

Modernising Environmental Impact Assessment through AI in Hong Kong

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Outline

1. Background
2. Hong Kong Environmental Database (HKED)
3. AI-Driven Bird Recognition System
4. Smart Tree Survey with LiDAR
5. AI Chatbot for Smart EIA Process
6. Smart Environmental Monitoring and Audit (EM&A) System




1. Background

Background

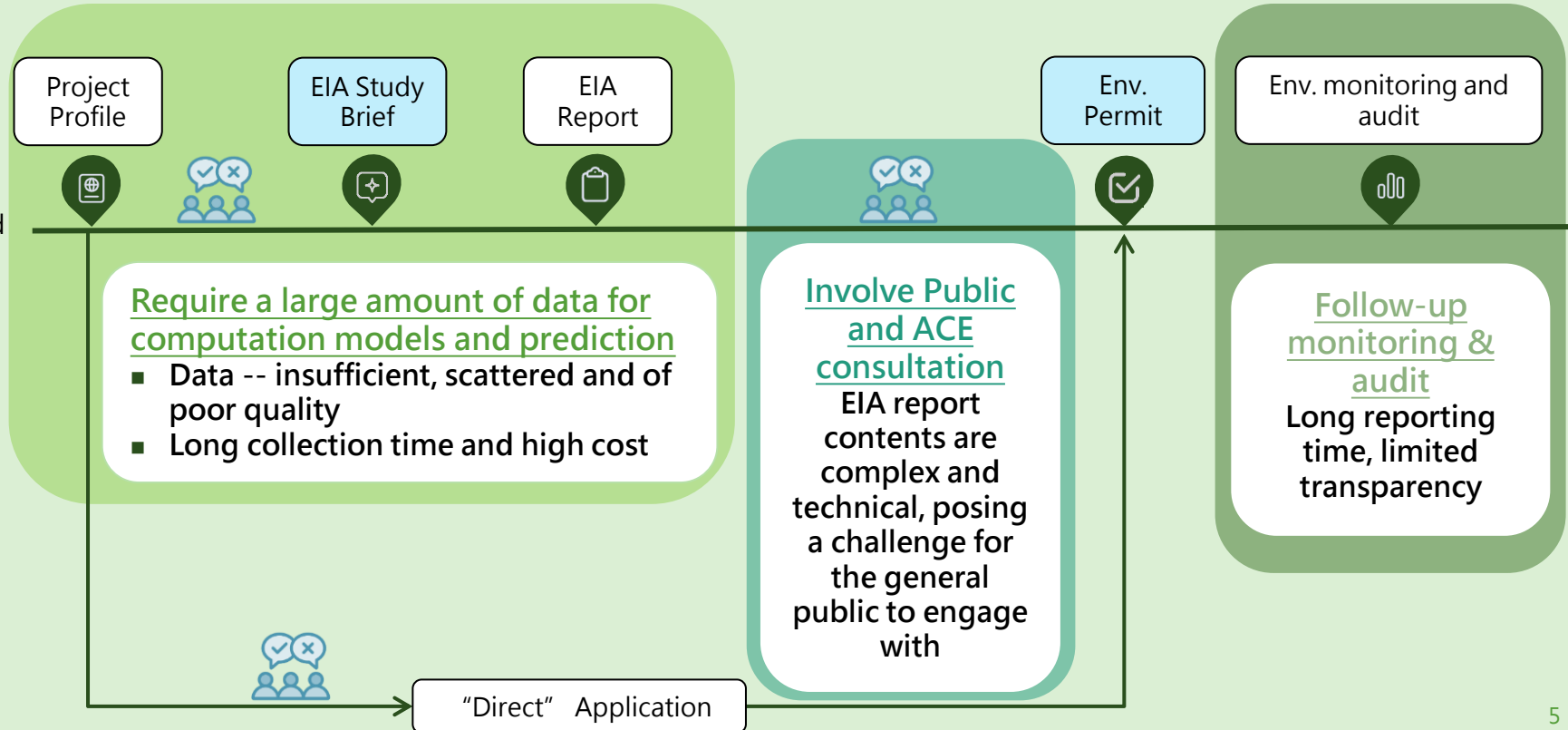


- The world is committed to enhancing working efficiency and accelerating development progress, and Hong Kong is no exception.
- Major development projects in Hong Kong are mandated to undergo Environmental Impact Assessment (EIA) process within the statutory EIA Ordinance framework.
- Hence, we conducted thorough review to optimise the EIA Ordinance with the aim of improving speed, quality and efficiency.

