



Green Campus Initiatives in Online and Distance Higher Education

EADTU Task Force on Green Campus

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Published by

European Association of Distance Teaching Universities (EADTU)

Parkweg 27, 6212 XN Maastricht, The Netherlands

E-mail: secretariat@eadtu.eu | www.eadtu.eu

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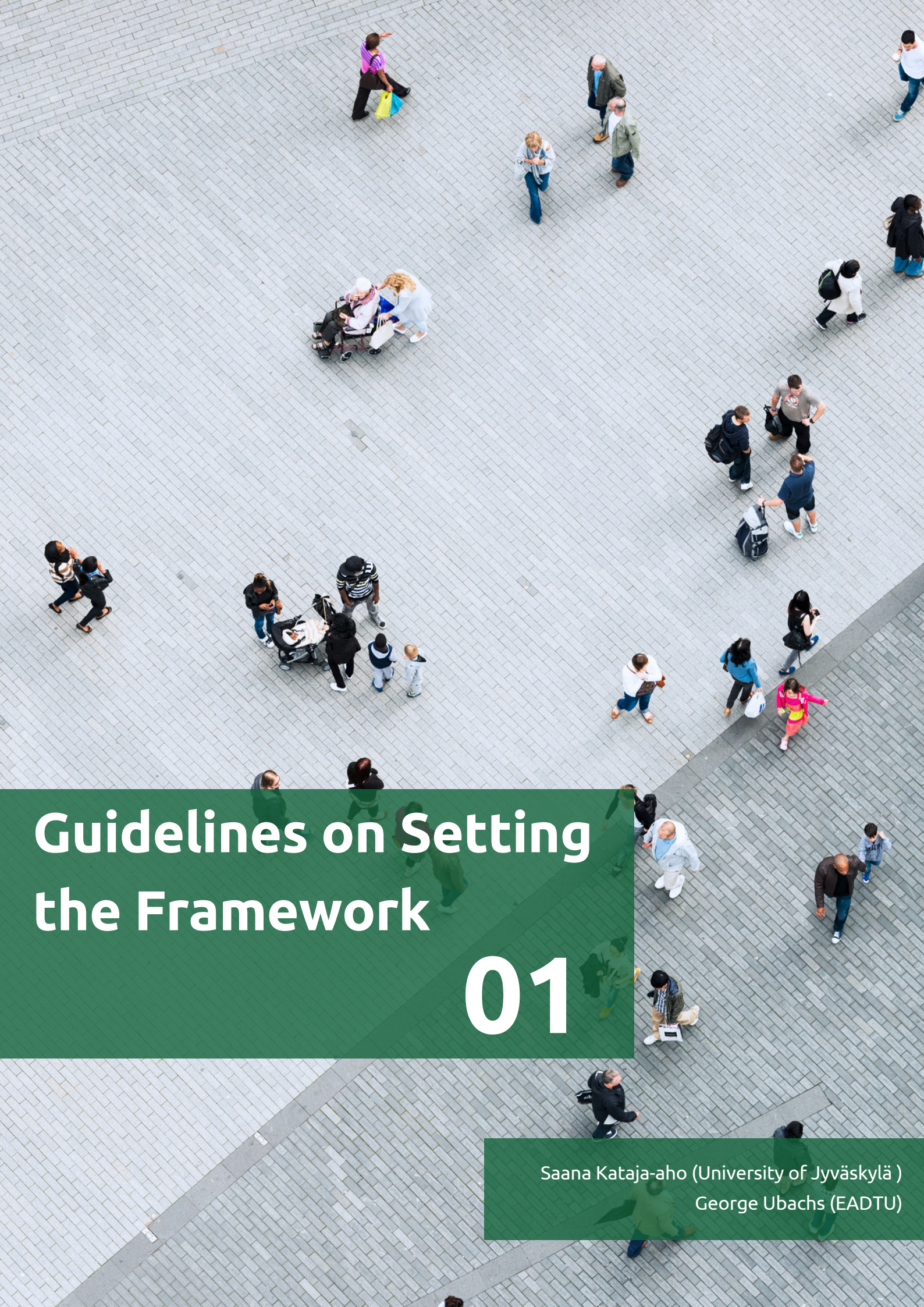
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This research is conducted as part of the Task Force Extending Student Numbers & Retention and Student Services. This Task Force is supported by the European Commission, DGEAC, under the Erasmus+ Programme. The European Commission supports for the production of this publication and does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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Guidelines on Setting the Framework

01

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A “Green Campus” refers to a Higher Education Institution (HEI) campus that is designed, built, and operated in an environmentally sustainable manner. This can include a variety of initiatives such as energy efficiency, use of renewable energy sources, recycling and waste reduction programs, sustainable transportation options, and conservation of natural resources. Green campuses also often include green spaces, such as gardens and parks, which provide habitat for wildlife and opportunities for outdoor recreation for students, faculty, and staff.

In higher education, green campuses are becoming increasingly popular as HEIs strive to reduce their environmental impact and create a more sustainable future. There are several possibilities for implementing green initiatives on campuses, including:

- Investing in energy-efficient buildings and retrofitting existing buildings to reduce energy consumption;
- Implementing recycling and waste reduction programs;
- Using renewable energy sources such as solar and wind power;
- Encouraging sustainable transportation options such as biking and public transportation;
- Promoting sustainable food choices in campus dining halls and cafes;
- Encouraging conservation of natural resources and protecting biodiversity;
- Creating green spaces for outdoor recreation, education, and research;
- Related research.

By implementing these initiatives, HEIs can not only reduce their environmental impact but also provide valuable educational opportunities for their community (including students, faculty, and staff) to learn about sustainability and environmental stewardship.

The European Commission's "green campus" approach is a programme aimed at promoting sustainable practices and reducing the environmental impact of HEIs and research institutions throughout Europe. The program encourages institutions to adopt environmentally friendly policies and practices in areas such as energy efficiency, waste management, and transportation. Additionally, the program provides support for research and innovation in sustainable technologies and helps to raise awareness among students and staff about the importance of environmental sustainability. The goal of the green campus approach is to help HEIs and research institutions to become leaders in sustainable practices, and to contribute to the European Union's broader efforts to combat climate change and promote sustainable development. The connected topic is the ‘green deal’ and a reference document can be found [here](#).

This report is the result of the work of the European Association of Distance Teaching Universities (EADTU)’s Task Force Green Campus with focus on:

- Developing a vision on the specific role and position online and distance teaching HEIs have in supporting the concept of a Green Campus;
- Making an inventory of EADTU HEIs’ policies on Green Campus;
- Sharing expertise and experiences between EADTU HEIs and collaborating in support of Green Campuses;

- Collection of good practices;
- Sharing studies on research;
- Inventory of existing and development of new approaches;
- Identifying opportunities and obstacles;
- Leveraging collaboration among EADTU partners;
- Developing a reference model for institutional strategies.

This report takes stock of up-to-date action lines in Green Campus approaches and is complementary to existing reports on Green Campuses by focusing specifically on distance teaching HEIs.

Planetary well-being, vision, and ambition

The global crises of climate change and biodiversity loss are forcing humanity to react to these serious phenomena affecting all organisms. Human actions have played a central role in exacerbating these crises, but we also have the power to counteract them. For a long time, there have been discussions about sustainable development (e.g. United Nations, n.d.), the green transition (e.g. Borowiecki et al., 2023), and planetary boundaries (Rockström et al., 2009, Steffen et al., 2015 and Richardson et al., 2023) or the doughnut economy (Raworth, 2017). These are all more or less directly related to human activity and human well-being on the planet. Since humans are entirely dependent on nature and its functioning processes and ecosystems, which in turn are dependent on other organisms, it has been felt necessary to somehow connect these issues. The University of Jyväskylä's resource wisdom community, JYU Wisdom, has developed the concept of planetary well-being. According to this concept, planetary well-being refers to a state in which the integrity of the Earth system and ecosystems is maintained to such an extent that species and their lineages are conserved into the future and all organisms have the opportunity for species-specific behaviour (Kortetmäki et al., 2021). This means that in all human activities, we need to think about the bigger picture and consider the well-being of non-human species. Education is a key factor in the dissemination and assimilation of knowledge, comprehension, and the ability to manage global crises. Life matters.

Vision

HEIs are expected to consider both climate change and nature loss in their decision-making processes, as well as in their teaching, guidance, and research. A clear correlation can be seen between the concept of planetary well-being and the EADTU Green Campus policies.

HEIs have an important part to play in accomplishing and fulfilling sustainability goals on a national and international level. Within higher education, our influence is tied to our ability to produce new information and research and to educate future experts and agents, all of which serves to generate new social and cultural capital. In higher education, the impact we can have extends from the local and national all the way to the worldwide level.

Ambition

Green Campus guidelines, if taken into action, can mainly contribute to the United Nations Sustainable Development Goal (SDG) 4, target 4.7, which states: “By 2030, ensure that all learners acquire the

knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development" (*United Nations*, n.d.). For example, Green Campus HEIs could offer highly recommended courses on sustainability-related issues for their students. Thus, the idea of education for planetary well-being (Aaltonen et al. 2024) could form the foundation for implementing Green Campus guidelines and also for fulfilling SDG4 target 4.7 in higher education. The education for planetary well-being entails transformative learning (where ways of thinking, assumptions and so-called semantic perspectives are tested and modified) and renewal of practices. The main goal of education for planetary well-being is the learning and understanding of the **interconnectedness of all life on Earth** (Aaltonen et al. 2024). In addition, all Green Campus HEIs should examine not only their Carbon Footprint but also their Ecological Footprint (EF) or, more precisely, their Biodiversity Footprint, and modify their activities to minimise their impact on the climate and nature. Further, nature-positive HEIs are an example worth exploring for all Green Campus HEIs seeking to advance in their promotion of and adherence to sustainability.

Envisaged impact

A Green Campus, implementing environmentally friendly practices and technologies, can have significant impacts on the environment. By using renewable energy sources (solar, wind, etc.), promoting energy efficiency, and by supporting public transport structures or reducing waste, a Green Campus can significantly lower its greenhouse gas emissions. Implementing water-saving technologies and practices can lead to substantial water conservation. Through green spaces, local biodiversity can be promoted, and by decreasing the use of harmful chemicals and implementing better waste management practices, soil, air, and water pollution can be reduced contributing to improved and healthier living environments, enhancing the well-being of students, faculty, staff, and the broader community.

Looking more at educational impact, a green campus will contribute to the awareness among students, faculty, staff, and the broader community about the importance of sustainability and educate them about sustainable practices and technologies first-hand.

By committing to sustainability, campuses can lead by example, fostering a culture of environmental responsibility that influences both the local community and broader society.

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Online and Distance HEIs' Approaches to Green Campus

02

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Abstract

This chapter explores the transformative impact of distance education on promoting green campus initiatives in Higher Education Institutions (HEIs). It stresses the pivotal role of traditional distance education institutions in offering flexible learning while pioneering sustainable, environmentally friendly, green practices. Highlighting the comprehensive functions of HEIs—management, education, research, and community involvement—the chapter examines how distance education can significantly reduce carbon emissions and energy consumption compared to traditional methods. A framework is presented to guide HEIs in initiating green campus practices, emphasising a holistic approach that spans management, learning, research, and community engagement, aimed at fostering sustainability. This framework, alongside examples of good practices, offers a roadmap for HEIs to integrate sustainability into their core operations, ultimately contributing to a more sustainable future.

Although distance education has become one of the mainstream delivery modes in higher education owing to many factors, such as technological advancements, social and global movements, diseases, wars, social conflicts, natural disasters, and so forth, traditional distance education institutions still play an important role for offering flexible, lifelong learning opportunities to a large body of learners. They have been models to all institutions not only in introducing innovative, alternative learning opportunities and environments but also in managing an educational institution efficiently, attractively, and sustainably. Sustainable, or, with a closer focus, green campus implementations are also among the exemplary implementations of distance teaching providers.

According to Velazquez et al. (2006), a sustainable, or green university, is a higher education establishment that adheres to environmentally friendly economic, social, and environmental practices while carrying out its academic duties, conducting research, and engaging with the community in a way that promotes the shift of society toward sustainable lifestyles. As it has been widely accepted, there are four major functions in higher education: management and leadership, learning and education, research and development, and community involvement. Leal Filho et al. (2019) have listed green building, waste management, sustainable procurement, and sustainable mobility as the major areas of greening the management and leadership function. While concerning greening the learning and education function, HE institutions' responsibility is related to increasing their students' awareness of environmental and social issues, and to help them acquire competencies to be used in their daily life and future workplaces (Dagiliūtė et al., 2018). The research and development function is about creating new knowledge and best practices to be used by others on a large scale (Waas et al., 2010). Finally, the community involvement function covers the intensive communication and collaboration with regional and national stakeholders of HEIs on raising awareness, providing learning opportunities, sharing or reflecting new knowledge on greening, as well as modelling and leading green implementations (Sánchez-Barrioluengo & Benneworth, 2019). All in all, it is also the responsibility of HE institutions to be a role model by implementing the green campus practices and vision they advocate for on their own campus.

On the other hand, although there are some other opinions about the role of online and distance education in greening the campuses (e.g., Baker, 2021; Smith, 2023), a distance or technology-based education mode of delivery promises a more sustainable campus than traditional in-person alternatives in all functions of an HEI. For instance, Caird et al. (2015) concluded in their study that the primary causes of carbon emissions in HEIs were campus operations, home energy use, and mobility. When compared to campus-based modes of delivery, online and distance delivery modes produced significant carbon savings of 83 percent and lowered energy use by 88 percent. Although there were possible rebound effects linked to increasing ICT-related energy consumption and paper needed for printing, the online and distance education approach achieved the lowest energy consumption and carbon emissions. Schroeder (2022, August 2), in a blog post, suggested that online and distance education may help HEIs reduce their carbon footprint in several ways, such as less frequent commuting to campus among learners, academic and administrative staff, not producing and consuming paper handouts rather using digital versions, not using on-campus heating, air conditioning, lighting, water, sewer and associated facilities, etc. Distance education institutions have been using these ways for many years and can be considered as models for other HEIs in their green campus transition.

The following sections of the report first present a framework to help leaders of HEIs think on several important issues while initiating a green campus initiative and then offer good practices of the partner distance education institutions regarding green campus that can be used by any other HEI.

Framework

There are many frameworks that have been used to assess organizations about their extent of supporting sustainability and/or greening. The European Eco-Management and Audit Scheme (EMAS), Leadership in Energy and Environmental Design (LEED), Building Research Establishment Environmental Assessment Program (BREEAM), Campus Sustainability Assessment Framework (CSAF), Green League, Environmental and Social Responsibility (ESR), Index 2009, and GreenMetric are among the most cited ones. Our goal in this section is not to propose a new framework for transitioning to a green campus but rather a way of systemic (not systematic) thinking for those leaders or members of HEIs to use while they plan to initiate green campus practices.

There are several dimensions of this framework: (i) the functions of a HEI, (ii) the scope of greening (or sustainability), and (iii) the process of green transition. The first dimension is about the major functions of HEIs, namely management and leadership, learning and education, research and development, and community involvement. A great deal of initiatives mainly focusses on management and leadership functions, and some others focus on other dimensions. Although it is not easy, this chapter emphasises the need for a holistic approach for a greener campus and tries to develop various practices in all functions of the HEI. Green campus initiatives such as sustainable buildings, energy efficiency, waste management and recycling, carbon footprint reduction, etc. must be considered under each function. For instance, let's say the leadership in an institution has started an initiative targeting energy efficiency in its buildings. This is a managerial initiative. In order to increase its success, this initiative should be supported with, for example, an educational initiative to increase awareness of energy efficiency among all major stakeholders of the

institution (students, academic and administrative staff), and/or with a declaration of “energy-efficient campus” as one of the priority research and development areas of the institution.

The second dimension is related to the scope of greening. For a comprehensive and inclusive initiative, an institution should have policies, plans, practices (activities), evaluation and monitoring, as well as dissemination and transfer plans. The institution should have policies that cover its goals and SMART objectives and detailed plans to achieve them under every function, if possible. The practices should also address the goals and objectives. This structure helps the institutions monitor and evaluate their initiatives. In other words, evaluation and monitoring are the major components of any green campus initiative. The institutions should also develop plans for dissemination of the results of their initiatives to wider audiences starting from the main stakeholders (students, academic and administrative staff) to regional and national ones. They should be able to transfer their intellectual and physical outcomes to all possible future initiatives.

The last dimension is about the process of green transition or systematic problem-solving approach within the systemic framework. After diagnosing the problematic areas, the institutions should conduct analyses to develop a deep understanding of the sources and impact of these problems. In the scope of this chapter, the concept of “problem” means a “need”, or “need to be transformed” rather than negative results, implementations, etc. After learning more about the problem (need), the institutions should make detailed solution plans (actions) in the scope of their policies and implement them iteratively. During those iterations, monitoring, and improvements are also essential tasks to be completed. Once again, it should be noted that this three-dimensional framework is just a recommended way of thinking about developing practices in a green campus transition.

Case studies and reflections from the field

While this section provides a framework, distance education HEIs may adopt different Green Campus pathways due to different future strategies, missions, and visions, as well as social, economic, cultural, or regulatory reasons. Although they are institutions, distance education HEIs have a collective personality and the attitudes of different stakeholders, from students to educators, administrators and staff, help to shape this personality. In this context, the green campus strategies of two important distance education HEIs, Anadolu University in Türkiye and The Open University (OU) in the UK, can be taken as case studies.

Anadolu University addresses the challenge of implementing macro-level policies on an individual scale by developing personalized engagement strategies tailored to its vast student population. The University champions sustainability through significant green campus initiatives, such as zero-waste policies that have eliminated single-use materials in cafeterias, preventing millions of pieces of plastic and paper waste annually. Digital transitions further contribute to waste reduction, exemplified by the issuance of digital diplomas and optimized exam sessions, which cut carbon footprints, save numerous trees, and reduce CO2 emissions. An awareness campaign educates the university community about these sustainability practices. These efforts have earned Anadolu University recognition in the GreenMetric Index and underscored its alignment with Sustainable Development Goals (SDGs) according to Web of Science

classifications. While these initiatives highlight Anadolu University's dedication to sustainability, there is an ongoing need to prioritize goals and strengthen incentive mechanisms to achieve a wider impact.

The OU has implemented extensive carbon reduction measures to meet government targets, engaging all staff in sustainable procurement, transport, and ICT policies. Significant improvements include enhanced building insulation, efficient heating systems, and reduced electricity consumption through LED lighting and renewable technologies like photovoltaic roofing.

A key focus of the OU's sustainability efforts is understanding the environmental impacts of different higher education delivery systems. The Factor 10 Visions study revealed that distance education at the OU consumes nearly 90% less energy and produces 85% fewer CO₂ emissions than traditional campus-based education, mainly due to reduced student travel, efficient campus site utilization, and decreased energy use for student housing.

In response to the increasing use of ICT in education, the SusTEACH project assessed the carbon impacts of various teaching models, finding that ICT-enhanced and traditional distance teaching methods significantly reduce energy consumption and carbon emissions. The project highlighted that ICT usage accounts for a substantial portion of energy consumption and CO₂ emissions in module delivery. It also noted that despite the rise of digital learning, paper consumption remains consistent, suggesting students prefer printed materials for study.

The OU has also prioritized sustainability within its institutional strategy, setting ambitious goals in its Net Zero Carbon Policy and Plan 2030. Efforts include training staff and students in carbon literacy, launching sustainability planning tools, and improving campus operations to reduce greenhouse gas emissions. Collaborative initiatives extend across the four UK nations, promoting sustainability education and practices within the university community.

The OU emphasises its role as an educator in driving sustainability, integrating it into curricula, research, and public engagement. This commitment includes aligning research with the United Nations Sustainable Development Goals (SDGs), supporting learners and communities in transitioning to a renewable energy economy, and embedding sustainability in all aspects of the university's operations and teachings.

This comparative evaluation explores the green campus policies of Anadolu University and The Open University, applying the framework of major functions of higher education: management and leadership, learning and education, research and development, and community involvement. Both institutions demonstrate significant efforts in promoting sustainability, yet their approaches and achievements provide a rich ground for comparison.

Anadolu University demonstrates excellence in waste management, digital transitions, and community engagement through awareness campaigns. The Open University leads in carbon reduction, sustainable procurement, curriculum integration, detailed research on educational impacts, and broad public engagement. These complementary strategies highlight diverse pathways for higher education institutions to achieve sustainable campuses. Anadolu's focus on zero waste and digitalization contrasts with OU's

comprehensive carbon reduction and educational integration, offering valuable insights and models for other institutions aiming to implement or enhance green campus policies.

