrastructural projects (roads, railways, tunnels, reclamation works and the like) which may cause a variety of adverse environmental impacts are proposed."

1. Bearing these general observations in mind as to the approach to construction of the TM and SBs, I now turn to address the particular issues raised in this case.

Issue 1: Absence of quantitative 'stand-alone' analysis

1. The applicant's case is that baseline conditions without the projects in place were not presented in the EIA Reports. In this regard, reliance is placed on the Director's evidence which accepts that only the cumulative environmental impacts (i.e. the conditions with the projects in place) were presented in the EIA Reports:

"As the PATH results give information on the predicted background air quality levels without the project in place, the methodology is capable of addressing the existing or projected environmental conditions without the project in place and has fulfilled the requirements under paragraph 4.3.1(c). While the predicted background levels were modeled and evaluated during the process, only the cumulative

environmental impacts (with the project in place) were presented in the EIA reports for comparison with the established standards and criteria as required under paragraph 3.4.1.4(v)(c) of the SBs." [6]

1. Mr Dykes SC, leading counsel for the applicant,[7] submitted that the failure to present a separate (i.e. stand-alone) analysis of the projected environmental conditions without the projects in place is in breach of the following provisions of the TM, namely sections 4.1.1, 4.2.1, 4.3.1(c), section 4.4.2(g) and Annex 20 §4.6.
2. TM section 4.1.1 provides:

"An EIA report shall comprise a document or series of documents providing a 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 this technical memorandum. The EIA report shall be produced in accordance with the EIA study brief issued by the Director to the applicant."

1. TM section 4.2.1 provides:

"The project-specific study objectives and the detailed scope of any required EIA study shall be set out in a study brief issued by the Director. Typical study objectives may include the following: …".

1. TM section 4.3.1(c) provides:

"The general principles that the Director shall use in evaluating the assessment methodologies are described below:

…

Impact Evaluation: an evaluation of the anticipated changes and effects shall be made with respect to the criteria described in Annexes 4 to 10 inclusive, and in quantitative terms as far as possible. The methodologies for evaluating the environmental impact shall 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 extent the project aggravates or improves the existing or projected environmental conditions;

(iv) the environmental impact during different phases of construction and development of the project; and

(v) evaluation of the seriousness of the residual environmental impacts (see Section 4.4.3)."

1. TM section 4.4.2(g) provides:

"The EIA report shall be reviewed according to the following steps:

…

4.4.2 Quality of the EIA Report: The quality of the EIA report shall be reviewed having regard to the guidelines in Annex 20 and in Section 4.3. 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. In particular, the following factors shall be considered:

…

(g) whether the assessment has considered and compared the environmental benefits and disbenefits of various scenarios with or without the project;".

1. TM Annex 20 clause 4.6 provides:

"Guidelines for the Review of an EIA Report

…

4. Description of the Environment

…

Baseline Conditions

…

4.6 Has a prediction of the likely future environmental conditions in the absence of the project been developed?"

1. Mr Dykes submitted that the absence of an analysis of the conditions without the projects in place meant that it was not possible to ascertain the environmental footprint of the projects. He submitted that it also meant that it was not possible to ascertain the residual impacts of the projects. Without knowing this, it was impossible to know what mitigation measures ought to be required. In respect of the residual impact and mitigation, he referred to TM section 4.3.1(d) and to SB clause 2.1(v).
2. TM section 4.3.1(d) provides:

"Impact Mitigation: the methodologies proposed for mitigation shall give priority to avoidance of impacts. The assessment methods shall be capable of:

(i) identifying and evaluating mitigation measures in order to avoid, reduce or remedy the impacts;

(ii) assessing the effectiveness of mitigation measures; and

(iii) defining the residual environmental impacts, which are the net impacts remaining with the mitigation measures in place."

1. SB clause 2.1(v) provides:

"The objectives of the EIA study are as follows:

…

(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;".

1. Mr Dykes criticised the EIA Reports for concluding (in §5.7.6) that there will not be any residual air quality impacts for the operational phase of the projects. He submitted that this was inconsistent with the position in the Director's skeleton (§29) where the Director did not dispute that some environmental impact would necessarily arise in any given project. Mr Dykes submitted that, because the baseline conditions without the projects in place were not presented, this residual environmental impact is not stated in the EIA Reports and not quantified.
2. In response, Mr Paul Shieh SC, leading counsel for the Director,[8] submitted that the applicant was unable to do more than point to broad principles and wording on a high level of generality in the TM in support of her argument on this issue. He submitted that the applicant was unable to identify words or phrases which impose a positive requirement that the conditions without the project in place should be presented on the face of the EIA Reports.
3. In particular, Mr Shieh submitted that, in terms of presentation of calculations, the only provision in the SB requiring a quantitative prediction of the impact in the future was clause 3.4.1.4(v)(c) of the SB which only required calculations to be done on the basis of the cumulative air-quality impacts at the Air Sensitive Receivers ("ASRs") which would then be compared against the requirements of TM Annex 4 paragraph 1 and that this had been done in the EIA Reports.
4. SB clause 3.4.1.4(v)(c) provides:

"The air quality impact assessment shall include the following:

…

(v) Quantitative Assessment Methodology

…

(c) 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."

1. TM Annex 4 (Criteria for Evaluating Air Quality Impact and Hazard to Life) paragraph 1 provides:

"1 Air Quality Impact

1.1 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;

(b) meet hourly Total Suspended Particulate concentration of 500 microgrammes per cubic metre measured at 298°K (25°C) and 101.325 kPa (1 atmosphere) for construction dust impact assessment;

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

(d) for air pollutants not established under the Air Pollution Control 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."

1. Mr Shieh submitted that this was an explicit requirement to calculate and set out the results of any predictions as to air quality impacts and it clearly related only to the cumulative air quality impact, meaning the aggregate effect of any pollutants produced by the projects themselves combined with sources of pollution from elsewhere. There was no similar provision, he submitted, in which a requirement was set out to present a prediction of air quality on a without project scenario. On the contrary, he submitted that, in other places in the SB, references to impacts were similarly used to mean the ultimate effect or cumulative effect: see e.g. SB clause 3.4.1.4(vi). Mr Shieh contrasted other provisions in the SB which clearly imposed mandatory requirements of presentation such as 3.4.1.4(i)(a) ("[p]rovide"), 3.4.1.4(i)(b) ("[g]ive an account"), 3.4.1.4(i)(c) ("[p]resent") and clauses 3.4.1.4(v)(a) ("shall be presented").
2. Mr Shieh submitted that, when one looks at what is required in terms of the air quality impact assessment in SB clause 3.4.1.4, it is clear that the reference to "background air quality levels" in clause 3.4.1.4(i)(c) was a reference to the background in a historical sense and to the present state of the environment and not any future prediction on the basis of a numerical analysis of a without project scenario. This was reinforced by the subsequent stages identified in clause 3.4.1.4, namely the identification of relevant ASRs (clause 3.4.1.4(ii)), the construction phase impact (clause 3.4.1.4(iii)), the operational phase (clause 3.4.1.4(iv)) and then the quantitative assessment methodology (clause 3.4.1.4(v)). It was also reinforced, he submitted, by reference to SB Appendix B-2 paragraph 3 which concerns the presentation of existing air quality.
3. SB Appendix B-2 clause 3.1 provides:

"Background Air Quality – Estimation Approach

The approach

In view of the difficulties in estimating background air quality using the air quality models currently available, an alternative approach based on monitored data is suggested. The essence of this approach is to adopt the long-term (5-year) averages of the most recent monitored air quality data obtained by

EPD. These background data would be reviewed yearly or biennially depending on the availability of the monitored data. The approach is a first attempt to provide a reasonable estimate of the background air quality level for use in conjunction with EIA air quality assessment to address the cumulative impacts upon a locality. This approach may be replaced or supplemented by superior modelling efforts such as that entailed in PATH (Pollutants in the Atmosphere and their Transport over Hong Kong), a comprehensive territory-wide air quality modelling system currently being developed for Hong Kong. Notwithstanding this, the present approach is based on measured data and their long-term regional averages; the background values so derived should therefore be indicative of the present background air quality. In the absence of any other meaningful way to estimate a background air quality for the future, this present background estimate should also be applied to future projects as a first attempt at a comprehensive estimate until a better approach is formulated."

