



Global Forest Observatory: Public Involvement and Training in Scientific Research in Hong Kong

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Summary of the Impact

The Project forms the FIRST and ONLY Hong Kong inputs to a global forest research network where a wide range of community stakeholders and citizens were trained on climate change, forest dynamics and sustainability topics. These trained **citizen scientists** in turn have provided assistance to the scientific research work.

1. A 20-hectare secondary forest observatory plot was set up in Tai Po Kau Nature Reserve. **Every tree in the plot was surveyed (over 80,000 trees)**. Recorded data were input to the global network database consists of 63 plots in 24 countries contributing to the global and regional study of long-term forest dynamics. The HKU team has set up the plot in Hong Kong and conducted the first survey contributing to the monitoring of over 6 million trees and 10,000 species in the global network.
2. The establishment of the forest plot has made the plot **a field laboratory for future forest related researches**, e.g. forests' responses to global climate change. The first data set has also provided baseline information for these researches.
3. A 1-hectare demonstration plot was set up in Shek Kong (on Kadoorie Farm and Botanic Garden site with access via HKU Shek Kong Centre). This plot serves as **a training ground** for citizen volunteers, corporate members, NGO leaders, journalists, school teachers as well as students at all levels to learn about climate change, forest biodiversity and sustainability issues. Over **2,000 individuals were directly trained and engaged** on site and off site between 2011-2015. In return, some of the trained participants served as volunteer researchers to help survey the 20-hectare plot. Training packages that the project team prepared were endorsed by the HKSARG Education Bureau and many teachers are now using the materials for on-going teaching in Biology, Liberal Studies and Geography.

Underpinning Research – an outline

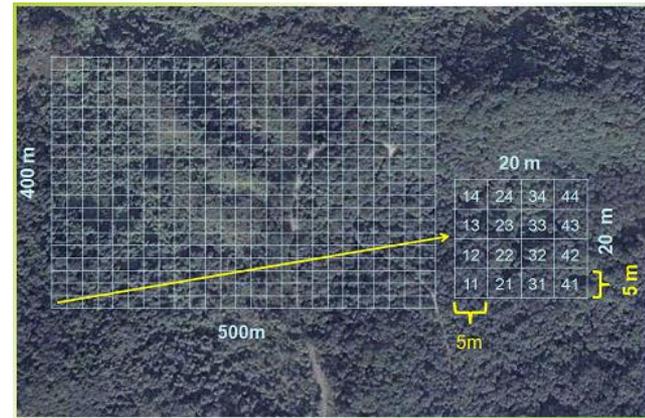
- The project was launched in June 2011 and completed in December 2015. However, the PI is still using the 20ha plot for collaborative research with scientists around the world.
- The research is part of the **Forest GEO network** coordinated by the the Center for Tropical Forest Science (CTFS) of the Smithsonian Tropical Research Institute. The network includes 63 forest plots in 24 countries covering all forest biomes on Earth. Data were collected using a standard methodology across all plots. Data are then consolidated and shared for scientists and scholars **to understand the diversity and long-term dynamics of forests**, in particular on the **key ecosystem processes that are being affected by global climate change processes**.
- The 20-hectare Hong Kong plot is the 42th plot joining the network and it is the **ONLY secondary forest plot** enabling scientists to study forest dynamics from the other end of the forest spectrum, i.e. the forest succession process from degraded forest land to secondary forest.



Survey Methodology

For both the 20-hectare and the 1-hectare plots, the core methods for long-term permanent CTFs-style plots have been used. The plots were demarcated by professional land surveyors with subdivisions of 5 m x 5 m sub-quadrats.

After the completion of demarcation, tree survey were carried out by researchers and volunteers. The tasks of tree survey are listed below:



Set up the quadrat



The diameter at breast height (DBH; taken at 1.3m from the ground) of all regular tree or shrub stems of 1 cm or above were measured. Only plants that have DBH exceed or equal to 10mm at their point of measurement (POM) were measured.



