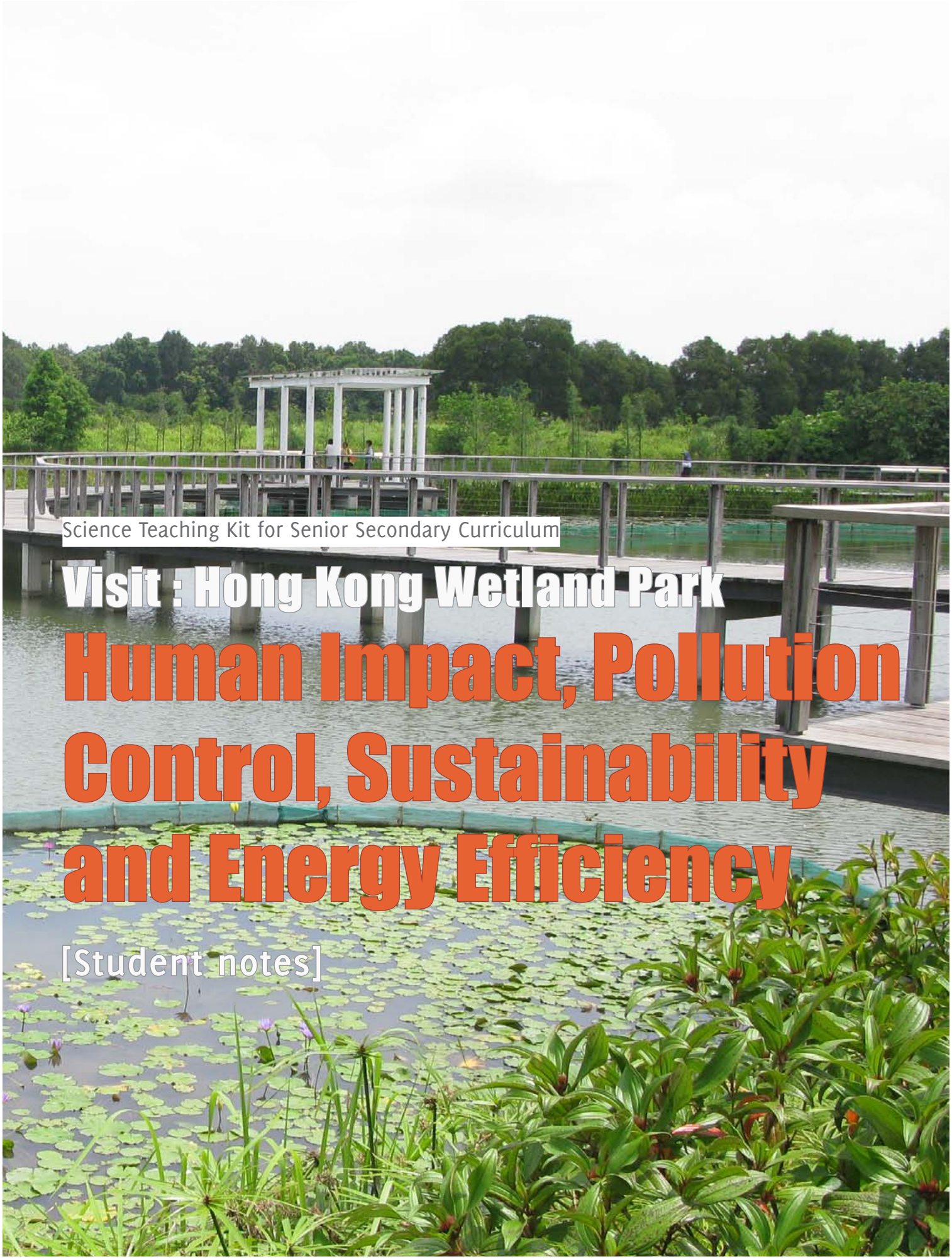

Science Teaching Kit for Senior Secondary Curriculum

Visit : Hong Kong Wetland Park

Human Impact, Pollution Control, Sustainability and Energy Efficiency

[Student notes]

Organizer

香港建築師學會
The Hong Kong Institute of Architects

Sponsor

CREATEHK

Research Team

THE UNIVERSITY OF HONG KONG 香港大學
faculty of architecture 建築學院
Community Project Workshop 社區項目工作坊

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Topic 09
Visit : Hong Kong Wetland Park

Major teaching areas

Biology: Chapter VI Applied Ecology

- Human Impact on the Environment
- Pollution Control
- Conservation
- Sustainable Development
- Values and Attitudes
- STSE Connections

Physics: Chapter VIII Energy and Use of Energy

- Electricity at Home
- Energy Efficiency in Buildings and Transportation
- Renewable and Non-Renewable Energy
- Values and Attitudes
- STSE Connections

