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# A survey report on Greening in Higher TVET in China

## Abstract

Sustainable development and greening are important developing trends highlighted as a global awareness among the member countries in the Shanghai Consensus of the 3rd International Congress on TVET—Transforming TVET: Building skills for work and life 2012. Together with the efforts of the international world, UNESCO UNEVOC International (Bonn) carried out a research project titled "Greening TVET & Skills in Asia Pacific Region". As one of the UNEVOC Centres, Shenzhen Polytechnic (SZPT, one of the best higher TVET colleges in China) participated the research by carrying out a questionnaire survey and a preliminary analysis of the collected data and desk research results in 3 polytechnics in Guangdong Province. And this report provides readers with the survey background, process and preliminary analysis results concerning with greening in construction and agriculture in China. From the report one can see the policy and regulation construction for greening in China, learn its development targets and the developing status in the two productive sectors and in education, including teachers' and students' feedback on the issue. Two cases are also provided for readers to learn the teachers' actions for greening.

***Keywords:*** *sustainable development, environment protection, greening, higher TVET, China, Shenzhen Polytechnic, UNEVOC, laws & regulations, strategies, questionnaire survey*

## 1 Background

Environment protection for sustainable development has been an important concern in the international world. And the level of the concern has kept going up for decades. Early in 1972, United Nations organized a Conference on the Human Environment in Stockholm, Sweden, to indicate the world concern about the environment. By the end of the same year, General Assembly of the United Nations decided to establish United Nations Environment Programme (UNEP) (2997 XXVII）taking the mission to stimulate, promote and facilitate member countries and their peoples in improving their quality of life without compromising the quality of life of the future generations, and to lead and promote partnership among member countries for protecting the environment (UNEP 2015). In 1988, the World Meteorological Organization and UNEP established the Intergovernmental Panel on Climate Change (IPCC 2015), taking the leadership in assessing the world climate changes. In June, 1992, UN Conference on Environment and Development (Earth Summit) (Rio +5) held in Rio de Janeiro during which Earth Summit --Agenda 21 was published (UN 1992). It formulated a non-binding, voluntarily implemented action plan of the United Nations with regard to sustainable development. Then in August, 2002, World Summit on Sustainable Development (Earth Summit 2002, Rio+10), the second Earth Summit, was convened in Johannesburg, South Africa, affirming UN commitment to "full implementation" of Agenda 21 alongside achievement of the Millennium Development Goals (UNESCO 2000) and other international

agreements. In June, 2011, UN again held a Conference on Sustainable Development (Rio+20) in Rio de Janeiro, Brazil, to mark the 20th anniversary of the historic Earth Summit and to improve the institutional framework for sustainable development. In December 2012, General Assembly of the United Nations put in place with a decision (67/251) to "strengthen and upgrade" the UN Environment Programme (UNEP) and establish universal membership of its governing body, which "provided a new, fully-representative platform to strengthen the environmental dimension of sustainable development, and provides all governments with an equal voice on the decisions and action needed to support the global environment, and ensure a fairer share of the world's resources for all" (Achim Steiner, United Nations Under-Secretary-General and UNEP Executive Director at the 67th General Assembly of the United Nations, UNEP 2012).

As for UNESCO, a related theme Education for Sustainable Development (ESD) has been put into its agenda. *Agenda 21*was the first international document that identified education as an essential tool for achieving sustainable development and highlighted areas of action for education. In the 2000 UN Summit, the above mentioned Millennium Development Goals (MDGs) which was finally signed by presidents and representatives of 189 countries again puts forward targets for the whole world for sustainable development including protecting environment and improving education for all. With the United Nations General Assembly's declaration of 2005-2014 (UN 2002) the UN Decade of Education for Sustainable Development (DESD) in 2002 (Resolution 57/254), ESD, EFA (Education for All) and UNLD (United Nations Literacy Decade) have become the most important priority components for overall sustainable development in UNESCO's work. And UNESCO has led the Decade and has developed an International Implementation Scheme (UNESCO 2003) for it. In 2012, UNESCO organized the 3rd International Congress on TVET—Transforming TVET: Building skills for work and life in Shanghai and put forward the Shanghai Consensus (UNESCO 2012) which has directed the developing route of ESD globally, including TVET.

As a branch of UNESCO, UNEVOC has also been in positive actions for ESD, for which greening TVET and skills has been a quite important concept for TVET development no matter in developed countries or developing ones. And the concept has been highlighted as a global awareness among the member countries. In the past a few years, UNEVOC has organized various conferences (including the on-line virtual ones), workshops and symposiums to discuss the theme, work out guidance for member countries and so on (UNEVOC 2015), including researches and capacity building activities.

