

Educational initiatives

Development of green campus in China

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ABSTRACT

The higher education is experiencing a rapid development in China, with the sharp increase of energy use and the low level of campus facility operation. Meanwhile, with the responsibility for knowledge transformation, sci-tech talents cultivation and technical innovation, universities are of great importance in the development of the sustainable society. The initiative of green campus has attracted great attention from both the society and the universities themselves. Therefore, it is very meaningful to get a full understanding of the current status of green campus development in China, and make the feasibility planning for the next step on this base. In this paper, the progress of green campus development in China is summarized, including all the initiatives to conduct the energy and resource efficient campus, and the current status of upgrading the energy and resource efficient campus to the green campus; the problems occurred during the development are analyzed, and the possible approaches and the action plan are explored accordingly, to promote the green campus development. It is found from the analysis that the development of energy and resource efficient campus has been expanded in a large scale in China, mainly aiming at the energy efficient technology application and campus energy management, and all these initiatives are strongly promoted by the national government with policy support and financial funding. With these great endeavors, an upgrade from the energy and resource efficient campus to the green campus is on progress, which expands its scope to sustainable education and the initiative of low-carbon life on campus. However, many problems also occurred during the progress, such as the lack of a good top-level design among different national ministries and the collaborative innovation among different departments in the university, and the need of a practical propulsion mode and a long-term mechanism to guarantee green campus development. Hence, some suggestions are made in terms of the administrative management, propulsion approach, evaluation standard, and action plan.

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1. Introduction

The higher education in China has achieved rapid growth. As shown in Fig. 1, by the end of 2011, there are a total of 2409 universities and colleges in China with 24.26 million students. The total floor area of campus buildings amounts to 780.76 million m², which is more than five times of that in 1998 (MoE, 2012). According to the statistics, annual total energy consumption in universities and colleges is nearly reaching 30 million tons of standard coal, and annual water consumption is nearly 4 million tons in China. The energy consumption per student and water

consumption per student are four times and two times as large as that of Chinese residents respectively (National Bureau of Statistics of China, 2009; Yuan et al., 2013). Under the background of the adjustment of social economy structure and the transformation of industrial production structure, the ratio of energy use in Chinese universities and colleges to the total national energy use becomes larger and larger, which attracts great social attention. Meanwhile, as the base of knowledge transformation, sci-tech talents cultivation and technical innovation, it is very significant to promote campus ecological civilization and to endow the universities a great duty of leading the sustainable development of society.

In 2007 the first demonstration project of energy and resource efficient campus was set up in Tongji University. This initiative drives a big batch of Chinese universities to build energy and resource efficient campus. The construction of the campus energy management system (CEMS) has become an important approach

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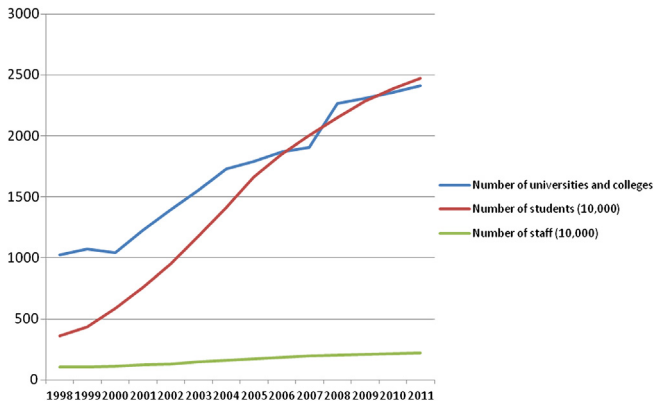


Fig. 1. Developments of Chinese universities 1998–2011.

associated with eco-tech application and green education for energy and resource efficient campus. So far, more than 200 universities and colleges have been funded to build the CEMS, jointly boosted by the Ministry of Housing and Urban–Rural Development, the Ministry of Education and the Ministry of Finance. Among them, more than 30 universities and colleges have established their CEMS, and successfully passed the acceptance tests. Great achievements and experiences were gained from this initiative, and hence it was highly regarded by the United Nations Environment Programme, the related international alliances for sustainable developments, and the domestic and foreign higher education institutions.