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Good Practices

Good Practice #1

The Open University in the United Kingdom: Past, present, and future green institutional phases

Andy Lane

The Open University | United Kingdom

The Open University (OU) in the United Kingdom has taught and researched sustainability in its many guises since its foundation in 1969. It has also sought to follow appropriate legislation and regulations relating to sustainability that apply to the University as an educational organization and business. Most of these actions covered the many and diverse operations of the university including its distributed estate around the four nations of the UK. For example, the Climate Change Act 2008 required universities, directly or indirectly, to take action to reduce carbon emissions to contribute to the national targets for carbon reduction. More recently it has explicitly included Sustainability as one of five goals in its Learn and Live Strategy 2022-26 whereby it is taking a whole institution approach to embedding sustainability within everything it does and all the people it employs and engages with as an educational organization and business.

Introduction

The Open University (OU) in the United Kingdom was established in 1969. Moving from the original concept of the “University of the Air” to the University of the Cloud, the OU is as relevant tomorrow as it was in 1969 – however, our founding principles continue to drive everything that we do – to be open to people, places, methods and ideas. We promote educational opportunity and social justice by providing high-quality university education to all who wish to realise their ambitions and fulfil their potential. Through academic research, pedagogic innovation and collaborative partnership we seek to be a world leader in the design, content and delivery of supported open learning. Most of our undergraduate courses have no formal entry requirements. We believe that the qualifications our students have when they leave are the only ones that matter. Operating under the differing funding and administrative arrangements in the four nations of the UK, we work in partnership with national and local organisations to open up higher education to underrepresented groups, reaching out to potential students in their communities – and ensuring that, once on board, these students receive the support they need to succeed in their studies. Every day, millions of people access free OU content, no matter where they live in the world, whether that be educational materials through OpenLearn and YouTube or research papers through the Open Research Online and CORE platforms.

Challenges: Putting into practice

The biggest challenge is bringing together the many strands of activities and people involved in managing teaching, student support, research, community engagement, employer engagement, international

development across a distributed estate and workforce throughout the United Kingdom. These activities and people use renewable and non-renewable resources and create waste products both directly within that estate and indirectly through the upstream suppliers of resources and services as well as the downstream beneficiaries of its activities.

Approaches: The first fifty years

Environmental teaching

Ever since it started teaching students in 1971 The Open University has had several modules and latterly qualifications with environment, environmental or sustainability in their title. It also has had several modules and qualifications ostensibly about other subjects that include a defined but minor component that deals with an aspect of environmental sustainability. Lastly the University has its unique Open qualifications through which students can choose, within defined regulations, their own profile of modules from across the OU's undergraduate and postgraduate curriculum. Some of these profiles will feature an environmental module. Nevertheless, only about 3% of our 170,000 students study one of these modules in any given year. In addition to its credit bearing curriculum The Open University also offers a small number of non-accredited courses and a much larger number of free courses and other educational resources via its OpenLearn platform. Most of these free courses are derived from credit bearing modules but some free courses and most other short form, rich media educational resources are made especially for OpenLearn or other channels such as YouTube. The annual audience for environment related courses and other content on these channels is in the hundreds of thousands.

Environmental research

In a similar vein there have always been academic staff that have researched different environmental topics about aspects of the world around us including those close to home. Two examples relevant to green campus are research projects on the carbon impacts of distance and online teaching models (Factor10 and SusTEACH) and a project about using digital technologies in urban settings called MK:Smart.

The first major study to assess the energy consumption and carbon impacts of campus-based and distance higher education systems was the Factor 10 Visions study 'Towards Sustainable Higher Education' (Roy et al, 2005). The study found that on average the production and delivery of distance teaching consumed nearly 90% less energy and produced 85% fewer CO2 emissions than campus-based higher education courses and modules. The much lower impacts of distance education were found to be mainly due to a major reduction in the amount of student travel, economies of scale in utilization of the campus site, and the elimination of much of the energy consumption associated with students' housing'. The greater use of online teaching models since then required further analysis of carbon impacts against the more traditional face-to-face and distance teaching models. This led to the SusTEACH project which examined the role of ICTs in Higher Education and their effect on carbon reduction across 30 courses and modules in several UK institutions. As with the Factor 10 study, SusTEACH found that the main sources of carbon impacts were associated with travel, residential energy consumption and campus site operations (Caird et al, 2015). However, the use of online and ICT enhanced teaching delivery methods and traditional distance teaching methods reduced these sources of energy consumption and therefore achieved significant carbon reductions. Building on the findings, a SusTEACH toolkit, was designed to support the planning of more

sustainable courses, modules and qualification programmes that is incorporated into a free course on ‘The environmental impact of teaching and learning’ on [OpenLearn](#).

Milton Keynes, where the OU has its main campus, has been a leading UK Smart City since 2014, when the successful three-year MK:Smart programme was launched. This highly influential initiative shaped the smart city agenda not just in Milton Keynes but at an international level, and established Milton Keynes as one of the leading smart cities in the world. The comprehensive research and development programme includes much involvement of researchers from The Open University across a number of projects. Two projects dealing with sustainability include GreenDATA, a project to capture, store and share power generation and use data from domestic renewable energy installations, including solar, wind and solar/geothermal sources, and iSpot Nature, a citizen science platform for biodiversity run by The Open University to help anyone learn about and engage with nature, building their wildlife identification skills, while sharing, recording and identifying species. Such developments are now linked to an institution wide Open Societal Challenges platform that cover over 200 projects dealing variously with sustainability, living well, and tackling inequality, with nearly 70 of the projects being solely or partly about sustainability. There is also an Open Societal Challenges Competition open to UK charities and Milton Keynes businesses.

Environmental impacts of operations

HEIs have always been subject to the same environmental legislation and regulations as other businesses in the UK. However, the Climate Change Act 2008 required HEIs, directly or indirectly, to take action to reduce carbon emissions to contribute to the national targets for carbon reduction. Since then, The Open University has devised plans for how to reduce, measure, review and report progress on its emissions as evidenced by its Net Zero Carbon Policy and Net Zero Carbon Plan 2030. At the same time, The Open University has been developing a specific Environmental Sustainability Policy but also a set of more specific policies on different aspects of its operations: sustainable construction, biodiversity, waste, water, heating and cooling, sustainable food and procurement. For many of these operations (e.g., energy, emissions and waste, transport, and environment) the university has had to report its data to the Higher Education Statistics Agency which is then published annually alongside similar data from almost all universities.

Since 2010 the University had gradually developed many aspects of a green campus, responding to both internal and external pressures, but much of this activity was left to dedicated staff and without a defined strategy. In 2021, partly in response to wider developments in the UK promoted by the Alliance for Sustainability Leadership in Education (EAUC) and the activities of both The Open University’s own students and students nationally through Students Organising for Sustainability UK and partly in response to consultations with staff The Open University explicitly included Sustainability as one of five goals in its Learn and Live Strategy 2022-26 (The Open University, 2022).

Approaches: The present day

Our delivery of sustainability firmly draws on our unique characteristics: our pioneering provision of distance education; our mass public engagement reach, often in partnership with the BBC; and our four-nations presence. We build on our long-standing social justice mission to enable environmental justice.

Our VCE sponsor for sustainability, the Executive Dean of STEM, and our Director of Sustainability, direct, coordinate and empower a matrix-team of senior colleagues to deliver on sustainability.

Our approach emphasises that **sustainability is ‘everyone’s job’** and we involve our staff and students in collaborative projects to integrate sustainability in all that we do and have a website dedicated to explaining all aspect of sustainability work at The OU (The Open University, 2024). In the academic year 2022-23, we:

- Upskilled and reskilled close to 700 of our staff and students through our free 8-hour Carbon Literacy training, with half becoming Carbon Literacy Project certified.
- Launched our co-produced Sustainability Planning, Action and Reporting Kit (SPARK) for units/sub-units. It enables teams to tailor actions, be creative in embedding sustainability in their daily work and form sustainability working groups for continuous improvement and impact prioritisation.
- Empowered our pan-OU Sustainability Coordination Group and our Sustainability Steering Group (a subset of VCE) in monthly briefings and meetings.
- Learned from best practice across the four nations, establishing a nations sustainability working group. We transferred good practice in Scotland to input into consultations in Northern Ireland and develop an institutional adaptation policy. We joined a group of all nine universities in Wales pioneering a collaborative Masters in Sustainability Leadership and are members of the Wales Innovation Network Net Zero steering group.

Institutional progress on our sustainability commitments means we had:

- Continued to reduce our greenhouse gas emissions from our energy use (‘Scope 1 and 2’) including building fabric upgrades, winter closures, server rationalisation, laboratory improvements and Electric Vehicle charging point installation for fleet.
- Collated data on emissions from procurement of goods and services (‘Scope 3’) including high spend/high carbon digital and travel.
- Trained our Central Procurement team to embed carbon reduction, sustainability and modern slavery prevention in procurement processes.
- Created internal guidance on responsible procurement for all buyers of goods and services, encouraging reuse wherever possible via our reuse portal (Warp-It).
- Made progress on completing our divestment from fossil fuels by the end of 2023.
- Drafted a Climate Risk Plan and processes ahead of Climate Risk Disclosure requirements in 2024.
- Left much of our Milton Keynes campus unmown to enhance biodiversity and support wildlife, whilst still being part of Britain in Bloom.
- Continued communications to all staff and students in a monthly sustainability bulletin, a 600+ Viva Engage community and monthly Go Green staff champion events.

- Led multi-stakeholder discussions on sustainability and green skills through our Open Conversations and ‘Net Zero Skills and the Role of Universities’ public event, bringing together the OU family of students, graduates and professors.
- Collaborated with Students Organising for Sustainability (SOS-UK) on inclusive and equitable sustainability, acknowledging the intersectionality with EDI.

Approaches: The future

We are committed to further embedding sustainability in our curriculum, research, and knowledge exchange activities. We aim to support our learners, their families, communities, and organisations to transition to a renewable energy economy, building long-term resilience and adapting to climate change impacts. To do so we have:

- Aligned our most recent Research Plan (2022–27) with the United Nations Sustainable Development Goals (SDGs) and welcomed UKRI’s draft Sustainability Concordat.
- Embedded sustainability in our offer to public sector, business and enterprise by promoting our popular Microcredential ‘Climate Change: Transforming your Organisation for Sustainability’ and initiating an ‘Environmental, Social and Governance’ (ESG) campaign to highlight our commitment to sustainable business.
- Trained 13 of our careers service staff on climate and green careers to ensure our students receive advice and support on jobs in sustainability and net zero.
- Engaged 90 students to map all OU modules against the SDGs and UNESCO 21st century competencies to inform curriculum design and course revalidation.
- Developed guidance for module writers so that our students are encouraged to think about sustainability whatever they study.
- Reviewed Professional Statutory and Regulatory Bodies accrediting processes which support sustainability and collaborated with the EAUC on enhanced engagement and guidance.

Outcomes: External reporting

It is important to monitor and evaluate our actions against both internal and external benchmarks as we continue to implement our institutional strategy. The annual reporting on Estates led activities has already been noted but we are also subject to other external evaluations. One that has run in the UK for many years is the student led People and Planet University League Table, and in 2023-24 the Open University was ranked 67 out of 151 universities but this was up 48 places from the previous year. So, an average but improving performance on the metrics used for these league tables. Also, in 2023 we published our UN Global Compact Communication on Engagement (The Open University, 2023) that includes a CEO statement of continued support for the UN Global Compact and its ten principles as well as a measurement of outcomes against those principles.

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Good Practice #2

Anadolu University: Initiatives to Form a Sustainable Learning Ecosystem

Aras Bozkurt & Cengiz Hakan Aydın

Anadolu University | Türkiye

Anadolu University, in Türkiye tackles the challenge of implementing macro-level policies on an individual scale, especially given its vast student population, by developing personalized engagement strategies. The university champions sustainability through significant green campus-oriented initiatives, such as zero-waste policies that have eliminated single-use materials in cafeterias, averting millions of pieces of plastic and paper waste annually. Digital transitions further reduce paper waste, exemplified by the issuance of digital diplomas, and optimising exam sessions to cut carbon footprints, saving numerous trees and reducing CO2 emissions. An awareness campaign educates the university community about these sustainability practices. These actions have earned Anadolu University recognition in the GreenMetric Index and underscored its alignment with Sustainable Development Goals (SDGs) as per Web of Science classifications. While these initiatives mark Anadolu University's dedication to sustainability, there is an ongoing need to prioritize goals and strengthen incentive mechanisms for a wider impact.

Introduction

Anadolu University, established in 1958 as a state university in Türkiye, embarked on a transformative journey in 1982 by adopting Open and Distance Education (ODE) methodologies. This strategic shift enabled the university to function as a dual-mode institution, catering to the educational needs of both on-campus and remote learners. The adoption of ODE was driven by a principal objective: to ensure educational equality and create a learning ecosystem with different entry and exit points. Anchoring this initiative was the philosophy of openness, which has since become central to the university's operational ethos. Anadolu University envisions itself as a global leader in lifelong learning, a vision highlighting its commitment to openness and educational innovation.

Challenges: Putting into practice

The biggest challenge of the practices conducted by Anadolu University is that the policies implemented at the macro level as an institution are reduced to individuals at the micro level. Although efforts are being made in this direction, the size of the student body in particular makes it difficult to reach wider audiences and points to the need to adopt different approaches for micro-strategies at the individual level.

Approaches: Sustainability and Green Campus-oriented projects

Anadolu University, which conducts activities in all social responsibility areas for the benefit of society, works with the theme of a Sustainable Campus by considering the future of our world and humanity. Anadolu University, which has implemented a series of practices within the scope of zero waste for sustainability and a green future, produces projects with an approach that prioritizes the needs of society.

Zero-Waste Policy: In line with the Sustainable Campus goal, the practice of using single-use materials in cafeterias was terminated in order to prevent waste and reduce the amount of waste generated. Plastic waste, which disappears in nature between 400 and 1000 years, but the effect of harmful chemicals released into the soil and water while dissolving continues much longer, has been removed from use. With this practice, Anadolu University has prevented more than 2.6 million plastic cups, more than 1.6 million dinner sets, more than 25 thousand oversized garbage bags, and tons of paper and plastic waste from being left to nature every year.

Paper-Waste Policy: In addition to the sustainability practices previously implemented in all units of Anadolu University, no printed material that is not compulsory will be used to prevent paper waste. In this context, the distribution of all materials such as posters, invitations, brochures, booklets, etc. will now be conducted in digital environments. On the other hand, unnecessary paper use has been minimized with the electronic document system. With the issuance of digital diplomas to students graduating from the open education system, the issuance of approximately 150-200 thousand printed diplomas each year has been eliminated. This project has resulted in significant paper savings.

Carbon-Footprint Policy: Systematic activities are carried out to reduce or not use activities that may harm the environment in Open Education System exams, which are held with intense participation. With the institutional processes conducted in this context, less paper is used, fewer products and services are implemented, contributing to the protection and development of natural life. While the number of exam sessions was 4 in 2021-2022 Fall Semester, this number was reduced to 3 sessions in the 2023-2024 Fall Semester. Anadolu University has thus managed to make a great improvement in terms of carbon footprint. With the savings achieved, 2140 trees were prevented from being cut down for each exam period, more than 5 tons of waste plastic was not released into nature, and thousands of tons of CO₂ were prevented from being released into nature with the reduced need for transportation.

Awareness Policy: Having trained 700 staff on awareness raising, Anadolu University plans to train all employees and students in the new semester. In this context, the Zero Waste Student Club, which will start its activities in the new semester, plans to organize a series of activities to raise awareness of the whole society, especially students.

Outcomes: State of the art

According to GreenMetric Indexes (GreenMetric, 2023), Anadolu University ranked 885th university with its total score (Figure A). Besides, if we benchmark the practices of Anadolu University related to Sustainable Development Goals (UN, 2015) based on Web of Science classifications (WoS) based on publications indexed by WoS (2024), we can see that (Figure B), in order of intensity of interest, SDG No 11, 07, 06, 13, 12 and 14 addresses in Anadolu University affiliated publications.

Current practices at Anadolu University have prioritized projects aimed at reducing unnecessary waste generation. Awareness projects aim to ensure that existing practices are adopted by Anadolu University and become part of the institutional culture. However, when the GreenMetric and WoS SDG results are examined, it is thought that goals should be prioritized, especially in the context of Green Campus, and incentive mechanisms should be put in place to increase the realization of these goals.

Rank 2023 ↑↓	University	Country	Total Score	Setting & Infrastructure	Energy & Climate Change	Waste	Water	Transportation	Education & Research
885	Anadolu University	Turkiye	4430	820	845	1275	350	625	515

Figure A. GreenMetric Anadolu University rankings.

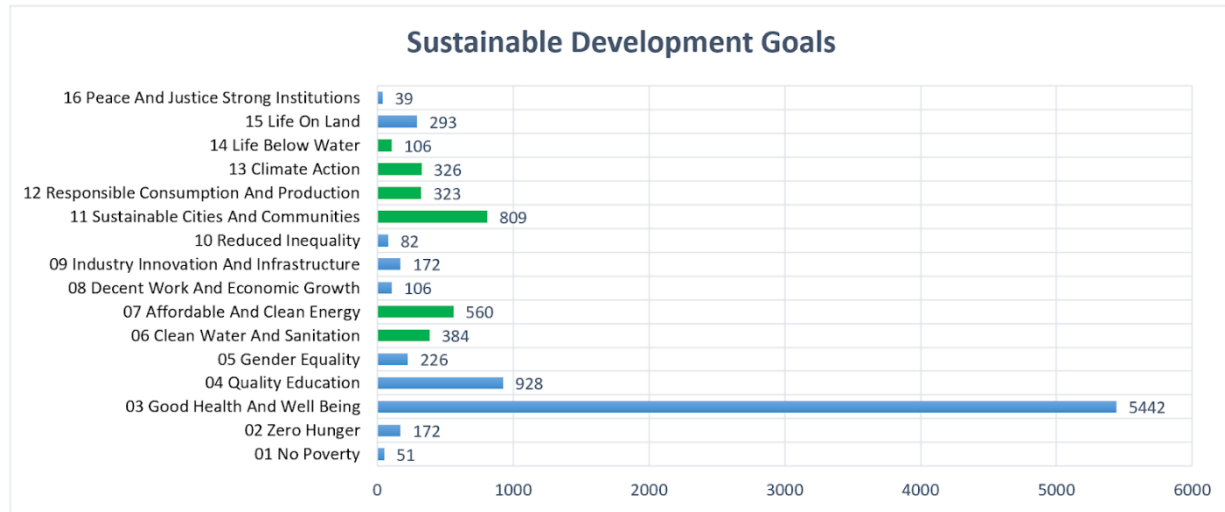


Figure B. Distribution of WoS SDG classification.

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Education

03

Mahsa Mapar & Sandra Caeiro (Universidade Aberta)

Abstract

Education for Sustainable Development (ESD) has evolved significantly from its origins in Environmental Education (EE), embracing a comprehensive approach that integrates social, economic, and environmental dimensions. The transition towards sustainability, notably through Agenda 2030 and the Sustainable Development Goals (SDGs), represents a pivotal shift towards broader educational objectives culminating in Education for SDGs. ESD emphasizes the development of essential competencies such as systems thinking, anticipatory skills, and collaborative problem-solving, which necessitate interdisciplinary approaches and diverse pedagogical models across various academic disciplines. This chapter provides an exploration of the historical background and evolution of ESD, underscoring its transformative potential within Higher Education Institutions (HEIs). It identifies key competencies that ESD seeks to cultivate, emphasizing the role of interdisciplinary education and the integration of non-formal learning alongside formal education. The chapter also highlights a spectrum of sustainability pedagogies ranging from general methodologies to specific techniques employed in HEIs. By integrating these educational strategies, competencies, and pedagogies, the chapter aims to equip educators and diverse learner groups with the necessary skills and knowledge to address global challenges effectively and contribute to sustainable societal change, aligned with the SDGs.

The roots of Education for Sustainable Development (ESD) can be credited to the Environmental Education (EE) movement that started in the early 1970s (Moreno Pires et al., 2020). This concept originated at the International Workshop on Environmental Education hosted by the International Union for Conservation of Nature in Carson City, USA. It aimed to define values and clarify concepts essential for fostering attitudes that recognize the interconnections between humans, culture, and the biophysical environment. By 1972, at the UN Conference on the Human Environment in Stockholm, EE was recognized as a continuous process involving values clarification, environmental management education, concept formation, and skill development to advance environmental protection and global education (Chasek 2020). Twenty years after the Stockholm Conference, the 1992 United Nations Conference in Rio de Janeiro introduced Agenda 21 to implement Sustainable Development (WCED, 1992). Following this, UNESCO launched the Decade of Education for Sustainable Development (DESD) (2005-2014), promoting numerous ESD initiatives (UNESCO, 2012b, 2014). Post-DESD, "Education for Sustainable Development" (ESD) began to replace "Environmental Education", linking environmental attitudes with human rights, social justice, and equity, promoting a holistic approach to sustainability while still recognizing the importance of EE in specific contexts (Disterheft et al. 2013).

