

Research on Sustainable University Construction

Wenqi Li^{1,a}, Chenguang Li^{1,b,*}, Xiaojuan Wang^{1,c}, Ruining Bai^{1,d}, Ruiling Yang^{2,e},
Daoxiao Chen^{1,f}, Zhimin Zhang^{1,g}

2022211135@email.cufe.edu.cn^a, chenguangli2024@163.com^{*b}, 1546994122@qq.com^c,
brn20040521@qq.com^d, 2110666@mail.nankai.edu.cn^e, cufecdx@163.com^f,
zhangzhimin68@aliyun.com^g

Central University of Finance and Economics, Beijing 100000, China¹
Nankai University, Tianjin 300000, China²

Abstract. Leading sustainable development is the core issue of global higher education governance and the fundamental issue of global social development. In the process of building a sustainable world, universities play an important role in proposing solutions and cultivating talents, promoting sustainable development of the ecological environment and the economy and society. [2] This article aims to explore the specific path of building sustainable universities, combined with the current development status of sustainable universities and propose effective suggestions for building sustainable universities in China from the perspectives of the country and universities.

Keywords: sustainable development; sustainable university; research

1 Introduction

With the rapid development of the global economy, humanity is changing the climate, nature, and ecology of the earth in an unprecedented way, and threatening all life on earth. The world urgently needs to embark on the path of sustainable development. To achieve sustainable development, it requires the joint efforts of the government and all sectors of society, as well as a large number of talents with sustainable development awareness and the ability to solve sustainable development problems. Based on this, integrating the concept of sustainable development into education has become one of the key focuses of the United Nations' sustainable development work, and the need to establish sustainable development oriented education has been continuously emphasized in different conferences and documents, leading to the emergence of "Sustainable University". It is the latest model of universities after the teaching university, the teaching-research university, and the entrepreneurial university.^[1]

2 Concepts and connotations related to sustainable university

2.1 Sustainable development

The concept of sustainable development can be traced back to 1980, when the International Union for Conservation of Nature (IUCN), United Nations Environment Programme (UNEP), World Wildlife Fund (WWF) jointly published the World Conservation Strategy. In 1987, the World Commission on Environment and Development (WCED) published a report titled "Our

Common Future", which for the first time formally proposed the concept of sustainable development: "Sustainable development is the development that meets the needs of contemporary people without compromising the ability of future generations to meet their needs." In the 21st century, the concept of sustainable development is no longer limited to the environmental level, but covers all aspects of social development. It can be said that sustainable development is a development strategy based on protecting environment, incentivizing economic development and aiming to improve the quality of human life.

2.2 Sustainable university

The University of Sustainable Development plays an important role in delivering talent to society, cultivating managers for enterprises, and cultivating political leaders for the country. At the same time, it also shoulders the social responsibility of educating citizens around the world to achieve sustainable development. As a globally recognized higher education institution, Sustainable university aims to educate global citizens to achieve sustainable development, provide relevant insights on social hot issues, reduce the environmental and social footprint on campus in operation.^[4] It is a combination of "Sustainable development" and "Sustainable higher education". Sustainable development involves the coordination and unity of sustainable economy, sustainable ecology, and sustainable society. Sustainable universities should also organically combine environmental and development issues, and become higher education institutions that focus on comprehensive socio-economic development.

3 Current status of sustainable university development

3.1 Current development status of sustainable university abroad

The research and practice of sustainable universities abroad started early and has been continuously advancing since the 1970s. After years of practice, there has been significant progress in the depth and breadth of research. In 1998, World Higher Education Conference (WHEC) issued the "Higher Education in the Twenty-first Century: Vision and Action", which emphasized that "the fundamental mission and value of higher education is to promote sustainable development and progress in society." In 2005, the United Nations officially launched the "Decade of Education for Sustainable Development" plan. In 2010, Nottingham Trent University (NTU) attempted to fully introduce the concept of sustainable development education and established the Sustainable Development Steering Committee - Sustainable Action Forum. Under the leadership of the forum, the Green College activity team and Sustainable Development team were established. The University of Edinburgh has established the Sustainable Development and Environment Committee and the Sustainable Development Office to complement the implementation of sustainable development strategies. In order to mobilize the enthusiasm of teachers and students and encourage them to translate good sustainable development ideas into practical actions, the school has also established the Edinburgh Sustainable Development Award. From a practical perspective, energy conservation and emission reduction, environmental governance, social ecology, and the impact of campus activities on schools, communities, and society are currently the main directions of concern for sustainable university construction in foreign countries. However, most people tend to

