European Research Studies Journal
Volume XXVII, Issue 1, 2024

pp. 96-113

Integrating Nature-Based Solutions in Social Economy Education for Enhancing Environmental Sustainability

Submitted 15/12/23, 1st revision 12/01/24, 2nd revision 22/01/24, accepted 28/02/24

Dorota Murzyn[1], Marta Czyżewska[2], Iwona Lupa-Wójcik[3], Wojciech Maciejewski[4], Ana Aleksić Fredotović[5], Antea Barišić[6], Antonija Buljan[7], Ivana Načinović Braje[8], Zoran Wittine[9], Dimitra Manou[10], Jason Papathanasiou[11], Susana Miguéis[12], Marilena Vlachou[13], Danuta Kandefer[14]

Abstract:

Purpose: *This study aims to provide internationally comparative insights into the ways in which higher education institutions (HEIs) in selected EU countries, particularly their social economy (SE) departments, effectively integrate active environmental learning using NBS (nature-based solutions) into their settings.*
Design/methodology/approach: *Desk research was used to identify the best practices among HEIs in selected countries (Poland, Croatia, Greece, Cyprus, Portugal), while case studies were developed on the basis of best practices analysis and interviews with relevant stakeholders.*
Findings*: The social economy's focus on social and environmental issues creates a favourable context for citizens to develop essential green skills. However, it can be noted that the use of NBS approach is not widespread. The need for an interdisciplinary approach was identified in most case studies, as was the need for more collaboration. Future approaches should focus more on creating paths of communication between educators from different disciplines.*

[1]*Assoc. Prof., University of the National Education Commission, Department of Entrepreneurship and Social Innovation, Krakow, Poland, dorota.murzyn@up.krakow.pl;*
[2, 3, 4] *University of the National Education Commission, Krakow, Poland.*
[5 , 6, 7, 8, 9] *University of Zagreb, Faculty of Economics & Business, Croatia.*
[10, 11] *University of Macedonia, Greece.*
[12] *ZERO - Associação Sistema Terrestre Sustentável, Portugal.*
[13] *SYNTHESIS Center for Research and Education, Cyprus.*
[14] *Rzeszowska Agencja Rozwoju Regionalnego, Poland.*

Practical implications: *The particular value of this study is in its potential to aid HEIs educators and education researchers to understand the use and educational value of NBS as a more effective alternative to traditional environmental education. Insights gained from this study are valuable in demonstrating the potential of SE departments to champion NBS initiatives, extending beyond the traditional confines of natural sciences and showing benefits of interdisciplinarity in addressing climate change.*
Originality/value: *This study is especially valuable given the increasing interest and recognised potential of NBS, a novel concept with varied levels of implementation in HEIs across countries.*

Keywords: *NBS, nature-based solutions, social economy, sustainability, higher education.*

JEL Code: *A2, B55, Q01, Q5.*

Paper type: *Research article.*

1. Introduction

In recent decades, the global economy has faced complex socio-economic challenges including globalisation, increasing inequalities, and demographic transition, alongside growing environmental and climate concerns. Increasing awareness of the challenges of modern industrial society, especially since the 1980s, has brought sustainable development to the centre of economic debates leading to the fundamental change in common values and reassessment of approaches to development.

This paradigm shift has highlighted the importance of integrating sustainability into educational paradigms, thereby reshaping the curricula and pedagogical approaches to foster deeper understanding of sustainable development principles (Alam, 2022; Karpan *et al.*, 2020; Kopnina, 2020).

In the quest for sustainability, nature-based solutions (NBS) have emerged as a particularly promising approach offering multifaceted benefits including climate change mitigation, biodiversity enhancement and improved environmental quality, while also contributing to economic and societal well-being (Stefanakis *et al.*, 2021; Cousins, 2021; Seddon *et al.*, 2020). NBS encompasses a range of practices and interventions that leverage natural ecosystems to tackle socio-economic challenges (Rice, 2020).

Despite the momentum NBS has gained in recent years as an alternative to "grey" infrastructure and technocratic management (Cousins, 2021), it is still considered a relatively new concept with highly unexploited educational potential (Oral, 2022). The role of education is particularly crucial, considering the varying levels of knowledge and attitudes towards NBS among the young generations (Giachino *et al.*, 2021). Current research in sustainable development and environmental education indicates that Europe is at its forefront compared to other continents (Acosta

Castellanos and Queiruga-Dios, 2022), yet an overview of specific NBS education initiatives is still lacking.

With the ambition of the European Union (EU) to lead in harnessing nature for more sustainable and resilient societies, higher education presents an opportunity to explore and expand this potential (Žalėnienė and Pereira, 2021; Bianchi, Pisiotis and Giraldez, 2022) what has been recognised through the Council of the EU which set learning for the green transition and sustainable development a priority in education and training policies (Council Recommendation, 2022/C 243/01).