In 2015, a research titled 'Greening TVET & Skills in Asia Pacific Region' has been under implementation led by UNESCO UNEVOC International Centre (Bonn) (UNEVOC International (Bonn)). The objective of it is to collect data and analyze the uptake of green skills in TVET programmes in those fields (construction, agriculture) so as to help educators and policy makers understand the gaps in skills training provision and highlight good practices. As one of the 255 UNEVOC Centres in the world, Shenzhen Polytechnic (SZPT) (one of the best higher TVET colleges in China) was accepted to carry out the fundamental survey for the data and information collection and preliminary analysis of green skills for the regional

research project. And this article presents the contributed results of the survey and the analysis. It is particularly focused on the available legislation and regulation building at the state level, training framework, present status of green skill education in polytechnic and examines the problems exist.

## 2 Survey design, requirements and research methodology

The research design was developed by the UNEVOC International (Bonn) that provided all participating countries with the guidelines including desk research topics and survey instruments. Two survey instruments, one for students, the other for teachers, were developed to map the current situation in terms of greening TVET in formal settings. They were aimed at collecting fundamental data and desk research findings to evaluate participating countries' current policies and status of green skills. At the end of the project, each country provides its report for further analysis of the overall picture of green skill development in the region.

Having got the study task from the UNESCO International (Bonn), Shenzhen Polytechnic started the work immediately. By contacting other two higher TVET institutions in the same province, i.e. Guangdong Construction Vocational Technology Institute and Guangzhou Panyu Polytechnic, 3 teams of teachers and students for the preliminary data collection were formed in the 3 polytechnics. For the survey, various methods were applied, such as document study, web information searching, questionnaire data collection, group discussion, data analysis, information summary, research report and so on. The teachers were asked to fulfill the desk research with document study in teams and complete the teaching staff questionnaire individually. In each institute, a teacher who was good in English language was also requested to provide guidance and help to the students. He/She explained the meaning of each question in the student questionnaire to the students while they were organized together in a classroom to give their personal answers to the questions individually. All the finished materials were scanned or computerized and then sent to Shenzhen Polytechnic for the initial analysis and country report writing.

The pity is that due to time and resource limitation, the sample for this study was not big enough: only 16 surveys from students in 2 polytechnics, 6 surveys from teachers and 3 desk researches from the 3 polytechnics. And all the study just focused on construction and agriculture sectors.

## 3 Survey outcome

### 3.1 The Situation of Greening in China

#### *3.1.1 Academic Concerns of the Theme*

Generally speaking, China's attention to this theme rose up sharply in the new century. By searching with the key words "绿色（green" and "**教育**（education" in China National

Knowledge Infrastructure (CNKI), one of the largest Knowledge Resource Integrated Database in China, the reporter gets a data collection of academic papers and formal reports published on the theme from 1961 to 2015 in China. The annual numbers of the papers from 1961 to 1989 are less than a hundred. And the figure for 2015 is only of the first quarter. Thus only the figures from 1990 to 2014 are applied to work out a trend chart of the research of the theme. The trend indicated in the graph is that the academic papers began to increase in 2000 and rose up sharply for over ten years, reaching the top point recently.