EIA Process and Challenges

 = Statutory Public and ACE Consultation

Designated Project



Our Strategy

- Leverage AI and Big Data to automate data collection and analysis
- Enhance transparency and scientific rigour by standardising data collection methods, models, and assessment criteria
- Accelerate and improve major projects, in particular the EIAs for Northern Metropolis projects, through data-driven optimisation and faster, more reliable decision-making



2. Hong Kong Environmental Database (HKED)

Hong Kong Environmental Database (HKED)



Launched in Dec 2022



200+ Spatial Data Layers



250+ Registered Users



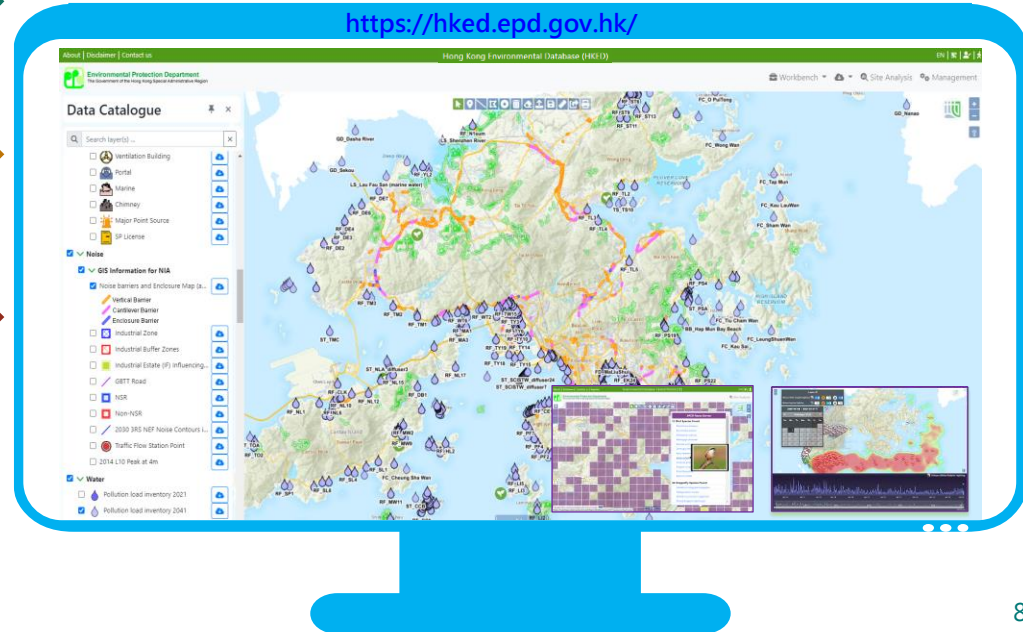
Embedded Smart Tools



3D Modeling Tools

- A comprehensive, one-stop platform that integrates essential environmental data and advanced smart tools to enhance transparency and efficiency of the EIA process