Thus, this study aims to provide internationally comparative insights into the ways in which higher education institutions in selected EU countries (Poland, Croatia, Greece, Cyprus, Portugal), particularly their social economy (SE) departments, effectively integrate active environmental learning using NBS into their settings. The research questions are as follows:

(1) Whether and how do SE faculties of Southeastern European countries integrate NBS into their curricula?
(2) What are the challenges (and opportunities) associated with the integration of the NBS-oriented approach in SE faculties?

This paper sheds light on how faculties in countries typically less engaged in environmental education activities, as compared to their more developed counterparts, navigate and overcome obstacles and provide meaningful and impactful educational practices of NBS education, setting a precedent for others to follow.

Additionally, insights gained from this study are valuable in demonstrating the potential of SE departments to champion NBS initiatives, extending beyond the traditional confines of natural sciences and showing benefits of interdisciplinarity in addressing climate change. This focus is driven by the increasingly recognised role of SE in tackling the sustainability challenges confronting the modern world.

The particular value of this study is in its potential to aid higher education institution (HEIs) educators and education researchers to understand the use and educational value of NBS as a more effective alternative to traditional environmental education.

It supports designing NBS-oriented educational programs and their systemic integration into existing curricula through offering an overview of various best practices across selected countries, exploring pedagogical approaches that can be used, and identifying potential opportunities and challenges that educators may encounter.

This study is especially valuable given the increasing interest and recognised potential of NBS, a novel concept with varied levels of implementation in HEIs

across countries. Lack of such insights in the literature will be addressed through findings of this study.

The paper is structured as follows: The second section provides literature review of the social economy concept and environmental sustainability education. Section 3 provides empirical insights, grounded in case studies that explore best practices in NBS within HEIs across selected countries. Section 4 contains conclusions.

2. Literature Review

2.1 Social Economy and Sustainable Development

Sustainable development is an overarching objective of many countries and organizations (including the European Union) to ensure economic growth, the well-being of the citizens, and a higher quality of life for present and future generations (COM (2016) 739 final). Reviewing the various definitions of sustainable development in the scientific literature, it is clear that the concept is imbued with multiple goals and components, complex interdependencies and a moral burden.

Earlier researchers such as Gladwin, Kennelly and Krause (1995), identified five principles of sustainable development: inclusiveness, connectivity, prudence, safety and equity. Inclusivity concerns the creation of conditions for human development in time and space. Connectivity involves ecological, social and economic interdependence.

Prudence refers to the ability to make a sound judgement of the situation in the context of the activities being carried out, and a duty of care and prevention. Safety requires protection from long-lasting threats and protection from harmful disruptions. Equity suggests intergenerational, intra-generational and inter-species fairness.

Recent approaches include a further variety of goals, such as the well-known 17 United Nations Sustainable Development Goals (SDG) (United Nations, 2015), which are commonly categorised into three distinct dimensions: environmental, economic, and social.

The conceptual and practical synergies between the social economy and sustainable development are often explored in the literature (Hudon and Huybrechts, 2017; Picciotti, 2017). The term “social economy” is generally used to refer to a set of organizations with social objectives that neither belong to the public sector nor have the profit-realizing objective as is typical of the private sector.

However, they generate at least part of their income from providing goods or services (Bridge, Murtagh and O’Neill, 2014). These are “organizations whose members are animated by the principle of reciprocity in the pursuit of common

economic or social goals, often through the social control of capital" (Restakis, 2006).

Thus, the social economy is made up of organizations that place the achievement of social objectives at the heart of their economic activity. The spheres in which the contribution of the social economy is most visible are: employment, social cohesion, democratic development, social innovation and local development. However, the social economy brings added value in terms of its neutrality towards existing interests and therefore can introduce elements of sustainable transformation (Greffe, 2007).

The social economy emphasizes the need to consider and improve the economic, social and environmental sustainability of business activities. Social economy business models and practices make them well suited to creating local and collective initiatives that generate environmental and social benefits. This has also been recognized in European Union strategies and documents.

The Social Economy Action Plan (COM 2021) emphasizes that the social economy contributes to ecological transformation by providing sustainable goods and services, for example, in the areas of the circular economy, organic farming, or renewable energy. The same goals can be achieved by using solutions that are inspired and supported by nature (NBS), which makes SE and NBS complementary tools to attain sustainable development.

Moreover, the particular combination of ethos and participative structure of SE organisational forms is particularly significant in developing green citizenship, understood as the recognition of duties to the environment and taking responsibility to act in line with those duties (Smith, 2005).

The social economy's orientation towards social and environmental injustice provides another favourable context where citizens can cultivate desirable green skills. Environmental education is a fundamental factor in sustainable development and environmental sustainability (Karpan *et al.*, 2020).

2.2 Environmental Education as a Response to Sustainability Challenges of the Modern World

The beginnings of environmental education date back to the 1970s. At that time, this area of education was not recognized as a separate concept, but attempts were made to assign it to other existing disciplines (Wheeler, 1975; Gayford, 1991). Over the years, the approach to environmental education has evolved towards a reorientation in which ecological education should be directed towards education for improving the quality of life of all citizens, defining it as ecological education for sustainable development (Orr, 1992; Fien, 1993).

