Modernising Environmental Impact Assessment through AI in Hong Kong

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Outline

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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

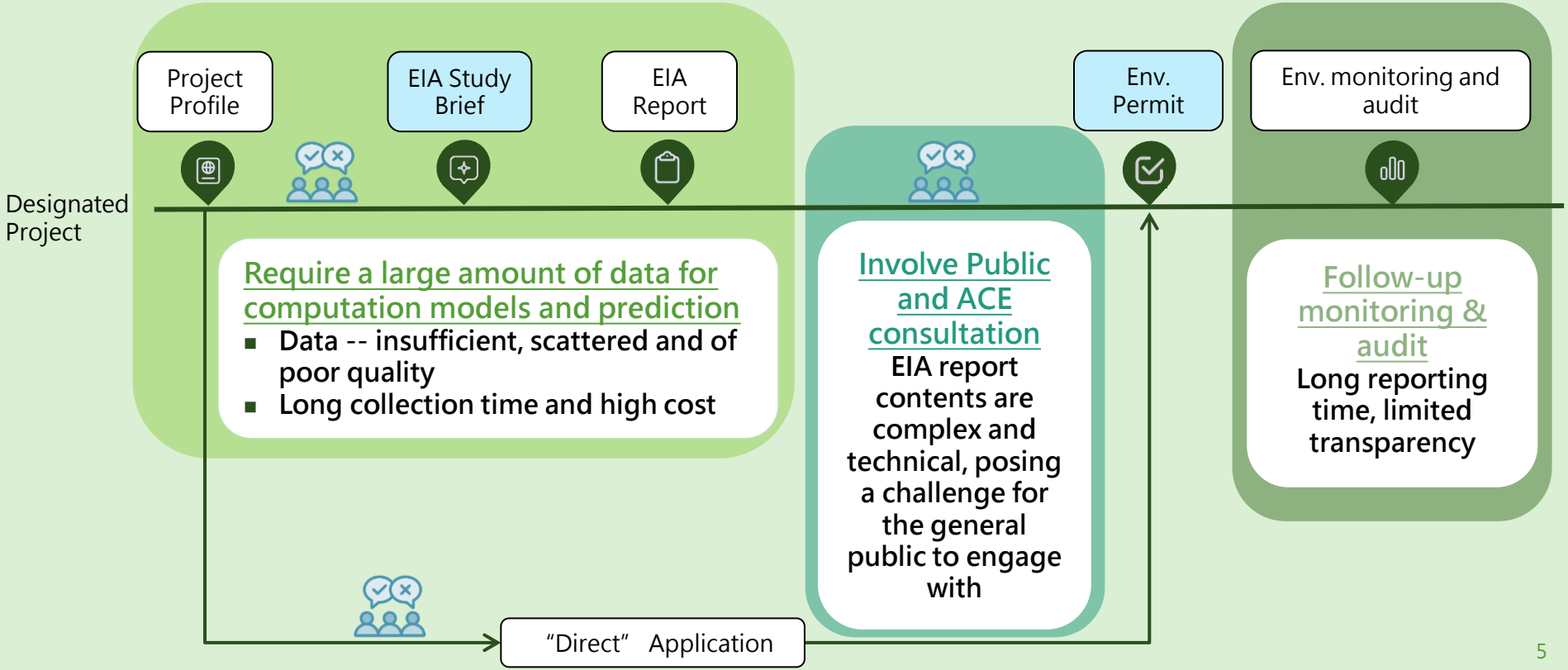
1. Background

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



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

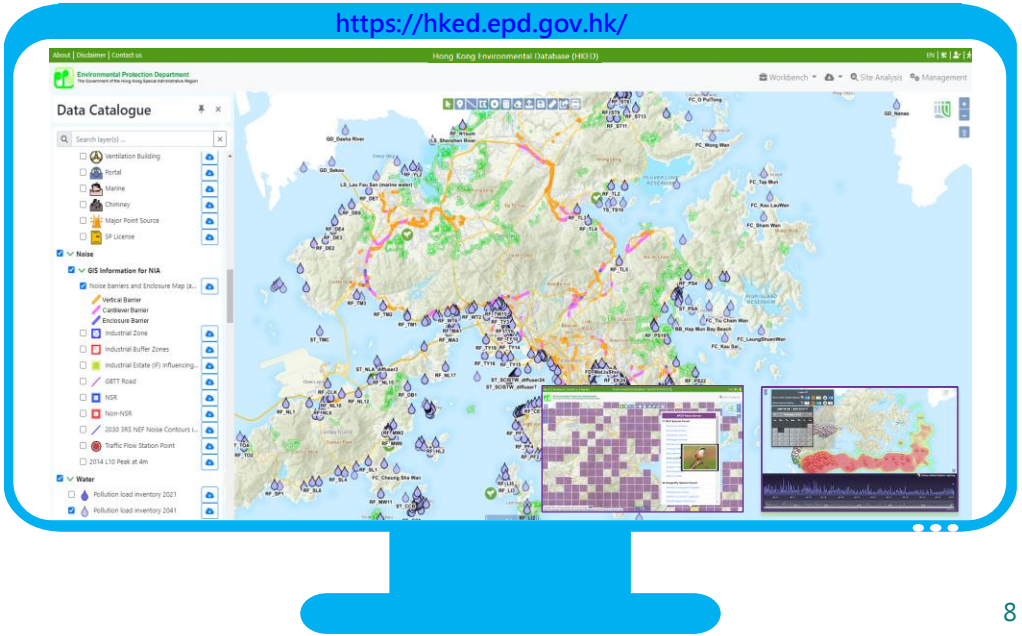
2. Hong Kong Environmental Database (HKED)