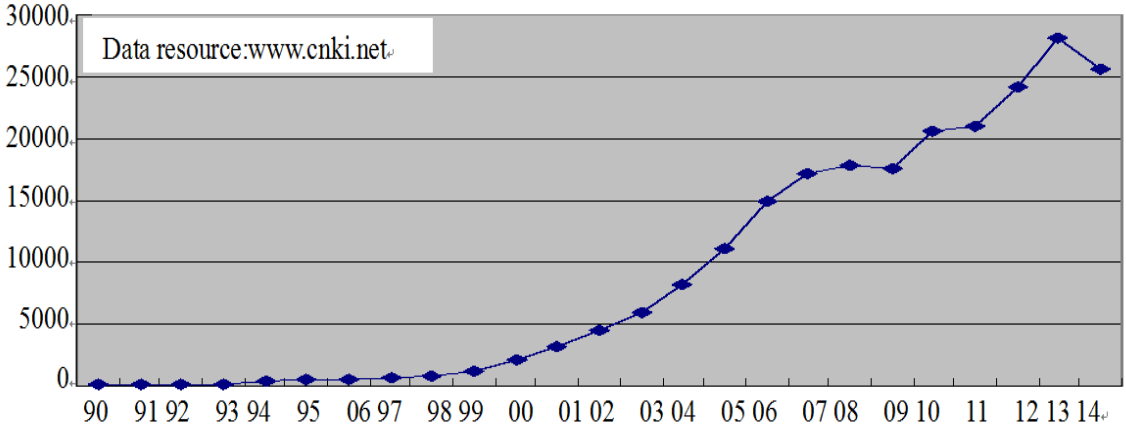


Figure 1: Research Trend of Green Education in China

### *3.1.2 Available Laws and Policies*

Greening and sustainable development has been continually highlighted by the Central Government for decades so as to lead the national development onto a sustainable route. Since 1980s, environment protection has been a national basic strategy. In 1984, China established a National Committee of Environment Protection. In 1989, the first Law of Environment Protection (NPC 1989) was issued. After the 1992 UNESCO Conference on Environment and Development, China became one of the countries firstly made and implemented strategy for sustainable development. In 1993, a Committee of Environment and Resources of Standing Committee of the China National People's Congress was established. In the past two decades, China National People's Congress and State Council have issued numbers of laws, regulations for protecting environment and natural resources. In 2011, six important state ministries at the Central Government level jointly proclaimed an announcement on issuing "National Action Program for Environmental Publicity and Education (2011-2015)" (6 State Bodies 2011) (6 State Bodies indicate the following 6 state ministries: the Ministry of Environmental Protection, the Publicity Department of the Central Committee of the Communist Party of China, the Civilization Office of the Central Committee of the Communist Party of China, the Ministry of Education, the CYL Central Committee and the National Women's Federation.). The announcement stresses that "strengthening of environmental publicity and education, enhancing social awareness of environmental protection need to be placed at an even more important position. Governments on different levels should promote the establishment of an action system for involving people in environmental protection. Prac-

tical work should be carried out for accelerating the construction of resource-saving and environment-friendly society, for upgrading the level of ecological civilization and creating a favorable atmosphere of public opinion and social environment". Provincial and local governments have also put forward over a thousand concerned regulations. By now, China has established its systematic laws and regulations for the protection of environment, natural resources and sustainable growth. In addition, China has also developed several strategic development plans concerned for the sustainable development.

In the field of construction, the China National People's Congress has promulgated 15 laws and regulations concerning with green buildings, such as "Construction Law" (NPC 1997), "Renewable Energy Law" (NPC 2005), "Energy Conservation Law" (NPC 2007a), "Law of Urban and Rural Planning" (NPC 2007b) etc. Central government has also published policies, for example, "Points on Accelerating the Development of Circular Economy" (State Council 2005a), "An Announcement on Recent Work for Building a Resource-saving Society" (State Council 2005b), "Directive Opinion on Constructing Energy & Land-saving Residences and Public Buildings" (MOHURD 2005) "Medium and Long-term Planning for Energy Saving" (National Development and Reform Commission (NDRC) 2004), Announcement on Releasing the Decision on Work Distribution among Sectors for the Implementation of the 12$^{th}$ Five-year Plan for Environment Protection (State Council 2012b) etc.

For a proper systematic development in the field of construction, a rating and labeling system of green buildings has been formed in China based on the researches carried out by Tsinghua University, China Academy of Building Research, Beijing Institute of Architectural Design and Research and other research institutions. In 2007, China Ministry of Construction issued a "Green Building Rating and Labeling Management Method" (Ministry of Construction 2007) and "Technical Details for Green Building Assessment" (MOHURD 2014). They provide criteria and regulation to start the formal assessment of green buildings. In 2008, Ministry of Housing and Urban-Rural Development (MOHURD) further issued "Technical Guidelines for Building Energy Efficiency Evaluation and Labeling" (MOHURD 2008). It requires that buildings need to be evaluated with the relevant standards and technical criteria for energy efficiency and energy consumption and the qualified buildings can be obviously labeled as "Green Building" to the public.