<https://hked.epd.gov.hk/>





環境保護署

Environmental Protection Department

香港環境數據庫

Hong Kong Environmental Database

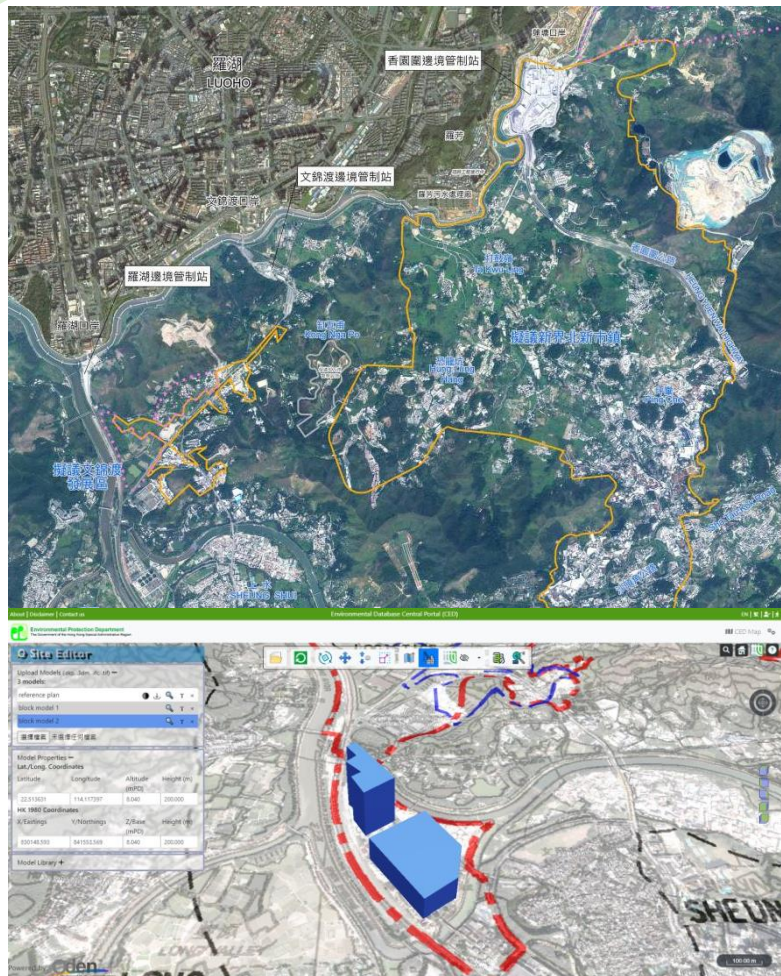
Benefits of HKED

Early identification of environmental constraints

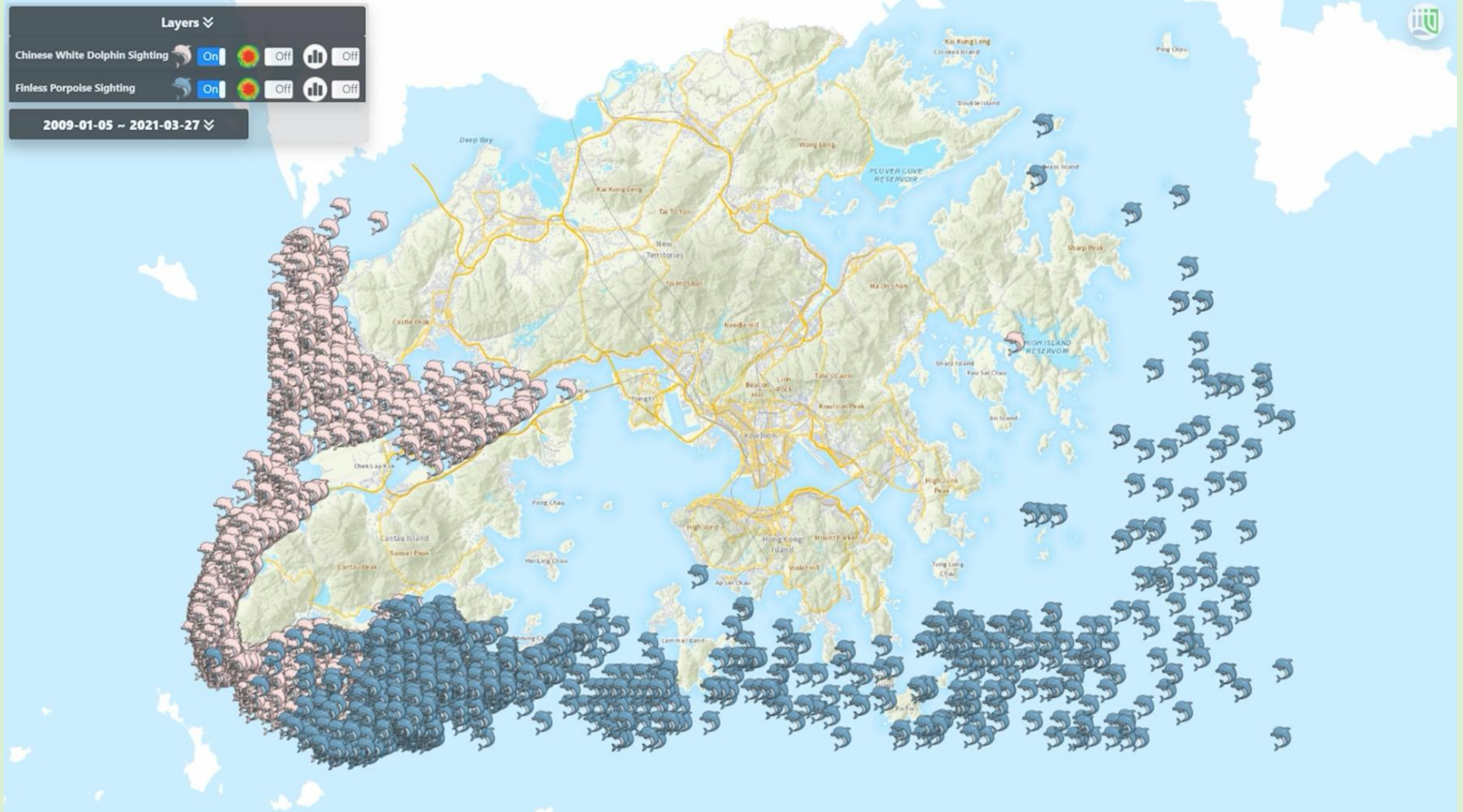
Quick comparison and optimisation of project design