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
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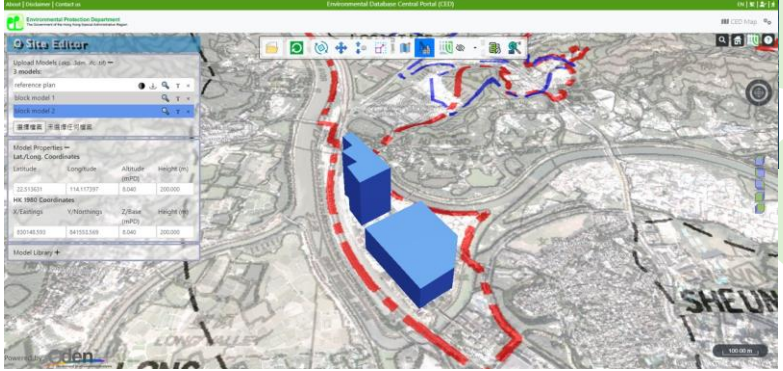
香港環境數據庫
Hong Kong Environmental Database



Benefits of HKED

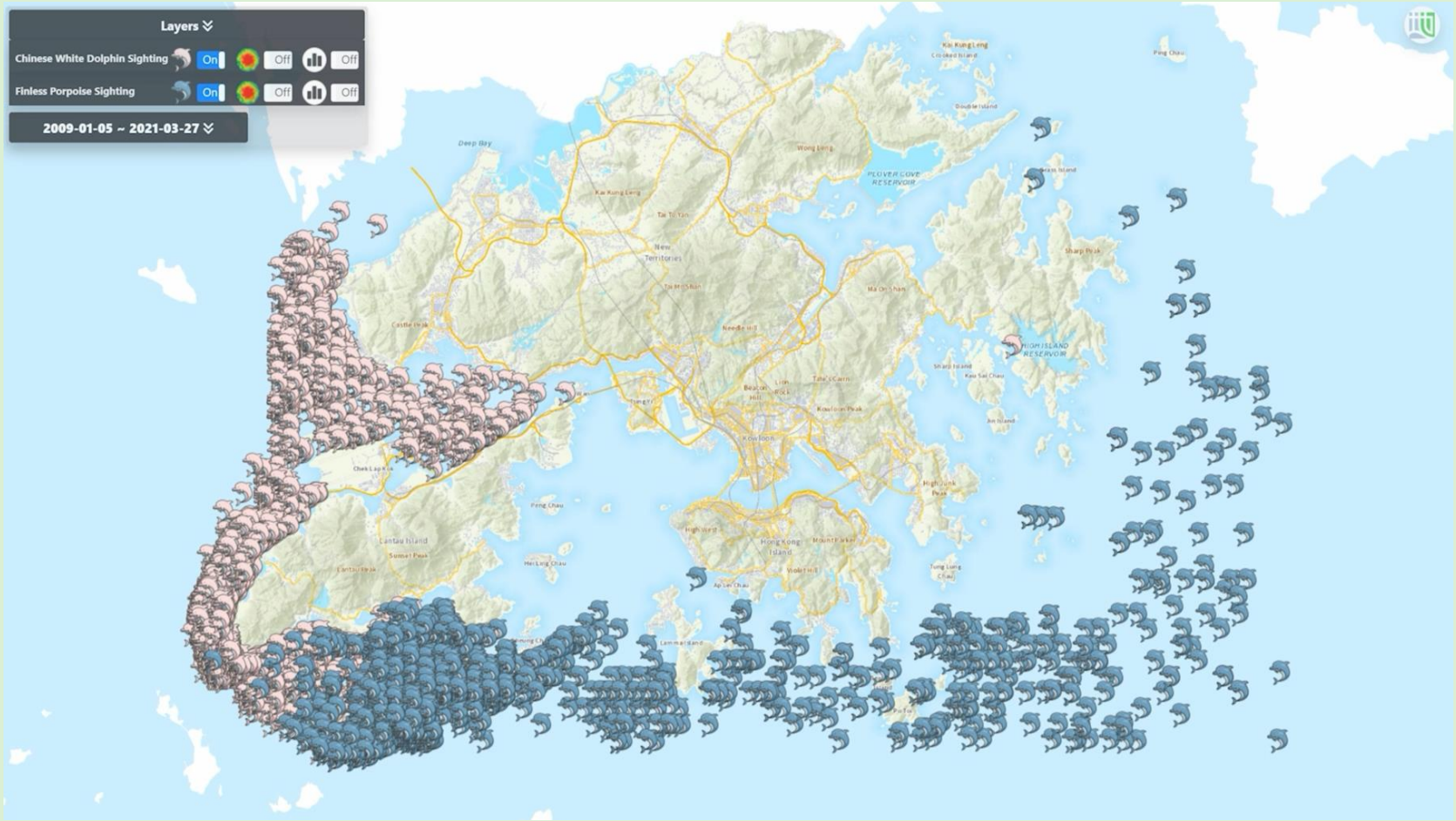
Early identification of environmental constraints