The ESD concepts align with "strong sustainability" rather than "weak sustainability", which rejects the theory of substitutability by pointing out that social and economic capital are derived from environmental capital (Wilson & Wu, 2017). The origin of ESD created a tendency for a predominant environmental-focused conceptualization (Lidstone et al., 2015; Stough et al., 2018), however, EE recognized that environmental issues were integrated within other dimensions of sustainability and currently cover

transformative learning and provide equal attention to economic, social, environmental, and institutional concerns (Moreno Pires et al., 2020; Moreno-Pires & Fidélis, 2012). In this context, integrating sustainability into HEIs is complex due to diverging views, with ESD presenting a broader, more ambiguous agenda than EE (Lidstone et al., 2015; Moreno Pires et al., 2020; Stevenson, 2007).

EE and ESD have a relationship together in which Eilam and Trop (2010) introduce 4 typologies in the relationship between EE and ESD (see Figure 1): i) as separate yet overlapping fields, ii) ESD is depicted as overwhelming EE, expanding its boundaries, iii) EE forms the foundation of ESD, which has evolved independently as an educational practice, and iv) a complete overlap between EE and ESD.

By introducing Agenda 2030 and the Sustainable Development Goals (SDGs) in 2015 (UN, 2015), as a reference and universal guidepost for transitioning to sustainable development in the period 2015–2030, a new concept of ESD has emerged which stressed the important role of education as a main driver of development and realization of the SDGs, further named by some author as Education for SDGs (Kioupi & Voulvoulis, 2019; UNESCO, 2017; SDSN 2020) (See Figure 1). Sustainable Development Solutions Network (2020) defined Education for SDGs as “education that provides students and people working in all professions with the knowledge, skills, and motivation to tackle the complex sustainable development challenges articulated by the SDGs through whichever career or life path they take (SDSN, 2020, P VI)”. Figure 1 shows the evolution of the educational terms from EE to ES/ESD and more recently to Education for SDGs.

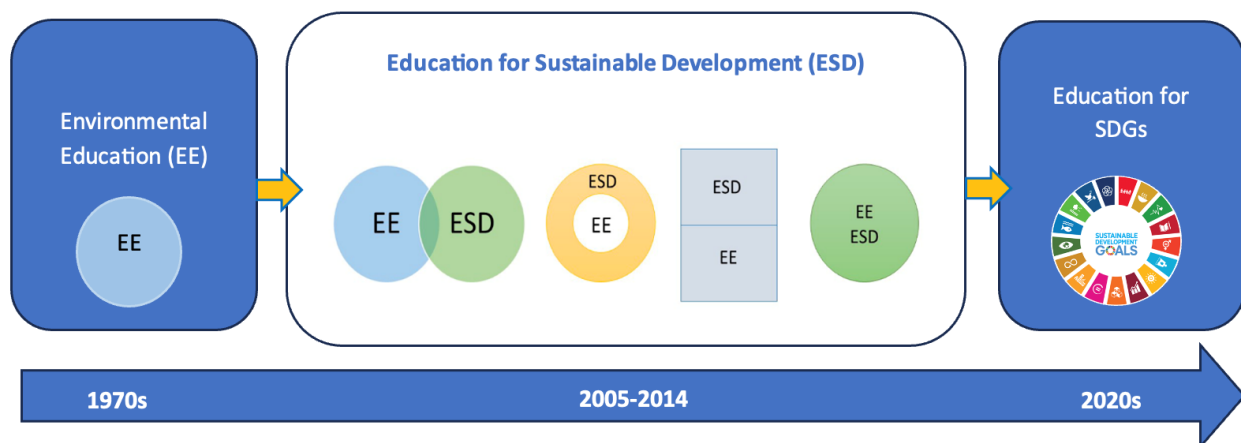


Figure 1. Evolution of the terms: From Environmental Education to Education for SDGs (Authors elaboration, partially adapted from Eilam & Trop (2010) and Moreno Pires et al. (2020)).

While Education for SDGs builds on the established field of ESD, it incorporates a wider range of issues, objectives, and methodologies that directly address the growing HEIs interest in engaging with the SDGs (SDSN, 2020). Education, as explicitly recognized in SDG Target 4.7 alongside Global Citizenship Education (GCED)- which UNESCO promotes as a complementary approach (UNESCO, 2015)- is crucial for all 17 SDGs, fostering competencies that drive sustainable development and societal change. It equips individuals with the skills needed to address challenges across all other 16 SDGs and promotes informed citizen engagement for transformative action (UNESCO, 2017).

Most recently, the 40th UNESCO World Conference on ESD, 2020, introduced the framework for “ESD: towards the achievement of the SDGs”, aiming to create a more just and sustainable world through the fulfilment of the SDGs (Ferrer-Estévez & Chalmeta, 2021). In this sense, ESD can develop cross-cutting key competencies for sustainability that are relevant to all SDGs, or alternatively, it can develop specific learning outcomes needed to achieve a particular SDG (UNESCO, 2017).

Transformation, competences, and interdisciplinary issues in ESD

The **transformation** towards sustainable futures represents an alternative pathway for both humanity and the planet—an aspiration towards a just and equitable global society. The transformation refers to the fundamental changes in human-environment interactions and societal structures on a large scale, encompassing global, national, or local contexts (Hölscher et al., 2018). Aligned with the Agenda 2030 and SDGs, this vision presents a convincing opportunity for advancing human well-being and underlines the need for evidence-based insights into the interconnectedness and synergies among the SDGs (Tremblay et al., 2020; TWI2050). The transformation to sustainable development requires profound shifts in norms and beliefs, alongside large-scale changes in perspectives and cognitive innovations. In this context, **education** plays a crucial role in fostering transformation, developing human capital, supporting economic growth, eliminating extreme poverty, promoting decent work, and addressing inequalities, all aligned with SDGs (Sachs et al., 2019).

To facilitate the process of sustainability transformation through education, and treats ESD, the HEIs need to foster the **competencies** needed to transition to a sustainable future (Kioupi & Voulvoulis, 2019), since the core competencies of ESD aim at fostering societal change and achieving transformation towards sustainability (Disterheft et al., 2013). Competency-based education, as an emerging topic in higher education, has inspired considerable debate, integrating knowledge, skills, values, and attitudes. This educational approach emphasizes clearly defined competences that learners are expected to achieve and demonstrate throughout their educational journey (Lambrechts & Van Liedekerke, 2014). ESD embeds competences for sustainable development by emphasizing responsibility, emotional intelligence, system orientation, future focus, personal engagement, and action (Lambrechts & Van Liedekerke, 2014).

ESD literature has recently started to focus on the connection between how ESD is delivered and the sustainability competences it might generate (Moreno Pires et al., 2020). An example is the study of Wiek et al (2016) in which, they employed 6 types of sustainability competencies in the field of ESD:

- i. **Systems-thinking competence** (to analyse sustainability problems cutting across different domains (or sectors) and scales, from local to global);
- ii. **Futures thinking or anticipatory competence** (to predict potential sustainability challenges while accounting for inertia, path dependencies, and critical events to craft rich pictures of the future related to sustainability issues and sustainability problem-solving frameworks);
- iii. **Value thinking or normative competence** (to articulate and apply sustainability values, principles, goals, and targets, informed by concepts like justice, equity, and responsibility, across visioning, assessment, and evaluation processes);

- iv. **Strategic thinking or action-oriented competence:** (the ability to collectively design and implement interventions, transitions, and transformative governance strategies toward sustainability);
- v. **Collaboration or interpersonal competence** (to initiate, facilitate, and support collaborations - including teamwork and stakeholder engagement - in sustainability efforts to effectively address sustainability challenges);
- vi. **Integrated problem-solving competence** (to integrate diverse problem-solving frameworks to address complex sustainability challenges, linking the previous five competencies to foster sustainability outcomes).

Lozano et al. (2017) discussed 12 competences to be achieved by ESD: Systems thinking; Interdisciplinary work; Anticipatory thinking; Justice, responsibility, and ethics; Critical thinking and analysis; Interpersonal relations and collaboration; Empathy and change of perspective; Communication and use of media; Strategic action; Personal involvement; Assessment and evaluation; and Tolerance for ambiguity and uncertainty. The authors underscored the necessity of equipping learners with a comprehensive array of sustainability competencies to effectively shape the mindsets and actions of future generations (Lozano et al., 2017).

More recently, the European Union has promoted measures that contribute to the green transition and strengthen sustainability competencies for all learners in ESD. They address these issues through a set of sustainability competences entitled “**GreenComp framework**” (Bianchi et al., 2022), which sets out the knowledge, skills, attitudes, and values that learners of all ages will need for the green and sustainable transition. The framework is intended for all learners - students, professionals, and organizations - and supports lifelong learning, complementing existing efforts at all levels, emphasizing that sustainability education goes beyond theoretical knowledge, focusing on empowering individuals as change agents for a sustainable future and highlighting the importance of transversal skills (Doichinova 2023). The Greencomp framework encompasses 4 main areas which cover a total of 12 competencies, providing a comprehensive set of key competences for sustainability to be developed through ESD:

- i. **Embodying sustainability values** (including valuing sustainability; supporting fairness; and promoting nature);
- ii. **Embracing complexity in sustainability** (including systems thinking, critical thinking, and problem framing);
- iii. **Envisioning sustainable futures** (including futures literacy, adaptability, exploratory thinking);
- iv. **Acting for sustainability** (including political agency, collective action, and individual initiative).

Therefore, current teaching pedagogies in HEIs for ESD must enhance global relevance by integrating sustainability topics and developing new sustainability competencies to enable transformative learning (Moreno Pires et al., 2020). This is crucial, as it enables the replacement of unsustainable practices with life-affirming actions, thereby promoting a transformative shift towards a sustainable way of living (Pacis & VanWynsberghe, 2020; Sterling et al., 2017).

Finally, considering that sustainable development is in itself an interdisciplinary sector that encompasses a broad range of disciplines—such as environmental science, biology, medicine, nutrition, agronomy, geography, engineering, architecture, citizenship, sociology, psychology, political science, history, law, economics, and business—and recognizing the extensive and interconnected nature of Agenda 2030, an interdisciplinarity approach is essential in ESD (Annan-Diab & Molinari, 2017; Du et al., 2013; Moksi et al., 2023). Interdisciplinary education refers to the integration of knowledge from diverse disciplines to address problems that cannot be solved by a single disciplinary perspective (Liu et al., 2022). In ESD, interdisciplinarity must be grounded in the interdependent integration of teaching and research, which allows learners to acquire both theoretical insights and practical experience in sustainability, thereby enriching their understanding and engagement with sustainability issues within the academic environment (Moksi et al., 2023). Also, the SDGs cannot be addressed through isolated disciplinary approaches; instead, they require a holistic interdisciplinary approach to be effectively achieved through ESD (Annan-Diab & Molinari, 2017). Even when focusing on a single SDG area, efforts should be made to meaningfully connect across different fields of study to explore interconnections and achieve a holistic systems view of the issues (SDSN, 2020).

Interdisciplinary Distance-learning Program in Environmental Sciences at FernUniversität in Hagen and Fraunhofer Institute UMSICHT [\[GP3\]](#)

Since 2000, FernUniversität in Hagen, in partnership with the Fraunhofer Institute UMSICHT, has been offering the Interdisciplinary Distance-Learning Program in Environmental Sciences (infernium) as part of its continuing education offerings. Targeted at professionals from various sectors—including business, science, associations, and administration—the program provides a comprehensive interdisciplinary qualification. It features modules across natural sciences, engineering, social sciences, law, and economics, delivered through a blend of asynchronous and synchronous learning formats.

Figure 2 shows the relationship between interdisciplinary education and ESD, as stated by Liu et al. (2022). Interdisciplinary education and ESD provide a complementary approach to enhancing learner's interdisciplinary competencies (boundary-crossing skills) and sustainable development competencies (e.g. those indicated in GreenComp framework (Bianchi et al., 2022)) (Liu et al., 2022). For instance, ESD prioritizes methodologies like disciplinary learning, discovery learning, and participatory learning. Interdisciplinary education further enhances this by incorporating group discussions as a key pedagogical strategy. Therefore, HEIs should implement collaborative learning techniques and teaching activities to foster a holistic and interdisciplinary ESD approach (Liu et al., 2022).

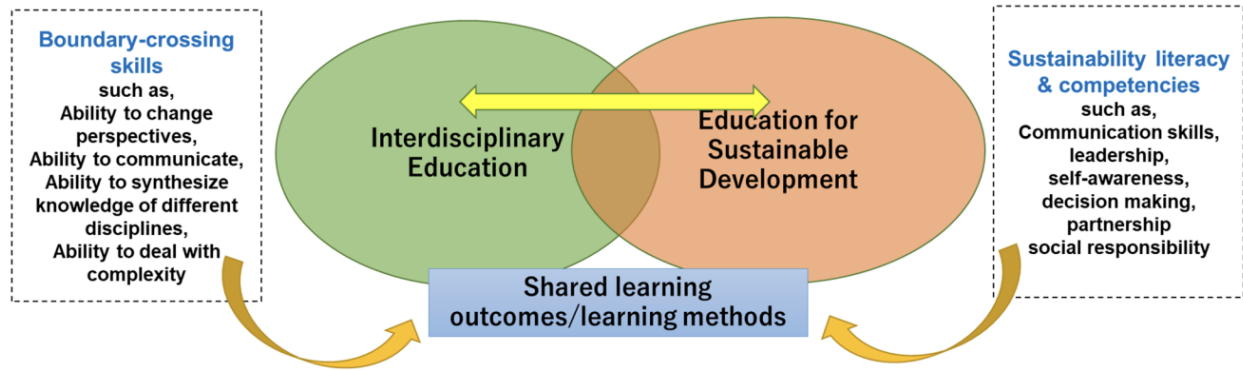


Figure 2. Relationship between interdisciplinary education and education for sustainable development (adapted from Liu et al. 2022).

Training types, target groups, and pedagogical approaches in ESD

In terms of training and incorporation into the ESD curriculum, actions/practices can be carried out at various levels as follows, in a way that all should encompass the lens of interdisciplinary perspective (Annan-Diab & Molinari, 2017) as discussed in the previous section:

- i. Incorporation of sustainability themes into existing disciplines (according to the “Multiple-Perspective” approach of UNESCO (UNESCO, 2012a));
- ii. Creation of modules within the existing discipline (e.g. sustainable mobility, in a discipline about cities and mobility);
- iii. Creation of a separate discipline dedicated to sustainability (e.g. Environment and Sustainability or SDGs);
- iv. Creation of formal courses as a whole program (e.g. Engineering for Sustainability);
- v. Creation of non-formal courses (e.g. Lifelong learning/training course professional).

The pedagogical implications for ESD are extensive, in which formal education alone is insufficient; non-formal (and informal) learning, including intergenerational lifelong learning within communities, is vital for connecting learners to relevant realities and motivating action (UNESCO, 2020). Both formal and non-formal education are crucial for empowering learners to address global challenges, as it shapes their attitudes and values. Current **formal** education systems tend to make minor adjustments rather than significant reforms needed (Wals & Kieft 2010) to integrate sustainability and contribute to SDGs.

ESD should extend beyond formal education and include non-formal education for all institutions, groups, and professionals of all ages. **Non-formal** education, defined as education occurring outside formal schooling (Jackson, 2016), must consider diverse audience characteristics such as age, education level, topic relevance, professional background, sociocultural factors, and connection to the responsible institution. It is notable that **informal** education for sustainable development, differs from both formal and non-formal education, as it involves knowledge transfer from parents, friends, or acquaintances in an

unstructured manner (Eaton, 2010) which can still be included in ESD in certain contexts. In contrast, non-formal education follows a structured approach but is not part of the formal curriculum (Adams et al., 2020) (see Figure 3).

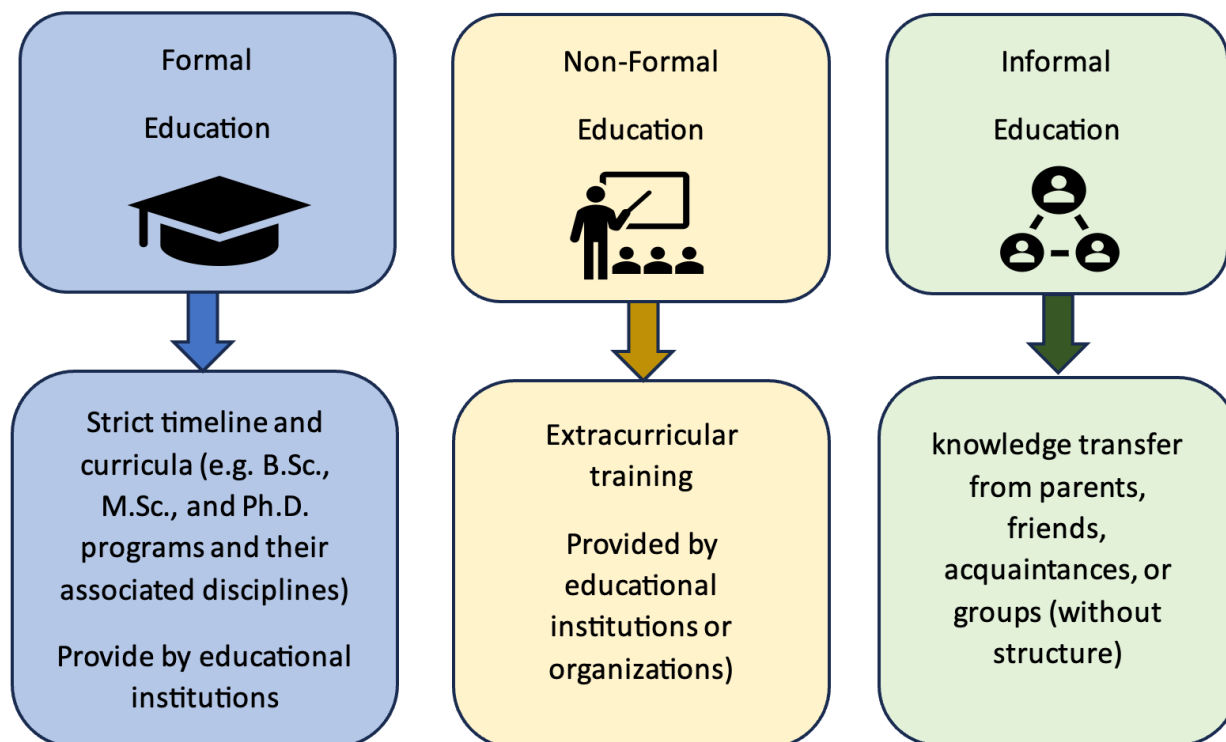


Figure 3. Formal, non-formal, and informal education for sustainable development (Authors' elaboration).

Recently, several **types** of non-formal training on sustainable development have been emerged and applied by different institutions, among them:

- i. **Massive Open Online Course (MOOC):** aims to educate a much wider audience about core issues of the times than classical university teaching could ever accomplish (Otto et al., 2019).

Planetary Well-being MOOCs at University of Jyväskylä ^[GP4]

The University of Jyväskylä, Finland, has taken a proactive approach by incorporating planetary well-being as a compulsory component in all bachelor's degrees, delivered through a series of MOOCs. The study module developed in 2021 -2023 consists of four one-credit MOOCs: Introduction to Planetary Well-being, Systems and Planetary Well-being, Good Life and Planetary Well-being, and Pathways to Planetary Well-being. These MOOCs are available year-round in both English and Finnish, free to all, and accessible through the university's online platform.

- ii. **Micro-credential:** Small, specialized learning units focus on specific skills or knowledge areas, usually offered online or in digital formats to provide targeted and practical knowledge and competencies (Hunt et al. 2020). There is still a type of digital micro-credential, known as a badge, which is associated with an online graphic that links to information about the nature of the

achievement, the work submitted, and the organization awarding the credential (Miller et al., 2020).

Micro-Credential on Sustainable Development Goals (SDGs) at Universidade Aberta ^[GPS]

Universidade Aberta (UAb), Portugal, is a prime example of integrating sustainability in the educational context through its 6 ECTS micro-credential, built around the 5Ps framework (People, Planet, Prosperity, Peace, and Partnerships). The course is intended to enhance the understanding of the SDGs in an interconnected context. Created through the collaboration of an interdisciplinary team, the module was initially piloted in 2022-2023 with undergraduate students and later broadened to include a wider range of stakeholders (2023-2024), even from public and private organizations. This micro-credential demonstrates UAb’s strong dedication to sustainability education by providing a flexible model for embedding SDGs into academic programs.

