Day 1
Closing remarks

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Education University of Hong Kong
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Issues discussed

- Manpower and economic development
- Policies on skills development
- Partnerships and skills-based innovation
- Governance of TVET systems
- Purposes of TVET
- Occupation specific knowledge and skills and generic skills
- TVET at all levels (from secondary to HE)
Reflect on

- Economy – manpower-competitiveness
- Policy
- Innovation
- Benchmarking and role of TVET; and
- TVET college initiatives
Economy – manpower-competitiveness
Megatrends

“Megatrends are macroeconomic forces that are shaping the world. They are factual and often backed by verifiable data. By definition, they are big and include some of society’s biggest challenges—and opportunities” (pwc, 2014)

“Mega Trends are transformative, global forces that define the future world with their far reaching impacts on business, societies, economies, cultures, and personal lives” (Frost & Sullivan)

- Accelerating urbanization
- Climate change and resource scarcity
- Demographic shifts
- Shift in global economic power
- Technological breakthroughs (pwc, 2014)
Climate change and resources scarcity

With a population of 8.3 billion people by 2030, we’ll need...

- 50% more energy
- 40% more water
- 35% more food

New industries created, or existing ones revolutionized, in response to energy scarcity, climate change and lack of resources; the pace of these changes will be accelerated by new technologies.

Cumulative total CO₂ emission from 1870 (GtC) caused by human activities

Representative Concentration Pathway (RCP) defines a specific emissions trajectory. GtC - Giga tonne Carbon
Greenhouse gas emissions by economic sectors (worldwide)

Estimated core environmental-related jobs through green mapping studies in four South-East Asian countries (2010-2012)

Source: UNESCAP, based on ILO (2013e, 2014d and 2014e).
Focus on technology - Malaysia

- Malaysian government recognizes technology among the key drivers for green economic growth. The National Green Technology Policy was launched in the country in 2009 to provide directions for development including the growth of green technology industry that should minimize environmental degradation, has zero or low greenhouse gas emission; is safe to use and promotes healthy and improved environment for all forms of life, conserve the use of energy and natural resources and promotes the use of renewable resources.

- Green technology development and its inclusion in training programs. The Roadmap on Green Technology prepared by the National Green Technology Centre includes training provision.
Top industries of the future

Source: Bloomberg, Frost and Sullivan Analysis
A smart product is characterized by an intelligent sensing technology that is increasingly being integrated with Internet technologies, thereby allowing the product to react to and communicate with the changing environment around it. This leads to optimal operations and improvement in efficiency.
Forest City – the Future is here
The construction sector in Asia

Construction spending by country 2013 (US$)  

Construction spending growth 2014-19 (% per annum)

Construction spending in Asia accounted for 44 percent of total global construction spending in 2013 (AECOM, 2014)

Green building sector in China

- Introduction of the Chinese Green Building Standard
- Annual growth rate of 60% in the green building sector (EU SME Centre, 2013)
  - Creates energy-saving opportunities at the market
  - Demand for skill training in construction increase

Source: (IGEBC, 2014)
Skills shortages: labor shortages and skill gaps - future

Difficulties in filling positions due to lack of available talent

<table>
<thead>
<tr>
<th>Countries</th>
<th>Percentage of employers who experience difficulties</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>67%</td>
</tr>
<tr>
<td>China</td>
<td>24%</td>
</tr>
<tr>
<td>Japan</td>
<td>80%</td>
</tr>
<tr>
<td>Australia</td>
<td>54%</td>
</tr>
<tr>
<td>New Zealand</td>
<td>44%</td>
</tr>
<tr>
<td>Singapore</td>
<td>44%</td>
</tr>
</tbody>
</table>

Source: Aring, 2012

Barriers to invest in green buildings in China, 2012 versus 2011

Estimation of green job numbers in construction

<table>
<thead>
<tr>
<th>Country</th>
<th>Green jobs or environment-friendly job estimates (% of total employment) and N of places</th>
<th>Total No. of Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysia</td>
<td>1.11 to 4.74% (10,906 – 46,155)</td>
<td>974,488</td>
</tr>
<tr>
<td>Philippines</td>
<td>11% (211,090)</td>
<td>1.9 million</td>
</tr>
<tr>
<td>Mongolia</td>
<td>5.2% (3,610)</td>
<td>69,300</td>
</tr>
</tbody>
</table>