3D visualisation of design

Online platforms/tools for modelling and assessments



Identification of Environmental Constraints

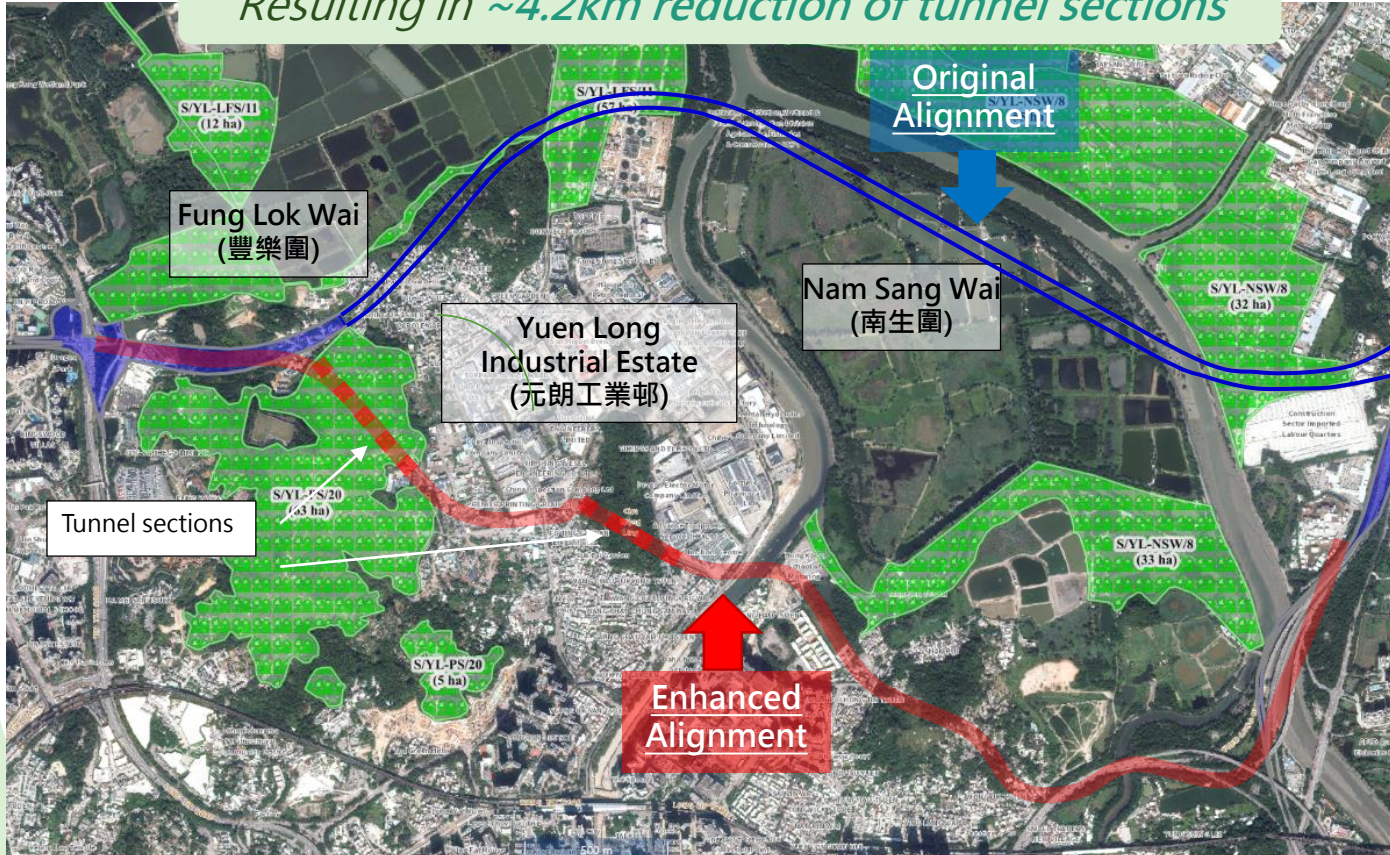


One Map for Environmental Assessment

— 圖 評 環

Design Optimisation using HKED

Resulting in ~4.2km reduction of tunnel sections



Original alignment
- 5.5km long, with 5km tunnel **passing through wetlands** in Nam Sang Wai and near Fung Lok Wai

Enhanced alignment
- **Route through non-sensitive areas** (i.e. existing Yuen Long Industrial Estate and Yuen Long Town Centre) instead of wetlands
- **Tunnel section reduced from 5km to 0.8km**

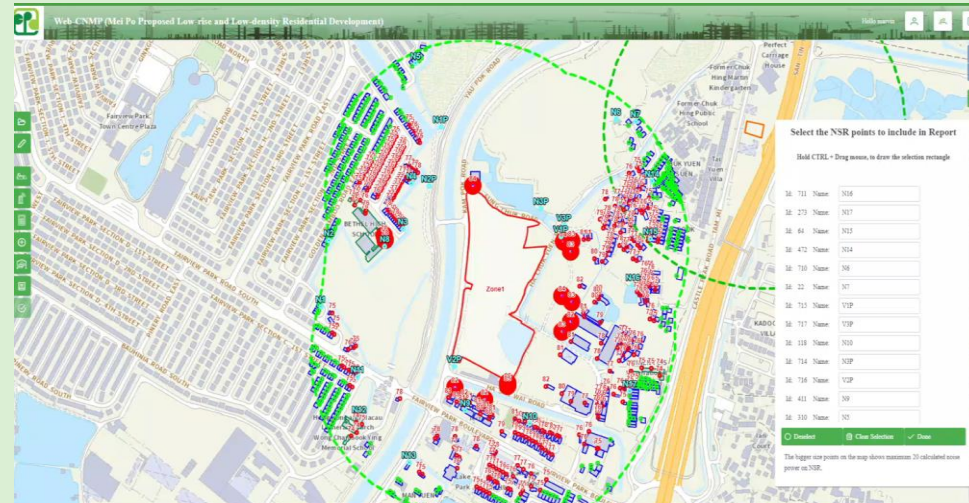
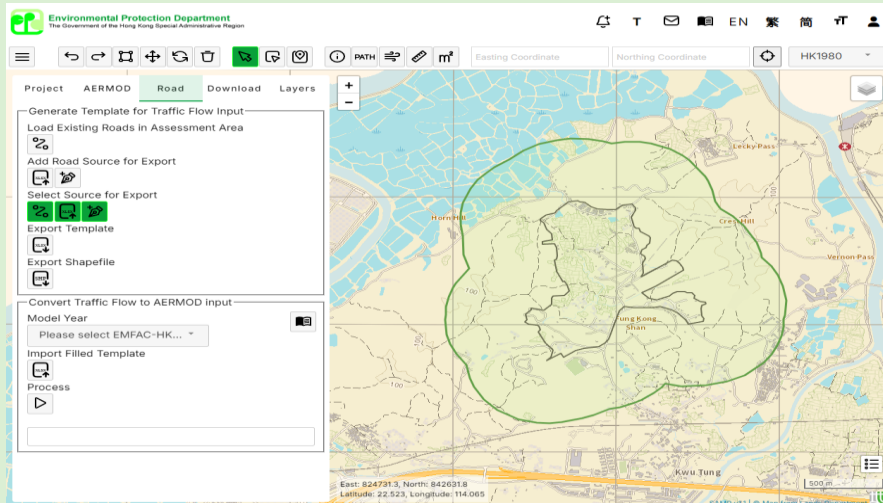
Legend

