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Carbon Neutrality Pathways for Universities: A Case Study of the UK University Carbon Management Plan

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Abstract

Our life and production have been seriously threatened by the problem of global warming. Global warming has become an important problem in the world. It urgently needs to be solved and carbon emissions urgently need to be lowered. Over the past years in China, higher education had rapid development. There is no doubt that colleges and universities have become large consumers of energy. So, if we can reduce carbon emissions, our society will certainly benefit. This paper focuses on the analysis and summary of the carbon management plan in British universities, hoping to be helpful to the future development of carbon management and carbon neutrality in domestic universities after the accounting of carbon emissions.

Keywords: Higher education institutions; accounting for carbon emissions; IPCC factor method; carbon management.

Global warming has seriously threatened the production and life of mankind, and has become a major problem facing mankind. Continued intensification of climate change will have serious impacts on future freshwater resources, ecosystems, agricultural coastal zones and low-lying areas, as well as human health. As society pays more and more attention to the problem of global warming, greenhouse gases, the source of this problem, have also aroused widespread concern at home and abroad. People realize that if we want to deal with climate change, we must take corresponding emission reduction measures. In the Paris Agreement adopted in December 2015, all countries promised to take active actions in the future and formulate specific measures and emission reduction plans to prevent climate warming and strive to achieve zero net emission of greenhouse gases at an early date. Colleges and universities are the backbone of today's society. If students can be aware of greenhouse gas emissions at the early stage of education, they will have an important influence on society in the future. In addition, evaluating the carbon emissions of colleges and universities and determining their emission reduction potential can also give full play to the leading role of colleges and universities in the field of carbon emission reduction.

1. Introduction to the carbon management plan

In 2008, Britain passed the Climate Change Act, which plans to reduce its greenhouse gas emissions by 80% by 2050, compared to that of 1990. However, this target was made more ambitious in 2019 when the UK became the first major economy to commit to a 'net zero' target. The new target requires the UK to bring all greenhouse gas emissions to net zero by 2050.

According to the UK government's targets, the Higher Education Funding Council for England (HEFCE) encourages the UK higher education sector to take a leading role in carbon reduction, aiming to reduce carbon emissions by 43% based on 2005/6 levels. UK universities are also required to develop their own carbon management plans, including project descriptions, baseline data, reduction targets, carbon emissions in the three scopes of the IPCC, reduction plans, emission forecasts, financing needs for implementation plans, stakeholder management and communication, and risk management. Through various incentives, more than 50 UK universities have developed their own carbon management plans based on government targets, their own carbon emissions, and their capacity for reduction, hoping to contribute to national carbon reduction. Under the supervision of HEFCE, universities have ensured that the plans are implemented smoothly through sponsorship and fundraising. As of now, most university plans have been implemented and produced benefits. Articles by Muhammad Usman Mazhar, Mark Lemon, and others have also reviewed the carbon management plans of the UK higher education sector and their success factors. In addition, many universities in countries such as the US, Japan, and Australia have voluntarily developed comprehensive and detailed carbon management plans and implemented them. It can be seen that foreign universities attach great importance to carbon emissions and carbon management. The author has reviewed the carbon management plans of most UK universities and summarized some of the indicators in their plans, hoping to provide inspiration for the development of carbon management plans in Chinese universities.

2. Characteristics of carbon management plan in British universities

(1) Determination of accounting scope

In order to address the serious consequences of global climate change, the International Organization for Standardization (ISO) has established a series of norms for the accounting of product carbon footprints, to urge organizations to take emission reduction measures. In this process, the ISO has fully exerted its international influence, forming some mature carbon footprint accounting norms, and achieving good results in practice. To better calculate carbon emissions, the IPCC divides carbon sources into three scopes and accounts for them separately to identify the potential for carbon reduction.

Scope 1	Direct emissions - emissions from direct fuel and energy use within the organization's boundaries.
Scope 2	Indirect emissions - emissions from imported electricity, heat or steam consumed by the organization.
Scope 3	Other indirect emissions - emissions from commuting and business travel, transportation of materials, personnel or waste; waste generated by the organization but managed by other organizations; emissions from the production and distribution of energy products other than electricity, steam, and heat consumed by the organization; and emissions from the procurement of raw materials.

Currently, there is controversy over which sources of emissions should be included when accounting for Scope 3, and there are many emission sources included in Scope 3, making it difficult to calculate and expensive to account for. Through reading relevant literature, we have learned that currently, most universities at home and abroad choose to abandon the accounting of Scope 3 and only account for Scope 1 and 2. Only a few countries account for Scope 3, mainly including travel, commuting, catering, procurement, and other areas.