Sources: Complied by the author, based on ILO (2014)
Skills gap: construction

<table>
<thead>
<tr>
<th>Unfulfilling demand of occupations in the following areas:</th>
<th>Occupations considered to be the most in-demand in the next five years:</th>
<th>Important soft skills required for tradesmen</th>
</tr>
</thead>
<tbody>
<tr>
<td>• green building expertise</td>
<td>• Architects,</td>
<td>• strategic skills,</td>
</tr>
<tr>
<td>• professionals handling engineering works with green building expertise</td>
<td>• Engineers,</td>
<td>• environmental awareness and sustainable development,</td>
</tr>
<tr>
<td>• quantity surveyors</td>
<td>• BERDE Assessors,</td>
<td>• coordination,</td>
</tr>
<tr>
<td>• safety engineers</td>
<td>• Green Building Certifiers,</td>
<td>• management and business skills, and</td>
</tr>
<tr>
<td>• energy designers and managers</td>
<td>• Green Material Suppliers,</td>
<td>• innovation</td>
</tr>
<tr>
<td>• sustainability officers, waste management officers</td>
<td>• Maintenance/Project Managers,</td>
<td></td>
</tr>
<tr>
<td>• marketing personnel with significant knowledge in green building</td>
<td>• Electrical/Energy Managers,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sanitation Personnel, and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mechanical/Laborer with Green Building Know-how</td>
<td></td>
</tr>
</tbody>
</table>

*(Mondal, Iqbal and Mehedi, 2010)*
Sustainable Development Goals

1. No Poverty
2. No Hunger
3. Good Health
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Renewable Energy
8. Good Jobs and Economic Growth
9. Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace and Justice
17. Partnerships for the Goals
Economic competitiveness and human capital

<table>
<thead>
<tr>
<th>Stage</th>
<th>Primary education indicators (pillar 4)</th>
<th>Higher education indicators (pillar 5) + brain drain (pillar 7.09)</th>
<th>Innovation indicators (pillar 12)</th>
<th>Total human capital</th>
<th>Institutions (pillar 1)</th>
<th>Infrastructure (pillar 2)</th>
<th>Macroeconomy (pillar 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor-driven stage (1)</td>
<td>7.5%</td>
<td>6.8%</td>
<td>2%</td>
<td>16.3%</td>
<td>15%</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Efficiency-driven stage (2)</td>
<td>5.0%</td>
<td>9.7%</td>
<td>4%</td>
<td>18.7%</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Innovation-driven stage (3)</td>
<td>2.5%</td>
<td>9.7%</td>
<td>12%</td>
<td>24.2%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: Sabadie and Johansen, 2010, p. 244
Global Sustainable Competitiveness Index, 2014 – Asia and the Pacific

<table>
<thead>
<tr>
<th>COUNTRIES</th>
<th>RANK</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>6</td>
<td>6.06</td>
</tr>
<tr>
<td>New Zealand</td>
<td>8</td>
<td>5.99</td>
</tr>
<tr>
<td>Australia</td>
<td>15</td>
<td>5.67</td>
</tr>
<tr>
<td>Malaysia</td>
<td>21</td>
<td>5.22</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>22</td>
<td>5.05</td>
</tr>
<tr>
<td>China</td>
<td>31</td>
<td>4.62</td>
</tr>
<tr>
<td>Thailand</td>
<td>35</td>
<td>4.51</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>42</td>
<td>4.33</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>44</td>
<td>4.30</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>45</td>
<td>4.28</td>
</tr>
<tr>
<td>Indonesia</td>
<td>46</td>
<td>4.28</td>
</tr>
<tr>
<td>Turkey</td>
<td>47</td>
<td>4.27</td>
</tr>
<tr>
<td>Philippines</td>
<td>49</td>
<td>4.25</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>65</td>
<td>3.89</td>
</tr>
<tr>
<td>India</td>
<td>68</td>
<td>3.85</td>
</tr>
<tr>
<td>Cambodia</td>
<td>75</td>
<td>3.71</td>
</tr>
<tr>
<td>Nepal</td>
<td>77</td>
<td>3.70</td>
</tr>
<tr>
<td>Iran, Islamic Republic of</td>
<td>78</td>
<td>3.68</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>92</td>
<td>3.50</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>95</td>
<td>3.47</td>
</tr>
<tr>
<td>Mongolia</td>
<td>96</td>
<td>3.45</td>
</tr>
<tr>
<td>Pakistan</td>
<td>105</td>
<td>3.08</td>
</tr>
<tr>
<td>Timor-Leste</td>
<td>109</td>
<td>2.78</td>
</tr>
</tbody>
</table>

Policy
The changing world of skills and work: and education

Without sufficient *investment in skills*, people languish on the margins of society, technological progress does not translate into productivity growth, and countries can no longer compete in an increasingly knowledge-based global economy... many [countries] continue to struggle with low level of adult basic skills, problems of skills mismatch, skills shortages and unemployment (OECD, 2013, p.60)
Overarching policies