- iii. **Open Educational Resources (OER):** are any type of educational materials in the public domain, or released with an open license, which allow users to legally and freely use, copy, adapt, and re-share (Roeder et al., 2017). OER, as content, are free of cost to learners and educators.

The Open University UK and Learning design and sustainability

The Open University’s (UK) Learning Design Team has created a set of resources to help prompt initial thoughts and discussions about embedding sustainability in course design. The aim is to prompt educators to reflect on whether sustainability can be included in the course design, and to flag that support is available. These open educational resources can be found [here](#).

Non-formal education (MOOC, micro-credential or badge, and OER) substantially supports the formal ESD by aligning global sustainability guidelines with local implementation (Adams et al., 2020). These types of non-formal education are essential for ESD, particularly in developing countries where financial limitations hinder the quality of formal ESD. Finally, stronger collaboration between HEIs and the labour market is critical to expanding services and roles in evaluating and recognizing the requirements and pathways for non-formal learning in ESD (Tamoliune et al., 2023).

For a successful implementation of formal or non-formal ESD, the appropriate choice of the **target audience** is a fundamental phase. The ESD should encompass a wide range of target audiences (from students to educators, HEIs staff, and learners in the wider community). To strengthen the role of education in promoting sustainable development, the "ESD Roadmap for 2030" (UNESCO, 2021) targets 5 groups, as shown in Figure 4, in which any ESD programs should be designed to address these diverse target audiences.

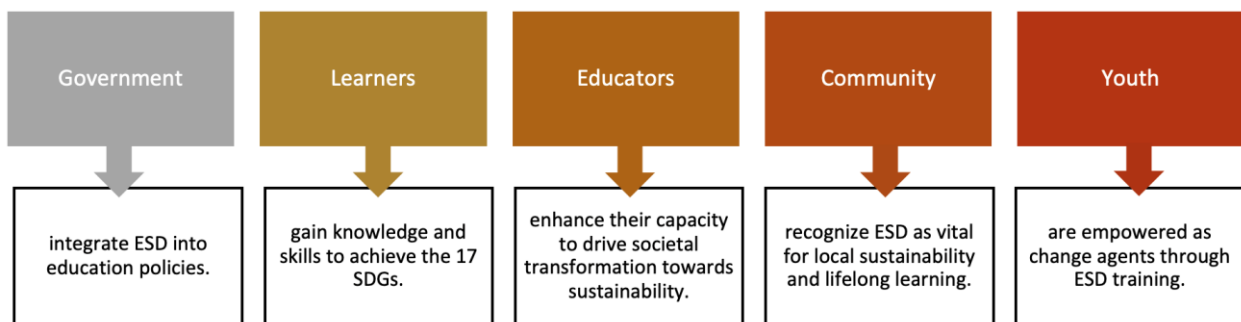


Figure 4. Priority action areas for ESD and the target audiences (Authors elaboration, based on (UNESCO, 2020)).

To guide all target audiences effectively, educating-the-educators is considered an essential step. Educators themselves must be equipped with the necessary knowledge, skills, values, and behaviours in ESD by comprehending the 17 SDGs, their interconnections, and the most effective gender-transformative pedagogical approaches for fostering transformative actions, as emphasized as the 3rd priority area of the ESD roadmap 2030 (UNESCO, 2020). This approach enables them to transfer knowledge more effectively to other target audiences.

In terms of **pedagogy**, Lozano et al (2017) define pedagogy as “the art or science of teaching”, that aims to optimize learning outcomes. This is achieved by strategically selecting teaching methods based on: i) Learning goals (the specific knowledge, skills, or attitudes learners are expected to acquire), and ii) Contextual factors (learners’ characteristics - e.g., prior knowledge, learning styles -, teacher expertise, and the learning environment). Diversifying pedagogical approaches is crucial due to learners’ heterogeneity, however, what is essential is to ensure the relevancy of pedagogical approaches that enable the acquisition of competences for sustainable development (Lozano et al., 2017). Several authors identified various sustainability pedagogies in HEIs (Kapitulčinová et al., 2018; Lozano et al., 2017; Moreno Pires et al., 2020) among them lecturing, team-based learning, eco-justice focus, place-based education, Life Cycle Assessment, traditional ecological knowledge, and various mapping techniques. However, as emphasized by Pulselli et al. (2021), the term 'sustainability pedagogies' in the literature encompasses broad methodologies like project-based teaching and participatory action research to more specific methods such as concept maps and worksheets.

Distance education and ESD

Recently, higher education has faced significant transformations, notably through the integration of technology to enhance learning experiences (Harrison, 2019). A prominent development is the proliferation of distance education, which promises broader access to education (Bell et al., 2017). In this context, digital tools have not only enhanced traditional on-campus courses but also hybrid and distance education programs (Harrison, 2019). Distance education leverages technology to i) facilitate online and e-learning interactions and foster autonomous learning, ii) overcome geographic and temporal constraints, enabling lifelong learning, and iii) offer educational pathways tailored to diverse learner needs.

As a result, distance education approaches are gaining popularity alongside traditional local educational approaches, advocating for an interdisciplinary educational approach (Bell et al., 2017). Distance teaching in higher education holds significant promise for fostering effective lifelong learning, particularly in the context of ESD, in students who are parallel employed full-time. Distance education enhances traditional education for adult learners, boosting motivation to engage with environmental issues and facilitating transitions into new social roles within programs (Azeiteiro et al., 2015). Due to its interdisciplinary nature, sustainable development is well-suited to distance education, which can significantly enhance learners’ knowledge construction (Luppi, 2011). In conclusion, Azeiteiro et al. (2015) state that: “formal e-learning programmes can provide an effective alternative to face-to-face training, allowing students to pursue their studies, in a flexible, collaborative and interactive way, whilst holding down full-time jobs. In this way, Education for Sustainable Development in an e-learning regime can contribute to, and have a role in, the transition to sustainable societal patterns.”

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Good Practices

Good Practice #3

infernium: Interdisciplinary Distance-learning Program in Environmental Sciences at the FernUniversität in Hagen

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The Interdisciplinary Distance-Learning Program in Environmental Sciences (infernium) is a university-based continuing education program that has been offered and supported jointly by the FernUniversität in Hagen and the Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT in Oberhausen since 2000. The course is primarily aimed at those working in business, science, associations and administration (regardless of their specialization) and, in terms of its content and organization, is geared towards providing a complementary and interdisciplinary qualification for students. It is designed to enable students to think, communicate, and act across various disciplines. After graduating, students have the necessary organizational skills to analyse environmental and sustainability problems and to develop interdisciplinary solutions. What sets infernium apart is its interdisciplinary orientation, the wide range of subjects taught, and the flexibility of its organization. Participants have the chance to obtain various certificates and/or a Master of Science degree while still at work. The range of courses includes modules from the natural sciences, engineering, social sciences, law, and economics as well as interdisciplinary topics. The course content is taught in a blended learning environment in which asynchronous and synchronous teaching/learning formats complement each other as required. Module selection and study organization are highly flexible, allowing students to tailor the content and scheduling of their study program to suit their individual needs.

Introduction: infernium – a flexible and sustainable approach to studying sustainability

Using an innovative cooperation model developed by the FernUniversität in Hagen and Fraunhofer UMSICHT (an institute of applied research), the Interdisciplinary Distance-Learning Program in Environmental Sciences (infernium) has been successfully offering part-time, university-based continuing education in the field of environmental sciences for more than 24 years. The unique selling point of this continuing education program lies in its combination of interdisciplinary orientation, comprehensive course offerings, inclusivity to participants from all disciplines and sectors, and its high degree of flexibility when it comes to course organization. The creation of the infernium study program by the FernUniversität in Hagen and Fraunhofer UMSICHT reflects the aspiration and commitment of both institutes to offer education on sustainable development at the highest level.

Challenges

Humanity's resource-intensive economy and lifestyle have brought about a planetary crisis. A recent study conducted by the Potsdam Institute for Climate Impact Research (PIK) starkly illustrates that six out of the nine planetary boundaries have already been exceeded and remain constantly under pressure, a situation that could potentially result in irreversible changes and damage (Richardson et al., 2023). What is needed is a comprehensive transformation of the economy, technology, society, and politics to safeguard the foundations of life on Earth. This requires experts in diverse fields who can draw on broad, interdisciplinary knowledge of environmental and sustainability sciences. Cross-disciplinary teams comprising individuals capable of transcending the boundaries of their respective disciplines will be essential. These teams must then collaborate to adopt a holistic perspective on environmental issues. For this, we need people who are willing to undergo continuing education in environmental issues, even if they are already at a stage in their lives at which they have professional or family commitments. With this in mind, it is clear that we need study programs that make allowances for diverse life circumstances, appeal to individuals of all ages, and offer flexible options for balancing study with work and/or family commitments. The offering also needs to comprise a wide choice of content so that students can select exactly the content they need for their personal development. To complement this, there is a need for programs that integrate theory and practice. Sustainable organizational competence requires not only a broad, interdisciplinary knowledge base but also methodological tools and a diverse range of hands-on practical experience. Lastly, there is a requirement for programs that offer flexibility regarding the breadth of material studied. This provides students with the opportunity to pursue a full academic degree in environmental science while also allowing them to engage in smaller certificate programs on a module-by-module basis, depending on their personal continuing education goals.

Approaches

To address these challenges, scientists and lecturers at the FernUniversität in Hagen and the Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT in Oberhausen collaborated to develop a unique study program in the field of environmental and sustainability sciences in the late 1990s: the Interdisciplinary Distance-Learning Program in Environmental Sciences, more widely known as *infernium*. *infernium* provides university-based continuing education in environmental sciences for individuals both with and without a prior academic degree. Students who have already obtained a first degree can obtain the academic degree "Master of Science" in Environmental Sciences. Participants without previous academic qualifications can pursue their further education goals in the area of environmental science on an individual basis via the certificate program.

The range of courses on offer includes modules from the natural sciences, engineering, social sciences, law and economics as well as interdisciplinary topics. Students enjoy a great deal of freedom of choice when putting together their course content. By embracing interdisciplinary study and the interdisciplinary framework of coursework and examinations, students develop the ability to approach questions and problems holistically and sustainably. Enabling students to navigate proficiently in diverse "scientific languages," optimally prepares them to collaborate effectively in interdisciplinary teams. Graduates become disseminators of knowledge who drive social, economic and political transformation in a wide range of areas.

infernium also offers maximum flexibility in terms of study organization. Students can start studying and begin modules at any time throughout the year without being constrained by traditional semester

schedules. Generally speaking, studying does not take place in fixed groups but is highly personalised. Students can flexibly scale the intensity of their study up or down at any time throughout the year. This allows them to effectively reconcile their studies with their professional and/or family commitments. The course content is taught in a blended learning environment in which asynchronous teaching/learning settings (printed and digital distance-learning material, video lectures, e-learning units) and synchronous teaching/learning settings (online and face-to-face seminars) complement each other as required.

The courses on offer are both science- and research-oriented. Throughout their studies, students have the opportunity to gain insights into Fraunhofer research projects and are encouraged to undertake their own practical projects in the context of term papers and master's theses. This ensures that their understanding of theory and practice becomes deeply intertwined. In addition to the FernUniversität and Fraunhofer UMSICHT, other renowned players in the field of sustainability are also involved in teaching (including the Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Wuppertal Institute for Climate, Environment and Energy, Centre for Sustainability Management at Leuphana University Lüneburg). This ensures that students and alumni have access to a valuable network of sustainability research and practice.

The infernum team is guided by and supports the United Nations Sustainable Development Goals (SDGs) in its daily work, both within the network and in the design of the study program.

Focused public relations efforts and involvement in activities and events extending beyond the course offerings, help infernum play a role in promoting education for sustainable development to society as a whole.

Outcomes

The infernum degree program was first accredited in 2003 and successfully reaccredited in 2009, 2015 and 2022. The course has already received several awards for its contribution to Education for Sustainable Development (ESD). In 2021, infernum received an award from the German UNESCO Commission and the Federal Ministry of Education and Research (BMBWF) as part of the UNESCO "ESD 2030" program. infernum previously received several awards in the periods 2006/2007, 2012/2013, 2014, 2016 and 2018 as part of the predecessor program, the UN Decade of Education for Sustainable Development. The program also received the "Ort des Fortschritts" (*Site of Progress*) award from the North Rhine-Westphalian Ministry of Education in 2014.

Each semester, around 600 students take part in the courses offered by infernum. Over 1,200 master's degrees and certificates have already been awarded. In the annual graduate surveys, the overwhelming majority of graduates indicate that their studies have had a highly positive impact on their professional development and facilitated their entry into the environmental sector. The program is gaining momentum thanks to word-of-mouth recommendations from satisfied graduates, and companies and institutions are increasingly recognising and supporting the infernum study program by sponsoring the further education of their employees.

The teaching content, formats, and program organization undergo regular and systematic evaluations. The insights obtained from this serve as the basis for ongoing development and improvements to the program. This process is marked by both rigorous academic standards and a strong focus on our participants' wishes and needs.

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Good Practice #4

Planetary Well-Being Studies at the University of Jyväskylä**Saana Kataja-aho & Anni Karhunen****Open University of University of Jyväskylä | Finland**

To fulfil the United Nations' SDG number 4 "Quality Education" and its target 4.7 regarding the need for acquiring knowledge and placing importance on sustainability through education on sustainable development lifestyles, the University of Jyväskylä has decided to make one course on themes of planetary well-being a mandatory part of every bachelor's degree issued by the university. What follows is a brief introduction into JYU's planetary well-being MOOCs.

Introduction

The United Nations' Sustainable Development Goal 4 "Quality Education", target 4.7 says that "By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and culture's contribution to sustainable development" (United Nations). The University of Jyväskylä has decided to add a compulsory course in sustainability studies to the curriculum for all bachelor's degrees from August 2024. This means that every student who will be doing their bachelor's degree at our university will have received a basic knowledge of sustainability during their studies through completing the MOOC *Introduction to planetary well-being*. The same course is also offered to anyone in the world who is interested in the topic. Planetary well-being means "a state in which the integrity of Earth system and ecosystem processes remain unimpaired to a degree that lineages can persist to the future as parts of ecosystems, and organisms (including) humans can realize their typical characteristics and capacities" (Kortetmäki et al., 2021; Elo et al., 2024). This means that in everything we do, we humans must consider the impact of our actions on the climate and nature. The planetary well-being mindset has been adopted more widely at our university: for example, the environmental programme of our university is called Roadmap to planetary well-being (JYU, 2022). As the mindset is in use, it is important to teach the basics of the concept to all our students.

MOOCs

MOOCs, Massive open online courses, are free online courses for anyone to study. People can study and develop themselves online through MOOCs offered by different actors. MOOCs are a flexible way to gain knowledge of various subjects. MOOCs serve to enable lifelong learning. There are thousands upon thousands of different kinds of courses available on the internet.

Good practices – Planetary well-being MOOCs

At the University of Jyväskylä, the Planetary Well-being MOOCs were developed during the years 2021–2023, resulting in four one-credit courses on the theme of planetary well-being. All four courses are open to everybody, free of charge, available in English and in Finnish and to be studied throughout the year on the university's onlinecourses.jyu.fi platform. All course materials are licensed under Creative Commons Attribution NonCommercial NoDerivatives 4.0 International License, with the exception of linked content, drawings and photographs, videos, organisation logos, technical implementation of the course platform,

source code, and technical elements. The first course, Introduction to planetary well-being, is open without pre-requisite studies, and it is the mandatory course for our bachelor's degree students. The other three courses are all voluntary but recommended to be completed in order, with course 1 as the prerequisite for course 2, course 2 as the prerequisite for course 3, etc. To complete the studies (courses) and to receive study credits, a student needs to register, which entails identification done by passport or valid EU ID card (or Finnish online banking IDs).

The first MOOC, *Introduction to planetary well-being* (1 ECTS), covers the environmental crises of declining biodiversity and climate change and discusses how we have ended up in this situation. The course also provides an overview of the sustainable development path and international agreements. The interdisciplinary idea of planetary well-being is introduced in this course.

The second MOOC, *Systems and planetary well-being* (1 ECTS), emphasises sustainability issues while taking a systemic approach to examine the characteristics and interactions of social and natural systems. The course examines how systems work, what the Earth is like as a system and what human systems look like.

The third MOOC, *Good life and planetary well-being* (1 ECTS), explores good life in relation to planetary well-being and presents ethical viewpoints on environmental and sustainability issues. The course examines how societal norms and institutions, as well as cultural perceptions and value systems, influence sustainability and the realisation of planetary well-being. In addition, individual values, choices and responsibilities are connected to wider cultural phenomena and value debates.

The fourth MOOC, *Pathways to planetary well-being* (1 ECTS), covers the topics and strategies for advancing sustainability, putting a focus on planetary well-being and a systems approach. The course explores what sustainability transition entails and what its purpose is. The course also covers the functioning of systems from the perspective of sustainability transition. The course leads the student to consider who or what are the changemakers, who are the key players in sustainability transition.

All the Planetary Well-being MOOCs are available to anyone at <https://onlinecourses.jyu.fi>.

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United Nations, <https://sdgs.un.org/goalsof>

Good Practice #5

Micro-Credential on Sustainable Development Goals (SDGs) at Universidade Aberta

Mahsa Mapar & Sandra Caeiro
Universidade Aberta | Portugal

In the higher education context, the methods by which learners engage with and address sustainability issues related to Agenda 2030 shape their roles as societal change agents. Despite this, education on the Sustainable Development Goals (SDGs) through micro-credentials remains in its early stage. Sustainability-focused micro-credentials are gaining global prominence, offering comprehensive education on sustainability and empowering learners to act as catalysts for change. These credentials integrate traditional knowledge preservation with skills improvement, fostering a robust movement towards ESD. Universidade Aberta (UAb), Portugal, exemplifies this trend with its 6 ECTS micro-credential, structured around the 5Ps framework (People, Planet, Prosperity, Peace, and Partnerships), designed to deepen understanding of SDGs in an interconnected context. Developed collaboratively by an interdisciplinary team, the module was piloted in 2022-2023, involving undergraduate students, and subsequently expanded to include broader participation from diverse stakeholders. The initiative underscores UAb's commitment to sustainability and offers a scalable model for integrating SDGs into higher education curricula globally.

Introduction

Sustainability-focused micro-credentials are becoming increasingly popular worldwide, offering a comprehensive approach to learning about sustainability and encouraging participants to actively engage as change agents in their professional and social environments (Mapar et al., 2023). Micro-credentials empower the communities to preserve their traditional knowledge while acquiring essential digital skills, fostering a global movement for education for sustainable development (ESD) (Gwin & Foggin, 2020). Micro-credentials (and digital badges) can lead to more just and sustainable education, adhering to ethical pedagogical standards for positive and inclusive learning experiences (Desmarchelier & Cary, 2022). In the sphere of sustainability, micro-credentials cover a wide range of topics, from specific environmental issues like energy, carbon literacy, and climate change to a set of broader courses that address multiple dimensions of sustainability (e.g. ENHANCE Alliance¹ (2023) and the micro-credential in Sustainability from UNA Europa² (2023)). These sustainability-focused micro-credentials aim to tackle the complexity and interconnectedness of sustainability issues by encompassing environmental, economic, and social aspects of the SDGs. Despite the existing variety, there is still a notable absence of micro-credentials that integrate all 17 SDGs in a comprehensive framework, instead of solely focusing on some SDGs. Furthermore, the

¹ ENHANCE Alliance. Enhance Certificate to Sustainability. Available at:

<https://microcredentials.enhanceuniversity.eu/enhance/app/microcredentialDetails?mcId=5694>.

² UNA Europa. Micro-credential in Sustainability. Available at: <https://www.una-europa.eu/study/microcredential-sustainability>.

surge of e-learning courses during the COVID-19 pandemic highlighted a gap, as many of these courses lacked a validated pedagogical foundation (Moreira et al., 2020). Therefore, it is imperative to integrate micro-credentials into non-formal education within Higher Education Institutions (HEIs) to advance Agendas 2030 both within campuses and beyond.

Micro-Credential Definition

A micro-credential is defined as “a certification of assessed learning that is additional, alternate, complementary to or a formal component of a formal qualification (Oliver, 2019, p. i)”. In 2019, the Council of the European Union (Council of European Union, 2019) endorsed a recommendation on a European strategy for micro-credentials aimed at lifelong learning and employability. This approach underscores the pivotal role of micro-credentials in facilitating the acquisition, updating, and enhancement of knowledge, skills, and competencies necessary to adapt to changes in the labour market and broader society.