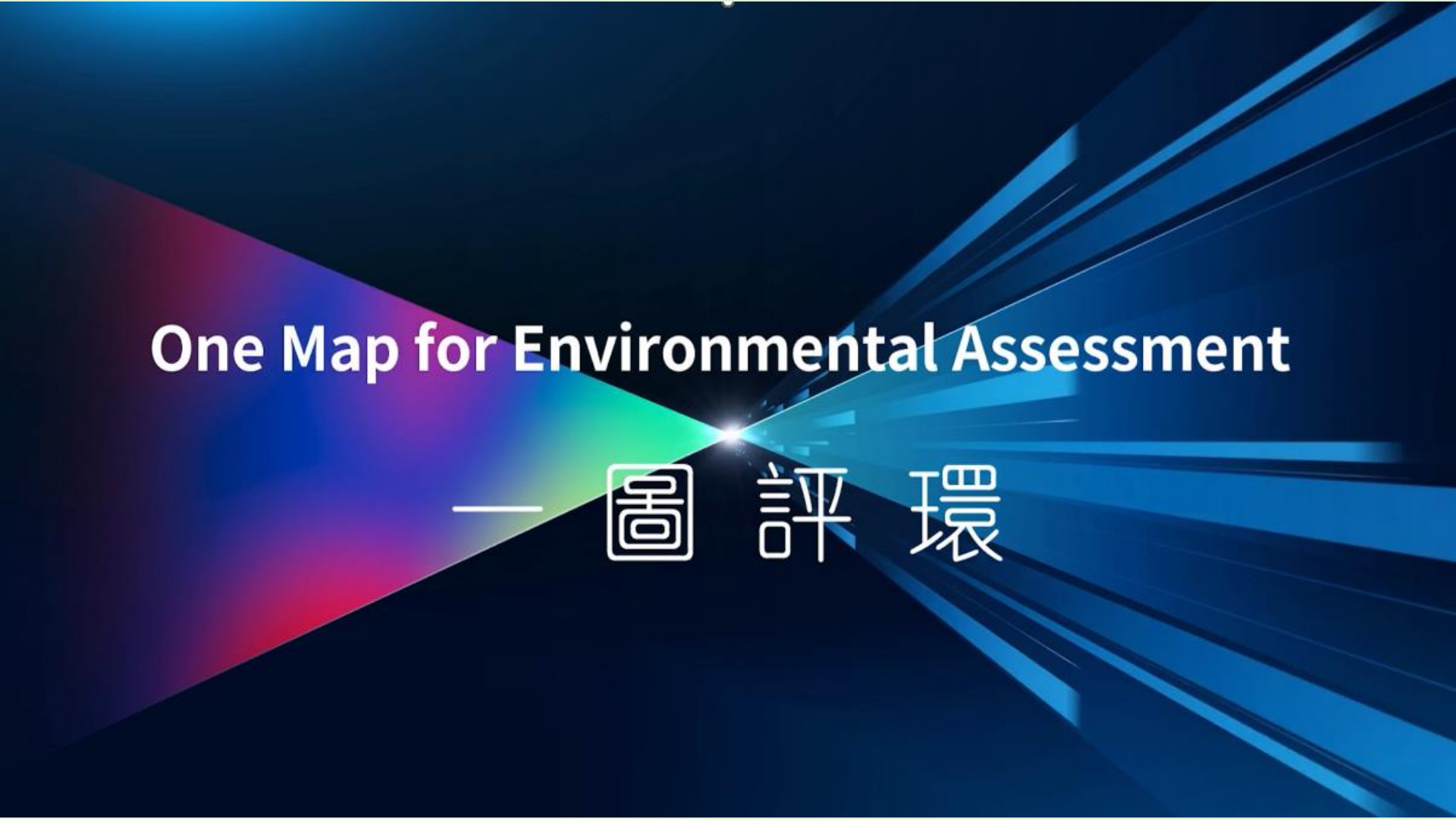
Quick comparison and optimisation of project design

