EIA Training and Capacity Building Programme for Government Works Departments

TRAINING MANUAL FOR THE EIA MECHANISM

(second edition)

January 2005

Environmental Protection Department

Note:

The second edition of this Training Manual contains two additional chapters in Part Four of the Manual, namely the Cultural Heritage Impact Assessment in a Nutshell and the Landscape and Visual Impact Assessment in a Nutshell and provides a supplement to the EIA Training Manual for the EIA Mechanism published by the Environmental Protection Department in September 2003.

HOW TO USE THIS MANUAL

Important Note

This Manual is for training purposes ONLY, and should not be taken as an interpretation of the law. Readers are advised to refer to and follow the provisions and requirements in the EIA Ordinance (EIAO) (Cap. 499) and the Technical Memorandum on the EIA Process for that purpose. Each case has to be considered on its own merits.

What to expect?

This Manual is developed based on resources and information from the EIA Training and Capacity Building Programme for Government Works Departments. With a view to sharing EIA knowledge with professional engineers, architects and others, this training manual focuses on the EIA mechanism, that links to a project life cycle, i.e. from project conceptual stage till implementation, irrespective of whether a project is a designated project under the EIAO.

Part One of this Manual is an introduction of this Manual.

Follow-up & Resources

Readers are welcome to visit our Cyber EIAO Help Bench (http://www.epd.gov.hk/eia/hb) on the EIAO Webpage (http://www.epd.gov.hk/eia/eiao_support) for detailed information. This manual is also available on the website http://www.epd.gov.hk/eia/eiao_support

In addition, readers can call our EIA Helpdesk at 2802 3111 for enquiries on EIAO procedures.

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PREFACE

PREFACE

The Policy Objectives 2001 outlined that the EIA mechanism provided for under the EIA Ordinance (EIAO) plays a significant role in balancing the need to protect the environment and development needs. It helps project proponents to pay due regard to environmental protection requirements, through evaluating potential impacts on the environment and necessary prevention and mitigation measures, at the early stages of project planning and design. Effective operation of the EIA mechanism is very important as development pressures continue to increase.

The Policy Objectives 2001 thus targeted to enhance the advisory role of Environmental Protection Department (EPD) in the implementation of the EIAO and to draw up a training and capacity building programme for relevant government departments to enhance their understanding of the EIA mechanism.

The EIAO Support Section was established in June 2002 under the Environmental Assessment and Noise Division of EPD to provide further assistance to the continuous effort of EPD in promotion of better understanding of the EIA mechanism. Since implementation of the EIAO, with a view to improving communication and building up stakeholders' capacity, EPD has implemented a variety of actions/measures. They include the following:

- Four Users Liaison Groups have been run since May 2000 to provide forums for government departments, consultants, contractors and private developers & utility companies to enhance communication, share experience on the EIA process;
- Eight sets of guidance notes were issued in January 2002 to enhance good EIA practices;
- A "Cyber EIAO Help Bench" was launched in January 2002 with information on EIA Ordinance including guidelines, good EIA practices, approved EIA reports etc. to enhance users-friendly access of information and a "one-stop-shop" on-line help facility on EIA applications.

As the EIAO Support Section is committed to deliver a training programme for relevant government departments in 2002-03 to enable staff in works departments to build up their capacity to better manage and understand the EIA mechanism, the Director of Environmental Protection has commissioned a hire of service to provide tailor-made seminars and workshops; training materials and necessary technical and professional supports.

Introduction

I. ABOUT THE EIA TRAINING AND CAPACITY BUILDING PROGRAMME

The training programme was conducted in 2002/03 with audience comprising professional engineers, architects and officers in works departments under the Environment, Transport and Works Bureau (ETWB) of the Hong Kong SAR Government. Works departments include Highways Department, Territory Development Department, Civil Engineering Department, Drainage Services Department, Water Supplies Department, Architectural Services Department, Electrical and Mechanical Services Department and Transport Department were participated in this training programme. Participants are in a majority responsible for management and/or implementation of projects that usually interact with the EIA mechanism.

The key objectives of the training programme are to:

- Enhance understanding of the EIA mechanism and roles of different parties in the process;
- Strengthen capacity and skills in EIA management for effective operation;
- Share experience over EIAs and good practices; and
- Introduce "know-hows" and practical tips to identify environmental impacts (and how to deal with these issues) at different stages of project lifecycle.

A half-day seminar was held on 13 November 2002 for approximately 180 senior engineers and professionals from various government departments aimed at providing a strategic overview of the EIA mechanism and other fundamental issues. Respectful speakers from the ETWB and the Advisory Council on the Environment (ACE) were invited to talk on topics related to successful experiences of the EIA process with a view to demonstrating how EIA could assist, rather than hinder, development and infrastructure projects.

Also, a series of tailor-made workshops were held during November 2002 to February 2003 for eight works departments aimed at assisting them to further understand the EIA mechanism as well as providing professional advice and guidance for achieving better environmental outcomes through the EIA process. Workshops are designed to be interactive so that participants can explore the practical and effective execution of the EIA mechanism. Workshops are designed with specific themes for each department, e.g highways, drainage, reclamation works, etc. Key environmental issues associated with these themes have been discussed in details at the workshops. The common difficulties encountered during the EIA process and misconceptions of the process have been explored and clarified from the Authority, Project Proponent and Consultant's point of views.

Approximately 200 professional engineers/architects from all eight works departments under the ETWB participated and were trained in the workshops.

II. ABOUT THIS TRAINING MANUAL

This Training Manual has been developed based on the course materials and experiences gathered throughout the workshops. It aims at providing the project proponents, especially the engineers from the works departments, with knowledge, guidance, technical information and skill sets of conducting an effective EIA.

The Training Manual is to:

- Enhance understanding and knowledge on the EIA mechanism;
- Offer advice and assistance to deal with common concerns and questions raised by project proponents in the EIA mechanism;
- Provide information, tools and tactics for users to acquire knowledge and skill in conducting EIA and managing the consultants;
- Provide practical tips/techniques to users to overcome common encountered problems during the EIA process; and
- Clarify common misconceptions of EIA.

III. MANUAL CONTENT

The information contained in this manual is arranged from the simple to the more advanced, allowing readers to understand basic principles from beginning of the EIA process and gradually work the way to more technical aspects. The manual is in seven parts:

Part 1: **Before you start the EIA process**

Part 1 is basic information about how the EIA mechanism interacts with project life cycle. For better planning, a project proponent should get an understanding of the basics of the EIA mechanism before starting a project. Section 1.6 is a general guide on application of this Manual in conjunction with the Public Works Proponents.

Part 2: **Learning the fundamentals**

Part 2 is the fundamentals and basic principles of the EIA mechanism. This is an extremely important section allowing a good start of the EIA process.

Part 3: **Getting an EIA process started**

Part 3 is a guide to start an EIA process including how to conduct EIAs with focus and what to look for from the environmental consultants.

Part 4: **Getting to know your EIA report**

Part 4 is on the knowledge and information about technical aspects of the EIA process.

Part 5: **Improving the EIA process**

Part 5 is dedicated to those readers who have mastered the fundamentals and want to improve and achieve a smoother and a more effective EIA process. A proactive management approach is very important.

Part 6: **Better environmental outcomes**

Part 6 will discuss the practical techniques and lessons learned from real cases. Once you have improved the knowledge and skills and have better appreciation of the EIA process, you should be able to contribute for better environmental outcomes.

Part 7: **Useful Resources and Guidelines**

Part 7 is some useful resources and materials for future reference and self-study purpose.

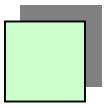
Throughout this Manual, you will notice a number of boxes and symbols, they are intended to emphasize certain points that are important to readers for the understanding of the EIA process.

Very Important Point.
This symbol points out some basic principles that need thorough understanding before continuing.

Complete No-go.
This is a common mistake or misconception. This is something we need to be aware of and not to do.

Hot Tip.
This is a suggestion and technique that comes from experiences learned. This will help in improving the EIA process.

FAQ.
This is the frequently asked question. This will provide you advice and assistance to deal with common concerns and questions raised by project proponents.



Definition and Fact Sheet.
This will contain terms, definitions and factual information in an easy-to-understand manner to give you extra appreciation of the information.

Watch Out.
This symbol points out a topic deserves careful attention. You need to know this information before continuing.

Getting Technical.
When the information is getting a bit technical, we will let you know so that you can study carefully.

PART ONE - BEFORE YOU START THE EIA PROCESS

1. BEFORE YOU START THE EIA PROCESS

1.1 PURPOSE AND NEED OF THE EIA MECHANISM

The Environmental Impact Assessment (EIA) Mechanism is a planning and decision making tool spanning a project development lifecycle. A brief review of its uses by different countries is presented in Section 2.1

An EIA may be applied in feasibility and design stage, or even in project conceptual stage. After predicting likely environmental impacts, **an EIA identifies alternative solutions or design measures to avoid or minimize problems and outlines ways to improve environmental performance of a proposal or project**. The aim of an EIA is to ensure that potential environmental problems are foreseen and avoided **at an early stage** in planning cycle so as to pre-empt problems (See Figure 1.1).

There are sometimes confusions over the interpretation of 'EIA mechanism' and the 'EIA under the EIAO'. The EIA mechanism is **a process starting right from conceptual stage till implementation**, irrespective of whether a project is a designated project under the EIAO. The EIAO process is a part of the EIA mechanism.

Like economic analysis and engineering feasibility studies, the EIA mechanism is a management tool for decision makers or engineers. A designer that develops a project suiting local environmental settings/ conditions is more likely to complete project on time and within budget.

Figure 1.1 illustrates a typical project life cycle.

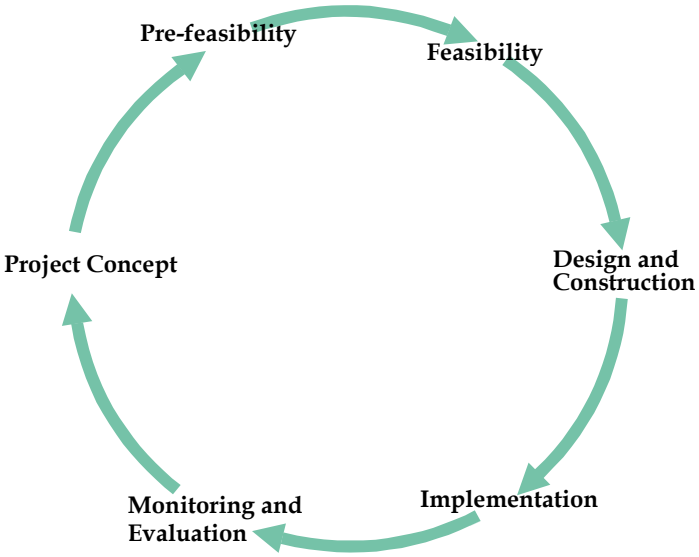


Figure 1.1 Typical Project Life Cycle

1.1.1 *Project Life Cycle and the Need for Environmental Considerations*

"Conventional Way of Running a Project"

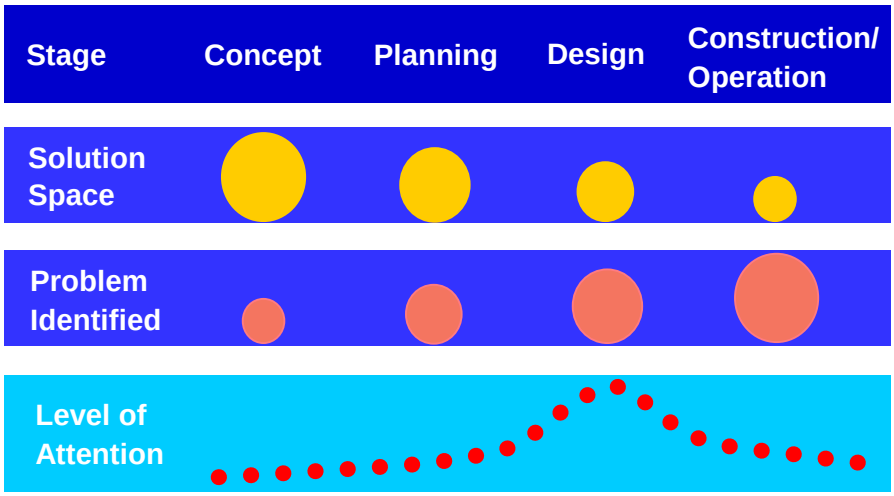
- Level of attention to environmental issues/problems during project concept and planning stage is low.
- Environmental problems are often identified at late stage of the project life cycle, such as detailed design and construction stage, with limited solution space.

Problems Encountered

Late focus might affect the overall project programme.

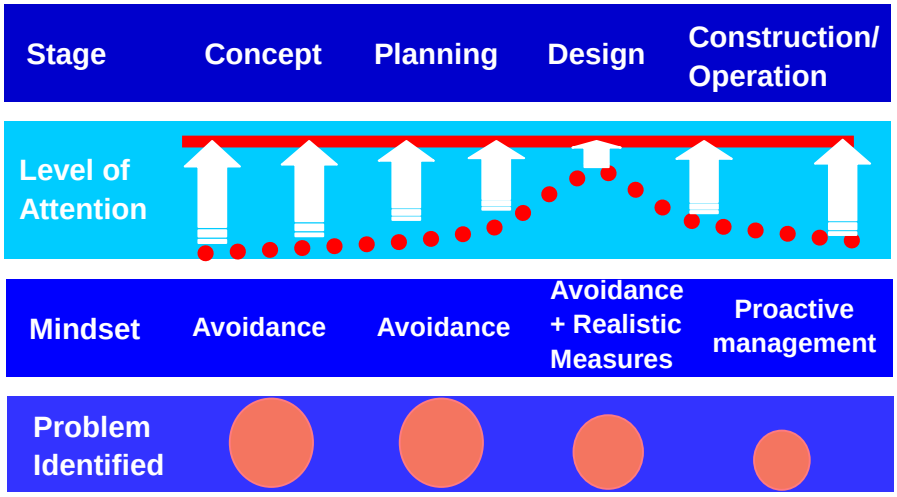
Conventional Approach of running a Project

Solution space decreases over time in project planning hence a need for early focus



"Recommended Approach"

Early dialogue and involvement - Need for a Mindset Change



There is a need to increase the level of environmental attention during early stage of a project so as to increase the solution space. A proactive approach during early planning stage shall be adopted by integrating the EIA process into the project planning cycle.

Benefits

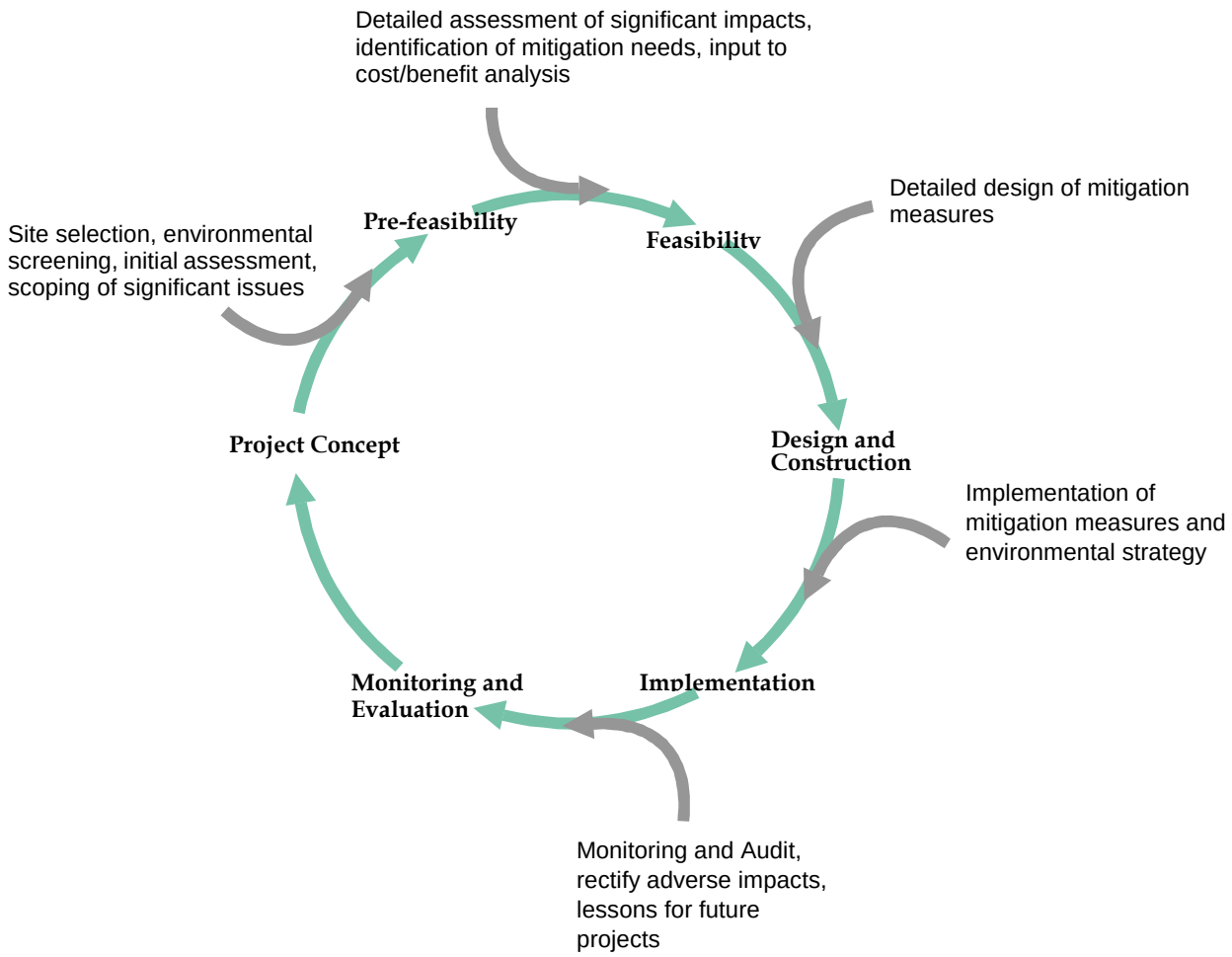
- Smooth project running and minimize public comments and objections (See Case Study in Section 1.7.2 of Part One of this Manual : HEC's 1,800MW Gas-fired Power Station at Lamma Extension)

1.2 *INTERACTION OF PROJECT LIFE CYCLE WITH THE EIA MECHANISM*

The EIA mechanism provides important information for decision making.

Figure 1.2 illustrates how environmental considerations integrate with the project life cycle, showing when and how an EIA can contribute positively to the project progress.

Figure 1.2 Integration of Project Life Cycle with the EIA mechanism



A thorough evaluation of environmental considerations in the early stage of project life cycle helps pre-empt environmental problems which might otherwise lead to uncertainties or even delay at later stage of project implementation. It is also very important that a project proponent should identify and avoid environmental problems, especially in project conceptual stage, by maintaining a close liaison with relevant authorities and parties involved during the whole project life cycle.

1.3 *SNAPSHOTS FOR EIA ORDINANCE IN THE EIA MECHANISM*

Commentaries in a Nutshell

What is the EIA Ordinance (EIAO)?

An Ordinance to provide for assessing the impact on the environment of certain projects and proposals for **protecting the environmental** and for incidental matter.

Why?

The Policy Objectives 2001 stated that the EIA mechanism provided for under the EIA Ordinance plays a significant role in balancing the need to protect the environment and development needs. It helps project proponents to pay due regard to environmental protection requirements, through evaluating potential impacts on the environment and the necessary prevention and mitigation measures, at the early stage of project planning and design.

When?

The EIAO went into effect on 1st April 1998.

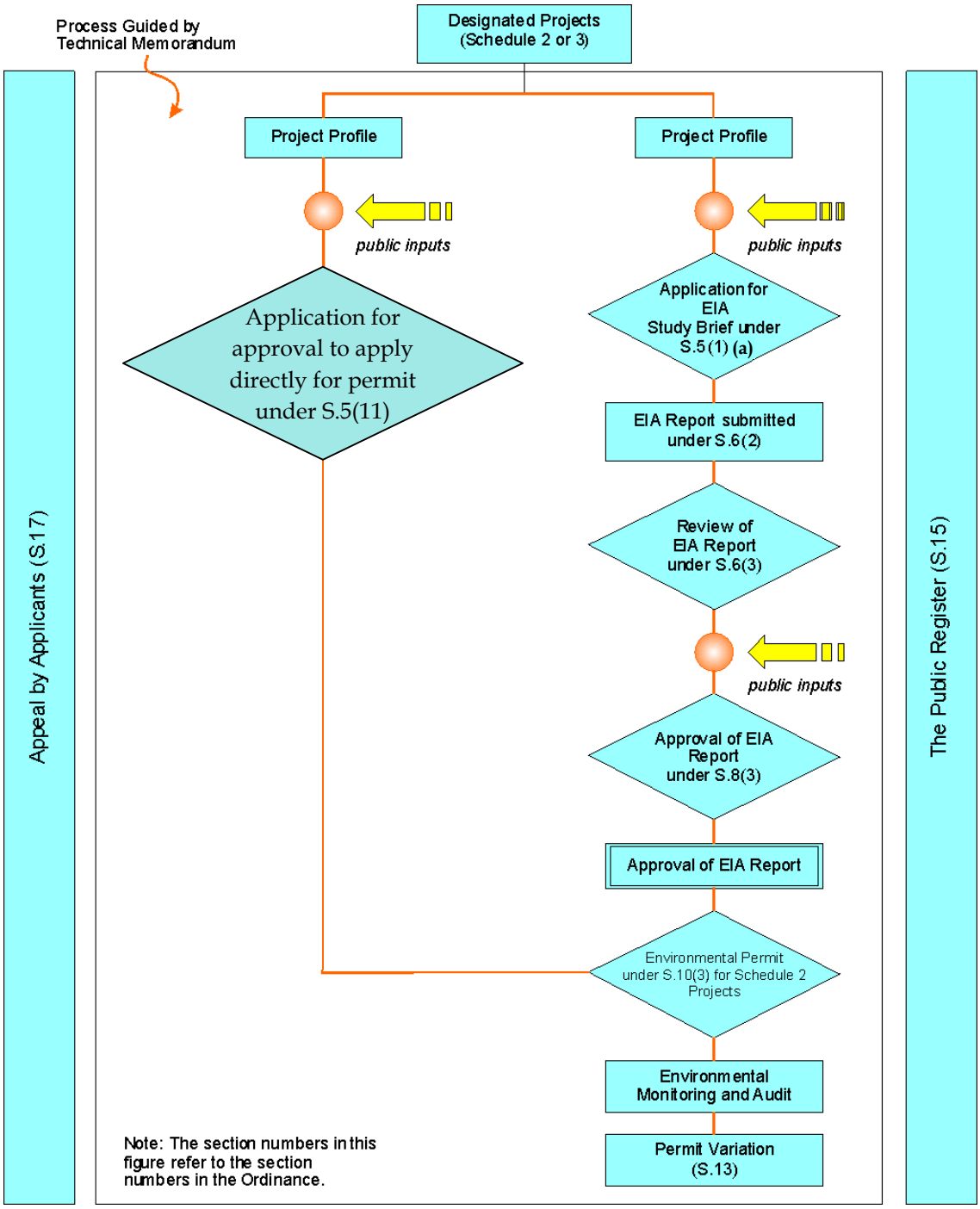
How?

- The list of Designated Projects (DP) in Schedule 2 & 3 of the Ordinance are those having potential for adverse environmental impacts. They are drawn from a list of completed or on-going EIA studies.
- If the project is classified as a DP, it will need to go through the EIAO procedure.

Whom?

- A person shall not construct or operate a DP without an Environmental Permit.

Figure 1.3 The Statutory Environmental Impact Assessment Process



(Source: Figure 1 of "A Guide to the Environmental Impact Assessment Ordinance, Environmental Protection Department)

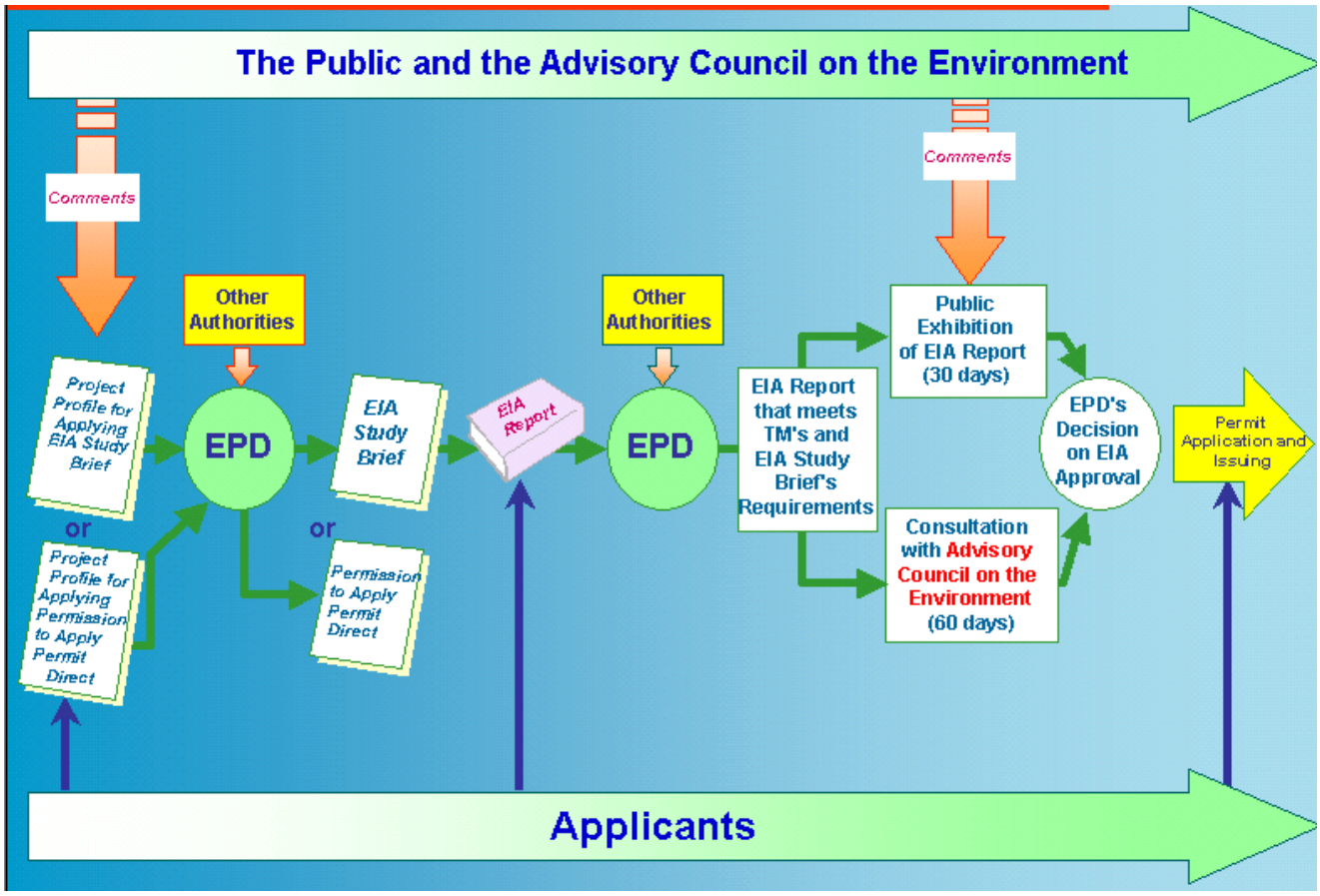


Figure 1.4 Public Participation under the EIA Ordinance

(Source: Figure 2 of "A Guide to the Environmental Impact Assessment Ordinance", EPD)

1.3.1 Timeline of the EIA Ordinance

	Time Limit for the Director	Time Limit for the Public	Time Limit for the ACE
Application for an EIA Study Brief	45 days of receiving the application or further information	14 days of placing the advertisement	14 days of placing the advertisement
Application for approval to apply directly for an environmental permit	45 days of receiving the application or further information	14 days of placing the advertisement	14 days of placing the advertisement
Review of EIA Report	60 days of receiving the EIA Report		
Public inspection of EIA Report		30 days of placing the advertisement	60 days of receiving the EIA Report
Approval of EIA Report	30 days of the expiry of the public inspection period, or the receipt of comments from the ACE, or the receipt of further information		
Application for environmental permit	30 days of receipt of the application (the same time limit as the approval of EIA Report if the two applications are submitted at the same time)		
Application for a further environmental permit	30 days of receipt of the application		
Application for variation of an environmental permit	30 days of receipt of the application		

(Source: Section 8 of "A Guide to the Environmental Impact Assessment Ordinance", EPD)

1.4 ROLE AND RESPONSIBILITY OF PROJECT PROPONENT IN THE EIA MECHANISM

In a project, the role of a project manager is multi-facet and can make a significant contribution to the efficiency and timely delivery of a project.

The <Project Management for the Public Works Programme> outlines that the aims of the PWP as:

"… the infrastructure of Hong Kong is developing rapidly to meet the needs of its people. PWP projects are a major part of this development and can involve thousands of people and billions of dollars. With projects of this scale, there is always the potential for problems when co-ordinating activities and keeping to defined scope, budgets and deadlines…"

whereas the Policy Objectives 2001 said:

"Public works provide the cornerstone of Hong Kong's physical infrastructure. We need to ensure that these projects are properly planned, thoroughly studied and well coordinated before proceeding to the construction stage. In so doing, we must also ensure that the planning and design process is completed efficiently so that construction could start in the shortest possible time in accordance with the planned programmes."

Of these, the environmental consideration invariably is one of the significant factors to be contemplated with during the decision making process.

Indeed, the Policy Objectives 2001 put it as:

"The EIA mechanism provided for under the EIAO plays a significant role in balancing the need to protect the environment and development needs. It helps project proponent to pay due regard to environmental protection requirement, through evaluating potential impacts on the environment and necessary prevention and mitigation measures, at the early stage of project planning and design. Effective operation of the EIA mechanism is very important as development pressures continue to increase."

In each stage of project development, a project proponent can play an active role to enable that environmental considerations are being factored into decision making process so to affirm creditability of the decision making process, strengthen public trust, and ensure timely and efficient promise delivery.