Good practices - Micro-Credential on Sustainable Development Goals (SDGs)

At Universidade Aberta (UAb) in Portugal, a 6 ECTS micro-credential was created to provide a comprehensive approach to teaching sustainability, focusing on the five critical areas essential for humanity and the planet: People, Planet, Prosperity, Peace, and Partnerships (known as 5Ps) (United Nations Development Programme, 2016). This initiative aims to deepen understanding of the Sustainable Development Goals (SDGs) by illustrating their interconnected nature within the framework of the 5Ps, rather than treating them as isolated objectives.

The micro-credential was developed under the support of the Sustainable Campus Group UAb, established in 2021 under the direct supervision of the university's rector to advance sustainability initiatives and practices. A collaborative approach guided the development process, with an interdisciplinary team comprising 9 professors, 1 researcher, and 2 instructional designers contributing expertise from diverse fields including environmental science and management, sustainability, education, and digitalization. Initial efforts included a comprehensive literature review of 11 clustering frameworks, concluding in two rounds of discussions that underlined the integration of the SDGs within the 5Ps framework, acknowledging their inherent interdependence and interconnectedness (Breuer et al., 2019).

The module was delivered in Portuguese. The pilot training initiative was conducted during the fall term of 2022-2023, spanning from October to February, with enrolment comprising 43 undergraduate students specialising in Environmental Science. Hosted on UAb's open Moodle platform, the online training adopted asynchronously leveraging UAb's pedagogical model and subsequent enhancements (Pereira et al., 2008; Amante and Oliveira, 2019). Following an analysis of the pilot phase results, including a questionnaire and feedback from 10 involved educators, adjustments were made to the module, paving the way for its second edition (2023-2024) which serves participation from approximately 100 individuals, including students, public and private sector staff, and the general public interested in sustainability concepts and SDGs.

The comprehensive module, totalling 156 study hours (equivalent to 6 ECTS credits), was structured into 6 micro-credential topics, each accounting for 1 ECTS credit: i) Introduction to Sustainable Development, ii) People, iii) Planet, iv) Prosperity, v) Peace, and vi) Partnerships. The initial module provided an overview of Sustainable Development through a historical lens, with subsequent topics delving into the significance

and achievement of the SDGs aligned with each respective 5Ps (Mapar et al., 2023). Figure C shows the characteristics, objectives, and structure of the micro-credential on SDGs at UAb.

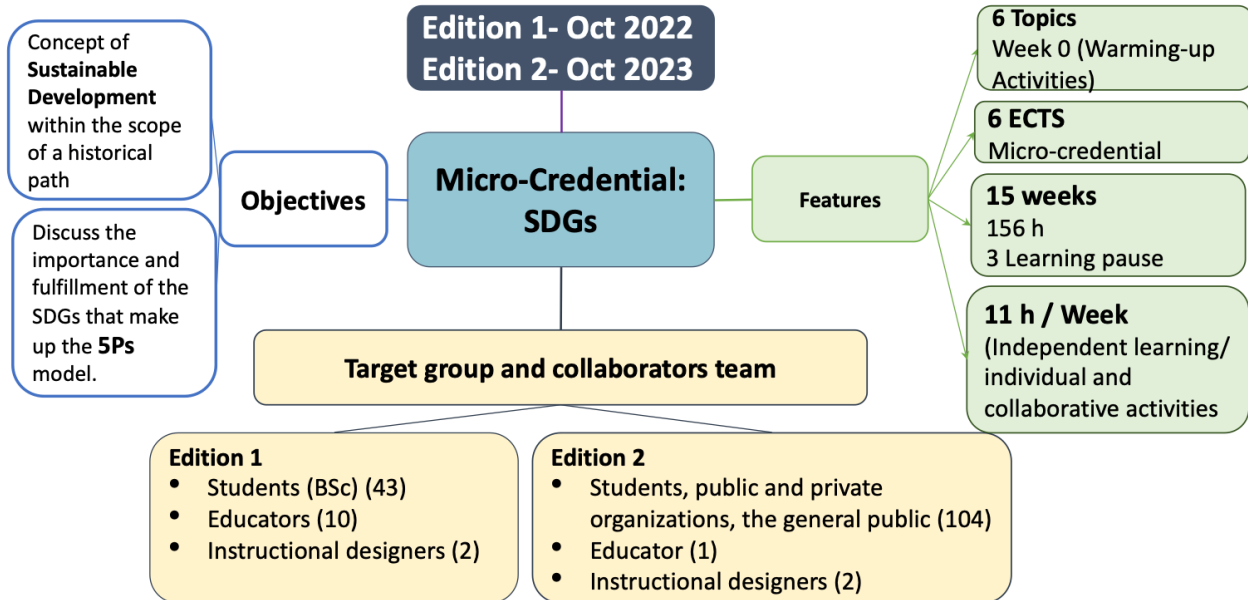


Figure C. Micro-credential on Sustainable Development Goals (SDGs) at UAb.

A diverse range of educational materials was developed, including texts, slides, videos, and interactive multimedia presentations. Each topic was complemented by a series of 6 introductory videos serving as pedagogical aids. The curriculum incorporated various individual and collaborative activities by applying engaging tools, such as Padlet, WIKIS, and Forums, designed to facilitate continuous assessment, in line with the recommendations of Moreira et al. (2020) for effective e-learning practices. Each topic included detailed learning instructions, materials, and assessments of equal weight. The module also included three designated learning pauses as optional weeks, allowing participants to catch up on remaining activities, with supplementary guidance provided through UAb's sustainability guideline "Be sustainable: Some tips to live sustainably on campus and outside" (Mapar et al., 2021).

As a warming-up activity, participants were invited to contribute to a "Wall of Happiness" at the outset of the module, sharing photos illustrating moments of personal well-being. This reflective exercise was revisited in the concluding week, encouraging participants to link these experiences with the concepts of SDGs and 5Ps. Also, participants were encouraged to share three keywords related to sustainability and identify three SDGs they were familiar with at the beginning of the course. This initial assessment aimed to assess their baseline understanding. After the course, participants re-answered these questions to assess their knowledge advancement and shifts in their comprehension of sustainability concepts.

Looking forward, the vision for the micro-credential on SDGs includes its integration as a formal curricular unit across various degree programs, also extending its utility as a module for academic and non-academic staff at UAb. This initiative underscores UAb's commitment to SDG4 (Quality Education) and SDG 17 (Partnerships for the Goals), with the e-learning pedagogical model and 5P approach serving as a potential proposal for adoption and adaptation in other HEIs.

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A small green plant with several leaves is growing out of a laptop keyboard. The background is a blurred laptop screen and keyboard. A dark green semi-transparent box is overlaid on the bottom left of the image, containing the text 'Sustainability Research Centres' and the number '04'. Another dark green semi-transparent box is overlaid on the bottom right of the image, containing the name 'Lars Jensen-Lampiri (FernUniversität in Hagen)'.

Sustainability Research Centres

04

Lars Jensen-Lampiri (FernUniversität in Hagen)

Abstract

Over the past two decades, Higher Education Institutions (HEIs) in Europe and beyond have often reacted to climate change by establishing inter- and transdisciplinary research centres. However, when assessing the performance of these centres, scholars frequently express concerns about the dominance of monodisciplinary or, at best, multidisciplinary research efforts.

The case study presented addresses the question of how inter- and transdisciplinary research activities can be nurtured and catalysed. The analysis focuses on the historical sequence of events and managerial decisions involved in the establishment and consolidation of the Energy, Environment & Sustainability Research Centre (E/E/S Research Centre) at the FernUniversität in Hagen, Germany. The main objective of the study is to provide good practice examples. It reports about challenges, lessons learned, and recommendations for creating processes and structures that promote inter- and transdisciplinary research activities on sustainability-related topics.

Challenges related to climate change have been increasing in magnitude, complexity, and urgency. A substantial number of HEIs have reacted by establishing inter- and transdisciplinary research centres to allow them to play a more effective role in mitigating (and adapting to) climate change (Bolger, 2021). These institutions aim to broaden research across disciplinary and institutional borders. We follow the classification of “disciplinarity” developed by Jensenius (2012) to discuss this research approach in our case study. Jensenius distinguishes the following approaches:

- *intradisciplinarity* (researchers share a common scientific language, culture, and similar backgrounds),
- *multidisciplinarity* (researchers present their disciplinary knowledge, but do not engage in integrating scientific cultures or creating shared knowledge),
- *cross-disciplinarity* (researchers view their own discipline from the perspective of colleagues from other disciplines, collaboration is characterized by interaction, cross-fertilization, and socially inclusive approaches,
- *interdisciplinarity* (researchers integrate knowledge and methods: teams share scientific terminologies to create new shared knowledge) and
- *transdisciplinarity* (researchers create knowledge by integrating state-of-the-art knowledge and techniques from different disciplines and collaborate and communicate beyond scientific boundaries)

In the debate on research policy within the field of sustainability, the concept of interdisciplinary research and transdisciplinary research has received massive attention and has been a hot topic of debate over the last decades (Bammer et al., 2020; Bolger, 2021; Horlick-Jones & Sime, 2004; Leal Filho et al., 2023; Norton et al., 2023).

The contemporary literature echoes calls and incentives for addressing climate crises by conducting research that extends the boundaries of scientific disciplines and by involving stakeholders from outside academia (Bolger, 2021, Hart et al., 2015, Wehrden et al., 2019). Schneidewind and Augenstein (2012) highlight the importance of inter- and transdisciplinary research centres that will make the necessary adjustments to the German HEIs system. The authors argue that challenges related to sustainability are complex, ambiguous, and multi-dimensional. Accordingly, research institutions must integrate diverse perspectives on problem perception and incorporate various forms of knowledge to adequately address these challenges. The same calls are directed to HEIs in Europe and Beyond. For instance, Hart et al. (2015) argue that *“research universities [...] contain an extraordinary breadth of expertise [...] that is needed to examine the causes and consequences of sustainability problems that are, by definition, multifaceted.”* Researchers, stakeholders, and funding organizations have embraced inter- and transdisciplinary research centres to solve sustainability problems (Lemos et al., 2018; Turnhout et al., 2020). When evaluating the performance of research centres, however, scholars repeatedly raise concerns over the prevailing monodisciplinary or, at best, multidisciplinary research efforts. The failure of research centres to live up to their potential to help HEIs strengthen their research profile and acquire research funds is criticized (Norton et al., 2023, Stahler & Tash, 1994). According to these scholars, the major challenges and underlying reasons for that are:

- finding a common terminology that is understood across involved disciplines;
- challenges in managing the steps in inter- and transdisciplinary research processes (i.e. building a collaborative context, co-creating and coproducing transferable knowledge, and integrating it into scientific and societal practice;
- the perception that interdisciplinary research and transdisciplinary research is less prestigious than research conducted in monodisciplinary domains;
- tendencies for centres to have a more authoritarian management structure than faculties.
- insufficient integration into the HEIs' governance structure;
- conflict between research centres and faculties;
- the rigidity of institutional structures and bureaucracy; and
- inadequate amounts of time being granted for the development of research centres.

Case study and reflections from the field

This case study explores how the FernUniversität in Hagen (FUH), Germany has dealt with the above-cited criticism in the institutionalization process of the Energy, Environment & Sustainability Research Centre (E/E/S Research Centre) over the last six years, starting in 2018. The case study elaborates on the historical sequence of events and decisions involved in the establishment and consolidation of the research centre. As such, we identify what has worked in the context of FUH and how the FUH has attempted to avoid potentially undesirable outcomes.

This discussion should be of particular interest to the management of research centres and those in the institutional leadership who aim to foster interdisciplinary research and transdisciplinary research on sustainability. By their very nature, research centres are more complex than academic departments.

Bozeman and Boardman (2003, p. 32) note that directors of research centres *“cannot look to decades of history and accumulated procedure to determine how to do their job. [...] centres are not embedded in the university administration in patterned and predictable ways. A department chair or dean moving from one university to the next would find familiar hierarchies and lateral relations.”* Research centres, however, are usually born into an existing governance structure, and administrative processes and patterns vary significantly from HEI to HEI.

As such, this case study contributes to the current understanding by examining the conditions necessary for the development of effective inter- and transdisciplinary research centres. Hence, sustained and intense communication, professional science management/leadership approaches, and adequate time for developing a membership identity are important elements in the development process of a research centre. To complement this, the study also discusses the challenges, lessons learned, and recommendations for creating processes and structures that promote inter- and transdisciplinary research activities on sustainability-related topics.

Definition of the term *Research Centre*

As the term “research centre” is the central element of this paper, it is important to clarify how this organizational unit is understood. The paper follows the definition provided by Bozeman and Boardman (2003:17) who specified a research centre as a *“formal organizational entity within a university that exists chiefly to serve a research mission, is set apart from the departmental organization, and includes researchers from more than one [faculty].”* Research centres across the HEIs landscape vary in terms of their nomenclature and defining characteristics, which include (Biancani et al., 2018; Stahler & Tash, 1994):

- the proportion of external and internal funding
- the degree of connectedness/cooperation with faculties
- the proportion of scientists as members of faculties versus researchers working exclusively in research and transfer
- the level of integration within the HEI
- the degree of interdisciplinary and transdisciplinary focus
- the proportion of applied and basic research approaches

Due to the complex nature of research centres, the case study contributes to the literature by describing management challenges. The following paragraphs encapsulate the above-described characteristics in relation to the development of the E/E/S Research Centre.

Conception – Identifying strategic potential (2017–2018)

In 2016, the board of the FUH identified the strategic potential of a research centre focusing on sustainability-oriented research. A survey of research activities across the five faculties (Humanities and Social Sciences, Psychology, Mathematics and Computer Science, Economics and Business Administration, and Law) identified a substantial number of researchers investigating a broad range of research topics within the field of sustainability.

In addition to individual research activities, two research groups received seed funding from the internal research fund. One group investigated the management of energy flexibility in energy-intensive production plants.³ The other group focused on the topic of smart traffic using edge and social computing.⁴ In addition to these ongoing research activities, the FUH has been cooperating successfully with the Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT⁵ in operating the Interdisciplinary Distance-Learning Program in Environmental Sciences (infernum⁶). The existence of this continuing education study program was identified to be complementary to the idea of institutionalising a research centre on sustainability featuring interested scholars from all faculties as its members. An institutionalized research centre was regarded as helpful for expanding and deepening inter- and transdisciplinary research activities.

The starting point for establishing the research centre was determining the framework conditions required by the FUH to foster innovative sustainability-oriented research. To answer this question, two workshops were organised to discuss the feasibility of an inter- and transdisciplinary research centre. The first networking event focused on getting an overview of research activities and university-based continuing education in the field of sustainability. The participants agreed that interfaces between disciplines exist not only in the study program but also in research themes.

The second meeting was organised to elaborate specifically on the research interests of researchers and on the potential of engaging in a scientific discourse across faculties with the help of a research centre. Initially, 24 researchers (16 professors and 8 junior faculty researchers) endorsed the idea of an inter- and transdisciplinary research centre and indicated their willingness to participate as members.

Based on this reinforcement, the President and the Vice-President for Research initiated the formation process of the E/E/S Research Centre in 2018. One important aspect of this was to calculate and provide a budget to financially support the institutionalization process of the E/E/S Research Centre for the period from 2018 to 2025. Equally important was the decision to appoint an advisory team consisting of researchers. This team initially comprised one senior advisor and three professors from different faculties. The senior advisor was chosen due to his long record of experience in leading positions at the institution (e.g., as a chair holder and internationally awarded researcher within the field of environmental resources, dean, vice-rector for research, member, and deputy chair of the FUH council). Moreover, it was also an

³ Under the following link the interested reader can access further information:

<https://www.fernuni-hagen.de/english/research/clusters/ees/research/groups/maxfab.shtml>

⁴ Under the following link the interested reader can access further information:

<https://www.fernuni-hagen.de/english/research/clusters/ees/research/groups/stream.shtml>

⁵ Fraunhofer UMSICHT is a well-recognized institute of applied research in Germany. For further information visit the following website:

<https://www.umsicht.fraunhofer.de/en>

⁶ The program has been successfully offering part-time, university-based continuing education in the field of environmental sciences for more than 24 years. The unique selling point of this continuing education program is rooted in its combination of interdisciplinary orientation, comprehensive course offerings, and inclusivity to participants from all disciplines and sectors.

acknowledgment of his outstanding expertise in one of the key fields of sustainability research: environmental economics. The other members were announced based on their long record of successfully conducting research within the field of sustainability and their experience of scientific and managerial processes within the FUH. Their task was to support the formation process of the E/E/S Research Centre and to initiate scientific discourse across disciplinary borders (2018 to 2021). Furthermore, an administrative support unit was created comprising a full-time coordinator (since 2020) and a part-time secretary (since 2018).

Parenthood – Nurturing the strategic potential (2019–2024)

Developing Scientific Management Structures

Following the initial formation process, the governance structure of the E/E/S Research Centre was adjusted in 2020 to better serve the consolidation phase. During this phase, the main task was to develop a research profile and a membership identity. To this end, the Senior Advisor and the university board decided to introduce a Directorate succeeding the Advisory Team and created a departmental principle of responsibilities:

A Deputy Director was installed and assigned the responsibility for the area of topic identification and cluster formation. Another member was made responsible for the promotion of young scientists. The third member overlooked activities in the areas of networking and internationalization. The previous senior advisor was made director of this newly formed unit and assumed responsibility for the combined development of the above-described areas. Leveraging their scientific and practical expertise, the Directorate has offered crucial insights for refining the research profile, identifying innovative research topics, securing external funding, and facilitating the transfer of scientific findings.

To complement this, an external advisory board was installed. This involved identifying six board members stemming from the realms of science, business, civil society, politics, and/or the media. Their task is to evaluate the activities from the outside and advise the research centre in identifying and developing research themes and clusters. In addition, the advisory board members were chosen to facilitate access to networks in science, business, politics, public administration, and society.

Broadening the research agenda by strategic appointments of professorships

The strategic appointments of professors constitute another decisive factor in the development of the E/E/S Research Centre. The following appointment procedures have been proactively and systematically linked to the faculty's, FUH's, and the E/E/S Research Centre's development planning. Since 2018, four professors have been appointed by the faculties of Humanities and Social Sciences (2), Law (1), and Business Administration and Economics (1) with a systematic link to the E/E/S Research Centre in their denomination.

In the faculty of Business Administration and Economics, a *Junior Professorship for Energy Economics* has been created. The professorship's research focus is set on the interactions and possible future developments in energy markets, particularly the European electricity market, and on the influence of fluctuating renewable energies. In the faculty of law, a *Chair of Civil Law, German and European*

Commercial Law, Energy Law, and Comparative Law was appointed. The chair focuses on relevant sustainability issues such as energy cartels and state aid law, energy contract law (e.g., pricing in the energy sector), legal issues relating to European solidarity obligations, and energy data protection law. Both professorships add valuable disciplinary perspectives to the E/E/S Research Centre.

The development towards a research HEI with a large and successful research centre on sustainability issues requires additional research staff and access to important networks and funds. Strategic partnerships with non-HEI research institutions have been used by the FUH to respond to this need. Such partnerships enhance the HEI's ability to compete for federal research funds. Non-HEI research institutions, with their stronger programmatic focus, align better with long-term political objectives and therefore consistently receive substantial state funding.

In 2019, the FUH established a *Professorship on Environmental Sciences*⁷ based on the Jülich model⁸ in cooperation with the Fraunhofer Institute for Environmental, Safety and Energy Technology in Oberhausen. The professorship focuses on engineering sciences but is located in the Faculty of Humanities and Social Sciences. The aim is to deepen the almost 20-year successful cooperation in continuing scientific education and expand it to the research area. The professorship's research approach combines technical disciplines such as environmental, process, and energy engineering with social sciences to investigate the relationship between humans and the environment.

A similar cooperation has been recently established with the Wuppertal Institute for Climate, Environment and Energy gGmbH⁹. Both institutions plan to appoint a professorship in the area of *Circular Society*. The professorship will also be affiliated with the Faculty of Cultural and Social Sciences. Previously, members of the E/E/S Research Centre have conducted successful collaborative projects with the Wuppertal Institute. For instance, a research project was undertaken to generate knowledge and develop recommendations for municipalities and the state government on effective policy approaches for transitioning to a circular economy and waste prevention. Consequently, the collaboration aims to expand research in this field. The professorship is expected to help the E/E/S Research Centre to build additional research capacity in the area of circular society. This development will advance the research centre's profile, extend its networks, and further support the acquisition of research funding.