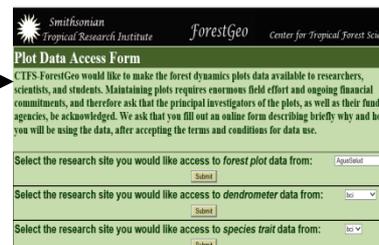
The POM would be marked with Green paint. The paint has been proofed to be non-toxic to the environment. Each measured plant was tagged with a metal tag with its own tag nos.



Measure the DBH



In addition to DBH, researchers would observe and record the tree species, tree conditions and the coordinates within the sub-quadrats



All data and information would then be input to the global network database for record and sharing and the project team would analyze the data



Specimen were made for all identified plant species and kept permanently at KFBG/ HK Herbarium

Key Research Findings

- The survey was completed in 2015 with the below facts:

	Tai Po Kau Plot	Shek Kong Plot
Plot size	20 hectares	1 hectares
No. of marker poles used	2,091	441
No. of 5mx5m sub-quadrats	8,000	400
No. of tree/shrub individuals	81,021	10,442
No. of stems	117,203	21,082
No. of tree/shrub species	173	66

- Discovery of a new plant**

an unknown *Euonymus* sp. was found on the 20ha plot which is probably a new species to Hong Kong. The discovery has been reported to the Hong Kong Herbarium for further investigation.



- Secondary forest dynamic and succession processes**

Machilus chekiangensis, *Diospyros morrisiana* and *Engelhardtia roxburghiana* are the dominant tree species in the Tai Po Kau 20ha plot. As a more mature forest at the 20 ha plot, the shrub species, *Psychotria asiatica* has replaced the niche of *Litsea rotundifolia* in younger forest like the 1 ha plot because it is more shade-tolerant in the forest understory.

Engagement Partners - A cross-sectoral collaboration

Policy for Sustainability Lab,
Faculty of Social Sciences

Project co-ordination &
management, training



School of Biological Sciences,
Faculty of Science

Research and training



Smithsonian Tropical Research Institute
Forest Global Earth Observatory - ForestGEO

Center for Tropical Forest Science

Research network and
methodological framework

Global Forest
Observatory



Hongkong Bank Foundation
Financial support for the first
4 years (HK\$5.9M)



The Kadoorie Farm and Botanic Garden

Provides the permanent demonstration and training site in
Shek Kong; provides data analysis supports to the research;
and manages and funds for the Project's on-going resurveys
(every 5 years)

Society for Community Organization(SoCO)

Co-organiser for the residential training camps for the
disadvantaged students and families