1. As regards the applicant's reliance on TM section 4.3.1(c), it was contended on behalf of the Director that TM section 4.3.1(c) is only concerned with the methodologies used and that the actual content of the environmental impact assessment report is governed by other relevant parts of the TM and SBs. Furthermore, Mr Shieh pointed out that Mr Dykes accepted that the methodologies used in the present case were capable of addressing the issues identified and that Mr Dykes' reliance was on the first sentence of that section which referred to the evaluation of "anticipated changes and effects". However, Mr Shieh submitted that this evaluation was nevertheless pegged to Annex 4 so that any evaluation could only be on a cumulative basis because that annex sets out aggregate limits.
2. Mr Shieh also submitted that, so far as mitigation was concerned, the requirements for mitigation in the SB were those set out in clause 3.4.1.4(vi) which required mitigation measures only "where the predicted air quality impact exceeds the criteria set in section 1 of Annex 4 in the TM". Hence, he submitted, the phrase residual environmental impact, which was defined in TM section 4.4.3 as "the net environmental impacts after mitigation", was to be understood as being the net impact after such mitigation measures were applied. This was also consistent with the reference to residual environmental impacts in TM section 4.5.1(d) which permitted approval of the EIA Reports if "the residual environmental impacts are within the relevant criteria, unless with sound environmental justifications and without long term serious environmental implications". In that context, residual environmental impacts could not mean the difference between the position with the project in place and without the project in place but rather meant the net position after mitigation. It was therefore not necessary, he submitted, to know the baseline conditions without the projects in place in order to arrive at the cumulative residual environmental impact.
3. I accept that Mr Shieh is correct in his submission that SB clause 3.4.1.4(v)(c) is an express requirement for the EIA Reports to set out the predicted air quality impacts of the projects and that this clause does not require the predicted air quality impacts over time without the projects to be set out. I also accept that Mr Shieh is correct in his submission that SB clause 3.4.1.4(vi) only refers to mitigation measures being required where the criteria in of TM Annex 4 paragraph 1 are exceeded. It follows also that TM section 4.5.1(d) is to be understood as referring to the cumulative residual environmental impact with the projects in place. I therefore accept that these provisions do not assist the applicant and, on the contrary, appear to limit the required air quality assessment to be presented in the EIA Reports to the position with the projects in place.
4. However, I do not accept that this provides an answer to the applicant's complaint of non-compliance in this respect. I noted above that, in *Shiu Wing Steel*, the Court of Final Appeal held that the purpose of the EIAO as declared in its long title governs its interpretation and also

that its purpose of protecting the environment must inform the meaning attributed to the TM and SB, being instruments created under its authority. In this respect, it is pertinent to keep in mind that, as declared in its long title, the EIAO is "to provide for assessing the impact on the environment of certain projects" and "for protecting the environment". The EIAO defines the term "environmental impact" as meaning:

"(a) an on-site or off-site change that the project may cause the environment;

(b) an effect of the change on –

(i) the well being of people, flora, fauna and ecosystems;

…

whether the change or effect occurs within or outside the site of the project".

Plainly, therefore, one of the means by which the EIAO seeks to achieve its purpose of protecting the environment is by assessing the extent to which a project will have an environmental impact. That adverse impact is the change in the environment from the position that would prevail if the project were not implemented.

1. In this jurisdiction, as in others, the protection of the environment is governed by legislation. The particular principles or approaches to environmental protection depend, therefore, on a construction of the relevant legislation and it does not follow, of course, that statutory procedures or approaches applicable in one jurisdiction will necessarily be the same as those in another. It is also clear that there are different approaches and principles that may be adopted in order to protect the environment.
2. For example, the case of *R (on the application of Edwards) v Environment Agency (Cemex UK Cement Ltd, intervening)* [2009] 1 All ER 57 demonstrates that, in England, the relevant regulations (the Pollution Prevention and Control (England and Wales) Regulations 2000) use a combination of two distinct approaches to the control of pollution. One approach, based on European Council Directive (EC) 96/91, is to impose limits on the quantities of polluting matter which a given activity may emit. The other approach, based on Council Directive (EC) 96/92, is to provide a framework for specific directives imposing quantitative limits on the extent to which the environment may be polluted. A specific regulation (Regulation 11(2)) gives effect to the former approach by requiring applicants for relevant permits to satisfy the Environment Agency that they are using the best available techniques calculated to prevent, or at least to minimise, the emission of polluting matter irrespective of whether the emission would cause a breach of an overall pollution limit: see per Lord Hoffmann at §§4 to 6. As the guidance notes issued by the Environment Agency state, the regulations:

"[require] us not to consider the environment as a recipient of pollutants and waste, which can be filled up to a given level, but to do all that is practicable to minimise the impact of industrial activities".

As Lord Hoffmann observed (§6), the remarks of Buxton LJ in *R (on the application of Rockware Glass Ltd) v Chester CC* [2007] Env.L.R. 32 at §§33-39 are to similar effect. In that case, Buxton LJ said (at §34):

"To put it bluntly, those who for their commercial purposes introduce potentially polluting operations have to be closely controlled, and cannot freeload on non-polluting local citizens by simply claiming that the EQS [i.e. Requirements of Environmental or Air Quality Standards] to which we all contribute has not yet been damaged."

1. Does the EIAO incorporate the first approach or does it simply adopt the latter or does it too adopt both approaches? This is a relevant question because, fundamentally, the debate between the parties on this issue boils down to whether environmental protection under the EIAO adopts a scheme whereby the Director is obliged to measure the cumulative impact of a particular project against benchmarks of environmental objectives (the Director's position) or whether it adopts a scheme whereby any change which has an environmental impact is to be identified and measured and then an assessment made as to whether that change is adverse so that measures for mitigation should, if possible, be drawn up (the applicant's position). Put crudely (and to adopt Mr Dykes' analogy), is the environment to be treated like a bucket into which pollutants may be introduced so long as there is still space within the bucket to accommodate them? Or, is it the case that any pollutant introduced into the bucket must be identified and measured and then, if possible, mitigated? If the former, it would be understandable that there would be no requirement for the EIA Reports to present the baseline conditions without the project in place. On the other hand, if the latter, this would lend weight to the applicant's contention that the TM and the SB, properly construed, require the baseline conditions without the projects in place to be presented.
2. Mr Shieh submitted that the cases of *Edwards* and *Rockware Glass* do not support an overarching principle of environmental law that as a rule or principle, when construing the requirements laid down in relevant instruments, it is presumptively not enough if existing standards such as those under the AQOs are satisfied. I accept that may be so but that does not conclusively answer the question I have posed at the beginning of the preceding paragraph as to the approach adopted in the EIAO.
3. In my opinion, the EIAO is to be understood as incorporating the two approaches referred to in *Edwards* and is not to be construed as if the only relevant yardstick is whether particular benchmarks are exceeded. If environmental protection is to be meaningful, it seems to me that it must aim to minimise the environmental impact of any project and, in the case of air quality, by minimising the amount of pollutants released into the atmosphere. It would be contrary to the purpose of the EIAO, which recognises that the environment is worthy of protection, if the statutory scheme in this jurisdiction were to be construed as if it treated the environment like a bucket into which waste may be deposited until it is full. That approach does not protect the environment. Instead, protecting the environment means endeavouring to minimise the environmental impacts of a proposed project.
4. In Introduction to Environmental Impact Assessment (3rd Ed.) by John Glasson, Riki Therivel and Andrew Chadwick, at para. 1.5.3, the nature of environmental impacts of a project are identified as those changes in environmental parameters, in space and time, compared with what would have happened had the project not been undertaken. Air quality is a relevant environmental parameter. The difference between the environmental impact of a particular project and the predicted situation without the project in place can be represented in a graph as a "strip zone", which constitutes the net environmental impact of the project and the authors use a standard diagram to illustrate this. They also state:

"Environmental resources cannot always be replaced; once destroyed, some may be lost for ever. The distinction between reversible and irreversible impacts is a very important one, and the irreversible

impacts, not susceptible to mitigation, can constitute particular significant impacts in an EIA. It may be possible to replace, compensate for or reconstruct a lost resource in some cases, but substitutions are rarely ideal. The loss of a resource may become more serious later, and valuations need to allow for this. Some impacts can be quantified, others are less tangible. The latter should not be ignored. … Finally, all impacts should be compared with the 'do-nothing' situation, and the state of the environment predicted without the project."

I acknowledge that the textbook in question is not addressing the particular statutory scheme under the EIAO and is instead commenting on the scheme in England. However, in my view, the comments are consistent with the statutory purpose of the EIAO and are therefore relevant to the preparation of an environmental impact assessment report under the EIAO.

1. The approach which I consider to be inherent in the EIAO is also supported, in my view, by reference to SB clauses 2.1(iv), (v), (vi) and (vii). These require the project proponent to "identify and assess the air quality impact …" (clause 2.1(iv)), then to "propose the provision of infrastructure or mitigation measures so as to minimize pollution … during the construction and operation of the Project" (clause 2.1(v)), then 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" (clause 2.1(vi)) and then to "identify, assess and specify methods … 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" (clause 2.1(vii)). That is to say, at the first stage of identifying the change in the quality of the air, the project proponent must propose mitigation measures to minimise pollution and this is a prior stage to the identification and mitigation of the residual environmental impacts and cumulative effects, which may call for further mitigation.
2. Furthermore, the provisions of the SB, even if they are not to be construed as requiring a stand alone analysis as Mr Shieh submitted, does not mean that the more general provisions of the TM and EIAO have no relevance. On the contrary, it is clear from EIAO s.6(1)(b) and s.10(2)(d) that an environmental impact assessment report must be compliant with the TM as well as the relevant study brief and so the provisions of the TM remain relevant and are not displaced by the project-specific study brief. Those provisions include: the requirement that the environmental impact assessment report shall provide a detailed assessment in quantitative terms, wherever possible, and in qualitative terms of the likely environmental impacts of a project (TM section 4.1.1); the need for the impact evaluation methodologies to be capable of addressing the projected environmental conditions without the project in place (TM section 4.3.1(c)); and the guideline for review of such a report that asks whether a prediction of likely future environmental conditions in the absence of the project has been developed (TM Annex 20 clause 4.6). Reading those provisions together and in the light of the purpose of the EIAO, I consider that they do require the project proponent to set out a prediction of the environmental conditions that would be expected in the absence of the proposed project.
3. The purpose of the requirement for an environmental impact assessment report is, in my opinion, clearly to provide the Director with relevant information so that she can make a fully informed decision on whether or not to grant an environmental permit. In *Berkeley v Secretary of State for the Environment and Anor* [2001] 2 AC 603, Lord Hoffmann quoted with approval from a UK government publication on the environmental assessment procedures which included the statement:

"One of the aims of a good environmental statement should be to enable readers to understand for themselves how its conclusions have been reached, and to form their own judgments on the significance of the environmental issues raised by the project."