3D visualisation of design

Online platforms/tools for modelling and assessments

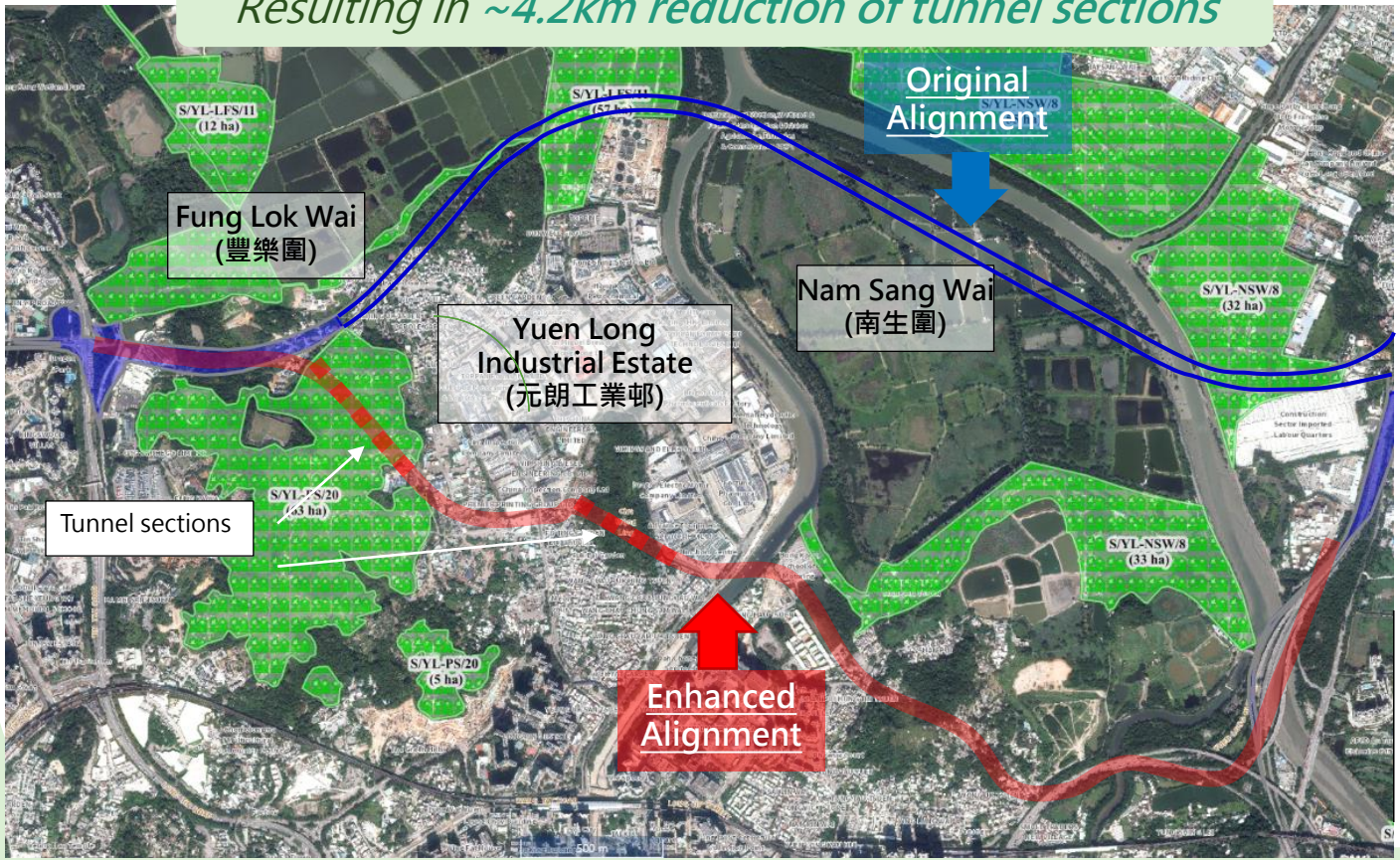
Identification of Environmental Constraints




One Map for Environmental Assessment
一圖評環

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

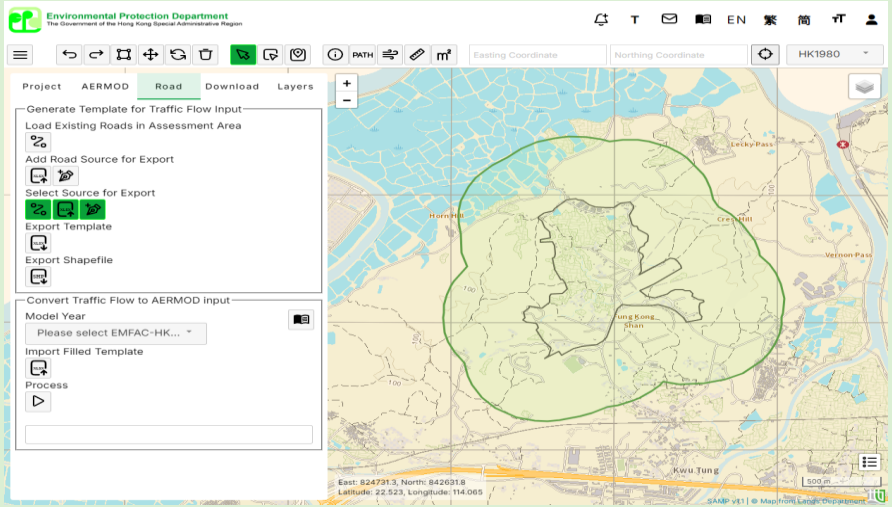
- Route through non-sensitive areas (i.e. existing Yuen Long Industrial Estate and Yuen Long Town Centre) instead of wetlands
- Tunnel section reduced from 5km to 0.8km