⁷ Under the following link the interested reader can access further information:

<https://www.fernuni-hagen.de/umweltwissenschaften/en/>

⁸ Under the following link the interested reader can access further information on the Jülich Model:

<https://www.fz-juelich.de/en/careers/professionals/joint-appointments/appointment-models>

⁹ The Wuppertal Institute for Climate, Environment and Energy gGmbH is an implementation-oriented research institute for sustainability and transformation research. The core mission of the Wuppertal Institute, founded in 1991, is to contribute to achieving global sustainability goals based on scientific findings. A particular focus is on transformation paths towards a climate-friendly and resource-saving future. <https://wupperinst.org/en/>

Organising the nest – Identifying who we are and where we want to go (2020–2024)

In 2020, the members of the newly established research centre agreed that its research focus would encompass the methodological, thematic, and paradigmatic approaches across all five faculties. Thus, the goal was set to “examine the political, economic, social, and technological dimensions of the energy and environmental sector – and their interdependencies – as well as to analyse the approaches and effects of energy and environmental policy. The interdisciplinary spectrum of these research perspectives ranges from the approaches used in business administration and economics to political science, social science, and law, as well as certain technological (IT-related) components (www.fernuni.de/ess, 2024).”

However, the members were not yet united in an active research community. Common topics of interest had not yet been identified and no systematic process to exchange ideas was in place. Research activities were conducted predominantly in an atomistic and monodisciplinary fashion. The majority of members did not know about the other scholars’ interests and expertise. Heterogeneity existed in areas such as:

- terms of research orientation (e.g., fundamental research vs. applied research, focus on publications, focus on acquiring funds, focus on regional, state, federal, and international research settings);
- research topics within the field of sustainability;
- methodological approaches.

The high level of heterogeneity created barriers to communication and collaboration. Despite these obstacles, the commitment and desire of members to use the E/E/S Research Centre as an arena for exchanging ideas and identifying common were high. With this in mind, the members agreed to dedicate a significant amount of time to overcoming epistemological differences, becoming aware of diverse methodologies, and identifying research themes of common interest.

Bolger (2021:178) assigns research centres a crucial role in minimising these significant barriers. Interviewing scholars participating in sustainability-oriented research centres, he observed that a successful centre is designed to act as a *“facilitator for interdisciplinary projects bringing its theoretical knowledge and practical experience to bear on interdisciplinary projects particularly in the early stages as faculty work out where they might contribute, how they can co-create research questions of mutual interest and how they can bring different methods to bear on the research question.”* The following formats are regularly organized by the management of the research centre to nurture scientific discourse across disciplinary borders:

A public lecture series

One successful format has been a public lecture series on current topics in the areas of energy, environment, and sustainability. The lecture series has been held since the very early days of the E/E/S Research Centre to facilitate internal and external network building. It usually takes place on the FernUniversität campus (as well as digitally via Zoom). Occasionally, the event takes place at a “special communal location in Hagen” such as a museum or the city’s town hall.

Both members of the research centre and renowned scientists from other HEIs present their scientific work to the public. The lectures encompass the disciplines covered by the E/E/S Research Centre but also additional sciences such as medicine and engineering. This gives E/E/S members the opportunity to showcase their work to their colleagues and external stakeholders. Presentations by distinguished guest speakers are useful to broaden the network of the research centre and to encourage the discussion of new and inspiring research themes. Up to three lectures are offered per semester that currently attract about 200 attendees, both on the campus premises and virtually via Zoom. Attendees belong to relevant stakeholders from inside the HEI (e.g., E/E/S members, board members, researchers, and other employees) and external stakeholders (e.g., industry, public administration, politics, and civil society). The lecture series has helped to establish contacts with companies and the Hagen city administration. These contacts have resulted in applications for third-party-funded projects.

Research workshops and symposia

Research workshops are particularly valuable for academic exchanges on the status of interdisciplinary and transdisciplinary research activities within the clusters. These workshops facilitate discussions on research themes and approaches and aid in developing a strategic orientation regarding publications and funding proposals.¹⁰

In addition, the research centre organizes symposia to discuss the perspectives of the E/E/S members both with internal and external stakeholders from science, politics, business, civil society, and public administration. This format helps to position the profile of the research centre to stakeholders and thereby extend the network. The program structure may, for instance, include a sequence of greetings, keynote presentations, tandem presentations from science and practice, workshops organized from the research clusters, and/or a panel discussion.¹¹

These formats are typically scheduled for a full day. Considering researchers' time constraints and the extensive organization required, they are held no more than once a year.

Research colloquium for young scientists

This format was installed to support research staff during the acquisition of their scientific qualifications. Participants learn to present their research ideas and findings to a scientific community with diverse epistemological and disciplinary backgrounds. The format is also connected to the existing Office for Graduate Services at the FUH and uses the repertoire of mentoring programs, advice offerings, and general qualification modules (including the technique of scientific work, presentations at conferences, writing

¹⁰ Under the following link the interested reader can access the program of the last research workshop held on June 12, 2024 (in German):

https://www.fernuni-hagen.de/forschung/schwerpunkte/eun/docs/240515_einladung-eun-workshop_12-06-2024.pdf

¹¹ A symposium was organized in 2022. The event is documented on the website of the E/E/S Research Centre (in German): <https://www.fernuni-hagen.de/forschung/schwerpunkte/eun/aktuelles-termine/berliner-symposium/index.shtml>

articles for specialist journals, academic English, preparation for disputation, application, and appointment presentations).

Learning to fly – A process of participation and sharing (2022-2024)

Biancani et al. (2018, p. 545) argue that faculties “have a strong meaning and influence on researchers. Faculties provide guidance to academics to be a member in a scientific community, to pursue career goals, and aspirations. [...] they have developed and communicated clear standards for academic rigor and academic achievements. Moreover, they ensure recognizable degrees for academia and jobs outside the university landscape. They have long been both the backbone and the arteries of the university.” Boardman and Bozeman (2007) found evidence that researchers experienced role strain while working in a layered organizational architecture being both members of research centres and faculties. Hence, the task was to create opportunities for researchers to gradually develop an E/E/S membership identity that complements, rather than competes with, their faculty identity.

The scientific management of the E/E/S Research Centre has always viewed the faculties as the core components of the HEI’s organizational structure. Consequently, the goal has been to help researchers cultivate a complementary identity that supports their roles both within their specific faculty and the E/E/S Research Centre. Currently, the E/E/S Research Centre consists of 33 members. The distribution across the five faculties of the FUH and the different status groups is summarized in the following figures:

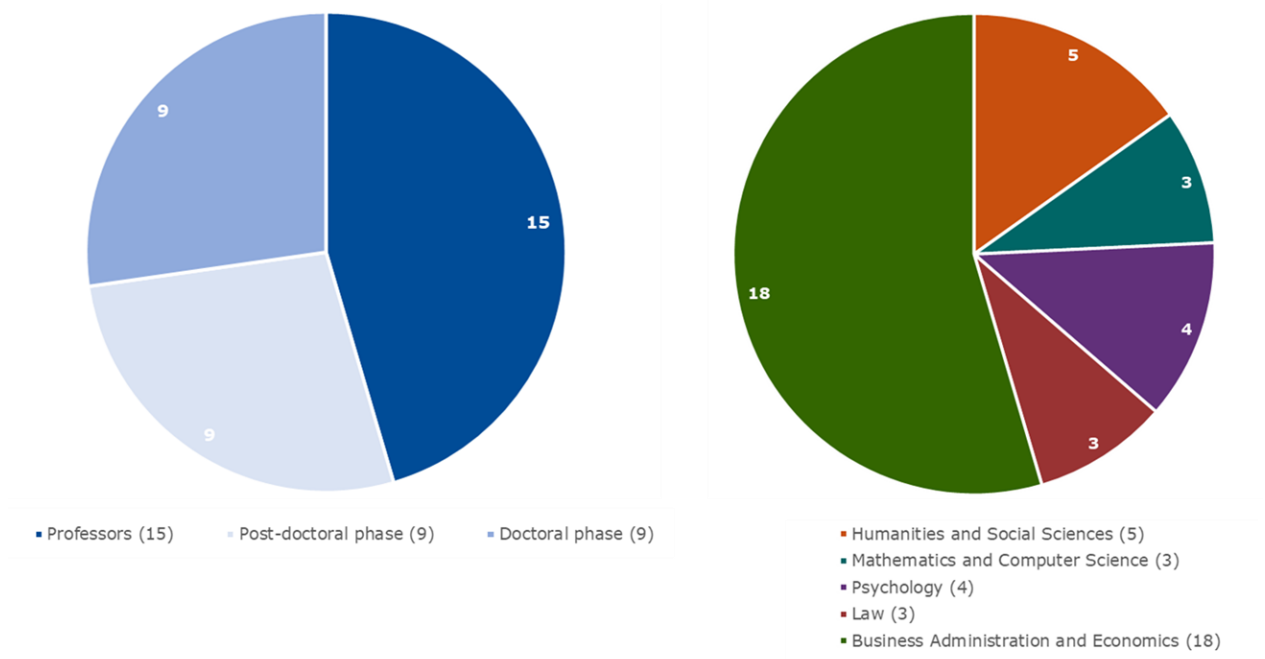


Figure 5. Faculty membership and status group of researchers involved (author’s elaboration).

How is membership in the E/E/S Research Centre perceived by the researchers? How can they get involved in it? These questions had to be answered to develop an identity and a research profile. A substantial amount of time and a trial-and-error approach was granted to support members in this process.

Wehrden et al. (2019) emphasise that the successful scientific management of research centres is based on creating trust, guiding and mediating discussions, and supporting members in finding common research interests on which further collaboration can be built. The following paragraphs describe how the scientific management used the formats of participation and information exchange to develop the E/E/S Research Centre.

Developing thematic clusters as catalysts of interdisciplinary research

A very important characteristic of a successful research centre is its ability to serve as an enabling network (Bolger, 2021). Scientific management can support the formation of a social network of sustainability scholars. The Directorate's task was to find a way to assemble and organize researchers with similar interests and complementary expertise in a way that most effectively advances sustainability-oriented science at the FUH. The key to this success was to identify members possessing a high intrinsic motivation to cooperate with colleagues from other disciplines. The following paragraphs describe the process in detail.

In the participative decision process, the Directorate and members agreed to identify similar research interests in topics of sustainability to pursue the formation of *research clusters*. It was argued that a research profile consisting of thematic clusters could catalyse interdisciplinary and transdisciplinary research. Accordingly, the Directorate initiated and coordinated a process designed to develop a set of thematic clusters. All of the members were invited to submit research exposés by answering the following questions:

- What topics are you (the department) working on?
- What questions are typically pursued?
- Which theories are used?
- What methods are used?
- What sustainability-oriented research projects have you conducted and what status do they have?
- To which other teaching areas/chairs/work areas do connections exist (already present or easily conceivable)?
- On which topics can you envision conducting research? What research questions are likely to arise, and which colleagues (from the FUH or external) would you consider for potential collaborations?

A content analysis of the submitted exposés resulted in the six clusters shown below. The directorate and the coordinator helped set up a self-selection process for members, allowing them to identify which clusters were best aligned with their research interests. A researcher may belong to more than one cluster: cluster membership is solely defined by research interests focusing on a distinct set of sustainability-related issues.



Figure 6. Overview of research clusters below¹² (elaboration of the E/E/S Research Centre, 2024, www.fernuni.de/ess).

In the next step, the six clusters were presented to the E/E/S members, and scholars were asked to check if their research interests were mirrored by the thematic foci of the respective research clusters. For each of the new clusters, a workshop was organized. Interested researchers were invited to debate about the first set of identified joint research themes. The establishment of the six clusters was merely the first phase of the challenge of establishing collaborations within and across clusters, as well as engaging with external partners. The next section describes how important it has been to grant a substantial amount of time to set up the processes for inter- and transdisciplinary collaboration within each cluster.

¹² **Socio-technical Interactions in Climate Protection**

This cluster examines methods for simulating socio-technical systems (e.g., agent-based modelling, system dynamics) which are then further developed and applied to climate protection issues. The idea is to provide opportunities for studying how actors in society interact with each other and with technologies, as well as the resulting system behaviour in terms of achieving climate protection goals.

Climate Protection at the Interface between Politics and Economics

This cluster researches political, economic, and societal interdependencies in climate protection at different levels (individual, local, state, federal, EU, and international climate cooperation). It also explores the question of which packages of measures are necessary to achieve effective climate protection – and how they can be achieved.

Emotions & Norms for Sustainable Development

This cluster investigates the influence of emotions and social norms on sustainable development. The issues considered include sustainable consumption, service management, energy price development, and climate policy.

Climate Change, Financial Markets and Macroeconomics

This cluster investigates the interdependencies between climate change, macroeconomic developments and financial markets. Its focus is on the macroeconomic challenges of climate change and the complementary roles of financial markets and technologies for sustainable economic development.

Sustainable Supply Chains

This cluster examines the design of sustainable value chains at strategic, tactical and operational planning and control levels.

Smart Cities

The cluster examines the technical, socio-technical, socio-economic and economic issues concerning the digital transformation of cities. Its focus is on solving urban problems and promoting sustainable urban development.

Organising scientific collaboration in clusters

The clusters were not developed to operate as narrowly defined research projects following a specific agenda. Instead, they serve as discussion arenas that foster inter- and transdisciplinary collaborations while also accommodating monodisciplinary research activities. The clusters are intended to work on innovative research ideas, joint publications, applications for third-party funding, and/or transfer projects. Their structure is designed to be “open” and “flexible”. Clusters have the flexibility to optimally match and adapt to the research interests of their members. Hence, clusters’ thematic foci may change, dissolve, or re-establish over time, if necessary.

Each cluster announced a cluster spokesperson – a crucial role for cluster development. These individuals are responsible for coordinating research activities, fostering interdisciplinary collaboration within the clusters, and managing transdisciplinary projects with external partners. For instance, they organize how clusters practice their research activities. One cluster, for instance, decided to write a state-of-the-art review/overview of research findings on a specific sustainability-oriented topic to identify how the disciplines associated with the cluster can contribute to the current state of knowledge. Other clusters have submitted joint funding proposals, enhancing cross-disciplinary exchange through collaborative research. Moreover, spokespersons plan internal and external workshops to present and discuss current projects and research questions. They communicate with new and interested researchers as well as practitioners about the clusters’ research profiles. Moreover, they fulfil the important task of managing and channelling research-relevant information within the cluster. They communicate with the directorate on research-relevant issues (e.g., available funding programs and the organization of events considering all clusters). Finally, spokespersons coordinate a reporting process conducted twice a year using a standardized questionnaire. The survey gathers information on publications as well as ongoing research, applications for external funding, networking, new members, and other cluster activities. A summary of activities and successes is communicated to all members of the E/E/S Research Centre, the FUH board, as well as stakeholders within and outside the institution.

In sum, the clusters are so fundamental to the research activities that they are commonly referred to as “the soul of the E/E/S Research Centre.” With the help of the above-described approaches, members gain valuable insights into research topics and methods that differ from their own areas of expertise. In combination, these varied approaches help the E/E/S Research Centre to deliver benefits for all its members. For instance, it allows them to identify research questions and proposals that cannot be addressed from one discipline alone. In addition to that, it may also bring to light research questions that can be addressed within one specific discipline (but have been ignored so far). Furthermore, by participating in the research clusters, it should be easier for the individual scientist to develop third-party funding applications and raise funds.

A brief overview of achievements

Considering that the E/E/S Research Centre is currently in its adolescence, the developments and academic achievements of the last four years have been extremely promising. The number of publications on sustainability-oriented issues is depicted in the chart below.

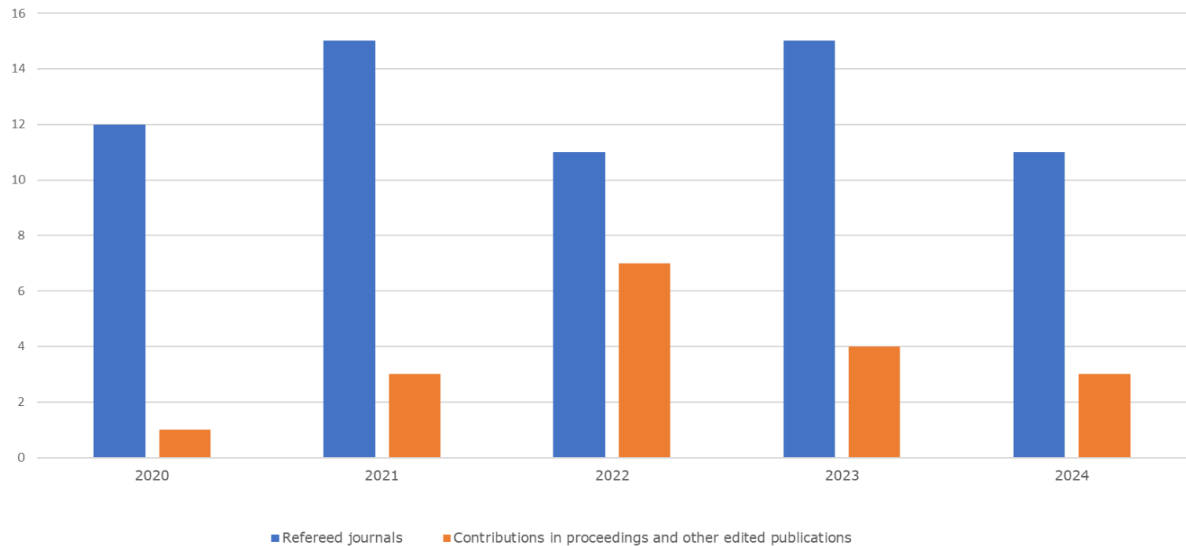


Figure 7. Number of publications on sustainability-oriented issues (elaboration of the E/E/S Research, 2024, www.fernuni.de/ess)

The clusters are increasingly engaging in interdisciplinary discourse which results in interdisciplinary publications. One example is the a joint publication from the disciplines of psychology and economics: Rogmann, J.; Beckmann, J.; Gaschler, R.; Landmann H. (2024): *Media Sentiment Emotions and Consumer Energy Prices*, *Energy Economics*, 130, 107278.

Moreover, members successfully applied for external funding. In total about 3.3 million euros have been raised for research projects.¹³ One example of a project that has recently been finalized involves the creation of a concept for a regional hydrogen economy in Hagen (HyExperts Hagen). Members of the E/E/S Research Centre worked on questions of local acceptance that will contribute to the success of a local hydrogen economy. Moreover, target group-specific mediation formats, seminars as well as further education offers for practitioners in public administration have been designed.¹⁴

Growing into adulthood – A discussion of further developments

The previous paragraphs outline the organization of the research centre in thematic research clusters. These units are characterized by inter-institutional ties that are growing continually stronger. Some clusters have started to collaborate with researchers from other institutions and practitioners from industry, politics, and public service.

¹³ The following website provides an overview of the externally funded projects: <https://www.fernuni-hagen.de/english/research/clusters/ees/research/projects/index.shtml>

¹⁴ The following website provides further information on the project: <https://www.fernuni-hagen.de/english/research/clusters/ees/research/projects/hy-experts-hagen.shtml>

To continue this development, the scientific management of the research centre needs to set the course for further cultivating inter- and transdisciplinary research and receiving institutional support. Hart et al. (2016) argue that experiences gained through discourse, joint projects, and publications lead to a higher capacity level for future collaborations over time. In this vein, Bolger (2021, p. 178) argues that *“as research projects come and go, [research centres] can continually learn from them and build institutional memory and long-term capacity in doing and facilitating interdisciplinary research at the coalface. Few other entities within the university have this capability.”*

However, the development of an inter- and transdisciplinary research centre is no simple task, and it requires time until the full potential can be reached. It is crucial that we acknowledge this long-term nature by granting a significant amount of time to allow collaborations across epistemological, disciplinary, and even institutional borders to flourish. It is also important to take the time constraints of members into account and offer goal-directed, open, and mutually beneficial communication forums.

In the case of the E/E/S Research Centre, the alignment and focus in the years ahead concentrate on the following issues:

- Sharpening the research profile via cluster structures
- Unfolding the potential of the strategic partnerships with non-HEI research institutions (e.g., developing a cluster with the expertise of the Wuppertal Institute, investigating themes and issues of a circular economy/society)
- Intensifying local and regional networking¹⁵ to foster transdisciplinary research
- Increasing the number of applications for interdisciplinary collaborative projects (in addition to national and EU ministerial funding)
- Increasing efforts to work and publish on interdisciplinary publications to increase the chances of acquiring third-party-funded projects
- Identifying approaches to integrate research with teaching activities

Conclusions and outlook

This case study highlights strategies for how research centres can enable inter- and transdisciplinary research during their initial years. The discussion provides a guideline for the scientific management of HEIs, helping research centres function as forums that promote and strengthen an interdisciplinary and transdisciplinary research agenda. As such, it describes important approaches for connecting researchers within HEIs as well as stakeholders outside the institution.