- At-grade or via-duct (Original Alignment)
- Tunnel (Original Alignment)
- At-grade or via-duct (Enhanced Alignment)
- Tunnel (Enhanced Alignment)
- Conservation Area

Web-based Assessment Platforms (Noise & Air Quality)



- **One-click data access** – faster model setup and higher accuracy
- **Automated calculation** – streamlined assessment process and consistent methodology
- **Reduced manual effort** – saved time and cost



SMART AIR MODELLING PLATFORM (SAMP)

HKED recognised by mainland and international experts



“Southeast Asia Forum” 2024 International Conference
“Best Environmental Innovation Award”



Hong Kong/Shanghai Co-operation Open Data Challenge 2025
“Best Smart Environment Award” and
“Grand Award”



CIWEM HK 2025 Innovation & Sustainability Awards
“Innovation Award – Major Project - Gold”



International Association for Impact Assessment
“2025 IAIA Corporate Initiative Award”

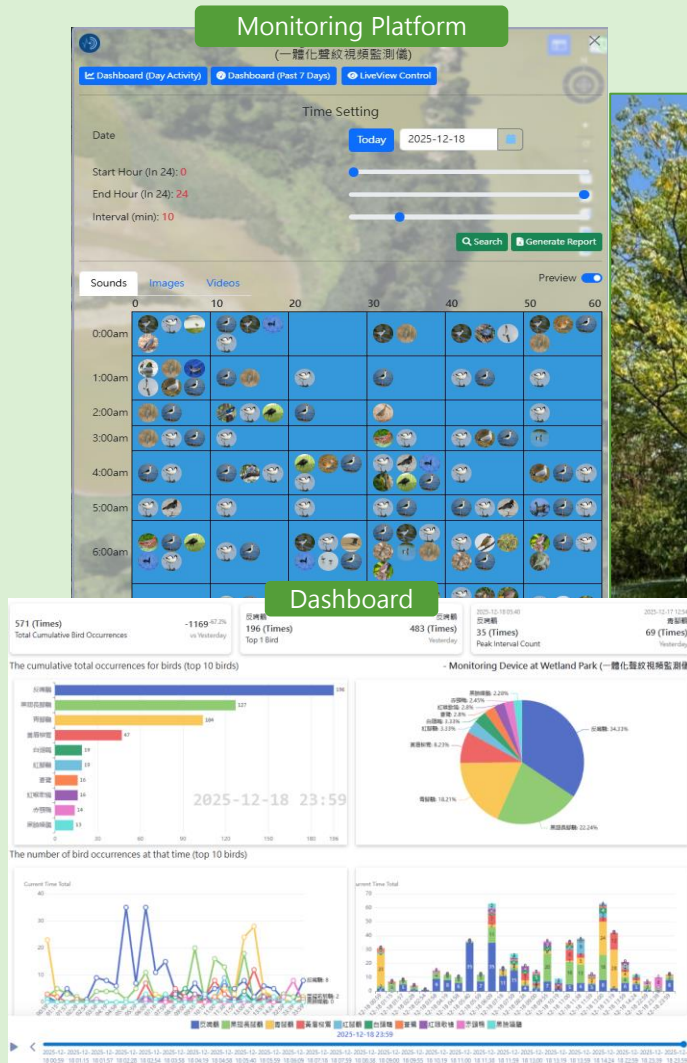


Conference on Environmental Impact Assessment for the Construction of a Beautiful China
7th China Environmental Assessment Forum
“Certificate for the Outstanding Environmental Innovation”

3. AI-Driven Bird Recognition System

AI-driven Bird Recognition System

- Use AI to identify more than 500 Hong Kong bird species
- Fully automated monitoring
- Central dashboard that helps analysing monitoring data
- Pilot application at Hong Kong Wetland Park (HKWP)



Integrated Monitoring Device



4. Smart Tree Survey with LiDAR

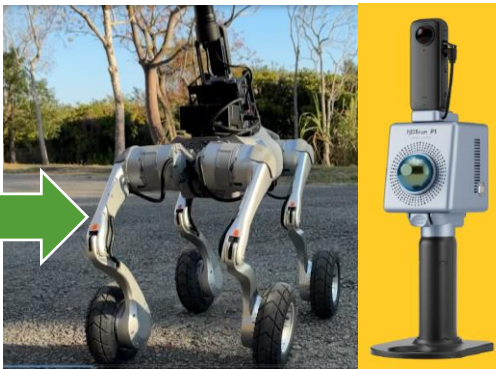
LiDAR for Tree Scanning

Manual measurements of tree data and mapping of tree locations



Traditional Tree Surveys

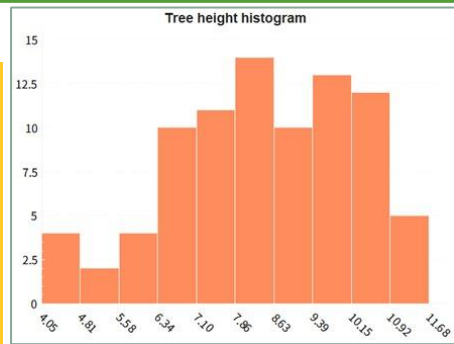
LiDAR 3D scanner (handheld or mounted on a robotic dog)