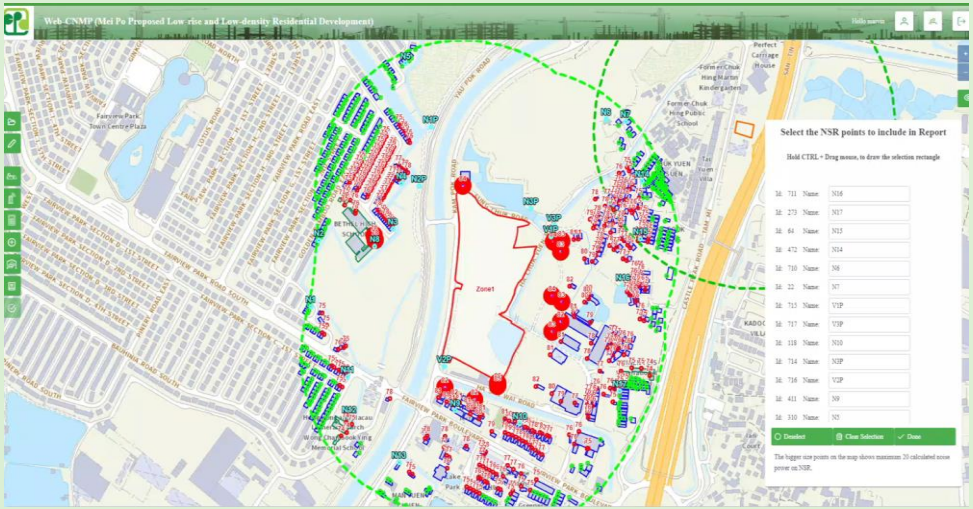
Legend

- 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

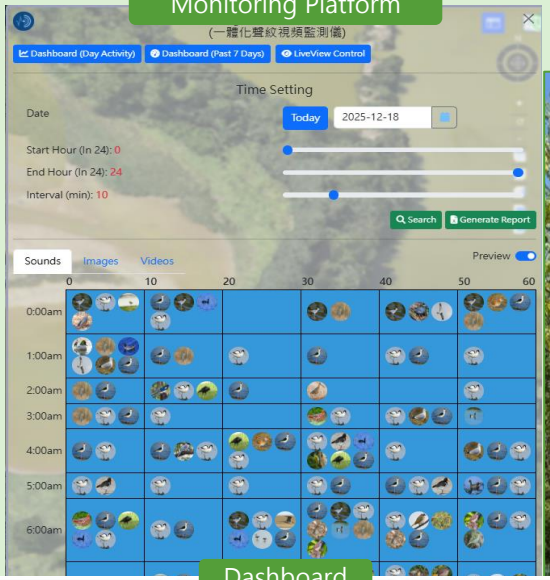
"Certificate for the Outstanding Environmental Innovation"

3. AI-Driven Bird Recognition System

AI-driven Bird Recognition System

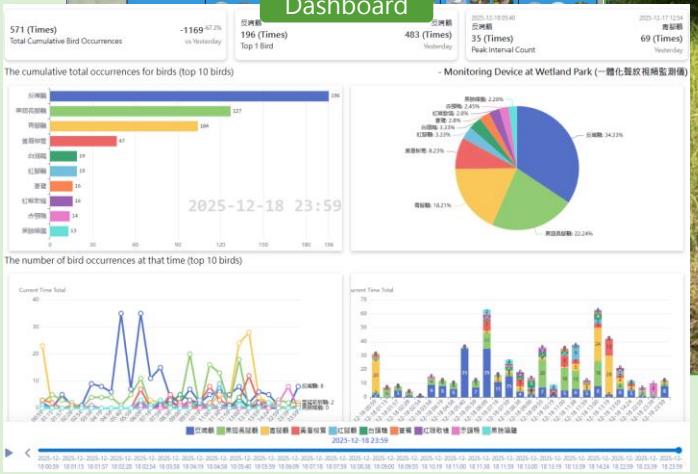
- Use AI to identify more than 500 Hong Kong bird species
- Fully automated monitoring
- Central dashboard that helps analysing monitoring data
- Pilot application at Hong Kong Wetland Park (HKWP)

Monitoring Platform



Integrated Monitoring Device

Dashboard



Benefits

- Round-the-clock, 24-hour continuous monitoring
- Unaffected by weather or lighting conditions
- Reduce the impact of human observation on wildlife
- Effective for monitoring nocturnal species and highly elusive species
- Study the behaviours of birds

