ADB-OECD LEED Pre-Forum Workshop

Responding to Greening Economies: How Well are Education and Training Doing?

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Contents

Korea's Green Growth Footprint

A. 2008: Green growth as a new vision

B. 2009: Establishing the foundation for green growth

C. 2010: Market driven green growth

D. 2011: International green growth development
- -GGGI(Global Green Growth Institute)
- -GCF(Green Climate Fund)

Ⅱ. Vision and Strategies of Green Growth in Korea

<Figure 1> Vision and Strategies of Korea Green Growth

Ⅱ. Vision and Strategies of Green Growth in Korea

<Figure 2> Promotion Goals and Strategies of Green New Deal Project

Ⅲ. Transformation towards a Green Economy

A. Expansion of Green R & D Investment

B. Change in Green Investment

C. Development of New and Renewable Energies

Ⅳ. Change of VET under the Green Growth Policy

A. Technologies, Technical Manpower Training to Promote the Green Industry as the New Growth Engine

B. Enhancement of Transferring to Green Manpower to Support Greenization of Existing Industries

C. Enhancing Green Manpower Supply Responding to the Demand of SMEs and Region

D. Establishment of National Technology Qualification System Leading Green Industry

E. Inviting Excellent Talents by Expanding Green Technology Investment

Ⅴ. BESHS, POSTECH, HRD Korea

A. New and Renewable Energy Workforce Program
: Busan Energy Science high School(BESHS) Case

☐ 'West Busan Engineering High School'(former name) was renamed to 'Busan Energy Science High School'

☐ Reorganized from a vocational high school to a specialized high school. Conversion to new renewable energy specialized high school

☐ Received support and cooperation from Busan Metropolitan City Office of Education and the Ministry of Commerce Industry and Energy

Ⅴ. BESHS, POSTECH, HRD Korea

Goal of Curriculum Development

-The goal is to nurture excellent talents who can learn the basic knowledge and technologies on the types and principles of new renewable energy sources (solar energy, wind energy), power electronics, automated control, electric electronics and semiconductor control devices, by providing them with curriculum where designing, producing, operation, and repairing.

-and maintaining utilizing various new renewable energy sources and electricity, electronics, and computer sectors are integrated, so as to nurture talents having capabilities and talent with increased on-site adaptabilities.

Ⅴ. BESHS, POSTECH, HRD Korea

Curriculum Development

-In order to achieve this educational goal, curriculum subject councils and industry-governmental-academia councils developed the curriculum, specialized vocational curriculum, and promoted specialization of majors through major club activities.

-Textbooks are developed 2-3 times a year responsive to customized education.

-Furthermore, high tech educational equipments have been supplemented, and industry-academia cooperation have been expanded and strengthened, to develop curriculum which are directly connected to the production sites.

-The human resources that most green industries (new renewable energy industries) need are those who have electrics, electronics, and machinery technologies.

Ⅴ. BESHS, POSTECH, HRD Korea

Curriculum Development

-The second semester of the third year (the last semester of 6 semesters) is for on-site training (employment type on-site training).

-Such a curriculum is advantageous for acquiring various licenses in electrics, information equipment operation, elevators, electronic calculators, electronic CAD etc.,

-and thus enables students to become qualified experts in the new renewable energy sectors.

Ⅴ. BESHS, POSTECH, HRD Korea

Improvement of educational performance through industry-academia cooperation

O Partnership with industries

-Special lectures and company tours are held by the Small and Medium Sized Business Administrations of Busan and Ulsan, and North Job Center to teach students about ways to have job interviews to promote employment of students in new renewable industry sectors.
-Thus, employment rate in public corporations and large enterprises is gradually increasing. Special lecture programs by company CEOs, related experts, and university professors are being held as well.
-The industry-academia program is developing practical skills needed in the workplace and the adaptabilities to the industry sites, developing on-site experience learning programs, practice-oriented major education, and education utilizing external lecturers such as industry-academia adjunct teachers and expert engineers etc.