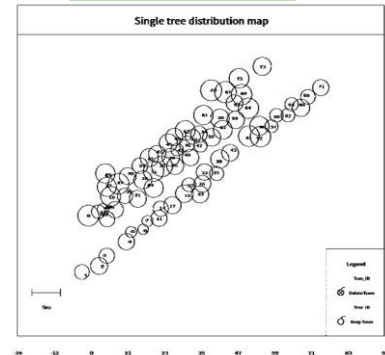
3D Visualisation



Tree Parameters Histograms



Tree Map



- Enhance efficiency and accuracy of tree surveys
- Quickly acquire high-precision 3D data
- Unified survey methods and data standardisation
- Support tree surveys and preparation of tree preservation proposals

Smart Tree Surveys with LiDAR



5. AI Chatbot for Smart EIA Process

AI Chatbot for Smart EIA Review



GIS Map

Integrated 200+ environmental and ecological datasets for EIA studies.



EIA Database

Consolidated:
300+ study briefs
260+ EIA reports
20+ guidelines
20,000+ public comments



LLM Chatbot

Trained on Hong Kong's EIA framework for effective, context-aware review assistance.

The screenshot displays the 'HONGKONG EIA SYSTEM' web application. At the top, it identifies the user as 'Residents' and provides language options (EN / 簡 / 繁) and a 'MANAGE [admin]' link. The main interface is divided into three sections:

- EIA Report Searcher:** A sidebar on the left with a search bar and filters. It lists several EIA reports, including:
 - 'Infrastructural Works for the Proposed Development at Telegraph Bay' (EIA-011/1999)
 - 'Installation of Submarine Gas Pipelines and Associated Facilities from Ma Tau K...' (EIA-182/2010)
 - 'A Rooftop Helipad at New Acute Hospital at Kai Tak Development Area' (EIA-266/2020)
 - 'Development of Anderson Road Quarry site - Road Improvement Works' (EIA-266/2020)
- Map:** A central map of Hong Kong with yellow lines representing infrastructure and blue circular markers numbered 1 through 55, indicating specific EIA study locations.
- Report Summary & AI Chatbot:** A right-hand panel showing a 'Report Summary' for 'Route 9 between Tsing Yi and Cheung Sh...' and an 'AI Chatbot' window with a chat history and a text input field.

Early Project Evaluation Using AI

- Evaluate environmental impacts with basic project information and boundary
- The Chatbot utilises verified environmental information in HKED to identify key issues
- Facilitate quick evaluation and optimisation of project alternatives at the early stage

× Generate Project Profile Vector 1

① **Basic Information**

Project Name*
e.g., Lung Kwu Tan Port Expansion

Project Proponent*
e.g., Civil Engineering and Development Department, HKSAR Government

Project Nature and Scale*
e.g., Approximately 80 hectares of reclamation including container terminal

Project Description*
e.g., This project aims to increase port facilities through reclamation...

② **Project Location**

Location Description*
e.g., Located in northern Lung Kwu Tan, Tuen Mun District, adjacent to existing industrial land

③ **Project Schedule**

EIA Study Start* Construction Start*

Select date Select date

Estimated Completion*

AI-Driven Compliance Checks

Complete Rating

(A Rooftop Helipad at New Acute Hospital at Kai Tak Development Area) , The rating for the chapter (DESCRIPTION OF ASSESSMENT METHODOLOGIES) of annex 11 is as follows:

Content completeness score for the section "DESCRIPTION OF ASSESSMENT METHODOLOGIES" is 8/10.

- (Section 3.6.6.18 and 3.6.6.19): These sections provide a detailed description of the meteorological data processing and surface characteristic parameters required for the AERMOD dispersion model. However, they lack information on how these parameters are determined specifically for the proposed helipad project, which is necessary for a comprehensive assessment methodology.
- (Assumptions in Appendix 3H): While the detailed assumptions are presented in the appendix, their relevance and appropriateness for the assessment methodology should be clearly discussed in the main text to ensure clarity and consistency.
- (QRA aspects related to the proposed helipad project): The QRA aspects mentioned in this section are relevant, but more details on how they were integrated into the overall assessment methodology would improve the section's completeness.
- (Noise standards for helicopter noise during evening and night-time periods): This section provides important information on noise standards, but it could be more detailed on how these standards were applied specifically to the proposed helipad project.
- (Individual Risk and Societal Risk models): These models are described in detail, including their assumptions and inputs. However, more discussion on how these models were validated or compared with other studies would strengthen the methodology's completeness.
- (Vapour Cloud Explosion (VCE) effects modeling): The use of TNO multi-energy model and associated fatality probabilities is well-described. However, more information on how these results were integrated into the overall assessment would improve the section's completeness.
- (Air quality impact assessment results): This section provides valuable insights into potential air quality impacts. However, discussing how these results were compared with other similar projects or international standards would enhance the methodology's completeness.
- (Environmental/Social Benefits of the Project): While this section provides some information on the benefits of the proposed helipad project, more details on how these benefits were considered in the assessment methodology would improve its completeness.