Potential Application in EIA process

- Baseline survey
- Monitor effectiveness of ecological enhancement measures

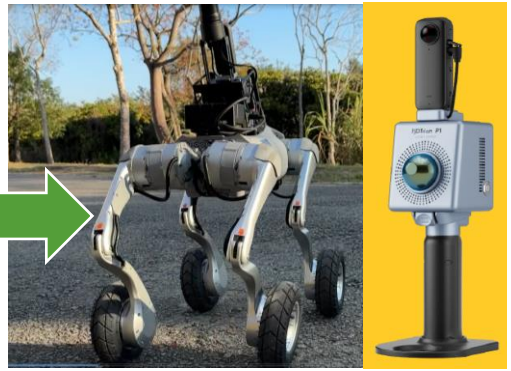
4. Smart Tree Survey with LiDAR

LiDAR for Tree Scanning

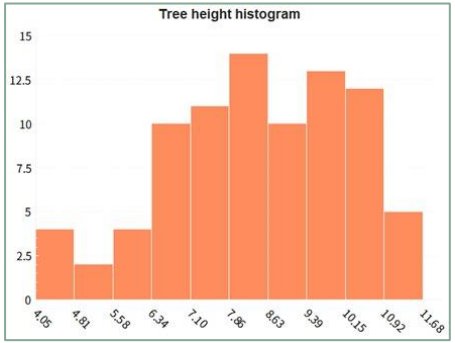
Manual measurements of tree data and mapping of tree locations

Traditional Tree Surveys

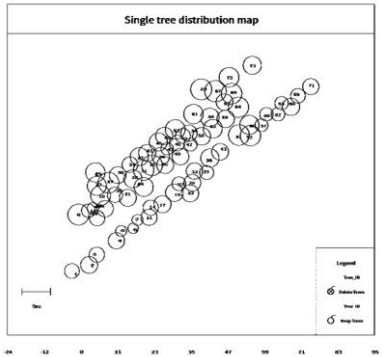
LiDAR 3D scanner (handheld or mounted on a robotic dog)



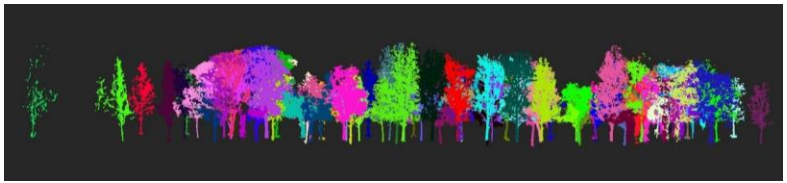
Tree Parameters Histograms



Tree Map



3D Visualisation



- 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

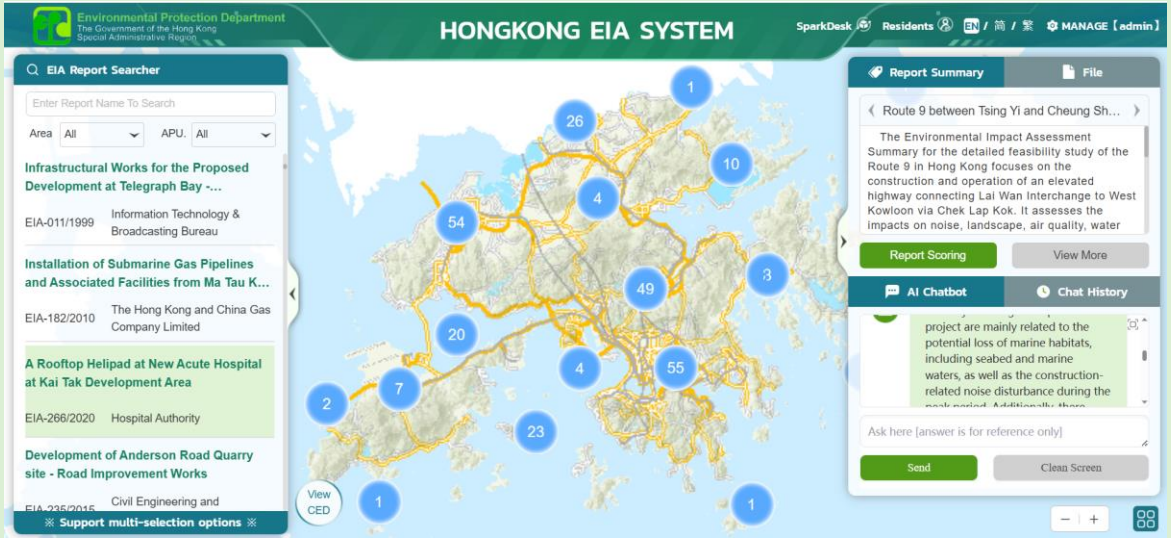
Integrated 200+ environmental and ecological datasets for EIA studies.