Although that statement was made in the context of the particular statutory scheme applicable in England, I regard it as entirely consistent with the purpose of an environmental impact assessment report in this jurisdiction under the EIAO.

1. In my view, it is highly material for the Director and public to know, for instance, what levels of NO_2 (one of the main air pollutants resulting from a road project) are predicted for the future at the ASRs relevant to these projects with and without the projects in place so that the Director can determine whether those increases in NO_2 levels are acceptable and the public can be made aware of the extent to which the proposed project will change the environmental conditions in the locations in question. If, as I consider the EIAO contemplates, the environment is not to be treated simply as a bucket to be filled up over time, ascertaining that the increases in a particular air pollutant do not exceed applicable guidelines, e.g. the AQOs, cannot be the sole determining factor in a decision whether to grant an environmental permit. Thus, for example, if for a particular road project the predicted levels of NO_2 without the project (i.e. the starting point) would be at 30% of the current maximum under the applicable AQO, a project that would result in those levels reaching 90% of the maximum would, in my opinion, fall to be considered differently to another project in which the starting point is 80% of the maximum. In other words, the footprint of the former (90%-30%) is much greater than that of the latter (90%-80%) and it is only by knowing the starting point (or baseline or stand alone position, to use other terms to describe the same thing) that one is able to measure that footprint.
2. Mr Shieh stressed that there is a danger in requiring an environmental impact assessment report to be too detailed. He referred to *R (on the application of Blewett) v Derbyshire CC* [2003] Env. LR 29 at §§41-42 where Sullivan J held:

"41. … In an imperfect world it is an unrealistic counsel of perfection to expect that an applicant's environmental statement will always contain the 'full information' about the environmental impact of a project. The Regulations are not based upon such an unrealistic expectation. They recognise that an environmental statement may well be deficient, and make provision through the publicity and consultation processes for any deficiencies to be identified so that the resulting 'environmental information' provides the local planning authority with as full a picture as possible. There will be cases where the document purporting to be an environmental statement is so deficient that it could not reasonably be described as an environmental statement as defined by the Regulations (*Tew* was an example of such a case), but they are likely to be few and far between.

42. It would be of no advantage to anyone concerned with the development process – applicants, objectors or local authorities – if environmental statements were drafted on a purely 'defensive basis', mentioning every possible scrap of environmental information just in case someone might consider [it] significant at a later stage. Such documents would be a hindrance, not an aid to sound decision-making by the local planning authority, since they would obscure the principal issues with a welter of detail."

These are sensible caveats that should also apply to an environmental impact assessment conducted under the EIAO. However, it cannot provide a reason for disregarding altogether the need to provide an

environmental impact assessment report which properly identifies the scale of the environmental changes that will be wrought by a particular project.

1. I did not understand Mr Shieh to contend that it would not be possible to provide a stand alone analysis of the environmental conditions without the projects in place. Indeed, Mr Tse's evidence was that the methodologies for evaluating air quality impact were capable of addressing the issues listed in TM secions 4.3.1(c)(i) to (v) and the background levels (without the project in place) were modeled and evaluated during the process. If that is so, including the stand alone analysis so that the Director and public could see what difference the projects will make to the existing environmental conditions would not appear to be an unduly onerous task. There was certainly no evidence to suggest that it would be.
2. Finally, I should address an argument which Mr Shieh advanced which was that it would be unfair to conclude that the EIA Reports were not compliant with the TM and SBs by reason of not including the stand alone analysis of the environmental conditions without the projects in place because this was not raised in the course of the public consultation of those reports or consideration of them by the ACE. In my opinion, this cannot be a valid reason for concluding that a non-compliant environmental impact assessment report is in fact compliant. In any event, there is no suggestion in *Shiu Wing Steel* that a particular matter of non-compliance must be raised at the public consultation stage and cannot later be raised by way of judicial review challenge after the approval of the environmental impact assessment report and grant of an environmental permit.

Issue 2: Lack of presentation of input data in PATH model

1. This issue relates to the use of an air quality simulation system which is a modelling system called Pollutants in the Atmosphere and their Transport over Hong Kong or the PATH model.
2. Air quality modelling seeks to consider three categories of impacts due to emissions from three tiers, namely the project under consideration (tier 1), the sources in the immediate vicinity of the project (tier 2) and matters not covered by the first two tiers (tier 3). In the EIA Reports, Ove Arup used ISCST3 and CALINE4 models for tiers 1 and 2 but proposed using the PATH model for tier 3. The ISCST3 and CALINE4 models are known as Lagrangian models, being models which simulate the impact of one emission source at a time.
3. The PATH model, which was developed by the EPD, seeks to measure the impact of far away sources, i.e. those outside Hong Kong, using what is called a Eulerian model, which uses a grid system to assess the background level of pollutants. The user of the PATH model has to provide emission estimates for each source type and allocate the emissions to each grid box of the PATH model over the study area. The PATH model then simulates the transportation of pollutants based on provided meteorological conditions and the chemical transformation of pollutants according to a mechanism built into the model to predict pollutant concentrations. The concentrations predicted by the PATH model are then used by the tier 1 and tier 2 models as background to produce further refinements using fine scale emissions to calculate the concentration of pollutants at specific receptors. The model is described in greater detail in the evidence of Dr Christopher Fung, a Senior Environmental Protection Officer of the EPD, for the Director but this summary is sufficient for present purposes.
4. The use of the PATH model for the EIA Reports was within the contemplation of the SB as shown by clause 3.4.1.3, which provides:

"The Applicant shall assess the air pollutant concentrations with reference to the relevant sections of the guidelines in Appendices B-1 to B-3 attached to this study brief, or other methodology as agreed by the Director. The Applicant shall also note that the PATH model may be used for estimating the cumulative background concentrations by taking into account **all the major air pollutant emission sources in Hong Kong** and nearby regions."

1. In his evidence, Dr Fung acknowledges that, if the total amount of emissions input into the PATH model is underestimated, then some of the predicted air pollutant concentrations calculated by the model may be lower than their actual concentrations. Also, they may be affected by where the emissions are placed within the grids of the study area. Dr Fung has drawn attention to the fact that the lapse in the update of emission data for the Pearl River Delta ("PRD") may be extremely severe and in a paper entitled "The Challenges of Air Quality Modelling in Hong Kong" ("the Fung Paper") he illustrated this by using the emissions data for 2000 to simulate the conditions in 2004 to illustrate the severe underestimations of concentrations.
2. However, it is Dr Fung's evidence that the problem he identified in his paper does not exist in this case because:

"I understand (and I have been assured) that the emission input used by the consultant as model input is chosen to be on the conservative side, for example, by assuming that the improvement in PRD emission is 'capped' at 2015 level in the sense that it has not been assumed that the level of PRD emission would continue to improve (as it would, realistically) beyond the predicted 2015 level; … These input emission assumptions, among other things, would mean that the pollutant concentrations calculated by the PATH in this case would not lead to under-estimating the emissions for the study years of the HZMB."[9]

1. Mr Dykes' submitted, in respect of this issue, that the applicant's main complaint was not about not being provided with all data fed into the PATH model but, rather, was about the lack of information about the methodology explained by Dr Fung in his evidence but not included in the EIA Reports.
2. He submitted that this was in breach of SB clause 3.4.1.4(v)(a) and TM Annex 20 paragraph 1.5. The former requires the EIA Reports to enable the reader to grasp how the model was set up to simulate the situation under study. The latter requires this to be done in a manner which is comprehensible to a non-specialist.
3. SB clause 3.4.1.4(v)(a) provides:

"The air quality impact assessment shall include the following:

…

(v) Quantitative Assessment Methodology

(a) The Applicant shall apply the general principles enunciated in the modelling guidelines in Appendices B-1 to B-3 while making allowance for the special characteristic of the Project. stage of submissions for **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."

1. TM Annex 20 clause 1.5 provides:

"Guidelines for the Review of an EIA Report

…

Presentation of Information

…

1.5 **Has information and analysis been presented so as to be comprehensive to the non-specialist using maps, tables and graphical material as appropriate?"**

1. **Mr Dykes submitted that the applicant's experts were unable to understand how the PATH model was used in the EIA Reports**. Mr Ormerod, a meteorology and climatology expert, described the PATH model as being essentially a "black box" with little explanation. The applicant's other expert, Professor Hedley, an expert in epidemiology and public health, raised a series of questions in his evidence arising from the **lack of presentation of emissions sources files and data that were input into the PATH model.** These questions are set out in paragraphs 24 to 31 of Professor Hedley's 2nd affirmation.
2. **The use of the PATH model is not mandatory under the SB**. Mr Dykes submitted that, by choosing to use the PATH model, the project proponent bore the responsibility to explain in the EIA Reports why the PATH model was chosen, what data was selected, how this was used in the assessment and its limitations. All this was necessary, he submitted, to facilitate proper consultation as required by the EIAO.
3. Instead, submitted Mr Dykes, the **reader of the EIA Reports is presented with a conclusion** stating that the cumulative impact from the projects is acceptable, but without indicating how this conclusion was reached, contrary to TM Annex 20 paragraph 1.4 (which asks, "Has information and analysis been offered to support all conclusions drawn?"). **Mr Dykes submitted that the conclusion in the EIA Reports was meaningless because the precise terms of the question leading to the conclusion were unknown.**
4. **So far as the applicant's complaint was that the input data in the PATH model was not set out in the EIA Reports,** as pointed out by Mr Tse in paragraph 9(2) of his 2nd affidavit, the EIA Reports set out (in Appendices 5D to 5I) over 150 pages of data showing the calculations and levels of air pollutants emission rates for input into the models adopted in the study. Appendix 5D provided a summary of the emission inventory for 2031 input into the PATH model.
5. **Despite that information, Professor Hedley stated, in his 3rd affirmation, that these Appendices still did not explain how the background air quality assessment was done, what the results of the PATH model were, and what assumptions it was based on and the overall reliability of the twenty-year predictions to 2031**. He maintained that the questions posed in his 2nd affirmation were still not answered.