consider environmental factors rather than social and economic factors when considering sustainability. ^[6]In addition, global sustainable development issues such as social equity, poverty alleviation, and climate change are gradually receiving attention.

3.2 Current development status of sustainable university in China

The construction of sustainable university in China started late and has been continuously explored over the years based on the experience of foreign universities. In 1998, Tsinghua University was the first to propose the construction of a "green university", which revolves around the core of human education. ^[7]Through promoting activities such as green education, green scientific research, and green campus demonstration projects, the concept of ecological civilization, energy conservation and environmental protection were integrated into all aspects of the university. The construction of a "green university" was regarded as an important component of creating a world-class university, and sustainable university construction began to take shape. In 2001, the State Environmental Protection Administration proposed to gradually carry out the activity of creating "Green University" in higher education institutions nationwide. Tsinghua University is officially named "Green University", which is the first in China. Since then, more and more universities in China have carried out green university practices and achieved certain results. In 2008, the "Symposium on Building Sustainable Development Campuses" organized by the Ministry of Education was held at Tongji University, where the "Declaration on Building Sustainable Development Campuses" was issued. This was the first time that Chinese universities had reached a consensus on the sustainable development strategy of universities. However, during this stage, the sustainable development of university construction focused more on energy conservation, emission reduction. Focusing on the environmental dimension within the triple bottom line of sustainable development, its responsibility and leading role in sustainable development for society, the country, and even the world are not obvious. Based on this, Tongji University has taken the lead in proposing to build a university guided by sustainable development, gradually expanding from the specific practice of resource-saving campuses to the teaching and research fields of sustainable development, and emphasizing the leading role of universities in the sustainable development of people and society. In addition, universities such as Peking University and Zhejiang University have actively participated in the construction of sustainable universities and achieved certain results. It can be seen that the construction practice of sustainable universities in China is currently limited to well-known universities, with less participation from private institutions. In practice, there are still some urgent problems that need to be solved. One reason is that although there are many sustainable development research institutions in Chinese universities, their research capabilities have not been able to effectively promote sustainable development teaching. Secondly, universities generally lack professional teaching staff and financial for sustainable development, making it difficult to carry out many activities and projects. Thirdly, although there is an increasing exchange between Chinese universities and the international community, the connection with surrounding communities is not yet close enough. The implementation of sustainable development activities on campus is also superficial, teachers, students, and staff on campus have not been mobilized. Overall, the awareness of sustainable development is weak. ^[8]

4 The necessity of building sustainable University: taking universities in Beijing as an example

Due to the characteristics of a large number of people and scale, diverse energy use methods, high resource utilization, high energy consumption and cost in universities, it is urgent to promote campus emission reduction and carbon reduction, and build sustainable universities. Taking Beijing as an example, as of 2022, there are a total of 92 ordinary higher education institutions in Beijing, of which 50 have been selected as key energy consuming units. The number of students in these institutions accounts for about 90% of all ordinary higher education institutions in Beijing, and energy consumption accounts for 25% of all education industries in Beijing. Therefore, using the energy consumption data of these 50 universities to analyze the energy consumption situation of universities in Beijing has certain representativeness. It can be seen from Figure 1 that from 2012 to 2021, the total energy consumption of Beijing and the education industry showed an overall upward trend. Among them, the total energy consumption decreased in 2020 due to the COVID-19. In addition, the energy consumption cost of universities has also been continuously increasing, with a year-on-year growth rate of about 5%.

