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GREEN UNIVERSITY AS AN ELEMENT OF FORMING A SUSTAINABLE PUBLIC HEALTH SYSTEM

Abstract. Universities have always had a significant impact on the development of society as centers of scientific and social progress. As a result, their role in the implementation of all sustainable development goals set by the UN is constantly growing. This is primarily due to the expansion of their ecosystem and significant progress towards the greening of the university environment through the introduction of the concept of "green campus". However, there is a logical need to analyze the effectiveness of such an approach through the prism of satisfaction of all participants in the educational and scientific process, especially in the context of ensuring a healthy environment as an element of public health. That is why the authors of this article try to determine the degree of correlation between the implementation of the concept of "green university" and the formation of a healthy environment in higher education institutions as components of sustainable public health. In their work they are guided by classical methods of scientific research such as systems analysis, scientific abstraction, synthesis, statistical analysis. They also use VOSviewer software to analyze more than 1,000 publications in the Scopus database and address green campus and healthy environments. During the study of bibliographic data, considerable attention was paid to the identification of clusters of key concepts used by scientists in the study of these issues. As one of the results of the research, the authors present an analysis of the spatial-cluster relationship of scientists, which reveals the main clusters and significant interest of scientists from China and the United States in implementing and improving the concepts of "green university". However, the results of this analysis are insufficient, because: there was a lack of holistic understanding of scientists from different countries of the essence and objectives of the concept of "green university"; low level of study of correlations between the attempt to form environmentally friendly higher education institutions and the formation of a healthy environment in them.

Keywords: green university, higher education, UI GreenMetric, healthy environment, public health.

Introduction. Higher education institutions are one of the key elements in the system of ensuring the implementation of the UN-defined sustainable development goals, both alongside the classic achievements of quality education and innovation, and in a more global sense. This is primarily due to the fact that modern universities have long gone beyond the educational space and are beginning to shape trends in areas of socio-economic life, such as renewable energy, ecology, healthy environment and public health. As a result, today the concept of "green campuses" is gaining more and more popularity in scientific circles, the main purpose of which is the transition to energy efficient consumption and the formation of a green worldview among all participants in the educational and scientific process. Such approaches make it possible to implement critical goals of sustainable development through the higher education system, such as combating climate change and responsible use of resources. However, in the pursuit of greening the educational space, the question arises as to how this concept affects the formation of a healthy

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environment at the university and the development of public health. Therefore, the main task of the publication is to try to systematize research in the field of analysis of the effectiveness of the implementation of the concept of a green university through the prism of ensuring a healthy environment in the educational and scientific space.

Literature Review. Analysis of publications in recent decades shows a significant interest of the scientific community in the study of the implementation of the concept of "green university". This problem was taken care of by Alshuwaikhat H.M. and Abubakar I. (2008), where they analyze the university in terms of a closed ecosystem and suggest ways to improve the environmental safety of its internal environment. Bowler D.E. and others (2010) analyzed the impact of the environment, including green campuses, on mental perception and sustainability. Blok V. and others (2015) conducted a study of the correlation between the environmental behavior of the same individual at home and at work in the "green university". Sharp L. (2002) analyzes the implementation of the concept of green universities in the United States and Australia. Geng Y. and others (2013) studied the cost-effectiveness of implementing green campuses on the example of Shenyang University (PRC). Tan H. and others (2014) in their study conclude that universities today are key drivers of the development and implementation of green technologies, but insufficient institutional support leads to a reduction in the benefits of their implementation. Tolley R. (1996) approached the assessment of the environmental friendliness of universities through the prism of the use of own transport by higher education workers and proposed the introduction of a policy of using environmentally friendly transport, such as bicycles.

A significant role in promoting the concept of "green university" is played by formed in 2010. UI GreenMetric, which ranks universities according to their level of friendliness to the environment. It should be noted that UI GreenMetric (2021) in 2021 included 18 institutions of higher education from Ukraine (223 – Ukrainian National Forestry University; 385 - Sumy State University; 389 - The National University of Ostroh Academy;...; 903 - National University of Water And Environmental Engineering). However, Suwartha N. and Sari R.F. (2013) publish a study that analyzes the methodology underlying UI GreenMetric and suggests ways to improve it.

Zhu B. and others (2021) conduct a comparative analysis of the implementation of the concept of "green campus" in the United States and China. They conclude that there is a fundamental difference between the Chinese and American approaches. The first focuses on energy saving, while the second focuses on solving global environmental problems. Rugatiri J. et al. (2021) analyze the concept of a green university through the prism of implementing a solid waste management policy on the example of IPB University. Atici K. B. and others (2020) attempted to analyze the correlation between the implementation of the green campus concept and academic performance. As a result of their research, they note that the implementation of this concept allows to attract more successful applicants. Garrido-Yserte R. and Gallo-Rivera M.-T. (2020) analyze the need and effectiveness of the implementation of the concept of "green university" through the prism of the interaction of internal and external stakeholders. Domestic scientists are also actively researching this issue. Thus, Savytskyi N. (2021) tried to reveal the essence and threats that arose in the process of implementing the concept of "green university" on the example of the Dnieper State Academy of Civil Engineering and Architecture. Laznenko, D. O. and others (2016) analyze the impact of the university on the formation of environmental awareness of applicants. Anisimova, H. V. and Donets, O. V. (2016) analyze the greening of education in Ukraine through the prism of environmental policy and regulatory support.