Ⅴ. BESHS, POSTECH, HRD Korea

-On-site practice programs are being developed jointly with companies participating in industry-academia expansion projects. Through one faculty from one company exclusive system, on-site training is being monitored on a regular basis.

-Strict monitoring is being made to find unqualified companies through satisfaction survey and follow-up.

-Busan Office of Education is providing employment coordinators for employment of graduates, and the Ministry of Employment is providing employment support officers and excellent lecturers.

-During 2007~2009, the school was selected for employment support expansion project by the Ministry of Labor.

-In addition, curriculum and project programs utilizing industry-academia-governmental-institute network were developed to promote on-site learning, student club activities, faculty job training, textbook research society activities, curriculum customized to companies, and textbook development.

Ⅴ. BESHS, POSTECH, HRD Korea

- Performance

-Curriculum living up to the government's green industry policies has been developed, having great implications in leading similar sectors. Students' interests in studying and school life, and employment and career in green industries are improving.

-Employment rates and license acquisition rates have increased. Cooperation with industries has been reinforced, improving the quality of students' employment.

<Table 1> Increase of Employment Rates and License Acquisition Rates

Year	Employment rate	License acquisition rate
2007	19.5%	-
2008	24.2%	-
2011	35%	95.8%
2012	40%	97.9%

Ⅴ. BESHS, POSTECH, HRD Korea

The environmental elements for which BESHS to shift as a specialized high school in nurturing human resources for new renewable energy industries are as follows:

☐ **Advantages**

-Busan has many mechanical component, shipbuilding equipment component, and electric electronic component companies which have large volume of skilled labor and high tech skills.

-There is also an industrial compound nearby, increasing possibility for support and cooperation. In addition, it is a promising field where investment has been concentrated in wind power generation plants and photovoltaic generation for which commercialization is easy.

-It is also a promising industrial area where investment is concentrated on wind power generation and photovoltaic generation for which commercialization is convenient.

-As for BESHS, the principal and faculty had strong will, and with spacious school space and excellent practicing equipments, it has an advantageous physical environment for creating studying atmosphere.

Ⅴ. BESHS, POSTECH, HRD Korea

☐ **Disadvantages**

-However, the first year students of BESHS had low academic achievement level

-the ratio of students who want to be employed after graduation was also low

- resulting in a low employment rate as well.

-Furthermore, the area where the school is located is outdated and the school lacks dormitories and gymnastic facilities.

-Also, the faculty lack expertise in the specialization areas, and thus faculty training programs were in need.

☐ **Opportunities**

-Attempts for specialization in new growth industries are expected to increase the human resources demand.

-The Busan Metropolitan Office of Education is increasing its interest and support for BESHS as it is the only new renewable energy specialized high school in Korea

-and the only specialized high school in the region (Buk-gu, Sasang-gu, Busan).

-And since the number of energy related majors is on the rise in the universities, it is expected that there will be more support and connections with BESHS.

Ⅴ. BESHS, POSTECH, HRD Korea

□Challenges

-The number and size of new renewable energy related companies are small.
-Large enterprises have a tendency to avoid graduates from vocational high schools,
-and there is no national registered license for the new renewable energy sector.
-Furthermore, the weak physical accessibility of the school is becoming an obstacle in recruiting first year students.

Ⅴ. Case Studies: Busan Energy Science High School, POSTECH

☐ **Strategies: Based on these SWOT elements**

○ To strengthen the image of the school as a new renewable energy specialization school which lives up to the government energy policy

○ To incorporate the new renewable energy sector into the curriculum of the high school and promote strategies concentrating on the new renewable energy sector, and to focus the budget in investing in equipments needed for practical training in the specialized school.

○ To secure numerous companies and research institutes related to the new renewable energy sector, and to promote development of curriculum, donation of equipment, appointing honorary faculty and special lectures, and sisterhood relationships.

○ To hold training programs and events to create a sense of unity to maximize the capabilities of the faculty.

○ To seek ways to create national registered licences with the Human Resources Development Service of Korea.

○ To establish school scholarship system for new renewable energy and increase the number of recipients.

○ To develop a career path manual oriented towards new renewable energy in order to increase the employment rate.