By summarizing, we can find that the accounting scope adopted by British universities is different when accounting for carbon emissions. Some schools only account for Scope 1 or Scope 2, some schools only account for Scope 1 and Scope 2, and some schools account for all. Overall, the vast majority of universities only account for Scope 1 and Scope 2, and do not account for Scope 3.

(2) The time to conduct a carbon management plan

By reading the carbon management plans of British universities, this paper finds that the time when these universities began to develop their carbon management plans also varied. A few schools developed carbon management plans before 2010, and most schools began developing carbon management plans in 2010 and 2011, with some schools developing plans gradually thereafter.

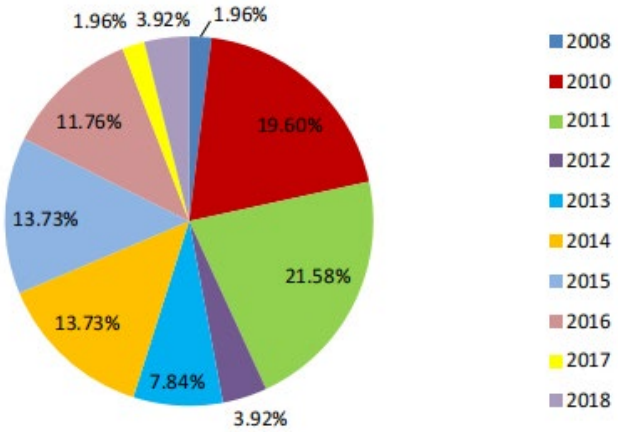

Figure 1 When British universities began to formulate carbon management plan

(3) Target year set by carbon management plan

Table 1 summarizes the target years set by universities. Since the same university may adopt several different target years, the number of universities included in the statistics is duplicated. It can be found that most universities have set short-term targets for 2015 and midterm targets for 2020, with a few schools setting long-term targets for 2030 or 2050.

Table 1 When British universities began to formulate carbon management plans

Target year	Number of universities	Proportion
2012	1	1.41%
2014	1	1.41%
2015	7	9.86%
2016	3	4.23%
2017	3	4.23%
2020	36	50.70%
2021	9	12.68%
2025	3	4.23%
2026	3	4.23%
2030	2	2.82%
2025	3	4.23%
Total	71	100%

(4) Difference of baseline

Table 2 presents the baselines adopted by different universities. "2004-2007" includes four cases: "2004/05, 2005, 2005/06, 2006/07", with "2005/06" being the most common; "2008-2009" includes two cases: "2007/2008, 2008/2009", with "2008/09" being more common; "2009-2011" includes two cases: "2009/10, 2010/11", with "2009/10" being more common; "2014-2016" includes two cases: "2014/2015, 2015/16", with "2015/16" being more common. From the table, we can see that most universities use the period of "2004-2007" as the baseline year, with "2005/06" being the most common. Most universities use the carbon emissions in 2005/06 as the baseline, on which they set their emission reduction targets and compare their emission reduction results.

Table 2 Baselines adopted by different universities

Baseline year	Number of universities	Proportion
1990	6	11.11%
2004-2007	35	64.81%
2008-2009	8	14.81%
2009-2011	3	5.56%
2012-2016	2	3.70%
Total	54	100%

(5) Time span of carbon management plan

The implementation time of most schools' carbon management plan is set between 5-7 years and 8-11 years.

(6) Emission reduction targets

The following tables summarize the different emission reduction targets of different universities in different time spans. It can be seen that most universities have emission reduction targets of around 30% within 5-7 years and around 40% within 8-11 years. A very small number of universities have set long-term targets to reduce emissions by 80% within 40 years.