6. As to the requirement to provide the input data, the following provisions of the TM and SB are relevant.
7. TM Annex 11 provides:

"Contents of an Environmental Impact Assessment (EIA) Report

…

Description of Assessment Methodologies

– Assessment methodologies, assumptions and criteria, including sample calculations and input and output files of a typical model run for all mathematical modelling".

1. TM section 4.3.2 provides:

"For issues described in Annexes 12 to 19, the Director shall evaluate the assessment approaches and methodologies in accordance with the guidelines in these annexes, unless otherwise stated in the study brief. For issues that are not fully covered in these Annexes, the Director shall apply the above general principles." (Emphasis added)

1. SB clause 3.4.1.4(v)(a) is set out above. The second sentence of that clause is to be noted, since it expressly stipulates that the 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" (emphasis added).
2. SB clause 3.4.1.4(vii) provides:

"The air quality impact assessment shall include the following:

…

(vii) Submission of Model Files

All input and output file(s) of the model run(s) shall be submitted to the Director in electronic format."

1. In my opinion, it is clear from the provisions referred to above that the model input files are not required to be presented in the EIA Reports themselves. Instead, I agree with the submission of Mr Shieh that, to the extent additional information of this nature may be required, it may be asked for at the consultation stage of the statutory process under the EIAO. It follows that the complaint of a failure to set out the input data in the EIA Reports is not made out. In any event, Mr Tse has confirmed (in his 2nd affidavit at §§4 and 9(3)) that all the input and output files were in fact submitted to the EPD and independently verified and agreed by the EPD.
2. In his skeleton argument, Mr Dykes made reference to the case of *Eisai Ltd v National Institute for Health and Clinical Excellence* [2008] ACD 77 to support the proposition that it was important to afford interested parties the opportunity of independent verification of a scientific process integral to the decision-making. However, in my opinion, that case is plainly distinguishable on its facts and in any event the case concerned a different issue. There, an

economic model was developed to determine the cost-effectiveness of a drug but was not made available to the interested party and, despite its repeated requests, it was not provided with a fully executable version of the model. The issue in that case was one of procedural fairness in the failure to provide the model. In the present case, the issue is one of compliance with the TM and SB, as a matter of construction. Furthermore, in this case, the PATH model was expressly sanctioned by the TM and SB and any perceived lack of input data could have been raised in the consultation period in respect of the EIA Reports. However, no such concerns were raised.

3. It is perhaps for these reasons that the thrust of the applicant's complaint in respect of the PATH model shifted from that of a complaint of the non-provision of input data to a complaint that details of the operation of the PATH model and its limitations explained in the Fung Paper were not disclosed in the EIA Reports. There was also a complaint about the quality of the information regarding the sources of emissions in the PRD as compared to that for Hong Kong.
4. As to the complaint about the failure to disclose details of the operation of the PATH model and its limitations explained in the Fung Paper, I am satisfied, looking at the EIA Reports themselves, that these disclose and explain clearly the assessment approach being used (paragraph 5.6.1) including the use of two strands of models, namely the PATH model for regional impacts and CALINE4 and ISCST3 for local impacts. The dispersion modelling methodology used by the PATH model is explained at paragraph 5.6.14. This description is, in my view, consistent with the explanation of the PATH model in Dr Fung's affidavit and in the Fung Paper. I do not consider that the contents of the Fung Paper should be read as indicating that the PATH model is in some way misconceived or irredeemably flawed. The point Dr Fung was making in that paper was the perhaps obvious point that the accuracy of pollutant concentrations predicted by the model depends on the accuracy and relevance of the emissions data input into the model. To the extent this point is not self-evident, the evidence of Dr Prasanta K. Misra, an expert in air quality modelling, for the Director (in §4.3 of his report) confirms that these limitations of the PATH model are common to other dispersion models. I cannot see any basis for holding the EIA Reports to be non-compliant with the TM or SB on the basis that these drawbacks in the PATH model were not set out.
5. As to the complaint regarding the quality of the information regarding the sources of emissions in the PRD, the sources and assumptions used in the PATH model in assessing the projects addressed in the EIA Reports are set out in paragraph 5.6.3 for the PRD and paragraphs 5.6.4 to 5.6.13 for Hong Kong sources. Mr Dykes contrasted the level of detail of the latter (concerning Hong Kong sources of emissions) with that of the former (concerning PRD emissions), which were based on a "Mid-term Review Study of Pearl River Delta Regional Air Quality Management Plan" commissioned by the EPD in Hong Kong and the Guangdong Environmental Protection Bureau in November 2006.
6. Although there may be a difference in the level of detail between the sources and assumptions relating to PRD emissions and Hong Kong emissions, I do not consider that this means that the data presented in the EIA Reports is non-compliant with the TM or SB. The emission inventory from all the sources for 2031, whether from the PRD or Hong Kong, were collated in tabular form in Appendix 5D and there is no difference in the way the various pollutants are treated or set out. The first row of the table sets out the PRD emissions as a group and the remaining rows set out the Hong Kong sources. The fact that there is a greater degree of breakdown for the Hong Kong sources is clear from the EIA Reports and the table but that does not lead to the conclusion that there is some flaw in the PRD data. In short, I do not think there is any substance in this point.

7. In his reply submissions, Mr Dykes raised a new point in respect of the use of the PATH model for the purposes of assessing worst case scenarios. The point is based on the differences between the Lagrangian and Eulerian models. Because the Lagrangian model deals with one pollutant at a time, it was possible to calculate the worst case scenario by choosing the particular pollutant to be assessed and maximising the input for that pollutant. The Eulerian model, on the other hand, was not apt to produce an accurate worst case scenario because it deals with multiples of pollutants fed into the PATH model for the purpose of its predictions. Thus, to obtain the worst case scenario, one would have to input the worst case scenario for each input and that would increase the margin of error. Mr Dykes submitted that this limitation inherent in the use of the PATH model in assessing worst case scenarios should have been pointed out in the EIA Reports.
8. I do not consider this point is open to the applicant since it was not raised in the Re-Amended Form 86A Notice, nor was it raised in Mr Dykes' skeleton or opening submissions. Mr Dykes' submission that it is inherent in the evidence, specifically paragraph 13 of Dr Fung's affidavit, is not sufficient to permit it to be raised as a ground of challenge. Those grounds are limited to what is set out in the Re-Amended Form 86A Notice. In any event, I accept Mr Shieh's submission that the evidence of the difference in the operation of the two types of models does not disclose a relevant deficiency in the PATH model since, for the reasons set out in the next section of this judgment, I do not consider that SB clause 3.4.1.4(iv)(a) requires the project proponent to predict a worst case scenario year. Therefore, the inability of the Eulerian model within the PATH model to assess far away sources of pollution individually is not material.
9. Finally, I would add for completeness that, on this issue, Mr Shieh addressed submissions in his skeleton argument on the footing that the applicant's complaint in relation to the PATH model was that the presentation of data in this case had denied the public a right to participate in the public consultation. I did not understand Mr Dykes to advance any such argument on this issue and so I therefore do not propose to address it.

Issue 3: 2031 as reasonably worst-case scenario

1. This issue turns on the construction of SB clauses 3.4.1.4(iv)(a) and 3.4.1.4(iv)(b). These provide:

"Operational Phase Air Quality Impact

(a) The Applicant shall calculate the expected air pollutant concentrations at the identified ASRs based on an assumed reasonably worst-case scenario under normal operating conditions. The evaluation shall be based on the strength of the emission sources identified in sub-section 3.4.1.4(ii)(b) above. The Applicant shall follow sub-section 3.4.1.4(v) below when carrying out the quantitative assessment.

(b) The air pollution impacts of future road traffic shall be calculated based on the highest emission 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. The Fleet Average Emission Factors used in the assessment shall be agreed with the Director. If necessary, the Fleet Average Emission Factors shall be determined by a motor vehicle emission model such as EMFAC-HK model to be agreed with the Director. All the traffic flow data and assumptions that are used in the assessment shall be clearly and properly documented in the EIA report."