V . BESHS, POSTECH, HRD Korea

B. Specialized Graduate School Program in the field of Wind Power: POSTECH Case

□ Background of the wind energy specialization graduate school project

□ Graduate school of Wind Energy, POSTECH, was established as a national policy graduate school designated by the Ministry of Knowledge and Economy in 2007.

□ It is the first general graduate school operated in industry-academia cooperation process.

V . BESHS, POSTECH, HRD Korea

*** POSTECH Ranked 1st in Times Higher Education 100 under 50 Rankings 2012**

Ranking		University	Country / Region
U50	WUR		
1	53	POSTECH	Korea
2	46	École Polytechnique Fédérale de Lausanne	Switzerland
3	62	HKUST	Hong Kong
4	86	University of California, Irvine	United States
5	94	KAIST	Korea
6	84	Université Pierre et Marie Curie	France
7	110	University of California, Santa Cruz	United States
8	121	University of York	United Kingdom
9	131	Lancaster University	United Kingdom
10	145	University of East Anglia	United Kingdom

※ ***WUR**: World University Ranking, **U50**: Under 50*

V . BESHS, POSTECH, HRD Korea

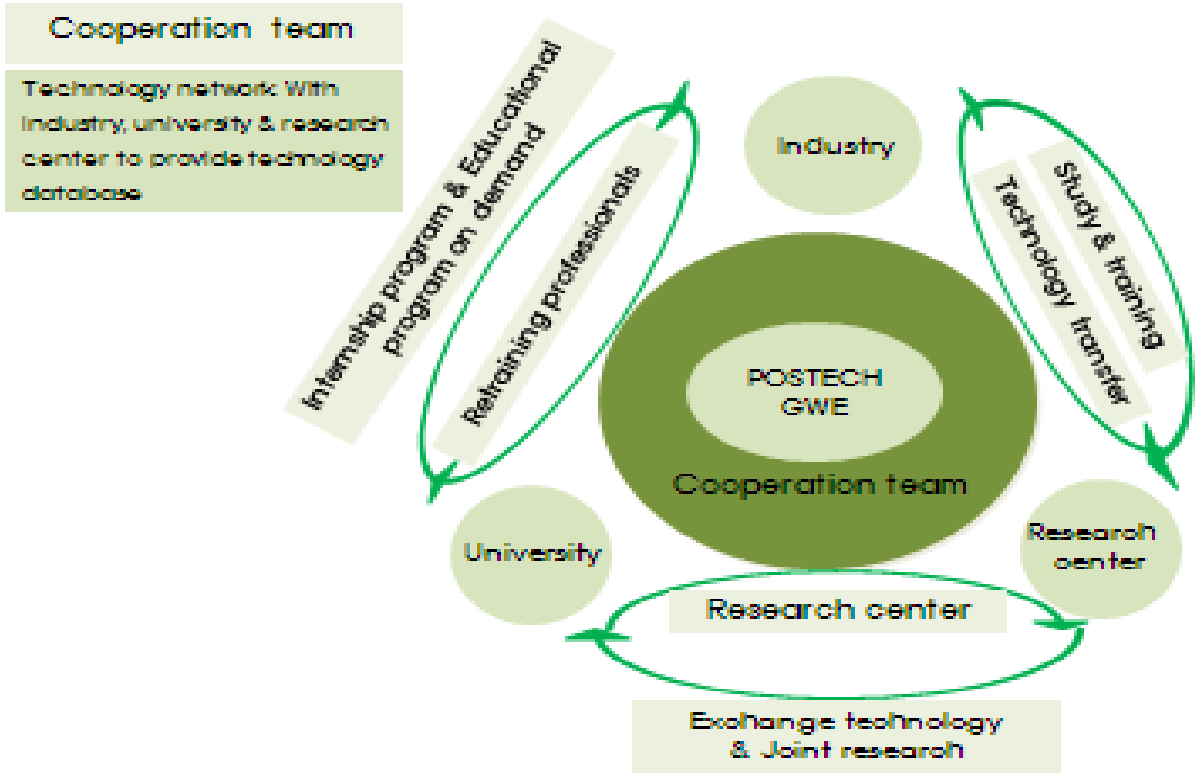
<Table 2> Numbers of Highly Skilled Graduates from POSTECH