Finally, the notion of environmental education has evolved into different concepts: "education for sustainable development", "sustainable education", "environmental education for sustainability" (Gough, 2013; Berryman and Sauve 2013; Tilbury, 1995). The terms mentioned above mean education that aims to build awareness of the environment and balance between social needs and the ecosystem in which we live (Pihkala, 2017).

In ecological education, great emphasis is placed on respect for the natural environment and shaping society's views towards the surrounding world. The education process should develop sensitivity to environmental problems, the ability to define the causes of changes, and the ability to predict the consequences of human activity and its environmental impact (Tuszyńska, 2006).

Environmental education is a process that helps individuals, communities, and organizations learn more about the environment, and develop skills and understanding about how to address global challenges. It has the power to transform lives and society (Ardoin, Bowers, and Gaillard, 2020).

Therefore, environmental education for sustainable development should not be limited to biological sciences, because the issues raised as part of education and building awareness of ecological changes concern a much broader perspective in which other sciences such as sociology, psychology or even economics allow for understanding this process in many other ways (Jacobson, 2013).

As part of this process, it is recommended to use a wide range of teaching tools to support the achievement of teaching goals (Marzano 2003; Marzano, Pickering, and Pollock, 2001). These include, among others:

- activating already acquired knowledge by reminding and prompting,
- constructing hypotheses by searching and developing problems using scientific methods,
- providing diverse and culturally responsive instruction, connecting the experiences of students learning and communicating in multiple cultural contexts,
- constructing lessons and tasks based on cooperation, reaching solutions thanks to interdependence and cooperation in the tasks performed,
- engaging students in constructing real goals for real applications.

Environmental education for sustainability adopts a three-fold approach (i.e., education about/in/for the environment) and includes a future dimension to the study of environment and development concerns (Tilbury, 1995). In such an understanding of education, a NBS approach can be used to support achieving the intended educational goals.

Indeed, learning about the potential of biodiversity can be contextually integrated

into nature-based learning, which aims to instill in students a sense of responsibility for the surrounding ecosystem (Vasconcelos and Calheiros, 2022).

Nature-based solutions (NBS) have the potential to be used as an educational framework that requires critical system thinking, a crucial component of truly democratic active citizenship, raises awareness about global environmental, social, and economic issues and fosters environmental citizenship among students (Pineda-Martos *et al.,* 2022).

Attempts are being made to use NBS in environmental education (Oral, 2022). Environmental education, as well as using elements of NBS, can contribute to promoting sustainable development. Like any change in the curriculum, this one requires several actions from teachers, including:

- encouraging interdisciplinary and transdisciplinary approaches (Remington-Doucette *et al.,* 2013, Sterling, 2013);
- use of both theory and practice (Moore, 2005);
- engaging individuals to develop group work (Glassey and Haile, 2012; Mochizuki and Fadeeva, 2010);
- reflections in the ethical dimension (Biedenweg *et al.,* 2013, Howlett *et al.,* 2016);
- using critical thinking (Howlett *et al.,* 2016; Wooltorton *et al.,* 2015).

3. Research Methodology

In order to support in-depth knowledge on best practices of using NBS in HEIs across different countries and explore the barriers and opportunities to embed sustainability education powered by NBS in SE faculties, research has been undertaken in several European countries: Poland, Croatia, Greece, Cyprus and Portugal.

The study was conducted from March to July 2023 and consisted of a set of diverse best practices according to the thematic focus of NBS, including NBS related to climate change mitigation and adaptation, water management, waste management, biodiversity management, air quality and urban regeneration. Desk research was used to identify the best practices among HEIs in these countries, while case studies were developed on the basis of best practices analysis and interviews with relevant stakeholders.

Initially, a comprehensive data set was compiled, encompassing an array of best practices identified across the selected countries. This dataset included various parameters: the country and city of implementation, the field of study, the educational institution, the level of study, course(s), NBS category, overarching topic of the best practice, its specific objectives, the results or impact achieved, stakeholders involved, pedagogical approaches utilised and any significant

considerations pertinent to the best practice.

Following an in-depth analysis of this data, a set of these best practices pertaining to various educational levels (from summer school to degree program) was selected for further analysis through interviews to gain a comprehensive array of insights on the integration of NBS across diverse levels of study.

Interviews have been conducted to provide practical aspects of integrating sustainability education powered by NBS within both SE and non-SE faculties and point out the contextual factors which either pose challenges or create opportunities for the adoption and success of innovative NBS-oriented educational programs.

4. Research Results and Discussion

A total of eight case studies offer a deeper understanding of how HEIs and particularly their SE departments, incorporate active learning in environmental sustainability and Nature-Based Solutions (NBS) within their setting. Basic information about the analysed case studies is included in Table 1.