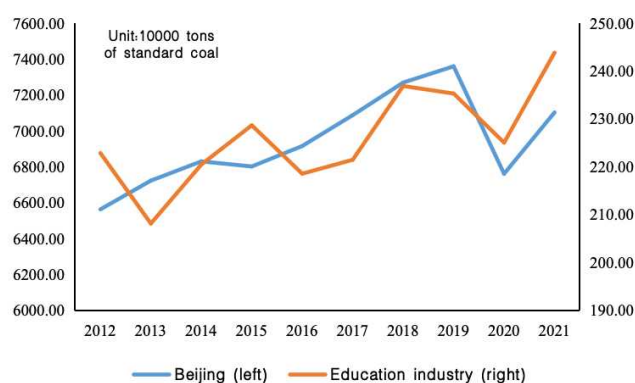


Fig. 1. Total Energy Consumption of Beijing and Education Industry from 2012 to 2021.

5 Case study: the construction path of sustainable University

Many foreign universities have integrated the concept of sustainable development into various fields such as teaching, research, environmental governance, infrastructure construction, providing strong impetus for the development of global higher education. ^[10]The University of British Columbia (UBC) is one of them, which located in Vancouver, Canada and was founded in 1908. In 1990, UBC signed the Tarley Declaration, marking it as Canada's first university to engage in sustainable development. Later, sustainable development was adopted as the guiding principle for future campus development planning.

UBC attaches great importance to cultivating the concept of sustainable development among teachers and students. The goal is to provide all students with the opportunity to learn sustainable development courses and participate in related research projects, making them

global leaders in sustainable behavior, sustainable infrastructure, and sustainable community research. UBC encourages teachers to develop and modify courses so that all undergraduate students can have the opportunity to learn green sustainability courses when choosing degree courses. In 2019, the Vancouver campus had 687 related green sustainability courses such as climate change and biodiversity. In addition to specialized course learning, UBC also helps teachers and students focus on research related to green sustainability, strengthening their perception and identification with the concept of green sustainability in their research.

In order to reduce greenhouse gas emissions and water resource consumption on campus, the UBC Sustainable Development Office has proposed the Whole Systems Infrastructure Plan (WSIP), which optimizes the sustainable development performance of the campus and surrounding communities through integrated design of the campus environment. WSIP views the entire campus as an integrated system, creating a synergistic relationship between infrastructure, architecture, and landscape environment. Through the integrated design process, the campus environment is designed to achieve sustainable development between humans and nature. After years of effort, the carbon dioxide emissions, water consumption, and energy consumption per unit area of campus buildings at UBC have all significantly decreased.

UBC has launched a green building program, which provides guidance for the sustainability of academic and residential construction projects on campus, and develops green campus buildings with negative carbon emissions that contribute to promoting human and ecological well-being. In recent years, UBC has gradually replaced 53000 fluorescent lights on campus with LED lights, which not only improves lighting quality, reduces maintenance costs of lights, but also significantly reduces energy consumption. In 2011, the Sustainable Development Interactive Research Center at UBC University was named the first "Greenest building" in North America to achieve zero negative environmental impact.

UBC supports residents on campus to widely carry out green campus sustainable development activities through student clubs, lectures, and other forms, encouraging all teachers and students to participate and cultivate their sustainable development concepts. For example, implementing campus garbage classification and piloting the recycling of sports textiles have promoted the zero waste action plan. Conduct a series of lectures on green sustainability forums, inviting renowned experts from around the world to discuss sustainability issues.

UBC has organized a large number of community outreach activities, including a student in class program, selecting 500 college students each year to schools with lower enrollment rates in the surrounding areas, tutoring students in learning, and helping to narrow the education gap for children from impoverished groups. The greenhouse gas management project has involved over 400 business school students in assisting 95 companies in reducing greenhouse gas emissions and obtaining environmental investor certification. With nearly 1000 student volunteers participating in local community development activities every year, can help students better understand the local community, support local sustainable development.