Classification	Energy resources	Renewable	Electric power	Total
Bachelor's, Master's, Doctoral degree personnel	1,281	501	12,477	14,259
Practical retraining personnel	20,928	7,830	34,665	63,423
Total	22,209	8,331	47,142	77,682

Source: Homepage of Korean Institute of Energy Technology Evaluation and Planning(2012)(www.ketep.re.kr)

V . BESHS, POSTECH, HRD Korea

<Figure 3> Promotion system of industry-academia cooperation in POSTECH GWE



Source: Homepage of POSTECH GWE (2012)(www.gwe.postech.ac.kr)

Ⅴ. BESHS, POSTECH, HRD Korea

- Against this backdrop, the human resources development project of POSTECH aims at nurturing talents customized to companies utilizing industry-academia-institute joint researches and joint use of facilities and industry-academia experts by opening the graduate school of wind energy sector in a cooperative process with the university through the specialization graduate school project.

- POSTECH GWE is a professional and technical institution supported by the Korean Government, educates specialists for wind energy technologies, seeks to prepare its students to assume leading roles in the fields of the industry, and is characterized by a close collaboration with the government, companies, research centers, and educational institutions.

Introduction of Curriculum

<Table-3> Curriculum of Wind Energy Graduate Programs

Department	Lectures	Contents
Mechanical Engineering	Designing Wind Farm	Based on the process of developing wind farm and records regarding the conditions of wind energy, Optimizing design and analyzing economical efficiency.
	Prediction of wind conditions	Making Wind Map from data recorded by the satellite, Predicting wind Conditions and analyzing energy production.
	Designing Rotating Blade	By using the computing data on the simulation and actual survey, aeroelastic theory and Fluid streaming, Designing the shapes of the rotating blade and calculating energy output
	Structural Designing of Rotating blade	Studies of the measuring methods by optical fiber and structural analysis program.
	Vibration & noise	Learning the calculating methods of measuring noise and vibration from the operating wind energy generator.

V . BESHS, POSTECH, HRD Korea

Department	Lectures	Contents
Mechanical Engineering	Structural designing of submarine support	Analyzing the stability of the submarine structure using computing devices and studying designing the seabed support.
	Calculating loads of the wind generator	In order to analyze loads of the crucial elements such as blade and rotor, researching on the process of designing.
Electronic & Electrical Engineering	Control of wind Generator	From the experiment of controlling system on wind generator, understanding designing of controlling system.
	Designing of inverter and generator	Conducting modeling simulations on mutual stabilities, efficiency, and the methods of controlling.
	Connecting cannel, output performance	Studying the stability evaluation of connecting cannels of electricity generated by wind farms and measuring methods of output performance.

Ⅴ. Busan Energy Science High School, POSTECH, HRD Korea

- Performance and Evaluation on the skilled human resources Nurturing Project of POSTECH

- GWE of POSTECH marked 100% employment rate of graduates in 2011.

- In the case of the Graduate School of Wind Energy, POSTECH, when it received financial support from the government, the school actively operated the department and provided good environment to the students.
  - But, there is a limitation that once the government's project ends and no financial support comes from the government, the school's project become disconnected.

Ⅴ. Busan Energy Science High School, POSTECH, HRD Korea

- Korea New and Renewable Energy was established with the purpose to develop and nurture new renewable energy industries to contribute to a sound development of national economy by promoting technology development and expansion of usage of new renewable energy, and to protect and nurture profitability of the new renewable energy industries.

- The Ministry of Employment and Labor and Human Resources Development Service of Korea, together with the Korea New and Renewable Energy, started the "Project to Support New Renewable Energy Industry Education Training Innovation Center" in February 2010.

C. Customized Re-training Program: HRD Korea and Korea New & Renewable Energy

□ 「Project to Support Educational Training Innovation Center」 for establishing new renewable energy industry strategies and applying the strategies to companies,

□ and for nurturing experts in photovoltaic, wind energy, fuel cell, and bio energy sectors, is supervised by Korea New & Renewable Energy with the budget support of the Human Resources Development Service of Korea,

□ and the aim is to nurture customized human resources which live up to the demands of new renewable energy industries.