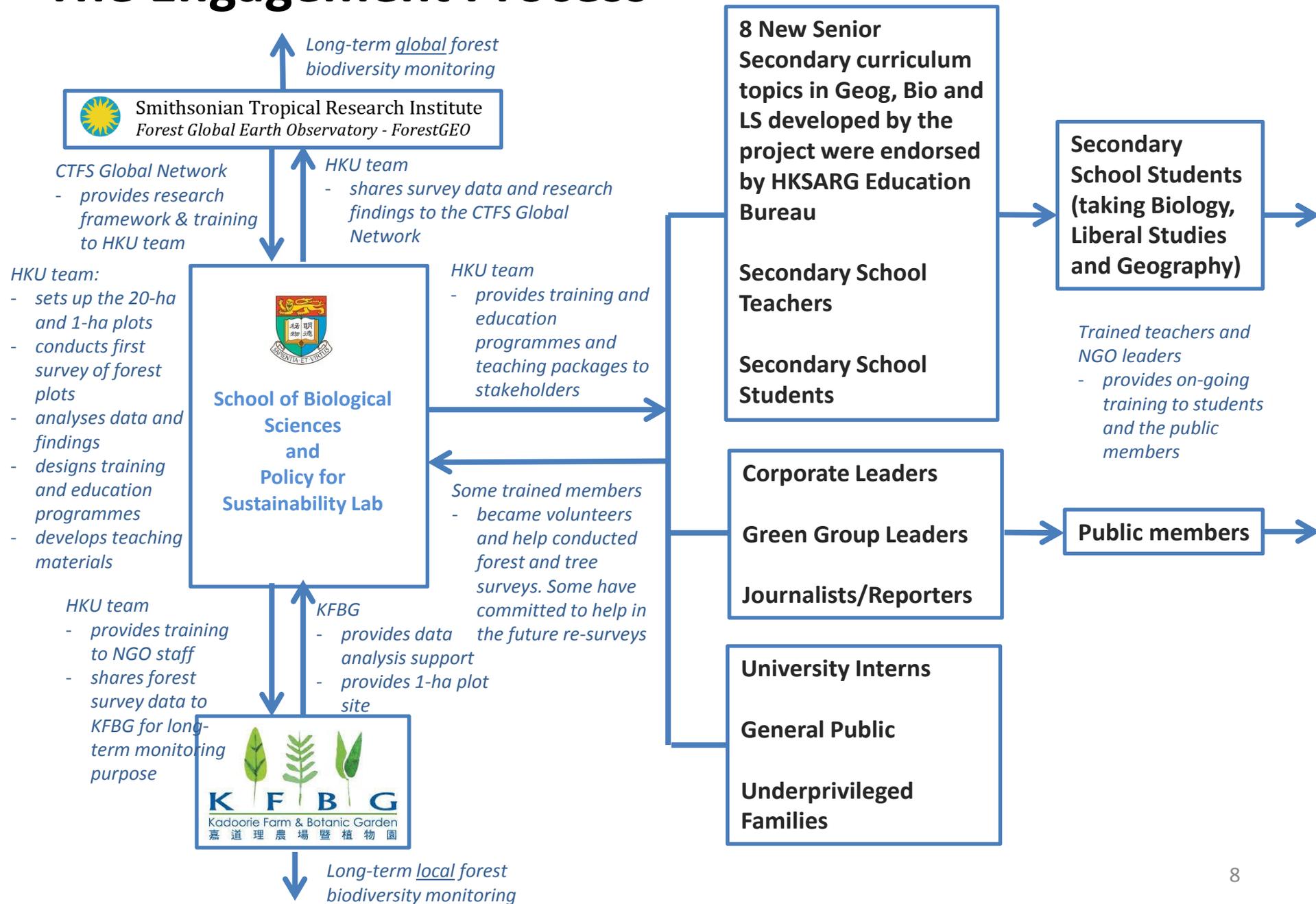
Hong Kong



香港特別行政區政府
THE GOVERNMENT OF THE HONG KONG
SPECIAL ADMINISTRATIVE REGION

**Agriculture, Fisheries and Conservation
Department** – Provides the permanent
research site at Tai Po Kau Nature Reserve
Education Bureau – Endorses training
programmes and promotes to schools and
teachers

The Engagement Process



Engagement – innovative approach

THREE principles were adopted for the engagement approach to ensure long-term and self-sustained impacts and benefits:

Train-the-trainers

Tailor-made and advanced training programmes and materials were developed for the below trainers:

- Secondary school teachers (in Biology, Geography and Liberal Studies)
- Green groups leaders/representatives

These trainers are expected to pass the knowledge and skill to their students and public members.

Influence the change-agents

Basic concepts of *biodiversity*, *climate change* and *sustainable development* were included in the training provided to the below stakeholders:

- Journalists and reporters
- Senior corporate staff
- Relevant government officials
- University interns

These stakeholders are often in a position where they may spread the correct knowledge and messages to a wider community.

Equip stakeholders/ public as citizen scientists

Involving the public in the scientific forest and climate change research is an effective way to nurture their environmental stewardship. The experiential learning programme includes lectures, field-based training and volunteering. The programme was provided to public aged 12 to 60. The work allowed them to appreciate the work of the researchers as well as to take real action in the pursuit of conservation and sustainable development.