Methodology and research methods. The research is based on classical empirical approaches using VOSviewer software to analyze almost 1,300 bibliographic data obtained from the Scopus database.

Results. Analysis of the direction of publications published in the Scopus database on the topic of green university and healthy environment based on VOSviewer software allowed us to identify seven main clusters that are combined based on proximity to the essence of the concepts (Fig. 1):

- 1) "Red cluster" is formed around the concepts of "green campus" and "sustainability". It is the largest and includes 13 key words, among which a significant role is played - "higher education", "climate change", "students", "green university";
- 2) "Green" is formed around the concept of "public health" and includes 12 key words, including - "environment" and "learning";
- 3) "Blue" is formed around the two concepts of "energy efficiency" and "energy saving", includes 11 keywords;
- 4) "Yellow" is formed around the phrase "urban area", contains 8 interconnected words and is one of the key elements in the formation of the contextual relationship between the "red" and "green" cluster;
- 5) "Purple" is formed around the concepts of "environmental management" and "environmental impact", contains 6 key words;
- 6) "Blue" is formed around the concept of "environmental protection", includes 5 relationships and is also one of the key elements of the relationship between the "red" and "green" cluster;
- 7) "Orange" - is formed around the concept of "origin of waste", contains 4 key words, is one of the key elements of the relationship between the "red" and "green" cluster.

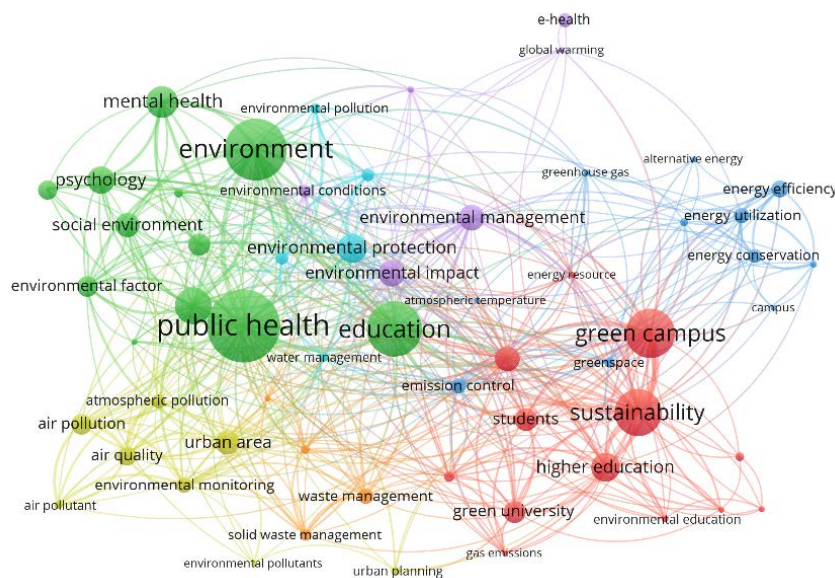


Figure 1 – Visualization of the interdependence of key concepts in publications on the concept of green university
Sources: created by the authors based on the Scopus database using VOSviewer software.

Based on the above data, we can say that the study of the correlation between the formation of a safe healthy environment and the greening of higher education institutions is almost unexplored. The analysis of the spatial representation of the publication on the topic of healthy environment and the concept of "green university" shows the high interest of authors from the United States (309 documents), Great Britain (126), Australia (81), India (78), China (72) (Figure 2). This pattern continues to be observed in the analysis of clusters of related authors (Figure 3).

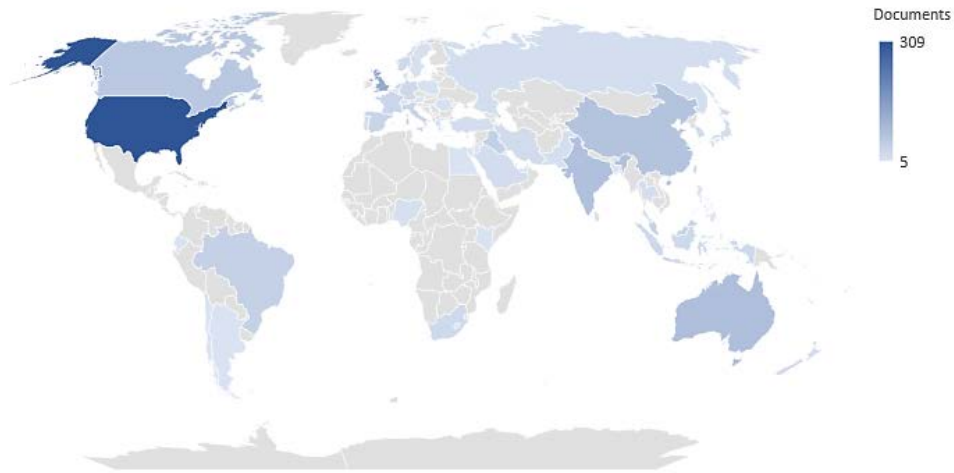


Figure 2 – Analysis of publishing activity by country
Sources: formed by the authors based on the Scopus database.