1. SB clause 3.4.1.4(iv)(b) therefore contains the concept of selecting the year of assessment for calculating the air pollution impacts of future road traffic. The objective is plainly to select a year with the highest emission scenario. In the EIA Reports (at §5.6.2), **Ove Arup concluded that 2031 would be the year with the highest emission scenario.**
2. The applicant contends that the selection of 2031 as the year of highest emissions has been wrongly applied by the project proponent to satisfy the requirements of SB clause 3.4.1.4(iv)(a). Mr Dykes submitted that whereas clause 3.4.1.4(iv)(b) addresses pollution from traffic emissions, **clause 3.4.1.4(iv)(a) is directed to overall pollution and background air quality**. He submitted that the approach in the EIA Reports demonstrated a misinterpretation and misapplication of the two clauses in that the EIA Reports conclude, for the purposes of clause 3.4.1.4(iv)(b) that 2031 is the year of highest emission strength from the road (i.e. pollution from traffic emissions) and simply adopts that year for the purposes of clause 3.4.1.4(iv)(a) which is directed to the assumed reasonably worst case scenario. In short, the applicant's contention is that the year of assessment in clause 3.4.1.4(iv)(b) is not necessarily the same as the worst case scenario under clause 3.4.1.4(iv)(a).
3. Mr Dykes' argument proceeds on the basis that **the project proponent accepted the assumption that background air quality will continue to improve from now until 2031**. If this is so, he submitted that it could not be the case that 2031 was the worst case scenario. Instead, he submitted, the worst case scenario should logically be at the beginning of the projects in 2015/2016 rather than at the end of the 15 year period.
4. Mr Dykes submitted his construction of SB clauses 3.4.1.4(iv)(a) and 3.4.1.4(iv)(b) was supported by the cross-reference, in SB clause 3.4.1.4(iv)(a), to clause 3.4.1.4(ii)(b) which required the project proponent to 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 in sub-section 3.4.1.4(i)(a)". And in SB clause 3.4.1.4(i)(a), the project proponent was required to provide in the air quality impact assessment "background information relating to air quality issues relevant to the Project, e.g. description of the types of activities of the Project that may affect air quality during construction and operation stages". Therefore, submitted Mr Dykes, clause 3.4.1.4(iv)(a) required the project proponent to identify more than one emission source but this was not done in the EIA Reports.
5. The Director's case on this issue was presented by Ms Eva Sit. She submitted that the applicant's construction of SB clauses 3.4.1.4(iv)(a) and 3.4.1.4(iv)(b) was incorrect. Her construction of the two clauses was as follows.
6. Textually, SB clause 3.4.1.4(iv)(a) requires the project proponent to calculate expected air pollutant concentrations at identified ASRs. The second sentence indicates how the expected air pollutant concentrations are to be identified. The last sentence of SB clause 3.4.1.4(iv)(a) states that the manner in which the quantitative assessment is to be conducted is addressed in SB clause 3.4.1.4(v). That requires the project proponent to identify the key air pollutants (SB clause 3.4.1.4(v)(b)) and to calculate the cumulative air quality impact at the ASRs identified under clause 3.4.1.4(ii) (SB clause 3.4.1.4(v)(c)). There is nothing in SB clause 3.4.1.4(iv)(a) that suggests it is limited to background air quality only, as contended by the applicant. Since the context of the EIA Reports was an assessment of the impact of roads on a bridge, it is logical to focus on the traffic on those roads as the source of pollution since roads do not themselves emit pollutants.
7. Next, Ms Sit submitted that the assessment exercise in the SB required a point in time against which that exercise was to be done so that a figure could be generated to be compared against the relevant benchmark. It is at this point that the concept of an assessment year in SB

clause 3.4.1.4(iv)(b) comes in. That requires the project proponent to identify the highest emission strength from the road within the next 15 years to arrive at a "selected year of assessment". But the selection of that year of assessment is not an end in itself. Once selected, the SB requires air pollution impacts of future road traffic to be calculated (i.e. predicted) for that chosen year.

8. The concept of the "reasonably worst case scenario" in SB clause 3.4.1.4(iv)(a) serves a different purpose from ascertaining the year with the highest emission scenario and is not part of the criteria for choosing the year with the highest emission. The SB does not require the identification of a year which represents the worst case scenario. Rather, once the year with the highest emission is ascertained under SB clause 3.4.1.4(iv)(b), reasonably worst case scenario figures are to be used for the purpose of predicting air pollutant concentrations for that chosen year.
9. Ms Sit therefore submitted there was a unitary concept of one assessment year in SB clause 3.4.1.4(iv). Once that assessment year was identified, the project proponent was required by clause 3.4.1.4(v) to project pollution from the bridge and marry that result (for which it could use the CALINE4 and ISCST3 models) with the projected air pollution for the background (for which it could use the PATH model). In other words, SB clause 3.4.1.4(iv)(b) tells the project proponent how to do the exercise required by SB clause 3.4.1.4(iv)(a) by telling it how to find the assessment year.
10. In my view, Ms Sit's construction of SB clauses 3.4.1.4(iv)(a) and 3.4.1.4(iv)(b) is correct. It is a more natural reading of the clauses, in their context in the SB, that there is to be only one year of assessment identified for the purposes of the quantitative assessment exercise. The reasonably worst case scenario referred to in SB clause 3.4.1.4(iv)(a) does not require the identification of another year of assessment that may be different to that identified under SB clause 3.4.1.4(iv)(b).
11. Ms Sit was also correct, in my opinion, in arguing that there was a further problem with the applicant's construction of SB clauses 3.4.1.4(iv)(a) and 3.4.1.4(iv)(b). The modelling used cannot group all emissions together. Instead, as explained in the EIA Reports (at §5.6.15), whilst traffic emissions for roads beyond Lantau were covered by the PATH modelling, traffic emission for roads in Lantau and the airport roads were assessed using near-field modelling. If, applying the applicant's construction, one were to assume two separate years of assessment, one being the highest traffic emissions and the other being the notionally different worst case scenario year, it would be necessary to have two different assessment years within the PATH model, which cannot have been intended.
12. I therefore do not consider that the EIA Reports proceed on a misinterpretation and misapplication of SB clauses 3.4.1.4(iv)(a) and 3.4.1.4(iv)(b).
13. Underlying the applicant's submissions on this issue was, in effect, a challenge to the choice of 2031 as the selected year of assessment for the quantitative assessment exercise on the basis it was based on assumptions that were optimistic. Insofar as that is the case, this is not a challenge to the compliance of the EIA Reports with the TM or SB but rather is an attack on the merits of the choice of the assessment year. That choice, however, is one for the Director and not for the applicant and her experts, subject to a challenge made on grounds of irrationality or *Wednesbury* unreasonableness. No such challenge has been made and it is therefore unnecessary to address the Director's further submissions (in the skeleton submissions for the Director) that, in any event, such a challenge would be bound to fail.

Issues 4 and 5: Failure to assess ozone and SO_2

1. SB clause 3.4.1.4(v)(b):

"The air quality impact assessment shall include the following:

…

(v) Quantitative Assessment Methodology

…

(b) 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 Discreet 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."

1. The EIA Reports identified nitrogen dioxide (NO_2) and respirable suspended particulates (RSP) (specifically PM_{10}) as the air pollutants of concern: at §§5.1.4 and §§5.2.2 to 5.2.7. In §5.2.5, the EIA Reports noted:

"The maximum hourly concentration of O_3 from 2004-2008 has been relatively high, in the range of 302-403ug/m3, against the AQO of 240ug/m3. However, the proposed project will not generate any O_3. Hence, O_3 is not a pollutant to be assessed in this EIA."

And in §5.2.6, the EIA Reports noted:

"For SO_2 and CO, the pollutant level [sic] are relatively low, in the order of less than 41% and less than 13% of the corresponding hourly AQOs respectively. Hence, SO_2 and CO will not be assessed in this EIA."

1. The issue between the parties is a simple one, namely whether ozone and SO_2 should have been identified as key/representative air pollutants within SB clause 3.4.1.4(v)(b) and evaluated in the EIA Reports.
2. The applicant contends that it is plain that ozone is a key/representative pollutant for five reasons which, in summary, are as follows:

(1) First, it is currently 140% above the AQOs.

(2) Secondly, NO_2 is to be assessed in the EIA Reports so there is no justification for omitting an evaluation of ozone on the basis it is created as a result of chemical reactions, since NO_2 is similarly created.

(3) Thirdly, supplementary information was requested on ozone under EIAO s.8(1).

(4) Fourthly, ozone was raised many times during the consultation by the public and the ACE.

(5) Fifthly, an regional impact must be given special consideration as required by TM section 4.4.3(a)(ix).

1. As for SO_2, the applicant contends that the project proponent's decision in advance that its impact would be insignificant and, hence, that it need not be assessed was precisely the same error that was committed by the project proponent in the *Shiu Wing Steel* case.
2. It is clear from the papers that there was discussion of the question of whether ozone should be included for assessment in the EIA Reports. At a meeting of the EIA Sub-committee on 21 September 2009, a member enquired about the assessment of ozone. In its report from that meeting, the EIA Sub-committee recommended to the ACE that the project proponent be asked to provide an assessment of the change of ozone levels arising from the projects. The issue of ozone was discussed at the ACE meeting on 12 October 2009 (minutes §§37-42). One member registered his reservation about the non-inclusion of ozone in the EIA Reports (§67). All the other members confirmed, however, that they were satisfied with the explanations that had been given and the minutes record "the majority view that the assumptions adopted for air quality assessment were considered reasonable and acceptable" (§77). Public comments were received on the EIA Reports including a comment concerning the levels of ozone in Tung Chung and these were considered in September and October 2009. On 19 October 2009 the Director requested from the project proponent, pursuant to s.8(1) of the EIAO, that it provide, amongst other things, "Supplementary information on Consideration and Assessment of ozone in the EIAs".[10] On 20 October 2009, the project proponent provided the Director with, amongst other things, the requested information on consideration and assessment of ozone in the EIA Reports.[11]
3. The explanation for not including ozone as a key pollutant in the EIA Reports is set out in the paper provided by the project proponent to the Director on 20 October 2009. That explanation is the same as that set out in paragraph 12 of the affirmation of Dr Mak, a Senior Environmental Protection Officer, as follows:

"To put the matter into proper perspective, it should be emphasized that O_3 is a regional air pollution problem which, it is well recognized, affects the Pearl River Delta Economic Zone ("PRDEZ"). Unlike other pollutants such as particulates, NO_x (nitrogen oxides), O_3 is not a pollutant directly emitted from man-made sources but is formed by a set of complex chain reactions between other pollutants (e.g. NO_x and VOC (volatile organic compounds)) in the presence of sunlight. As it would generally take several hours for these photochemical reactions to proceed, O_3 recorded locally could be attributed to emissions generated from places afar. Furthermore, the formation of O_3 is attributable to the cumulative effects of all emission sources in the PRDEZ to which the contribution by the HKBCF and HKLR is minimal (NO_x and VOC from the HKBCF and HKLR only constitute 0.09% and 0.01% respectively of the regional total) [TCW-20]. In other words, O_3 level at Tung Chung is mainly contributed by sources afar. As the project itself would not generate O_3, it is not considered as a key/representative pollutant parameter. The direct effect of the Project is the reduction of O_3 in the immediate vicinity of the roads by the reaction of O_3 with NO emission directly from vehicles. Further downwind of the roads, the O_3 level could be perturbed by the projects' contribution but should be minimal as explained above."

