Sustainable Campus in Taiwan

A movement from 「HEART」
A march toward a [sustainable Taiwan]

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NCKU, Tainan, Taiwan
Committee of Sustainable Campus,
Ministry of Education, Taipei, Taiwan

[IPCC, 2007]
Mean Temp.\(^{\circ}\)C/year: 21.9
Summer Temp.\(^{\circ}\)C/month: 26.1
Winter Temp.\(^{\circ}\)C/month: 16.8

12.0 mm/day in rainy season \(^{\circ}\); 3.1 mm/day in non-rainy season \(^{\circ}\)

The statistics between 1994 to 2005 by CWB in Taiwan

Humidity Range: 70-90 \%RH

NCKU is a leading comprehensive university in Taiwan with 9 colleges
- Area: 36,190 Km²
- Students: 21,005 (11,129 undergraduates students; 9,876 graduate students)
- Faculty: 1,261 (526 professors; 329 associate professors; 271 assistant professors; 65 lecturers; 70 other)
- 8 research centers

A reflection from “Earthquake 921”, 1999

- Campus as a rescue center?
  - Safety
  - Community
  - Education
  - Ecology

1999/09/21 (1546 damaged; 293 completely ruined)
Campus: the basic unit of Taiwan’s new “green island initiative”, 2000

- Network information sharing
- Community information deliverance
- Green and ecological corridors
- Sustaining original ecology

Sustainable Campus

- Industry Cultural Center
- Educational Center
- Community Cultural Center
- General Education Center
- Community Activity Center
- Sports and activity facilities
- Community/District gatherings

Sustainable Community

- Eco-City
- Eco-County
- Eco-Country

Green Island Sustainable Taiwan
### Building a Sustainable Campus

**Sustainable Campus**

<table>
<thead>
<tr>
<th>Campus ecology</th>
<th>Sustainable building technology</th>
</tr>
</thead>
</table>

**Sustaining ecological environment**

**Upgrading technology in related industry**

1. Campus environmental strategies
2. Campus buildings and environment management
3. On campus environmental education opportunities through curriculum designs
4. Linking living with sustainable techniques/principles
Funding items for physical renovation

<table>
<thead>
<tr>
<th>Resources and energy recycling</th>
<th>Sustainable site mediation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource recycling and reuse</td>
<td>Top soil improvement</td>
</tr>
<tr>
<td>Permeable surface paving</td>
<td>Non-obtrusive barriers</td>
</tr>
<tr>
<td>Rainwater and tap water recycling</td>
<td>Multi-layers eco-sensitive planting</td>
</tr>
<tr>
<td>Artificial wetland purification system</td>
<td>Education oriented (landscaped) eco-ponds</td>
</tr>
<tr>
<td>Renewable energy use</td>
<td></td>
</tr>
<tr>
<td>Energy-saving methodologies</td>
<td></td>
</tr>
<tr>
<td>Water-saving devices</td>
<td></td>
</tr>
</tbody>
</table>

- **Ecological recycling**
  - Home-made humus made with fallen leaves and left-over food
  - Demonstration farmland
  - Animal livestock co-habitation

- **Healthy buildings**
  - Natural/recyclable building materials
  - Interior environment improvement
  - Interior dry building constructions using component methods

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Resources and energy recycling

- Resource recycling and reuse

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<thead>
<tr>
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<td></td>
</tr>
<tr>
<td>Water-saving devices</td>
<td></td>
</tr>
</tbody>
</table>
Resources and energy recycling
Permeable surface paving

Resources and energy recycling
Constructed wetland purification system
Resources and energy recycling

Renewable energy use

Site remediation

Top soil replantation
Sustainable site mediation
Education-oriented (landscaped) eco-ponds

Ecological recycling
Compost with foliages and left-over food
Ecological recycling

Teaching gardens

Animal livestock co-habitation
Healthy buildings
Natural/ recyclable building materials

Indoor environmental quality improvement

Recycled and healthy materials used inside of an elementary school in east coast of Taiwan

The MoE formed a “Technical Committee for Sustainable Campus” to review operational schemes, monitor progress, and to advice appropriate strategies.
In the year 2002, 23 schools were funded out of 76 proposals, and the number of competing proposals increased to 564 in 2004, almost 16.8 % of all elementary and secondary schools in Taiwan.