Related teaching areas

Physics: Chapter I Heat and Gases

- Values and Attitudes
- STSE Connections

Integrated Science: Module C1 Water for Living

- Effects of Human Activities on the Balance of Water Distribution and Water Quality

Integrated Science: Module C6 Balance in Nature

- Disturbance and Restoration
- The Hunt for Balance

Integrated Science: Module E1 Energy, Weather and Air Quality

- Energy Use and Air Quality

Interdisciplinary teaching area

Design and Applied Technology:

- Strand 3 Value and Impact

Liberal Studies:

- Module 2 Hong Kong Today
- Module 6 Energy Technology and Environment

Learning objectives

- To understand the comprehensive planning and measures of a world-class conservation region in Hong Kong, under the scope of conserving natural habitats and energy efficiency in buildings
- To get hands-on experience and witness how an environmentally friendly building and landscape can perform via on-site exercises

Learning plan

Lesson	Contents	
Visit	• 1.1	Planned itinerary for the field trip
Hong Kong Wetland Park	• 1.2	Background information and environmental value of Hong Kong Wetland Park
	• 1.3	Master planning and landscaping work at HKWP
	• On-site exercise	Human impact and restoration of natural habitats
	• 1.4	Practical approaches to preserving ecology in HKWP
	• On-site exercise	Energy efficiency in buildings

1.1 Planned itinerary for the field trip through Hong Kong Wetland Park

Source: Hong Kong Wetland Park

Pre-Trip Introduction (20 min)

- Background information of Hong Kong Wetland Park
- Objectives and on-site exercises introduction
- Planned route
- Points to note (e.g. equipment needed, meeting point, rules in HKWP)

Field Trip (approximately 2 hours)

10 min	30 min	20 min	10 min	30 min
1	2	3	4	5
Ticket office	Visitor Centre	Satellite Building	Bird Hides	Outdoor Visitation Area

1.2 Background Information

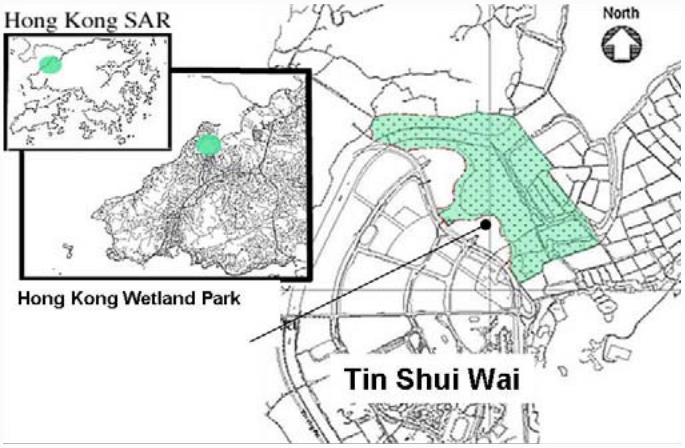
Background Information
Hong Kong Wetland Park (HKWP) is Hong Kong's first major ecotourism facility and the first of its kind in Asia. The constructed wetland was designated by the Government of the Hong Kong Special Administrative Region as one of the Millennium projects.

HKWP is built upon an Ecological Mitigation Area (EMA) that is intended to compensate for the wetlands lost to the Tin Shui Wai New Town development built in 1998. The 61-hectare HKWP comprises a 60-hectare wetland reserve with bird hides and various habitats, and a 10,000 square metre visitor centre offering exhibition galleries, resource centre, theatre, souvenir shop, and café.

At the time of the park's founding, the Government commissioned a feasibility study that concluded that it was feasible to develop a wetland park in this location without compromising the area's intended ecological mitigation functions.