Table 1. *Case studies of NBS in HEIs*

Name of the initiative	Country	Organiser	Type of initiative
Change management	Croatia	Faculty of Economics and Business, University of Zagreb	Course
HEIght Innovation	Cyprus	European Institute of Innovation and Technology, University of Central Lancashire (Cyprus campus), The Malta College of Arts, Science & Technology, Özyeğin University (Turkey) and the National Centre of Entrepreneurship in Education (UK)	Toolkit
International and European Environmental Governance	Greece	School of Law, Aristotle University of Thessaloniki (open for enrolling as an elective course for all other students at Aristotle University)	Course
Nisyros GeoPark Summer School	Greece	Faculty of Geology and Geoenvironment of the National and Kapodistrian University of Athens and the *UNESCO* Chair Conservation and Ecotourism of Riparian and Deltaic Ecosystems of the International Hellenic University	Summer School
The Inter-University Climate Academy	Poland	Stanislaw Staszic University of Science and Technology in Krakow, the Warsaw School of Economics and the University of Wroclaw	Postgraduate studies
EKOMIASTO (eng. *ECOCITY*)	Poland	University of Lodz: Faculty of Biology and Environmental Protection and the Faculty of Economics and Sociology	3-year Bachelor's degree studies
MSc in Law and Economics of the Sea - Ocean	Portugal	NOVA School of Law and the NOVA School of Business and Economics	MSc studies

Governance (MDEM) and Ocean School			
HortaFCUL project	Portugal	Faculty of Sciences, University of Lisbon	Project

Source: *Authors' study.*

The "Change management" course, organized by the Faculty of Economics and Business, University of Zagreb, Croatia, aims to initiate change at four distinct levels: change within ourselves, change within the team, change within the organization, and change within society. It is based on learning about social responsibility by integrating students into society and fostering a sense of social cohesion.

As a part of this course, students are encouraged to develop and implement some socially responsible projects, including social entrepreneurship activities. Specifically, students' task as a part of this course is to design a socially useful, non-profit-oriented project that must be feasible, and to put it into practice.

What is common to all these projects was that they all represent initiatives to act socially responsible in an innovative manner. Throughout the years, many projects developed by students were directly aligned with the scope of social economy but also included green or NBS practices.

For example, one of the most recent activities undertaken by students of "Change management" in academic year 2022/2023 was to educate students and the general population about the importance of natural solutions for health protection.

In addition to a combination of academic and practical experiences, this course includes active engagement with the community through civic education, service-learning, and volunteering. Such example of EE is unique as it relies on students' initiatives to implement NBS projects as a part of their course requirements

The second initiative is HEIght Innovation Toolkit in Cyprus. It is an initiative of a pan-European consortium of four forward-thinking higher education institutions (HEIs) and the European Institute of Innovation and Technology (EIT). It was an optional, extra curriculum course offered to all students of UCLan Cyprus. The course lasted five days and included lectures, presentations, team collaboration and feedback.

The Innovation Toolkit forms a tool for transformative change beyond the project's life. The aim was to create a vibrant ecosystem for the students to develop their entrepreneurial mindset and enable them to develop their green ideas and turn them into innovative products/services or businesses that also incorporated nature-based solutions.

The third initiative is a course on "International and European Environmental Governance", offered by the School of Law, Aristotle University of Thessaloniki in Greece. It is a new course included in the undergraduate programme, offered by the Department of International Studies to undergraduate students in the 3rd year (and above) of their studies. It focuses especially on global environmental challenges and the policies undertaken at the international and EU levels.

It is divided into two major sections: international and European environmental governance. Under this perspective, the instructors have included an interdisciplinary approach and taught about new tools and instruments such as nature-based solutions for environmental protection. Although it is not an autonomous course, NBS are discussed during the course, specifically analysing the role of law in providing the necessary framework for designing and implementing NBS interventions.

During the courses, experts from other disciplines may be invited to offer their perspectives in a range of subjects, including NBS. As there are differences between the two levels of analysis (international and EU), special attention is given to understanding NBS and how existing legal frameworks can further promote or hinder NBS effectiveness.

Another example is also from Greece, called Nisyros GeoPark Summer School. It is a young initiative, completing its second year of existence in the summer of 2023, a part of the syllabus of the Intradepartmental Master's Programme "Water, Biosphere and Climate Change".

This Master's has been designed to emphasize the importance of a transversal and interdisciplinary approach to biodiversity, employing environmentally friendly initiatives like NBS as case studies and exploring their educational impact/potential. The Summer School is not a mandatory part of the programme curriculum.

In Poland, postgraduate studies have been created called the Inter-University Climate Academy, organized by the three universities: Stanislaw Staszic University of Science and Technology in Krakow, the Warsaw School of Economics and the University of Wroclaw, with significant support from the banking and business sectors. After the first semester students can choose from three thematic tracks: engineering and energy, economics and finance, man, society, spatial management.

