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# Campus sustainability in Chinese higher education institutions

## Focuses, motivations and challenges

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### Abstract

**Purpose** – The purpose of this paper is to examine the focuses, motivations and challenges of achieving campus sustainability in Chinese higher education institutions (HEIs).

**Design/methodology/approach** – A multisite case study was conducted in Changchun City, Jilin, where eight HEIs of various types were examined. Structured interviews with school managers, students and government officials were accompanied with analysis of relevant documents.

**Findings** – The focuses of sustainability among the studied HEIs were on water and energy conservation and on non-technical initiatives. The focuses can be explained by motivations and challenges. The HEIs are motivated by government and financial pressures and face challenges in limited accessibility to funding. The reliance of non-technical initiatives has negatively impacted student welfare and has become unpopular among students.

**Practical implications** – The government is advised to increase funding to HEIs in relation to sustainability and to make the funding more equitable. The HEIs are advised to modify sustainability practices that severely affect the daily lives of students, to share the benefits of water and energy conservation with their students and to involve students in sustainability governance.

**Originality/value** – This paper adds to the existing literature in two ways. First, it expands the geographical reach of the literature to developing countries, in general, and to China, in particular. Second, it adopts the multisite case study research approach to study the whole spectrum of Chinese HEIs and highlights the differences among these HEIs when it comes to sustainability.

**Keywords** China, Sustainability, Energy conservation, Campus sustainability, Higher education institutions, Water conservation

**Paper type** Research paper

### 1. Introduction

Higher education institutions (HEIs) around the world have become engaged in sustainable practices, and a small but growing body of literature has investigated this trend. These studies have primarily focused on case studies of HEIs in developed countries, such as the USA (Emanuel and Adams, 2011; James and Card, 2011; Button, 2009), Canada (Helferty and Clarke, 2009; Brinkhurst *et al.*, 2011) and Australia (Atherton and Giurco, 2011). Taken together, the literature posits that campus sustainability is a complex process with multiple stakeholders, pathways, mechanisms and objectives.

This paper examines the progress toward sustainability in Chinese HEIs with a focus on the actions, motivations and challenges. The work adds to the existing literature in two ways. First, it expands the geographical reach of the literature to developing countries, in general, and to China, in particular. To the best of my knowledge, sustainability in Chinese HEIs has not been studied systematically, despite the fact that China has by far the largest higher education system in the world. According to the latest figures, there are 2,409 regular HEIs (of which 698 are private) and 353 adult HEIs, with a total enrollment of approximately 32 million students (National Bureau of Statistics, 2011). Second, it adopts the multisite case study research approach. Compared to the single site case study approach, the multisite approach has the advantages of enhancing the generalizability of findings and, more importantly, capturing the phenomenon in all its various dimensions (Sharp *et al.*, 2012; Heimer, 2006). Instead of focusing on one institution, this study covers the whole spectrum of Chinese HEIs and notes the differences among these HEIs when it comes to sustainability.

To ensure clarity and consistency, the term sustainability is defined. Next, the eight studied HEIs are introduced and currently sustainability efforts at these HEIs are discussed. Motivations for and challenges of campus sustainability are analyzed. Finally, the results of this study are compared to international experiences and the implications of the findings are discussed.

## 2. Defining sustainability

Sustainability derives from the French word *soutenir* meaning to “hold up or support” (Bender *et al.*, 2012). It is, thus, a temporal concept describing the continuation of something over an extended period. According to Heinberg (2007), the concept of sustainability first emerged in the area of nature resource management, particularly in forestry, where the concept was used to denote a pathway to deal with the threats of imminent collapse in the industry (e.g. sustained yield forestry). Sustainability has since become more holistic, eventually being used in the context of a complex global system that incorporates both human and non-human systems (Bender *et al.*, 2012). Theoretically, sustainability can incorporate an endless list of systems, although in practice the economic, social and environmental pillars – the so-called triple-bottom line sustainability – are often used as a benchmark of sustainability (Cam, 2013). Sustainability, then, is about how these systems can coexist and continue indefinitely. Applying the concept of sustainability to the context of HEIs is challenging. One working definition was provided in the Sustainable Endowments Institute’s College Sustainability Report Card and had four pillars:

- (1) ecological (food and recycling, green building and transportation);
- (2) economic/financial (endowment transparency and investment priorities);
- (3) institutional (administration, student involvement and shareholder engagement); and
- (4) energetic (climate change and energy).