EIA Database

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

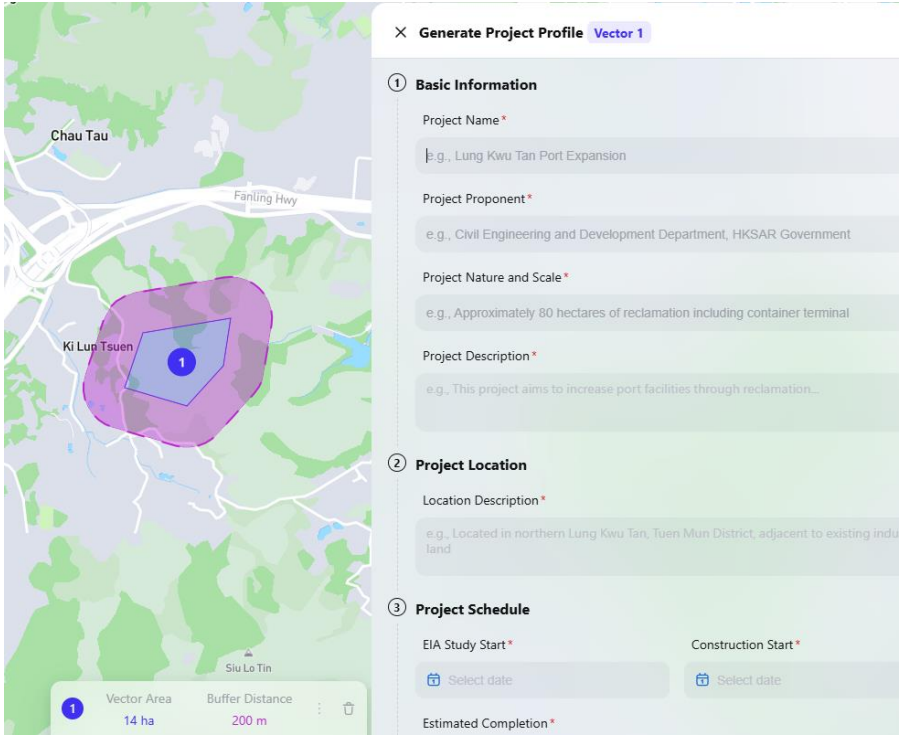
LLM Chatbot

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

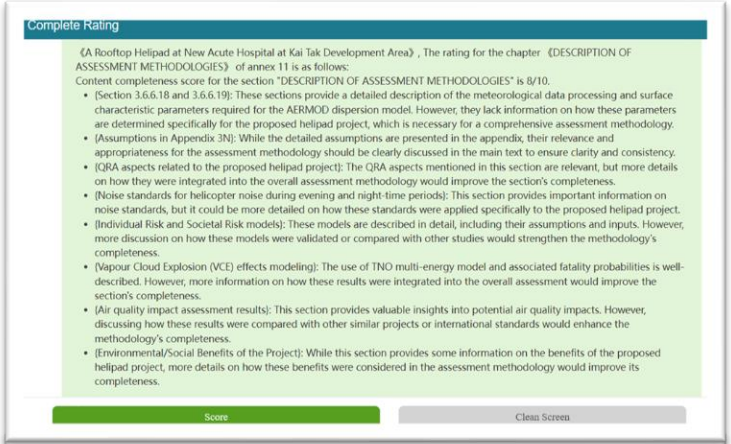


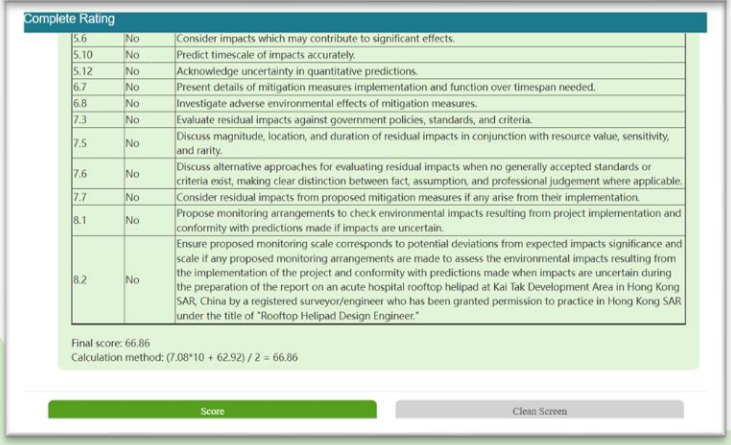
Early Project Evaluation Using AI

- 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



AI-Driven Compliance Checks





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.