In the field of agriculture, similar efforts have also been made for breaking the challenges in agricultural resources and environment protection, including protection of arable land, conservation and efficient utilization of water resources, efficient controlling of environmental pollution, realization of agricultural ecological renovation. China government works vigorously to promote the optimization and development and strives to achieve by 2020 sustainable development of agriculture and has achieved already initial results as planned. According to a recent report of Xinhua News Agency, the China State Council Executive Meeting has approved in March, 2015 the "National Plan for Sustainable Agricultural Development" (CULCEN 2015). It clearly describes the future direction and aim of agriculture development in China and the concerned work arrangements and requirements. According to the Plan, China will focus on 5 aspects for agricultural development. 1) Efforts will be made to

optimize the development layout, enhance stability of agricultural productivity, promote ecologically circulating development of agriculture, and achieve more than 60% of better agricultural technological contribution rate by 2020. 2) Efforts will be made to guarantee the quantity and quality of stable arable land, and ensure that the whole country has no less than 533 million hectares of high-standard farmland that can ensure stable yields despite drought or excessive rains. 3) Efforts will be made to carry out red line management of water resources, promote water-saving irrigation, expand rain-fed agriculture. The aim is to achieve 0.55 ratio of effective utilization of irrigation water and realize efficient water-saving irrigation to an area of 19.2 million hectares by 2020. 4) Efforts will be made to prevent farmland pollution, comprehensively control cultivation contamination, improve rural environment. The aim is to achieve in main agricultural areas zero growth of chemical fertilizers and pesticides application by 2020, fundamental and comprehensive utilization of cultivation wastes, basic recollection and recycling of agricultural plastic sheeting and pesticide packaging waste, overall utilization of crops straws by 2030. 5) Efforts will be made to renovate agricultural ecology, enhance ecological functions. The aim is to realize over 23% of forest coverage rate and 56% of national comprehensive vegetation coverage of grassland by 2020 (National Plan for Sustainable Agricultural Development (2015-2030), 2015).

### *3.1.3 Strategic Targets and International Contribution*

In planning and targeting perspectives, the Chinese Central Government has been making continuing efforts to promote the concept of greening and sustainable development all over China in all sectors. And it has also set very high strategic targets for both domestic promotion and for international contribution.

President Xi Jinping of China declared together with President Barack Hussein Obama of the USA during Xi's visit to the USA in last September that both of them will support the implementation of Sino-US Joint Statement on Climate Change signed in Nov. 12$^{th}$, 2014. In the bilateral agreement, China promises based on the figures of 2005 to decrease 60% -65% of carbon dioxide emissions per unit of GDP and to have forest stock volume increase about 4.5 billion $M^3$ by 2030. China is planning to launch a nationwide carbon emission trading system in 2017, which will cover steel, electricity, chemical industries, building materials, paper making and non-ferrous metals and other key industries. China pledges to promote low-carbon buildings and green transportation. The targets are:

- to have 50% of the newly constructed buildings as green buildings by 2020 in cities and towns,
- to achieve 30% of motorized public transportation of all mobilized movement in metropolitans and middle sized cities,
- to complete the next phase of the truck vehicle fuel efficiency standards by 2016 and put into effect by 2019,

- to support and accelerate continually the reduction of utilizing hydro fluorocarbons, including the 2020 effective control tri-fluoromethane (HFC-23) emissions (CULCEN 2015).

For promoting global sustainable development, China decides to offer RMB 20 billion *yuan* to establish a "China Fund for South-South Cooperation in Coping with Climate Changes" to support other developing countries in dealing with climate changes, including enhancing their ability of utilizing the green climate funds (People.com 2015).

By now, China has established 6 provincial and 36 municipal low carbon experimental sites (CULCEN 2015). That is to say all provincial territories expect Hunan, Ningxia, Tibet and Qinghai have at least one low carbon experimental cities or towns. In other words, low carbon city experiment has been implemented all over China (CULCEN 2015).

To carry out work according to the legislation and government requirements, the concerned sectors have also their own corresponding organizations, development plans and strategies for the set aims and sustainable development. Take construction for example, specified organizations, such as Science and Technology and Industrialization Development Center of MOHURD, China Green Building Council (China GBC), China Association of Building Energy Efficiency (CABEE), Specialized Research Committee of Eco-cities etc. (One may refer to the following concerned websites of these organizations: http://www.cstcmoc.org.cn/, http://www.chinagb.net/, http://www.cabee.org/, http://www.cityup.org/chinaecoc/.) They have been quite active in pushing forward the development of green construction. In 2013, the MOHURD issued the Action Plan for Green Buildings (MOHURD 2013). It sets the tasks to have 20% of new constructed buildings in towns and cities meet the green construction criteria by the end of 2015 and to realize basically energy conservation renovation of the worthwhile buildings in towns and cities in the north heating areas by the end of 2020. In Guangdong province, its Provincial 12th 5-Year Plan for Construction Energy Conservation (Department of Housing And Urban-rural Development of Guangdong Province 2011) sets the task to have 99.5% energy efficiency standards for the new green buildings be reached, apply the new green building standards in all large-scale invested newly constructed public buildings, government offices, schools, stadiums, other public welfare facilities, all new buildings in Guangzhou and Shenzhen. In the period, Guangdong Province will build 4 more green eco-cities, give more efforts in training of green ecological buildings and push forward implementation of green building assessment system and standards. Based on researches and practices, industrialization, standardization and industrialized and structured products have been the natural genes of green buildings. They have become kernel elements of the green building industry nowadays.