Impacts Achieved – beneficiaries



Secondary school teachers



Secondary school students



Tertiary students



Corporate staff



Green group leaders and government officials



Journalists and reporters



General public



Students from underprivileged families



University interns

Impacts Achieved – primary impact

Over 2,000 people, including tertiary students, Secondary School teachers and their students, corporates, green group leaders, journalists, local and international researchers and the general public have been trained and benefitted.

1. Advanced trainer's knowledge and teaching techniques on forest sciences with latest global research trends and findings.

When	How and What	Beneficiaries
2012-15	<ul style="list-style-type: none"> • Geography Field Study Programme on “Forest, Climate Change and Cities” at HKU Shek Kong Centre and Tai Po Kau Nature Reserve • To aid the learning and teaching of NSS curriculum modules: (i) Disappearing Green Canopy; (ii) Global Warming; and (iii) Building a Sustainable City • The Programme offers 3 pedagogical strategies: (i) experiential learning and life-wide learning; (ii) data recording and handling; and (ii) data and information presentation. <i>(Annex 15a: Training Programmes for Geography Teachers)</i> 	122 Geography teachers from 106 secondary schools joined the training for Geography teachers. In addition, 11 practical sessions have been conducted by 17 teachers from 11 secondary schools, which involved 225 students
2013-15	<ul style="list-style-type: none"> • Liberal Studies seminar, field trips and role-plays on “Sustainable Development Issues” • To aid the learning and teaching of NSS curriculum modules: (i) Hong Kong Today; (ii) Modern China; and (iii) Energy Technology and the Environment • The Programme offers 2 pedagogical strategies: (i) issue-enquiry and multiple perspectives; and (ii) experiential learning outside classroom and life-wide learning. <i>(Annex 15b: Training Programmes for Liberal Studies Teachers)</i> 	435 Liberal Studies teachers joined the training seminars and 179 teachers joined the field study trips
2014-15	<ul style="list-style-type: none"> • Biology Field Study Programme on “Forest, Lichen and Air Pollution” at Sheung Tsuen Park, HKU Shek Kong Centre and Tai Po Kau Nature Reserve • To aid the learning and teaching of NSS curriculum topics: (i) Human Impact on the Environment; and (ii) Conservation • The Programme offers 4 pedagogical strategies: (i) contextual approach; (ii) practical work and scientific investigation; (iii) life-wide learning; and (iv) group discussion <i>(Annex 15c: Training Programmes for Biology Teachers)</i> 	114 Biology teachers from 92 secondary schools joined the trainings. 3 practical sessions have been conducted by 3 teachers from 3 secondary schools, which involved 61 students

Impacts Achieved – primary impact

2. Increased change-agent's and public's knowledge and sense of responsibility for forests and its biodiversity.

When	How and What	Beneficiaries
2011	1-Day Training Programme on Forest Science and Sustainable Development in the Context of Urbanisation . Lectures, roundtable discussion, skill workshop and day and night field trainings were organised. <i>(Annex 15d: Training Programmes for Journalists)</i>	7 journalists joined the 1-day Environmental Training Workshop
2011	1-Day Training Programme on Forest Science and Forest Dynamic Plot Research . Lectures and field demonstrations were organised. <i>(Annex 15e: Training Programmes for Green Group Leaders and Government Officials)</i>	71 green group leaders and government officials (incl. AFCD, KFBG, WWF-Hong Kong and Hong Kong Bird Watching Society) joined the professional training on forest monitoring
2012	1-Day Training Programme on Forests, Climate Change and Sustainable Development. Lectures, skill workshop (plants identification), field demonstration and practical were organised. <i>(Annex 15f: Training Programmes for Corporate Staff)</i>	41 corporate staff have joined 2 trainings
2012-14	2 briefings and 3 training sessions were organised for the university interns. Training programme includes lectures, skill workshops (plants and birds identification), tree survey practicals and field trips. <i>(Annex 15g: Training Programmes for University Interns)</i>	217 interns from 8 tertiary institutes were recruited for the internship programme
2013-14	3 Study Tour cum Volunteer Camps were carried out. Camp activities include lectures, 5 field trips, discussions and sharing. <i>(Annex 15h: Training Programmes for Underprivileged Families)</i>	66 students from underprivileged families in Shum Shui Po, Tin Shui Wai and Tung Chung were benefitted from 3 experiential learning camps
2013-14	5 school outreach seminars were conducted. Seminar topics include Biodiversity and Sustainable Development <i>(Annex 15i: Training Programmes for Primary/Secondary Students)</i>	430 primary and secondary students participated in 5 thematic seminars