On the first of the mentioned paths, topics focusing on NBS are implemented under the course: Ecological Engineering and Nature Based Solutions. Stakeholders partnering are invited to lead some lectures, and some of them have their own businesses where the NBSs are used and demonstrated to students.

The second example from Poland is EcoCity, an initiative of the University of Lodz (UL). It is a unique 3-year Bachelor's degree course, the only educational offer of

this kind in Polish higher education. The study programme is unique in placing urban sustainability and NBS-related issues at the centre of education.

These are interdisciplinary studies that combine the study of two faculties of the UL: the Faculty of Biology and Environmental Protection and the Faculty of Economics and Sociology. This combination ensures compatibility and a wide range of knowledge being transferred to the students.

Another great advantage of the studies is the involvement in the educational process of experienced practitioners working locally in Lodz and the Lodz region daily in public services, non-governmental organisations or businesses.

These practitioners are responsible for the practical part of the course – field activity, apprenticeships, and the study of selected subjects. The studies respond to the university's diagnosis of the current needs of the labour market in terms of the growing demand for urban managers, i.e. experts shaping sustainable urban development. They also respond to the need for active cooperation with employers in profiling courses and curricula.

Hence, the 'city' should be seen as a space for the concentration of natural resources, capital and the generation of income and benefits, including ecosystem services.

NBS in HEI's initiatives can also be found in Portugal. The first one is MSc studies in Law and Economics of the Sea. It is an interdisciplinary initiative emphasizing integrating NBS and the social economy to address environmental challenges and promote sustainable practices in ocean governance.

The program welcomes applicants from diverse academic backgrounds, including Law, Economics, Management, Finance, Social and Political Sciences, International Relations, Geography, Marine Biology, and Engineering. The syllabus fosters holistic approaches to maritime studies, equipping students with new tools for improved ocean governance.

The second example from Portugal is Horta FCUL, Permalab, Bioislands and FCULresta. This project was initiated by a group of students in 2009 from the Faculty of Science of the University of Lisbon (FCUL). Driven by their interest in permaculture and its potential to address ecological, social, and economic challenges, Horta FCUL is an edible garden near their C2 building, blending agriculture and landscaping with horticulture, herbs, and fruit trees.

This space, considered the heart of the project, aims to raise awareness and demonstrate more eco-friendly practices based on the ethics, principles, strategies, techniques, and tools proposed by permaculture and Nature-Based Solutions (NBS). Permaculture is a sustainable design system inspired by nature, aiming to create self-sustaining and regenerative human habitats that work in harmony with the

environment.

Permaculture and NBS are linked by their shared focus on sustainable practices, ecosystem design, and working with nature. Both aim to create resilient systems that benefit the environment and communities.

All these case studies cover various aspects, including the elaboration of innovative environmental education practices, especially in SE faculties, providing an overview of the diversity of pedagogical approaches used, outlining interdisciplinarity and transdisciplinarity challenges, and effective strategies to overcome these challenges.

These very issues were the subject of in-depth interviews conducted with stakeholders involved in the implementation of identified NBS practices to elicit useful information on these practices, factors, and conditions affecting their effectiveness and impact on education. The key findings are summarised in Table 2.

Table 2. *NBS educational practices, opportunities and challenges met through its integration in HEIs*

Name of the initiative	**Interviews made**	**Pedagogical approaches**	**Opportunities and challenges**
Course "Change management"	5	service learning; project-based learning; teamwork; seminar;	need for the institutional and financial support; need for an interdisciplinary approach;
HEIght Innovation Toolkit	4	teacher-centred approach; an inquiry-based learning; experiential learning; real-life examples;	great interest in using the term NBS; the course gives an edge when entering the labour market; certification of the course; the need for more real-life practical examples;
Course "International and European Environmental Governance"	4	lectures; collaborative learning; teamwork; video-projections; e-forums for exchanging opinions; seminars;	lack of state or university policy on including NBS in the universities' curricula; need for financial resources; opportunity for fostering interdisciplinarity and collaboration between students from different areas;
Nisyros GeoPark Summer School	4	experiential learning; project-based learning; teamwork activities; interdisciplinary / transversal learning;	lack of state support; financial hurdles; growth challenges; possibility of engaging with the local community; possibility to communicate science to the mass;

The Inter-University Climate Academy	3	project- and problem-oriented learning; real-life examples; seminars;	interdisciplinarity and cross-sectoral contacts; the challenge of reconciling specialists and experts from different fields; administrative challenges with organizing studies by three universities;
ECOCITY 3-year Bachelor's degree	4	laboratory exercises; project-based learning; field activities; seminars;	responding to the needs of the labour market; the challenges of interdisciplinarity and creating a joint programme across faculties;
MSc in Law and Economics of the Sea - Ocean Governance (MDEM) and Ocean School	3	lectures and seminars; problem-based learning; action-competence learning; place-based learning (internships, field visits); participatory action research;	opportunities for collaboration, knowledge exchange, and interdisciplinary learning; cultural exchange and expanding global networking opportunities; need for an effective communication, collaboration, and adaptability; challenge with coordinating faculty members from different disciplines and ensuring effective communication;
HortaFCUL project	4	learning by doing; science-based education; living laboratory; experiential learning;	the university community and faculty support new interesting methodologies such as Dragon Dreaming; the involvement of various stakeholders in educational practices fosters cooperation and the creation of networks; need for additional energy and manpower; constraints due to time limitations;