1.5 ENVIRONMENTAL CONSIDERATIONS IN DEVELOPMENT OF PUBLIC WORKS

The Project Administration Handbook for Civil Engineering Works (thereafter call "the Handbook"), of which a softcopy is now available in website of the Civil Engineering Department in downloading area, overviews that the general steps of public works development as:

A. Identification of needs for a project

B. Completion of a Project Definition Statement (PDS) by Policy Bureau to gain status in the Public Works Programme (PWP)

C. Completion of Technical Feasibility Study (TFS) to ascertain viability, identify development/environmental constraints, formulate implementation strategy and estimate cost. Thereafter, inclusion of the project in Category C of the PWP

D. Successful inclusion of the project in the Resource Allocation System will entitle it to attain a Category B status. Works Departments can carry out further planning and design into it

E. Upon completion of detail design, Works Departments can seek funding from the Legislative Council

F. After funding approval, Works Departments will take out projects for tendering and construction

Works Department should monitor the planning, design and construction of works to ensure that there is adequate consultation among the parties concerned.

For small scale projects not exceeding the cost ceiling, these Category D projects do not generally require a PDS and TFS.

As environmental consideration is an integral part of this process, a project proponent should best use the information in the design or planning process.

1.6 HOW TO USE THIS MANUAL IN PROJECT DEVELOPMENT WORKS?

1.6.1 *How this Manual is built?*

Readers might take note that the Handbook does indeed see that environmental considerations, consideration of alternatives, and project justifications as an integral part of project development lifecycle. This Manual will further elaborate good environmental practice with examples in modules to tie in with the above steps in the Handbook. Readers should take note that the Handbook is under regular updates in collaborating with EPD.

Readers from private sectors might draw parallel reference.

1.6.2 *Where to get important background information?*

Readers might be aware that when a project is being proposed, some decisions, based on previous studies, invariably would have been made. A project proponent is advised to gather this information, especially recommendations on environmental matters and alternative considerations, for follow up. Typical source of background history might come from:

- strategic studies, such as Comprehensive Transport Strategy, Territory Development Strategy, Sub-regional studies and plans, Port Development Strategy
- site search exercises
- deliberations in decision making committees such as Strategic Highways Committee for major highways
- outcomes in public consultation, such as meeting with the Advisory Council on the Environment, District Councils, or the Legislative Council

Part 3.1 of this Manual can be referred to.

Thereafter, a generic approach of defining problems; avoiding them or finding solutions; setting the timeline can be applied.

1.6.3 *Where to refer in this Manual?*

In each step of project development cycle for public works, a project proponent can apply relevant sections in this Manual for building up of environmental considerations. They are:

A. <u>Identification of needs for a project</u>

Part 2.4 of this Manual will discuss requirements following the Handbook especially over alternative considerations.

A project proponent can apply the avoidance-minimization-mitigation principle for better planning.

B. <u>Completion of a Project Definition Statement (PDS) for inclusion into the Public Works Programme (PWP)</u>

The PDS explains the rationale for the project and the commitment to it. According to the Handbook, the PDS should determine that:

(a) the need for a project has been identified and justified;

(b) the proposed project will meet the need in full or in part;

(c) the proposed project will not duplicate or be in conflict with any other existing or planned projects, and

(d) the proposed project is in line with approved policy and approved plans.

As a good practice, a project proponent is advised to review and follow up recommendations of strategic planning studies, if available. Then, the project proponent should anticipate and avoid environmental problems; or infringement into ecologically, environmentally, etc. sensitive areas. Part 2.3 of this Manual can be referred to.

If in doubt, a project proponent should seek advice from EPD as soon as practicable.

C. Completion of Technical Feasibility Study (TFS) for inclusion into Category C of the PWP

The Handbook requests preliminary considerations in TFS should be given to:

(a) The scope of the project;

(b) Land requirements;

(c) Development constraints;

(d) Environmental consideration including whether a project is a Designated Project and application of avoidance-minimization-mitigation principle;

(e) Project Programme; and

(f) Capital Cost Estimate.

With a more defined project scope, a project proponent should seek advice from EPD on whether the work is a Designated Project. Part 3.2 of this Manual can be referred to.

Irrespective of whether a project falls under remit of the EIAO, a project proponent should plan the layout, design, or alignment to avoid environmental impacts as the first priority together with minimizing and mitigating the environmental impacts.

If a project is a Designated Project, a project proponent can prepare a project profile for application of study brief or seek permission to apply directly for Environmental Permit. Part 3.3 of this Manual can be referred to.

A project proponent should plan the project programme to avoid putting environmental assessment on a critical path; might decide whether to

commence EIA or gather background and baseline information at this stage.

If a value management study is required for major projects exceeding HK$200 million following Environmental, Transport and Works Bureau Technical Circular (Works) No. 35/2002, a project proponent will find useful information in Part One to Part Three in this Manual.

The Environment, Transport and Works Bureau Technical Circular (Works) 13/2003 is relevant.

If in doubt, the project proponent should seek early advice from EPD.

D. Successful inclusion of the project Category B for further planning and design

If an EIA is carried out, a project proponent would have the role of steering environmental, engineering and other consultants to see that predictions and recommendations of EIA are reasonable, practicable and effective.

Part 4 & 5 of this Manual can be referred to. The Parts include good practices for a project proponent in reviewing a consultant's EIA report for practical outcomes; preparing for consultations steering positive environmental outcomes.

E. Completion of detail design . Funding from the Legislative Council for inclusion into Category A of the PWP

Feedback from public comments on EIA would be useful.

F. Construction and Operation Stage

The delivery of promises is essential in implementation stage together with handling of variations. Some feedbacks during construction stage including better drafting of EIA recommendations; and good planning of reporting are included. Part 6 of this Manual can be referred to.

1.7 *PROACTIVE PLANNING OF THE EIA MECHANISM*

Proactive planning is the key to success in an EIA mechanism.

Some tips for a project proponent about proactive planning of the EIA mechanism….

- Understand a project, particularly over its need and justifications, and identify its environmental concerns
- Take a pro-active role and seek an early dialogue with EPD, relevant authorities under the EIAO, the ACE and other stakeholders, as appropriate
- Inject environmental considerations into project life cycle as early as possible, i.e. at strategic level or conceptual stage
- Rigorously apply the cardinal principle of EIA viz, avoidance-minimization-mitigation at each stage of a project life cycle
- Carry out objective and comprehensive alternative considerations to avoid environmental problems. Document rationale and justifications in coming up with a particular decision or choice. Follow them through in project life cycle
- Plan to avoid putting environmental studies on the critical path of a project delivery
- Constantly validate fundamental assumptions in an EIA and see that promises/mitigation measures can be delivered timely and efficiently

1.7.1 *Good Practices of Proactive Planning of the EIA Mechanism*

A project proponent can make positive impacts during a project life cycle. The followings are some good practices:

Strategic Planning Studies/Sectoral Policy Studies/Sub-regional Plans/Site Search Exercise

Understandably, there would be limitations on information available in planning studies. Despite that, in project implementation stage, a project proponent and planning authorities are advised to make use of existing database or other best available information to identify environmental constraints.

Alternative scenarios or development options can then be developed to avoid environmental problems through rigorously applying the cardinal principle of EIA, viz, avoidance-minimization-mitigation.

The considerations should be well documented for future reference and follow through.

Project Conceptual Stage/Pre-feasibility

With due regard to the need and justification of a project, a project proponent should critically review alternatives and/or options to avoid major environmental problems. If strategic planning studies are not available, a project proponent can apply the avoidance-minimization-mitigation principle in project planning through site selection, alternative alignment, and initial screening etc. On the other hand, if strategic planning studies are complete, a project proponent should recap and review the findings and recommendations with a view to following through and implementing them.

In the event that further detailed studies are reasonably anticipated, a project proponent should seek early dialogue with EPD; plan for the timeline and funds for study; understand issues involving stakeholders' concerns; and gather baseline information available.

About gathering baseline information, ecological survey can be used as an example to demonstrate how time can be saved. After reviewing available database and completion of desktop studies, if an ecological survey is contemplated, a project proponent can plan for an early start when floats are plenty in a project timeline. This is indeed one of the common practices in private sector project to fast-track their works.

Project Feasibility Stage / EIA Stage

A project proponent is advised:

- To thoroughly understand the project and the issues in an EIA study brief;
- To seek early advice from EPD with maintaining open and frank dialogue;
- To understand and anticipate both the adverse and beneficial impacts of a project at the start of an EIA;
- To get first-hand information on site conditions, environmental and physical constraints. To update them regularly;
- To find out stakeholders' concerns, rather than peripheral issues, and use an EIA as a tool to address them;
- To manage and lead EIA consultants and understand their assumptions; take ownership of the EIA process to facilitate project design and implementation;

- To set clear milestones in the EIA process including submission of working papers and draft reports;
- To steer agreement over parameters in quantitative assessment throughout the EIA process;
- To scrutinize input assumptions, e.g. construction sequence or plant inventory, and scenario to see that they are reasonable and practicable, but not underestimating nor overestimating;
- To build in flexibility in project implementation, a scenario approach can be set up in the study;
- To critically review recommendations of an EIA to see that they are practicable and effective measures, ready to be implemented by the project proponent.

Implementation Stage

Even though contractors would normally be engaged, a project proponent can make positive contributions:

- To ensure relevant parties, including the contractors and resident site staff at all levels understand the conditions listed in the environmental permit and fully implement them;
- To establish efficient and effective communication channels;
- To see that Environmental Team and Independent Environmental Checker are independent professionals to monitor and audit changes.

1.7.2 *A Consultant's Tip on good practice: HEC's 1,800 MW Gas-fired Power Station*

The Hongkong Electric Company Limited (HEC) proposed to develop a new 1,800MW power station development in Hong Kong in the mid 90's to meet the forecast growth of electricity demand in the 21st century. Sufficient time was allowed to ensure the site search and subsequent EIA studies to meet Government requirements and public expectations before construction work commenced.

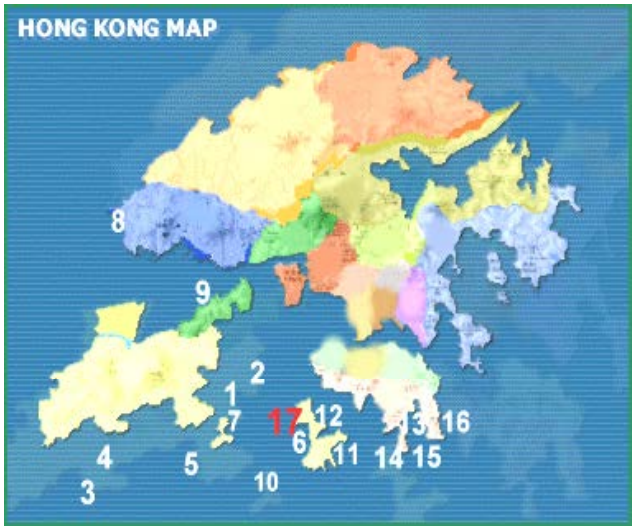
Before starting the formal EIA process, extensive studies including the Stage I EIA has been undertaken as an integral part of a wider site search study. The assessment included the environmental implications of alternative fuels, power generation technologies and design options and to determine the environmental feasibility of building a new power station within the territorial boundaries of the Hong Kong SAR. These studies also helped in identifying the key issues that would need to be addressed in the detailed assessment of the significant impacts.

The outcome of the Stage I EIA is that the preferred fuel is natural gas and the preferred technology is combined cycle technology. The site search study concluded that an extension to Lamma Power Station was the preferred site for a new power station without significant impacts on the environment. The

sharing of facilities and services with the existing power station has resulted a much smaller reclamation area (about 22 ha versus a stand alone site of 50 ha). This helps to minimise the reclamation size and hence reduce the potential impact to the marine environment. The proposed gas-fired combined cycle units will also reduce the total emissions of SO_2, NO_x, particulates and greenhouse gas emissions from the HEC system with Lamma Extension fully operational when compared with the emissions before commissioning of the new power station.

Case Study: HEC's 1,800 MW Gas-fired Power Station

Comprehensive Site Screening - At the early planning stage, 17 alternative sites were shortlisted for comparative assessment of their environmental performance:



Site 1 - South Hei Ling Chau
Site 2 - South Sunshine Island
Site 3 - South Tai A Chau
Site 4 - South Siu A Chau
Site 5 - South Shek Kwu Chau
Site 6 - West Lamma
Site 7 - North Cheung Chau
Site 8 - Lung Kwu Tan
Site 9 - North Lantau
Site 10 - Artificial Island, West Lamma Channel
Site 11 - South East Lamma
Site 12 - East Lamma
Site 13 - Western Coastline of D'Aguilar Peninsula
Site 14 - South West Stanley Peninsula
Site 15 - South East Stanley Peninsula
Site 16 - Artifiaial Island, Bokharo Rocks
Site 17 - Lamma Extension

Avoidance of Adverse Impact - At the early planning stage, different coal and gas firing technologies identified and evaluated:

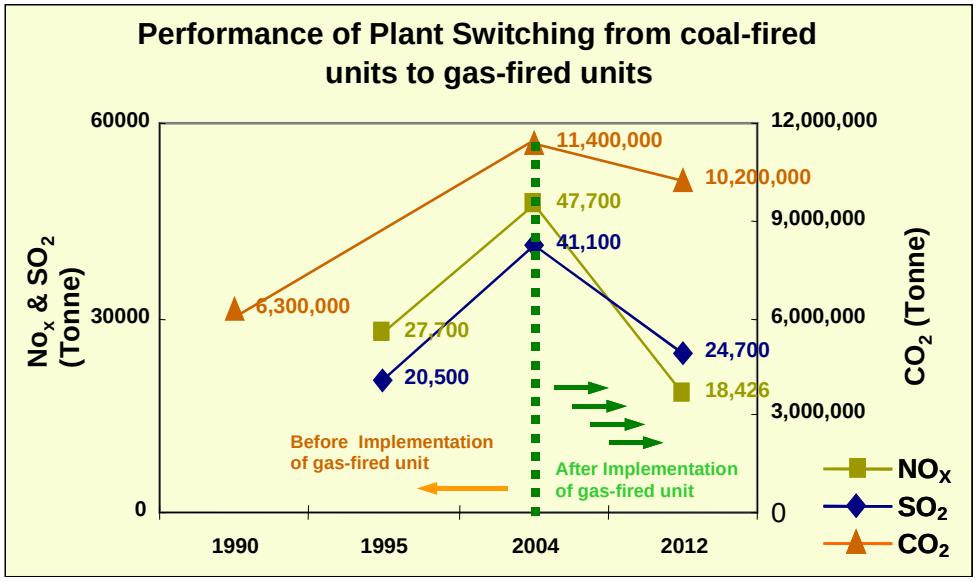
Coal Fired

- Advanced pulverized Coal-fired (without De-NO_X)
- Advanced pulverized Coal-fired (with De-NO_X)
- Integrated gasification combined cycle
- Pressurized fluidized bed combustion
- Circulating fluidized bed combustion

Gas Fired

- Combined cycle
- Steam cycle

Alternative Environmental Technology and Siting of the Facility - Adopting environmentally friendly fuel for new power generation to avoid significant pollutants emission and minimizing reclamation



PART TWO – LEARNING THE FUNDAMENTALS

2. LEARNING THE FUNDAMENTALS

2.1 WHAT IS THE EIA MECHANISM?

There is a common misconception that an EIA is a report. In fact, an EIA is NOT simply a Report but is a Process.

EIA should not be viewed as solely for assessing the adverse environmental impacts arising from a project and finding out mitigation measures for such impacts. There are more about an EIA as a planning tool.

On the other hand, EIA practitioners see that: EIA is a **PROCESS** and a **PROACTIVE PLANNING TOOL**:

- To pre-empt adverse environmental impacts associated with development projects, by assessing their environmental implications and ensuring that measures are implemented to avoid any potential problems that are identified;
- To provide a major meeting point between development decisions and environmental management; and
- To provide dialogue and consultation among stakeholders which link to the decision making process.

Literature Review of what an EIA is……

" EIA is a process carried out to ensure that the likely significant environmental effects of certain projects are identified and assessed before a decision is taken on whether a proposal should be allowed to proceed. This means that the most environmentally favourable option, or at least the environmentally acceptable option, can be identified at an early stage and projects can then be designed to avoid or to minimise environmental effects" (Environmental Agency, UK, May 2002)

"EIA is a process to safeguard a transparent, publicly accountable decision making process in which sufficient environmental consideration is assured, inter alia by sufficient environmental information of good quality" (Robert Verheem, Dutch EIA Commission)

2.1.1 *How Do You See the Use of the EIA Mechanism?*

There are some common myths about why an EIA is needed:-

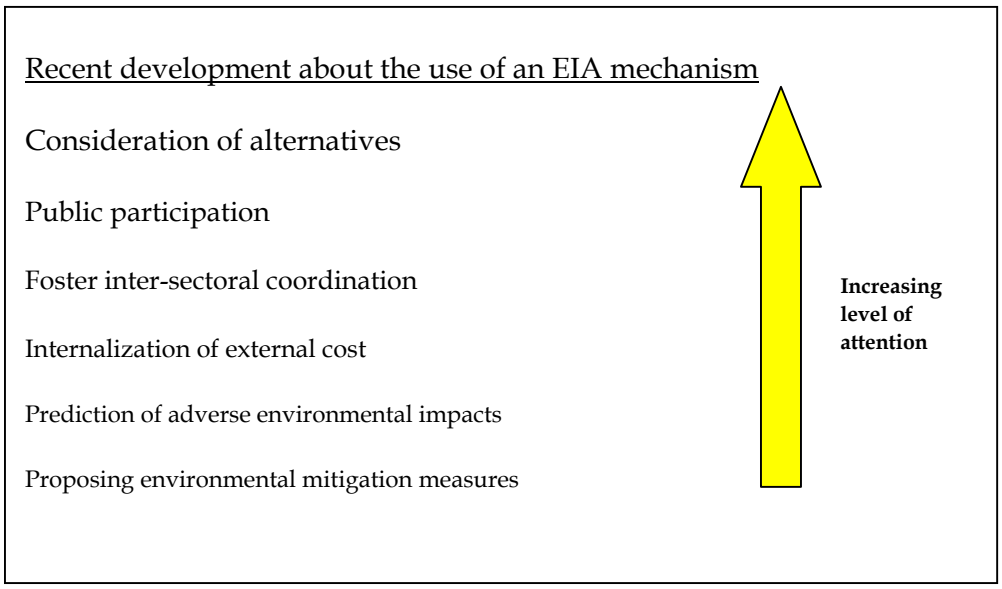
"EIA is needed only because Environmental Protection Department wants it!"

"EIA is needed to fulfil the requirements under the EIA Ordinance!"

On the other hand, EIA practitioners see that: the EIA mechanism can be used:

- To enhance public support for the project;
- For early resolution of stakeholders' concerns;
- To provide a legal and credible framework for dealing with environmental issues;
- To promote public image of project proponents; and
- As a decision making tool.

Increasing attention is given in the EIA to the consideration of alternatives to avoiding, minimizing and mitigating adverse environmental impacts of the proposed developments. Also, public participation is becoming a key element in the EIA process.



2.2 *BASIC PRINCIPLES OF THE EIA MECHANISM*

VIP

An EIA mechanism can apply to projects or development, in the order of priority, to:

- **Avoid** adverse environmental impacts
- **Minimize** and control adverse environmental impacts
- **Mitigate** adverse environmental impacts

Under the EIAO Guidance Note GN1/2002, it sets out 10 basic principles of the EIA process.

Principle One: Proactive Planning and Decision Tool

Principle Two: Avoidance, Pre-emption and Prevention of Adverse Environmental Consequences

Principle Three: Making Positive Influence on Decision Making at the Earliest Possible Opportunity and Thinking Proactively about Options and Alternatives

Principle Four: Living Process Throughout the Project Cycle

Principle Five: Making EIA Recommendations Enforceable

Principle Six: Flexibility Amidst Robustness and Transparency, with Public Participation and with the Ability to Adapt to Changes

Principle Seven: Seeking Practical Environmental Outcomes for the Environment and Community

Principle Eight: Avoidance of any Late Focus

Principle Nine: Efficiency Amidst Effectiveness

Principle Ten: Transparent Agreement among Relevant Parties, Clear Expectations of what need to be done and what the Performance will be, and Explicit Resolution of any Conflicts

The importance of avoidance of environmental problems can be illustrated in the ecological section of the Technical Memorandum of the EIA Process:

EIAO TM Annex 16 Section 5.4.1

The General Policy for mitigating impacts on important habitats and wildlife, in the order of priority, are:

(a) Avoidance:
Potential impacts shall be avoided to the maximum extent practicable such as adopting suitable alternatives (e.g. change of site, design, construction method, alignment, layout, programme, etc). In extreme cases when the ecological assessment identifies some very serious impacts which could not be mitigated, the "no-go" alternative may be the only realistic option and shall be included and assessed against all other options.

(b) Minimizing:
Unavoidable impacts shall be minimized by taking appropriate and practicable measures such as transplanting important plant specimens, confining works in specific area or season, restoration (and possibly enhancement) of disturbed areas, etc.

(c) Compensation:
The loss of important species (e.g. trees) and habitats (e.g. woodland) may be provided elsewhere (on-site or off-site) as a compensation. Enhancement and other conservation measures shall always be considered, whenever possible.

A word on mitigation:

Definition of Mitigation Under EIA Ordinance

Schedule 1 of the EIAO

"Mitigation", for a designated project -

(a) means the elimination, reduction or control of adverse environmental impacts of the project;

(b) includes restitution by replacement, restoration, compensation or other means for damage to the environment caused by the impacts.

2.3 *EXAMPLES OF GOOD EIA PRACTICES* (SOURCE: EXAMPLES AND GOOD PRACTICES UNDER THE EIAO, EPD)

2.3.1 *Avoidance of Environmental Problems at Planning Stage by Alternative Alignment and Design*

- ✓ Site Selection
- ✓ Alignment Option
- ✓ Choice of development/ construction/ operation type, scale and form
- ✓ Choice of technology/fuel type

Examples of Avoiding Environmental Problems at the Planning Stage

- Case 1 - KCRC East Rail Extension from Hung Hom to Tsimshatsui
- Case 2 - HEC's 1,800 MW Gas-fired Power Station
- Case 3 - Improvement to the Lantau North-South Road Link
- Case 4 - Tung Chung and Tai Ho Remaining Developments
- Case 5 - 132kV Power Cable from Po Lam to Tui Min Hoi

2.3.2 *Minimization and Mitigation of Environmental Impacts through incorporation of Mitigation Measures at the Design Stage*

- ✓ Design of suitable layout, form and configurations
- ✓ Environmental treatment technologies and facilitates
- ✓ Built-in protection zones

Examples of Environmental Measures at the Design Stage

- Case 6 - Cyber Port Development
- Case 7 - West Rail Phase 1
- Case 8 - Hong Kong Disneyland

2.3.3 *Incorporation of Mitigation Measures during the Construction Stage*

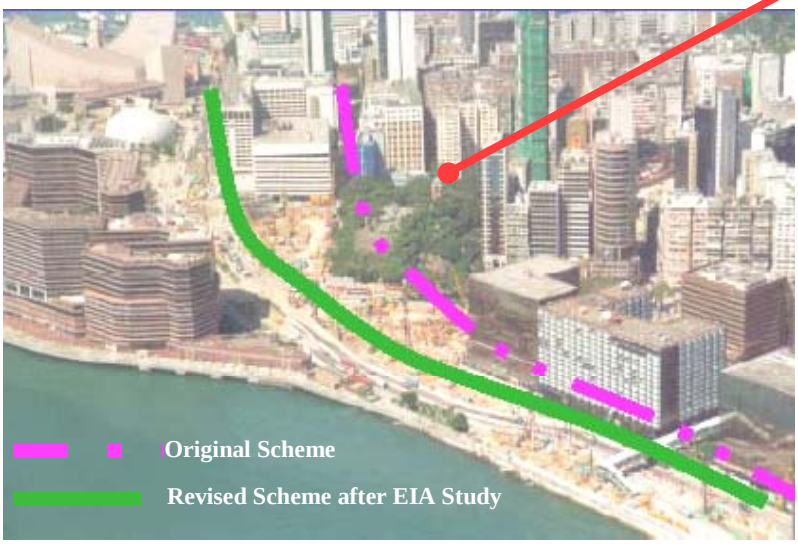
- ✓ Phasing of reclamation/works
- ✓ Minimize pollution using silt curtain
- ✓ Minimize noise impact using noise barrier/acoustic cover
- ✓ Environmental monitoring and audit

Examples of Environmental Measures to Minimize Impacts During Construction

- Case 9 - Pak Shek Kok Reclamation
- Case 10 - Dredging at Cheung Sha Wan Fish Culture Zone
- Case 11 - Reclamation for HEC's 1,800 MW Gas-fired Power Station
- Case 12 - Northern Access Road for Cyber Port

Case Study 1: KCRC East Rail Extension from Hung Hom to Tsimshatsui

Nature and Scope of the Project:
Construction and operation of approximately 1.5 km underground railway.

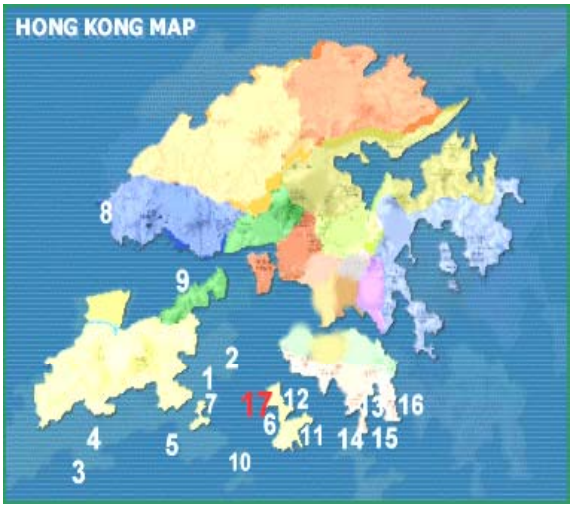


The polygonal Edwardian - Style Signal Hill Tower was erected in 1907 to house the time-ball apparatus. It helped bring a western standard of time to a Chinese society that used the traditional timing system.

Key Environmental Concerns:
The original scheme encroached upon the Signal Hill site of high cultural heritage value.

Basic EIA Principle applied to resolve the concerns:
Avoid adverse environmental impacts by alternative alignment and design to avoid the 100-year-old Signal Hill.

Case Study 2: HEC's 1,800 MW Gas-fired Power Station



Site 1 - South Hei Ling Chau
Site 2 - South Sunshine Island
Site 3 - South Tai A Chau
Site 4 - South Siu A Chau
Site 5 - South Shek Kwu Chau
Site 6 - West Lamma
Site 7 - North Cheung Chau
Site 8 - Lung Kwu Tan
Site 9 - North Lantau
Site 10 - Artificial Island, West Lamma Channel
Site 11 - South East Lamma
Site 12 - East Lamma
Site 13 - Western Coastline of D'Aguilar Peninsula
Site 14 - South West Stanley Peninsula
Site 15 - South East Stanley Peninsula
Site 16 - Artifiaial Island, Bokharo Rocks
Site 17 - Lamma Extension

Nature and Scope of the Project:
Proposal for a new 1800 MW Power Station

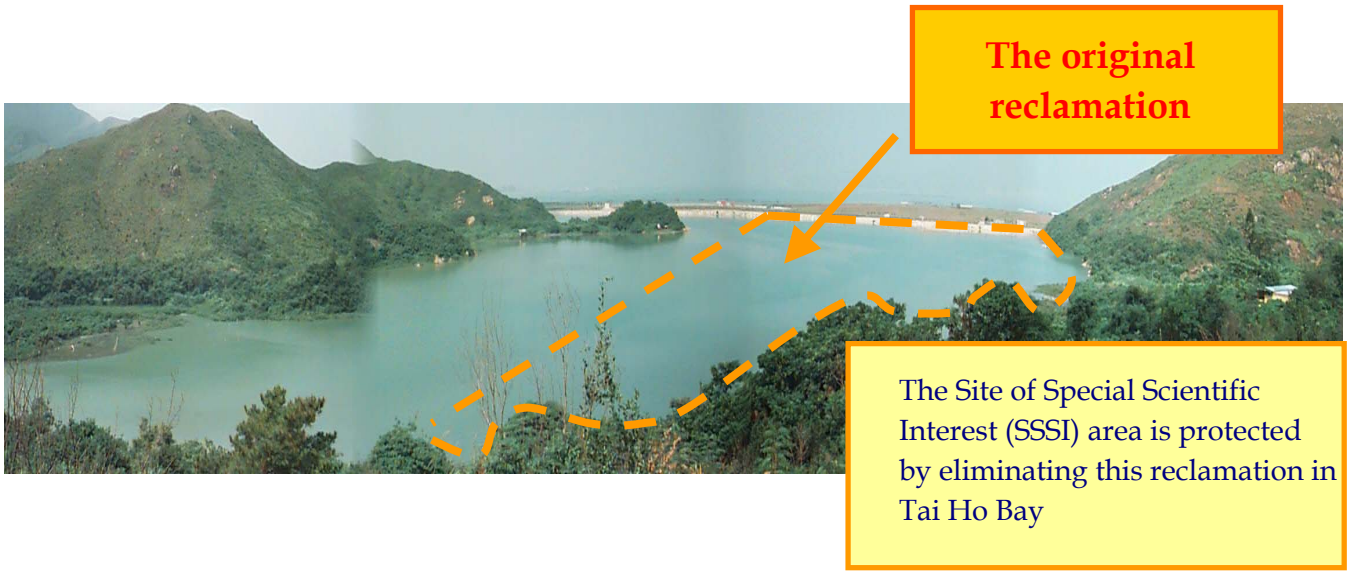
Basic EIA Principle applied to resolve environmental concerns:

Comprehensive Site Screening - At the early planning stage, 17 alternative sites were shortlisted for environmentally sound option.

Avoidance of Adverse Impact - At the early planning stage, different coal and gas firing technologies identified and evaluated.

Alternative Environmental Technology and Facility - Adopting environmentally friendly fuel for new power generation to avoid significant pollutants emission and minimizing reclamation.