### Cases in year 2002

<table>
<thead>
<tr>
<th>District</th>
<th>Number of campus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>7</td>
</tr>
<tr>
<td>Central</td>
<td>6</td>
</tr>
<tr>
<td>Southern</td>
<td>8</td>
</tr>
<tr>
<td>Eastern</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>
Total Number: 532

Cases in year 2002~2009

% of sustainable campus in individual city/county (2002-2009)
% of sustainable campus in respective level of schools (2002-2009)

Elementary school: 75%
Junior high school: 11%
High school: 8%
College: 6%

% of sustainable campus in respective level of schools by city/county (2002-2009)

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Elementary School
Secondary School
College
### 台灣直轄市、省轄市及三一九鄉鎮中永續校園之基地

<table>
<thead>
<tr>
<th>鄉鎮市名</th>
<th>所屬轄市</th>
<th>郵遞區號</th>
<th>所在之鄉鎮數</th>
<th>所有之行政區數</th>
<th>所佔比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taoyuan City</td>
<td>Taoyuan County</td>
<td>312</td>
<td>21</td>
<td>29</td>
<td>72.41%</td>
</tr>
<tr>
<td>Hsinchu City</td>
<td>Hsinchu County</td>
<td>300</td>
<td>5</td>
<td>8</td>
<td>62.50%</td>
</tr>
<tr>
<td>Miaoli County</td>
<td>Miaoli County</td>
<td>360</td>
<td>8</td>
<td>12</td>
<td>66.67%</td>
</tr>
<tr>
<td>Tainan City</td>
<td>Tainan County</td>
<td>700</td>
<td>8</td>
<td>11</td>
<td>72.73%</td>
</tr>
<tr>
<td>Changhua County</td>
<td>Changhua County</td>
<td>360</td>
<td>14</td>
<td>20</td>
<td>70.00%</td>
</tr>
<tr>
<td>Yilan County</td>
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<tr>
<td>Nantou County</td>
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<td>540</td>
<td>10</td>
<td>13</td>
<td>76.92%</td>
</tr>
<tr>
<td>Chiayi County</td>
<td>Chiayi County</td>
<td>620</td>
<td>12</td>
<td>18</td>
<td>66.67%</td>
</tr>
</tbody>
</table>

### 台灣北、高二市及院轄市中永續校園之基地

<table>
<thead>
<tr>
<th>鄉鎮市名</th>
<th>所屬轄市</th>
<th>所在之城市數</th>
<th>所有之行政區數</th>
<th>所佔比例</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taipei City</td>
<td>Taipei County</td>
<td>10</td>
<td>12</td>
<td>83.33%</td>
</tr>
<tr>
<td>Kaohsiung City</td>
<td>Kaohsiung County</td>
<td>6</td>
<td>11</td>
<td>54.55%</td>
</tr>
<tr>
<td>Keelung City</td>
<td>Keelung County</td>
<td>3</td>
<td>7</td>
<td>42.86%</td>
</tr>
<tr>
<td>Hsinchu City</td>
<td>Hsinchu County</td>
<td>1</td>
<td>1</td>
<td>100.00%</td>
</tr>
<tr>
<td>Taichung City</td>
<td>Taichung County</td>
<td>7</td>
<td>8</td>
<td>87.50%</td>
</tr>
<tr>
<td>Chiayi City</td>
<td>Chiayi County</td>
<td>1</td>
<td>1</td>
<td>100.00%</td>
</tr>
<tr>
<td>Tainan City</td>
<td>Tainan City</td>
<td>6</td>
<td>6</td>
<td>100.00%</td>
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### 行政區數

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<thead>
<tr>
<th>鄉鎮市名</th>
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<th>郵遞區號</th>
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### 台灣直轄市、省轄市及三一九鄉鎮中永續校園之基地