Alternatively, Sustainability Smarts (Association of College Unions International, 2011) offers a definition that is much closer to the triple bottom line concept: environmental (recycling, building green, community garden and clean energy), economic (green investment) and social (student leadership, community outreach).

### 3. Method

This study adopted a multisite case study approach. Fieldwork was conducted in Changchun City, which is the provincial capital of Jilin Province, from March to August 2012. Changchun City was selected because of its large number of HEIs and the presence of a contact. Information was obtained through interviews with HEI managers, students and relevant government officials and through document analysis. The selection of HEIs was conducted with the aim of covering the diversity of HEIs in China. There are four types of HEIs in China as characterized by their administrative structure. The first type is central-level HEIs. These HEIs are placed under direct control of the central government's Ministry of Education. They are usually part of the prestigious Project 985 and Project 211, which offer substantial amounts of funding (Zhang *et al.*, 2012), and are considered the top-tier universities in China. The second type is provincial-level HEIs. These HEIs are under the control of provincial governments. This is the largest group of HEIs and is comprised of smaller, less prestigious and less well-funded local universities and three-year vocational colleges. The third group is private HEIs. These schools are fully privately owned and are usually for-profit. Private HEIs in China face serious challenges, including policy inconsistencies, perceived low quality and low reputation (Lei, 2012; Li and Morgan, 2011). The fourth group is independent HEIs. These schools are managed through partnerships between the public and private sectors. Private and independent HEIs do not receive funding from the government and, thus, usually charge higher tuition fees. Theoretically, both private and independent HEIs are autonomous from the government; however, independent HEIs are still subjected to extensive government control, in practice (Zhang, 2011).

Based on the classification of HEIs, two central-level HEIs, four provincial-level HEIs, one private HEI and one independent HEI were selected for this study. Jilin University (JU) is a central-level super-sized HEI with multiple campuses, almost 70,000 full-time students and a strong national reputation. Northeast Normal University (NENU) is also a central-level HEI, but it is much smaller and has a focus on humanities in general and pedagogy in particular. It is also known for its large body of foreign students learning the Chinese language. Changchun University of Science and Technology (CUST) is a high-ranking provincial-level HEI with a focus on engineering. Changchun Institute of Technology (CCIT) is also engineering-focused, but it is smaller and relatively poorly resourced. Jilin University of Finance and Economics (JLUF) is a leading provincial institution in finance, economics, business and taxation studies. The school has recently moved to a new campus and, therefore, enjoys better facilities than the other HEIs in the city. Changchun Vocational Institute of Technology (CVIT) is a three-year vocational college and is relatively poorly resourced. The College of Humanities and Sciences of Northeast Normal University (CHS) is an independent school that was co-established by NENU and private companies. Finally, Jilin Huaqiao Foreign Languages Institute (JHFLI) is a well-established, relatively well-resourced and reputable private HEI specializing in humanities, especially foreign language education. Table I lists the selected HEIs and their basic characteristics.

### 4. Focuses of sustainability: water and energy conservation

Sustainability is a multifaceted and ambiguous concept, and it is unavoidable that large and complex organizations such as HEIs often need to operationalize the concept by narrowing it down to several manageable focuses (Krizek *et al.*, 2012). Additionally,

| Institution | Gross footprint area (million m <sup>2</sup> ) | Full-time student | Full-time teachers | Administration type | Specialization    |
|-------------|--|-------------------|--------------------|---------------------|-------------------|
| JU          | 3.38   | 68,132            | 17,104             | Central             | General           |
| NENU        | 0.73   | 24,887            | 1,554              | Central             | Pedagogy          |
| CUST        | 0.64   | 16,242            | 1,302              | Provincial          | Engineering       |
| CCIT        | 0.46   | 13,500            | 769                | Provincial          | Engineering       |
| JLUFE       | 0.35   | 12,694            | 680                | Provincial          | Finance/Economics |
| CVIT        | 0.25   | 7,300             | unknown            | Provincial          | Vocation          |
| CHS         | 0.26   | 10,800            | 640                | Independent         | Humanities        |
| JHFLI       | 0.21   | 7,936             | 456                | Private             | Language          |