Case Study 3: Tung Chung and Tai Ho Remaining Developments



Elimination of the reclamation in Tai Ho Bay completely

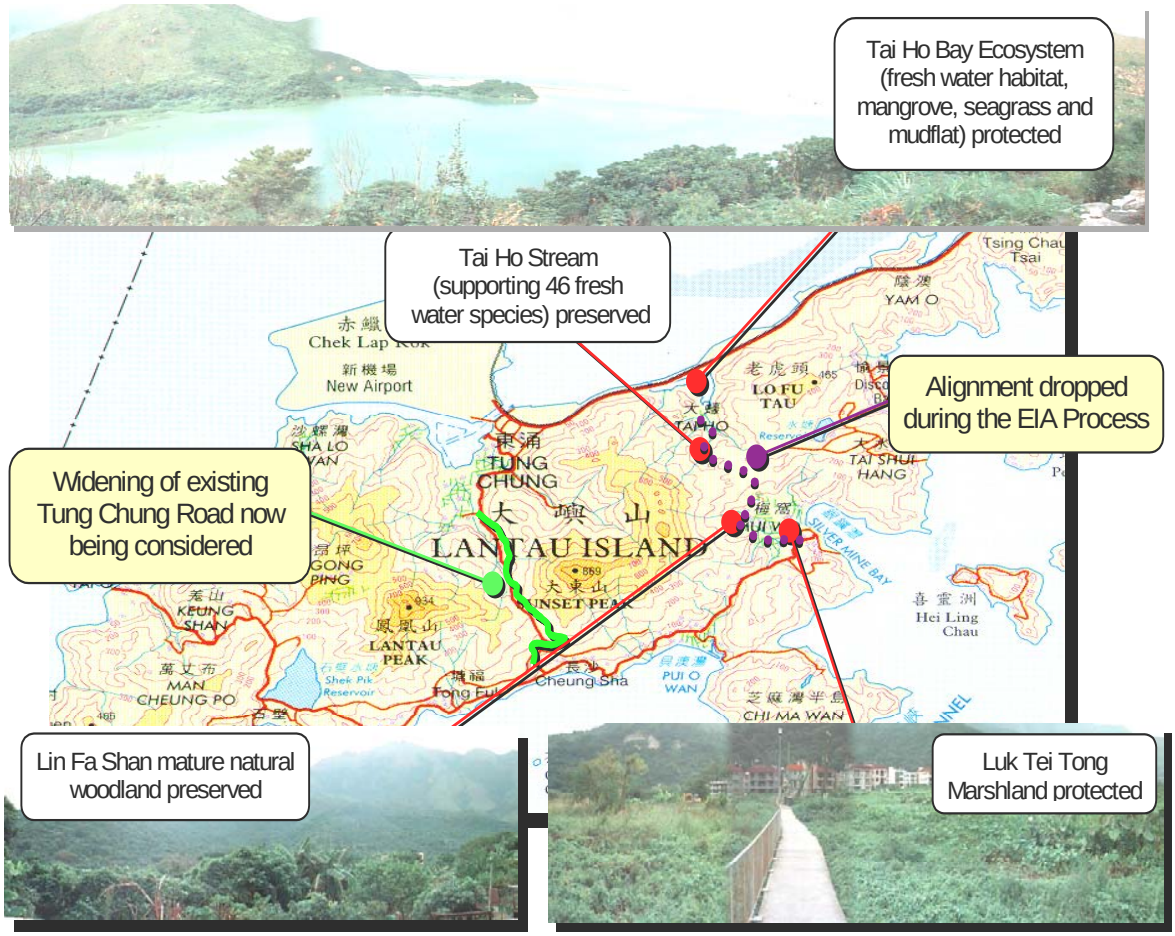
Natural Stream Courses and Habitats being Conserved

Nature and Scope of the Project:
A Reclamation Project

Key Environmental Concerns:
There were ecological impacts in Tai Ho Bay due to the new development.

Basic EIA Principle applied to resolve the concern
Avoid the ecological impacts through the EIA process by elimination of the reclamation in Tai Ho Bay completely.

Case Study 4: Improvement to the Lantau North-South Link

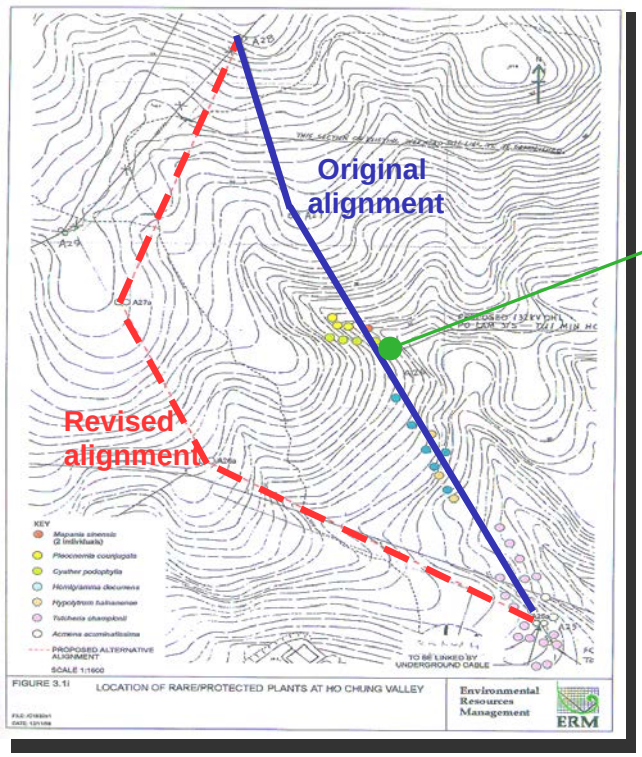


Nature and Scope of the Project:
To improve the existing sub-standard Tung Chung Road and provide an improved roadway for connecting north and south Lantau.

Key Environmental Concerns:
The proposed road will go through rural area, comprising country parks and ecologically sensitive areas.

Basic EIA Principle applied to resolve concerns:
The **avoidance** and **minimization** of environmental impacts has been a key element throughout the EIA process. A comprehensive option assessment process was undertaken which provided an evaluation and comparison of 4 northern alignment options and 4 southern alignment option combinations within the Tai Tung Shan – Cheung Sha corridor.

Case Study 5: 132kV Power Cable from Po Lam to Tui Min Hoi

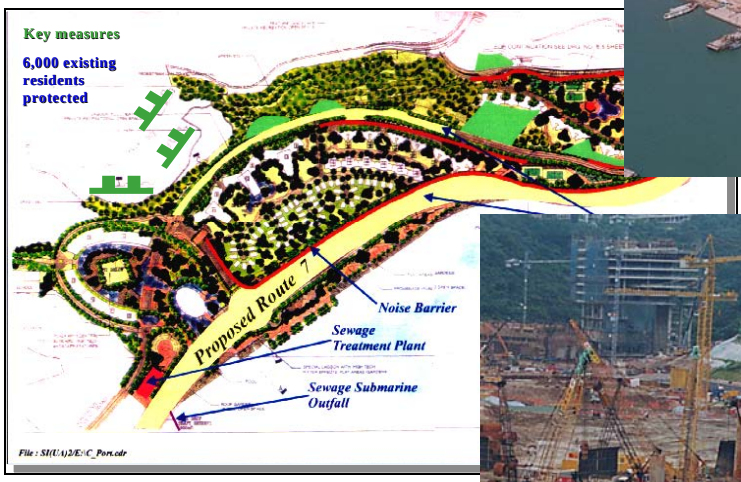


Nature and Scope of the Project:
Construction and operation of 132kV overhead pole line and underground cable, parts of which lie within the Ma On Shan Country Park and Conservation Areas in Tseng Lan Shue, Ho Chung and Pak Kong.

Key Environmental Concerns:
Rare tree species and protected trees species are found along the original alignment.

Basic EIA Principle applied to resolve the concerns:
Avoid adverse environmental impacts by alternative alignment and **minimize** impacts by environmentally friendly design.

Case Study 6: Cyber Port Development



Nature and Scope of the Projects:

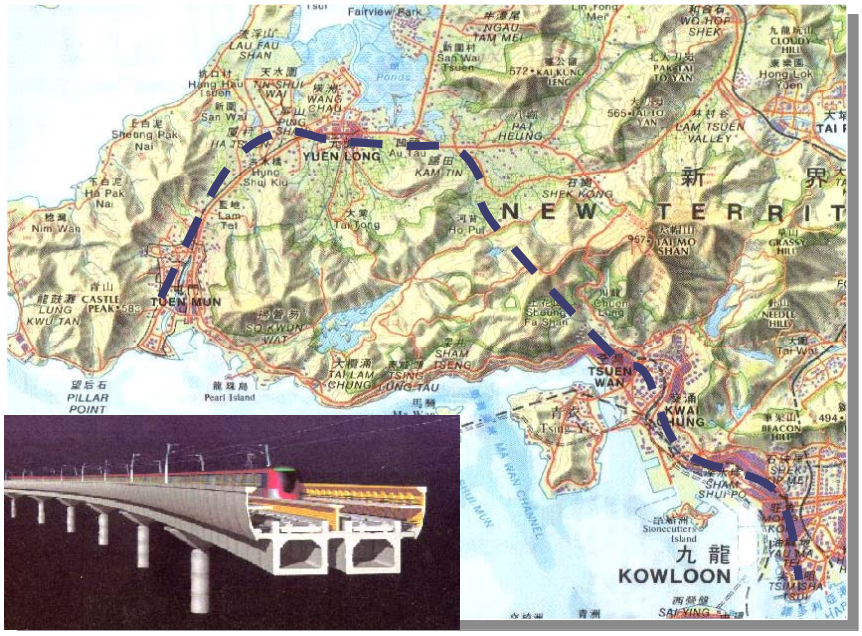
The Cyberport development is proposed as a world class location for information technology, involves the construction of housing and commercial developments, distributor roads, sewage treatment plant and 300m long sewage submarine outfall on an existing reclaimed land of 26 ha.

Key Environmental Outcomes:

Temporary noise enclosures/ barriers and sufficient watering of the filling materials to control environmental pollution.

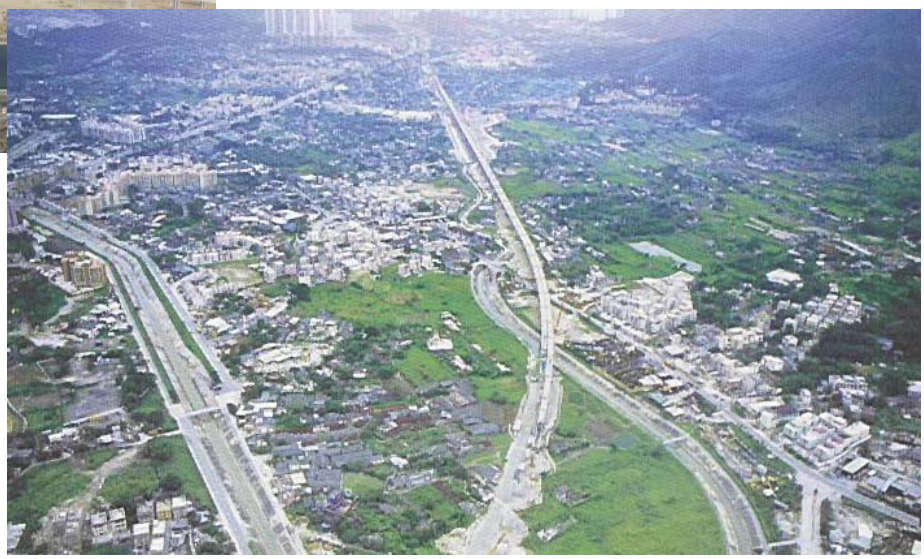
Frequent watering

Case Study 7: West Rail Phase 1



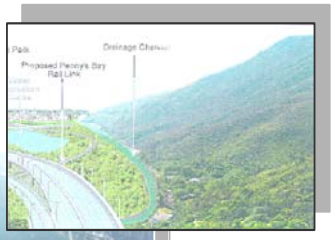
Nature and Scope the Project:
The Project is an electrified double – tracked passengers railway system

Key Environmental Outcomes:
About 560,000 existing and future residents to be protected by special noise reduction design, noise barriers and enclosures devised through EIA.



Case Study 8: Hong Kong Disneyland

Armour rock sloped seawall design was adopted to facilitate recolonization of intertidal and subtidal hard surface assemblages



2 km long Natural Coastline preserved by adopting an open drainage channel design

6 km long landscaped earth bunds were incorporated in the Theme Park Layout Plan to protect 25,000 and 11,000 residents at Discovery Bay and Peng Chau respectively

Ecologically sensitive area will be protected by zoning the Pa Tau Kwu Headland and nearby waters as Conservation Area as recommended by the EIA study

Key Environmental Outcomes:

Comprehensive environmental measures incorporated into the Theme Park development project which will create over 20,000 employments and attract 20 million visitors per year.

Case Study 9: Pak Shek Kok Reclamation

Key Environmental Outcomes:

Reclamation phasing to minimize suspended solids and sediment plumes dispersion.

Case Study 10: Dredging at Cheung Sha Wan Fish Culture Zone

Key Environmental Outcomes:

Use of silt curtains and closed dredging grab to minimize SS dispersion to protect the 22 ha Fish Culture Zone.

Case Study 11: Dredging for HEC 1,800MW Gas-fired Power Station at Lamma Extension

Key Environmental Outcomes:

Minimize SS dispersion using silt curtain to protect nearby sensitive receivers.

Case Study 12: Northern Access Road at Cyber Port Development

Key Environmental Outcomes:

Minimize noise emission using noise barrier and noise cover.

The Project Administration Handbook for Civil Engineering says:

"The need for a project may arise:

a. to meet planning and development requirements;

b. to improve existing facilities/services; or

c. to complete an existing development programme.

In order to establish the need for a project, general consideration should be given to:

a. the problems requiring solution;

b. alternative solutions, including an assessment of relative merits and demerits;

c. reasons for the choice of the preferred option vis-à-vis other possible solutions; and

d. consequences of doing nothing.

It is the responsibility of the client to consider the need for a project, and help explain the rationale for the project before defining a project.

At the commencement of preliminary project planning, it should be determined that, among others, that:

a. the need for a project has been identified and justified;

b. the proposed project will meet the need in full and part.

VIP

Robust project justification and alternative development do play a central role in a project life cycle, including the Technical Feasibility Study and Feasibility Study stages.

To facilitate progress in later stage of a project life cycle, a project proponent is advised to rigorously identify environmental impacts and apply the cardinal principle of EIA, viz, avoidance-minimization-mitigation. The application of EIA mechanism is more important in the project conceptual stage when solution space is aplenty.

In light that the public very often want to understand the need, justification and alternatives of a project, these considerations should be recorded and presented with justifications in the project development history.

2.5 *FREQUENTLY-ASKED QUESTIONS*

The following should be viewed solely for training purpose. It should not be construed as legalistic or comprehensive.

2.5.1 *Fundamentals and Principles of EIA Mechanism*

What is the use of an EIA mechanism? What is the basis of the EIA Ordinance and Environmental Permits?

The EIA mechanism provided for under the EIAO plays a significant role in balancing the need to protect the environment and development needs. As stated in the Policy Objectives 2001, the EIAO helps project proponents to pay due regard to environmental protection requirements at the early stages of project planning. Effective operation of the EIA mechanism is very important as development pressures continue to increase.

The EIAO is an ordinance to provide for assessing the impact on the environment of certain projects and proposals, for protecting the environment and incidental matters.

How can a person have access to the latest information regarding the EIAO?

The EIAO register Office on 27/F Southorn Centre, Wanchai, Hong Kong displays all EIAO records for public access. In addition, the public can gain access through the EIAO website http://www.epd.gov.hk/eia/ to the latest EIA information which include approved EIA reports, EIA Study Briefs Environmental Permits issued, etc. The webpage also contains useful references such as the EIAO Guidance Notes, EIA good practices and examples, and other useful resources.

At what stage should a proponent put environmental considerations into project planning?

VIP

Environmental considerations should be part and parcel in **every planning or decision making step** of a project, starting from the strategic planning stage to the construction and operational stages. A number of strategic environmental assessment studies have been completed and can be referred to in our Cyber EIAO Help Bench.

A project proponent is suggested to follow up recommendations of strategic studies in project implementation, particularly at the project conceptual stage. Early focus on environmental issues can help avoid environmental problems.

What are the practices of avoidance, minimization and mitigation in a general EIA process?

These are the cardinal principles of the EIA mechanism in the order of priority.

VIP

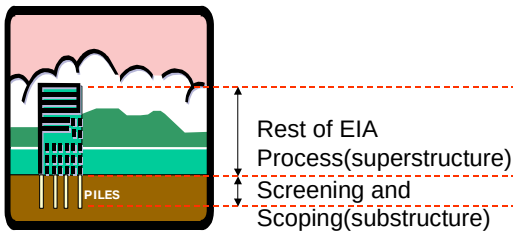
One of the key aims of the EIA process is to **avoid and prevent adverse environmental consequences** from proposed projects. If adverse environmental impacts cannot be fully avoided, measures should be considered to reduce and control the possible environmental impacts to the established criteria.

For better communication with EIA report readers, the project history section of the EIA report should list out alternative considerations to avoid environmental impacts.

What are the relationships among screening, scoping and an EIA study?

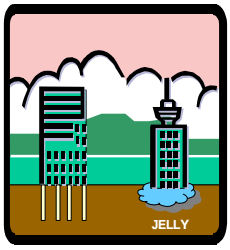
In a typical EIA process, screening is to determine whether a proposal requires an EIA study whereas scoping identifies relevant environmental issues to be examined in the EIA study. The importance of screening and scoping in an EIA process can be illustrated by the following :

Importance of Screening and Scoping



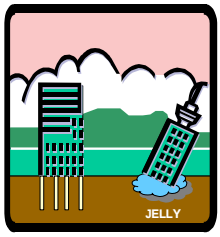
- Screening – determine whether pile foundation is required
- Scoping – determine what type of pile foundation is required (bored-piles, H-piles, etc)

Importance of Screening and Scoping



Without screening and scoping EIA process, like a building sitting on jelly, very unstable

Importance of Screening and Scoping



Finally, building will collapse

If an applicant decides to submit an EIA, the applicant should submit a project profile for application of a study brief. In preparing a study brief, a scoping exercise will be carried out with a view to identifying pertinent environmental issues.

For more information on the process and timeline, readers can refer to the booklet <A Guide to the Environmental Impact Assessment Ordinance>.

Is an EIA compulsory for Environmental Permit application for a Designated Project?

For application of an Environmental Permit, a Designated Project can either go through an EIA process or through application for permission to apply directly for Environmental Permit.

What are the roles of public comments in the EIA process?

The EIAO is a **transparent process**. The public and the ACE may comment on project profiles and EIA reports during the public inspection stage.

For more in-depth understanding of the role of public comments, readers can refer to the Judgement on the Appeal to Sheung Shui and Lok Ma Chau Spur Line on the EIAO Website

What are the roles of a client over EIA consultants throughout the course of an EIA study?

Apart from contractual requirements, it is advisable to develop a partnership relationship between a client and the consultant. A client shall take ownership of a project, knowing that they are responsible for project implementation as well as EIA recommendations. They should check whether the EIA assumptions, inputs, and recommendations are engineering practicable and effective for timely and orderly delivery of their works.

How to prepare a project profile?

Requirements of a project profile are laid down in Annex 1 & 2 of the EIAO TM.

As a piece of advice, in light that a project profile very often is the first piece of project information for public access, a project profile shall be prepared clearly but with adequate information for the public to understand the scope of a project to avoid misunderstanding.

How to get references from similar projects and EIAs?

All the EIA reports approved under the EIAO are available for public access in the EIAO Register Office and on the EIAO Webpage, http://www.epd.gov.hk/eia/

What is the role of baseline study and input assumptions in impact assessment?

A credible and adequate baseline and impact assessment form the very basis of EIA study. Without a proper establishment of these fundamental matters, an EIA will not be credible.

How to get credible prediction from quantitative models?

All prediction techniques, by their nature, involve some degree of uncertainty. The use of appropriate model and accurate input data is the key to obtain credible predictions from models. It is imperative for all parties, especially a proponent, to get involved in the scenarios and assumptions development. A proponent shall review the process to ensure that the parameters are indeed that the proponent will implement.

What is the function of an Environmental Monitoring and Audit program ? The roles of Environmental Team and Independent Environmental Checker? Who should engage them?

The Environmental Monitoring and Audit Guidelines for Development Project in Hong Kong is a useful resource from which readers can draw reference.

The Guidelines explain that an EM&A programme is an effective means to oversee the environmental performance of a development project during its implementation, and to apply appropriate mitigation measures to ameliorate adverse environmental impacts. Indeed, not all development projects are required to conduct EM&A programmes. It is a requirement of an approved EIA study to conclude the need of an EM&A. Part Six of this Manual will discuss further on an effective EM&A programme with case studies.

What are some useful techniques for a proponent to review flexibility in implementation of mitigation measures?

Upon completion of an EIA, a project proponent is responsible for implementing mitigation measures and proposals in an EIA. A project proponent should therefore review all these proposals in details with a view for an efficient, effective but flexible implementation. In light that an Implementation Schedule might summarize many EIA recommendations, a project proponent should diligently review it among other recommendations in the EIA report, noting the Schedule might be the backbone in terms of promise delivery.

Useful review guidance is available in the EIAO Guidance Note No 5/2002 &3/2002 entitle respectively "Implementation Schedule for Mitigation Measures arising from the Environmental Impact Assessment Process" and "Flexibility and Enforceability of Mitigation Measures Proposed in an Environmental Impact Assessment Report".

Broadly speaking, a project proponent shall check over the effectiveness and engineering viability (such as whether there are enough construction clearance, adequate traffic sight line, or presence of conflicting utilities) over implementing proposals. As a general tip, a proponent shall also check over the **Five "W"s** as:

- **What** mitigation measures will be implemented?
- **Who** will implement the measures?
- **When** will the measures be implemented?

- **Where** (i.e. at what location) will the measures be implemented?
- To **what** standards or requirements should these measures be implemented?

Part Six of this Manual will discuss in detail and provide more hand-on tips on how to maximize the flexibility of implementing mitigation measures.

PART THREE – GETTING AN EIA PROCESS STARTED

3. GETTING AN EIA PROCESS STARTED

3.1 USE OF STRATEGIC ENVIRONMENTAL ASSESSMENT AND PLANNING INFORMATION

What is a Strategic Environmental Assessment (SEA)?

SEA is a formalized, systematic and comprehensive process of evaluating the environmental implications of policy, plan or program and its alternatives, including the preparation of a written report on the findings of that evaluation, and using the findings in publicly accountable decision-making.

How to use information in SEA in the EIA mechanism

A SEA usually would have recommendations, environmental and alternative considerations. A project proponent is advised to record and keep a regular update of them in order to apply them in the EIA stage.

Objectives of a SEA

- Promoting full considerations and integration of environmental implications at the early planning stage of major strategic policies or plans; and
- Avoiding environmental problems and identifying environmentally-friendly options.

3.1.1 *How Does SEA Relate to the Project Life Cycle?*

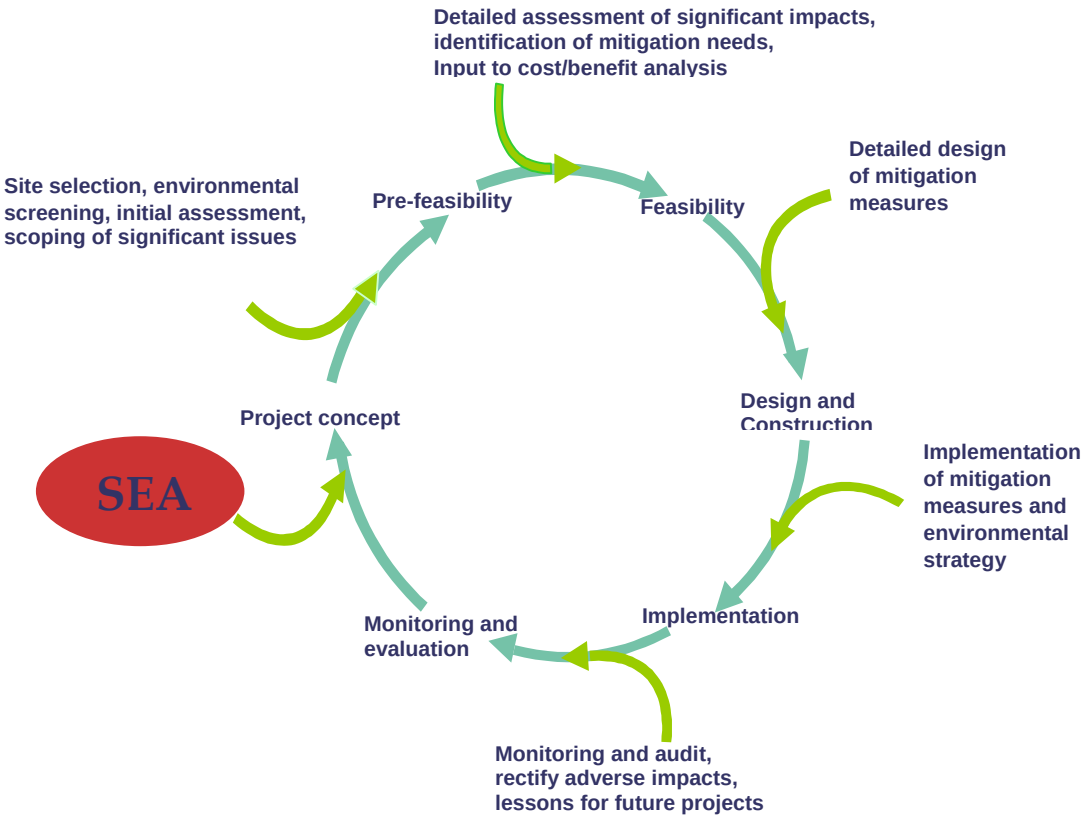


Figure 3.1 SEA and Project Life Cycle

3.1.2 *The Importance of SEA*

SEA is important and should be encouraged because:

- SEA can take up a pro-active role to steer development towards environmentally "robust" direction or avoid damaging environmentally sensitive areas;
- SEA at a higher level can oversee the cumulative impacts of relevant projects;
- SEA at a policy level can test alternatives before proceeding with site specific projects; and
- SEA can be a central step to achieve sustainable development by incorporating the principles of sustainable development into the policies and plans of development for guiding it on to sustainable tracks.

3.1.3 The Use of SEA and Planning Studies in EIA

As mentioned earlier, a project proponent and consultants can make use of existing database or other best available information from the strategic planning studies, sectoral policy studies and other sub-regional plans to identify environmental constraints for specific projects. Alternative scenarios or development options can then be developed to avoid environmental problems through rigorously applying the cardinal principle of EIA, viz, avoidance-minimization-mitigation.

Findings of strategic planning studies or SEA could be used to identify environmental preferred options for the development of recommended strategy for certain development projects. The use of integrated planning and engineering feasibility studies could avoid incompatible land uses and excessive mitigation measures.

With the appropriate strategic environmental input to the decision making process, various potential environmental damages and problems can be avoided. It should be noted that strategic environmental factors could influence the formulation and selection of strategies and regional development options as illustrated in *Figure 3.2*.

The findings of SEA or planning studies could then be summarized and integrated into the project specific EIA Report to demonstrate that alternative proposals have been considered and positive environmental outcomes, such as impact avoidance and minimization, have been achieved. Better use of planning information at the earlier stage of the project implementation would contribute to the success in maintaining Hong Kong's environmental sustainability.

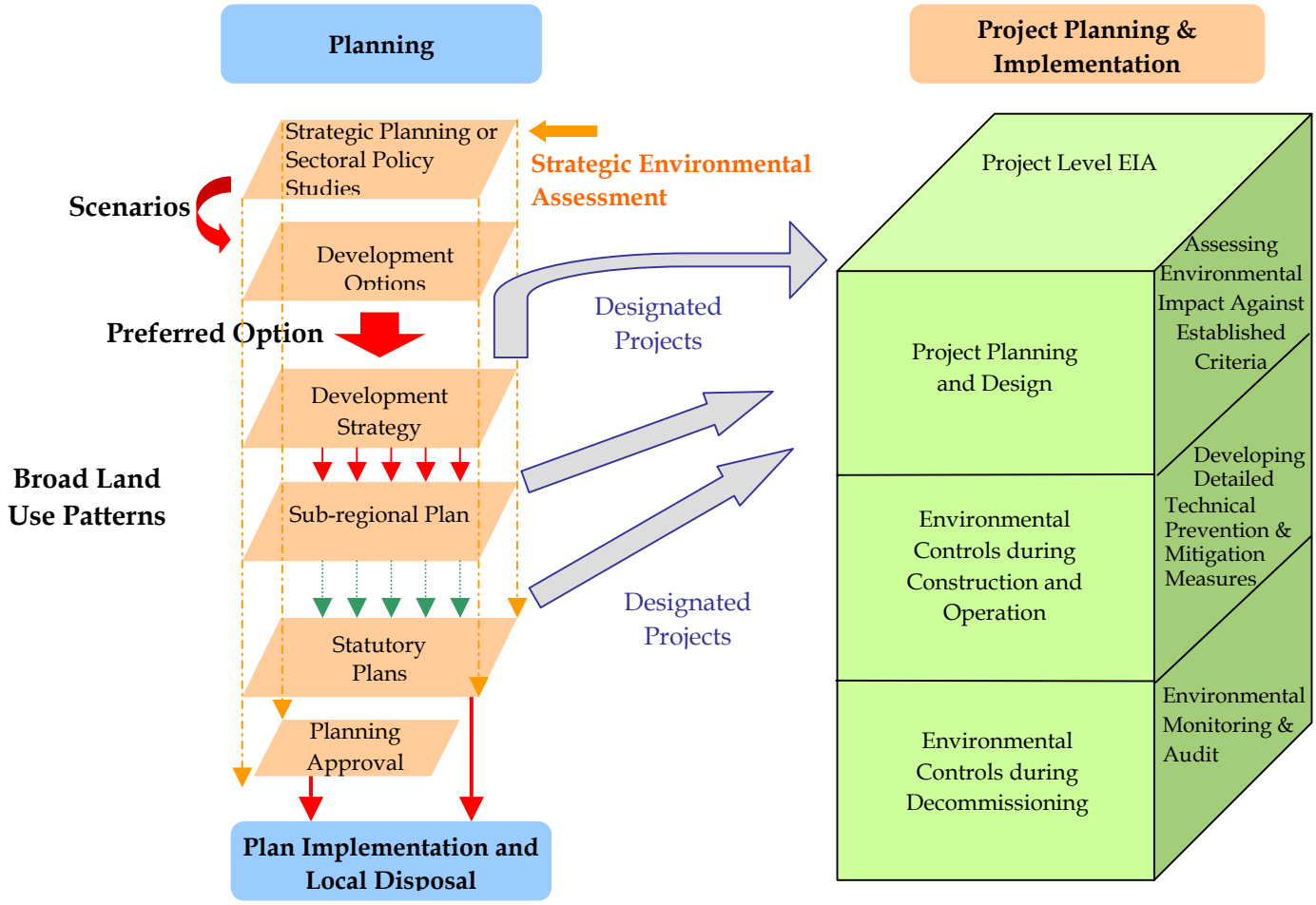


Figure 3.2 Interaction Between Planning and EIA

An example of SEA in Hong Kong is provided below.

Territorial Development Strategy Review 1996

Type of Strategic Environmental Assessment (SEA)

Strategic level environmental assessment of the medium term and long term territorial development strategies.

Nature and Scope of the Proposal

Strategic land use - transport - environment framework for Hong Kong up to year 2011 to cater for a total of 8.1 million population.