<table>
<thead>
<tr>
<th>縣市別</th>
<th>鄉鎮市名</th>
<th>所佔比例</th>
<th>地之鄉鎮</th>
<th>位置別</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taichung County</td>
<td>Guantian Township, Dongshan Township, Houshi Township, Yujing Township, Shinyo City, Bathe Township, Beimen Township, Yongkang City, Guiren Township, Rende Township, Madijiu Township, Shinsing Township, Louying Township, Jiali Township, Shinsing Township, Yanhsai Township, Nanhua Township</td>
<td>31</td>
<td>54.84%</td>
<td></td>
</tr>
<tr>
<td>Kaohsiung County</td>
<td>Mingdong Township, Luoguan Township, Dajian Township, Gaoshu Township, Gangshan Township, Zhiguan Township, Jading Township, Neimlin Township, Liyu Township, Shansin Township, Cishan Township, Yanchau Township</td>
<td>27</td>
<td>44.44%</td>
<td></td>
</tr>
<tr>
<td>Pingtung County</td>
<td>Jilou Township, Kandezheng Township, Changshing Township, Neiba Township, Dongshan Township, Yangdu Township, Reedong City, Loli Township, Long Township, Sandimep Township, Malia Township, Wannian Township, Gaoshu Township, Linh太湖 Township</td>
<td>33</td>
<td>45.45%</td>
<td></td>
</tr>
<tr>
<td>Yilan County</td>
<td>Yilan City, Toucheng Township, Luoding Township, Su-an Township, Tungtian Township, Shanshing Township, Sanying Township, Dongshan Township, Wuje Township, Kuoc Township</td>
<td>12</td>
<td>83.33%</td>
<td></td>
</tr>
<tr>
<td>Hualien County</td>
<td>Fongbin Township, Yuli Township, Shoubong Township, Sului Township, Sincheng Township</td>
<td>13</td>
<td>38.46%</td>
<td></td>
</tr>
<tr>
<td>Taitung County</td>
<td>Laiung City, Beian Township, Jincheng Township, Donghe Township, Lanyo Township, Daren Township, Taimai Township, Yanhsai Township</td>
<td>16</td>
<td>50.00%</td>
<td></td>
</tr>
<tr>
<td>Kinmen County</td>
<td>Sinching Township, Jinpin Township, Lieyu Township, Jinhua Township</td>
<td>6</td>
<td>66.67%</td>
<td></td>
</tr>
<tr>
<td>Penghu County</td>
<td>Wang-an Township, Cimei Township</td>
<td>6</td>
<td>33.33%</td>
<td></td>
</tr>
<tr>
<td>Lienchiang County</td>
<td>Nangan Township</td>
<td>4</td>
<td>25.00%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>168</td>
<td>319</td>
<td>52.66%</td>
<td></td>
</tr>
</tbody>
</table>

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**Taiwan Green-school Partnership Network**

http://www.greenschool.org.tw/english/home.htm
Taiwan Green-school Partnership Network

As of 2009/05, more than 3710 schools (out of 4721) in Taiwan, have joined and recognized as part of the G-Network.

Distribution of funded items (No. of schools/ NT dollars) (2003)

Permeable surfacing
Rain and grey water reuse
Multi-layer sensitive planting
Education-oriented eco-ponds
Fallen leaves and left-over food composting

Teaching garden
What have we accomplished?


The percentage of green-covering area increased from an average of 23.4% to 35.8% for those participating campuses.

The permeable ground surface was 12.8%.

22.6% of the schools funded have successfully integrated compost from foliages and kitchen waste into the use of their organic farm.

10.6% schools have incorporated the use of drained and recycled water in their daily functions.

Renewable energy (2003)

33.2% of the funded projects have demonstrated their opportunities in utilizing “renewable energy” for actual use and teaching purposes.
Change of educational environment (2003)
More than 80% of the funded projects have successfully creating a more versatile teaching environment through the Program, and the meaningful process and outputs have been shared among the schools and the neighboring communities.

Community participation
Integrating cultural and environmental diversity
**Community participation**

Wun-Shan elementary school

**Consensus building and conceptual permeation from campus to community**

**Concurrent development of teaching modules and curriculum reform**
Development of teaching modules: 
Engineering activity coupled with Curriculum design

<table>
<thead>
<tr>
<th>Teaching plan</th>
<th>contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers involved</td>
<td></td>
</tr>
<tr>
<td>Renovation subjects funded</td>
<td></td>
</tr>
<tr>
<td>Teaching theme</td>
<td></td>
</tr>
<tr>
<td>Area to be integrated</td>
<td></td>
</tr>
<tr>
<td>Teaching contents</td>
<td></td>
</tr>
<tr>
<td>Learning stage</td>
<td></td>
</tr>
<tr>
<td>Intended duration and time for the material</td>
<td></td>
</tr>
<tr>
<td>Resources application</td>
<td></td>
</tr>
<tr>
<td>Other unique strength</td>
<td></td>
</tr>
</tbody>
</table>
Effectiveness Assessment