**Table I.**  
Eight studied HEIs  
and their  
characteristics

HEIs are likely to have different focuses, depending on both local and international factors. For example, through reviewing sustainability reports, [Fonseca et al. \(2011\)](#) found that Canadian HEIs emphasized eco-efficiency and green architecture. In contrast, [Atherton and Giurco \(2011\)](#) documented through their case study that Australia was advancing campus sustainability through three strategies: climate change mitigation, transport and paper reduction. Based on an analysis of the quantity, intensity and impacts of actions, as well as the interviews conducted with school managers, I found that the sustainability agenda of the eight studied HEIs is dominated by concerns over water and energy consumption. The reasons for these focuses will be explored in the next section when I consider the motivation of sustainability practices. The aim of this section is to analyze the sustainability initiatives adopted by the HEIs, conceptualizing them into technical and non-technical initiatives. The key difference between technical and non-technical initiatives is that technical initiatives primarily involve upgrading technologies (e.g. installing solar panels), whereas non-technical initiatives primarily target behavior changes (e.g. sustainability education).

#### 4.1 Non-technical water and energy conservation initiatives

The eight HEIs share a high level of similarity in the non-technical water and energy conservation initiatives that they have adopted. The main focus has been on water and electricity consumed in student dormitories. Five groups of non-technical measures are most common. The first group is the institutionalization of water and energy conservation, which includes the establishment of a leading high-level administration body responsible for long-term planning and the creation of water and energy conservation offices for managing daily operations. The head of the water and energy conservation offices usually signs a performance contract with the schools that contains targets for water and energy conservation. In addition, the HEIs incorporate water and energy conservation into staff evaluations and staff recognition for excellent conservation efforts.

The second group of conservation mechanisms targets student dormitories and involves charging students for services that were originally provided for free; this original practice was believed to lead to wasteful behavior. Previously free showers have been converted to time-based pay showers to discourage students from taking excessively long showers. Students use IC cards that automatically store the duration of the shower and calculate fees accordingly. Charging for hot drinking water is a less common

practice, and only two schools have implemented such a measure. Furthermore, almost all of the HEIs have installed electricity meters in their dormitories since 2008 to measure electricity consumption and to charge students fees if certain limits are exceeded.

The third group of conservation measures, currently only applied to energy conservation, is electricity restriction. For example, the electricity restriction policy introduced by JU in 2009 includes the following six clauses:

- (1) the period of electricity cutoff is from 23:30 to 06:00;
- (2) each room can consume a total of 20 kWh per month free of charge. In addition, each undergraduate can consume 1 kWh per month, each graduate student can consume 3 kWh per month and each PhD student can consume 4 kWh per month;
- (3) electricity usage that exceeds the abovementioned limits will be charged a fee of 0.525 RMB/kWh;
- (4) each room has a maximum power of 2,500 W and automatically powers off if this usage is exceeded;
- (5) the limit for resistance heaters is 550 W. They automatically power off if this usage is exceeded; and
- (6) students are prohibited from using high-power appliances (e.g. electric heaters, kettles and electric blankets).

The extension of winter breaks, a measure that has been recently adopted by many HEIs in northern China to conserve water and energy, is the fourth group of conservation measures. For example, since 2009, JU has extended their traditional five-week winter break to seven weeks. Significant water and energy savings can be achieved by extending winter breaks; however, because the longer winter breaks are not compensated by shorter summer breaks, HEIs must intensify their teaching activities to fulfill their educational requirements.

The final group of non-technical measures involves awareness-raising, or environmental education, which is concentrated into two week-long programs: the National City Water Conservation Promotion Week held every year in May and the National Energy Conservation Promotion Week that is held every year in June. During these two weeks, schools offer a wide variety of activities with the objective of promoting water and energy conservation behaviors, such as inter-school competitions on the knowledge of energy and water conservation, information leaflets, banners with slogans that urge students to live a conservation lifestyle and asking students and teachers to sign pledges to not to waste water and energy. The highlight of the National Energy Conservation Promotion Week is usually the energy shortage/low-carbon experience day, during which lighting, air-conditioning, escalators and elevators are shut off, and students and staff are encouraged to walk, ride a bike or take public transportation to school.