• The National action Plan for Haritha Lanka Program (Sri Lanka, National Council for Sustainable Development, 2009);
• The Vietnam Sustainable Development Strategy for 2011-2020 (Vietnam Government, 2012);
• The Vietnam National Green Growth Strategy (Vietnam Government, 2012);
• The National Action Plan for Climate Change and its Eight Missions in India (Prime Minister’s Council on Climate Change, 2012);
• The 12th Five-Year Plan for Economic and Social Development of China (2011-2015) (The Central People’s Government of the People's Republic of China 2011);
• Law of the Republic of Indonesia No.17/2017 on the Long Term National Plan 2005-2025;
• Analysis of government policies and existing TVET provisions identified gaps in the following training areas:
  • **Technicians**: Methane/land field gas generation system; biofuels processing; biomass plan; wind turbine service; hydroelectric plant; geothermal; edible vertical gardens; renewable energy
  • **Workers**: air/water pollution control; Methane/land field gas collection system

**TESDA Green Technology Centre – the Philippines**

Built in partnership with the Federation of Filipino Chinese Chambers of Commerce and Industry Inc. (FFCCCI), the TESDA Green Technology Center (GTC) will serve as the green skills hub, which will offer training courses to cater to the needs for renewable and emerging green jobs.
Skill gaps - Viet Nam

• Governments’ plans to set up 10 high-tech agricultural zones and areas in the country by 2020, and another 10 by 2030 set up a very high demand for updating/ topping up skills in agriculture.
• Use of advanced technologies such as solar energy for drying fruits or rice require additional skills. Seminars organized by donors/investors to support local farmers in topping up their skills through learning about new practices can provide the required in-service training.
• However, TVET should respond quickly by adjusting their training programs to support the demand initiated by the government initiative to minimize the skills gaps.
Green jobs in construction (green buildings)

Six clusters of green occupations classified by ILO (2011)

• **Conceiving, planning, designing and advising**
  (Construction company/Managers and Business Functions; Architects and civil/structural/Environmental Engineers; Architectural Technicians/Technical Drawing Specialists; HVAC, Electrical, Mechanical, Sanitary, RE & Building Services Engineers/Designers; Surveyors; Energy and Water Efficiency and Waste management Analysts, Consultants and Advisors)

• **Construction, installation and maintenance**
  (Building Site Supervisors, Site Engineers and Site Architects; Conservation; Building Level Renewable Energy [and High Efficiency Energy] Systems)

• **Controlling**
  (Energy Auditors; Inspectors, Certifiers and Quality Controllers)

• **Enabling**
  (Policy Makers; Urban Planners; Financing; Educators and Information Providers; Researchers)

• **Manufacturing and distribution**
  (Manufacturers and Distributors of Green Building Materials and Products; IT & System Technicians)

• **Green building clients**
  (Developers; Energy Managers, Facilities Managers and Building Managers; Public Servants Working in Procurement and Management of Buildings; Householders and Tenants) (ILO, 2011).
Parents' preferences for students' plans after leaving school:

- University only: 66
- University or vocational course/apprenticeship: 16
- Vocational course/apprenticeship only: 1
- Vocational course/apprenticeship or employment: 1
- Employment only: 1
- No preference: 9
- Other combination: 6

The EdUHK study: Preparing urban youth for further study and careers: an international study involving Hong Kong, 2013-2016
Innovation
Competencies for dealing with tasks and challenges

Competences for dealing with tasks and challenges Company 1 (at present)

- be committed
- govern oneself
- build trust
- have social astuteness
- have interpersonal influence
- be a social person
- be inventive
- control and coordinate
- cope with chaos and uncertainties
- interpret
- negotiate
- combine

Competences for dealing with tasks and challenges company 2 (at present)

- be committed
- govern oneself
- build trust
- have social astuteness
- have interpersonal influence
- be a social person
- be inventive
- control and coordinate
- cope with chaos and uncertainties
- interpret
- negotiate
- combine
Benchmarking and role of TVET
The new Greening TVET continuum

UNESCO-UNEVOC, Bonn
Benchmarking: What is regional/local engagement?

- Diverse ways of interaction among institutions (staff and students), public agencies, business community, not-for-profit organisations and community groups to facilitate knowledge exchange, sharing of skills and experience;
- Relationship between providers and the communities within their locality

Benefits:
- improve students learning
- benefit the social, economic and cultural development of the region
- benefit the quality of life and opportunities in the region
- improve well-being of the region
- make broader international connections
Forms of regional/local engagement

- Formal such as partnerships
- In-formal: depends on the particular interests of individual staff and students
- Direct contribution to service provision, economic development and health and well-being in the region
- Engagement in areas with respect to the social, economic and cultural life in a region
Benchmarking domains

1. Institutional processes for promoting, managing and supporting engagement
2. Developing human capital
3. Developing regional learning processes and social capital
4. Developing business processes and innovation
5. Community development processes
6. Cultural development
7. Promoting good practice in sustainable development
8. Contributing to regional infrastructure and development processes (An additional domain is concerned with institutional processes through which ‘drive’ and encourage engagement activity)