1. The fact that vehicles do not generate ozone directly but instead generate NO_x and a smaller amount of VOC is accepted by the applicant's expert, Mr Ormerod. He also accepts that the formation of ozone by photochemical reaction takes several hours and the ozone recorded in Hong Kong at, for example, Tung Chung could be attributed to NO_x and VOC emissions from afar such that the presence of ozone in Hong Kong is largely attributable to the cumulative effects of all the emission sources in the PRDEZ. Importantly, he accepts that the NO_x generated by traffic using the HKZM Bridge would quickly react with the ozone in the air to

form NO_2 so that the net effect would be a decrease in the level of ozone in the air in the immediate vicinity of the roads.

2. In the case of SO_2, the project proponent's reason for not selecting that as a key pollutant is based on the undisputed evidence that its level between 2004 and 2008 was relatively low compared with the AQOs and steadily decreasing.
3. SB clause 3.4.1.4(v)(b) specifically states that it is for the applicant to identify the key/representative air pollutant parameters to be evaluated and to provide an explanation for its selection. The language of clause 3.4.1.4(v)(b) is very clear: the choice of key pollutants is left to the project proponent, although he must justify his choice. Thus, if he omits to identify a key pollutant or fails to justify the omission, a decision to approve a report in the absence of an assessment of that particular pollutant may be susceptible to judicial review on the ground of irrationality or *Wednesbury* unreasonableness. But as a matter of construction, I agree with the submission of Mr Shieh neither this clause nor any other provision in the TM or SB mandates that ozone or SO_2 must be identified as key pollutants and assessed.
4. I turn to consider the reasons advanced by Mr Dykes in support of his argument that it is plain that ozone is a key/representative pollutant. However, I preface this part of the discussion with the observation that these reasons essentially address a challenge that has not been made, namely that it was irrational or *Wednesbury* unreasonable for the Director to approve the project proponent's decision not to select ozone as a key pollutant, rather than to the question of construction of SB clause 3.4.1.4(v)(b). I would add that, given the project proponent's explanations for not identifying ozone and SO_2 as key pollutants as set out above, I do not consider that irrationality or *Wednesbury* unreasonableness has been established.
5. The fact that ozone is currently above the relevant AQOs may be a relevant factor to be taken into account by the project proponent in deciding whether ozone should be selected as a key pollutant but it does not affect the fact that the choice and justification of that choice are left to him, as a matter of construction of SB clause 3.4.1.4(v)(b). The same point applies to the fact that the EPD identified ozone (and SO_2) as air pollutants in a public consultation document entitled Air Quality Objectives Review published in 2009. The mere identification of an air pollutant in general does not, however, make it necessary to be identified as a key pollutant under SB clause 3.4.1.4(v)(b).
6. I do not accept Mr Dykes' submission that there was illogicality in excluding ozone from selection and assessment because it was not man-made but was instead a by-product of a chemical reaction when NO_2, which was similarly produced, was selected as a key pollutant and assessed. The essential point here is not that ozone was excluded, or NO_2 included, because they were both the by-products of a chemical reaction. Rather it is because the existence or production of one, NO_2, results from the elimination of the other, ozone, that the latter is not a by-product which exists in the vicinity of the projects.
7. The fact that the Director sought further information from the project proponent also does not, in my opinion, affect the proper construction of SB clause 3.4.1.4(v)(b). As noted above, when the Director sought such further information, the project proponent provided supplementary information in which it maintained the opinion that ozone was not a key pollutant and provided further justification for the non-selection of ozone as such. That non-selection and justification was consistent and compliant with the procedure laid down in the SB. For the same reasons, the fact that ozone was identified as a concern by the public and one member of the ACE cannot affect the proper construction of SB clause 3.4.1.4(v)(b).
8. Finally, the applicant's reliance on TM section 4.4.3(a)(ix), which requires consideration of adverse impacts which affect an issue of international or regional concern to be considered when evaluating the residual environmental impacts of a project does not, in my opinion,

require a different construction to be placed on SB clause 3.4.1.4(v)(b) to that set out above. It remains for the project proponent to identify the key pollutants and justify that selection. TM section 4.4.3(a)(ix) cannot be read as requiring the specific inclusion of an assessment of ozone as a key pollutant under SB clause 3.4.1.4(v)(b), even if it is regarded as an issue of regional concern.

9. I return to address Mr Dykes' submission that the omission to assess SO_2 (and ozone) as a key pollutant was the same error as that committed in the *Shiu Wing Steel* case by the project proponent in that case failing to carry out a hazard assessment in respect of a 100% loss scenario. However, the answer to that submission is that the relevant provision in the relevant study brief in the *Shiu Wing Steel* case was very different to SB clause 3.4.1.4(v)(b) under consideration in the context of the present issue. In the *Shiu Wing Steel* case (see §55), clause 3.3.10.1(i) of the study brief required a hazard assessment of the "risk to the life, including the workers of nearby plants, due to … tank farm storage and pipeline transfer of aviation fuel" to be assessed and to identify "all hazardous scenarios associated with … tank farm storage and pipeline transfer of aviation fuel, which may cause fatalities". Thus, the fact that a 100% loss scenario was very unlikely did not affect the fact that a hazard assessment for that scenario must be undertaken. There was no element of judgment to be made in deciding which scenarios required a hazard assessment. Here, in contrast, the choice of key pollutants is expressly left to the project proponent to identify and justify.

Issues 6 and 7: Public health impact

1. The applicant advances discrete criticisms of the EIA Reports in respect of the public health impact of the projects. First, the applicant contends that the EIA Reports do not provide a quantitative or qualitative assessment of the projects' impact on public health as required by the TM and that the omission of such an assessment means that the Director could not perform her statutory duty under s.10(2)(c) of the EIAO.
2. Next, the applicant contends that the Director should not have relied on satisfaction of the existing AQOs to demonstrate there will be no public health impact from the projects and, in doing so, the Director did not perform her statutory duty under s.10(2)(c) of the EIAO.
3. Further, the applicant also contends that the EIA Reports should have but failed to assess the health risk posed by pollutants outside the AQOs, such as toxic air pollutants (TAPs) and fine suspended particulates ($PM_{2.5}$) and, hence, the Director did not perform her statutory duty under s.10(2)(c) of the EIAO.

<u>Quantitative assessment of public health impact</u>

1. As regards the need for a quantitative or qualitative assessment of the projects' impact on public health, Mr Dykes submitted that EIAO s.10(2) clearly requires the impact of a project on public health to be taken into account when issuing permits.
2. EIAO s.10(2) provides:

"Application for environmental permit

…

(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."

The relevant sub-paragraph of s.10(2) is clearly (c) which refers to prejudice "to the health or well-being of people, flora, fauna or ecosystems".

1. Mr Dykes submitted that the requirement in s.10(2) to take into account the impact on public health was reinforced by reference to TM sections 4.4.3(a)(i) and (v) and TM Annex 3 paragraphs (a), (c) and (g).
2. TM section 4.4.3(a)(i) and (v) provide:

"Evaluation of the Residual Environmental Impacts: The residual environmental impacts refer to the net environmental impacts after mitigation, taking into account the background and environmental conditions and impacts from existing, committed and planned projects. When evaluating the residual environmental impacts (the net impacts with the mitigation measures in place), the following factors shall be considered:

(a) the importance of the residual environmental impacts in terms of the following factors:

(i) effects on public health and health of biota or risk to 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;

…

(v) the likely size of the community or the environment that may be affected by the adverse impacts: Those adverse impacts affecting larger numbers of people or greater areas of ecosystem shall be considered of greater importance;".

1. TM Annex 3 is headed "Factors for Consideration in Identifying Adverse Environmental Impacts" and provides in a column under "Effects Resulting from Environmental Changes":

"(a) negative effects on human health, including increases in mortality or morbidity, and/or decreases in personal well-being

…

(c) reduction of the quality or quantity of recreational opportunities, amenities or perceived aesthetics

…

(g) loss of or risk to human lives".

1. Mr Dykes also submitted that TM section 4.3.1(c)(v) required the residual environmental impacts to be evaluated against public health. TM section 4.3.1(c)(v) provides:

"The general principles that the Director shall use in evaluating the assessment methodologies are described below:

…

(c) Impact Evaluation: an evaluation of the anticipated changes and effects shall be made with respect to the criteria described in Annexes 4 to 10 inclusive, and in quantitative terms as far as possible. The methodologies for evaluating the environmental impact shall be capable of addressing the following issues:

…

(v) the evaluation of the seriousness of the residual environmental impacts (see Section 4.4.3)."

1. In practical terms, the applicant contends that a hazard assessment as contemplated by paragraph 2.1 of TM Annex 4 should have been conducted.
2. TM Annex 4 (Criteria for Evaluation Air Quality Impact and Hazard to Life) clause 2.1 provides:

"2. Hazard to Life

2.1 The criterion for hazard to human life is to meet the Risk Guidelines, as shown in Figure 1."

Figure 1 is entitled "Risk Guidelines" and sets out the risk guidelines for acceptable risk levels as being a maximum of off site individual risk not exceeding 1 in 100,000 per year. A graph setting out the societal risk guidelines for acceptable risk levels is also set out which seeks to measure the number of fatalities (on the horizontal axis of the graph) against the frequency of accidents with N or more fatalities per year (on the vertical axis of the graph).[12] Depending on the data input, the result may be acceptable, unacceptable or "ALARP", meaning as low as reasonably practicable (in which case the risk should be mitigated to as low as reasonably practicable).