Basis of SEA Requirement

A requirement to provide information on environmental implications in the submissions to the highest level decision making body (the Executive Council) in Hong Kong.

Downstream EIA requirements for individual projects arising from the strategy.

Alternatives or Options Assessed

2 scenarios and more than 22 options were assessed.

Methods and Techniques

Environmental Baseline Study on environmental carrying capacity and sustainability.

Territory-wide models to assess cumulative environmental implications on sewage, water quality, noise, air quality, waste disposal and ecology.

Key Environmental Outcomes or Influences:

1. Major policy issues were raised at the highest level of the Hong Kong Special Administrative Region Government.
2. Elimination of major environmentally unacceptable and undesirable development options, such as the filling up of Rambler Channel.
3. Identification of environmental constraints and potential adverse impacts due to the preferred options, such as the identification of potential air quality and sewage problems, and recognition of the conservation value of various environmentally sensitive areas.
4. Consideration of indicative mitigation requirements and outline environmental follow up plans and sectoral policies, such as vehicle emission control, sewage infrastructure provision, and better transport planning.
5. Provided key input to informed public debate raising the awareness on the need for environmentally sustainable development.
6. Commitment from the highest level obtained to embark on a comprehensive sustainable development study - Study on Sustainable Development for the 21st Century (SUSDEV 21).

Reference: http://www.epd.gov.hk/epd/english/environmentinhk/eia_planning/sea/ebook1_7.html

"Screening" is a process of determining whether an EIA is required for a project. Screening often is the first stage of the EIA process when a decision is made on whether an EIA is required.

The list of Designated Projects (DPs) is listed out in Schedule 2 & 3 of the EIAO.

If a project is a DP, a project proponent has to get through the EIAO.

Examples of Designated Projects are provided below.

Project: **Reprovisioning of Diamond Hill Crematorium**

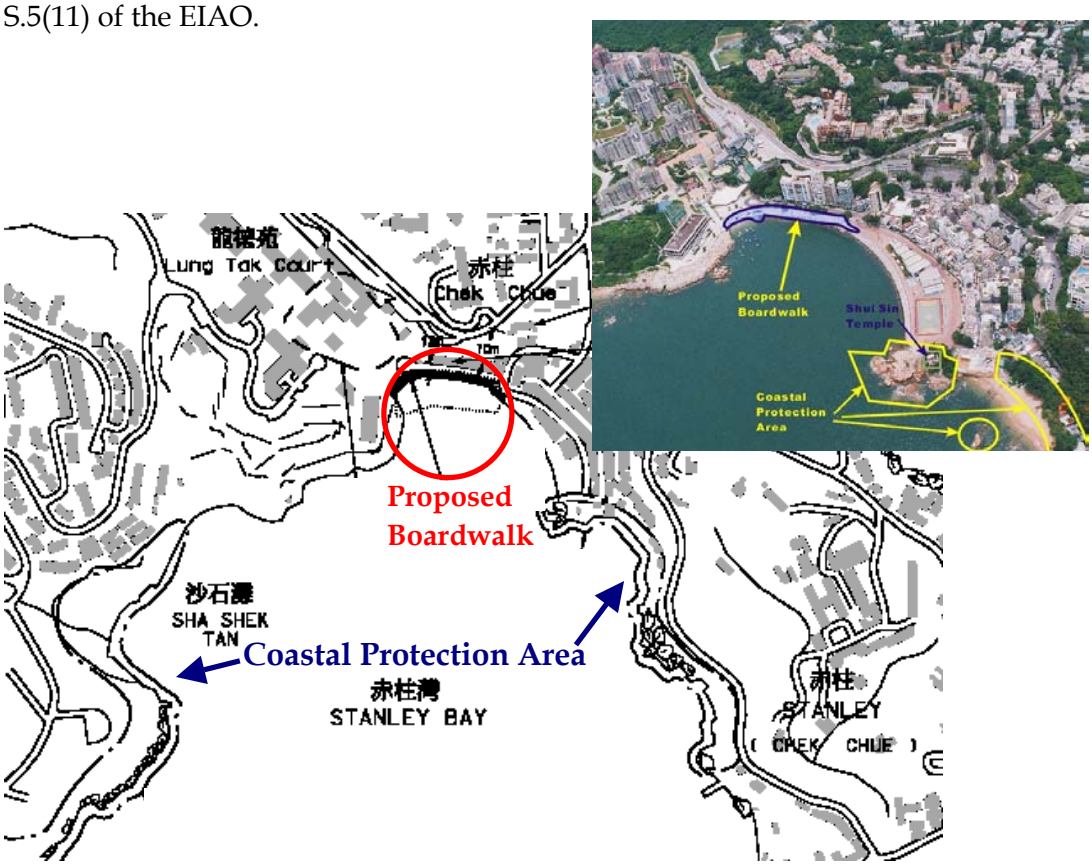
Works: A crematorium proposing 6 new cremators to replace 6 existing cremators

A crematorium is a Designated Project under N.4, Schedule 2 of the EIAO. An application for an EIA Study Brief was submitted on 25 March 2002 with a Project Profile (No. PP-166/2002).

Project: **Stanley Waterfront Improvement Project – Construction of Boardwalk**

Works: Dredging operation about 140m from an existing coastal protection area in Stanley

A dredging operation which is less than 500m from the nearest boundary of an existing or planned coastal protection area is a Designated Project under C.12(a)(vii), Schedule 2 of the EIAO. A Project Profile (No. DIR-084/2003) was submitted on 2 July 2003 to apply directly for an Environmental Permit under S.5(11) of the EIAO.



3.3 *HOW TO PREPARE A GOOD PROJECT PROFILE?*

A Project Profile can be used for:

- Application of Study Brief; or
- Application for permission to apply directly for Environmental Permit (EP).

Project Profile for Application of Study Brief

Some Tips ……

- A Project Profile should contain information specified in Annex 1 of the EIAO TM for the Director of Environmental Protection to identify what environmental issues are required to be addressed in the EIA report.
- A Project Profile may cover more than one designated projects.

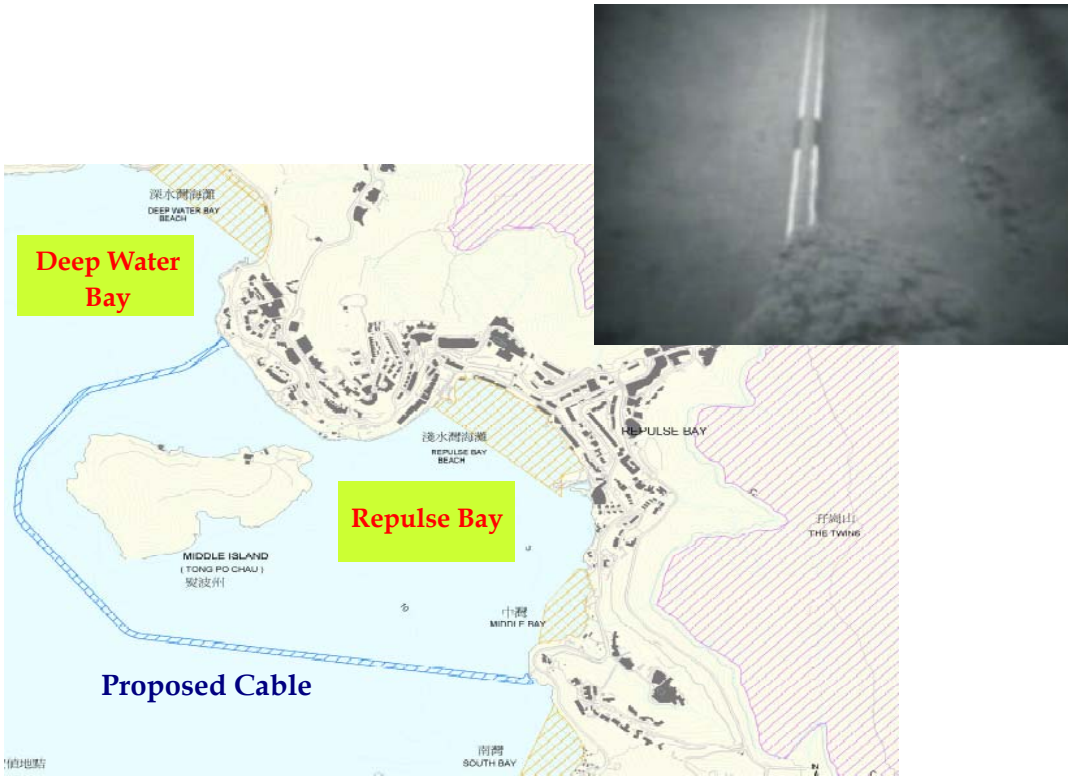
Project Profile for Permission to Apply Directly for Environmental Permit

- Readers can draw necessary reference from the EIAO Register.
- Examples are given below.

Project: **132 kV Submarine Cable Installation for Wong Chuk Hang – Chung Hom Kok 132 kV Circuits**

Works: Dredging operation less than 500m from an existing bathing beach in the Deep Water Bay

A dredging operation less than 500m from an existing or planned bathing beach is a Designated Project under C.12(a)(iii), Schedule 2 of the EIAO. A Project Profile (No. DIR-063/2002) was submitted on 21 Jan 2003 to apply directly for an Environmental Permit under S.5(11)of the EIAO.



Project: **Design and Construction of Causeway Bay Flyover**

Works: Construction of a two-lane flyover to replace the existing one-lane flyover in Causeway Bay

A primary distributor road is a Designated Project under A.1, Schedule 2 of the EIAO. A Project Profile (No. DIR-082/2003) was submitted on 23 April 2003 under S.5(10) of the EIAO to apply directly for an Environmental Permit for a material change to an exempted designated project.

Project: **10-Year Extended Landslip Preventive Measures Project, Phase 2**

Works: Slope works within Lantau South Country Park

Projects within a country park are Designated Projects under Q.1, Schedule 2 of the EIAO unless they fall into exceptions. A Project Profile (No. DIR-070/2002) was submitted on 22 Aug 2002 to apply directly for an Environmental Permit under S.5(11) of the EIAO.

3.3.1 *Key Information in a Project Profile*

The information to be included in a Project Profile is specified in Annex 1 of the EIAO TM:

Basic Information

- Purpose and nature of the Project, Proponent's contact information, location/scale/history of site, number and types of DP covered in PP

Outline of Planning and Implementation Programme

- Project time-table

Possible Impacts on the Environment

- Outline any process involved
- Describe environmental impacts/issues arose during construction, operation or decommissioning of the Project

Major Elements of the Surrounding Environment

- Outline existing and planned sensitive receivers which might be affected by the Project
- Outline major elements of the surrounding environment and/or relevant past land use(s) on site which might affect the Project

Environmental Protection Measures

- Describe measures to minimise environmental impacts
- Comment on possible severity, distribution and duration of environmental effects

Use of Previously Approved EIA Reports

3.3.2 *Merits of a Good Project Profile*

- Early identification of environmental issues (apply "avoid-minimise-mitigate" principle in project design);
- Early public awareness of the potential implications to the environment and the community (can promote good public relation);
- Facilitate preparation of an EIA Study Brief.

"Scoping" is a process for determining what environmental issues to be covered, assessed and addressed in an EIA Report.

Broadly speaking, scoping in the EIA process helps EIA be focus and effective to assess at least:

- Key environmental impacts of a project;
- Alternatives to a project; and
- Any other matters that may be of public concerns.

In general, results of a scoping exercise is documented in a Study Brief. For this reason, a Study Brief is a key document in an EIA process.

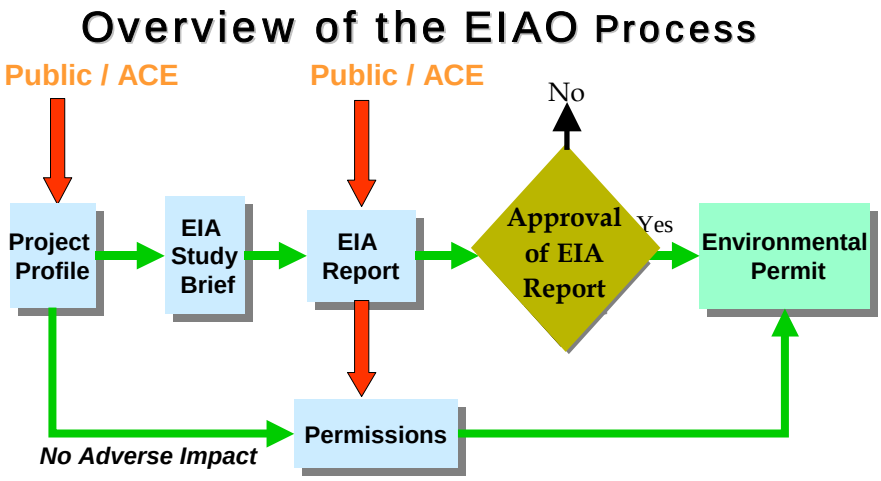


Figure 3.3

3.4.1 Identifying Possible Environmental Impacts

The primary objective of scoping is not to undertake the full EIA studies but to identify possible environmental impacts for further assessments. Many different techniques and tools, such as Checklist and Matrix, have been developed to proceed with the scoping exercise. These tools provide a systematic way of thinking through the potential interactions between a project and its environment.

Scoping Checklist is a more simple, systematic and widely accepted approach for such purpose. It is designed to help users to identify the likely environmental effects of the proposed projects during the scoping exercise. In most cases, a Scoping Checklist is helpful to identify all the activities or sources of impacts that could arise from construction, operation and/or decommissioning of the project, to reveal the characteristics of the project environment that could be affected and to study the interaction between them, if any. The findings of the scoping exercise (i.e. information recorded in the Scoping Checklist) provide a list of potential environmental issues, which should be considered and assessed in detail in the subsequent EIA.

An example of a simplified Scoping Checklist is given in *Table 3.1*.

Table 3.1 *Identification of Potential Environmental Impacts by Scoping Checklist*

Type of Potential Impact	Construction Phase	Operational Phase
Air Quality		
Gaseous, Dust or Odour emission	☐	☐
Noise		
Noisy operation	☐	☐
Night-time operation	☐	☐
Water Quality		
Liquid effluent, discharge or contaminated run-off	☐	☐
Solid Waste		
Generation of waste by-products (i.e. chemicals, asbestos)	☐	☐
Disposal of wastes/spoil materials at the landfill or public fill	☐	☐
Land contamination	☐	☐
Ecology		
Loss of native species or genetic diversity	☐	☐
Deterioration to area of high conservation value (e.g. with endangered/rare/protected flora and/or fauna species)	☐	☐
Stress on Ramsar Site, SSSI, Country Parks, Marine Parks/Reserve or Conservation Area	☐	☐
Damage or removal of important habitats (e.g. woodland, wetland, etc.)	☐	☐
Fisheries		
Jeopardising to the maricultural zones by traveling or operating dredger	☐	☐
Discharge close to maricultural zones/fish ponds	☐	☐
Visual and Landscape		
Unsightly visual appearance	☐	☐
Sites of Cultural Heritage	☐	☐
Damage to the site of cultural heritage by excavation works	☐	☐
Structural vibration of the historical buildings or structures	☐	☐
Hazards		
Explosions, spillage, fires, etc. of hazardous materials during storage, handling, transport or disposal	☐	☐
Pollution or hazard resulted from risk of accidents	☐	☐
The site is within the consultation zone of landfill or PHIs	☐	☐

Note:
✓ the activity likely to result in environmental impact
× the impact not expect to occur
? It is uncertain at this stage whether the impact will occur or not

3.4.2 *Considering Possible Alternatives and Mitigation Measures*

Alternatives are, essentially, different ways in which the project proponent can meet the project's objectives, for example by carrying out a different type of action, choosing an alternative location or adopting a different technology or design for the project. Alternatives and mitigation measures therefore cover a spectrum ranging from a preliminary review to very detailed aspects of project design.

VTP

As a commonly adopted practice, **the "Avoidance-Minimization-Mitigation" approach is regarded as a preferable procedure to tackle the environmental problems**.

In a typical EIA mechanism, particularly at the SEA stage, when considering mitigation measures, a project proponent shall give priority to avoidance of impacts and the adverse effects shall be avoided to the maximum practicable extent as far as possible. A project proponent should avoid the environmental problems at the conceptual or planning stage, since early focus on major adverse environmental consequences could save huge amount of efforts and/or costs that may otherwise arise from expensive or time consuming remedial works at a later stage.

Where unavoidable impacts are anticipated associated with the project, the project proponent shall minimise/mitigate the impacts by taking appropriate and practicable measures. As such, the impacts could be minimised to an acceptable level (i.e. comply with the legislation).

Examples of alternatives and mitigation measures that had been used throughout a project life cycle including:

- **different strategies of implementation** e.g. to improve existing facilities/infrastructure to meet the demand rather than develop a new one;
- **different sites or routes for all or part of the project** e.g. the sites or routes should be designed to avoid and minimise possible environmental impacts;
- **different technologies/working methods and raw materials** e.g. construction of a combined cycle gas turbine power plant rather than a coal fired power station;
- **alternative layouts or designs** e.g. locating noisy activities away from sensitive receivers; and
- **environmental measures incorporated into the project design** e.g. low energy consumption equipment in the facility.

The practicality and validity of alternatives and mitigation measures considered in scoping stage against envisaged environmental impacts should be reviewed and confirmed in the later EIA stage if any.

For an in-depth understanding of the alternative considerations, readers can refer to the Judgment of the Appeal for Sheung Shui to Lok Ma Chau Spur Line in the EIAO Register.

3.5 HOW TO SELECT AND MANAGE EIA CONSULTANTS?

Tools for Consultancy Management

From a consultant's perspective, an EIA Study Brief clarifies technical scope of an assignment, they generally require further details for their communications. These include:

- technical objectives
- management objectives
- "political" objectives
- simple answers to obvious questions
- concise and precise Inception Report

Management Objectives

A consultant generally expects a client to tell them *exactly* what he wants and what is important (and what is not)

- programme
- least cost solution
- wide spread community acceptance
- minimal conditions

From a Consultant's Perspective

Report on Consultants' Performance – *key elements* to look for ...

The Consultant drew up an EIA Report with very thoughtful consideration on practical site application. They were very proactive and readily available in assisting client office to prepare submission for ACE Sub-committee consultation. They addressed promptly and effectively to queries on the EIA Report during ACE consultation. Their advice was always constructive. This ultimately led to the EIA Report smoothly endorsed and approved by ACE and the EPD respectively.

The Consultant's key staff were competent and very initiative and responsive to client's requests and concerns. They had worked in full collaboration with the client office in this quarter. Their principal was directive and positive in resolving problems.

A Competent Team

Keys to success:

- Experienced EIA project manager
- In-house EIA resources *(Successful EIAs require a coherent multi-disciplinary team and should avoid a sub-sub consultant arrangement!)*
- Clear demarcation of roles and responsibilities

Relationship of Consultants and Project Proponents

- More than a simple contractual relationship
- Team effort to meet common objectives
- Key areas of collaboration:
    - Establishing a common vision for the project
    - Liaison with other government departments
    - Meeting programme on Response to Comment
    - Balancing permitting and design considerations

Best Practices….

- Start the process as soon as possible, preferably before the Project Profile is submitted, if possible.
- Have a clear vision of messages to be communicated.
- Emphasis on the positives.
- Listen and assimilate legitimate concerns.
- Maintain dialogue to resolve issues as they arise.

4. GETTING TO KNOW YOUR EIA REPORT

4.1 IMPORTANCE OF BASELINE DATA COLLECTION & SURVEY AND SENSITIVE RECEIVERS IDENTIFICATION FOR AN EIA

Baseline information plays a critical part in the EIA process.

A good environment baseline enables potential environmental impacts from a project to be predicted and evaluated and it is the foundation of an EIA, whereas a baseline environmental survey shall be carried out where necessary to determine the existing environmental conditions on the site.

Section 4.3 of the EIAO TM outlines the general approach and methodologies for assessment. A baseline survey can help establish at least the following, among others:

- Description of Environment

  "… characteristics of environment shall be described in a way sufficient for identification and prediction of environmental impacts..."

- Impact Prediction

  "… identifying receivers, habitats or resources which are vulnerable to change …"

- Impact Evaluation

  "… an evaluation of the anticipated [environmental] changes and effect shall be made…"

- Impact Mitigation

It can be readily discerned that without credible baseline information, the impact prediction and evaluation will not be very objective.

In a nutshell, a baseline survey is important because:

- A good baseline survey is the foundation of an EIA, resembling piling of a building.
- A baseline survey establishes identity of a project; identifies affected communities and their status, and provides yardsticks for impact prediction.

Tips… …

Both project proponents and consultants shall possess first hand knowledge on site constraints, site conditions, location and status of sensitive receivers, and etc. If necessary, regular updating might be needed on a regular basis. With that, it is recommended to have regular site visits during the course of an EIA.

Problems Encountered
Incorrect assumptions result in inaccurate prediction. For instance, positions of fresh air intakes might affect interpretation of air quality prediction.

4.1.1 *Sensitive Receivers for Noise and Air Quality Impact Assessment*

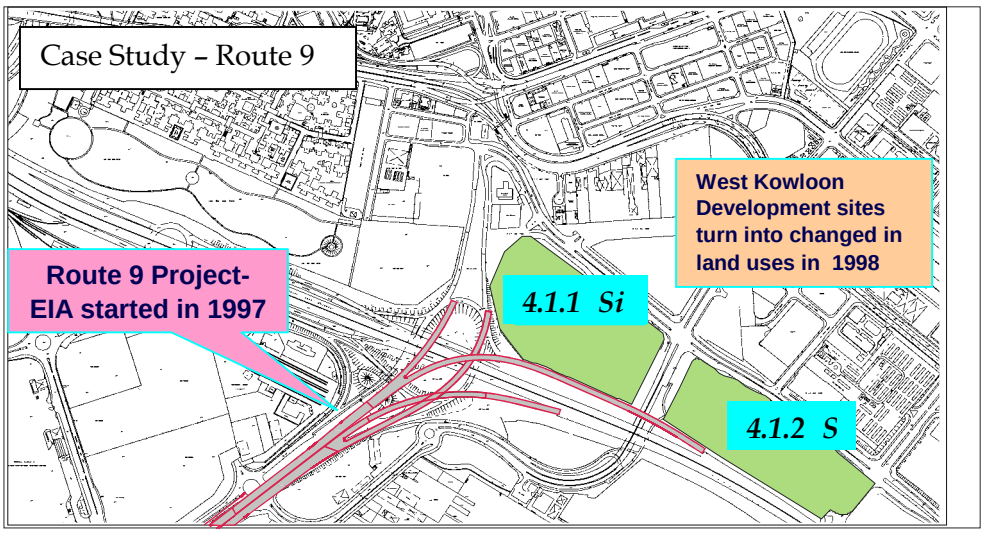
The EIAO TM lists out classifications for sensitive receivers. For instance, Annex 13, Section 3, delineate uses that are classified as noise sensitive uses.

Proper planning should be carried out before commencement of baseline survey. For sensitive receivers in air and noise, typical information can be gathered via:

- Survey Maps
- Site visits
- Outline Zoning Plans
- Liaison with Planning Department & EPD for planned use
- Pertinent approved EIAs in the EIAO Register

Points to note:

Planned land uses might change during project development phase. A proponent is suggested to keep abreast of updated land uses plan. As an example, if industrial land uses are turned into sensitive uses, such as in the case of Route 9 EIA, an EIA might need suitable revision.



4.1.2 *Ecologically Important Areas*

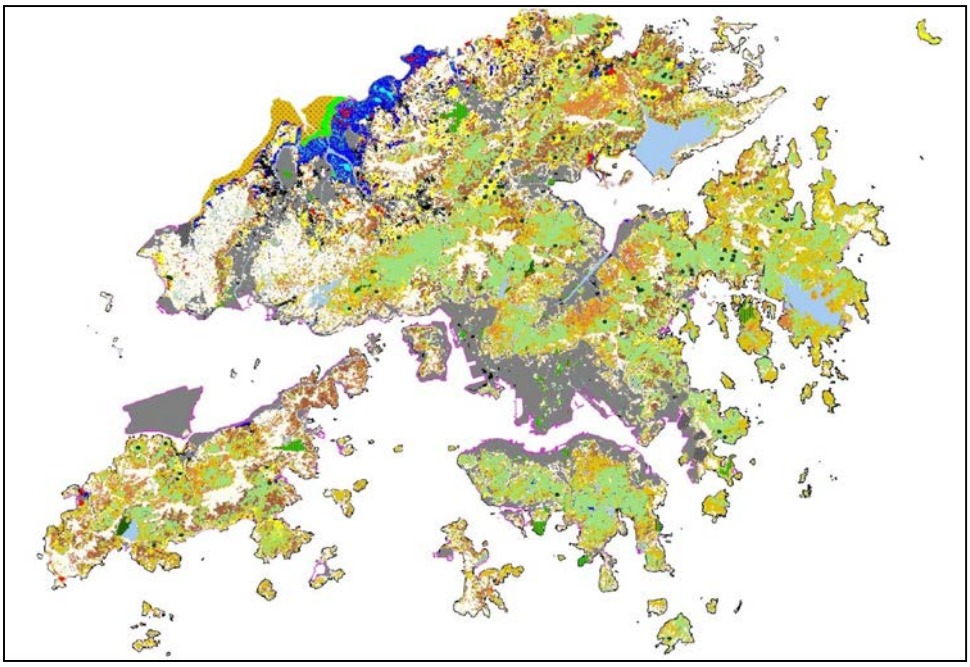
Annex 16 of the EIAO TM lists out the definition of "Recognized Sites of Conservation Importance", "Important Habitats Where an Ecological Assessment will be Necessary", and "Species of Conservation Importance".

They are listed out in Note 1, Note 2 & Note 3 of the Annex 16. Also, Annex 8 of the EIAO-TM prescribes the criteria to evaluate the importance of site/habitat.

Locations of some ecologically sensitive areas can be drawn reference from:

- Survey maps (e.g. scaled survey maps and Hong Kong Map published by the Lands Department)
- Site survey
- "*A Key Map of Country Parks, Special Areas, Marine Parks, Marine Reserves, Fish Culture Zones, Major Agricultural Areas and SSSI*" Published by AFCD
- Pertinent approved EIAs in the EIAO Register
- Site of Special Scientific Interest (SSSI) Register maintained by the Planning Department
- Aerial photographs from Lands Department
- Boundary of Ramsar Site
- Mangrove Study by the Hong Kong City University
- Freshwater Wetland Study by the University of Hong Kong
- Sustainable Development Unit (SDU) – Terrestrial Habitat Maps

Figure 4.1 Terrestrial Habitat Mapping (SUSDEV-21)



Annex 16 of the EIAO TM indeed provides the assessment methodology for baseline study. In addition, the EIAO Guidance Note No GN7/2002 entitled "Ecological Baseline Survey" offers some practical tips on the survey effort.

It is readily demonstrated that establishment of a credible baseline is critical in an ecological impact assessment.

4.1.3 *Sensitive Receivers for Water Quality Impact Assessment*

Annex 6 and 14 of the EIAO TM, list out definitions of beneficial uses sensitive to water pollution.

Locations of some of these uses can be checked via:

- Survey maps (e.g. scaled survey maps and Hong Kong Map published by the Lands Department)
- Seawater Intake Map published by CED
- Gazetted plans of water control zones in the WPCO
- Site surveys
- "*A Key Map of Country Parks, Special Areas, Marine Parks, Marine Reserves, Fish Culture Zones, Major Agricultural Areas and SSSI*" Published by AFCD

4.2 *DIRECT, INDIRECT & CUMULATIVE IMPACTS*

Direct environmental impacts arise directly from a project such as loss of footprint in the site area. Using road projects as an example, the direct environmental impact will be the loss of habitats from clearance for roadwork.

Indirect environmental impacts are directly resulted from a project. For road projects, they are vehicular emission and noise pollution associated with the roadwork.

Cumulative impacts are the sum total of environmental impacts from a project and other works in the vicinity. For road projects, the rule of thumb for emission impact is the accumulation of project-induced emissions and those from other pollutant-emitting activities within 500m radius of the project site.

In consideration of prediction of cumulative and direct impact, the TM in Section 4.3(c)(iii) says that "***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***" shall be evaluated.

In evaluation of cumulative impacts, incremental loss of ecologically important habitat, e.g. fishponds, or the incremental increase of vehicular often is of public concerns. An example is the cumulative environmental impacts from proposed road network in the New Territories as shown in the following layout. Handling of global effect required a strategic assessment.

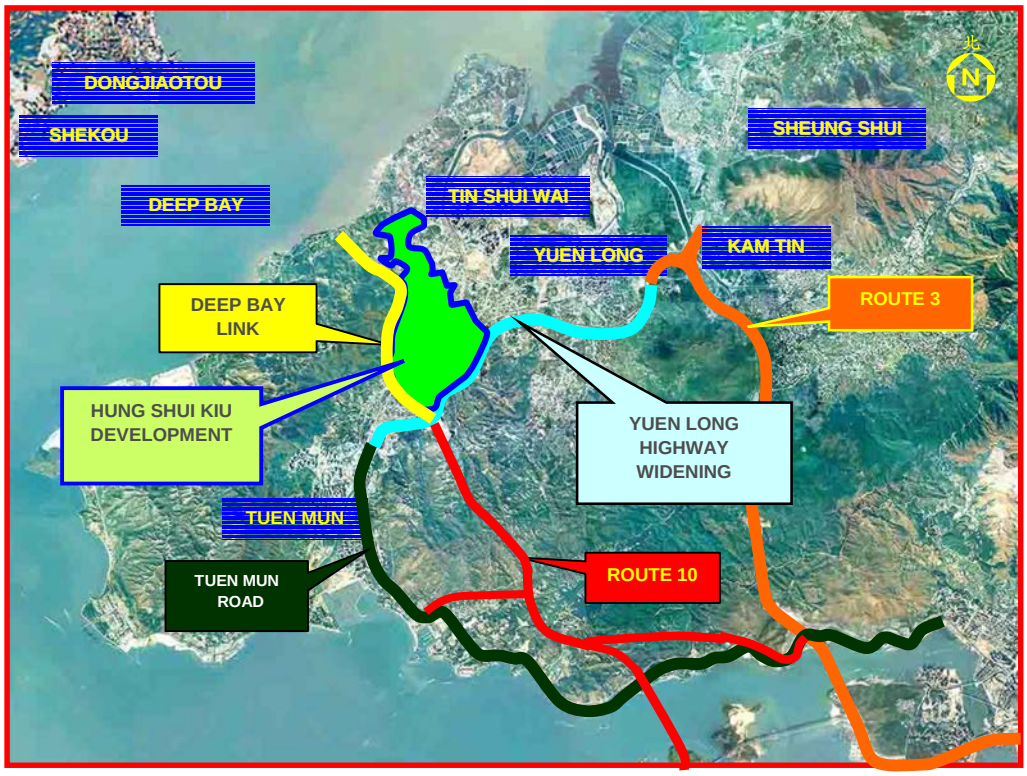


Figure 4.3 Consideration of Cumulative Effects for Yuen Long Highway Widening, Deep Bay Link, Route 10 and Hung Shui Kiu Development

4.3 *NOISE ASSESSMENT IN A NUTSHELL*

Annex 5 and Annex 13 in EIAO-TM list down the criteria and guidelines respectively for noise assessment. In addition, EPD is in the process of promulgating a series of guidance notes on the assessment of various sources. They will be available in the EIAO Cyber Help Bench http://www.epd.gov.hk/epd/eia/.