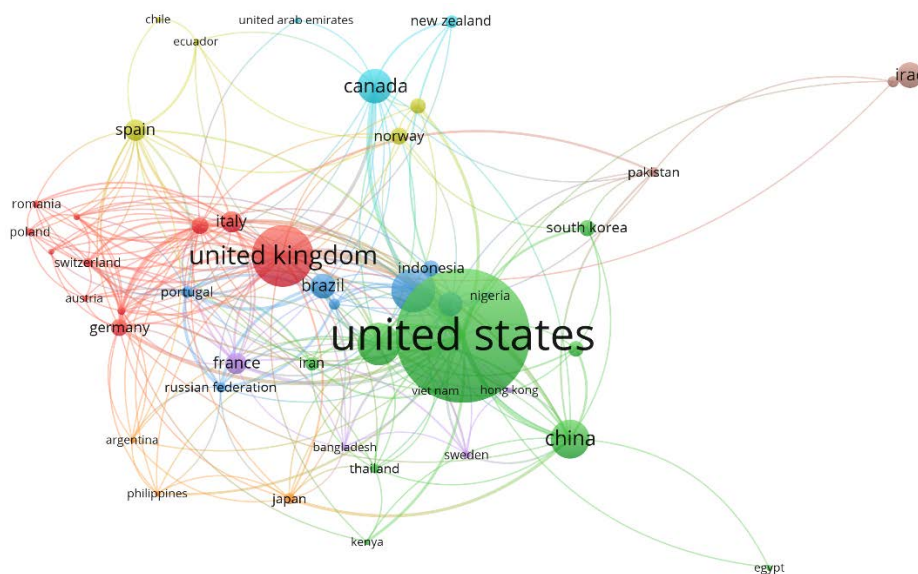


Figure 3. Spatial analysis of bibliographic data
Sources: created by the authors based on the Scopus database using VOSviewer software.

Thus, the analysis of bibliographic data showed an indirect correlation between the provision of sustainable public health and the concept of "green university" through the prism of the study of urban pollution and responsible consumption

Conclusions. "Green University" is a modern vision of achieving the goals of sustainable development in education through the formation of an ecological and healthy environment. Based on the analysis of bibliographic sources, it becomes clear that this concept has been repeatedly studied by scientists from

different countries, including through the prism of meeting the needs of the public health system. However, most foreign authors do not have a common vision of the essence of the concept of "green campus" and try to conduct primarily an economic assessment of the feasibility of its implementation. Such global trends emphasize the correctness of the chosen direction and the relevance of further research aimed at identifying the correlation between the implementation of the concept of "green university" and the formation of a healthy environment in the educational and scientific space.

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Зелений університет як елемент формування сталої системи громадського здоров'я

Університети завжди мали значний вплив на розвиток суспільства як осередки наукового та соціального прогресу. Як результат постійно відбувається зростання їх ролі в процесі імплементації всіх цілей сталого розвитку визначених ООН. В першу чергу це відбувається через розширення їх екосистеми та суттєвий поступ у бік екологізації університетського середовища шляхом впровадження концепції «зеленого кампусу». Проте постає логічна необхідність в аналізі ефективності впровадження такого підходу через призму задоволеності всіх учасників освітньо-наукового процесу, особливо в контексті забезпечення здорового середовища, як елемента громадського здоров'я. Саме тому автори в даній статті проводять спробу визначення ступеня кореляційних зв'язків між імплементацією концепції «зеленого університету» та формуванням здорового середовища в закладах вищої освіти, як компоненти сталого громадського здоров'я. В своїй роботі вони керуються класичними методами наукових досліджень таким, як системний аналіз, наукова абстракція, синтез, статистичний аналіз. Також ними застосовується програмне забезпечення VOSviewer, що дозволило провести аналіз понад 1000 публікацій розміщених в базі даних Scopus та направлених на розкриття проблематики «зеленого кампусу» та «здорового середовища». В ході проведення дослідження бібліографічних даних значна увага приділялась виокремленню кластерів ключових понять, що використовувались науковцями в процесі вивчення даних питань. Як один з результатів досліджень, авторами наводиться аналіз просторово-кластерного взаємозв'язку науковців, що дозволяє виявити основні кластери та значну зацікавленість вчених із КНР та США в запровадженні та удосконаленні концепцій «зеленого університету». Та все ж результати даного аналізу є недостатніми, оскільки: було виявлено відсутність цілісного розуміння науковцями різних країн сутності та завдань, що постають перед концепцією «зеленого університету»; низький рівень вивчення кореляційних взаємозв'язків між спробою формування екологічно чистих закладів вищої освіти та формуванням здорового середовища у них.

Ключові слова: зелений університет, вища освіта, UI GreenMetric, здорове середовище, громадське здоров'я.