Impacts Achieved – primary impact

3. Overcome the knowledge-action gap and induced environmental action among stakeholders and the public and allow them to become citizen scientists.

When	How and What	Beneficiaries
2012-14	<p>1 in-class and 3 on-the-field trainings were provided to the volunteers. After the training and their performance upon the project team's satisfaction, volunteers were required to help conduct tree survey. Research tasks include measure, mark and tag trees; record and manage data; and prepare plant specimen</p> <p><i>(Annex 15j: Training Programme for Volunteers)</i></p>	<p>360 citizen scientists carried out over 400 volunteer days. These citizen scientists include university students, green group leaders and members, corporate staff and the general public.</p>



Corporate volunteers



University student volunteers



In-class training for volunteers

Impacts Achieved – secondary impact

4. Mainstreaming the understanding of sustainable development and biodiversity through the project's publicity. Overcome the knowledge-action gap and induced environmental action among stakeholders and the public and allow them to become citizen scientists.

When	How and What	Beneficiaries
2011	7 newspaper reports	Public at large
2011	1 magazine story (paper)	Public at large, HKU alumni
2013-now	Educational flyer at Tai Po Kau Nature Research	Hikers and users of Tai Po Kau Nature Reserve
2011-now	Project websites (@HKU, @CTFS, @HSBC, @HKSARG Education Bureau)	111,000 viewers – public at large



Educational flyer displayed at TPK



Hong Kong Economic Times (15/08/2011)