The methodology (developed by Glasgow university, Scotland) based on Charles for HEFCE (2002)
Data of the Institution

Domain 1 – Promoting Engagement within the institution

- Embedding engagement in provider mission
- Community involvement in HEP governance
- Developing staff skills for engagement
- Rewarding and valuing engagement
- Resources for engagement

Domain: 2 – Human capital development

- Access for students from disadvantaged backgrounds
- Retention of highly skilled and graduates in regions
- Tailored training programmes for local policy organizations
- Course provision, including CPD, for local employers
- Involvement of employers in curriculum development
- Collaborative relationship with local schools
- Collaboration in regional skills strategies
- Responsiveness to regional labour market demands
Domain 3 – Developing regional learning and social capital

- Involvement in regional governance
- Contribution to regional economic analysis and regional foresight programmes
- Staff Exchanges
- Participation in regional learning strategies
- Connecting regional partners to international networks
- Hosting policy seminars and workshops with local partners

Domain 4 – Business development processes

- Strategic plan for business support
- Incentives for staff to engage with business
- Student placements and service learning with...
- Creation of company spin-outs
- Engagement in investment attraction
- Promoting entrepreneurship
Domain 5 – Community development processes

Contributing to healthy cities and health promotion
Support for community regeneration
Opening up facilities to the community
Organising and hosting events and festivals for the community
Co-production of community-relevant research with community partners
Supporting community development through service learning
Student community action

Domain 6 - Cultural development

Cultural strategy
Provision of cultural facilities
Contribution to local tourism
Community participation in cultural provision
Fostering regional cultural identities
Support to local creative and cultural industries
Domain 7 – Promoting sustainability

- Leading societal responses to the challenges of sustainability
- Sustainability in institutional governance from climate, environmental and sustainability issues
- Supporting research on social challenges from climate, environmental and sustainability issues
- Sustainability through the curriculum
- Environmental management system
- Promoting education for sustainable development outside institution

Domain 8 – Regional infrastructure planning and development

- Engagement in regional infrastructure planning and assessment
- Using institutional demand as a lever for infrastructure development
- Investment in high quality campus
- Provision of core public services
- Involvement in provision of multi-partner local knowledge precincts
TVET college initiatives
“Buildings are responsible for more external pollution than any other product” (Mackenzie, 1997, 38)
SMK 27
SunPulse Water
Solar Water Pump

The SunPulse Water is a world-leading low-temperature Stirling engine water pump for decentralized water supply and distribution. It is particularly simple to construct and can therefore be produced locally.

Concept
The SunPulse Water can pump water from various depths according to the water pump which has been installed with the engine. The effectiveness of the engine can be increased with additional water tank. The machine is working when the sun is shining and the distribution of the water for irrigation or to the houses can be done out of the tank even when there is no sunlight.

This machine uses the sunlight to heat the air inside the engine and the pumped water to cool it again, resulting to pressure fluctuations inside the engine, which are moving a piston. The piston will turn the flywheel, then rotation of flywheel can be used for various applications, for example to drive water pump like in this Sunpulse Water.

Application
- Suitable for developing countries that the majority of the population depends on home grown agricultural products.
- Can be produced with the simple facilities available in sunbelt countries.
- Can be put into service as the prime mover in a variety of other applications, such as:
  1. Driving grain mills, power saws, presses etc.

Technical details
- Dimension : 3600 x 3600 x 3400(mm)|with booster|
  2500 x 2500 x 1800(mm)|without booster|
- Total weight : 650 kg
- Manual daily tracking angle moveable
- Water cooler temperature : max 30°C
- Out rotation of machine : 30 rpm
- Depth of wells : maximum 5 meters (7 meters with special pump)
- Pumping height : maximum 10 meters (60 meters with special pump)

Advantages
- Use sun’s rays as energy, so it is environmentally friendly and cost efficient solution.
- Can also be employed to provide drinking water
- SunPulse water with bellow pump can pump from storage lakes or ground water from max. 5 meters deep, and max 10 meters high, this is ensuring the irrigation of an average family business
- can pump deeper till 60 m with by coupling it to a immersed piston pump like India Mark 2

1. Driving air compressors to store compressed air to be used for pneumatic tools, for water oxygenation, etc.
2. Driving a generator to produce electricity.
3. Driving an oxygen concentrator to selectively filter oxygen from atmospheric air.
Balai Latihan Pendidikan Teknik (BLPT) Yogyakarta
Interesting models generated by TVET providers

- Production of green products for skills development
- Establishment of companies by several VTPs
- Start-up companies for greening
Looking forward for day 2