1. In the applicant's skeleton argument (at §139), the results of such a hazard assessment conducted by Professor Hedley were set out in a graph in the form prescribed by TM Annex 4. It is contended (*ibid.* at §140) that these results show that the increased hazard to life posed by the increases in NO_2 and PM_{10} identified in the EIA Reports are sufficient to trigger an obligation to consider means of reducing their impact to a level as low as reasonably practicable.
2. There can be no doubt that the Director is obliged, when considering whether or not to grant an environmental permit under s.10(2) of the EIAO, to have regard to 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. But I do not think it follows that the project proponent must present a hazard assessment in relation to air pollutants in the EIA Reports. The hazard assessment in TM Annex 4 is, in my opinion, not directed towards the issue of health risks arising from air pollution.

3. The requirement to conduct a hazard assessment is addressed in TM section 12 which provides:

"Hazard Assessment (HA) shall be conducted for projects if, and only if, risk to life is a key issue with respect to Hong Kong Government Risk Guidelines. Reference shall also be made to Section 4.4.3(a)(i) in so far as risk to life is concerned. The need for a HA and its technical requirements and procedures shall be considered by the Director subject to the advice of the authorities stated in Annex 22. The Risk Guidelines are set out in Annex 4 and Figure 1."

1. Turning to TM Annex 22, one sees the "relevant authorities for hazard assessment" are specifically limited to the Director of Electrical and Mechanical Services in respect of the manufacture, storage, use or transport of fuel gas dangerous goods and the Director of Environmental Protection in respect of the manufacture, storage, use or transport of other dangerous goods. There is no reference to any health authority in TM Annex 22. Mr Shieh submitted, and I agree, that the absence of reference to any health authority in TM Annex 22 informs the construction to be placed on "risk to life" in TM section 12 and also in the Risk Guidelines in TM Annex 4.
2. The purpose of Figure 1 in TM Annex 4 is to identify whether the number of fatalities per year measured against the frequency of accidents or occurrences per year is sufficiently high to require the occurrence of the particular accident or occurrence to be treated as unacceptable or to require mitigation. Mr Shieh submitted, and again I agree, that the risk to life addressed in TM section 12 and Figure 1 to TM Annex 4 is dealing with the risk to life posed by accidents, incidences, occurrences or events and not to the health risks posed by long term air pollution.
3. The methodology by which Professor Hedley arrived at his version of Figure 1 to reflect the risk to life from increased levels of NO_2 and PM_{10} is set out in the Re-Amended Form 86A (see pp. 56 et seq.). It would appear from the explanation there set out that the value which Professor Hedley would seek to insert in the vertical axis of the graph is the average individual mortality risk for every $10\mu gm^{-3}$ increase in NO_2 in Tung Chung after the operation of the HZMB projects. However, I am unable to discern from that how it relates to the frequency of accidents referred to in Figure 1. Unlike an industrial accident, e.g. an explosion, where the causal link between the event and a fatality is readily apparent, the causal connection between fatalities and the release of pollutants into the air is not so straight forward. Whilst it is apparent from the evidence that Professor Hedley considers this can be done, for example by the application of an index compiled by him and a team from the University of Hong Kong called the Hedley Index, the fact remains that so far as the requirement to conduct a hazard assessment is concerned, the TM does not require this to be done in relation to the risk to life posed by air pollution.
4. So far as TM section 4.4.3(a)(i) is concerned, I do not read this provision as requiring a hazard assessment to be conducted where TM section 12 and TM Annex 4 do not require this to be done. In my opinion, TM section 4.4.3(a)(i) is too general a provision to override the specific requirement of TM section 12 and TM Annex 4. I also consider the same point applies in respect of the applicant's reliance on TM section 4.3.1(c)(v).
5. The challenge in the present case is not that the SBs should have required a hazard assessment to be conducted. Instead, the challenge is that the EIA Reports do not comply with the TM and

SBs because those instruments, properly construed, required a hazard assessment to be conducted. In my judgment, for the reasons I have set out, that challenge fails.

6. **However, my conclusion that a hazard assessment need not be presented in the EIA Reports themselves does not mean that the Director is relieved from the obligation imposed by s.10(2)(c) of the EIAO to have regard to whether the environmental impact caused by the project is or is likely to be prejudicial to public health. On the contrary, that obligation subsists on the clear wording of s.10(2)(c). There is no evidence that the Director had regard to whether the environmental impact caused by the project is or is likely to be prejudicial to public health beyond the conclusion that the projected air quality would not breach any of the AQOs. It is therefore necessary to turn to consider whether the Director's reliance on the satisfaction of the AQOs was irrational or *Wednesbury* unreasonable.**

<u>Reliance on existing AQOs</u>

1. The applicant's case in this regard is based on the fact that the Director relied on the satisfaction of the AQOs, established under APCO s.7, as proof that there will be no public health impact.
2. Mr Dykes drew a distinction between the EIAO and the APCO. Insofar as the former was concerned with air pollution, he submitted that it was concerned with measuring the impacts on air quality of designated projects and providing the Director as decision-maker with information about those impacts by way of a compliant environmental impact assessment report so that decisions can be made to avoid or minimise the impacts. The APCO, on the other hand, is not concerned with impacts from projects but instead is concerned with the control of the atmosphere over Hong Kong generally. An "air pollutant" is defined in the APCO (s.2) as "any solid, particulate, liquid, vapour, objectionable odour or gaseous substance emitted into the atmosphere" and "air pollution" is there defined as "an emission of air pollutant which either alone or with another emission of air pollutant – (a) is prejudicial to health …".
3. Mr Dykes' submission was that, since the thrust of the EIAO was to assess the evaluation of impacts including that on air quality, if there would be an impact from an air pollutant from a particular project, it must be assessed. Once that assessment is made, it is for the Director to make a value judgment at the stage of considering whether to grant an environmental permit or not as to the significance of the impact. The fact an impact may be within the AQOs may be a factor to persuade her that the impact is acceptable. Similarly, if the air pollutant is not within those covered by the AQOs but within the limits of the APCO, she may be persuaded to grant a permit. But in either case, if there is an impact from air pollution, there must be an assessment by the project proponent.
4. Further, Mr Dykes referred to the fact that TM Annex 4 stipulated that the criteria for evaluating air quality impact shall "include" at (a) the AQOs and "other standards" established under the APCO. He submitted that the Director had misconstrued TM Annex 4 paragraph 1.1(a) to conclude that if the AQOs were not breached there was no need for an assessment of the impact of a particular pollutant. Such a construction deprived the Director of the opportunity at the s.10 stage under the EIAO to decide if the pollutant was harmful.
5. Construing TM Annex 4 in context, paragraph 1 of that annex, dealing with air quality impact, lays down the criteria for evaluating air quality impact as including the AQOs and other standards established under the APCO. The cross-reference to the APCO is natural since that is the ordinance in Hong Kong which, as its long title provides, is "[t]o make provision for abating, prohibiting and controlling pollution of the atmosphere and for matters connected therewith". **In my view, the proper construction of TM Annex 4 requires that air quality impacts should meet the current AQOs and other standards established under the APCO. That is the**

standard against which the TM requires the project proponent to assess the impact of air pollution.

6. Mr Dykes criticised the current AQOs as being less stringent than those adopted by other countries and the guidelines laid down by the World Health Organisation ("WHO"). He referred to a table comparing Hong Kong's existing AQOs with the standards applied in other countries and the WHO guidelines which is an annex to the Government's Air Quality Objectives Review public consultation document. That review was conducted in response to the new WHO air quality guidelines published in 2006.
7. There is no correct or universal yardstick for measuring air quality and the evidence of Mr Tse for the Director was that different countries adopt difference standards, objectives and guidelines for air quality, as is clearly apparent from the table referred to in the preceding paragraph. Mr Tse's evidence is also that, although the numerical values of the limits imposed by different countries may be more stringent than those in the current AQOs in Hong Kong, there are differences in the allowances for exceedances of those limits which make it difficult to compare relative stringency when looking at the numerical limits themselves.
8. **There is certainly a strong case for adopting more stringent AQOs. As the Government's own Air Quality Objectives Review states (at §3.5):**

"[t]he current AQOs are lagging behind those being pursued by other developed countries/economies in at least two aspects –

(a) they allow for much higher concentration levels of key pollutants; and

(b) they do not provide for the assessment of fine suspended particulates (FSP or $PM_{2.5}$), which has been scientifically proven to have greater adverse impact on human health than PM_{10}."

Indeed, the Air Quality Objectives Review has proposed that more stringent AQOs be introduced but those proposed AQOs are still at the consultation stage.

1. However, as recognised by Hartmann J (as he then was) in *Clean Air Foundation Ltd & Anor v The Government of the HKSAR*, HCAL 35/2007, unrep., 26.7.07 at §38, the establishment of the AQOs is a matter of policy and:

"… 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."

The fact remains, therefore, that the current AQOs represent the current policy of the Government as regards the acceptable level of air pollutants having taken into account a number of factors including public health.

1. Thus, although suggestions were made at the ACE and public consultation stage in respect of the EIA Reports in the present case that the proposed AQOs or WHO guidelines should be applied instead of the existing AQOs, it is not for the court to impose a new policy in this regard. To do

so would be to trespass on the balancing process which is the exclusive domain of the Executive.