Also, EPD has a list of publications on dealing with construction, traffic and operational noise. They include inter alia:

- Screening Structures and Building Designs Against Transportation Noise in Hong Kong
- A Concise Guides to the Noise Control
- A Practical Guide for the Reduction of Noise from Construction Works

In a nutshell, a generic approach in a noise assessment is in the following sequence:

- Identify noise sources
- Identify noise sensitive receivers
- Quantify noise impacts (modelling or measurement)
- Mitigation measures
- Consideration of residual impacts

Without intention to repeat matters set out in details in other guidelines and publication, this chapter will list out some key matters warranting a proponent's attention during the course of an EIA. Should there be any divergent view on interpretation, other publications will take precedence on this manual which primary aim is for training purpose.

4.3.1 *Identification of Noise Sources*

As an illustration, the Annex 13 of the EIAO-TM outlines some potential noise sources:

(a) Road traffic noise

(b) Fixed noise sources (including, but not limited to, general industrial noise sources, concrete batching plants, pump houses, electricity sub-stations, gas pressure reduction plants, rock crushing plants, quarries, railway depots/marshalling yards, airport facilities, wholesale markets, bus depots/termini, open car lorry parks, vehicle pounding areas, refuse handling areas, abattoirs, container terminals, sand depots, public cargo working areas, multi-purpose terminals, fire stations, ambulance depots, tram depots

(c) Construction noise (including noise from powered mechanical equipment and vehicle movement on haul roads)

(d) Railway noise

(e) Aircraft noise

(f) Helicopter noise

4.3.2 *Noise Sensitive Receivers*

Some typical Noise Sensitive Receivers are: *

	NSR
Domestic premises & temporary housing	✓**
Hostel	✓**
Hospital, clinic & nursery	✓**
School, educational institution	✓**

*300m Study Area

**Relevant standard in TM applicable to the uses rely on opened windows for ventilation only.

Noise Criteria

As stated in the EIAO - TM (Annex 5) and Hong Kong Planning Standards and Guidelines (HKPSG)

- Daytime Construction noise
  - L_{eq} (30 min) 75 dB(A) – Residential
  - L_{eq} (30 min) 70 dB(A) – School
- Road traffic noise
  - L_{10} (peak hour) 70 dB(A) – Residential
  - L_{10} (peak hour) 65 dB(A) – School

4.3.3 *Quantifying Noise Impacts*

There are various quantifying methods for predicting noise impacts. In a nutshell, a noise model would apply acoustic principles to predict noise impacts at sensitive receivers. In modelling, the tips are to identify characteristics of sensitive receivers and input a credible assumption of noise source.

Generic Approach in Calculation of Construction Noise

Assumptions on construction sequence and plant inventory

Identification of Noise Source (expressed in terms of Sound Powered Level or Sound Pressure Level)

Separation Distance between source and receiver

Apply basic separation distance correction

Distance correction = $10 \log (2\pi r^2)$
where r = separation distance (m)

Screening + façade correction

Generic Approach in Calculation of Road Traffic Noise

Establishment of road horizontal and vertical alignments

Prediction of traffic noise impact through application of document published by the UK Department of Transport applying methodology developed based on measurement data undertaken in the UK. The prediction is a function of:

- Traffic conditions (flow, speed, percentage of heavy vehicles)
- Road conditions (alignment, gradient, road surface)
- Source and receiver geometry (distance, shielding, angle of view, etc.)

Apply basic separation distance correction

Simple screening + façade correction

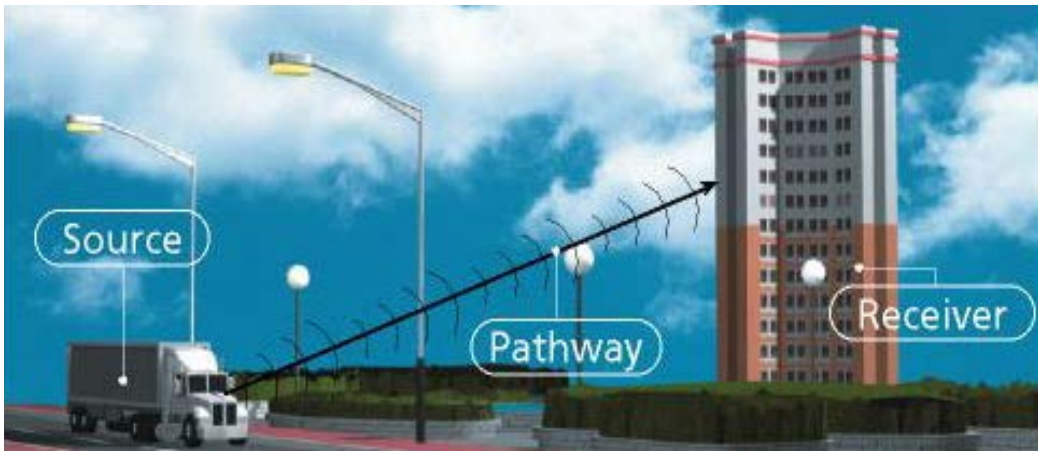


Figure 4.4 Source-Pathway-Receiver Relationship

Some practical tips about carrying out noise assessment using modelling techniques:

- A proponent would commonly engage a consultant to carry out the noise assessment by using modelling techniques. Before carrying out modelling, a proponent and consultant are recommended to check thoroughly the status of each sensitive receivers as well as confirming them through site inspection.

- It is also recommended that a proponent shall check whether the input parameters and assumptions are a proper reflection of the project.

<u>For Construction Noise Impact</u>

- A proponent shall see that input parameters for modelling including construction sequence & methodology, progress rate, number and type of mechanical plants, site areas, haul road, and mugging out areas, are all reasonable and practicable assumptions for works to be completed satisfactorily and timely;

- In particular, the number and type of mechanical plants should neither be too few nor excessive;

- Also, the location of haul road might affect modelling results critically; and

- Early involvement of contractors may be useful.

<u>For Traffic Noise Impact</u>

- A proponent shall see that the traffic volume and flow composition in modelling dovetails with the design;

- A proponent shall see that the heavy vehicle composition is a reasonable assumption; and

- A proponent shall also confirm the status and layout of planned and committed land uses to ascertain that mitigation measures can be applied flexibly and timely if needed.

Calculation of Railway Noise

- Define source terms of trains (L_{max} or SEL at a reference distance from track, reference speed and track type) – usually obtained from rail operator or by measurement
- Physical parameters (length of train, operating speed, type of track, train frequency)
- Source and receiver geometry (distance, shielding, angle of view, etc.)

Typical Calculation for Locomotive

$SEL = L_{max} + 10 \text{ Log } (d/V) + 8.6$

where V = train operating speed

d = distance from track

(*Transportation Noise Reference Book* edited by Paul Nelson. Chapter 15, Pg11)

$L_{eq} = SEL + 10 \text{ Log } (N/T)$

where N = number of trains in period T

- source height taken at top of locomotive

Other Factors

- Switches and Crossings
- Types of Track
- Wheel Squeals

4.3.4 *Mitigation Measures*

Annex 13 of the EIAO TM puts up a list of mitigation measures in the event of noise exceedance are predicted.

In addition, EPD has promulgated a list of guidance notes and publications in the devising of them.

Tips….

In light that it is a common practice to engage consultant in carrying out EIA, before adopting mitigation measures being recommended, a project proponent shall see that these measures are practical and engineering feasible without undue effect on the construction programme or other side environmental impacts.

For instance, in the provision of noise barriers, a proponent should check that whether there are enough space for foundation construction, or clearance for construction plant movement and etc.

Without meaning to generalize the noise assessment and provision of mitigation measures, some illustrations of common mitigation measures are:

Construction

- Use of "quiet" PME or construction method
- Noise barriers/ enclosures
- Rescheduling of noisy construction works

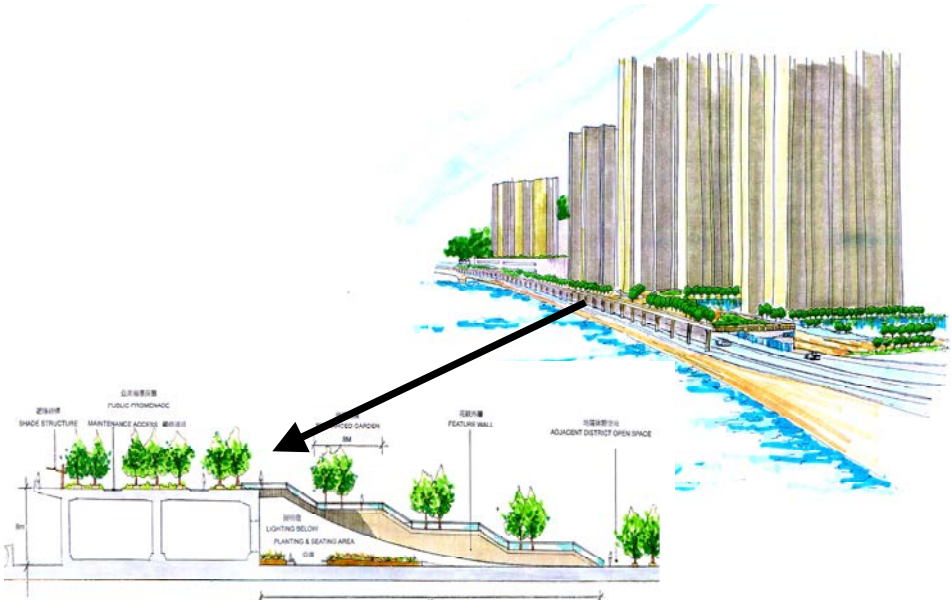
Example 1: Noise Barrier

Example 2: Noise Enclosure

Road Traffic Noise

- Alternative horizontal or vertical alignment of road
- Alternative landuse or landscape as buffer
- Use of low noise road surfacing
- Noise barriers / enclosures

Example 1: Alternative Alignment



Example 2: Landscape Buffer

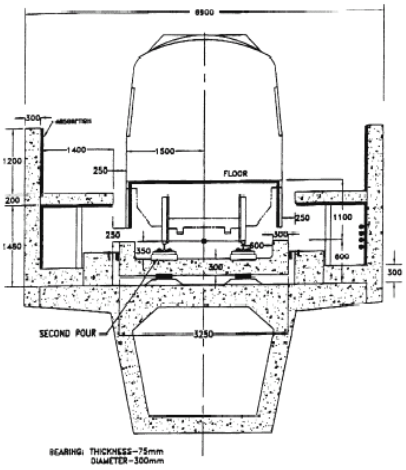
Example 3: Noise Barrier

Example 4: Noise Enclosure

Railway Noise

- Alignment
- Trackside barrier
- Multi-plenum Noise Reduction System
- Noise Enclosure

Multi-Plenum Noise Reduction system



Noise Enclosures

4.4 AIR QUALITY ASSESSMENT IN A NUTSHELL

The assessment criteria and guidelines have been listed down in the EIAO TM Annexes 4 and 12. EPD Air Policy Group also sets a list of assessment methodologies and guidelines for the different types of the air quality assessment which includes:

- *Guidelines on Choice of Models and Model Parameters;*
- *Guidelines on Assessing the 'TOTAL' Air Quality Impacts;*
- *Guidelines on the Use of Alternative Computer Models in Air Quality Assessment; and*
- *Guidelines on Estimating Height Restriction and Position of Fresh Air Intake using Gaussian Plume Models.*

These guidelines are available in the EPD website http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/guide_aqa_model.html.

In a nutshell, the generic approach in an air quality assessment is according to the following sequence:

- Identify air pollution sources
- Identify air sensitive receivers
- Quantify air quality impacts by modeling
- Mitigation measures

4.4.1 *Identification of Air Pollution Sources*

Typical air pollution sources and the associated air pollutants ---

Air Pollution Source	**Air Pollutants**
Construction activities	• Total suspended particulates (TSP)
Vehicle emission from highway/road including tunnel portal and ventilation building	• Nitrogen dioxide (NO_2) • Respirable suspended Particulates (RSP) [(a)] • Carbon monoxide (CO)
Chimney emissions from combustion process	• Nitrogen dioxide (NO_2) • Sulphur dioxide (SO_2) • Respirable suspended particulates (RSP) [(a)] • Carbon monoxide (CO) • Non-criteria pollutants [(b)]
Sewage treatment works, sewage pumping station, slaughter house, etc	• Odour

Notes:

(a) RSP means suspended particulates in air with a nominal aerodynamic diameter of 10 micrometers or smaller.

(b) Non-criteria pollutant means those pollutants are not bounded by the Air Quality Objectives under the Air Pollution Control Ordinance (APCO). Such pollutants include heavy metals, dioxin & furans, volatile organic compounds, etc.

4.4.2 *Identification of Air Sensitive Receivers*

EIAO TM Annex 12 sets out the definition of air sensitive receivers (ASRs). Some typical ASRs are summarized as follows:

	ASR
Domestic premises & temporary housing	✓
Hotel & hostel	✓
Hospital, clinic & nursery	✓
School & education institution	✓
Office, factory, shop & shopping centre	✓
Place of worship, library & court of law	✓
Sport stadium & performing arts centre	✓

In general, the assessment will be carried out within 500 m from the boundary of the project site or as defined in the EIA Study Brief. Examples of ASRs are shown in *Figure 4.5*.

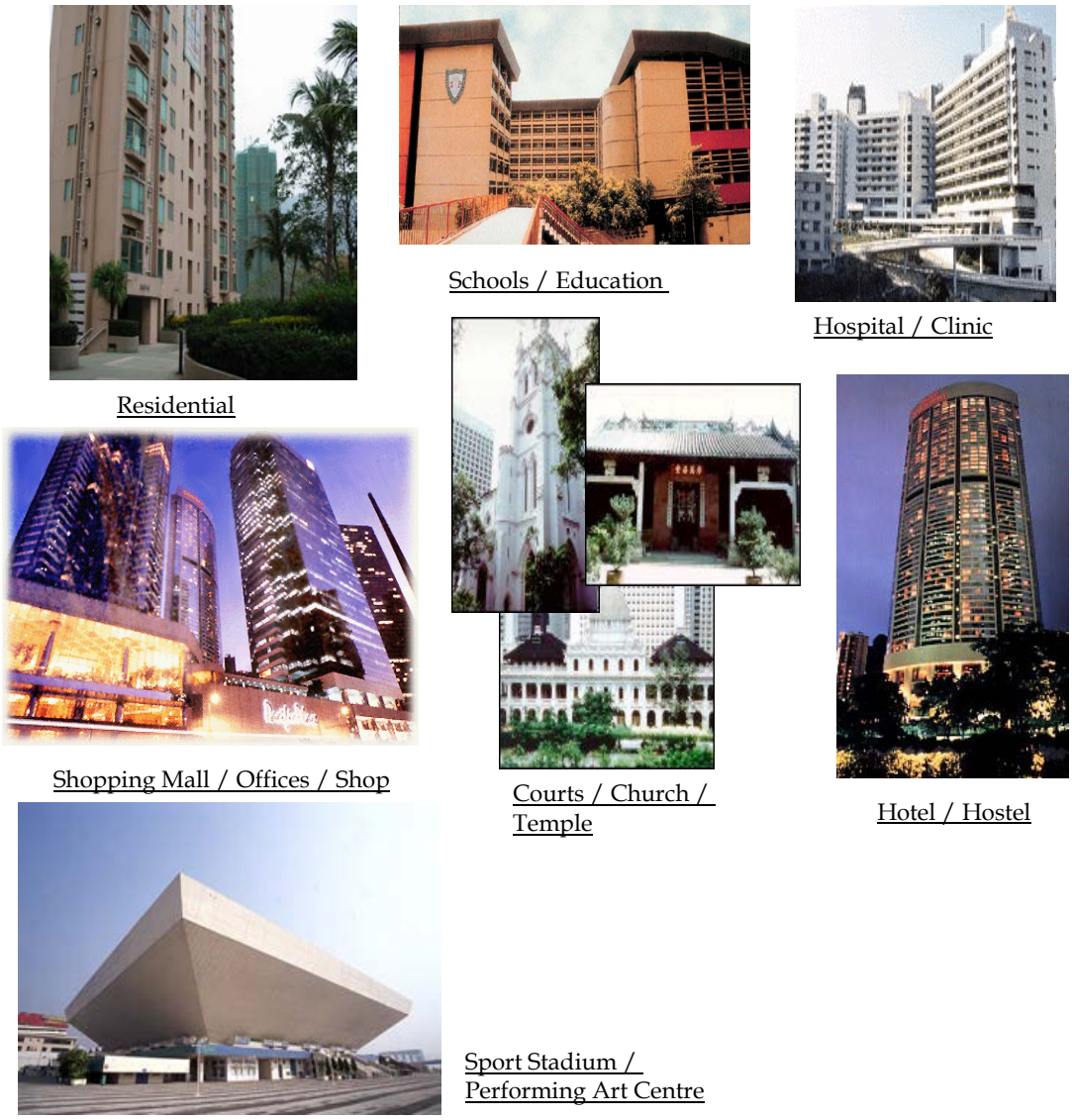


Figure 4.5 Typical Air Sensitive Receivers

4.4.3 *Quantifying the Air Quality Impacts*

Air Quality Assessment Criteria

Criteria Pollutants ---

- Air Quality Objectives (micrograms per cubic meter) under APCO

Air Pollutant	Averaging Time			
	1 Hour [b]	24 Hours [c]	3 Months [d]	1 Year [d]
Total Suspended Particulates (TSP)	-	260	-	80
Respirable Suspended Particulates (RSP) [e]	-	180	-	55
Sulphur Dioxide (SO_2)	800	350	-	80
Nitrogen Dioxide (NO_2)	300	150	-	80
Carbon Monoxide (CO)	30,000 [g]	-	-	-
Photochemical Oxidant (as Ozone (O_3)) [f]	240	-	-	-
Lead (Pb)	-	-	1.5	-

Notes:
(a) Measured at 298K (25°C) and 101.325 kPa (1 atmosphere)
(b) Not to be exceeded more than three times per year
(c) Not to be exceeded more than once per year
(d) Arithmetic means
(e) Respirable suspended particulates are defined as particles suspended in the air with a nominal aerodynamic diameter of 10 micrometres and smaller
(f) Photochemical oxidants are determined by measurement of ozone.
(g) 8-hr average AQO for CO is 10,000 µg/m^3.

- EIAO TM Annex 4
  - Hourly TSP Criteria : 500 µg m^{-3} measured at 298 K and 101.325 kPa for construction dust impact assessment
  - Odour Criteria : 5 Odour Units (OU) based on an averaging time of 5 seconds for odour prediction assessment

Non-criteria Pollutant ---

- For air pollutants not established under the APCO nor above: meet the standards or criteria adopted by recognized international organizations such as WHO or USEPA as to be agreed with the Director of EPD.

Background Air Quality

Reference can be made to the *Air Quality in Hong Kong* published by the EPD Air Services Group and the recommended background air quality in the *EPD's Guideline on Assessing "TOTAL" Air Quality* in estimating the background air quality of the study area. These information could be downloaded from the EPD's website:
http://www.epd.gov.hk/epd/english/environmentinhk/air/air_quality/aq_annualrpt.html and
http://www.epd.gov.hk/epd/english/environmentinhk/air/guide_ref/guide_aqa_model.html, respectively.

Assessment Methodology

There are various methods to predict and quantify the air quality impacts. Air quality model is usually applied to predict air quality impacts at the sensitive receivers.

In accordance with the EPD APG's *Guidelines on Choice of Models and Model Parameters*, three models, i.e., *Fugitive Dust Model* (FDM), *California Line Source Model* (CALINE4) and *Industrial Source Complex Short Term* (ISCST3) are recommended for general local-scale assessment. These models are developed by the US Environmental Protection Agency (US EPA) using the Gaussian equation in a Lagrangian framework.

Other dispersion models would be needed to assess regional air quality impacts and deal with complex terrain. *Pollutants in the Atmosphere and their Transport over Hong Kong* (PATH), *Computational Fluid Dynamic* (CFD) model and *Wind Tunnel* are techniques that are commonly used apart from the aforesaid Gaussian dispersion models.

Different types of air quality model would be required to assess the impacts from different sources.

Model	**Application**
FDM	Construction dust, fill bank, concrete batching plant
CALINE4	Road traffic emission
ISCST3	Stack, portal, odour, ventilation building
PATH	Cumulative regional assessment of different air pollution sources, especially for photochemical species such as ozone and nitrogen oxides
Wind Tunnel/CFD	Near to medium-field assessment for dispersion of air pollutants from air pollution sources in complex terrain

Modelling Input

A list of information will be required to prepare for the modelling input. Some information can be provided by the Design Engineer such as construction programme, construction activities and design of the highway. Some general information includes meteorological data and landuse information based on latest survey maps, Outline Zoning Plan (OZP), land resumption plans and layout plans for committed planned landuses.

Typical Information required for air quality assessment

Construction Dust ----

- Location of works areas & haul roads
- Typical construction programme and construction method
- Volume of excavated spoils / fill materials
- Processing capacity of concrete batching / rock crushing plant
- No. of blasting and blasting area
- No. of trucks using the haul roads
- US EPA AP-42 Emission Factors
- Scheduled project programme and location plans of all other projects in the vicinity (within 500m)
- Assessment results if EIA conducted in the vicinity

Chimney Emission ----

- Chimney location
- Fuel consumption rate
- Stack height
- Exit diameter
- Exit flue gas temperature and velocity

Vehicle Emission ----

- Road alignment and road height
- Peak traffic data in veh/hr and diurnal pattern with detail breakdown for each vehicle categories including existing and future roads within the study area (Operation year of the roadworks and traffic projections within 15 years from commissioning)
- Vehicle emission factors
- Location of noise barrier / semi-enclosure / fully enclosure proposed

Tunnel Portal and Ventilation Building Emissions ----

- Map showing locations of tunnel portal, ventilation building and length of the tunnel
- Height of tunnel portal and the ventilation building
- Cross-sectional area of tunnel portal and ventilation building
- Peak hour traffic data in veh/hr with detail breakdown for each vehicle categories of the worst assessment year
- Ventilation rate (m^3/s) and velocity (m/s) of the ventilation building

Odour Emissions ----

- Identification of type of odour
- Map showing location of odour sources
- Dimension including width, length, diameter and height of the odour sources
- Methodology for odour emission estimation based on research paper and/or odour concentration measured from similar odour source
- Ventilation rate (m^3/s) and efflux velocity (m/s) of the sewage pumping station / odour sources
- Treatment process and sewage flow (m^3/s)

1-year meteorological data from the HK Observatory including ----

- Wind speed and wind direction
- Stability classes
- Mixing height
- Temperature

Practical Tips ---

- Ask the consultant to seek EPD's agreement on the modelling parameters before doing the modelling works to smoothen the works and minimize EPD's comment; and

- The proponent shall confirm the status and layout of planned and committed landuses to ascertain the impact on them have been assessed.

4.4.4 *Interpretation of the Modelling Results*

As stated in the EIAO TM Annex 12, the presentation of assessment results should be assisted by a summary table and contour plots of pollution concentration. And the assessed results should be compared with the air quality standards as defined in the AQOs, EIAO TM Annex 4 and the international guidelines if necessary.

Example :

Hourly TSP Concentration

Tips on Inspecting the Modelling Results…

- Check Emission Factors (e.g. fuel consumption rates)
- Compare the predicted concentrations at discrete receptors with the contours
- Compare the source location with the pollution contours (e.g. using overlay of the stack locations)
- Check concentrations always decrease in all directions from the identified sources

4.4.5 *Mitigation Measures*

Typical Construction Dust Control Measures

Covering dusty load with tarpaulin sheet

Watering on haul road

Automatic wheel washing facility

Stockpile covering by tarpaulin sheet

Compaction and hydroseeding

Vehicular Emissions

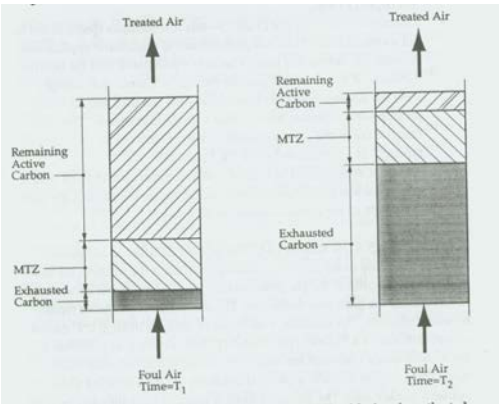
- Adjust the vertical/horizontal alignment of the roadway
- Redesign the ventilation building and tunnel ventilation
- Tighten vehicle emission standards

Odour Emissions

- Redesign the process
- Siting of the facilities
- Covering major odour sources, provision of odour removal facilities, application of chemical dosing, oxygen injection

Water Scrubber

Covering Tank



Activated Carbon Filter

4.5 *WATER QUALITY ASSESSMENT IN A NUTSHELL*

The assessment criteria and guidelines have been listed down in the EIAO TM Annexes 6 and 14. Other relevant legislations and guidelines are listed in:

- Water Pollution Control Ordinance
    - Water Quality Objectives
        - **Parameter Specific**
        - **Water Quality Control Zone Specific**
- Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN 1/94)
- Technical Memorandum - Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters
- Practice Notes for Drainage Plans (PN 5/93)
- A Revised Streamlined Approach for Vetting of Drainage Plans (PN 3/97)
- Environment, Transport, and Works Bureau Technical Circular (Works) No. 34/2002 on "Management of Dredged/ Excavated Sediment"

4.5.1 *Approach to Water Quality Assessment*

The generic approach in water quality assessment is according to the following sequence:

- Scope water bodies in spatial and temporal extent, according to direct, indirect, near field and far field; and cumulative impacts of the Project;
- Identify pollution sources
- Identify water sensitive receivers
- Assess water quality impact
- Define mitigation measures
- Assess residual impact

Identify Pollution Sources

Some common pollution sources include:

- Reclamation Construction (dredging, filling)
- Sand Dredging
- Mud Disposal
- Sewage Discharges
- Industrial Discharges (effluent, thermal or cooling water)
- Stormwater Discharges / Sediments

Identify Sensitive Receivers

The aquatic system and beneficial uses sensitive to water pollution have been specified in Annex 14 of the EIAO TM.

In general, these include:

- Water Intakes
- Beaches
- Water Recreation Areas
- Fish Culture Zones
- Marine Parks/ Reserves
- Areas of Ecological Value
- Water Gathering Grounds
- Inland Water for Agriculture and Recreational Use
- Embayed Waters like Typhoon Shelters, Marinas and Boat Yards
- Coastal Protection Area
- Wild Animal Protection Area
- Fisheries Nursery and Spawning Grounds

Water Quality Parameters[1]

Toxics (trace metals, pesticides, organics, biocides, unionised ammonia)

Sources	Sewage Discharges Stormwater/run-off Industrial Discharges Contaminated sediments
Main SRs	All
Standards	WQO (limited) EU WQS (or similar)

Bacterial Contamination

Sources	Sewage Discharges Stormwater/run-off
Main SRs	Beaches Secondary Contact Recreation Zones
Standards	180 cfu 100 ml (beaches) 610 cfu 100 ml (2° contact)

Dissolved Oxygen [2]

Sources	Most sources can cause depletions of DO
Main SRs	Fisheries & Marine Ecological Receivers Flushing seawater intakes operated by the WSD
Standards	4 & 2 mg L^{-1} (WQO) 5 mg L^{-1} (FCZ)

Suspended Solids

Sources	Most sources include SS
Main SRs	Beaches Secondary Contact Recreation Zones Fisheries & Marine Ecological Receivers
Standards	Not more than 30% elevation above the natural ambient level (90-le) (WQO) 50 mg L^{-1} (FCZ) 0.1 kg m^{-2} day^{-1} deposition (Coral)

Nutrients (TIN, Ammonia, Chlorophyll a)

Sources	Most sources can cause elevations of nutrients, sewage main contributor
Main SRs	Enclosed Bays Marine Parks
Standards	Vary depending on the areas and water quality control zones

(1) WQOs for marine water. Discharge temperature limit varies among WCZs.

(2) DO criteria should make reference to bottom and depth-averaged respectively; and percentile requirements where appropriate. For specified DO criteria in the Harbour, Buffer and Channel Subzone in Tolo, please refer to the WPCO.

4.5.2 *Quantifying Water Quality Impact*

- Water Quality Model
  - Near Field – sewage/thermal, outfall initial dilution
  - Hydrodynamic – tidal flow modelling (currents and water levels)
  - Plume – sediment, bacterial, thermal
  - Water Quality – range of water quality parameters, establish pollution loading inventory
- Alternative Method
  - Desktop mathematical calculation

Why Water Quality Modelling?

- Quantification of Potential Impacts
- Determination of Zones of Impact
- Comparison against Numerical Assessment Criteria, if applicable
- Determination of Requirements for Mitigation Measures
- Quantification of residual impacts of mitigation

Some Tips……

When to Use Water Quality Modelling?