For agricultural development, the tasks for these years are mainly of two according the China National Development Plan for Modern Agriculture proclaimed by the State Council in 2012:

1) By the end of 2015, development of modern agriculture should have significant progress. The supply of grain and other major agricultural products are effectively guaranteed. The

structure of agriculture becomes more reasonable while the level of concerned materials and equipments obviously upgraded and technology supporting capacity is significantly enhanced. Based on these, agricultural production and management will be constantly optimized so as to have the agricultural production system perfectly industrialized, land productivity, labor productivity and resource utilization significantly improved and to have the eastern coastal areas, suburbs of big cities and large agricultural pioneer areas realize basically modern agriculture.

2) In perspective of 2020, development of modern agriculture will have breakthrough results. A new agriculture sector will be formed basically with advanced technology and equipment, optimized organization, perfect system of production, powerful logistical supply support. And such agriculture can produce comprehensive outcomes and benefits. Meanwhile, modernization of agriculture will be realized in major advanced agricultural product areas.

#### *3.1.4 Concerned Training Organizations*

All these policies and strategic plans, of course, bring about a lot of changes in jobs, working requirements, needed skills and training requests. For these changes and training needs, different sectors have established their own training bodies and organizations to provide up-to-date concept and concerned technical trainings. For example in construction sector, there are National Mayor Training Institute (Institute of Caders, MOHURD), China Design and Research Institute of Architecture Standards, Science and Technology Development Promotion Center of MOHURD, Human Resource Development Center of MOHURD, Qualification Registration Center of MOHURD, Research Institute of Standards and Norms of MOHURD (and related institutes for standards compiling ) etc. In agriculture sector, there are Training Department of Central Agricultural Broadcasting and Television School, Institute of Management Cadres of Ministry of Agriculture, Education and Training Department of China Agricultural Society, Research Institute of Agricultural Information of Chinese Academy of Agricultural Sciences, Nanjing Research Institute of Mechanization of Ministry of Agriculture, Education and Training Department of Human Resources Development Center of Ministry of Agriculture, Fruit Tree Research Institute of Chinese Academy of Agricultural Sciences. Of course they are only small part of such training institutions all over China. In addition, TVET schools and higher polytechnics certainly have the responsibility as well to be important bases for greening education and training.

### 3.2 Outcome of the Preliminary Questionnaire Analysis

#### *3.2.1 Understanding and Feedback from the Teachers*

The collected data with the questionnaire for teaching staff indicate that teachers have been strongly influenced by national environmental regulations and government initiatives in establishing green targets for the economy and in greening training standards. Correspondingly, local communities and industries and even educational institutions have also put for-

ward their related regulations and require concerned changes, which enhance the influence of the national policies and regulations. Comparatively, the influence of international regulations in China is no stronger than the national, government, local and industrial ones. This matches with the character of Chinese government and people.

The answers to question 36 in the Teaching Staff Questionnaire ("36. In terms of Green Economic Transitions, what motivated the changes in your programs/ courses over the last two years?") tell us that some teachers here in the polytechnics are making changes in their programmes/courses accordingly due to practical green economic transitions in daily life, such as there are more energy from renewable sources, more products and services that increase energy efficiency, more processes that reduce/remove pollution and greenhouse gas emissions and transfer to recycling and reusing, that conserve natural resources etc. These changes are based on teachers' close connecting with industry and professional associations and even some private enterprises. These changes are usually reflected in some "general" subjects and some "specialized" subjects by providing students some concepts and middle and even low level skills. Motivated by these changes, some teachers are in action themselves. The following are the two cases happening in Shenzhen Polytechnic (SZPT).