2. There is clearly considerable room for reasonable disagreement as to the standards to be adopted for air quality and, in the circumstances, I am not persuaded that the Director's application of the current AQOs in considering her decision under s.10(2) of the EIAO was irrational or *Wednesbury* unreasonable.
3. I do not consider this conclusion is affected by the applicant's reliance on various provisions in the TM, including: TM section 3.4 which requires that the assessment shall be based on the "best available information at the time of the assessment"; the TM section 4.4.3(a)(x) requirement to apply the precautionary principle where adverse environmental impacts are uncertain; and the requirement in TM section 4.4.2(f) to consider whether adverse environmental effects are avoided to the maximum practicable extent. In my opinion, those provisions are too general to override the provisions of TM Annex 4 paragraph 1.1(a) stipulating the requirement to meet the AQOs.

<u>Failure to assess pollutants outside the AQOs</u>

1. Toxic air pollutants ("TAPs") and fine suspended particulates, or particulate matters with particle sizes of less than 2.5 microns ("$PM_{2.5}$"), were not assessed under the EIA Reports. As established by the evidence, these are known to be pollutants harmful to public health. There is evidence that the Government has been aware of the harmful effects of TAPs and $PM_{2.5}$ as reflected in a consultancy study commissioned by it in 2003: viz. Assessment of Toxic Air Pollutant Measurements in Hong Kong, Final Report, section 7.2. However, they are not covered by the current AQOs.
2. The applicant contends the mechanism in TM Annex 4 paragraph 1.1(d) should have been used to formulate applicable standards for these pollutants not established under the APCO. TM Annex 4 (Criteria for Evaluation Air Quality Impact and Hazard to Life) paragraph 1.1(d) is set out in paragraph 63 above.
3. There are two aspects to the applicant's challenge. First, whether the TM required the establishment of relevant standards for the assessment of TAPs and $PM_{2.5}$ as a matter of construction and, secondly, whether the Director's failure to insist on the assessment of TAPs and $PM_{2.5}$ in these projects was irrational or *Wednesbury* unreasonable.
4. The first aspect is a matter of construction. In this regard, as noted above in the context of the discussion of the failure to assess ozone and SO_2, the choice of key pollutants is for the project proponent. In the context of these projects, it is those key pollutants that TM Annex 4 is addressing. If the project proponent has not identified TAPs and $PM_{2.5}$ as key pollutants, then there is no requirement to apply TM Annex 4 paragraph 1.1(d) to require standards or criteria for air pollutants not established under the APCO to be agreed with the Director.
5. The applicant relied on TM section 3.2(d) to support the submission that the project proponent was required to agree standards for the assessment of TAPs and $PM_{2.5}$ since the expert evidence demonstrated that TAPs are assessed in environmental impact assessments overseas. TM section 3.2(d) provides:

"In setting out the scope of the issues to be addressed, the Director shall have due regard to the factors listed in Annex 3, other guidelines and criteria laid down in this technical memorandum, and the following criteria in limiting the scope of the EIA study:

…

(d) experiences on actual implementation of similar projects, scientific researches or overseas experiences show that a particular aspect of the project has potential to cause serious environmental effects."

1. However, TM section 3.2(d) is addressing what should be set out in the relevant study brief for a particular project and, therefore, I do not consider that it requires TM Annex 4 paragraph 1.1(d) to be construed to mean that, simply because TAPs may be included in environmental impact assessments for particular projects overseas, they must inevitably be assessed in the EIA Reports in the present case.
2. Mr Dykes made reference to environmental impact assessment reports for other projects (Cape Collison Crematorium, Wo Hop Shek Crematorium and a biodiesel plant at Tsueng Kwan O Industrial Estate) in which dioxins and TAPs had been required to be assessed under the relevant study briefs. However, express provisions in other study briefs requiring the assessment of those particular pollutants cannot, in my view, guide the construction of the different provisions in the SBs in the present case.
3. Turning to the second aspect of the applicant's challenge, the question is whether the Director was irrational or *Wednesbury* unreasonable in not insisting that TAPs and $PM_{2.5}$ should have been assessed in the EIA Reports and requiring appropriate standards for those pollutants to be agreed with her under TM Annex 4 paragraph 1.1(d).
4. Whilst Professor Hedley and Mr Ormerod for the applicant have put forward evidence to support the fact that TAPs and $PM_{2.5}$ present health risks, there is no evidence that TAPs and $PM_{2.5}$ were raised as matters of concern at the stage of public consultation in respect of the EIA Reports.
5. The evidence of Dr Mak Shing Tat, Senior Environmental Protection Officer (Air Stream) of the EPD, is that the EIA Reports are consistent with environmental impact reports for other road projects in identifying NO_2 and RSP as the key/representative air pollutants and in not identifying TAPs as such. Vehicle related TAPs in Hong Kong are maintained at relatively low levels compared with overseas standards and guidelines (Table 1 in §33 of his affirmation). His evidence is that the alignment of the Boundary Crossing Facilities and Link Road are sufficiently far from the major populated areas of Tung Chung so that their contribution to TAPs is expected to be minimal.
6. So far as the pollutant $PM_{2.5}$ is concerned, the Director's case is that this is subsumed within PM_{10}, i.e. RSP, and so is a pollutant assessed in the EIA Reports against the relevant AQOs for PM_{10}: per the affidavit of Mr Tse at §38. It is apparent from the comparative table of international standards and guidelines that there is no uniform practice of treating $PM_{2.5}$ separately to PM_{10}. The current review of AQOs is considering whether to adopt and establish new AQOs for $PM_{2.5}$ separately to those for PM_{10}.
7. In the circumstances, I accept the submission of Mr Shieh that it was not irrational or *Wednesbury* unreasonable for the Director not to insist on the selection of TAPs and $PM_{2.5}$ as key/representative pollutants for the purposes of the EIA Reports or to approve the EIA Reports without requiring the project proponent to agree standards for assessing those pollutants. In short, there is nothing to demonstrate that issues concerning these pollutants from these particular projects were raised so that it would be perverse for the Director to proceed to approve the EIA Reports and grant the environmental permits in the absence of TAPs and $PM_{2.5}$ being assessed in the EIA Reports. Whilst $PM_{2.5}$ may be separately classified in new AQOs, until that occurs, I am not persuaded the Director can be said to be acting irrationally or *Wednesbury* unreasonably in treating them as being in the same category and subject to same standards as PM_{10}.

Conclusion and costs

1. For the reasons set out above, although I reject the applicant's contentions on issues 2 to 7, I hold that she is correct in her contention on issue 1, **namely that the absence of a stand alone analysis in the EIA Reports means that they do not comply with the TM and SBs**. It therefore follows that the Director had no power to approve them, nor did she have power to grant the environmental permits for the two projects in question: see *Shiu Wing Steel* at §29. It follows that the decisions of the Director under challenge must be quashed and I so order.
2. In conclusion, I would add that the quashing of the Director's approval of the EIA Reports and the environmental permits for these projects is not a judgment on the merits of the projects themselves nor on the question of whether, despite any adverse environmental impact caused by those projects, their benefits may nevertheless justify the grant of environmental permits. Once the adverse environmental impact of the projects are properly assessed and presented in compliant environmental impact assessment reports, those will be decisions for the Director and not for the court.
3. Finally, as to the question of costs, the applicant has succeeded but only on one of the various grounds relied upon. She is therefore entitled to some, but not all, of her costs of this judicial review. If the judicial review had been limited to the issue on which she succeeded, the hearing before me would, in my view, have lasted one day rather than the three it did and therefore, adopting a broad brush approach, I make an order *nisi* that the Director is to pay one-third of the applicant's costs of this judicial review, such costs to be taxed if not agreed. The applicant's own costs are to be taxed in accordance with the Legal Aid Regulations.

(Joseph Fok)

Justice of Appeal

Mr Philip Dykes SC and Mr Dennis W H Kwok, instructed by Messrs Yip, Tse & Tang (DLA), for the Applicant

Mr Paul Shieh SC and Ms Eva Sit, instructed by Department of Justice, for the Respondent

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[1] Report on the 110th EIA Sub-committee Meeting §§22 and 23 [Bundle of Exhibits, Vol.6, Tab 46].

[2] Letters from the Director to the HD dated 19 October 2009 [Bundle of Exhibits, Vol.7, Tab 53].

[3] Letters from the HD to the Director dated 20 October 2009 [Bundle of Exhibits, Vol.7, Tab 54].

[4] So far as the TM-CLK Link EIA Report is concerned, the applicant contends that its methodology and conclusion suffers from the same problems and deficiencies as the EIA Reports. However, since the HKZM projects are all inter-connected, the applicant says she does not intend to challenge the TM-CLK Link EIA Report and the environmental permit for the TM-CLK Link to avoid complicating this application: see Re-Amended Form 86A Notice at §59.

[5] Applicant's Skeleton §6.

[6] See the affidavit of Mr Tse Chin Wan, the Assistant Director (Environmental Assessment) of the Environmental Protection Department ("EPD"), at §120.

[7] Appearing with Mr Dennis W.H. Kwok.

[8] Appearing with Ms Eva Sit.

[9] Affidavit of Christopher Fung §29.

[10] Letters from the Director to the HD dated 19 October 2009 [Bundle of Exhibits, Vol.7, Tab 53].

[11] Letters from the HD to the Director dated 20 October 2009 [Bundle of Exhibits, Vol.7, Tab 54].

[12] This graph is reproduced in §36 of the judgment of the Court of Final Appeal in *Shiu Wing Steel*