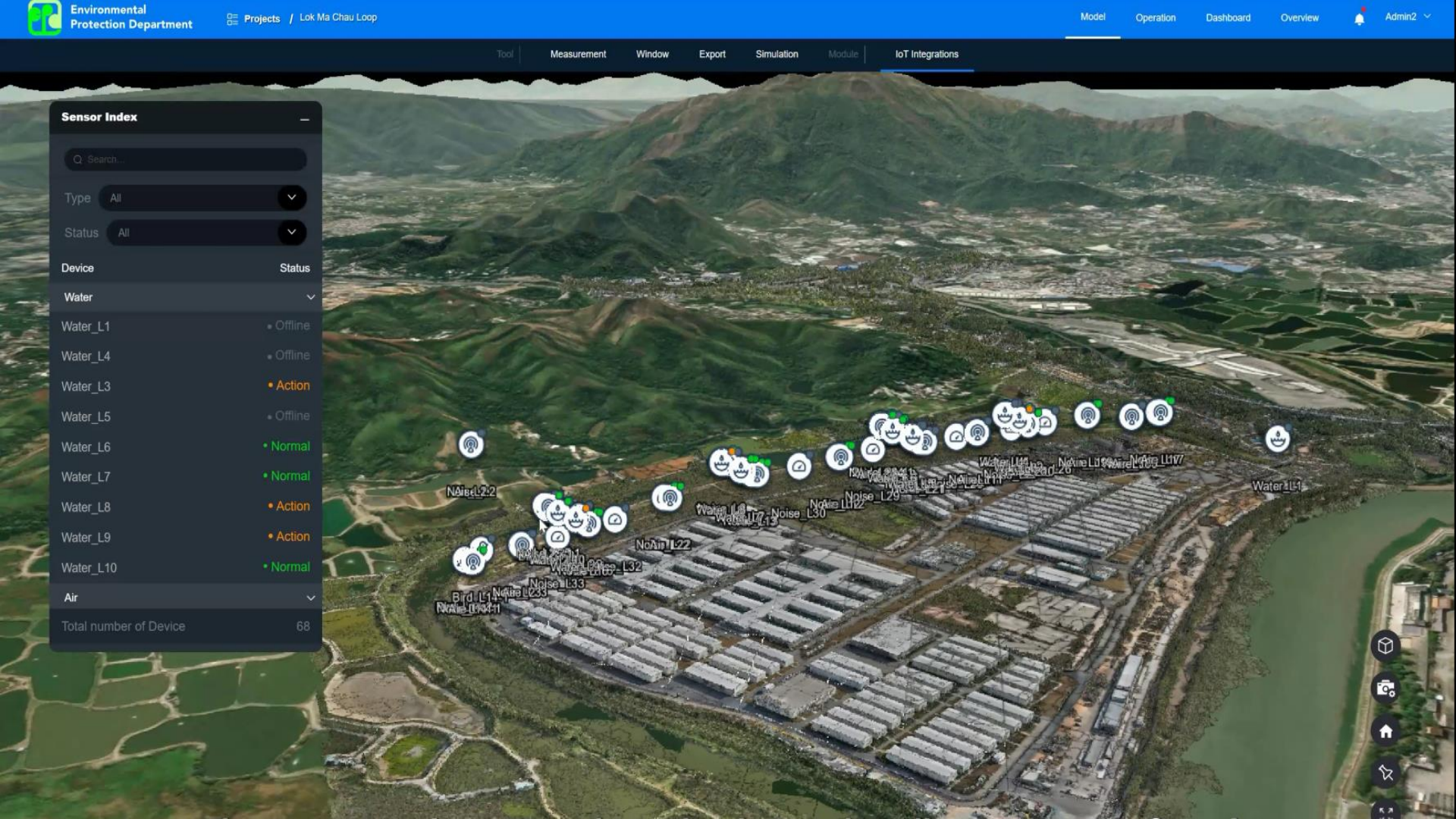
Proactive Insights

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

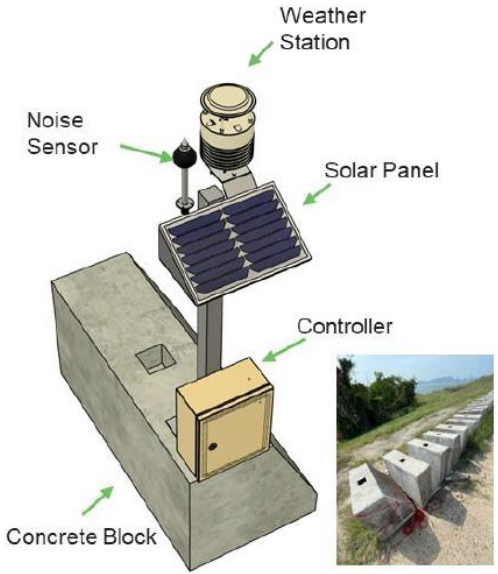
Increased Efficiency

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

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


Environmental Protection Department
Projects / Lok Ma Chau Loop
Model
Operation
Dashboard
Overview
Admin2
Tool
Measurement
Window
Export
Simulation
Module
IoT Integrations
Sensor Index
Search...
Type All
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

= Statutory Public and ACE Consultation

1. **HKED**
   - Visualisation of design

Project Profile | EIA Study Brief | EIA Report | Env. Permit | Env. monitoring and audit

Designated Project

1. **HKED**
   - Retrieve historical and baseline environmental data
   - Evaluate and compare different design options
2. **AI Chatbot**
   - Early identification of environmental issues

1. **HKED**
   - Retrieve historical and baseline environmental data
   - Optimise project design
2. **AI Bird Recognition System**
   - Conduct baseline ecological monitoring
3. **3D LiDAR**
   - Conduct tree survey

1. **AI Chatbot**
   - Compliance check of the EIA report
   - Analyse public comment

1. **Smart EM&A Platform**
   - Real-time monitoring with IoT sensors
   - Streamlined workflow for environmental exceedances
2. **AI Bird Recognition System**
   - Monitor the effectiveness of ecological enhancement measures
3. **3D LiDAR**
   - Monitor the effectiveness of compensatory woodland

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