**Case 1: Embedding Greening in Course with the National Sector Criteria**

*The School of Media and Communication, SZPT, is the institute where set the Chinese Sub-Committee of Technology for Printing Books and Magazines, Sub-Committee of Technology for Package Printing under the Chinese National Committee of Printing Technology Standardization. Two deans of the School are Chief Secretaries of the two sub-Committees respectively. They have led the drafting of the two very important greeting criteria for the sector in recent years, i.e.* ***Green printing-Terms and Green printing-General Technical Requirements & Assessment Methods--Part 1: Planographic Printing*** *which were formally published on April 14th, 2015 by the China State Administration of Press, Publication, Radio, Film and Television. (SAPPRFT 2015) Based on these and other concerned criteria for the printing sector, the School has embedded the criteria in its module named "Standardization and Quality Assessing Techniques for Printing" (SZPT Module No. 50452028) introducing to the students the national and international criteria for the sector and the concerned assessing skills. Based on this, they are going to develop a new module named "Introduction of Standardization" from next semester on.*

**Case 2: Study Greening and Bring Changes in Instructing Modules of Exhibition Design**

*A group of art teachers in SZPT has been considering greening in their instruction of graphic design since 2007[34]. Later during 2011-2012, one of them went to USA for a visiting scholar year when he noticed a textbook titled* ***"Okala Ecological Design" (2004 Edition).*** *The book has been edited by a group of ecological art designers and has been recommended by USA Association for Industrial Design. At present, more than a hundred art specialties in USA higher education institutions are applying the book for their education of product design, construction interior design, graphic design and so on. In addition, the teacher also found another closely related book titled* ***"Okala Practitioner, Integrating Ecological Design" (2013 Edition)****. After being back to SZPT, the teacher organized his team to study the two books and they have absorbed the kernel concepts in the books while improving their consideration and practice for embedding greening in their instruction of art design. At present, they have formulated their own teaching model for embedding greening concept in their classroom teaching, i.e. input of concepts for sustainable design→specialty instruction→output of sustainable design results. They try firstly to embed "low carbon sustainable recycling design" in their teaching hypothesis and teaching principles for delivering their two closely related modules, i.e. Practice of Exhibition Design and Systematic Design of Exhibition Stands. They emphasize the input "low carbon sustainable recycling" and "innovative design programmes" in classroom so as to help the students keep in mind greening concepts and output satisfactory results. Their changes and practices have already been summarized in the published academic papers.* (Xiong Taotao, *et. al*. 2007, 2012, 2013a, 2013b, 2014, 2015)

Proudly speaking, the impact of these changes has already reflected the students, such as their employability, self-employment, and advancing the students' skills for protecting environment. In addition, the changes promote the students for life-long learning and low-carbon transition. The teachers all agree (including strongly agree and agree) such a change brings about cognitive competence improvement among the students, including all 9 aspects listed in question 56 as follows.

| Question 56 | |
|---|---|
| 1. | *Environmental awareness and willingness to learn about sustainable development* |
| 2. | *Systems and risk analysis skills to assess, interpret, and understand both the need for change and the measures required* |
| 3. | *Innovation skills to identify opportunities and create new strategies to respond to green challenges* |
| 4. | *How to be a part of the solution* |
| 5. | *How to think about things differently* |
| 6. | *How to be aware of the habits in what you do and think* |
| 7. | *How to deal with complexity* |
| 8. | *How everything is connected* |
| 9. | *How to judge the truth of a matter* |

In addition, changes also give the students some improvement in their technological skills, such as item 1, 2, 4, 5, 6, 7, 8, and 11 listed in Question 58 as follows.

| Question 58 |
|---|
| *1. Quantification and monitoring of either waste, energy or water* |
| *2. Management systems of either waste, energy, water* |
| *3. Selection and acquisition of goods and services from external sources that are appropriate in terms of quality and environmental impact* × |
| *4. Material use and impact quantification* |
| *5. Impact assessment* |
| *6. Minimisation of environmental impact* |
| *7. Minimisation of materials used* |
| *8. What can be recycled* |
| *9. Environmental laws and regulations* × |
| *10. Environmental risk management* × |
| *11. How learnt skills contribute to greening of industry* |

Upgrading of interpersonal and intrapersonal competence, including all items except 2) in the list of question 60, is also achieved though the changes. Greening education has led the students to conserve water, power, fuel, to sort waste, follow safe working methods and so on.

| Question 60 |
|---|
| *1. Strategic and leadership skills to enable change* |
| *2. Coordination, management and business skills to develop approaches that encompass economic objectives* × |
| *3. Coordination, management and business skills to develop approaches that encompass social objectives* |
| *4. Coordination, management and business skills to develop approaches that encompass ecological objectives* |
| *5. Communication and negotiation skills to discuss conflicting interests in complex contexts* |
| *6. Marketing skills to promote greener products and services* |
| *7. Networking, IT and language skills to enable participation in global markets* |
| *8. Consulting skills to advise consumers about green solutions and to spread the use of green technologies* |

### *3.2.2 Understanding and Feedback from the Students*

The outcome of the Student Questionnaire can be summarized as the following.