Score

Clear Screen

Complete Rating

5.6	No	Consider impacts which may contribute to significant effects.
5.10	No	Predict timescale of impacts accurately.
5.12	No	Acknowledge uncertainty in quantitative predictions.
6.7	No	Present details of mitigation measures implementation and function over timespan needed.
6.8	No	Investigate adverse environmental effects of mitigation measures.
7.3	No	Evaluate residual impacts against government policies, standards, and criteria.
7.5	No	Discuss magnitude, location, and duration of residual impacts in conjunction with resource value, sensitivity, and rarity.
7.6	No	Discuss alternative approaches for evaluating residual impacts when no generally accepted standards or criteria exist, making clear distinction between fact, assumption, and professional judgement where applicable.
7.7	No	Consider residual impacts from proposed mitigation measures if any arise from their implementation.
8.1	No	Propose monitoring arrangements to check environmental impacts resulting from project implementation and conformity with predictions made if impacts are uncertain.
8.2	No	Ensure proposed monitoring scale corresponds to potential deviations from expected impacts significance and scale if any proposed monitoring arrangements are made to assess the environmental impacts resulting from the implementation of the project and conformity with predictions made when impacts are uncertain during the preparation of the report on an acute hospital rooftop helipad at Kai Tak Development Area in Hong Kong SAR, China by a registered surveyor/engineer who has been granted permission to practice in Hong Kong SAR under the title of "Rooftop Helipad Design Engineer."

Final score: 66.86

Calculation method: $(7.08 \times 10 + 62.92) / 2 = 66.86$

Score

Clear Screen

Automated Cross-Referencing

The chatbot fine-tunes its analysis to reference relevant technical memoranda and guidance notes for EIA reviews

- Flags missing or inconsistent content
- Detects deviations from required standards

Automated Checking

EIA report sections are automatically checked on compliance, saving significant reviewer time.

- Provides transparent checking results
- Highlights report problems

AI-Powered Public Comments Evaluation



Stakeholder Evaluation

Evaluate public concerns from multiple stakeholder viewpoints.



Theme Identification

Flags recurring themes and emerging issues for proactive stakeholders engagement.



Cross-Referencing

Matches each predicted comment to the relevant EIA report section to assess response adequacy.



Overall Advantages of AI Chatbot

Automation



Leverage AI to automate project profile preparation and verification of completeness of EIA reports.

Enhanced Consistency



Standardised data collection methodologies, statutory compliance and public comment assessment across all EIA submissions.

Proactive Insights



Enables earlier identification of stakeholder concerns, with a view to address public comments received.

Increased Efficiency



Automates routine tasks, freeing consultants/officers for deeper, more strategic analysis and high-value tasks.

6. Smart Environmental Monitoring and Audit (EM&A) Platform



Sensor Index

Search

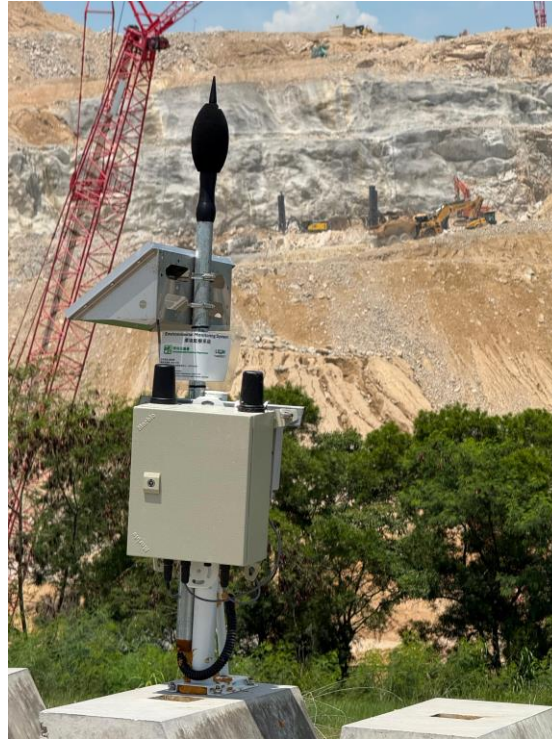
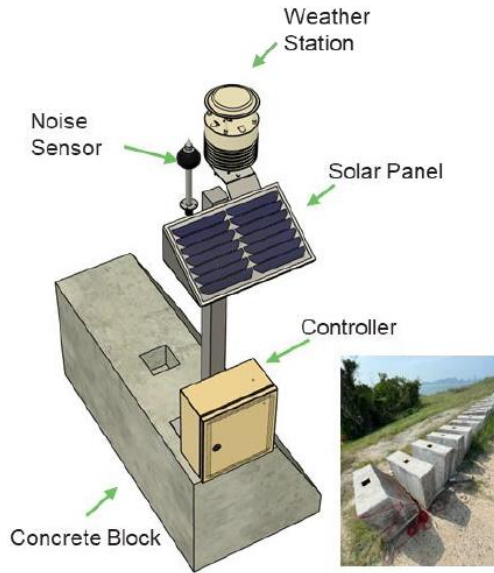
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Status All