Source: *Authors' according to interviews with stakeholders.*

These case studies demonstrate the significant role of HEIs in promoting environmental sustainability and NBS education. Pedagogical diversity allows students to engage in practical projects, fostering teamwork and awareness of personal responsibility. Overcoming interdisciplinarity challenges is facilitated by involving various backgrounds in teaching and including various stakeholders through hands-on approaches. These cases provide strategies and examples for modernising education for sustainability, particularly useful for SE faculties to enhance their role as a key driver of green transformation.

When analysing NBS in HEIs, it is worth mentioning the solutions that are increasingly being introduced at universities as separate projects and initiatives outside of study programs. Sometimes, these are larger projects (including research projects) financed by the EU or other foreign funds, and sometimes smaller initiatives involving creating certain solutions/installations based on nature on the university campuses.

More and more universities are adopting the goal of making academies more "green". Some have prepared appropriate strategies and are taking several actions in this direction (including those related to NBS).

The importance of the green university concept (or sustainable university) is also demonstrated by the fact that it has become the subject of an international ranking, which attracts more and more institutions every year to compete for the title of most eco-efficient university.

Moreover, initiatives involving the creation of some NBS installations on university campuses are becoming increasingly common (e.g., green roofs and walls, beekeeping on the roof, hedgehog house systems in the university park, flower meadows, etc.). Such practices, although outside the curriculum, also have educational potential and introduce students to examples of NBS applications.

Universities by undertaking green campus initiatives and implementing solutions in the field, stimulate youth creativity and shape desired attitudes among students, making it easier to implement practical curricula.

5. Conclusions, Proposals, and Recommendations

The comprehensive literature review on education (section 2) coupled with the analysis of case studies (section 3) collectively point towards the conclusion that curricula must be strategically reformed to cultivate students into more environmentally conscious and responsible citizens. Changes in education should extend globally ensuring that its outcomes have a tangible impact on sustainable development and harnessing the full potential of nature's power more effectively.

The social economy's focus on social and environmental issues creates a favourable context for citizens to develop essential green skills. Increasing number of such initiatives are being integrated into higher education curricula. Presented best practices in HEIs in different countries (Poland, Croatia, Greece, Cyprus and Portugal) cover various aspects, including elaboration of innovative environmental education practices, providing an overview of the diversity of pedagogical approaches used, outlining interdisciplinarity and trans-disciplinarity challenges, and effective strategies to overcome these challenges.

However, it can be noted that the use of NBS approach is not widespread in SE faculties. While NBS topics are incorporated into study programmes, their presence is predominately in the fields of natural sciences and engineering.

There are very few examples from the social sciences and hardly any involve the social economy. In contrast, examples from social sciences faculties, and particularly those related to social economy, are notably scarce. There NBS typically appear only in selected courses within the curriculum.

Nevertheless, there are some interesting examples of interdisciplinary studies combining the natural and social sciences. Such an interdisciplinary approach is essential for properly integrating NBS in SE studies. Embedding environmental sustainability education focused on NBS within SE faculties helps students understand the interconnectedness between social, economic and environmental dimensions. It encourages an interdisciplinary approach that brings together researchers, practitioners and students from various disciplines to collaborate on NBS.

The case studies presented in this paper identified several challenges related to integrating NBS in HEIs' curricula. Most of them focus on institutional, administrative and financial constraints, as there is usually no state and/or university support on including NBS in the universities' courses. The need for an interdisciplinary approach was identified in most case studies, as was the need for more collaboration.

As inclusion of NBS requires an interdisciplinary approach in the HEIs' curricula, finding ways and tools to coordinate educators from different disciplines may be a very difficult exercise. Lack of real-life examples has been also identified as an extra burden in integrating NBS.

Future approaches should focus more on creating paths of communication between educators from different disciplines, in ways that could foster integration of NBS in HEIs' curricula and SE studies in specific. Collaboration between educators and students as well as between the academic community and the local community may further support the inclusion of NBS.

This may be a win-win situation, as the academic community will get in touch with real-life examples, and the local community will have an opportunity to approach scientific issues in an easy, understandable way. The challenge of interdisciplinarity is also an opportunity for networking and knowledge exchange, and it should be the basis for any future approach in integrating NBS in HEIs' curricula and SE studies in particular.

In future research, the challenges and opportunities presented in this paper may be tailored to design a framework that will support including NBS in SE studies within HEIs curricula. Inclusion of NBS in HEIs' curricula may embrace sustainability principles, promote environmentally responsible practices and enhance a culture of sustainability at the institutional level.