1) Channels for students to learn greening skills are three, i.e. in general subjects, specialized subjects and industry placement during courses.

2) Students have improved their cognitive, technological, interpersonal and intrapersonal competences through the learning. All the improvement items in question 20 (cognitive) and 22 (technological) (see the following Question lists) are recognized except "how to judge the truth of a matter" and "environment risk management" getting only low support. Similarly, students have improved their intrapersonal competences quite a lot for the items in question 26 and 27 are completely supported. Students think that the green learn-

ing helps them in life. Comparatively speaking, benefit is smaller in interpersonal competences improvement for only 5 out of 8 items get 2/3 students' support even though all 8 items win support from more than 1/2 of the students. In this aspect, the most accepted benefit is that it help the students to learn "strategic and leadership skills to enable change".

| Question 20 | SA | A | Ud | D | SD |
|---|---|---|---|---|---|
| *Environmental awareness and willingness to learn about sustainable development* | 1 | 10 | 5 | 1 | 0 |
| *Systems and risk analysis skills to assess, interpret, and understand both the need for change and the measures required* | 3 | 10 | 3 | 1 | 0 |
| *Innovation skills to identify opportunities and create new strategies to respond to green challenges* | 2 | 13 | 1 | 1 | 0 |
| *How to be a part of the Solution* | 2 | 15 | 0 | 0 | 0 |
| *How to think about things differently* | 2 | 10 | 2 | 3 | 0 |
| *How to be aware of the habits in what you do and think* | 1 | 9 | 6 | 0 | 1 |
| *How to deal with complexity* | 3 | 7 | 7 | 0 | 0 |
| *How everything is connected* | 3 | 5 | 8 | 1 | 0 |
| *How to judge the truth of a Matter* | 1 | 10 | 5 | 1 | 0 |

Note: *SA :Strongly agree; A: Agree; Ud: Undecided; D: Disagree; SD: Strongly disagree*

| Question 22 | SA | A | Ud | D | SD |
|---|---|---|---|---|---|
| *Quantification and monitoring of either waste, energy or water* | 4 | 8 | 1 | 2 | 0 |
| *Management systems of either waste, energy, water* | 4 | 8 | 1 | 2 | 0 |
| *Selection and acquisition of goods and services from external sources that are appropriate in terms of quality and environmental impact* | 2 | 7 | 3 | 3 | 0 |
| *Material use and impact quantification* | 3 | 6 | 3 | 3 | 0 |
| *Impact assessment* | 3 | 6 | 4 | 2 | 0 |
| *Minimisation of environmental impact* | 6 | 7 | 0 | 2 | 0 |
| *Minimisation of materials used* | 3 | 7 | 3 | 2 | 0 |
| *What can be recycled* | 6 | 8 | 1 | 0 | 0 |
| *Environmental laws and regulations* | 3 | 9 | 1 | 2 | 0 |
| *Environmental risk management* | 4 | 3 | 6 | 2 | 0 |
| *How learnt skills contribute to greening of industry* | 3 | 8 | 3 | 1 | 0 |

Note: *SA :Strongly agree; A: Agree; Ud: Undecided; D: Disagree; SD: Strongly disagree*

| Question 26 | SA | A | Ud | D | SD |
|---|---|---|---|---|---|
| *Adaptability and transferable skills to enable workers to learn and apply the new technologies and processes required to green their jobs* | 3 | 10 | 0 | 1 | 0 |
| *Entrepreneurial skills to seize the opportunities of lowcarbon technologies* | 6 | 6 | 1 | 1 | 0 |

Note: *SA :Strongly agree; A: Agree; Ud: Undecided; D: Disagree; SD: Strongly disagree*

| Question 27 | SA | A | Ud | D | SD |
|---|---|---|---|---|---|
| *To conserve water* | 8 | 7 | 1 | 0 | 0 |
| *To conserve power* | 7 | 7 | 1 | 1 | 0 |
| *To conserve fuel* | 8 | 7 | 0 | 0 | 0 |
| *To sort waste* | 8 | 8 | 0 | 0 | 0 |
| *To follow safe working methods* | 6 | 7 | 3 | 0 | 0 |
| *To suggest better ways to do things* | 7 | 7 | 2 | 0 | 0 |
| *To follow procedures and instructions* | 2 | 13 | 1 | 0 | 0 |
| *To meet the requirements of the environmental regulations* | 3 | 11 | 2 | 0 | 0 |