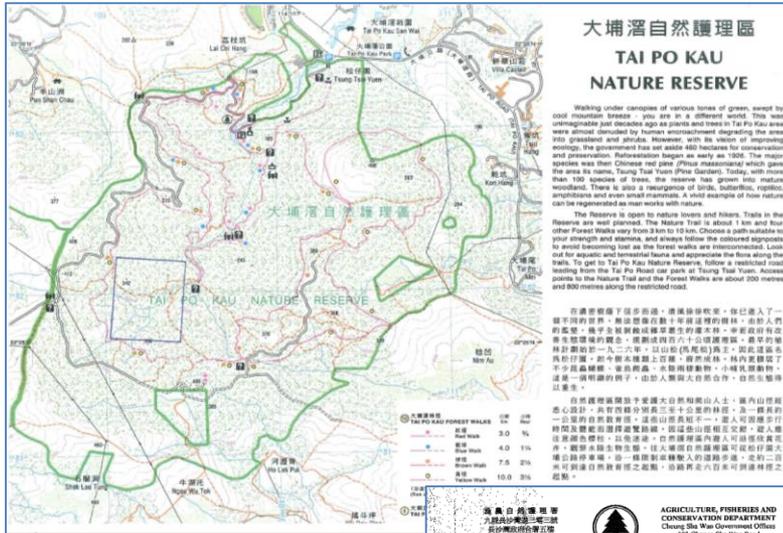
HKU The Review 2011



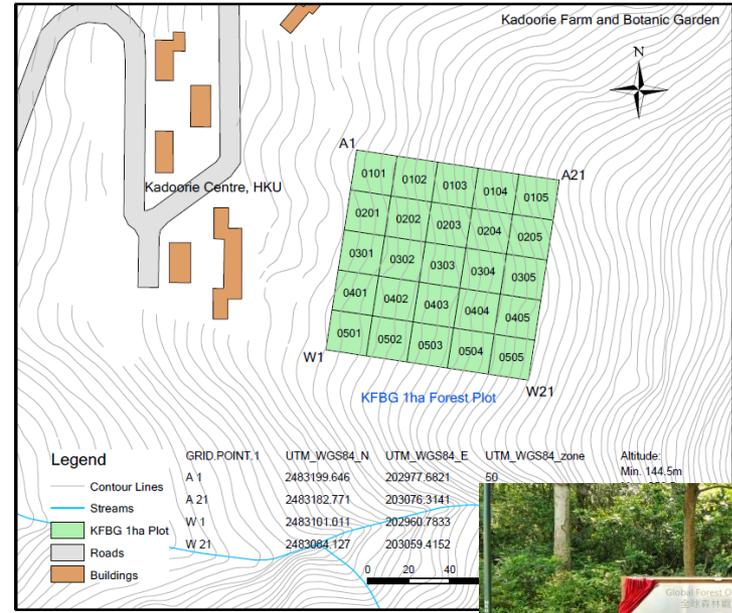
Project website

Impacts Achieved – impact beyond project period

5. Established 2 permanent sites as education and training field-sites as well as long-term forest biodiversity monitoring.



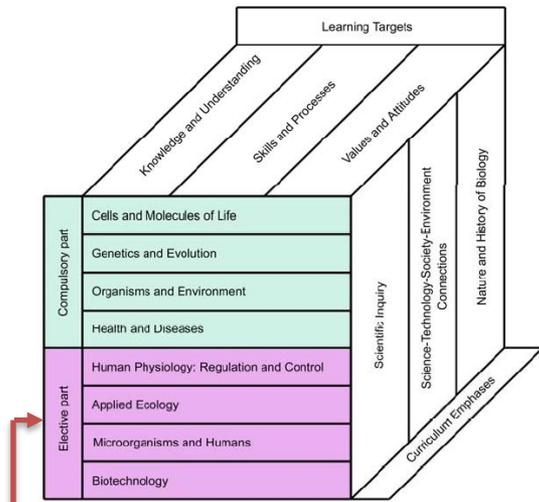
The location of the permanent 20-hectare forest observatory plot at Tai Po Kau Nature Reserve confirmed with the Agriculture, Fisheries and Conservation Department, HKSARG



The location of the permanent 1-hectare demonstration plot at Shek Kong (on KFBG land and access via HKU Kadoorie Centre)

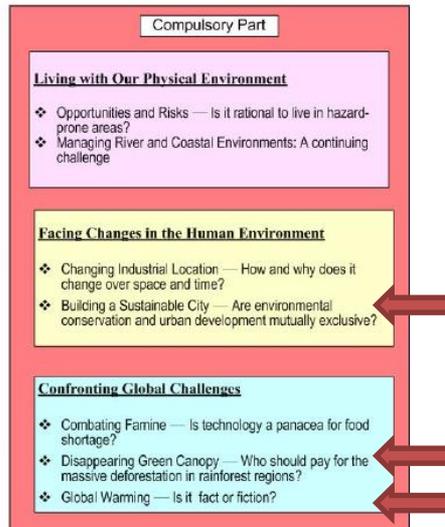
Impacts Achieved – impact beyond project period

6. Provision of Education Bureau approved training programmes and packages to aid 8 curriculum modules in 3 New Secondary School Curriculum (Geography, Liberal Studies and Biology) through 8 different pedagogical strategies and activities.