Table 3 Emission reduction target for 1~4 years

Emission reduction target	Number of universities
52%	1
43%	1
30%	2
10%-12%	3
3%	1

Table 4 Emission reduction target for 5~7 years

Emission reduction target	Number of universities
5%	1
13%-15%	3
20%-21%	4
29%-35%	7
40%-45%	5
48%-50%	3
60%	2

Table 5 Emission reduction target for 8~10 years

Emission reduction target	Number of universities
5%	1
11%	1
22.5%-25%	2
29%-34%	4
40%-44%	9
48%-50%	2

Table 6 Long-term Emission reduction target

Time span	Emission reduction target	Number of universities
14	40%	1
15	48%	1
19	50%	1
24	34%	1
40	78%-80%	3

3. Conclusion

According to the previous analysis, we know that making carbon management plans is beneficial to colleges and universities to carry out carbon management work and reduce carbon emissions. For the convenience of accounting and easy comparison, it is best to only account for scope 1 and scope 2 in the current carbon management planning of colleges and universities. We can set a short-term emission reduction target of 5-7 years based on 2022, such as reducing emissions by 30% by 2027; Then set a medium-term emission reduction target for 8-11 years, such as a medium-term target of reducing emissions by 50% by 2035, and regularly check the implementation effect of the planned projects. Of course, in addition to accounting school carbon emissions and setting emission targets, carbon management planning also needs to provide some clear and detailed measures. Due to the limited time and conditions of research, this paper has not made specific plans for the measures, but based on the action measures of UK universities, the following carbon reduction recommendations for universities are summarized:

(1) Direct energy

Direct energy sources include gasoline, oil, and natural gas. In this regard, universities are encouraged to use clean energy as much as possible and find more alternative energy sources. Details such as timely maintenance of gas stoves and regular cleaning of iron pots to reduce energy consumption should be taken into account. Gasoline and diesel are used exclusively as fuel for university fleets, so the travel arrangements of the fleet should be as reasonable as possible to reduce unnecessary travel. At the same time, to reduce the traffic emissions of the entire school, universities can establish more bicycle sheds and appropriately control the number of private cars on campus.

(2) Electricity consumption

In recent years, due to the expansion of the campus, the electricity consumption has also increased, resulting in an increase in greenhouse gas emissions from Scope 2 electricity. Therefore, preventive measures need to be taken at the university level to optimize the energy use of various consumers on campus and reduce the environmental burden. The following aspects can be considered:

1) dormitory electricity use can be limited and timed power outages can be carried out at night;
2) voice-activated power switches can be used in public areas;
3) energy-saving systems can be installed;
4) computer energy-saving measures can be implemented, such as shutting down unused computers on non-working hours and timely sleep mode.

(3) Water use

We know that carbon emissions produced by water use are minimal. However, we still need to conserve water and minimize energy consumption. At the university level, the overall water use should be monitored and measures should be taken to reduce water consumption. For example, the water supply pipes need to be thoroughly inspected and leak detection instruments installed in a timely manner to avoid unnecessary water loss. Water meters should be installed on the main buildings of the university for real-time dynamic monitoring and data analysis. If possible, water-saving devices can be upgraded.

(4) Environmental education

As a higher education institution, universities should make contributions to energy conservation, water conservation, environmental protection, and resource utilization, and become a sustainable organization. In this vision, we cannot ignore our identity as educators. Environmental education for university students can encourage them to participate in carbon reduction actions and contribute to sustainable development. For example, students can be encouraged to produce a film to showcase their ideas on sustainable development in universities. Each major can establish an environmental working group and set up environmental courses related to their major to enhance environmental awareness through education. A series of lectures related to "green" research can be held, and regular green initiatives such as competitions can be organized every semester. Universities can actively respond to international initiatives such as Earth Day or "Earth Hour" activities, and promote resource conservation and environmental protection in the media.

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Annexes: 50 UK universities referenced in the paper

1	Aston University
2	University of Bedfordshire
3	University of Birmingham
4	Bournemouth University
5	University of Cambridge
6	Cardiff University
7	University of Chester
8	City University London
9	De Montfort University
10	Durham University
11	Edinburgh Napier University
12	University of Glasgow
13	University of Greenwich
14	Harper Adams University
15	Heriot-Watt University
16	University of Hull
17	Keele University
18	University of Leeds
19	University of Leicester
20	Liverpool John Moores University
21	London Metropolitan university
22	London South Bank University
23	Manchester Metropolitan University
24	Newcastle University
25	Northampton University
26	Northumbria University
27	University of Nottingham
28	University of Oxford
29	University of Plymouth
30	Queen's University Belfast
31	University of Reading
32	University of Roehampton
33	University of Salford
34	University of Scottish
35	University of Sheffield Hallam
36	University of Sheffield
37	Southampton Solent University
38	University of St Andrews
39	University of Staffordshire
40	University of Strathclyde
41	University of Sunderland
42	University of Sussex
43	University of Swansea
44	University of Warwick
45	University of Ulster
46	University of Bath
47	University of Exeter
48	University of West of England
49	University of Worcester
50	University of York