#### *4.2 Technical initiatives*

Although the non-technical initiatives organized by the HEIs are characterized by similarities across the different type of HEIs, the technical initiatives are characterized by differences. Moreover, the technical initiatives are less intense and widespread compared to the non-technical initiatives. Although the resourceful central-level schools

(i.e. JU and NENU) are able to invest in a wide variety of projects, the smaller schools are limited to a small number of low-cost or government-subsidized projects. This is particularly true in the smaller provincial schools, which have implemented very few technical initiatives because of a lack of financial resources. The most popular technical initiatives for electricity conservation are measures that target lighting, including LED- and solar-powered street lighting, compact fluorescent lighting and infra-red lighting controls. Although most schools have invested in these measures to various degrees, none have completely revamped their campuses with renewable or energy efficient lighting. Solar water heating is also popular. Because of low water temperatures during the winter, solar water heating systems are used in combination with electric heat to deliver sufficient quantities of hot water. Solar water heating has been reported to result in energy conservation savings as high as 30 per cent. Other less common sustainability measures include: real-time energy monitoring systems (JU), voltage reduction (NENU) and energy-efficient transformers (NENU). Compared to investment in energy conservation, investment in water conservation is, in general, less common because water expenses are low and, therefore, reduce the enthusiasm of the schools for investing in water conservation. The most common measure is installing infra-red urinal and sink sensors. In contrast with international schools, none of the schools in the study have invested in rain water capture or water recycling.

In addition, the HEIs have spent minimal effort and money on thermal energy conservation, even though thermal energy consumption is significant because the schools are located in northeast China and experience long and frigid winters. A small number of the older buildings without insulation have been retrofitted with polystyrene insulation and double-glazed windows. As an exception rather than the norm, JU invested substantially in heat transfer stations and pipework renovations, which resulted in approximately 5 per cent energy conservation savings.

## 5. Motivations: government pressure and financial pressure

What are the reasons for the HEIs' focus on water and energy conservation? This brings us to question the motivation of the HEIs in pursuing sustainability. In this section, I discuss two key sources of motivation: government pressure and financial pressure. Together they wield significant influence over the course of action taken by the HEIs.

### 5.1 *Government pressure*

The focus on water and energy conservation among Chinese HEIs mainly reflects the central government priority that places the HEIs under severe government pressure to conserve water and energy. The publicly funded HEIs are regulated under the Public Institution Conservation Program, which was introduced in 2009 by Jilin Province People's Government (JPPG) under the instruction of the central government. It is a command and control program that requires public institutions (e.g. schools, hospitals and government departments) to reduce water and energy consumption. Because all but one of the HEIs (JHFLI is a private HEI and is, therefore, exempted from the program) are regulated by the program, the program is influential in promoting sustainability behaviors among the HEIs. In 2012, the program stipulated 32 tasks. These tasks are multifaceted. Some are organizational, such as establishing a conservation leading group and designating staff responsible for collecting water and energy consumption statistics. Some are concerned with statistical reporting: making quarterly and annual



reports and publicizing statistics. Some are related to the technical initiatives: investing in water and energy conservation projects. However, the most important evaluation criteria are results-oriented. Out of 100, 25 marks were allocated on the basis of how well the HEIs meet their targets, determined by JPPG each year. In 2012, the target was to reduce water, electricity and gas consumption by 2 per cent, measured either in per capita or per floor area. None of the tasks are mandatory, but completion of each task yields certain points in the yearly evaluation; therefore, it is necessary for HEIs to complete a high percentage of the tasks to pass their assessment. The HEI with the highest score is rewarded with a certificate and 10,000 RMB. HEIs that fail the evaluation (scoring less than 60 out of 100) are asked to submit an improvement proposal within one month. High levels of compliance have been reported for the past three assessments, with the majority of HEIs scoring above 80.

The central government's concern over water and energy conservation is closely related to its concerns over social stability and long-term economic development. Water conservation is a long-lasting policy challenge in China because of constraints on water supply, over-allocation of water resources, inefficiency and pollution by industrial wastes (Gleick, 2009; Liu *et al.*, 2013). In contrast, energy conservation only recently emerged in the national agenda, driven by severe energy shortages in the mid-2000s and international pressure to control carbon emissions (Lo and Wang, 2013). The sustainability of HEIs, then, is closely linked to the national sustainability strategy and can be understood as an integral part of China's national conservation programs.

### *5.2 Financial pressure*

Although the motivation to satisfy government regulation suggests that the HEI sustainability agenda is driven by the government from the top, financial pressure presents a second source of motivation that is localized and driven by school administrators. Most of the eight HEIs are under tremendous financial pressure because of debts incurred since the introduction of the expansion policy in 1998, when the central government decided to greatly increase student intake in the higher education sector (Lo, 2013). The growth rate was phenomenal from 1999 to 2004, when the sector experienced annual growth in excess of 20 per cent. To accommodate the extra students, Chinese HEIs engaged in massive structural expansion, building entire new campuses. However, because of insufficient government funding, the HEIs have been forced to secure loans from state banks to finance their expansions. The debt of the higher education sector is estimated at as high as 400-500 billion RMB (Halachmi and Ngok, 2009). Consequently, school administrators of HEIs are under pressure to reduce the operational costs of the school, and water and energy conservation are viable means. The economic benefits of sustainability have been reported elsewhere, but over-focusing on the economic benefits because of financial pressure leads the schools to focus mostly on the low-hanging fruits, whereas more expensive measures are ignored. In other words, financial pressure contributes to the phenomenon of the focus on cheap, if not profitable, non-technical measures.