Some limitations of the study can be pointed out. It focuses on a specific set of EU countries so the findings may not be fully generalizable to HEI's in other regions or countries with different geographical, socio-economic and cultural contexts. Another problem is related to the small sample size of the cases analysed.

However, desk research showed so few examples of NBS integration in SE faculties that the case studies selected for the analysis are, in the authors' opinion, representative examples. While the study emphasizes the educational value of NBS, measuring and comparing the impact of NBS approaches across different institutions may be challenging due to the subjective nature of educational outcomes.

Acknowledgements:

These studies were carried out as part of the project "Integrating Nature-Based Solutions into Higher Education towards exploiting the transformative potential of Social Economy for a green and inclusive future" (acronym: “SEgoesGreen”), funded by the European Union (2022-1-PL01-KA220-HED-000087149). The authors would like to thank all the Partners for their fieldwork inputs.

References:

Acosta Castellanos, P.M., Queiruga-Dios, A. 2022. From Environmental Education to Education for Sustainable Development in Higher Education: a Systematic Review. International Journal of Sustainability in Higher Education, 23(3), 622-644.

Alam, A. 2022. Mapping a Sustainable Future through Conceptualization of Transformative Learning Framework, Education for Sustainable Development, Critical Reflection, and Responsible Citizenship: an Exploration of Pedagogies for Twenty-first Century Learning. ECS Transactions, 107(1), 9827, 9827-9840.

Ardoin, N.M., Bowers, A.W., Gaillard, E. 2020. Environmental Education Outcomes for Conservation: A Systematic Review. Biological Conservation, vol. 241.

Berryman, T., Sauve, L. 2013. Languages and Discourses of Education, Environment, and Sustainable Development. In: Stevenson, R.B., Brody, M., Dillon, J., Wals, A.E.J. (eds.), International Handbook of Research on Environmental Education. New York, NY: Routledge.

Bianchi, G., Pisiotis, U., Cabrera Giraldez, M. 2022. GreenComp: The European Sustainability Competence Framework (No. JRC128040). Joint Research Centre (Seville site).

Biedenweg, K., Monroe, M.C., Oxarart, A. 2013. The Importance of Teaching Ethics of Sustainability. International Journal of Sustainability in Higher Education, 14(1), 6-14.

Bridge, S., Murtagh, B., O’Neill, K. 2014. Understanding the Social Economy and the Third Sector. Palgrave Macmillan.

COM (2021) 778 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Building an Economy that Works for People: an Action Plan for the Social Economy. Brussels, 9.12.2021.

COM (2016) 739 final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Next Steps for a Sustainable European Future European Action for Sustainability. Strasbourg, 22.11.2016.

Council Recommendation of 16 June 2022 on Learning for the Green Transition and Sustainable Development 2022/C 243/01, OJ C 243, 27.6.2022, p. 1-9.

Cousins, J.J. 2021. Justice in Nature-based Solutions: Research and Pathways. Ecological

Economics, 180, 106874.
Fien, J. 1992. Education for the Environment. Doctoral thesis, University of Queensland, Brisbane, Australia.
Gayford, C. 1991. Environmental Education in the National Curriculum: an up-date. Annual Review of Environmental Education 1990/91 (4), 11-13.
Giachino, C., Pattanaro, G., Bertoldi, B., Bollani, L., Bonadonna, A. 2021. Nature-based Solutions and their Potential to Attract the Young Generations. Land Use Policy, 101, 105176.
Gladwin, T.N., Kennelly, J.J., Krause, T.S. 1995. Shifting Paradigms for Sustainable Development: Implications for Management Theory and Research. Academy of Management Review, 20(4), 874-907.
Glassey, J., Haile, S. 2012. Sustainability in Chemical Engineering Curriculum. International Journal of Sustainability in Higher Education, 13(4), 354-364.
Gough, A. 2013. The Emergence of Environmental Education Research. In: Stevenson, R. B., Brody, M., Dillon, J., Wals, A.E.J. (eds.), International Handbook of Research on Environmental Education. New York, NY: Routledge.
Greffe, X. 2007. The Role of the Social Economy in Local Development. In: Noya, A, Clarence, E. (eds). The Social Economy. Building Inclusive Economies. OECD, Paris, 91-118.
Howlett, C., Ferreira, J.A., Blomfield, J. 2016. Teaching Sustainable Development in Higher Education: Building Critical, Reflective Thinkers through an Interdisciplinary Approach. International Journal of Sustainability in Higher Education, 17(3), 305-321.
Hudon, M., Huybrechts, B. 2017. From Distant Neighbours to Bedmates: Exploring the Synergies Between the Social Economy and Sustainable Development. Annals of Public and Cooperative Economics, 88(2), 141-154.
Jacobson, B. 2013. Can Education Improve the Environment? Applying the Pressure-State-Response Environmental Indicator Framework to Environmental Education Program Outcomes. Antioch University (Doctoral Dissertarion).
Karpan, I., Chernikova, N., Motuz, T., Bratanich, B., Lysokolenko, T. 2020. Conceptual Principles of Education for Sustainable Development. European Journal of Sustainable Development, 9(2), 99-99.
Kopnina, H. 2020. Education for the Future? Critical Evaluation of Education for Sustainable Development Goals. The Journal of Environmental Education, 51(4), 280-291.
Marzano R.J. 2003. What Works in Schools: Translating Research into Action. Alexandria. VA: Association for Supervision and Curriculum Development.
Marzano, R.J., Pickering, D.J., Pollock, J.E. 2001. Classroom Instruction that Works: Research-based Strategies for Increasing Student Achievement. Alexandria, VA: Association for Supervision and Curriculum Development.
Mochizuki, Y., Fadeeva, Z. 2010. Competences for Sustainable Development and Sustainability: Significance and Challenges for ESD. International Journal of Sustainability in Higher Education, 11(4), 391-403.
Moore, J. 2005. Seven Recommendations for Creating Sustainability Education at the University Level: A Guide for Change Agents. International Journal of Sustainability in Higher Education, 6(4), 326-339.
Oral, H.V. 2022. Recommendations for Promoting Environmental Education Through Nature-Based Solutions (NBS) Perspective at Turkish Higher Education Institutes. In: Enhancing Environmental Education Through Nature-Based Solutions (pp. 183-198). Cham: Springer International Publishing.