□ Promotion system

○ 「Project to Support Educational Training Innovation Center」 is a project to support development of abilities of workers in industries customized to field demand through expert groups of industries

○ which have good understanding of industrial characteristics and which connect with companies, instead of the government-led, central method of human resources development system.

C. Customized Re-training Program: HRD Korea and Korea New & Renewable Energy

<Table 4> Overview of Financial Support for Projects

(unit: million won)

	Total	phase 1 project			phase 2 project	
		1st year ('05.9.~ '06.8.)	2nd year ('06.9. ~ '07.8.)	3rd year ('07.9. ~ '08.8.)	1st year ('08.9. ~ '09.8.)	2nd year ('09.9. ~ '10.6.)
Support amount (average per organization)	27,411	2,000 (222)	2,000 (222)	3,561 (396)	7,850 (604)	12,000 (632)
Number of organizations	-	9	9	9	13	19

Note: Providing different amounts from 500 million won to 820 million won to the existing 9 groups based on performance evaluation, and providing 600 million won (fixed amount) to 6 new groups (different amounts will be provided according to performance evaluation from next year)

Source: Press release by the Human Resources Development Service of Korea under the Ministry of Labor. September 14, 2008

C. Customized Re-training Program: HRD Korea and Korea New & Renewable Energy

☐ The Ministry of Employment & Labor and Human Resources Development Service of Korea designated and announced private training organizations which will nurture 14,000 engineers in green / new growth engine industry sector including key industries including plant facilities and photovoltaic generation facilities.

☐ 97 training organizations were designated including the Korea Electrical Contractors Association, and this screening process focused on encouraging field experts of industries to participate and on increasing field adaptability of trainees.

☐ This training aims at nurturing human resources for promising future industrial areas by operating mid to high level courses to young generations, and the screening process is planned to reflect various opinions from experts such as universities and human resources development councils of industries regarding whether or not facilities and equipments were directly related to industry fields

☐ and training curriculum, and trainers having technologies and expertise that industries demand. (HRD-Net, Homepage of Human Resources Development Service of Korea; www.hrdkorea.or.kr).

C. Customized Re-training Program: HRD Korea and Korea New & Renewable Energy

- With the operation of new renewable energy human resources development center in 2012, education on nurturing human resources for the new and renewable sector is picking up speed.
- This project is supported by the Ministry of Employment and Labor, and Human Resources Development Service of Korea, and 15 education courses of 7 fields of new renewable energy sectors including photovoltaic, wind energy, solar heat, and geothermal have been opened for workers and individuals. (See <Table 5>)
- Starting from 'Designing and Practicing Photovoltaic Generation System' course, 12 courses will be implemented. Furthermore, by the end of the year, 3~5 new courses will be implemented including ▲ New Renewable Energy Green Gas Target Management System ▲ New Renewable Energy Overseas Project Feasibility Analysis (F/S course) and ▲ New Renewable Energy Project Planning Course.

C. Customized Re-training Program: HRD Korea and Korea New & Renewable Energy

<Table 5> New Renewable Energy Educational Courses of 2012

Name of course	Period	Total number of students
New Renewable Energy Overseas Feasibility Study (F/S) Course	2012.03.13~2012.03.16	33
Photovoltaic Generation System Construction Course	2012.03.13~2012.03.21	36
New Renewable Energy Project Planning Course	2012.04.25~2012.04.27	36
Photovoltaic Generation System Construction Course	2012.09.11~2012.09.19	35
New Renewable Energy Project Planning Course	2012.09.12~2012.09.14	36
Greenhouse Gas·Energy Goal Management Course	2012.10.10~2012.10.12	35
Wind Energy Generating Complex Construction Course	2012.10.15~2012.10.18	35
New Renewable Energy Overseas Feasibility Study (F/S) Course	2012.10.23~2012.10.26	35
Solar Heat System Construction General Course	2012.10.23~2012.10.26	35
New Renewable Energy CDM Project Strategy Course	2012.10.29~2012.11.01	35
Photovoltaic Generation System Construction Course	2012.11.06~2012.11.14	35
New Renewable Energy Project Planning Course	2012.11.21~2012.11.23	35
New Renewable Energy Overseas Feasibility Study (F/S) Course	2012.12.04~2012.12.07	35
Geothermal Heat Pump System Construction Course	2012.12.10~2012.12.18	35
Wind Energy Generating Complex Construction Course	2012.12.10~2012.12.13	33