The work of green campus in foreign countries more focuses on spreading the idea, publicity and education. As early as in 1972, the conception of green school was put forward in the Stockholm Conference on the Human Environment, asking for the attention on the education of environment protection (Xu, 2010). In 1990, over 300 university administrators in over 40 countries have signed the Talloires Declaration, a 10-point action plan for incorporating sustainability and environmental literacy in teaching, research, operations and outreach at colleges and universities (ULSF, 2013; Habib and Ismaila, 2008). In 1992, the UN conference on Environment and Development was held in Rio, Brazil. In 1994, UNESCO put forward that the concept of sustainable development should be integrated in the education, and conducted the EPD (Education for Environment population and Sustainable Development) project, which aimed to accelerate the environment improvement, population quality uplift and social sustainable development, by the environment education, population education and sustainability education of adolescent and the whole society (Xu, 2010). The increasing importance of declarations and conferences, for fostering transformative sustainable development is evidenced by more and more university leaders who ratified their commitments to work to enhance sustainable development education and research (Calder and Clugston, 2003; Cole and Wright, 2005). For instance, some American universities launched the Non-Profit Organization of C2E2 (The Campus Consortium for Environmental Excellence) for the purpose of sustainability-oriented education and publicity (Xu, 2010). The Australian National University also set its sustainability targets and implementation strategies to guide environmental management to 2015 and beyond, including the initiatives in environment protection, education and student engagement and so on (Australian National University, 2009). Compared with the foreign mode in which the foreign universities spontaneously pay more focuses on the idea spread, publicity and education, and have relatively weak enforcement of energy efficient technology application projects, the green campus development in China begun

with the eco-technology demonstration and facility energy management with strong enforcement from the government, and this leads to deal with concrete matters related to energy and resource efficient campus, and then more fields are gradually covered, and this finally promotes the upgrading from the energy and resource efficient campus to green campus. It is a step-by-step progress from the concept to the practice and from several demonstrations to the popularization on the whole campus, and may involve more people and work processes on campus. It takes the campus energy management as the start point, and put the green concept and technology into the construction and operation of campus facilities. An effective CEMS with energy and resource consumption monitoring tool for all buildings on campus has been set up and given a powerful support for energy audit and energy efficient retrofit. Complete institutions have been worked out to guarantee these initiatives. Finally green education, green research, and green campus culture are involved besides the energy and resource conservation.

In this paper, the progress and trend of green campus development in China were summarized, and aiming at the current status, especially the existing problems, some practical approaches on how to boost green campus development are put forward.

2. Progress of campus development in China

The green campus development can be tracked back to 1990s, and it takes nearly two decades from the beginning of green school advocacy, to the energy and resource efficient campus development, to the current green campus development, as shown in Fig. 2. In 1996, the State Environmental Protection Administration, the Ministry of Education and the Propaganda Department of CPC Central Committee jointly promulgated the “Action Outline of National Environmental Publicity and Education (1996–2010)”, and put forward to the activities that till 2000, the country gradually carried out the creation of ‘green schools’, which mainly aimed at primary and secondary schools.

Beginning at the unprecedented merger of institutions and enrollment in 1990s, the campus infrastructure construction presented the climax in China. During the formation of “Education for Sustainable Development” concept in the international, many problems were occurred during the campus construction in China, like the campus unconventional scale expansion, oversized land use, commercialized landscape and luxury building, which got serious attention from the society.

The Ministry of Education issued the “Circular of the Ministry of Education on carrying out the spirit of the State Council to focus on the near future key work of building a conservation-oriented society” (Education [2005] No. 19). Later in 2006, the Ministry of Education issued a notice on the construction of resource efficient schools (Education [2006] No. 3).

In 21st century, the universities in China have started their active exploration within the context of the international community highly concerned environmental issues. The concept of green university emerged in the theory of university operation based on the concept of sustainable development, and all the work in universities should be organized and implemented from the perspective of long-term sustainability of the university. The scope and definition of green university was put forward at this stage, but the concept is too broad and macro. Moreover, there was lack of detailed target on how to realize the green university, and the concrete measures were not figured out as well. Therefore, it mostly remained in the advocacy level of green concept.

China has strengthened the building energy conservation work since 2006, which was a critical period of the “Eleventh Five-Year plan” of national economy development. In 2007, Tongji

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