6 Conclusions

Overall, the research and development efforts of sustainable universities in the world are mainly concentrated in developed countries, and the promotion of sustainability measures has

improved the learning environment for students and the daily quality of life for university residents. [3]Developing countries are still relatively backward, such as Saudi Arabia, where universities lack sustainable development measures in terms of campus operations, curriculum arrangements, and academic research. [1]However, there are also countries similar to Romania that have explicitly used the concept of sustainable development in their school strategic planning. [5]Currently, the construction of sustainable universities in China is progressing in an orderly manner and has achieved certain results, but it is still in its early stages. We must fully realize that sustainable development is not only a technical issue, but also a cultural issue. Establishing concepts and exploring practical paths are indispensable.[9]

The construction and development of sustainable universities require collaborative efforts from multiple parties. From a national perspective, on the one hand, it is necessary to leverage the macroeconomic regulation and control role of the state in sustainable education, strengthen the top-level design of sustainable development in higher education, and formulate relevant policies to refine the development plan of sustainable universities in combination with the national sustainable development strategy. It is also necessary to clarify the sustainable development goals and priorities of different types of universities and introduce corresponding policy measures to promote reasonable division of labor and optimize the structure of higher education. At the same time, the country should establish an efficient financial investment decision-making, distribution, and feedback mechanism to improve the efficiency and ultimate effect of implementing financial subsidies for campus green construction. On the other hand, to promote the sustainable development of universities, the government should play a regulatory role. While streamlining administration and delegating power, the government monitors the implementation of sustainable development in universities and the effectiveness of sustainable development funding allocation, achieving a combination of decentralization and management. ¹From the perspective of universities, a dedicated sustainable development working group should be established to strengthen education and awareness of sustainable development, actively carry out cooperation within and outside the school, and disseminate sustainable concepts. In the future, the promotion of China's sustainable development strategy requires all universities to take action together.

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References

- [1]Alshuwaikhat H M et al.:Sustainability assessment of higher education institutions in Saudi Arabia. Sustainability. pp.1-16(2016)
- [2]de Souza Silva J L et al. :Case study of photovoltaic power plants in a model of sustainable university in Brazil. Renewable Energy. pp.1-4(2022)
- [3]Das D et al.:Developing a Smart and Sustainable Campus in Singapore.Sustainability. pp.1-18(2022)

¹ Implementation Opinions of Fujian Provincial Department of Education, Fujian Provincial Department of Education, and Five Other Departments on Deepening the Reform of Streamlining Administration, Decentralizing Power, and Combining Management with Optimizing Services in the Field of Higher Education, November 27, 2018,http://jyt.fujian.gov.cn/xxgk/zywj/201811/t20181127_4685129.htm

- [4]Maoyuan Pan:Pan Maoyuan's Discussion on Higher Education.Fujian Education Press.(2000)
- [5]Stoian C E et al.:A comparative analysis of the use of the concept of sustainability in the Romanian top universities' strategic plans.Sustainability. pp.1-34(2021)
- [6]Wright T S A,Wilton H.: Facilities management directors' conceptualizations of sustainability in higher education. Journal of Cleaner Production.pp.118-125(2012)
- [7]Xu Yuan,Zhong Zhou,Binbin Wang:Universities: An Innovation Laboratory for Sustainable Transformation: A Comparative Study of Sustainable Development Strategies among Five World Class Universities.Journal of World Education. pp.47-56(2022)
- [8]Yingying Li,Fanqi Liu,Jun Ding.:Sustainable development practices of Australian universities and their implications for the sustainable development of Chinese universities.Environmental Protection and Circular Economy. pp.16-18(2016)
- [9]Yingmin Jiang,Ruiqi Jia.:The Strategy and Practice Path of Dutch Universities in Promoting the 2030 Agenda for Sustainable Development.International and Comparative Education.pp.40-48(2022)
- [10]Zhou Zhong,Xu Yuan:The Rise of Sustainable Universities:
A comparative study on sustainable development strategies of world-class universities.Journal of World Education.pp.38-46(2022)
- [11]Zhong Z et al. Making university and curricular sustainable entrepreneurship: a case study of Tsinghua University.Asia Pacific Education Review. pp.559-569(2022)