¹⁵ An example of an early stage in this context is a public lecture that took place in the town hall of the city of Hagen. The lecture’s topic central topic was the “Transformation of urban traffic systems.” However, despite focusing on transformation in general, it also discussed the specific problems inherent in Hagen’s traffic system. The interested reader can access the video stream of the public lecture here (in German):

<https://www.fernuni-hagen.de/forschung/schwerpunkte/eun/aktuelles-terme/videos/video-Becker.shtml>

The roadmap presented emphasizes that the development of a research centre is a participatory process that needs to be framed by an institutional strategy and clearly formulated support mechanisms.

The complex development stages of building a research community across disciplinary and institutional boundaries underscore the need to master interdisciplinary and transdisciplinary research. Therefore, we strongly believe that research centres benefit from regularly discussing and sharing successful approaches and projects with all members. The scientific management of research centres can stimulate the learning process by highlighting good practices and achievements in training sessions or workshops.

A limitation of the study is that it is confined to a relatively young research centre in a single HEI. Extending this discussion to include other EADTU members could provide a more detailed understanding of scientific and socio-cultural processes in interdisciplinary and transdisciplinary research centres focusing on sustainability-oriented research.

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Assessment and Reporting

05

Mahsa Mapar & Sandra Caeiro (Universidade Aberta)

Abstract

Higher Education Institutions (HEIs) have a pivotal role and significant responsibility in advancing sustainability and achieving Sustainable Development Goals (SDGs). Recently, sustainability assessment and reporting have emerged as critical components for implementing sustainability within HEIs and the development of diverse tools to assess sustainability implementation at HEIs is one of the initiatives that has attracted growing global attention. However, there is still a gap in comprehensively exploring the assessment tools, particularly in examining the indicators associated with these tools, to determine their suitability and coverage of all dimensions of the whole-institution approach. On the other hand, the evolution of sustainability within academic settings has driven HEIs to actively engage with society and communicate the outcomes and impacts of their sustainability endeavours. Nonetheless, monitoring sustainability reporting trends in HEIs remains challenging due to the absence of dedicated sustainability reporting frameworks or sustainability documentation scenarios at the higher education level. Therefore, this chapter delves into how sustainability assessment and reporting in HEIs can cover only education and research - the main functions of HEIs-, but also encompass other operational, governance, and engagement elements.

Higher Education Institutions (HEIs) can function as experimental learning spaces for sustainability and should adopt sustainability principles in all their processes (Christou et al., 2024). Some HEIs worldwide have been transforming their campuses into more sustainability-oriented by addressing sustainability in their institutional practices (Kapitulčinová et al., 2018). They can implement sustainable development in different dimensions, according to a holistic approach, including education and curricula, campus operation, organizational management, external community, research, assessment and communication (Lozano et al., 2015). The United Nations Educational, Scientific and Cultural Organization (UNESCO, Paris, France) refers to these fundamental aspects as the "Whole-Institution Approach". Among them, in achieving sustainability in HEIs, sustainability assessment, disclosure, and reporting have emerged as crucial elements, and various models and tools have been developed for this purpose (Brusca et al., 2018).

Assessing the effectiveness and impact of various implementation dimensions enables the measurement and evaluation of how sustainability is being put into practice. This process helps identify weaknesses, strengths, and areas of improvement (Caeiro & Azeiteiro, 2020). Consequently, "sustainability assessment tools" play a pivotal role in shaping sustainability strategies and activities within the HEIs (Berzosa et al., 2017). These tools serve to measure, audit, benchmark, and communicate the institution's sustainable development efforts effectively (Findler et al., 2018). Alongside, "sustainability reporting" has emerged as a critical component in HEIs in completing the "assessment" process by effectively communicating the outcomes of the institution's sustainability practices and activities (Domingues et al., 2017). Therefore, within the framework of HEIs, sustainability assessment, and reporting are broadly linked: Assessment provides data for evaluating the sustainability level across all elements of the whole-institution approach while reporting disseminates these findings to stakeholders, thereby facilitating the implementation of a comprehensive institutional approach.

Sustainability assessment

Since the emergence of sustainability declarations, particularly in higher education during the 1990s (such as the Tallories Declaration in 1990 (ULSF), Halifax Declaration in 1991, and Tbilisi Declaration in 1977) numerous sustainability assessment tools have been introduced. These tools aim to assess the extent of sustainability initiatives in HEIs, covering various themes, indicators, and assessment methodologies (Husaini et al., 2018). According to Findler, et al. (2018) sustainability assessment tools in the context of HEIs are “instruments that offer HEIs a systematic set of procedures and methods to measure, audit, benchmark and communicate their efforts towards sustainable development”. By applying these tools, the institution can determine whether they are implementing all dimensions of sustainability comprehensively (Caeiro et al., 2020).

The current sustainability assessment tools, designed for assessing the sustainability performance of HEIs across various fields (Singh et al., 2009, Berzosa et al., 2017; Caeiro et al., 2020; Mapar et al., 2022), could be categorized based on i) their applied methods, ii) the context (focal point), and iii) assessment process (see Figure 8).

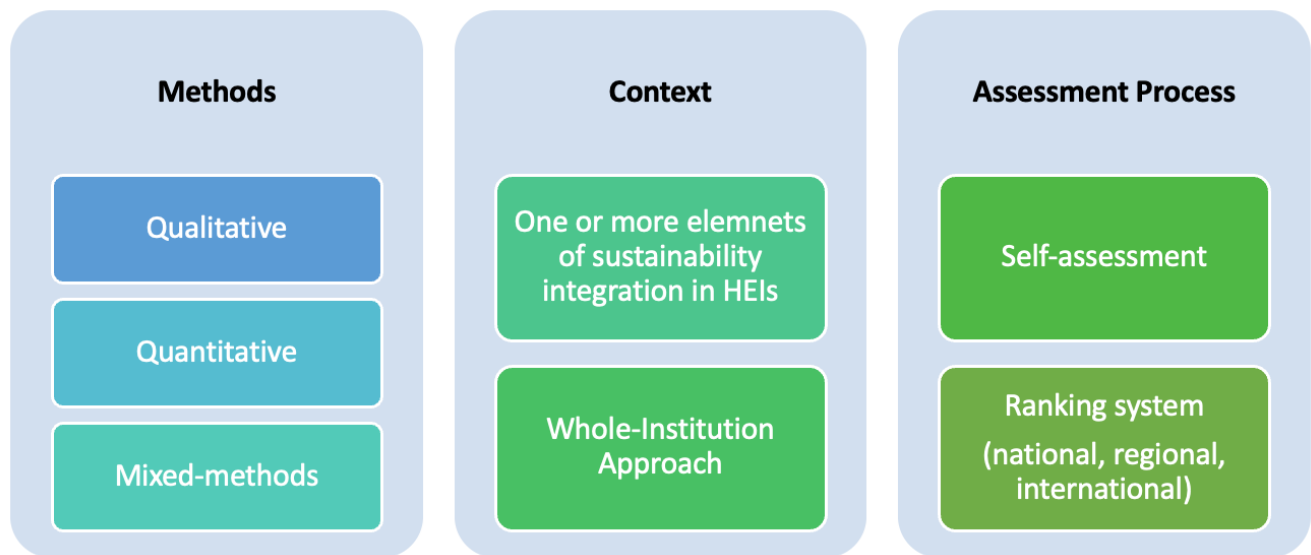


Figure 8. Approaches in Sustainability Assessment Tools for HEIs.

In terms of methods (Singh et al., 2023), these tools can be divided into i) quantitative, e.g. Sustainability Assessment Questionnaire (SAQ) (ULSF 2009), ii) qualitative (e.g. Ecological Footprint Analysis (EFA), or Graphical Assessment of Sustainability in Universities Tool- GASU (Lozano, 2006)), and iii) mixed methods, both qualitative and quantitative, e.g., Sustainability Tracking, Assessment, and Rating System (STARS) (AASHE 2019).

Nature positivity by assessing biodiversity footprint at the University of Jyväskylä [\[GP6\]](#)

The University of Jyväskylä (JYU), as part of its commitment to the global Nature Positive Universities Alliance, introduced its "Roadmap to Planetary Well-being" in 2022, to become carbon-neutral and nature-positive by 2030 to address biodiversity loss within the higher education sector. To assess its environmental impact, JYU calculates its biodiversity footprint. Alongside the habitat hectare methodology, the university's School of Resource Wisdom has developed an innovative approach using multiple databases to express this footprint through the Potentially Disappeared Fraction (PDF). PDF estimates the potential loss of species richness due to environmental pressures from JYU's operations and procurement. These initiatives not only support JYU's commitment to becoming nature-positive but also set a standard for how universities can lead in biodiversity conservation and sustainability.

Regarding the context, these tools typically concentrate on one or more elements of the whole-institution approach. For instance, certain tools exclusively target curricula, research, or educational areas, like STAUNCH (Sustainability Tool for Assessing Universities' Curricula Holistically) (Lozano, 2010), while others lean towards campus-based approaches and operations, such as GM (Green Metrics University Ranking) (Lauder et al., 2015). However, there are still assessment tools that comprehensively cover all elements of the whole-institution approach, with STARS serving as a notable example.

Anadolu University's Performance in the UI GreenMetric

Anadolu University participates in the Green Metric University Ranking, an initiative launched by Universitas Indonesia in 2010 to evaluate green campus practices. This ranking assesses universities across six criteria (setting and infrastructure, energy and climate change, waste, water, transportation, and education and research) by using 39 indicators to measure environmental performance. In the 2023 rankings, Anadolu University was positioned 885th globally based on its total score.

Université TÉLUQ Performance in the STARS [\[GP7\]](#)

Université TÉLUQ, an online and distance education university in Canada, is committed to promoting a sustainable future through its strategic focus on digital responsibility. As part of its 2021-2026 strategic plan, the university has initiated the development of its sustainability strategy, applying the Sustainability Tracking, Assessment & Rating System (STARS) as a central management tool. In 2023, it became the second fully online university in the world to receive a STARS rating, achieving a Silver-level distinction.

In terms of the assessment process, sustainability assessment tools vary from self-assessment tools, focusing on specific sustainability aspects (Caeiro et al., 2020) that can be completed by a leader or researcher alone, such as DUK (Yarime & Tanaka, 2012), to tools capable of conducting a "comparative analysis" of the sustainability processes and performance across various HEIs worldwide, like THE (Times Higher Education Impact Rankings) (THE Impact Rankings, 2024).

Ecological Footprint Analysis through University Footprint Calculator at Universidade Aberta ^[GP8]

Universidade Aberta (UAb) annually assesses the Ecological Footprint generated by its activities and services, using the "University Footprint Calculator"¹⁶. The calculator was created in 2022 as part of the EUSTEPs project (Enhancing Universities' Sustainability Teaching and Practices) through a collaborative effort involving five partners: Aristotle University of Thessaloniki (Greece), University of Aveiro (Portugal), Universidade Aberta (Portugal), University of Siena (Italy), and the Global Footprint Network (GFN). The calculator is an open-access digital tool designed to measure the biologically productive land and water required to support a university's resource consumption and waste generation (Mancini et al., 2022). By using this self-assessment tool, UAb evaluates and compares its environmental impact across various consumption categories each year. This process allows UAb to benchmark its environmental performance, identify the most impactful consumption areas, and cultivate a culture of sustainability within the university, providing a model that other institutions can follow.

Primarily, these assessment tools are mainly focused on the environmental impacts of HEIs' operations, while other dimensions of sustainability integration in HEIs still require further development within these tools. However, the most recent tools are striving to address this issue by adopting a comprehensive perspective, covering all dimensions of sustainability. For instance, the Times Higher Education (THE) Impact Rankings stands out as the first global ranking to recognize HEIs' contributions towards SDGs. Launched in 2019, THE Impact Ranking is the foundational global ranking at the institutional level aimed at evaluating the contribution to each of the 17 SDGs, with universities having the option to participate in some determined SDGs. Despite its recent inception, THE Impact ranking has already aroused interest in the higher education community. In THE Impact Rankings 2024, a total of 2,152 universities from 125 countries/regions participated in the ranking (THE Impact Rankings 2024), demonstrating a positive shift in HEIs, and the broader public's commitment, to addressing Sustainable Development in its entirety (Bautista-Puig et al., 2022).

For effective implementation of sustainability assessment tools, the whole HEI community, particularly the staff and management body, must embrace the responsibility behind their sustainable actions and the institution's operations (Baboulet & Lenzen, 2010). Therefore, alongside teaching and research, which are the main functions of HEIs, there is still a need to engage in a "participatory assessment tool", involving the whole internal community of the Institution, which can also foster the sustainability culture throughout the institution.

Reporting initiatives

Besides the fundamental role of HEIs in teaching and research, they are also recognizing the importance of actively engaging with society and communicating the results and impacts of their sustainability initiatives. This commitment is exemplified through reporting of the institution's outcomes and practices, in an open document known as the "sustainability reporting" (Fiorani & Di Gerio, 2022). According to the

¹⁶ More information on University Footprint Calculator: <https://www.eusteps.eu/resources/university-footprint-calculator/>.

Global Reporting Initiative (GRI), sustainability reporting involves “the practice of measuring, disclosing, and being accountable to internal and external stakeholders for organizational performance towards the goal of sustainable development”. It is a voluntary activity with two purposes: i) to assess an institution’s current status on economic, environmental, and social dimensions, and ii) to communicate its efforts and progress towards sustainability to stakeholders (Lozano & Huisingh, 2011).

For many HEIs, publishing sustainability reports has become an instrument to disclose and publicize their commitment to the 17 SDGs (Caputo et al., 2021). However, HEIs are facing increasing institutional pressures and stakeholders' demands for a higher level of commitment to “disclosing” social and environmental information as responsible actors. Consequently, many HEIs have begun adopting sustainability reports and other voluntary disclosure tools to meet stakeholders’ demands and respond to institutional forces. Despite the growing interest in sustainability reporting within HEIs in recent years (Moggi, 2023), the reporting practices are still in their early stages (Kapitulčinová et al., 2018; Lozano et al., 2015). Challenges include the limited number of HEIs publishing sustainability reports, the low quality of the reports, the lack of consecutive reporting, and the absence of institutionalization of sustainability reporting in the higher education system (Ceulemans et al., 2015; Mapar et al., 2022). Also, there is still a doubt about which framework could be suitable to apply for reporting sustainability initiatives within HEIs. Monitoring trends is also challenging due to the inadequate updates in the main reporting databases by HEIs (Moggi, 2019). Therefore, HEIs should not only use assessment tools for evaluation purposes but also for reporting the outcomes to ensure they are progressing in the right direction (Alghamdi et al., 2017, Mapar et al., 2022).

Adopting criteria linked to the SDGs in sustainability reporting could streamline information systems within HEIs, simplifying the readability of sustainability reports and allowing for more accurate comparisons between the performances of various HEIs (Fiorani & Di Gerio, 2022).

While there is extensive research on corporate sustainability reporting in the private sector, limited attention has been given to the public sector (Mapar et al., 2017) and even less to the academic sector such as higher education. The delayed incorporation of sustainability reporting into the Higher Education sector may be attributed to the fact that, in contrast with profit-driven sectors, HEIs may perceive less urgency to promptly communicate their impacts, given the lower external pressure by stakeholders or society.

The assessment of the quality of sustainability reporting in HEIs is still a topic of debate in the literature. While some studies explore the suitability of the GRI guidelines to be applied as a main framework in the HEIs reporting (Alonso-Almeida et al., 2015; Lozano, 2006), others highlight the absence of a common distinct framework for disclosing sustainability information in the higher education sector (Caputo et al., 2021).

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Good Practices

Good Practice #6

Nature positivity – Good practice at the University of Jyväskylä

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It is important to understand that human activity is based on ecological sustainability; we are totally dependent on nature. Ecological sustainability is the preservation of biodiversity and ecosystem function, in practice, the absence of harm to the natural environment from the activities of people, businesses or communities. At our university, being nature-positive has become as important a goal as being carbon-negative. In this chapter, we explain how nature-positivity manifests itself in our university.

Introduction

Habitat loss and degradation is now faster than at any time in human history (IPBES, 2018). However, the loss of nature affects more than just the environment: it also has an impact on the economy, international security, human health and well-being, sustainable development, and legal certainty. The University of Jyväskylä's (JYU) environment programme, Roadmap to Planetary well-being (JYU, 2022), adopted in 2022, sets out a vision for the university to become carbon-neutral and nature-positive by 2030. The university also wants to serve as an example of a sustainable, resource-wise, as well as inclusive and safe workplace for all. JYU follows UNIFI's (Rectors' Council of Finnish Universities) theses (UNIFI, *n.d.*) on sustainable development and responsibility, which are based on the UN's sustainable development goals, Finland's Society's Commitment to Sustainability (*Yhteiskuntasitoutumus 2050*), the Convention on Biological Diversity, and the Paris Climate Accords (JYU, 2022). JYU also holds the WWF Green Office certificate. In addition, the University of Jyväskylä is a founding member of the Nature Positive Universities Alliance.

Nature Positive Universities

Nature Positive Universities Alliance was established in 2022. According to a press release from 2022 by the United Nations Environment Programme (UNEP, 2022), the higher education sector has committed to reversing biodiversity decline through the worldwide Nature Positive Universities Alliance (naturepositiveuniversities.net). The initiative aims to move the global higher education sector toward a more environmentally friendly future as part of the UN Decade on Ecosystem Restoration. In order to improve their ecological footprint on Earth through the Nature Positive Universities Alliance, 136 universities have already made a formal commitment and started evaluating their environmental impact (naturepositiveuniversities.net).

Being a Nature Positive University entails strengthening a university's beneficial effects on the environment and restoring species and ecosystems that have been damaged by the university's actions. This encompasses all activities undertaken by a university, including teaching, research, and supply chain management. A measured baseline for biodiversity, time frame, goals, explicit actions, an analysis of the

cumulative effects of actions, monitoring, and open reporting are all necessary for being nature positive (naturepositiveuniversities.net).

Good practices - Nature Positivity

The University of Jyväskylä's Code of Conduct (JYU, n.d.) already states that we practice responsible decision-making and support ecological, social, and cultural sustainability when we plan, buy, and invest. We oppose the use of child or forced labour, bribery, corruption, or any other inappropriate behaviour. We support circular economy and methodically evaluate the need for the things we purchase. When it comes to investing, we adhere to the United Nations Principles for Responsible Investment (UN PRI) and consider the environmental, social, and governance aspects (ESG). Our investments help our university achieve its carbon neutrality objectives. We also follow all these aspects together with the asset managers in question, and we have recently adopted qualitative biodiversity goals for our investments.

To prevent, manage, and lessen environmental damage, it is crucial to understand the source and extent of the damage. While increased greenhouse gas emissions are referred to as "climate damage" (IPCC, 2023), ecosystem degradation or negative biodiversity impact includes harm to ecosystems such as logging-related habitat degradation in forests or construction-related environmental destruction (IPBES, 2018). Limiting climate change and halting habitat degradation are mutually reinforcing objectives and, according to scientists, must be addressed simultaneously (Pörtner et al., 2021, IPBES, n.d.).

Organisations can describe their climate impacts through a carbon footprint and usually the emissions from their activities are calculated and expressed in terms of carbon dioxide equivalents. Standards are already available, such as the Greenhouse Gas Protocol (WRI & WBCSD, 2015) for carbon footprint calculations. Ecological footprint is often used to assess the environmental impact of a person, organisation, or state (Wackernagel & Rees, 1995, p. 9). Ecological footprint describes the productive land area needed to satisfy consumption, expressed in global hectares. There is also a standard for this metric (Global Footprint Network, 2009). However, ecological footprint does not allocate degradation geographically or indicate the level of degradation of ecosystems. There are other indicators as well, and a better indicator of nature impacts/disadvantages might be the biodiversity footprint, which combines information on consumption-related land use and species richness across different land use classes and habitats. In other words, biodiversity footprint indicates the loss of biodiversity caused by consumption (Asselin et al., 2020). However, it should be noted that different methods of measuring nature damage give different units, and it might be useful to commensurate things together in these cases. One method for commensurating the measured units is to use the habitat hectare. Originally, the habitat hectare was created as a measure of ecological compensation. Habitat hectare is a standard that describes the ecological condition of a habitat per unit area (Parkes et al., 2003).