Orr, D. 1992. Ecological Literacy: Education and the Transition to a Postmodern World. Albany, State University of New York Press.

Picciotti, A. 2017. Towards Sustainability: The Innovation Paths of Social Enterprise. Annals of Public and Cooperative Economics, 88(2), 233-256.

Pineda-Martos, R., Andreucci, M.B., Atanasova, N., Baganz, G.F., Calheiros, C.S., Castellar, J.A., Langergraber, G. 2022. How Nature-Based Solutions Can Contribute to Enhance Circularity in Cities. In: Enhancing Environmental Education Through Nature-Based Solutions (pp. 313-343). Cham: Springer International Publishing.

Pihkala, P. 2017. Environmental Education after Sustainability: Hope in the Midst of Tragedy, Global Discourse, 7(1), 109-127.

Remington-Doucette, S.M., Hiller Connell, K.Y., Armstrong, C.M., Musgrove, S.L. 2013. Assessing Sustainability Education in a Transdisciplinary Undergraduate Course Focused on Real-world Problem Solving: A Case for Disciplinary Grounding. International Journal of Sustainability in Higher Education, 14(4), 404-433.

Restakis, J. 2006. Defining the Social Economy - The BC Context. British Columbia Cooperative Association.

Rice, L. 2020. Nature-based Solutions for Urban Development and Tourism. International Journal of Tourism Cities, 6(2), 431-448.

Seddon, N., Chausson, A., Berry, P., Girardin, C.A., Smith, A., Turner, B. 2020. Understanding the Value and Limits of Nature-based solutions to Climate Change and other Global Challenges. Philosophical Transactions of the Royal Society B, 375(1794), 20190120.

Smith, G. 2005. Green Citizenship and the Social Economy. Environmental Politics, 14(2), 273-289.

Stefanakis, A.I., Calheiros, C.S., Nikolaou, I. 2021. Nature-based Solutions as a Tool in the New Circular Economic Model for Climate Change Adaptation. Circular Economy and Sustainability, 1, 303-318.

Sterling, S. 2013. The Sustainable University: Challenge and Response. The Sustainable University: Progress and Prospects, 2, 17.

Tilbury, D. 1995. Environmental Education for Sustainability: Defining the New Focus of Environmental Education in the 1990s. Environmental Education Research, 1(2), 195-212.

Tuszyńska, L. 2006. Edukacja ekologiczna dla nauczycieli i studentów. Wyższa Szkoła Pedagogiczna Towarzystwa Wiedzy Powszechnej, Warszawa.

United Nations. 2015. Transforming our World: the 2030 Agenda for Sustainable Development. Resolution adopted by the General Assembly on 25 September 2015, A/RES/70/1.

Vasconcelos, C., Calheiros, C.S. (Eds.). 2022. Enhancing Environmental Education through Nature-based Solutions. Springer.

Wheeler, K. 1975. The Genesis of Environmental Education In: Martin, G. Wheeler, K. (Eds.), Insights into Environmental Education, London.

Wooltorton, S., Wilkinson, A., Horwitz, P., Bahn, S., Redmond, J., Dooley, J. 2015. Sustainability and Action Research in Universities: Towards Knowledge for Organisational Transformation. International Journal of Sustainability in Higher Education, 16(4), 424-439.

Žalėnienė, I., Pereira, P. 2021. Higher Education for Sustainability: A Global Perspective. Geography and Sustainability, 2(2), 99-106.