Elective Part (50 hours, any 2 out of 4)

- V. **Human Physiology: Regulation and Control**
 - a. Regulation of water content (osmoregulation)
 - b. Regulation of body temperature
 - c. Regulation of gas content in blood
 - d. Hormonal control of reproductive cycle
- VI. **Applied Ecology**
 - a. Human impact on the environment
 - b. Pollution control
 - c. Conservation
 - d. Global issues
- VII. **Microorganisms and Humans**
 - a. Microbiology
 - b. Use of microorganisms
 - c. Microbial genetics
 - d. Harmful effects of microorganisms
- VIII. **Biotechnology**
 - a. Techniques in modern biotechnology
 - b. Applications in biotechnology
 - c. Bioethics



NSS Geography Curriculum Framework

Areas of Study	Independent Enquiry Study (IES)
Self & Personal Development <ul style="list-style-type: none"> • Module 1: Personal Development & Interpersonal Relationships 	Students are required to conduct an IES making use of the knowledge and perspectives gained from the three Areas of Study and extending them to new issues or contexts. To help students develop their IES titles, the following themes are suggested: <ul style="list-style-type: none"> • Media • Education • Religion • Sports • Art • Information and Communication Technology (ICT)
Society & Culture <ul style="list-style-type: none"> • Module 2: Hong Kong Today • Module 3: Modern China • Module 4: Globalization 	
Science, Technology & the Environment <ul style="list-style-type: none"> • Module 5: Public Health • Module 6: Energy Technology & the Environment 	

NSS Geography Curriculum Framework

NSS Biology Curriculum Framework

Impacts Achieved – impact beyond project period

7. Collaborative researches using the 20 ha and 1 ha plots with local and international researchers

- a. Dr. Chu Chenjin, Assistant Professor, Sun Yat Sin University, Guangdong, China
 - A manuscript is being finalised on asymmetric competition of forest tree species using data from 22 forest dynamic plots in the region
- b. Dr. Derrick Yuk-fo Lai, Assistant Professor, Department of Geography and Resource Management, The Chinese University of Hong Kong
 - Seasonal Variation of CO₂ Efflux from Soils of a Secondary Forest in Hong Kong. Field work is still undergoing.
- c. Mr. Yu Yat Tung, Research Manager, Hong Kong Bird Watching Society
 - An ECF funded project: Assessment of the ecological role of birds in Hong Kong's secondary forests is being conducted at both plots.
- d. Dr. James A Lutz, Assistant Professor, Forest Ecology Wildland Resources Department, Utah State University.
 - Preparing a manuscript on climate-structure relationships of forests in the world using most of the forest dynamic plots in the world.
- e. Dr. Tim Bonebrake, Assistant Professor, School of Biological Sciences, HKU.
 - Supervising a PhD research project comparing insect communities in the 20ha plot in Hong Kong and a 25 ha plot in Dinghushan, Guangdong Province.
- f. Dr. Tak Fung, Postdoc Fellow, National University of Singapore.
 - A manuscript is being prepared on patterns of abundances and demographic rates of nitrogen-fixing versus non-nitrogen-fixing trees across latitudinal gradients and among biogeographic regions

Impacts Achieved – indicators of increased/enhanced knowledge and skill for participants

HKSARG Education Bureau administered evaluation for the training programmes in Liberal Studies. The project team adopts the same questions and carried out the evaluation to Geography and Biology training. A total of 221 teachers (46 Geography; 60 biology; 115 liberal studies) completed the survey (on a 1 – 5 Likert scale in which 5 as the highest effectiveness achieved):

Questions	Ratings
Overall, I am satisfied with this programme 總的來說，我對這專業培訓課程感到滿意	Geography: 53% rated 5; 100% rated 4 and above Liberal studies: 60% rated 5; 97% rated 4 and above Biology: 51% rated 5; 100% rated 4 and above
The objectives of the programme are achieved 專業培訓課程的目標可以達到	Geography: 46% rated 5; 100% rated 4 and above Liberal studies: 61% rated 5; 98% rated 4 and above Biology: 50% rated 5; 100% rated 4 and above
The contents are relevant to the subject area of programme 專業培訓課程內容切合主題	Geography: 33% rated 5; 100% rated 4 and above Liberal studies: 65% rated 5; 98% rated 4 and above Biology: 65% rated 5; 98% rated 4 and above
Overall, the speakers and facilitators were effective 講者/導師的整體表現有效	Geography: 63% rated 5; 100% rated 4 and above Liberal studies: 69% rated 5; 97% rated 4 and above Biology: 61% rated 5; 100% rated 4 and above
The knowledge gained can be applied to my teaching/ learning 所獲知識可應用於教學工作上	Geography: 29% rated 5; 96% rated 4 and above Liberal studies: 51% rated 5; 92% rated 4 and above Biology: 48% rated 5; 95% rated 4 and above