- Significant water quality concerns cannot be concluded by qualitative assessment
- Required by EIAO Study Brief(EIAO-TM Annexes 6 and 14)
- Potential for adverse water quality impacts
- Proximity to sensitive receivers
- Usually for discreet, quantifiable pollution sources
- Discharges exceeding the TM limits for Effluents
- Discharges into Drainage and Sewerage Systems Inland and Coastal Waters

*When **Not** to Use Water Quality Modelling*

- Land based construction activities – controlled through specification of suitable control measures
- Very small scale cable laying – small scale sediment disturbance, sediment disturbance close to sea bed
- Very small scale dredging/reclamation works – subjective decision on not to model (e.g. Sai Wan Typhoon Shelter Reclamation EIA)

Application of Water Quality Model

Reclamation Construction

- Dredging
- Filling
- Alteration to tidal hydrodynamics and flushing characteristics

Mud Disposal

- Contaminated
- Uncontaminated

Dredging Works

- Access Channels
- Tunnel Construction
- Pipeline Laying
- Construction of Mud Disposal Pits
- Maricultural Zones
- Marine Borrow Areas

Pollutant Discharges

- Effluent discharges
- Stormwater discharges
- Upgrading and Relocation of Sewage Treatment Works

Application of Hydrodynamic Modelling

Simulation

- Define coastline/bathymetry features, requiring information on future configurations, and/or data on large scale discharges
- Typical simulation for 15 day spring-neap tidal cycles in the wet and dry seasons
- Results provide data on hydrodynamic effects and link to Plume and Water Quality Models

Usage

- Potential for hydrodynamic and flushing capacity changes due to reclamation and sea bed bathymetry changes
- Potential for hydrodynamic changes due to large scale thermal discharges (thermal model coupled to hydrodynamic model)
- Hydrodynamic data required for Plume or Water Quality Model

Examples of Critical Information

- Adequate resolution of coastline and bathymetry features
- Accuracy of information on future coastline developments

Application of PLUME Modelling

Set up/Calibration

- Usually no calibration required, compared to Water Quality Model
- Cost effective and time saving

Simulation

- Definition of discharge to be simulated (location and rate)
- Typical simulation for 15 day spring-neap tidal cycles in the wet and dry seasons, based on Hydrodynamic Model data

Usage

- Small scale dredging works where erosion/deposition is not a major factor
- Bacterial discharges from sewage outfalls (simulation of E. coli)
- Small scale thermal discharges (may also be used for scoping studies of larger discharges)
- Discharges of conservative pollutants

Limitations

- Suitable only for small scale discharges of single pollutant
- Hardware limits on quantities of pollutants entered into model
- Cannot simulate interactions of different water quality parameters
- Does not account for hydrodynamic effects of large scale thermal discharges
- May not effectively simulate erosion or deposition of sediment at sea bed

Application of Water Quality Modelling

Set up/Calibration

- May use existing models, saving time/money
- Existing models for both large scale (Update Model) and small scale (Victoria Harbour Model)
- If model does not cover required area in either scope or sufficient detail, then new model may be required
- Calibration for new model based on range of water quality parameters, requiring approval from EPD
- New model set up/calibration: time consuming and expensive
- Delft model has pre-defined coastal features and pollution load inventory data for 2007 and 2012

Simulation

- Detailed information on pollutant discharges required (location, rate, concentration)
- For buoyant discharges (e.g. sewage effluent or cooling water), then use initial dilution modeling to define vertical position of plume
- Range of scenarios may be simulated representing different operating strategies or time horizons
- Simulations typically 15 day spring-neap tidal cycles in the wet and dry seasons (based on Hydrodynamic Model data). Annual simulations may be required for major projects such as large scale sewage disposal scheme and/ or significant reclamation
- Wet and dry season results may be combined for annual representation

Usage

- Hydrodynamic changes due to reclamation to predict water quality impacts
- Large scale dredging/filling works, where erosion/deposition present and assessment of effects other then suspended sediment required
- Sewage outfalls (particularly cumulative effects causing large scale water quality impacts)
- Diffuse pollutant sources (e.g. stormwater) covering large areas
- Annual representation allows comparison with Water Quality Objectives (key parameters include DO, TIN, Ammonia, suspended solid)

Limitations

- Adequacy of calibration
- Spatial resolution limited by size of grid, which is controlled by hardware limits
- Annual representation sometimes based on factoring wet and dry season results
- Level of detail on discharges, based on future population estimates

Case Study: Sham Tseng Further Reclamation

Factors Considered

- Tidal flow changes
- Sediment plumes formed during construction

Modelling Techniques

- Hydrodynamic Model (tidal flows)
- Water Quality Model (suspended sediment, sediment deposition, water quality effects)

Information Required for Modelling Input Data

- Reclamation layout
- Construction sequence
- Rates of working (dredging and filling)
- Methods of construction (dredger type, options for placing fill)
- Quality of sediment to be dredged

Modelling Input Data

- Locations of sediment loss
- Method of entry of sediment to water
- Sediment loss rate
- Sediment quality

Modelling Ouput

- Vectors of current speed & direction
- Tidal flow volumes through major channels
- Contours & graphs of suspended sediment
- Contours of sediment deposition
- Contours of water quality parameters (DO, nutrients, ammonia, micro-pollutants)

Alternative Quantitative Assessment Techniques

- Suitable for assessing small scale dredging works where impacts on sensitive receivers are minimal
- Near field model of sediment plumes, calculating depth averaged suspended sediment concentrations as a function of distance from works
- Successfully applied to CT10 & 11, Yam O Reclamation, Sai Wan Typhoon Shelter Reclamation, trenching works for cable installation

4.5.3 *Mitigation Measures*

Options for Mitigating Reclamation/Dredging Impacts

- Re-sequence works
    - Avoid overlap between concurrent activities
    - Complete seawalls to above high water mark before core filling commence
    - Filling with leading seawall in front
- Reduce dredging rate
- Use alternative dredging methods
    - Grab dredging vs trailer dredging
- Reduce filling rate
- Use alternative filling method
    - Bottom dumping vs pumping down
- Use silt curtains/screens
    - Floating silt curtains may reduce concentrations by a factor of 2.5
    - Fixed silt screens may reduce concentrations by a factor of 4
- Configuration of silt curtain deployment should be specified
- Avoid dredging, particularly contaminated sediment (levee marine sediment in-situ)
- Use close grab dredger

Options for Mitigating Wastewater Discharges

- Water conservation, effluent reuse
- Improve quality of effluent
    - Enhanced treatment levels
- Re-site outfall

- Select areas of greater flow for greater dilution
- Increase distance to sensitive areas

- Redesign diffusers for greater initial dilution
- Advance extension of outfall from embayed water (reclamation construction)
- Divert away from sensitive uses (e.g. typhoon shelter, ecological sensitive receivers)
- Suppress foam formation (thermal discharge)
- Use suitable aeration devices to oxygenate the treated effluent
- Use environmentally friendly chemicals for water, wastewater and cooling water treatment

Example 1: Pak Shek Kok Reclamation

Reclamation phasing to minimise suspended sediments

Example 2: Lamma Power Station Extension

Silt Curtain installed to protect nearby beaches and corals

(source: EPD)

4.6 ECOLOGICAL ASSESSMENT IN A NUTSHELL

4.6.1 *What is Ecology?*

Ecology is:

- the scientific study of the interactions that determine the distribution and abundance of organisms; or
- the study of the inter-relationships between living organisms and their environment.

The ecological assessment should make reference to EPD's Guidance Note GN 6/2002 and GN 7/2002. These guidance notes can be found in EPD's website (http://www.epd.gov.hk/epd/eia/hb/content/index.htm). In addition, Annex 8 and 16 of the EIAO TM in set down the important habitats, criteria for evaluating ecological impact and guidelines for the assessments.

Level of Integration

Ecology deals primarily with the three starred * levels of integration:

Biosphere	↑	
*Ecosystems	|	
*Communities	|	
*Populations	|	
Organisms	|	decreasing
Organs	|	scientific
Tissues	|	understanding
Cells	|	
Subcellular organelles	|	
Molecules	|	

On one side, ecology overlaps with environmental physiology and behaviour in studies of individual organisms, and on the other side, ecology fades into meteorology, geology, and geochemistry when we consider the biosphere, the whole earth ecosystem. The boundaries of the sciences are not well defined but diffuse, and natures do not come in discrete packages.

Some Basic Ecological Terms

Species
A group of organisms formally recognised as distinct from other groups.

Population
A group of organisms of one species, occupying a defined area and usually isolated to some degree from other similar groups.

Community
Any group of organisms belonging to a number of different species that co-occur in the same habitat or area and interact through trophic and spatial relationships.

Ecosystem
A community of organisms and their physical environment interacting as an ecological unit.

Species Diversity
A measure of the number of species and their relative abundance in a community.

Species Richness
The absolute number of species in an assemblage or community.

4.6.2 *Hong Kong's Seasons*

Hong Kong has a monsoon climate, dominated by the seasonal alternation of wind direction and the resulting major contrast in weather between winter and summer. On average, the summer monsoon dominates from early May to the end of September and is replaced by the winter monsoon from November to February. Between the summer and winter monsoons are shorter periods of transitional weather. A characteristic and ecologically significant feature of Hong Kong winters is the occurrence of short-lived cold surges: outbreaks of cold Siberian air that cause a sharp drop in temperature. Summer is the wet season, with 77% of the total annual rainfall falling between May and September, as opposed to only 6% in the four winter months (data derived from the Hong Kong Observatory, years 1983 to 1992). Approximately 18% of the annual rainfall - more than twice the monthly average - falls in August.

The use of the terms 'summer' and 'winter' for Hong Kong's seasons is perhaps unfortunate but well established: 'dry season' and 'wet season' might be more appropriate from the point of view of the biologist. Nevertheless, although Hong Kong is geographically within the tropics, temperature

seasonality is greater than most places at similar latitude. Indeed, the relatively large annual temperature range, cool winter, and low absolute minimum temperature, have prompted many climatologists to classify Hong Kong's climate as subtropical.

4.6.3 *Hong Kong's Habitat Types*

Based on the most comprehensive and latest habitat map (SUSDEV habitat map), Hong Kong consists 25 habitat types as listed in *Table 4.1*.

Table 4.1 Habitat and Feature Categories Mapped in Hong Kong

Habitat/Feature Type	Category	Area (ha)	% Cover
Natural Terrestrial Habitats	Bare rock or soil	1,440	1.3
	Grassland (without visible woody plants)	26,081	23.4
	Shrubby grassland (with woody plant cover < 50%)	8,703	7.8
	Mixed shrubland (grass < 50%, shrubs the major woody life form)	16,478	14.8
	Baeckia shrubland	5,977	5.4
	Fung shui forest over 60 years old and dominated by native species	112	0.10
	Montane forest (above 600 m above sea level)	60	0.05
	Lowland forest (below 600 m above sea level)	18,225	16.3
	Plantation or Plantation/mixed forest	180	0.16
Natural/Artificial Aquatic Habitats	Freshwater/Brackish wetland	1,031	0.92
	Fishpond/Gei wai	1,836	1.6
	Natural watercourse	783	0.70
	Modified watercourse	2,827	2.5
	Mangrove	327	0.29
	Rocky shore	-	-
	Artificial rocky/hard shoreline	-	-
	Intertidal mudflat	1,564	1.4
	Sandy shore	206	0.18
	Seagrass	41	0.04
Disturbed areas which provide some Habitat	Cultivation	4,381	3.9
	Golf course/Urban park	1,007	0.90
Disturbed areas which provide little or no habitat	Rural industrial storage/containers	1,008	0.90
	Quarry	229	0.20
	Buildings	-	-
	Landfill	398	0.36
	Other (urban or other highly modified area)	18,820	16.9

Watch out for those sites… …

Recognized Sites of Conservation Importance *(EIAO TM Annex 16, Note 1)*

1. Existing or gazetted proposed Special Area
2. Existing or gazetted proposed Country Parks
3. Existing or gazetted proposed Marine Reserves
4. Existing or gazetted Marine Parks
5. Restricted Areas listed under the *Wild Animal Protection Ordinance Chapter 170*
6. Sites of Special Scientific Interest
7. Ramsar Site
8. Inner Deep Bay and Deep Bay Buffer Zones
9. Any other areas declared by the Government as having special conservation importance

Important Habitats Where an Ecological Assessment Will Be Necessary *(EIAO TM Annex 16, Note 2)*

1. Over one hectare of woodland
2. Over one hectare/500 metres of undisturbed natural coast
3. Over 0.5 hectare of intertidal mudflats
4. Established mangrove stands of any size
5. Over 0.5 hectare of freshwater or brackish marshes
6. Established seagrass (*Zostera* or *Halophila* or *Ruppia* species) bed of any size
7. Over 100 metres of natural stream courses and rivers of significant length
8. Over one hectare wetlands (as defined by the Ramsar Convention) other than those mentioned in 2 to 7 above
9. Established coral communities of any size
10. Other habitats considered as having special conservation importance

4.6.4 *Artificial and Natural Habitats*

Most of the habitats in Hong Kong are not the original and "natural" habitats, which has been influenced by human activities and regenerated as "secondary" habitats (i.e. fishponds and agricultural lands). Some of the "secondary' habitats are still highly utilised by the wildlife. In particular, wetland is one of the most important habitats in Hong Kong.

Article 1 of the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat* (the Ramsar Convention) defines wetlands as 'areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters.' According to this definition, the fishponds and agricultural lands (artificial habitats) are classified as wetland.

4.6.5 *Baseline Ecological Survey*

Consideration of collecting ecological baseline information for ecological assessment:

- Study Area – 500m from the site boundary or the area likely to be impacted by the project;
- Review of existing information;
- Identifying the information gaps;
- Areas of ecological interest identified in the review that were considered to have the potential to be directly or indirectly affected by the proposed works will then be surveyed in more detail; and
- Ecological surveys - Terrestrial and Aquatic Ecology covering habitat/vegetation, mammals, birds, herpetofauna, invertebrates and stream fauna; Marine Ecology covering coral (SCUBA diving), subtidal benthos, intertidal and marine mammal.

Duration of Ecological Baseline Surveys

Consideration of the duration of ecological baseline surveys:

4-month survey

- The Study Area consists of common habitats.
- The 4-month period should provide reasonable amount of information on general wildlife use of the Study Area.
- Some surveys in the wet season are necessary if there are stream courses or wetlands in the study area

6-month survey

- The Study Area consists of relatively diverse habitats and species.
- A certain extent of seasonal patterns in wildlife use of the Study Area is anticipated.
- Some surveys in the wet season are necessary if there are streams courses or wetlands in the Study Area.

9-month survey

- The Study Area consists of diverse habitats and species.
- A certain target species with marked seasonality is likely to be present in the Study Area.

12-month survey

- A special requirement of 12-month survey has been stipulated in the Town Planning Board Guidelines for Developments Within Deep Bay Area.

To obtain good results, ecological baseline surveys should be surveyed at the time of the year when the target group is more active, conspicuous or easy to be identified, the timing could be refer to the following table.

Table 4.2 Time of the Year to Survey Major Floral and Faunal Groups

Months	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
				WET SEASON								
Vertebrates												
Terrestrial Mammals	Active throughout the year, no distinct seasonality											
Marine Mammals	Active throughout the year, with seasonal distribution and abundance											
Resident Birds	Active throughout the year											
Migratory Birds	Major migrant									visiting period		
Amphibians			Active period of most frog & toad species									
Reptiles				Active period of most reptile species								
Freshwater Fish			Active period of most fish species									
Invertebrates												
Butterflies			Occurrence of flying adults of most species									
Odonates				Occurrence of flying adults of most species								
Horseshoe Crab				Active period of juveniles in intertidal zone								
Higher Plants	Survey period for most species											
Seaweeds	Flourishing period									Flourishing period		

There are a number of factors influencing the frequency and efforts of the ecological surveys:

- Size of the Study Area;
- Nature of the project;
- Structural complexity of the Study Area;
- Availability of the ecological information within the Study Area;
- Ecological sensitivity of the Study Area; and
- Presence of important habitats or species, particularly those with distinct seasonal variation.

4.6.6 *Criteria for Ecological Assessment*

Annex 16* of the *EIAO TM sets out the general approach and methodology for assessment of ecological impacts arising from a project or proposal, to allow a complete and objective identification, prediction and evaluation of the potential ecological impacts.

Annex 8 recommends the criteria that can be used for evaluating ecological impacts. The criteria include consideration of:

- naturalness, size, diversity, rarity, re-creatability, fragmentation, ecological linkage, potential value, nursery/breeding ground, age and abundance/richness of wildlife for evaluating a site or habitat;
- protection status, distribution and rarity for evaluating species found within a site or habitat; and
- habitat quality, species, size/abundance, duration, reversibility and magnitude for evaluating the significance of an ecological impact.

VIP

The findings of the ecological assessment will, if required, form the basis of an action plan which will detail the mitigation measures to be adopted. The general policy for mitigating impacts on important and sensitive ecological resources, as per *Annex 16* of the *EIAO TM*, are in the following descending order of priority: **avoidance, minimisation and compensation**. From an ecological point of view, mitigation measures for ecological impact shall preferably be carried out on-site and well in advance of the works, rather than off-site and after the completion of works.

4.6.7 *Types of Impacts*

Impacts due to a project are generally include:

Direct Impacts

- Habitat loss; and
- Loss of individuals of species.

Indirect Impacts

- Isolation and fragmentation;
- Change of hydrology;
- Disturbance (i.e. noise, human activity);
- Impacts to water quality/discharge (SS, DO, nutrients); and
- Temporary and Permanent Loss.

Typical Information Required for an Ecological Assessment…..

- Project areas/ layout plan in digital format;
- Construction programme;
- Detailed basemap;
- Recent aerial photos of the Study Area;
- Outline Zoning Plan (OZP);
- Previous reports/ information;
- Ecological baseline information; and
- Predicted effect of the project on particular species.

An Ecological Assessment - Issues that require special concerns….

- Effort required for the ecological baseline surveys;
- The involvement of sensitive areas or "no-go" areas, including Ramsar site, Wetland Conservation Area (WCA) and Wetland Buffer Area (WBA), Country Parks, Marine Parks and Marine Reserves, Site of Special Scientific Interest, Special Areas, Restricted Areas and habitats of high ecological value (i.e. coral, mangrove and seagrass);
- Human-made habitats, such as agricultural lands, fishponds, artificial seawall, may have high ecological value, which should be confirmed by the ecological baseline surveys;
- The presence of Species of Conservation Concern which demonstrated the species depend on the habitats within the Study Area;
- Cumulative impacts; and
- Media and public concerns.

Tips….

- Baseline survey scope to be agreed with Agriculture, Fisheries and Conservation Department and project proponent before survey commencement.
- Undertake baseline survey as soon as possible to identify important habitat, if any, in the early project stage.
- For project located within or near ecological sensitive area, early dialogue with Green Groups to cultivate mutual understanding of concerns.

4.6.8 *Practical Ecological Mitigation Measures*

The general policy for mitigating impacts on important and sensitive ecological resources, as per *Annex 16* of the *EIAO TM*, are in the following descending order of priority:

- Avoidance
- Minimisation
- Compensation

From an ecological point of view, mitigation measures for ecological impact shall preferably be carried out on-site and well in advance of the works, rather than off-site and after the completion of works.

The principle should also consider the following:

- No-net-loss in wetland (only applicable in the Deep Bay Area);
- "Like for like" basis, in terms of size and/or ecological function (only required when compensating for the loss of important species/habitat).

Examples of EIA studies adopted the principle of **Avoidance** include:

- North East New Territories Planning Study and Sheung Shui Lok Ma Chau Spurline - avoided the ecological sensitive Long Valley; and
- Lantau North South Link - avoided the ecological sensitive Tai Ho Valley.

Examples of EIA studies adopted the principle of **Minimization** include:

- Yuen Long and Kam Tin Sewerage and Sewage Disposal Stage 1 – minimised the construction works within WCA & WBA;
- Route 10 & Aviation Fuel Facility – using bubble curtain to minimize the impacts on marine mammals due to blasting works; and
- Theme Park – translocation of rare/protected/restricted plant species, deployment of noise barrier/ silt curtain.

Examples of EIA studies adopted the principle of **Compensation** include:

- KCRC West Rail - re-provision of wetland;
- San Tin Main Drainage Channel - re-provision of wetland;
- Yuen Long Bypass Floodway - re-provision of wetland;
- Theme Park - provision of compensatory woodland and provision of sloping artificial seawall; and
- Cheoy Lee Shipyard Decommissioning - re-provision of Rice Fish habitat.

4.7 *CULTURAL HERITAGE IMPACT ASSESSMENT IN A NUTSHELL*

The assessment criteria and guidelines for cultural heritage impact assessment have been listed down in the EIAO-TM Annexes 10, 18 and 19 and other relevant impact assessment guidelines where appropriate. Guidance Notes on Assessment of Impact on Sites of Cultural Heritage in Environment Impact Assessment Studies is also available on EPD's website (http://www.epd.gov.hk/epd/eia/english/guid/ index5.html). Other legislation and guidelines relevant to cultural heritage impact assessment are:

- Antiquities and Monuments Ordinance (Cap. 53);
- Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 10 – Conservation, Section 4 (June 2001); and
- Criteria for Cultural Heritage Impact Assessment issued by Antiquities and Monuments Office (AMO).

4.7.1 *Basis for Assessment and Broad Assessment Approach*

A project proponent should appreciate that sites of cultural heritage provide an essential, finite and irreplaceable link between the past, the present and the future and a general presumption in favour of their protection and conservation. Adverse impacts on sites of cultural heritage should be kept to the absolute minimum in development proposals affecting them.

Before conducting a cultural heritage impact assessment as part of the EIA study for the project, the proponent should clearly understand the basis for the assessment.

A "site of cultural heritage" is defined in Schedule 1 of the EIAO as an antiquity or monument, whether being a place, building, site or structure or a relic as defined under in the Antiquities and Monuments Ordinance (Cap. 53) and any place, building, site, or structure or relic identified by the AMO to be of archaeological, historical or palaeontological significance.

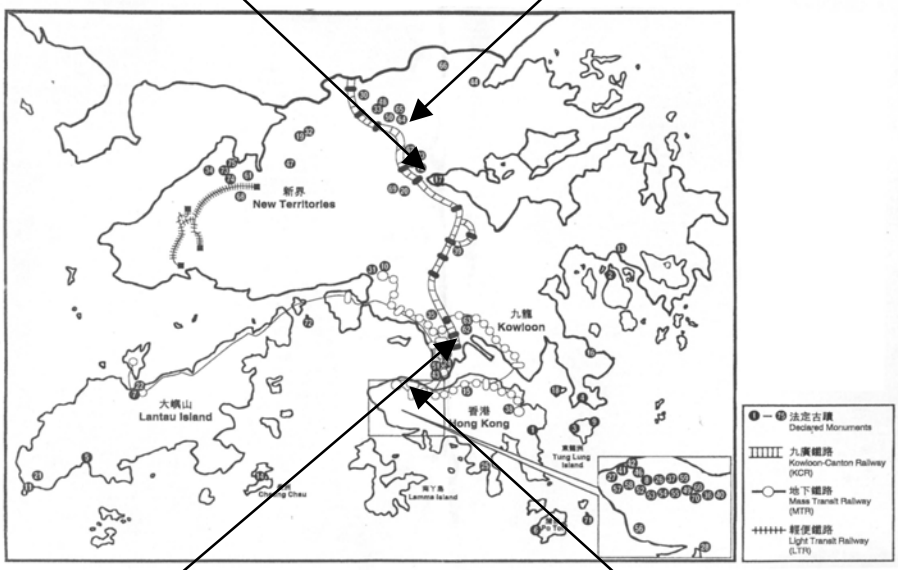
> As the site of cultural heritage covers a wide range of site, building, structures and other heritage features, project proponent can make reference to paragraph 6 of the Guidance Notes on Assessment of Impact on Sites of Cultural Heritage in EIA Studies to establish the basis for conducting a cultural heritage impact assessment for the project.

Examples of sites of cultural heritage are shown in Figure 4.6 below.

Declared Monuments

Old District Office, Tai Po

Entrance Gate of Lo Wai, Fanling



Location of Declared Monuments in HK

Remnants of the South Gate of Kowloon Walled City

The Old Supreme Court, Central

Figure 4.6 Examples of sites of cultural heritage in Hong Kong

The broad assessment approach for cultural heritage impact assessment includes the following:

- **Baseline Study** (Desktop Review and Field Evaluation) to compile a comprehensive inventory of cultural heritage sites within the impacted area of the proposed project site;
- **Impact Assessment** to identify the direct and indirect impacts on the cultural heritage sites (including visual and landscape impact on sites of cultural heritage); and
- **Recommendation of Mitigation Measures** to keep the adverse impact to the absolute minimum.

4.7.2 *Baseline Study*

Desktop Review

Typical information required for the assessment include:

- Old and current aerial photos and survey maps (Lands Department);
- Proposed Development Works Boundary and Construction Works involved;
- Written Documents, photos and maps (tertiary institutions, Public Record Office, HK Museum of History);
- Admiralty Charts (to identify record of shipwrecks) (UK/Hong Kong Hydrographic Office of Marine Department); and
- Site records and reports kept by the Antiquities and Monuments Office (AMO) including the lists of archaeological and historical sites, unpublished archaeological investigation and excavation reports by AMO and the AMO Monograph Series etc.

Field Evaluation

Built Heritage Survey

- Field scan the project area to identify historical buildings and structures (including old bridges, shrines and graves etc.), their associated cultural landscape such as *fung shui* line (e.g. the visual corridor for temple), woodland and pond together with other cultural features such as foundation stones, boundary stones and lamp posts etc.
- Oral history (interview with the local and the relevant informants).
- Provision of the survey report for built heritage sites including:
  - A location plan of each site (in 1:1000 scale);
  - Photographic record(s) of each site;

- Historical and architectural appraisal of each site;
- Written record of the inscription as shown on the cultural feature, e.g. old grave, boundary stone and etc.; and
- A master layout plan showing both the locations of all identified built heritage sites and the proposed development and work areas within the project boundary.

Discussion with local informant

Recording site information

Terrestrial Archaeological Survey

The terrestrial archaeological survey normally includes the following tasks:

- Fieldwalking – walking over the study area and collect artefacts.
- Augering – Fieldwalking where concentrated area of artefacts are identified, auger holes will be bored to investigate the soil profile and check if artefacts are bored out.
- Test Pitting – excavate approximately 1 m x 1.5 m test pits at concentrate artefacts area to define the stratigraphy of cultural deposits.
- Machine Trenching and earthwork surveys.

Augering

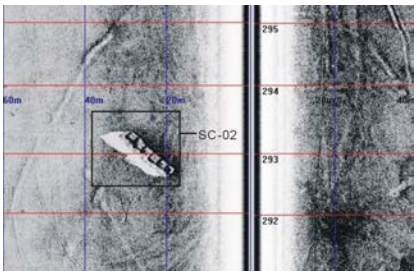
Test pit excavation

Machine Trenching

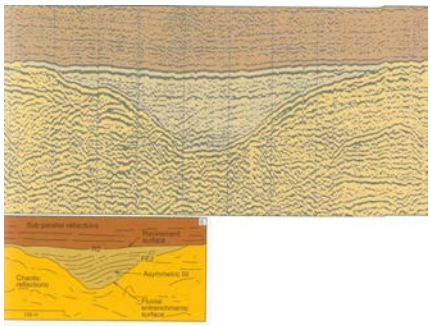
Marine Archaeological Investigation

The marine archaeological survey may involve the following task:

- Geophysical Survey where Side Scan Sonar and Seismic Profiling will be undertaken.
  - Side Scan Sonar – Identification of features on seabed
  - Seismic Profiling – Identification of features in seabed



Example of side scan sonar result showing a Shipwreck on the seabed



Example of Seismic Profiling showing seabed profile.

Note: Raw Data of the Geophysical Survey should be interpreted by a qualified marine archaeologist to identify if archaeological interest anomalies exist.

- Dive Inspection/Remote Operated Vehicle (ROV) – if archaeological interest anomalies are identified and potentially to be impacted, Dive Inspection /ROV is required.

Dive Inspection

Licence to Excavate and Search for Antiquities under the Antiquities and Monuments Ordinance (Cap.53) is required to be obtained by a qualified archaeologist for any archaeological investigation. The licence application process normally takes at least two months to process.

The survey requirement varies from project to project due to the different locality and archaeological potential and hence there are no standards on the survey scope. The Survey Scope (number of auger holes and test pits required) should be discussed and agreed by AMO and the Project Proponent before survey commencement.

4.7.3 *Impact Assessment*

There is a general presumption in favour of the protection and conservation of all sites of cultural heritage. The project should be designed to avoid a site of cultural heritage, or, if the site of cultural heritage can be integrated into project design without impairing or compromising its heritage value, there will be a beneficial impact.

Impact assessment should therefore address the quality and value of the site of cultural heritage identified and should critically evaluate the direct, indirect and cumulative impacts and explain with sound justification the loss to a site of cultural heritage as a result of the proposed project is consistent with the general presumption in favour of protection and conservation.

Partial preservation of a site of cultural heritage is not a preferred option and it is most likely that proposals for total destruction of a site of cultural heritage will not be accepted.

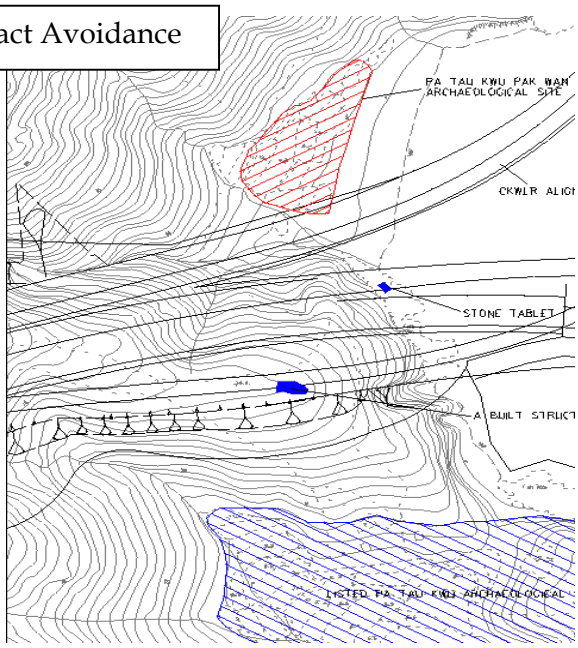
4.7.4 *Typical Mitigation Measures*

Typical mitigation measures for cultural heritage include the following:

- **In-situ Preservation** to avoid direct and indirect impact by changing the project design
- **Minimisation of the Adverse Impact** by reviewing the construction method or engineering design or other means
- Full justification for the following measures with alternative proposals or layout designs which confirm the impracticability of total preservation, together with a comprehensive and practical rescue plan shall be considered:
  - **Partial Preservation**
  - **Rescue Excavation for Archaeological Heritage Site** (last resort)

- **Relocation of Built Heritage Site** (detailed photographic and cartographic survey prior to relocation)

Example 1: Impact Avoidance



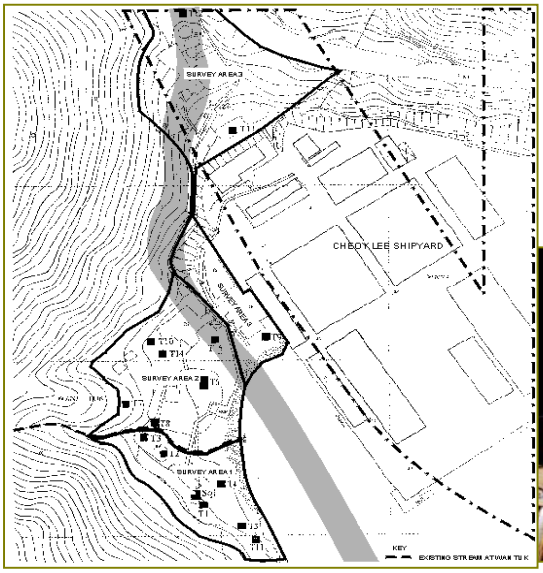
Project: Northshore Lantau Development Feasibility Study –Environmental Impact Assessment

- Pa Tau Kwu Archaeological Site was avoided by shifting the proposed Chok Ko Wan Link Road northward.
- Impact on Stone Feature was avoid by adjusting the alignment northward
- Pak Wan Archaeological Site was avoided by moving the column base supporting the Chok Ko Wan Link Road outside the archaeological site boundary.