Source: Homepage of Korea New & Renewable Energy Association-http://hrd.knrea.or.kr)

C. Customized Re-training Program: HRD Korea and Korea New & Renewable Energy

□ Policy performance and evaluation

○ In September 2009, the 'Project to Support Educational Training Innovation Center' was adopted to develop job analysis and nine training programs for four areas including photovoltaic and wind energy utilizing the systemized HRD process (FA, DACMU method etc.), for 20 months,

○ and 2,000 workers of new and renewable energy industries completed the work ability improvement education course.

C. Customized Re-training Program: HRD Korea and Korea New & Renewable Energy

- Experts say that the 「Project to Support Educational Training Innovation Center」 provided an opportunity to revitalize human resources development in high-tech and skilled technology sectors such as display, semiconductor, RFID/USN etc. for which providing professional educational training was difficult in the past. Approximately 150 related officials from industries

- and educational training organizations gathered in the Textile Center in March 2011 and shared the performances so far.

Ⅵ. Implications

A. Government Policy Makers

a) Leading sustainable growth by nurturing highly skilled technology experts that can create high value-add products. Therefore, vocational training should resolve the mismatch of skills and labor supply and its programs should relate to labor market demands, vocational education for improvement of quality, relevant education in the global environment, definition of distinct identity and a role of TVET institutions

b) More prompt reaction on consilience of technology in the green energy sector may be necessary as a vocational and education training system for Asian countries has been designed to be suitable to the industrial era even at present.

c) Construction of a system on the supply side to promote job seekers' prompt return to employment through the vocational and education training system and an active labor market program is necessary.

d) Construction of an applicable, tailor-made training system for manpower specialized education of the green energy sector is necessary. Carrying out the policy and improving the quality level continuously to train manpower of the green energy sector is also required.

e) Development of professional manpower through green energy-related majors in domestic universities and graduate schools is necessary for operating of curriculum tailored for a consilience era.

Ⅵ. Implications

B. Researchers for Green Growth and Green Jobs

a) Researches for further green energy sector of Asian countries through analysis of employment creation in the green energy sector should be based on results achieved through various methods.

b) Employment creation in the green energy sector through systematic, continuous job surveys. It is necessary to develop promising occupations through the systematic, continuous job survey on the renewable energy-related sector.

c) Construction of the forecasting system for manpower supply and demand of the green energy sector, construction of a cooperative system among the branches of the government to forecast manpower supply and demand of the green energy sector, and construction of a basic statistics infrastructure to forecast manpower of renewable energy sector are necessary.

Ⅵ. Implications

C. How Can the Experience of Korea be Helpful to Less Advanced Countries in Asia?

a) First, less advanced countries should establish a system to promote green skills training. They should establish a green skills training system focusing on companies and their employees based on the demand for a market-friendly skills development system and customized skills development systems.

b) Second, those governments should implement skills training policies that can support various training activities such as informal training, formal training, and blended learning for green growth.

c) Third, the direction of support needs to shift towards one that can lead and induce green growth by participating in skills training by providing a customized support system.

d) Fourth, to promote the programs and action plans for skills training described above, Korea can expand its multilateral programs and be ready to co-finance all the support activities in collaboration with other international organizations for more effective implementation.

e) Fifth, Korea believes that one of its best possible contributions to less advanced countries would be cooperating with them to promote skills development and make progress towards green growth. In order to promote green growth strategies for improvement of green skills, Korea can provide efficient policy directions to support them in achieving green skills training for green growth.

Thank You.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