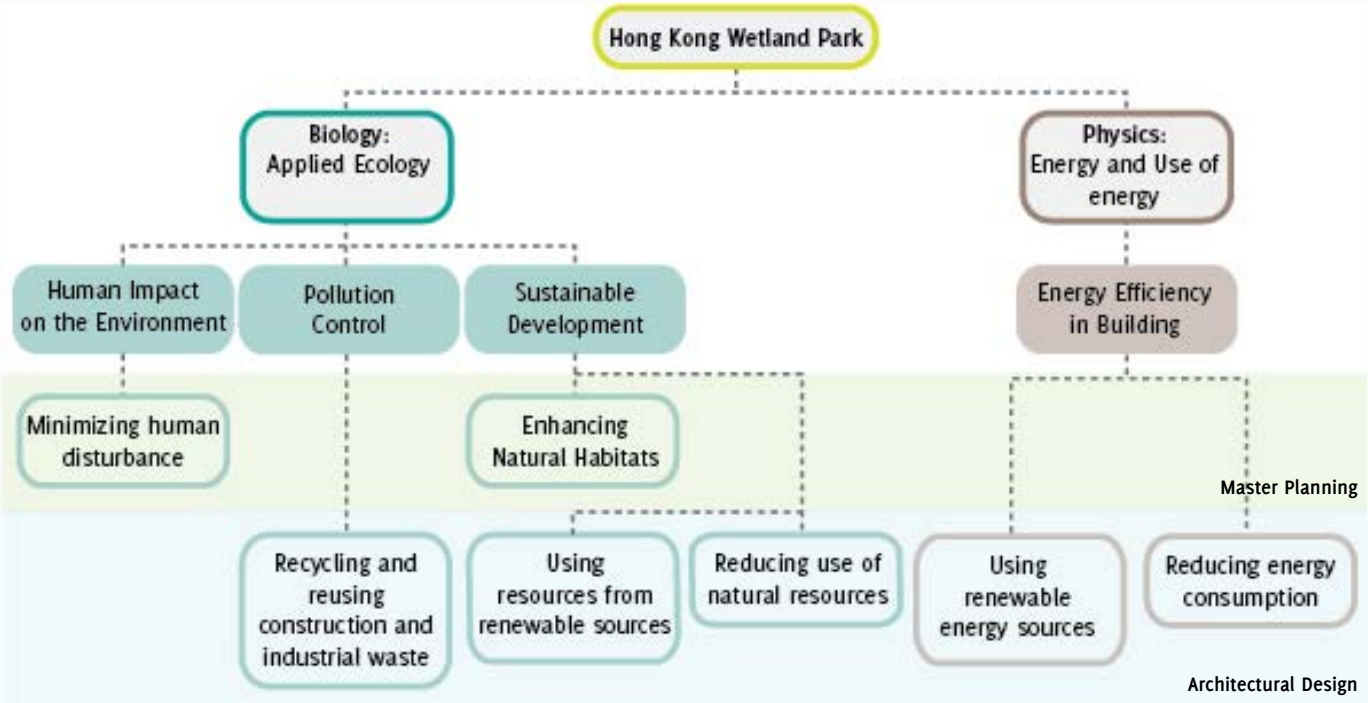
Architectural Merit
HKWP is an outstanding example of architecture in harmony with its landscape. The project has been recognized as a success, winning a number of awards including the Green Building Awards 2006, and the Hong Kong Institute of Architects' Medal of the Year in 2005.

The master planning, landscaping and building design in HKWP set high standard for ecological building in all the following areas:



© Hong Kong Wetland Park

▲ Hong Kong Wetland Park is adjacent to Tin Shui Wai New Town development



1.3 Human Impact and Restoration of Natural Habitats

▲ Floating pedestrian boardwalks

1.3.1 Master Planning and Landscaping Work

Human impact on the environment

1. Minimizing human disturbance

Sustainable development

1. Enhancing natural habitats
2. Using resources from renewable sources
3. Reducing use of natural resources

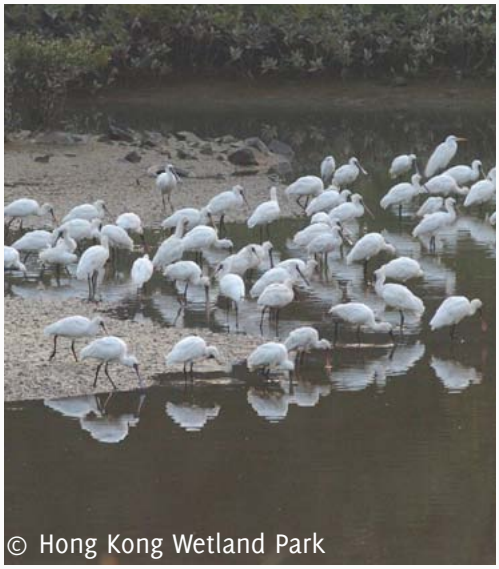
Pollution Control

1. Recycling and reusing construction and industrial waste

© Hong Kong Wetland Park

[On-site Exercise: Human Impact and Restoration of Natural Habitat]

Biology students should work individually to find out how HKWP contributes to the conservation and sustainable development of Mai Po Wetland. The following principles should be considered.