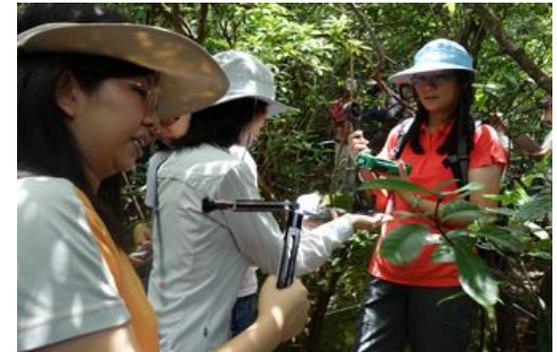
Some qualitative comments extracted from the evaluation forms:

- *“The sharing is enlightening”*
- *“The training materials are rich, the field trip to Lung Mei can intensify our experience”*
- *“Practical, should continue to organise”*
- *“ I hope the Institute can keep organising this kind of courses, which really enhances on skills in teaching!”*
- *“Very detailed, very professional. I do appreciate it very much!”*

Impacts Achieved – indicators of increased/enhanced knowledge and skill for participants

A PhD student has carried out an indepth evaluation for the Geography training programmes and results were published in a conference paper. A total of 68 valid questionnaires were received from Geography teachers on a 1(strongly disagree) – 7(strongly agree) Likert scale:

Questions	Ratings
This Programme can successfully enrich their Geography knowledge	6.08 ± 0.77
Learnt new skills and techniques for conducting Geography field study	6.28 ± 0.75
If their Geography classes joined the Programme... <ul style="list-style-type: none"> - it can develop students' skills and interests in Geography - it can raise students' environmental awareness - Improves students' attitudes and behaviour towards environmental conservation 	5.93 ± 0.78 5.98 ± 0.72 5.90 ± 0.76
Interested in conducting this Programme with the teaching materials, equipment and venue provided	5.91 ± 0.88
For the teaching materials: <ul style="list-style-type: none"> - the seminar PPTs were good and easy to use - equipment, field work manual and worksheets were good - field site was good for teaching (1-hectare plot in Shek Kong) - field site was good for teaching (20-hectare plot in Tai Po Kau) 	5.94 ± 0.88 5.91 ± 0.88 6.07 ± 0.80 6.25 ± 0.74



Teachers practicing the microclimate measurement technique



Training on data analysis and discussion on results

Project team

Name	Position and Department	Role in the Project
HAU, Chi Hang Billy	Principal Lecturer, School of Biological Sciences	Project Leader and Chief Trainer
LAW, Winnie Wai Yi	Principal Lecturer, Policy for Sustainability Lab, Faculty of Social Sciences	Project Leader and Chief Trainer
CHOW, Wan Chi Joyce	Project Manager, Policy for Sustainability Lab, Faculty of Social Sciences	Project Manager
LEUNG, Siu Him Ryan	Senior Project Officer, Policy for Sustainability Lab, Faculty of Social Sciences	Researcher and Trainer
MAK, Yuen Ling Shirley	MPhil Candidate, Faculty of Social Sciences	Researcher and Trainer
LEUNG, Hoi Shan Vivian	Project Officer, Policy for Sustainability Lab, Faculty of Social Sciences	Researcher and Trainer
YIU, Si In Sianna	Project Officer, Policy for Sustainability Lab, Faculty of Social Sciences	Researcher and Trainer
LO, Wing Fung Kimchi	PhD Candidate, Faculty of Social Sciences	Researcher and Trainer