Example 2: Relocation

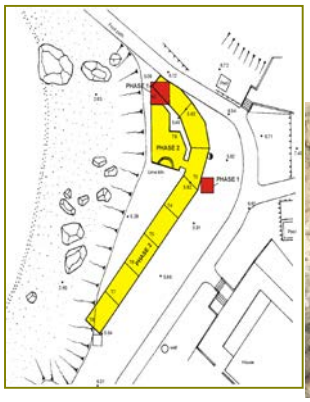
Project : NENT Study

Relocation of stone inscription is allowed as the present stone inscription had been relocated.



Example 3: Rescue Excavation prior to construction

Project: Decommissioning of Cheoy Lee Shipyard at Penny's Bay



Preserve by Record

Total destruction of cultural heritage site with only preservation by records should not be considered as a mitigation measure. Total destruction must be taken as the very last resort in all cases and shall only be recommended with a meticulous and careful analysis balancing the interest of cultural heritage preservation as against that of the community as a whole.

Mitigation is not only concerned with damage reduction but shall include consideration of potential enhancement and sustainability of our cultural heritage (e.g. enhancement to the accessibility and cultural tourism potential of a built heritage site or passive land use/zoning for an archaeological site). Wherever possible, design that would enhance the preservation of a cultural heritage site (including improvement of its landscape and visual quality) shall be considered.

4.8 LANDSCAPE AND VISUAL IMPACT ASSESSMENT IN A NUTSHELL

4.8.1 *Why Landscape is Important?*

Landscape is important because:

- it forms a vital part of our environment;
- it is an essential part of our natural resources;
- it is a reservoir for archaeological and historical evidence; and
- as a habitat for wildlife.

4.8.2 *Landscape and Visual Impact Assessment (LVIA) in EIA Study*

LVIA in an EIA study shall be directed towards predicting and judging of the magnitude and significance of the effects that the project may have on landscape resources/characters and visual amenities.

LVIA relies both on **experienced professional judgement** and measurements. In assessing the significance of impacts in LVIA, it is necessary to differentiate between judgement on the significance of change, which involves a greater degree of professional opinion, and measurement of magnitude of change, which is an objective and quantifiable task. LVIA should always be supported by quantified data, clear evidence, logical deduction, reasoned argument and informed judgement.

4.8.3 *Broad Assessment Methodology of LVIA*

Annexes 10 and 18 in the EIAO-TM list down the assessment criteria and guidelines for landscape and visual impact assessment. Other relevant guidelines are listed in:

- Hong Kong Planning Standards and Guidelines
- EIAO Guidance Note 8/2002 on Preparation of Landscape and Visual Impact Assessment under the EIA Ordinance

In a Nutshell, the broad approach in a landscape and visual impact assessment is in the sequence indicated in Figure 4.7 below.

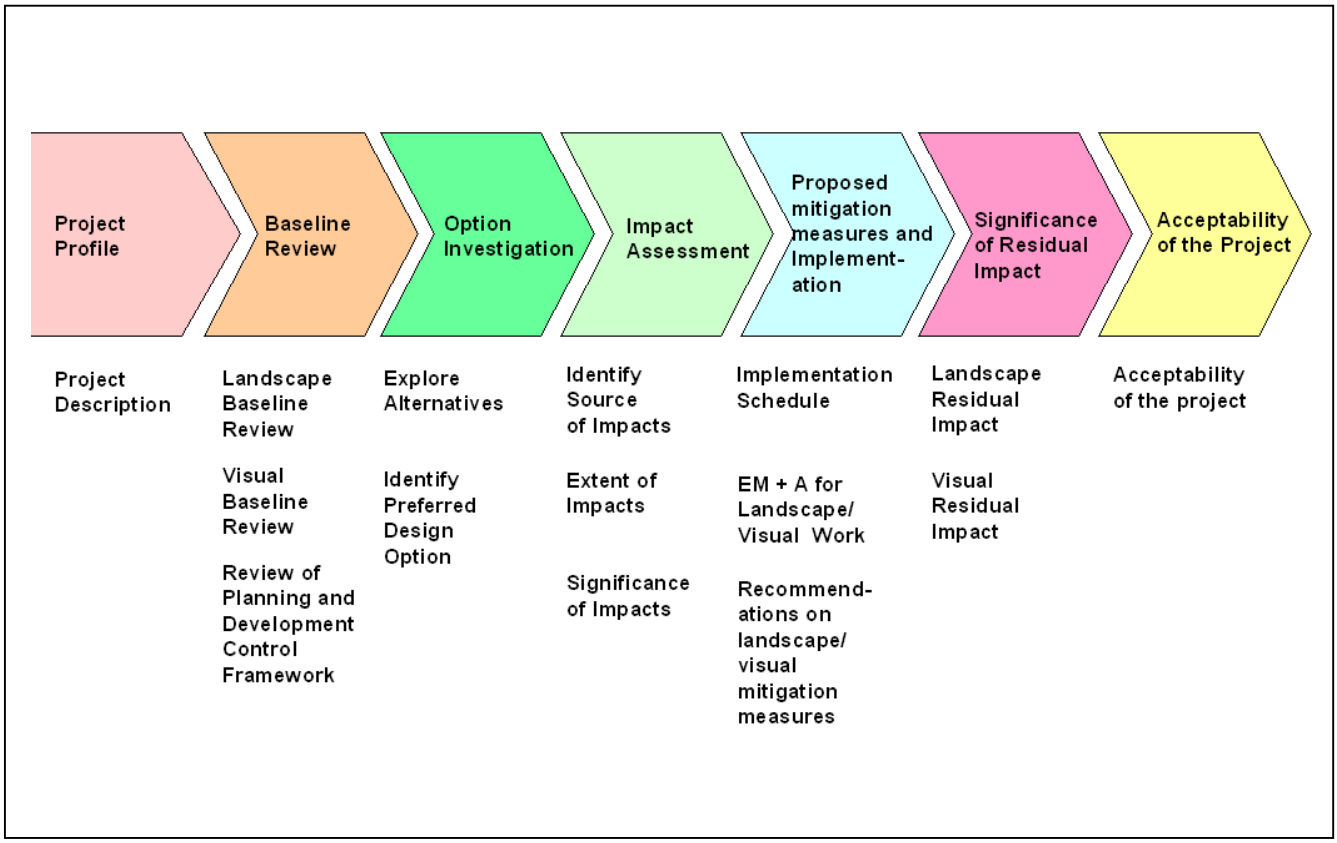


Figure 4.7 Assessment Methodology in LVIA

4.8.4 Landscape and Visual Baseline Review

For the purpose of carrying out a LVIA, the baseline study shall include an appraisal of the landscape and visual resources of the assessment area focusing particularly on the sensitivity of the landscape and visual system and their ability to accommodate change.

For the Landscape Impact Assessment, the assessment area shall normally include all areas within 500m from the works limit of the proposed development. For linear project, such as railway and road, sewerage, pipeline, the landscape assessment area can be confined to 100m from both sides of works limit.

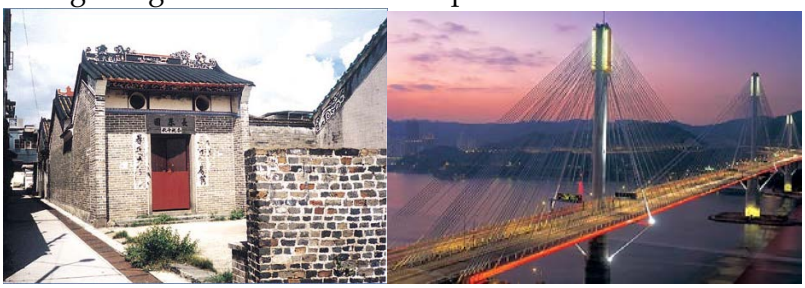
For the Visual Impact Assessment, the assessment area shall be up to the visual envelope (zone of visual influence), which is generally the viewshed formed by natural/man-made features such as ridgelines or building blocks.

Landscape Resources (LRs) and Landscape Character Areas (LCAs)

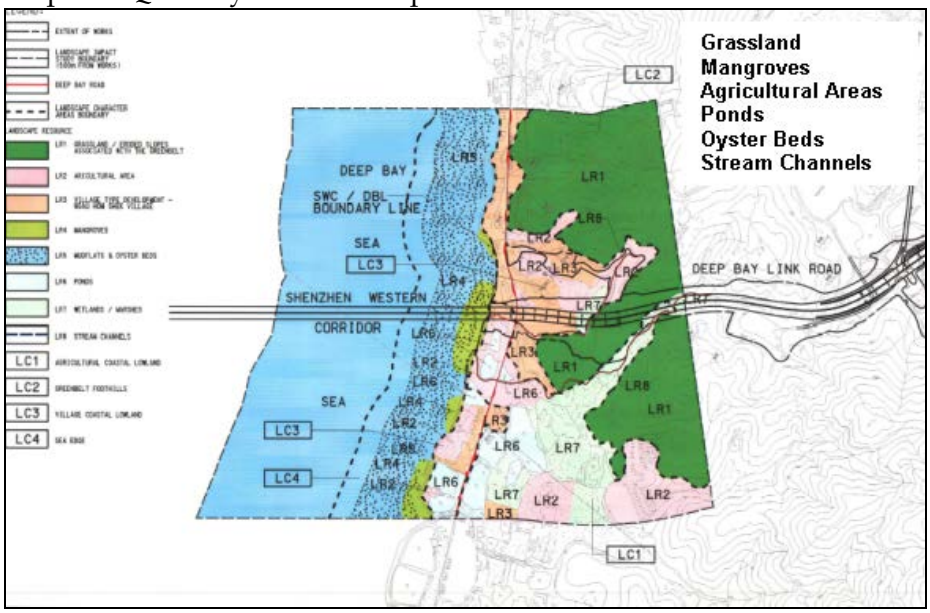
Landscape resources should be **quantified**, with respect to special landscape features. Landscape character areas (LCAs) and key landscape elements within the assessment area should be identified and annotated on plans. Some projects may require a broad tree survey to be carried out. Examples of landscape resources and landscape character areas are illustrated in Figures 4.8 and 4.9 respectively below.

Hong Kong's Natural Landscape Resources

Hong Kong's Man-made Landscape Resources



Map and Quantify the Landscape Resources



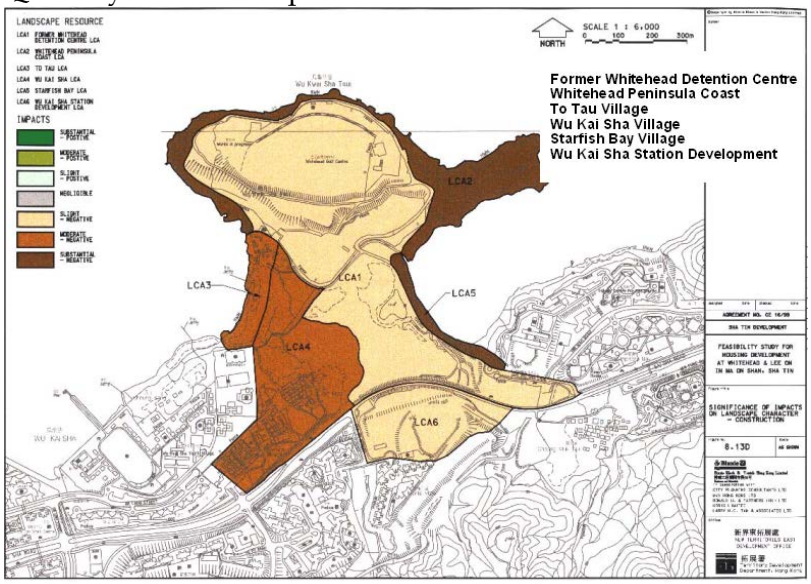
Source: Shenzhen Western Corridor EIA Report

Figure 4.8 Examples of Landscape Resources in Hong Kong

Landscape Character Area (LCA)

Individual geographic areas in which there may be a number of LRs, combining to create a distinctive LCA.

Map and Quantify the Landscape Character Area



Source: Feasibility Study for Housing Development at Whitehead & Lee On in Ma On Shan – EIA Report

Figure 4.9 Examples of Landscape Character Areas in Hong Kong

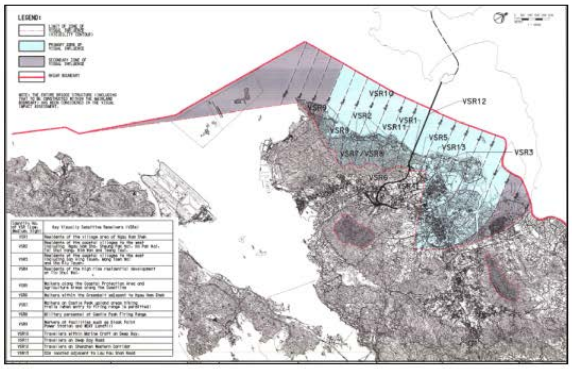
Visual Resources (VRs) and Visually Sensitive Receivers (VSRs)

In a LVIA, visual resources such as key views, viewing corridors/viewing directions and visual characters should be identified on plans. Key visually sensitive receivers from residences, from workplaces and from public areas within the zone of visual influence whose views will be affected by the project should be clearly shown on plans. The nature of their view could be transient or permanent.

Figures 4.10 illustrate the examples of zone of visual influence (ZVI), visual resources and mapping of visually sensitive receivers in a LVIA.

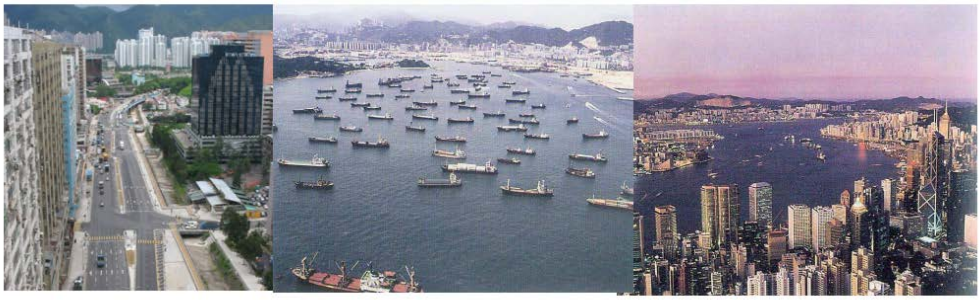
Identification of ZVI in according to the visibility of the project from vary distances.

Zone of Visual Influence – ZVI
All areas from which the proposed project can be seen. This area is generally the view shed formed by natural/man-made features such as existing ridgelines or built development.

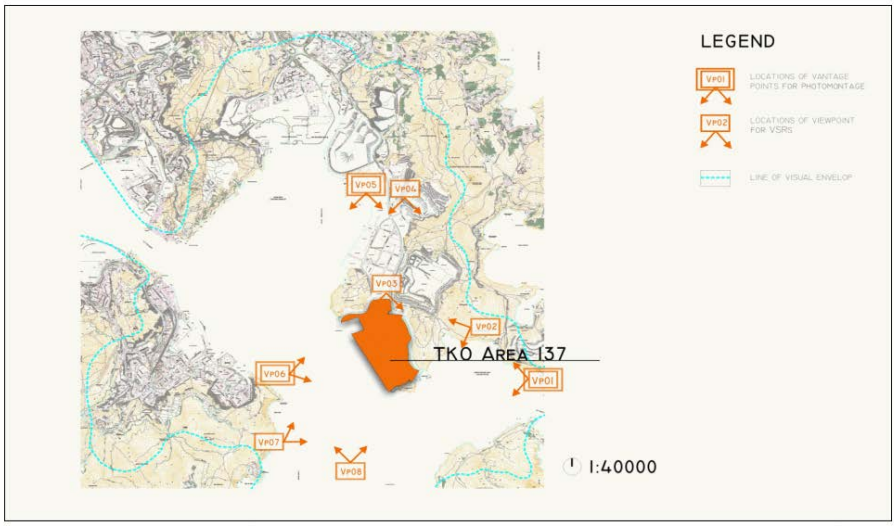


Source: Shenzhen Western Corridor EIA Report

Examples of Visual Resources : Key views, viewing corridor/viewing directions and visual characters.



Map the key views and locations of VSRs



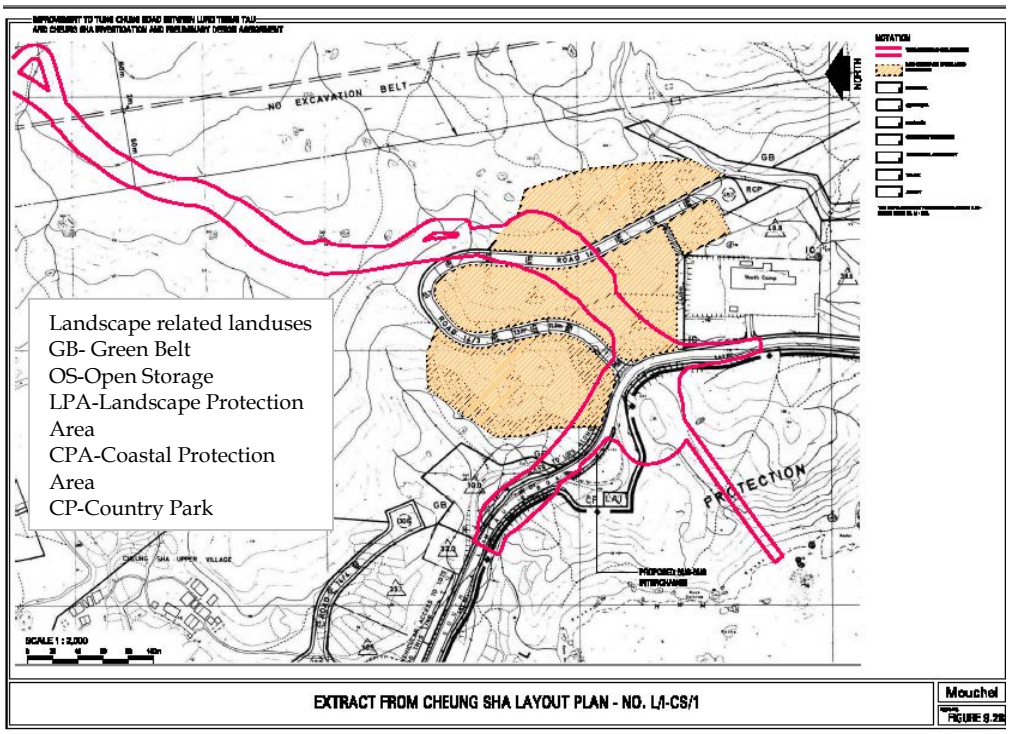
Source : Environmental and Traffic Impact Assessment for Fill Bank at Tseung Kwan O Area 137

Figure 4.10 ***Examples of Zone of Visual Influence, Visual Resources and Mapping of Visually Sensitive Receivers in a LVIA.***

Review of Planning and Development Control Framework

The review should cover information in the draft or approved plans prepared under the Town Planning Ordinance, adopted departmental plans and other land use plans published by the government when the EIA report is under public inspection. The purpose of reviewing the latest statutory plans is to identify any conflict on landscape related zoning and guidelines. Example of reviewing the existing layout plan is illustrated below in Figure 4.11.

Review of Planning and Development Control Framework
Review the latest statutory plans and identify any conflict on landscape related zoning and guidelines



Source: Improvement to Tung Chung Road EIA Report

Figure 4.11 Example of reviewing the existing layout plan

4.8.5 Impact Assessment

- Landscape impact Assessment should comprise assessment of impacts created by the project or development both on landscape resources and landscape character of the area.
- Visual impact assessment should identify and predict the type and extent of impacts from visual obstruction, glare and changes in visual amenity and compatibility with surroundings.

Landscape and visual impact arising from a project or development could be:

- Beneficial/adverse
- Direct/indirect
- Short term/long term
- Reversible/irreversible
- Accumulative impacts

Impact of the proposed development on landscape resources including special landscape features and on the LCAs should be assessed. Where situations warrant, it may be necessary to evaluate the merits of preservation in totality, in parts or total destruction of existing landscape and the establishment of a new landscape character area.

Impact assessment can be made for individual sensitive receiver, sensitive receiver group, or if appropriate for representative sensitive receivers.

LVIA should be determined in significance thresholds, which are made up of two components, namely magnitude of change to baseline conditions due to the project and sensitivity of receivers. An evaluation matrix shall be derived for judging impact significance.

Determine the significance thresholds with the following matrix:

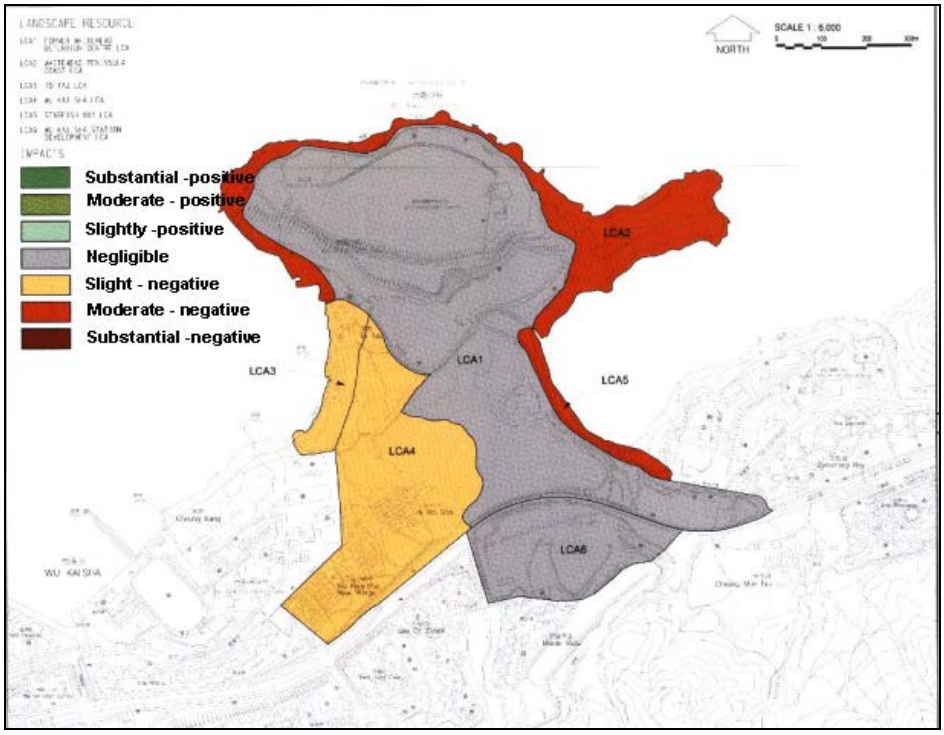
Magnitude of Change caused by Project	Large	Moderate Impact	Moderate/ Significant Impact	Significant Impact
	Intermediate	Slight/ Moderate Impact	Moderate Impact	Moderate/ Significant Impact
	Small	Slight Impact	Slight/ Moderate Impact	Moderate Impact
	Negligible	Negligible Impact	Negligible Impact	Negligible Impact
		Low	Medium	High
	• Sensitivity To Change			

Significance threshold should be given to unmitigated impacts, operation Day 1 and operation Year 10 with mitigation measures.

For easy understanding, annotated illustrative materials such as computer-generated photomontages, oblique aerial photographs, photographs, layouts, plans, elevations, perspective drawings and section drawings should be extensively used to convey the findings of LVIA to the readers. Descriptive text should provide a concise and reasoned argument. Examples of annotated illustrative materials are presented in Figures 4.12, 4.13 and 4.14 below.

Figure 4.12 Examples of illustrative maps to convey findings of LVIA

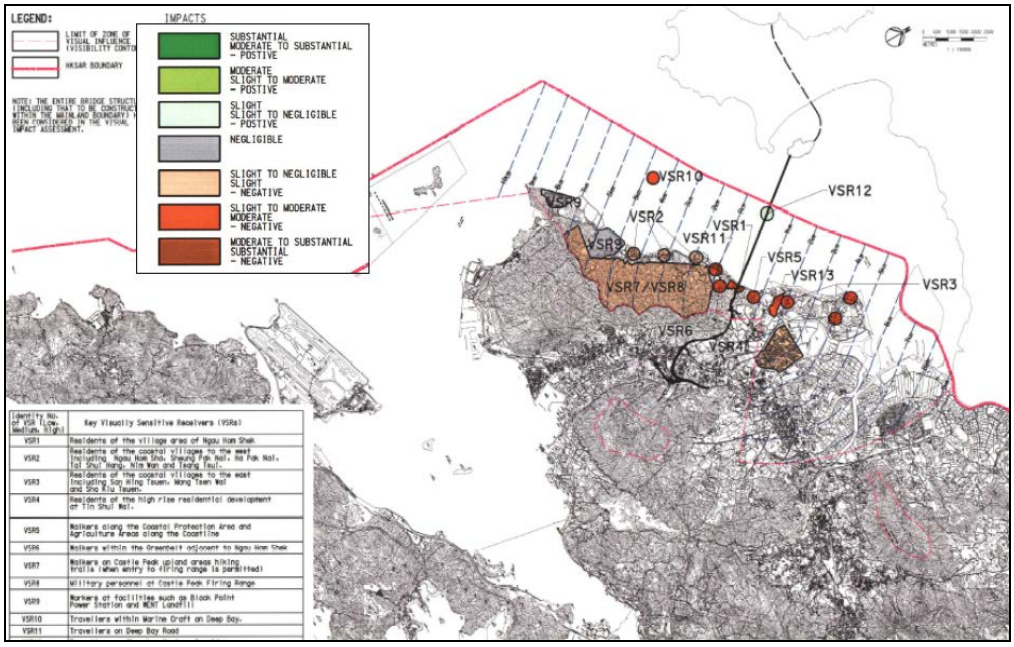
Map and Quantify the impacts on each LR and LCA and the significance thresholds



Project: Housing Development at Whitehead and Lee On in Ma On Shan

Impacts on each LR and LCA can be mapped and quantified based on landscape dynamic with significance thresholds.

Map the impact on each VSR and the significance thresholds



Project : Shenzhen Western Corridor

Figure 4.13 Example of photomontages used to illustrate the effectiveness of the proposed landscape mitigation measures in four stages

Existing condition

Unmitigated impacts

Partially mitigated impacts after implementation of the proposed mitigation measures at Operation Day 1 of the project

Residual impact at Year 10 of the operation stage

Source: Ngong Ping Sewage Treatment Works and Sewerage EIA Report

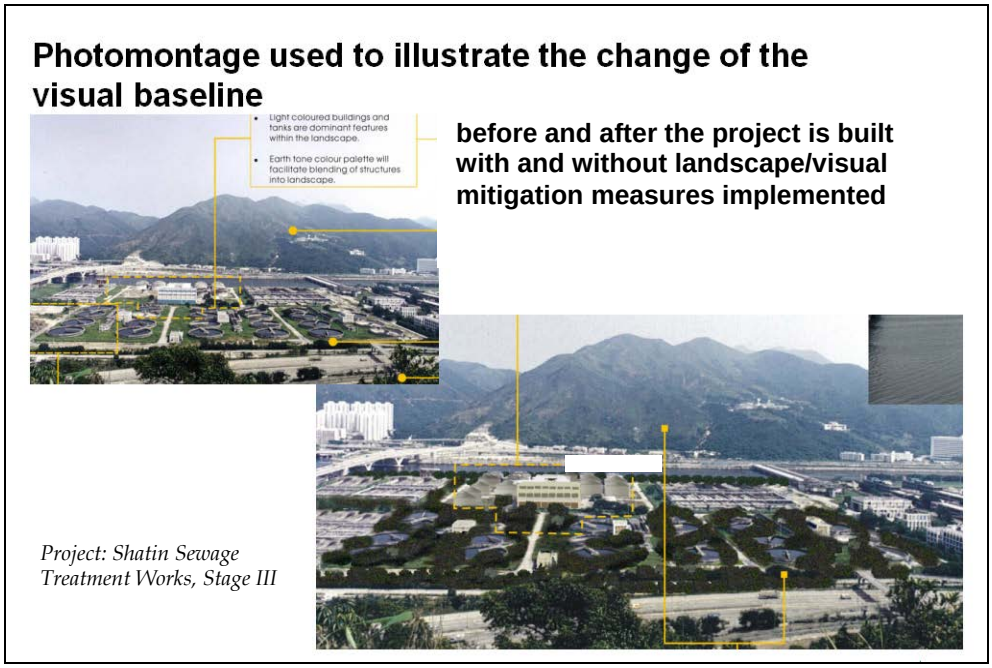


Figure 4.14 Example of photomontages used to illustrate the change of visual baseline

Below are some common but non-exhaustive factors normally considered in deriving the magnitude of change and sensitivity in assessing landscape and visual impacts:

Factors affecting the magnitude of change for assessing landscape impacts:
• compatibility of the project with the surrounding landscape, • duration of impacts under construction and operation phases, • scale of development, and • reversibility of change.
Factors affecting the sensitivity for evaluation of landscape impact:
• quality of landscape characters/resources, • importance and rarity of special landscape elements, • ability of the landscape to accommodate change, • significance of the change in local and regional context, and maturity of the landscape.
Factors affecting the magnitude of changes for assessing visual impacts:
• compatibility of the project with the surrounding landscape, • duration of impacts under construction and operation phases, • scale of development, • reversibility of change, • viewing distance, and • potential blockage of view.
Factors affecting the sensitivity of receivers for evaluation of visual impacts:
• value and quality of existing views, • availability and amenity of alternative views, • type and estimated number of receiver population, • duration or frequency of view, and • degree of visibility.

4.8.6 *Mitigation Measures*

Mitigation measures for landscape and visual impacts should not only be concerned with damaged reduction but to include consideration of potential landscape and visual enhancement.

Alternative alignment, design and construction method that would avoid or reduce the identified impacts on landscape, or that would make the project visually compatible with the setting shall be thoroughly examined before adopting other mitigation or compensatory measures to alleviate the impacts.