## **6. Challenges: lack of funding and conflicts with student welfare**

One of the key challenges the HEIs face is lack of government and school funding, and this limitation further explains the schools' focus on non-technical sustainability initiatives. The lack of school funding is closely related to, if not caused by, the fact that

most of the schools are in debt. The problem with government funding is that the funding mechanism is unequal. Central-level HEIs (i.e. JU and NENU) can apply for funding from the central government through the annual round of central-level maintenance and procurement funds, whereas provincial-level HEIs must apply for funding through the provincial government, which is substantially more limited. Private HEIs are not eligible to apply for any government funding for the purpose of sustainability. Since 2008, priority funding has been allocated to energy conservation projects. Nevertheless, although the central-level HEIs obtain funding with relative ease, smaller schools can apply for years without one successful application because of the unequal allocation of funding. Another hurdle is that governments require the schools to assume a minimum of 20 per cent of the project cost. This 20 per cent rule significantly dampens the enthusiasm of HEIs in applying for funding. NENU, for example, has prepared all the necessary documents for applying for funding for a real-time energy monitoring system but has not submitted the application due to insufficient funds to cover the 20 per cent costs.

Because of this limitation in funding, many HEIs are forced to focus on the inexpensive non-technical measures. Through interviews with students, it became clear that some of these measures are having a detrimental impact on student welfare and are very unpopular among students. One case is the electricity restriction policy. Students' daily lives are severely disrupted by prohibiting high-power appliances and cutting-off electricity for extended periods of time. Moreover, imposing water and electricity charges on students in the name of sustainability and preventing wastage has stimulated resentment and is perceived by students as unfair and greedy. In a recent survey conducted in a university in Nanjing, 73.7 per cent of the students viewed energy conservation on campuses as important, but only 14.1 per cent of students were satisfied with the way energy conservation was achieved ([Nanjing University of Aeronautics and Astronautics, 2008](#)). In addition to feeling that their quality of life was negatively affected, the students felt that energy conservation did not benefit them, even though the implementation saved substantial amounts of money for the schools. Although the survey is limited in scope, the problems it highlights have universal applicability across most HEIs in China.

This conflict between sustainability and student welfare is likely a unique phenomenon in China, as it has not been reported in the literature. If so, the reasons for this phenomenon are unclear; perhaps, it reflects the authoritarian nature of the regime. No matter what the reason, it is clear that sacrificing student welfare to pursue certain environmental objectives is harmful to the long-term prospect of sustainability because it promotes administration – student antagonism and goes against one of the key principles of sustainability – the pursuit of environmental objectives and quality of life need not be mutually exclusive but instead synergetic.

## 7. Conclusion

The analysis of campus sustainability in eight Chinese HEIs identified some significant differences between China and overseas institutions. Compared to international cases, Chinese HEIs have a remarkably uniform and narrow interpretation of sustainability: water and energy conservation. This is because the sustainability agenda is largely set by the central government, and enforced by local governments. Further, Chinese HEIs rely more heavily on non-technical initiatives rather than the more expensive technical

initiatives. However, there are significant variations among the studied HEIs: central-level HEIs are the best resourced and therefore are able to implement more capital intensive programs in water and energy conservation.

The findings of this study lead to two practical implications. First, although the schools have implemented comprehensive non-technical sustainability measures, their investment in technical measures is limited by a lack of funding. Therefore, there is a need for increased government funding, and removal of the rule that schools must assume part of the project cost. Second, some of the sustainability initiatives negatively impact student welfare and, consequently, created conflicts between the administrations and their students. To reduce administration – student antagonism, sustainability practices that severely affect the daily lives of students may need to be modified. The schools should also consider sharing the benefits of water and energy conservation with their students, for instance, by lowering dormitory fees or establishing conservation rewards. Moreover, students are not actively involved in sustainability governance in Chinese HEIs. Increasing student involvement could produce fairer results and enhance the legitimacy of the programs.

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