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching contents design</td>
<td>20%</td>
</tr>
<tr>
<td>Number of hours and students participated</td>
<td>15%</td>
</tr>
<tr>
<td>Dissemination of the core values</td>
<td>20%</td>
</tr>
<tr>
<td>Archive of the learning records</td>
<td>20%</td>
</tr>
<tr>
<td>Self-reflection by the teachers</td>
<td>10%</td>
</tr>
<tr>
<td>Learning effectiveness of the students</td>
<td>15%</td>
</tr>
</tbody>
</table>

Analysis of Teaching Modules for Sustainable Campus

Learning Fields

- Life
- Nature Science
- Information
- Language
- Physics
- Sociology
- Health
- Integration
- Art & Humanity
- EE
Analysis of Teaching Modules by Themes

- Culture
- Water Cycle
- Ecology
- Eco-pond
- Material Cycle
- Energy
- Constructed Wet Land
- Hydraulics
- Campus Space
- Plantation

Analysis of Teaching Modules by Strategy

- Research
- Implementation
- Handcraft
- Media application
- Plantations
- Game
- Animal Raises
- Literature Creation
- Environ-Experience
- Art
Analysis of Teaching Modules by Learning Stages

Continuing evolvement of “sustainable campus” program

Integrated Program (Group) Project
心手相「蓮」.風華永續 (hand-to-hand with “Lotus”, glamour and beauty sustained)
Unique characteristic

Learning in the environment by doing
Increased exposure to the nature
Resource sharing
Participation by the community
Study and grow in the nature
Graduation camp  Xin-Xing elementary school

Visit to neighboring campuses
Solar energy  Herbal garden
Participation by the community

Interaction between schools and communities
(Xin-Xing elementary school workshops generating business opportunities)
Website for campus products

Organic fruit
handmade soap

Timber Bugs
handmade soap
Sound-absorption board
Bench of floating wood

Plant-dyed clothing
Plant-dye handbag

Press conference on the "commercial products" from sustainable campus (2005/03/11)
Continuing evolvement of the project

• University level
• Summer program
• Eco-tour
Tainan National University of the Arts

Green Building

Pilot program for “sustainable campus” program in the Universities

National University of Kaohsiung
Pilot program for “sustainable campus” program in the Universities

National Ping Tung University of Science & Technology

Pilot program for “sustainable campus” program in the Universities

National Taiwan Normal University
Summer scholarship program

Summer internship/thesis scholarship
Graduate Institute of Architecture
Summer internship/thesis scholarship

東海大學建築研究所
學生

Summer internship/thesis scholarship

Graduate Institute of Art/education
Summer internship/thesis scholarship

The sustainable campus of my ideal...
Eco-tour

Proposed tour path for sustainable campus in northern TW
Proposed tour path for sustainable campus in northern TW

Proposed tour path for sustainable campus in SE-S TW
Annual review and workshop

Award ceremony (recognized by the Ministry of Education)
UN Decade for Education for Sustainable Development

UN Decade for Education for Sustainable Development (2005-2014)

There can be few more pressing and critical goals for the future of humankind than to ensure steady improvement in the quality of life for this and future generations, in a way that respects our common heritage – the planet we live on. As people we seek positive change for ourselves, our children and grandchildren; we must do it in ways that respect the right of all to do so. To do this we must learn constantly – about ourselves, our potential, our limitations, our relationships, our society, our environment, our world. Education for sustainable development is a life-wide and lifelong endeavour which challenges individuals, institutions and societies to view tomorrow as a day that belongs to all of us, or it will not belong to anyone.
探索實作區
Learning By Exploration

校園探索
Campus Exploration

為什麼要探索校園？

大學生活多變的時刻帶來許多不同面貌，無論何時進入校園，都是充滿探索環境的時刻在手中蓬勃生之某一日。

校園環境學校師生共同營造的第一個安全感「小社會」，鍾聲聲聲響徹環境、校園內一片綠樹的承著，為此校園有人文、有文化、甚至美自然，我們的進步探索校園從「校園」開始。
學習資源

學習資源

5. 討論會（發言及發問）：
在這個課程中，我們介紹了有關議會的程序。在每個議院發言後，其他代表可以馬上針對發言進行發言及發問。

發表意見及發問示例：
我們可以示範幾段，粗大發言和發言示例。
Integrating sustainability into the Institutional Mindset?

- students; faculty; staff; administrators …
- K-12; high school; college/university; community…
Sustainable campus
Starting from HEART
Shared by all

http://www.esdtaiwan.edu.tw/
Taiwan picture of “green school”