Applied Approaches in conserving the ecology of Mai Po Wetland		
Human Impact on the environment		What the environmental approach can you see: Pedestrian boardwalks Where can you find it: How can it help conserving the ecology:
Pollution Control		What environmental approach can you see: Oyster shell infill wall Where can you find it: How can it help conserving the ecology:
Sustainable Development	 © Hong Kong Wetland Park	What environmental approach can you see: Intertidal mudflat Where can you find it: How can it help conserving the ecology:

1.4 Energy Efficiency in Buildings

There are two major ways to increase energy efficiency in a building:
- Use renewable energy
- Reduce energy consumption

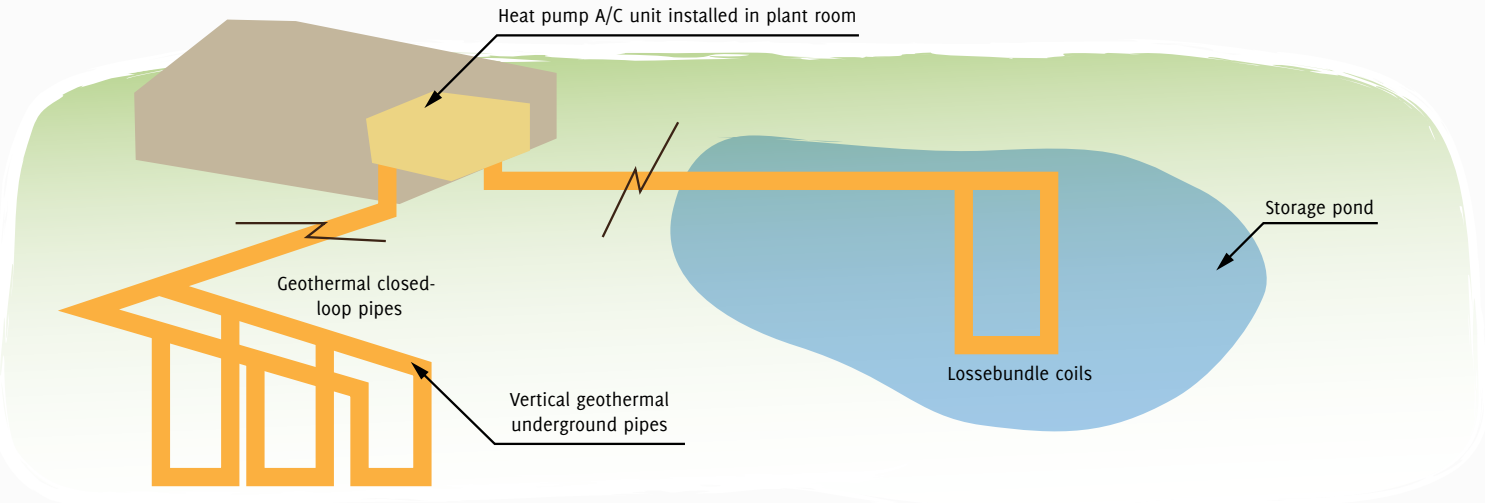
An energy-efficient building can
- Lower greenhouse gas emissions
- Minimize waste heat generated to the surroundings
- Reduce operation and maintenance costs in the long term

[Discussion]
What are the environmental problems caused from typical air-conditioning system?

Special Feature in Hong Kong Wetland Park
Geothermal Heat Pump Air-conditioning (GHP A/C) System
Visitor Centre makes use of a GHP A/C System. In this system, the ground serves as a large heat sink and there is no direct rejection of waste heat into the atmosphere. In summertime, the condensing water from the A/C units is used for temperature and humidity control. Surplus heat energy, if any, is rejected to the ground via buried water pipes. In wintertime, heat is extracted from the ground to provide heating for the building.
(Source: Architectural Services Department)

▼ Geothermal Heat Pump Air-conditioning System

Conceptual schematic diagram of Geothermal Heat Pump A/C System for The Hong Kong Wetland Park



[On-site Exercise: Energy Efficiency in Buildings]

Physics students are divided into four groups. Each group examines the building performance of one of the following buildings:

- Ticket Office
- Visitor Centre
- Satellite Building
- Bird hides

Name of HKWP buildings that adopt energy efficiency approaches: _____		
Building Assessment	Outdoor temperature: _____ Indoor temperate: _____ Outdoor and indoor temperature difference: _____ Lighting: Too bright / Sufficient / Too dark Indoor Comfort: Too hot / Comfortable / Too cold	
Energy Saving Features		What are the architectural features: _____ _____ _____ _____ _____ _____ How can they help in energy efficiency: _____ _____ _____ _____ _____ _____ _____

[Discussion]

1 What is the positive influence of the wetland reserve on the natural surroundings?

2 Which do you think is the most creative sustainable construction in HKWP?

3 What are the economic and environmental considerations of green technologies? Which do you think is more important?

Summary

Hong Kong Wetland Park sets a role model for conservation of our natural ecology through environmentally friendly design. It showcases:

- how human impacts on the environment can be minimized,
- how natural habitats can be restored,
- how to reduce pollution, and
- how to minimize the use of energy,

via thoughtful master planning and architectural design.

Key words

Sustainable development
Energy efficiency
Renewable materials
Renewable energy
Geothermal energy
Photovoltaic

Further reading

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