Note: *SA: Strongly agree; A: Agree; Ud: Undecided; D: Disagree; SD: Strongly disagree*

3) Students have widely accepted green concept and begin to influence their daily behaviors. They have accepted environment protection as a basic standard for their behaviour. Yet the major obstacles in front of them for learning more green skills are the following, the greening content is not included in curriculum, teachers' weak awareness and confidence in environment issues, people's weak interests in the issue in workplace. All of them have weakened the student interest and efforts in greening development.

4) Suggestions for the students to develop further environment skills in the questionnaire, i.e. items in question 44-51 are widely accepted by the students.

### *3.2.3 Summary of the Questionnaire Analysis*

The above preliminary questionnaire analysis results are just based on a small number of samples. They may just reflect a corner of green education in higher TVET institutions in China. We all know that the most difficult things for greening is to carry out practical and efficient work for achieving the aims bit by bit steadily. Changing people's awareness of greening, involving massive people to offer their own contributions for greening development are the kernel. In China, a proper environment for greening education has not been satisfactory yet. For the answers in Section 4 of the Teaching Staff Questionnaire show us that no means are available at the institutional level for certifying environmental skills in existing qualification standards, no assessment mechanisms and no proper curriculum at present. School administrations have not taken the development of "green attitude" as an initiative for their staff. And teachers themselves have not taken greening as an important content for their students. They even think that they have no time for greening education. In addition, they themselves are lack of corresponding skills and are not confident in carrying out greening education. Greening training of the teachers is mainly depended on teachers themselves by mentoring of more experienced teachers and on-line courses although some professional associations, skill councils bring them some hopes by providing some concerned training, workshops and in-house seminars.

## 4 Conclusion

China is a country that development goes through a top to bottom processing format. In the past 2 decades, Chinese government has given quite a lot of efforts in leading the whole country to a green economy and society development route. And systematic legislation and regulations have established and all sectors have been following up with various actions, development plans and implementations and so on. Great achievement has been made while quite a lot of problems still exist.

Through this survey, the positive development in greening perspective can be summarized as the following points.

1) Chinese government is quite keen on greening and has put it into its kernel working agenda for development while providing very strong support for it. In order to guarantee the greening for overall social and economic development, Chinese congress and government systems have issued series of laws, regulations and principles to regulate and promote the developing process. In addition, China has already set very high aims for greening and sustainable development and promised to the international world that it will achieve the results as scheduled while China participates and contributes quite a lot in international cooperation for sustainable development.

2) There are corresponding training systems to meet the needs for greening training in production sectors. Construction and agriculture, as examples, have their own production criteria for greening and sustainable development, which are of the key contents in the training systems. And the greening and sustainable promotion is in rapid developing route nowadays.

3) In education sector, teachers and students have the awareness of greening more or less. They have recognized the impact of green education for students' overall development, including interpersonal and intrapersonal competence, their employability, skills for protecting environment, their awareness of life-long learning and low-carbon transition. Some teachers are actively studying the greening concepts and international movement and are trying to embed greening contents in their instructions.

Yet, there are still many problems existing for the greening development, especially in education sector. This survey tells us that education needs to offer more efforts in greening development comparing with production sectors. Firstly, TVET institutions and schools need to modify their understanding of greening and their role in greening development. They should take the responsibility more actively of pushing forward the training of green skills and concepts among all teachers while cooperating with industrial sectors and external providers. Secondly, TVET institutions and schools need to take greening development as a part of their campus culture although they have followed government requirements and have done a lot. They need to root green concepts in students' mind through lectures, presentations, discussions, promoting activities, experience exchange and so on. Thirdly, more practical and appli-

cable researches need to be emphasized so as to provide hypothesis and suggestions for curriculum development, skill training, work placement and campus activities.

As everyone knows, China is a vast country with unbalanced economy and social development from north to south and from east to west. The above mentioned perspective of the future requires quite a lot of practical work to be carried out. It is not too difficult to make policies, plans and working strategies. The difficult things, in deed, are to carry out practical and efficient work for achieving the aims bit by bit steadily, to change people's awareness of greening, to involve massive people to offer their own contributions for greening development.

Greening development is a career for majority of people, especially for production sectors and educators. We still have a long way to go and more efforts should be offered jointly both nationally and internationally.

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