Possible measures that may mitigate or compensate the impacts include:

Reduction/Remediation

- preservation of existing landscape resources including trees preservation/transplanting
- screen planting
- façade treatment
- colour scheme and texture of materials used

Example of landscape mitigation measures for reduction and remediation of impacts:

(1) Woodland, tree and shrub planting on new or disturbed slopes and adjacent to any new structure;
(2) Contouring of new slopes in order to visually integrate them into the existing topography;
(3) Use of vegetable earth mounding or structural solutions for screening;
(4) Provision of screen planting along the road boundary; and
(5) Other greening measures such as vertical greening

Compensatory

- landscape treatment
- compensatory planting
- creation of interesting landscape or visual features.

Examples of landscape mitigation measures for compensation:

(1) Compensatory tree planting along the road side
(2) Wetland habitat generation
(3) Provision of landscape amenity area for temporary or after use.

4.9 REVIEWING THE CONSULTANT'S EIA REPORT

There is a myth about an EIA report being very scientific, voluminous and difficult to read and understand.

Below are some tips for project proponent on reviewing the Consultant's EIA report.

When reviewing an EIA Report….

1. Understand the assumptions made in the report.

2. Do you agree and accept the assumptions?
   - Are the assumptions realistic and practicable?
   - Assumptions include: plant schedule, plant inventory, construction methods, construction period, dredging rate, traffic data, discharge rate, operating hours, etc.

3. Ask yourself common sense questions/ ACE questions
   - need for the project
   - consideration of alternatives
   - what have been done to avoid and minimize the environmental impacts
   - are the proposed mitigation measures practicable and effective, whether these measures successfully used in practice?
     (programme, cost, land availability, engineering feasibility, etc may be considered)
   - who are the responsible parties for implementing and maintaining the measures?
   - review the implementation schedule of mitigation measures recommended in the EIA report
   - whether cumulative impacts have been adequately addressed?

4. Conduct site visit to confirm
   - assumptions
   - background environmental situations
   - sensitive receivers

PART FIVE – IMPROVING THE EIA PROCESS

5. IMPROVING THE EIA PROCESS

5.1 RESOLVING MATTERS THROUGH THE ENVIRONMENTAL STUDY MANAGEMENT GROUP (ESMG)

The EIAO Guidance Note No. 2/2002 sets out ground rules of an ESMG. Project Proponents are encouraged to have dialogues at the early planning stages to exchange views on preparation of EIA reports.

Purpose of the ESMG

Purpose of an ESMG is stated in the GN 2/2002 in the Cyber EIA Help Bench on our webpage.

In a very broad term, an ESMG is a liaison forum that brings proponent, consultants, and relevant government authorities under the EIAO together to:

- assist members to clarify requirements under the EIAO;
- facilitate early identification of potential differences in views amongst different parties;
- provide a forum to resolve such issues; and
- serve as basis, on unresolved issue(s), to trigger the conflict resolution procedures under the EIAO.

Who attends an ESMG?

- Principal Environmental Protection Officer or above of EPD as chairperson
- Proponent for the EIA, supporting teams and consultants
- Relevant EIAO authorities
- Relevant EPD officers and specialists

Common items discussed in an ESMG

- Particular project
- Specific provisions of the Technical Memorandum
- Assumptions, methodology, models, baseline collection in EIA
- EIA Report findings, recommendations and Implementation Schedule of Mitigation Measures
- Specific topics raised by ESMG members

ESMG meeting facilitates early identification of any potential differences in views among members of the ESMG and provides a forum to resolve the issues. To make a best use of the ESMG in exchange of view, a proponent should prepare the discussion items. Proponents are encouraged to have frank and open dialogues at the early stages to exchange views on preparation of EIA reports, especially about the considerations of possible alternatives, any major environmental concerns, the assumptions adopted in modelling, and the likely environmentally friendly designs.

Examples of key issues in EIA being found out during discussion process among all parties involved:

- Operation hours of facility being wrongly assumed;
- Construction works areas, especially for spoil storage, being under-provided; and
- Under-estimation of construction programme to meet progress. These include insufficient plants, unrealistically low dredging rate, and different assumptions of working into restricted hours.

5.1.1 *How to Carry Out an EIA with Focus and Prepare an EIA Report Efficiently?*

For effective EIA report preparation, a project proponent and his consultants shall get hold of a variety of information. Some of the suggestions that might be useful are as follow:

Understand the Study Brief and environmental issues

- Get a thorough understanding of the study brief issued under the EIAO;
- Critically examine requirements for considerations of alternatives, if any; and any specific environmental concerns as listed down in the Study Brief; and
- Critically review any public comments received, particularly during the public exhibition of project profile.

Understand the Public Concerns

- Take proper account of public comments and opinions on environmental implications of the project;
- Get views from key stakeholders and green groups as early as possible;
- Understand the environmental issues - think from the perspective of the general public and those to be affected; and

- Present issues in layman terms.

Understand project history, the project justification and options available

- Identify and understand the issues, available options and solutions before deciding on whether detailed modelling or assessment is required;
- Critically examine the need and justification for a project. Collect background information from strategic, planning or feasibility studies; and
- Proactively look for environmentally-friendly alternative schemes or options to meet project need - avoidance versus mitigation or compensation. Laying down clearly the considerations being made to show the effort being given.

Understand assumptions made in an EIA, scenarios development, input parameters in impact prediction

- Know assumptions in EIA, especially basic information (e.g. traffic forecast & composition, pollution load, loss rate in dredging and etc.);
- Know assumptions made in identifying sensitive receivers, such as planned land uses, changing development programs, concurrent projects in the vicinity;
- Know spatial and temporal assumptions in construction methods and sequence, together with plant schedule. A project proponent shall critically review whether it is an engineering realistic construction program. Critical matters include, among others, whether a 24 hour operation is required for the works; adequacy of works areas; location of temporary haul road, concrete batching plant, rock crushing plant, jetty, mug-out portals, conveyor belts and etc.;
- Review practicality and programming of EIA recommendations and proposal of mitigation measures;
- Rigorously review the Implementation Schedule of Mitigation Measures in the EIA report and the EM&A Program;
- Review permanent structure/fixtures that are essential in operation phase such as location of ventilation shafts, passenger connections, overflow bypasses. Clarify roles of maintenance and implementation;
- Find out concurrent projects for cumulative impacts.

5.2 GOOD PRACTICES FOR PUBLIC CONSULTATION

Public Consultation – When?

The public and ACE have two occasions to provide comments during the statutory EIAO process. They are:

- during exhibition of a project profile; and
- during public inspection of EIA report.

Notwithstanding the statutory provision, a project proponent is encouraged to proactively get public comments or involvement during the project life cycle. Not only will this improve transparency and acceptance of a project, it can also gauge and gather public concerns for a project proponent to address in an EIA report.

Early dialogue with the locals and seeking comments from different stakeholders helps:

- Promote good public relationship;
- Avoid 'surprises' and find out concerns in the early stages of a project; and
- Gain public acceptance of a project.

5.2.1 What to Expect during Public Consultation of an EIA Report?

In preparation of the public consultation, a proponent should get conversant with his EIA report, especially the implementation schedule of mitigation measures. Some of the common questions raised over an EIA report are matters relating to:

- Quality and Completeness of the EIA Report;
- Accuracy - the margin of error and the environmental risk;
- Consistency with other similar EIA Reports;
- Cumulative impacts;
- Considerations given to options/alternatives; and
- Delivery of promises - the practicality and cost-effectiveness of mitigations.

All approved EIA reports and their approval conditions are put on the EIAO register office and the EIAO Website. A proponent can search similar EIA reports for reference.

Minutes of EIA Subcommittee Meeting and ACE Papers are posted on http://www.info.gov.hk/etwb-e/board/board2_1.html. A proponent can get useful information from the web page.

5.2.2 *The Role of Executive Summary during Public Consultation*

The Executive Summary of an EIA report is an useful tool in presenting findings of a project. It should set down all useful materials in a concise way in a manner readily understandable by general public.

Get Ready for Public Consultation….

- Understand EIA process and recommendations
- Review, understand, and get conversant with environmental impacts from a project and the public comments and opinions gathered
- Think from the perspective of the general public and those to be affected. Understand their stance and expectations
- Present issues in layman terms
- Know need and justification for projects
- Know alternatives being considered and gone through in the project lifecycle
- Know assumptions used in the EIA —planning horizon, traffic forecast, reference to past studies, changing development programs, concurrent projects in the vicinity: cumulative impact
- Know and ready to implement EIA recommendations including:
    - Implementation Schedule in the EIA report
    - EM&A Program
- Know whether there are residual impacts predicted in EIA reports and their effects
- Make a frank and open dialogue

5.3 *HOW TO HANDLE VARIATION IN THE EIA PROCESS*

A variation or change is not uncommon in a project life cycle. As the EIA process is a proactive planning tool that starts in the early stage of a project, it is reasonably envisaged that variation will occur during the development process.

The EIA process indeed can flexibly handle some of these variations. They are illustrated in the EIAO Guidance Note No. 3/2002 entitled "Flexibility and Enforceability of Mitigation Measures Proposed in an Environmental Impact Assessment Report". For instance, scenario development, situational description of mitigation measures, and design audit are general means available to flexibly implement the EIA process. Part Six of this Manual will discuss in detail and provide more hand-on tips on how to maximize the flexibility of implementing mitigation measures. Some general illustrations over their uses are:

<u>At Project Profile Stage</u>

Alternative alignments, route corridors and different development scenarios are the most common approaches used in project profile in the application of

Study Brief, when a project is under planning. An example is the project profile for the North Island Line where alternative alignments were proposed.

At EIA Stage

If it is uncertain over the final development, an alternative development scenario approach can be used in an EIA to assess the environmental impacts under different situation. A situational description of mitigation measures under "if-then" scenario is often a handy tool to build in flexibility in an EIA.

Implementation Stage

Design audit through Environmental Team and Independent Environmental Checker is a useful tool to handle minor environmental changes during implementation. In case where variation to an environmental permit is needed, an applicant can apply for variation of environmental permit under the EIAO.

5.4 ENVIRONMENTAL PERMIT

An environmental permit would be issued based on Part III, "Environmental Permit" of the EIAO and Section 7, "Issuing Environmental Permit" of the TM., and other relevant sections in the EIAO and TM. Schedule 4 of the EIAO lays down the matters that may be specified in Environmental Permit

Section 7.2 of the TM says

> *"The Director will use the following criteria in determining the conditions to be imposed in an environmental permit:*
>
> *(a) the mitigation measures set out in the project profile or the findings and conclusions of the approved EIA report, whichever is applicable;*
>
> *(b) the conditions of approval of the EIA report;*
>
> *(c) the conditions of approval of proceeding directly with the application for environmental permit;*
>
> *(d) the advice given to him by other relevant authorities on matters within their jurisdiction as listed in Section 9 of this technical memorandum, or*
>
> (e) *the measures that are necessary to meet the guidelines, standards or criteria laid down in this technical memorandum, and …"*

Since mitigation measures set out in project profile or the findings and conclusions of EIA reports are essential, a project proponent is advised to critically review them in his/her submission.

5.5 *MATERIAL CHANGE*

Please note that material change refers to significant change only.

The guiding principles are well presented in Section 6 of the EIAO TM. If in doubt, an applicant should seek early advice from EPD to avoid putting the matters on the critical path of programme development.

PART SIX – BETTER ENVIRONMENTAL OUTCOMES

6. BETTER ENVIRONMENTAL OUTCOMES

6.1 MAXIMIZE FLEXIBILITY OF IMPLEMENTING MITIGATION MEASURES

The EIA mechanism is a tool to assist decision making. It is therefore a legitimate expectation that recommendations and findings in an EIA will be implemented, irrespectively of whether the work falls under the EIAO.

Part 5.4 of this Manual outlines the provision under EIAO for permit issuance.

VIP

A project proponent is strongly advised to critically review the EIA findings, recommendations, and conclusion, together with its implementation schedule. Proponents should satisfy themselves that they would implement all these recommendations and that these undertakings are certain and clear enough to be implemented timely, properly and flexibly.

A project proponent can go through a preliminary check following section 4.4 of the TM to see whether he/she is satisfied with any environmental study. Among others, a project proponent can see that whether the report has assessed and determined the feasibility, practicability, programming and effectiveness of the recommended mitigation measures.

The EIAO Guidance Note No. 3/2002 - Flexibility and Enforceability of Mitigation Measures Proposed in an EIA Report provides some guiding principles on the approach to assess the recommended environmental mitigation measures in EIA reports. The note also recommends some approaches the project proponent may consider for flexible implementation of the mitigation measures.

Some tips:

A project proponent shall critically review an EIA report including the implementation schedule with a view to ensuring the proposed mitigation measures are practicable and effective.

Useful tips are:

- Whether measures possess Preventive Ability? – The primary purpose of proposed measures is to prevent environmental problems from happening, but not to rectify problems after occurrence. Consideration should, therefore, give priority to avoid, pre-empt and prevent adverse environmental consequences.
- Whether measures possess Flexibility? - It is fundamental to note that an EIA study is a planning tool at early stage of project planning. Changes are reasonably foreseen along the project life cycle. Proposed mitigation measures being proposed should have a degree of implementation flexibility.
- Whether measures can be Implemented? – A proponent can review proposals against the "5-W" requirement in Section 6.7 of the TM, namely,

  (i) **What** mitigation measures will be implemented?

  (ii) **Who** will implement the measures?

  (iii) **When** will the measures be implemented?

  (iv) **Where** (i.e. at what locations) will the measures be implemented?

  (v) To **what** standards or requirements should these measures be implemented?

6.1.1 *Case Studies*

Some illustrations are below.

Example 1: Construction Noise Barrier

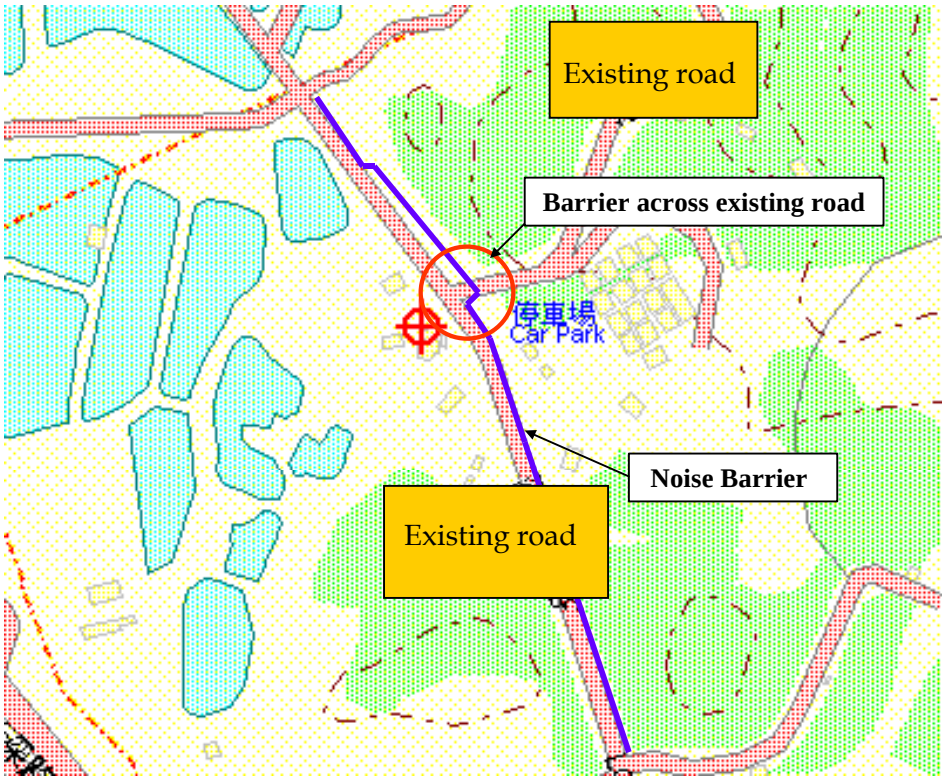
EIA Recommendation suggests that:

"*Installation of gap-free noise barrier prior to construction works commenced at some designated construction worksite.*"

There is a continuous line delineating extension of barrier, cutting across an existing road junction.

Implementation constraints

Barrier cuts across road junctions



Tips:

On-site check to see EIA proposals fit site constraints

Example 2 : Construction of wheel washing facility

EIA Recommendation suggests :

"Wheel washing facility should be provided at the main entrance/exit of each of the worksite"

Implementation Constraints

Worksite along existing road allows no space for facility installation.

Example 3:

Some scopes for improvement

- Clear definition of Terms

An EIA might recommend that "Works in certain stage might not begin before "site formation", "remediation phase" or "completion of baseline study".

It is prudent for a proponent to ascertain where exactly these terms are defined, or whether work programmes allow these. If a phased implementation is proposed, will this kind of "blanket clauses" hinder progress?

- Handling phased implementation

If a project is planned for phased implementation, a project proponent can specify in the EIA the construction programme and timing. This approach was adopted in expansion of sewage treatment work.

- Adopting a scenario approach

It is not uncommon that scenario approach be used in an EIA. This will definitely enhance flexibility of choice through the project life cycle.

For instance, X-type noise mitigation measures will be used if certain train are used, whereas Y-type noise mitigation measures are then used if other train are adopted.

6.2 AN EFFECTIVE ENVIRONMENTAL MONITORING AND AUDIT PROGRAMME

What is an EM&A Programme?

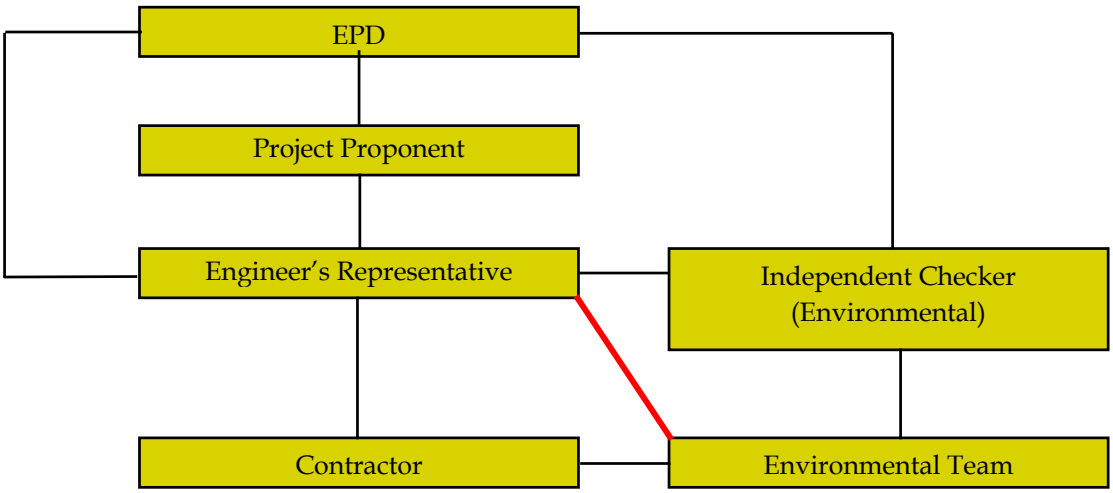
- An environmental management tool to bridge the gap between EIA predictions and actual environmental performance.
- A mechanism to ensure project proponents really do what the EIA recommended and can deal promptly with new problems.

Typically the EM&A programme shall be clearly set out in an EM&A Manual, including:

- Technical requirements (monitoring parameters, frequencies, equipment and location);
- Reporting requirements;
- Complaint investigation procedures;
- Event action plans;
- Organisation and structure of Environmental Team; and
- Management and reporting relationship between various parties and EPD.

The environmental monitoring and audit requirements are set out in Section 8 of the EIAO TM. The content of a full environmental monitoring and auditing programme contained in Annex 21 of the EIAO TM provides a good framework to the development of project specific EM&A programme.

Figure 6.1 Project Organisation Chart and Reporting Relationship



Has the incorporation of EM&A programme helped bring better environmental performance?

Example 1: North Lantau Expressway

- Water quality monitoring showed that the suspended solids in the Tung Chung Channel exceeded the pre-set Trigger Level.
- A water retention tank was set up to retain grey water prior to discharge.
- **Pollution to the marine environment being avoided.**

Example 2: Route 3 Northern Portal

- Routine site inspection was one of the EM&A requirements.
- Site inspection revealed that grey water from construction had mixed with mud, thereby polluting nearby freshwater streams.
- A twin-celled desilting pond was installed to intercept and treat silty water prior to discharge.
- **Pollution to streams being avoided.**

6.2.1 *Reporting*

A project proponent shall critically review the scope of EM&A being proposed in an EIA report for its scope and justification.

A Word on Submission

The report submission requirements should be thoroughly understood. Project proponents and/or their contractor are advised to understand the review procedure of reports and the necessary preparation work to ensure timely planning.

Example 1: Submission of plans before works commencement

Submission

Baseline monitoring reports, waste management plans, habitat creation management plan to be submitted before works commencement.

Good Practices

Find out the submission requirements to plan early. Avoid putting them in the critical path.

Example 2: Monthly EM&A Report Submission

Submission Deadline
Within 2 weeks after the end of reporting month.

Submission
Hard copy and soft copy of the report (html and pdf formats) at the same time.

Actual time spent
Report preparation (2-3 days) → Environmental Team Leader to review and certify (1 day) → Revise report (1 day) → Independent Environmental Checker to comment and verify (1-2 days) → Revise report (1 day) → conversion of document to html and pdf formats (1-2 days)

A good planning is required to comply with the timeline.

6.3 MANAGE CONTRACTORS FOR COMPLIANCE WITH ENVIRONMENTAL PERMITS

Key to Success

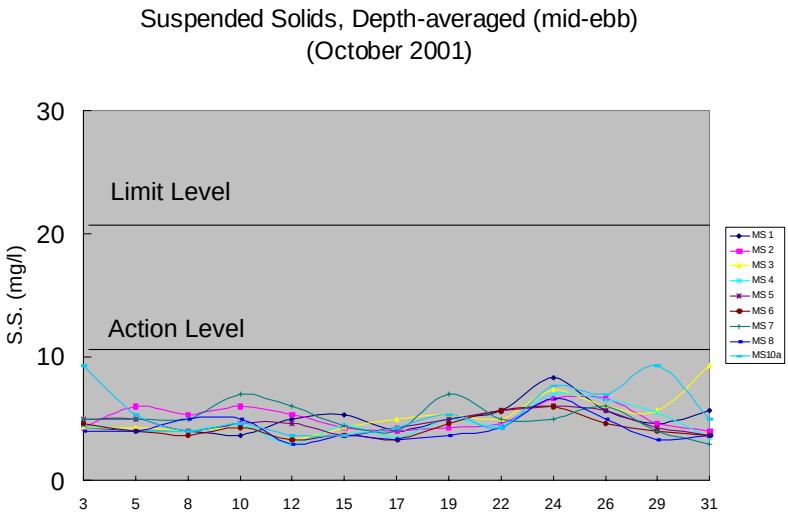
General mitigation measures during construction phase:

- Phasing reclamation works;
- Minimise pollution using silt curtain;
- Minimise noise impacts using noise barrier/ acoustic cover;
- Frequent watering of haul roads; and
- Environmental monitoring and audit.

Successful Case Studies

Example 1: Phased Reclamation at Pak Shek Kok

Phasing reclamation to minimize suspended solid. The level of suspended solid well controlled below the action limit.



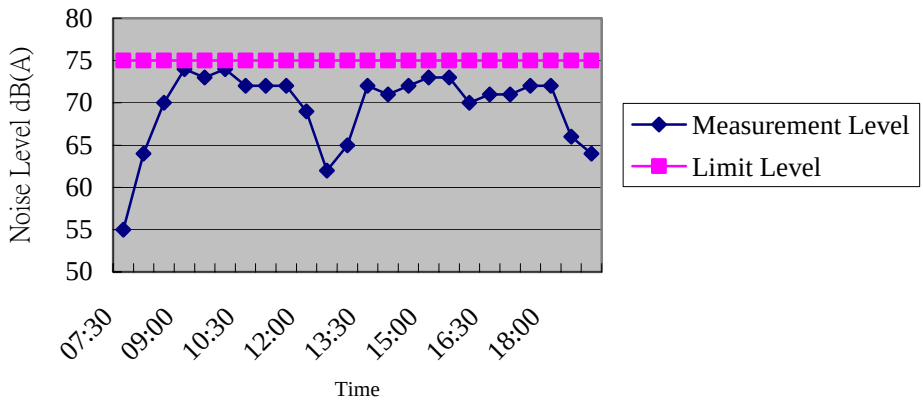
Example 2: Silt Curtain to minimize suspended solid migration

Dredging near Cheung Sha Wan Fish Culture Zone

HEC 1800 MW Gas Fired Power Station Extension

Example 3: Noise Abatement Along Northern Access Road at Cyber Port Development

Noise Level at Baguio Villa (President Tower) on 24 Nov 01



Tips to Manage Contractors…..

- Financial Incentives/Penalties via contract arrangement
- Partnership
- Independent Environmental Team Leader and Independent Checker (Environmental)
- Proactive Site Engineer
- Use Further Environmental Permit to pass the responsibilities to the contractor

Penalty for Offences

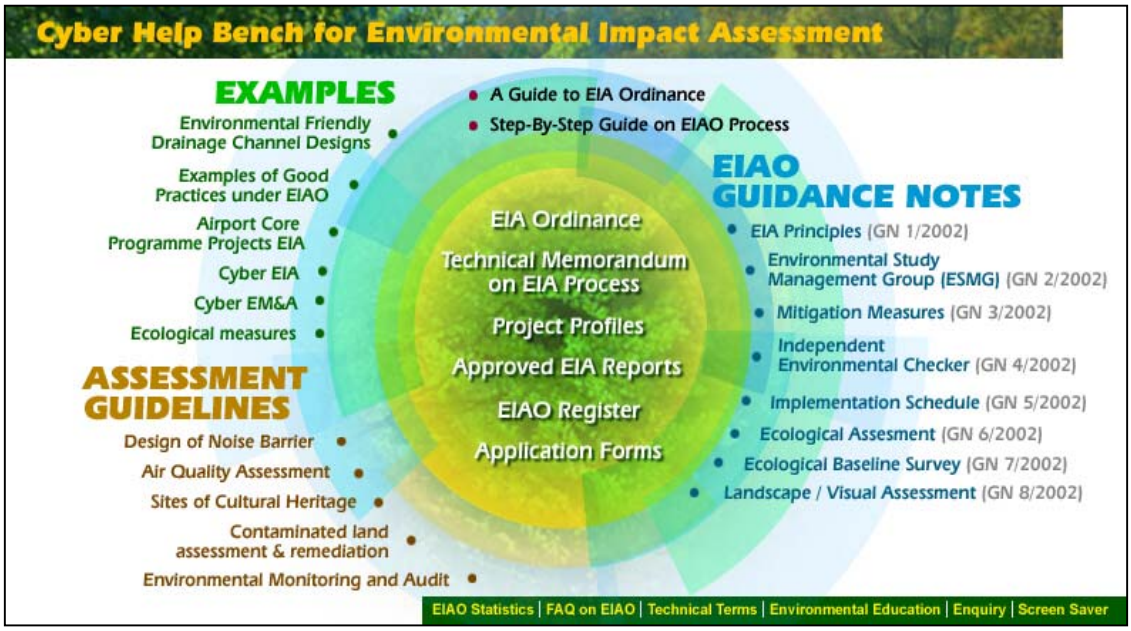
	Fine	Imprisonment
First conviction	$2,000,000	6 months
Second or subsequent Conviction	$5,000,000	2 years
First summary conviction	Level 6	6 months
Second or subsequent Summary conviction	$1,000,000	1 year

* The penalty of continuing offence: $10,000 per day

7. USEFUL RESOURCES AND GUIDELINES

7.1 REFERENCES

Useful Resources are available at the Cyber Help Bench website http://www.epd.gov.hk/epd/eia/hb



In short, they are:

- A Guide to the EIA Ordinance
- A Guide to the Environmental Impact Assessment (Appeal Board) Regulation
- Advertising Requirements and Public Inspection of Documents
- Modus Operandi of the Environmental Impact Assessment Subcommittee of the Advisory Council on the Environment
- General Notes for the Applications under the Environmental Impact Assessment Ordinance (Chapter 499)
- Assessment of the Impact on the Sites of Cultural Heritage in Environmental Impact Assessment Studies
- Basic Principles of Environmental Impact Assessment Process (GN 1/2002)
- The Role and Operation of Environmental Study Management Group (GN 2/2002)

- Flexibility and Enforceability of Mitigation Measures proposed in an EIA Report (GN 3/2002)
- The Role on Independent Environmental Checker (GN 4/2002)
- Implementation Schedule for Environmental Impact Assessment Process (GN 5/2002)
- Some Observations on Ecological Assessment From the Environmental Impact Assessment Ordinance Perspective (GN 6/2002)
- Ecological Baseline Survey for Ecological Assessment (GN 7/2002)
- Preparation of Landscape and Visual Impact Assessment Under the Environmental Impact Assessment Ordinance (GN 8/2002)

In addition, SEA Reports are available on our website through the link http://www.epd.gov.hk/epd/english/environmentinhk/eia_planning/sea/sea

All the approved EIAs are displayed in the EIAO Register and on the EIAO website. An applicant can get useful resources and references from them, together with collecting relevant site-specific information. **Nonetheless, an applicant should take note that each project has case specific matter, and references can only be applied after professional consideration.**

7.2 *APPROVED EIAS*

A short recap of some of the approved EIAs in the EIAO Register that would be useful reference:

Road Projects	
EIA-082/2002	Shenzhen Western Corridor
EIA-078/2002	Deep Bay Link

Railway Projects	
EIA-071/2001	Sheung Shui to Lok Ma Chau Spur Line
EIA-053/2001	Modifications to MTRC Tsim Sha Tsui Station

Theme Park

EIA-041/2000	Construction of an International Theme Park in Penny's Bay of North Lantau together with its Essential Associated Infrastructures – Environmental Impact Assessment

Power Station

EIA-009/1998	1,800 MW Gas-fired Power Station at Lamma Extension

Sewerage Works

EIA-079/2002	Ngong Ping Sewage Treatment Works and Sewerage
EIA-074/2002	Yuen Long and Kam Tin Sewerage and Sewage Disposal Stage 1 Packages 1A-1T and 1B-1T – Kam Tin Trunk Sewerage Phase I and II

Reclamation Works and Future Landuses

EIA-040/2000	Northshore Lantau Development Feasibility Study – Environmental Impact Assessment

Decommissioning and Land Contamination Projects

EIA-072/2001	Decommissioning of Cheoy Lee Shipyard at Penny's Bay
EIA-064/2001	Demolition of Buildings and Structures in the Proposed Kennedy Town Comprehensive Development Area Site