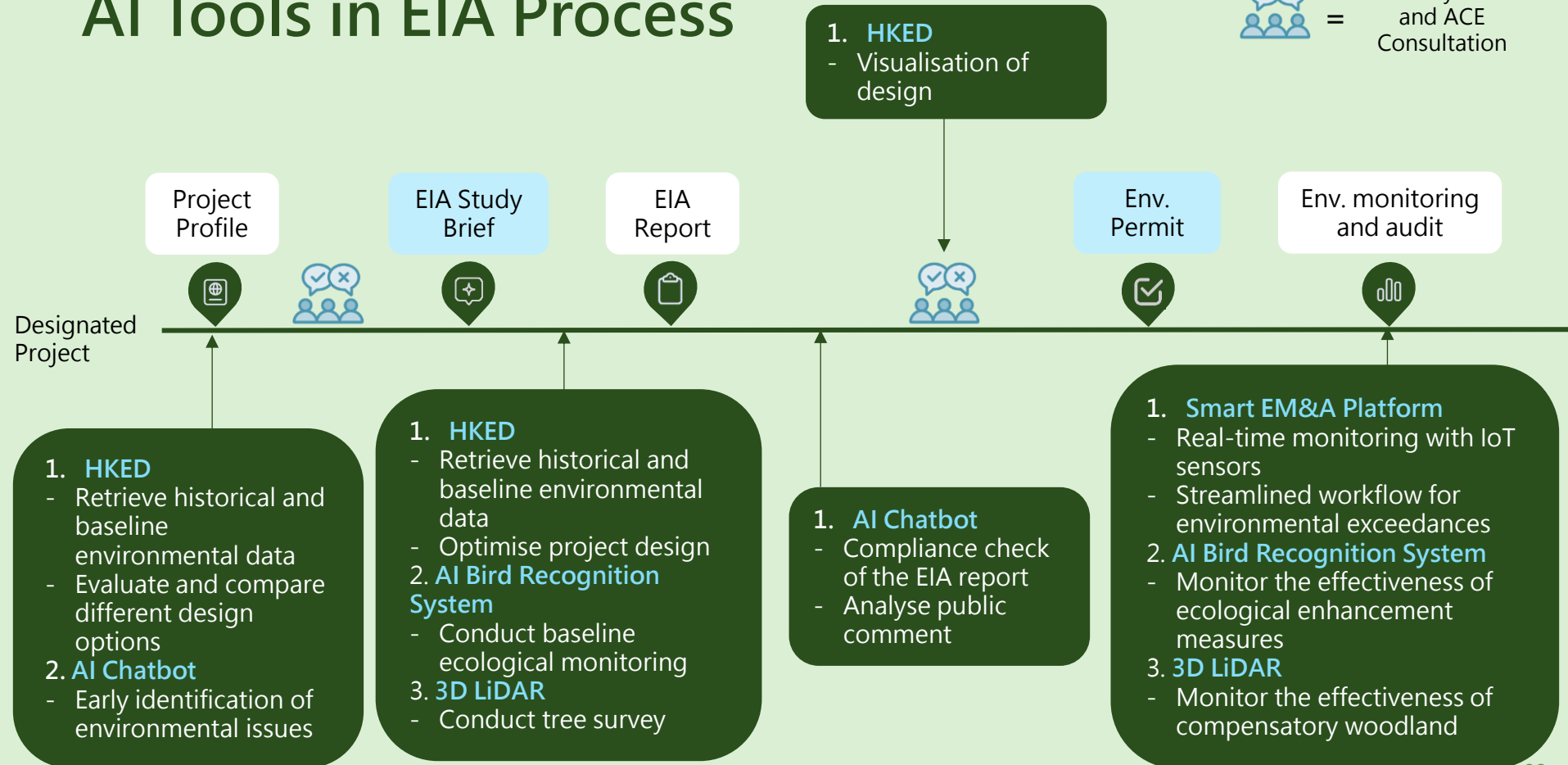
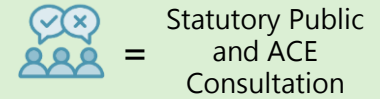
Device	Status
Water	
Water_L1	Offline
Water_L4	Offline
Water_L3	Action
Water_L5	Offline
Water_L6	Normal
Water_L7	Normal
Water_L8	Action
Water_L9	Action
Water_L10	Normal
Air	
Total number of Device 68	



Real-time monitoring using IOT devices



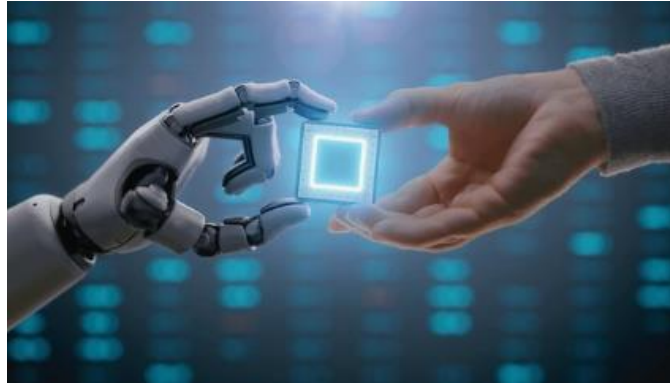
AI Tools in EIA Process



AI as A Partner in EIA Process

AI

- Objective and standardise data collection
- Data-driven environmental analysis
- Automate routine checks and accelerate review cycles



Human

- Development vs Environment balancing
- Ethical judgement
- Adapting to new challenges

AI enhances, but not replaces, professional expertise

Thank You