In addition to calculating a carbon footprint, JYU uses habitat hectare methodology to calculate its biodiversity footprint, i.e. damages to nature caused by the organisation's activities. In addition, another methodology for the biodiversity footprint calculations was developed, and lately refined by the School of Resource Wisdom (JYU.Wisdom) Community (El Geneidy et al., 2021). The methodology combined different methods and/or databases (EXIOBASE-database by Stadler et al., 2018 and the research of Chaudhary & Brooks, 2018) and is expressed in Potentially Disappeared Fraction (PDF). PDF accounts for a fraction of species richness that may be potentially lost due to environmental pressure. By using two different kinds of methods, JYU was able to decipher how the university's activities and procurements

affect nature: how many species are potentially under threat of extinction in a certain area. Recently, the researchers of JYU.Wisdom have further developed biodiversity equivalent calculations (El Geneidy et al., 2023).

Within all activities, JYU seeks to avoid or minimise damage to the environment. Those that cannot be avoided should be restored or compensated in the future, in accordance with the hierarchy of mitigation of environmental and natural damage (IUCN, 2016). Another method is currently being explored and developed in JYU that could, in the best and most cost-effective way possible, quantify and provide answers on how to compensate, restore or offset damages caused to nature (El Geneidy et al., 2021, 2023). Not only do we want to be a truly nature-positive university, but we also want to meet nature-positive university expectations. To achieve this, we still need further research and development on biodiversity footprint calculation methods for different categories, offsetting responsibilities and practical biodiversity offsetting opportunities.

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Good Practice #7

Developing a Sustainability Strategy for a Distance Education Institution Using STARS among other tools: The Example of Université TÉLUQ

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Université TÉLUQ is dedicated to advancing sustainability as a fully online and distance education Higher education Institution (HEI), with a strong focus on digital responsibility. The university's strategic plan includes a commitment to sustainability, demonstrated through its participation in the Sustainability Tracking, Assessment & Rating System (STARS), resulting in a Silver STARS rating. This framework enables the assessment of sustainability performance and highlights the unique challenges faced by distance education institutions.

Introduction

Université TÉLUQ, Quebec, Canada, a fully online and distance education university in Quebec, is committed to contributing to a more sustainable future. Despite the fact that distance education HEIs significantly reduce commuting and energy consumption, Université TÉLUQ has decided to go further and place particular emphasis on digital responsibility. In its 2021-2026 strategic plan, the university has included a pledge to formalize its commitment towards sustainability. The approach taken by Université TÉLUQ to develop its first sustainability strategy, described below, could serve as an example for any distance learning institution seeking to commit to a more sustainable future.

Good practice- Sustainability Tracking, Assessment & Rating System (STARS)

In 2023, the university chose to participate in the Sustainability Tracking, Assessment & Rating System (STARS), an internationally recognized framework for measuring sustainability in HEIs. (AASHE 2019). This system was used as the primary management tool to assess current contributions to sustainability, identify areas for improvement, and develop its sustainability strategy. Université TÉLUQ thus became the second fully online university in the world to earn a STARS rating, and the first to achieve a Silver STARS rating (see Figure D).



Figure D. The score of Université TÉLUQ in STARS version 2.2.

STARS has enabled Université TÉLUQ to measure its sustainability performance by evaluating all areas (academics, engagement, operations, planning and administration, innovation and leadership). It highlighted actions that could be undertaken, drew inspiration from best practices, enabled the development of measurement tools and methodologies, for example how to assess courses and programs with regards to their inclusion of sustainability, and mobilized the university community while creating links between different departments and services.

Even though the STARS version 2.2, which Université TÉLUQ used (AASHE 2019), takes some of the specificities of distance education into account, such as the number of students enrolled exclusively in distance education, it is still not fully adapted to the reality of a distance education university. For instance, STARS asks if the institution undertakes actions for sustainable transportation, measures and reduces the amount of waste generated, and manages its land responsibly, regardless of their context. For Université TÉLUQ, and generally for distance education institutions, these are peripheral concerns, as there is not much commuting, very little waste generated, and few green spaces, if any. Sustainability priorities can differ in a distance education university compared to one with a physical campus.

To better reflect its specific context, Université TÉLUQ completed its sustainability assessment by focusing particularly on its direct and indirect greenhouse gas (GHG) emissions (scopes 1, 2, and 3), ensuring that all emissions associated with online and digital activities were included. Measuring the carbon footprint of digital activities goes beyond the basic requirements of STARS but represents one of the main areas of sustainability concerns for a distance education HEI.

Finally, to develop its 2025-2028 Institutional Sustainability Action Plan, Université TÉLUQ strove to extensively consult its employees and students through a virtual suggestion box, collaborative workshops, surveys, and discussion meetings. The people who took part in the assessment and consultation process were encouraged to think outside the box to ensure they addressed the university's unique challenges.

The 2025-2028 Institutional Sustainability Action Plan, subtitled "A University Committed to a Sustainable Future and to Digital Responsibility," emphasizes responsible digital practices as a cross-cutting priority and is structured around five key areas: teaching, research, community engagement and well-being, operations management, and governance. As a distance education university, it appears both important and necessary to make digital responsibility central to its sustainability strategy.

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Good Practice #8

Ecological Footprint Analysis through University Footprint Calculator at Universidade Aberta

Mahsa Mapar & Sandra Caeiro
Universidade Aberta | Portugal

Besides the role of Higher Education Institutions (HEIs) in education and research, they are increasingly expected to adopt sustainable practices and tools to measure the environmental impacts of their operations. While current assessment and ranking tools exist, there is a notable lack of digital tools specifically designed to quantify the tangible environmental impacts resulting from HEIs' activities. One prominent tool addressing this need is the Ecological Footprint Calculator¹⁷, which quantifies the biologically productive land and water required to support HEIs' resource consumption and waste production. This open-access digital tool allows HEIs to comprehensively evaluate and document their consumption of natural resources and ecosystem services across various operational domains. Universidade Aberta (UAb) has already integrated this tool within its operational activities, applying it annually to analyse and compare its environmental impacts across different consumption categories, thereby contributing to its commitment to sustainability and fostering a benchmarking approach within the higher education sector.

Introduction

Along with teaching and research, it is imperative for HEIs to practice sustainability by equipping themselves with tools that can measure the “actual impact” of their actions and activities on the environment and offering guidance to institutional decision-makers for reducing the impact. Among the current self-assessment and ranking tools, there is a noticeable limitation on the tools specifically designed to measure the “tangible environmental impacts” resulting from HEIs' activities and operations.

One such tool is Ecological Footprint (EF) which serves as an aggregate measure that represents the amount of biologically productive land and water area required to provide resources consumed and assimilate waste produced by a given entity. This measurement is standardized using a measurement unit called “global hectare” (gha) (Ortegon & Acosta, 2019). By framing the Ecological Footprint as an accounting system rather than a normative indicator of progress, it becomes applicable across broad contexts, which is a crucial feature of sustainability assessment frameworks (Lin et al., 2018). As an internationally recognized environmental accounting system, the EF effectively communicates the scale and impact of human activities on natural resources in a clear and impactful manner.

Methodology

The **University Footprint Calculator**, developed under the scope of the EUSTEPs project (Enhancing Universities' Sustainability TEaching and Practices) is an open-access digital tool that allows HEIs to

¹⁷ More information on University Footprint Calculator: <https://www.eusteps.eu/resources/university-footprint-calculator/>.

evaluate and keep records of consumption of natural resources and ecosystem services within their activities and operations (The calculator is available online [here](#)). The calculator was created through a participative approach and by leveraging the shared experiences and skills of the 5 project partners: Aristotle University of Thessaloniki (AUTH-Greece), University of Aveiro (UAv-Portugal), Universidade Aberta (UAb-Portugal), and University of Siena (UNISI-Italy) – and the international Non-Governmental Organization (NGO) Global Footprint Network (GFN). The process of development involved several educators, researchers, administrative staff, PhD and MSc students, as well as ICT experts (Moreno Pires et al., 2022). As shown in Figure E, the University Footprint Calculator tracks the natural resources demanded by activities and operations of HEIs in providing education and conducting research.



Figure E. Main parameters of the EUSTEPs University's Footprint Calculator.

The Calculator is organized into two main sections:

1. distinguishing consumption actions under the **Direct Control** of the University administration and;
2. actions under the **Indirect Control** of the University administration.

Each parameter is tracked for the whole university's community - including students, educators, and administrative staff - however, the target users for collecting the input data are administrative staff.

Under **direct responsibility**, the calculator tracks two areas: i) Infrastructures/utilities (e.g. energy consumption, buildings, and other utilities), and ii) university community actions (e.g. mobility for research and education reasons, and food provision).

Under the **indirect responsibility**, the impact of university-related activities of staff and students are monitored over which the administration does not exert direct influence, mainly including mobility to and from the campus, energy consumption outside the university, and food purchased outside the university (Mancini et al., 2022).

The interesting point is that the calculator includes a dedicated feature tailored for **Distance Education HEIs**, where teaching and classes are conducted in sole online mode, and students do not physically attend the University campus. In this case, commuting the staff to and from the institution (not applicable to students)- can be addressed when calculating the EF of a distance teaching HEI (Mancini et al., 2022).

UAb, besides contributing to the development of the calculator, applies it yearly to analyse the EF of its institution. The UAb team successfully gathered data from 2019 to 2023 for all sections except food, as UAb does not operate any canteen, restaurant, or bar, as a distance education HEI. The yearly EF results are compared with those of the previous year, enabling the identification of recommendations for reducing the university's total EF within specific categories.

For instance, based on the results of the EF in 2023, as a total EF, about 27% was due to the implementation of activities under the "direct responsibility" of the UAb's administration, and the remaining 73% to activities under the administration's indirect responsibility.

Regarding the EF under the administration's direct responsibility, "staff labour" was found to be the main driver (around 56% of the total direct responsibility), which makes sense as a distance education HEI, followed by materials and equipment and Energy consumption in the second and third levels. While calculating through the online tool, UAb used Tier 1bis - designed exclusively for distance education HEIs- instead of Tier 1, to analyse indirect responsibility, in which the EF associated with commuting is calculated for the sole Staff (since the UAb's students do not commute to university due to accessing online teaching).

Under the Indirect Responsibility, referenced to the year 2023, the contribution of the three indirect categories to the total Indirect Footprint was identified as follows: food at home accounted for approximately 74%, energy consumption at home for around 24%, and commuting for 2%. Notably, the EF associated with energy consumption at home (e.g., for students' study purposes) at UAb is higher than that of commuting. This observation underscores how effectively the calculator can outline the environmental impact differences between a distance education HEI and a traditional HEI.

This process of assessing the actual impact through the online calculator enables UAb to even compare its environmental impacts with other HEIs, since the calculator also provides the capability to analyse the EF per certain categories, for instance per student, per publication, or per graduation.

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Division of Tasks and Responsibilities

06

Andy Lane (The Open University)

Abstract

Creating a green campus requires the involvement of all staff and often other stakeholders in the institution, in particular students. Their input is needed in helping define what type of green campus is needed for their context, in shaping the strategy for the Higher Education Institution (HEI) and most importantly for setting out all the ongoing tasks that are needed and who is responsible for implementing them. These tasks will often relate to four main sets of activities – leadership and governance; partnership and engagement; learning, teaching and research; and estates and operations. Everyone at all levels and working in one or more of these sets of activities will have some tasks and responsibilities that they need to exercise but key people in every unit or department will be needed to help develop, promote, and monitor those tasks that their unit or department has most responsibility for. Greening a campus takes time as the many changes will be needed to green these four sets of activities which also need to be coordinated and reported on both internally and externally to understand what works and what does not work.

While it is relatively easy to read and talk about the issues surrounding a green campus, the actual development of a green campus needs clear sets of tasks and responsibilities for everyone involved. This means that attention must be given to both strategic and operational plans with appropriate consultations and communications with stakeholders. Inevitably this requires a whole-institution approach that covers all aspects of sustainability.

Tasks: What needs to be done to make a green campus?

Defining what a green campus means for your institution

As has been shown in previous chapters, creating a green campus or sustainable HEI requires adopting a whole-institution approach and thus thinking about what it means to green all the functions and activities of the institution and all the people responsible for those functions and activities. The notion of a green campus has emerged in several ways across many parts of the world and with different takes on what should be included. The Centre for Sustainable Futures (CSF) at the University of Plymouth in the UK was an early proponent of a “4C” model in which *“Curriculum, Campus, Community and (institutional) Culture are seen as mutually enfolded and complementary foci”* (Jones, Selby and Sterling, 2010, p. 7). Anand et al. (2015) adapted this 4C model by adding research as an additional element and by elaborating “campus” into “campus operations”.

Meanwhile, in 2017, The Alliance for Sustainability Leadership in Education (formerly the Environmental Association of Universities and Colleges or EAUC), developed the LiFE tool which has provided its many members both in the UK and in other countries with a broader framework to bring all aspects of the institution together in a holistic, whole-institution approach (see Figure 9). This model reflects the fact that

there are both inward looking and outward looking dimensions to a green campus centred around environmental sustainability as seen in this definition from the Green Office Movement:

'A green university is an educational institution that meets its need for natural resources, such as energy, water, and materials, without compromising the ability of people in other countries as well as future generations to meet their own needs'¹.

But as important is this statement from a particular green campus initiative:

'The Green Campus institution is a laboratory of self-scrutiny, experimentation, and application. At its best, it is a model environmental community where operational functions, business practices, academic programs, and people are interlinked, providing educational and practical value to the institution, the region, and the world'²

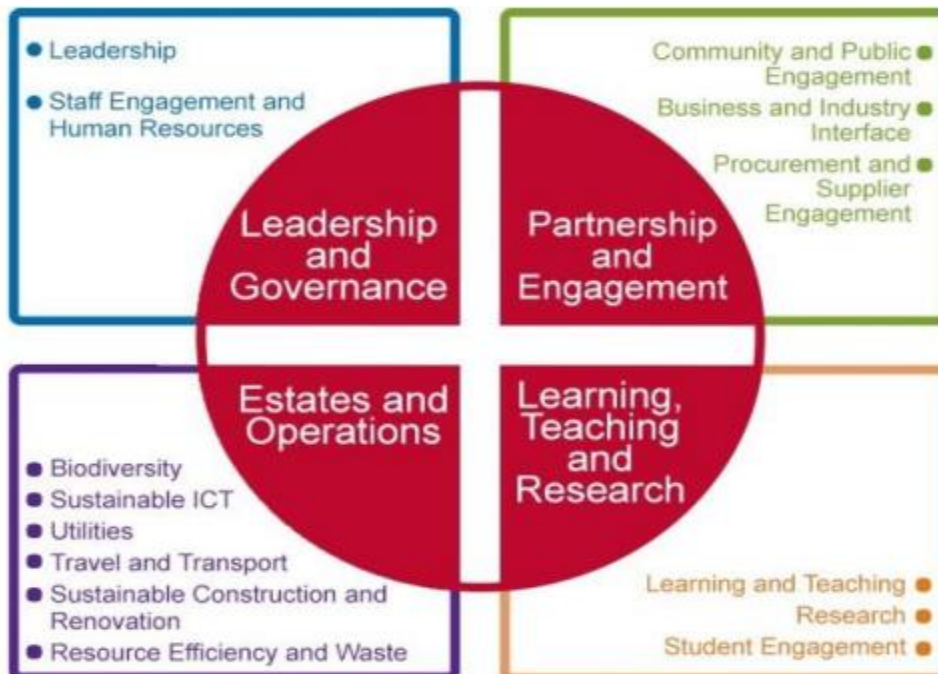


Figure 9. The LIFE Framework for a green campus (Appleton, 2017).

These two definitions use different language but have a similar philosophy – that of the HEI being a learning organisation that has a strategic goal and plan for sustainability agreed through governance mechanisms, owned by the leadership, and signed up to by all staff (and students). The operational plans for each part of the institution are then aligned with the strategic plan for sustainability and reported and reviewed by the normal governance mechanisms with everyone having defined responsibilities whatever their role and seniority in the institution.

Appleton (2017) identified several key structural and strategic dimensions that HEIs need to consider for a green campus:

Structural Dimensions	Strategic Dimensions
<p>Organisational structure</p> <p>Governance matters</p> <ul style="list-style-type: none"> • Highest level of authority • Monitoring and reporting <p>Implementation</p> <ul style="list-style-type: none"> • Top-down process • Careful language • Service orientation 	<p>Leadership and authority</p> <ul style="list-style-type: none"> • The right leader • Champions, sponsors and academic leads <p>Engagement and representation</p> <ul style="list-style-type: none"> • Bottom-up, student voice • Partnerships and collaboration • Community engagement

While this may provide a list of things to consider the fundamental point is that there is no one standard approach to sustainability. Off the peg or tick box approaches can appear attractive on the surface but change can often be just that, on the surface. The key to success is for a HEI to define sustainability for itself and build a unique strategy and structure which reflects its nature, context, and geography. This is particularly true for distance education HEIs with their mode of teaching, the geographical spread of their students and often their multi campus estate. However, much can be learned from the experiences of others.

Responsibilities: Who makes it a green campus?

Creating and running a green campus is a shared responsibility between staff, students, and other partners or stakeholders. However, each group has specific roles to play, which need to be coordinated across the institution and over time.

Staff

Most staff, whether academic or providing professional services, will be employed by the HEI for many years to undertake specific roles, but all will be dedicated to the success of the institution. It is therefore important to show all staff at all levels and of all types how sustainability contributes to the success of the HEI through its educational, research, and engagement activities and then how they can contribute to the institution’s sustainability whether that be through small things they can do individually or big changes to the operations and activities that their team or teams are involved in.

An essential element is having an appropriate leadership team that both sets strategy and engages with all other staff through clear mechanisms, including having sustainability leads or champions in all parts of the HEI covering all aspects of what the HEI does.

Sustainability champions in the OU [\[OU Sustainability Office\]](#)

The Open University has a central Sustainability Office that consists of core people from across the University who are working to support the institution to embed sustainability. Led by the Vice Chancellor's Executive Team Sponsor, the office team link in and work closely with all academic units and professional services departments through the Sustainability Coordination Group (with about 50 members), and feed directly into the Sustainability Steering Group (with about 15 members). The academic faculties and/or schools each have a sustainability lead with a defined set of roles such as:

- Act as the main point of contact for sustainability in all aspects of the school's work, collaborating closely with colleagues already active in this area.
- Lead in the effective dissemination and discussion within the school of relevant Faculty and University sustainability strategies, policies and activities and other information associated with sustainability.
- Represent the School at relevant Faculty and institutional working groups and committees on sustainability matters.
- Provide regular briefings, updates and recommendations to the Head of School, School Management Team and wider School community on sustainability matters and update the Sustainability Office on progress.
- Liaise with the School Employability Lead, Faculty Employability Lead and appropriate Associate Dean(s) in terms of engagement with employers, professional and external organisations in order to identify and address professional needs related to sustainability and the School's curriculum.

As well as having sustainability leads and champions in every department there is also scope to have institution wide activities that help staff understand the bigger picture as well as the particulars of what they and their team can do. One way to help individuals is by providing bespoke training courses for all staff or creating activities and events that all staff can join in with. Delivering such training, staff development or other activities to large numbers is a strength of distance education HEIs.

Staff training in the OU

The Open University in the UK has encouraged staff to use two externally devised training mechanisms to learn more about sustainability and more about what they can do both at work and in their home lives. In 2022-23 The OU upskilled and reskilled close to 700 of its staff and students through a free 8-hour Carbon Literacy training course, with half becoming Carbon Literacy Project certified. The OU also communicated to all staff and students using a monthly sustainability bulletin, a 600+ Viva Engage community, and monthly Go Green staff champion events. In addition, many staff and students have done the How Bad are Bananas game and/or signed up to use the Giki Zero carbon footprint calculator.

Students

Most students usually spend less time with their institution than staff, but some may choose to study with a particular HEI based on its commitment to sustainability. And with there being many more students than

staff, particularly at distance education universities, they can be very prominent in making their views known. Some students will organise to lobby their HEI over sustainability issues while some may coordinate their efforts with students from other universities to run national campaigns. For example, in the UK there are two substantive student run national initiatives dealing with sustainability. One, the People and Planet University League, is a comprehensive and independent league table of UK universities ranked by environmental and ethical performance, compiled annually by the UK's largest student campaigning network. The other, Students Organising for Sustainability United Kingdom (SOS-UK) is a student-led education charity focusing on sustainability. They undertake programmes and campaigns, run learning events, do research, and provide consultancy to educational organisations. This can include doing a sustainability audit and curriculum mapping of an HEI using students, often from that HEI, to do the work.

The nature and scope of student involvement in green campus activities differs for a distance education HEI but that is where it is important to develop a strategy that embraces the perspectives of the students but that also acknowledges the wider role that students (and staff) have in supporting sustainability beyond the direct and indirect activities of the HEI.

Anadolu University's Awareness Policy [\[AU Sustainability Policy\]](#)

Having trained 700 staff on awareness raising, Anadolu University plans to train all employees and students in the new semester. In this context, the Zero Waste Student Club, which will start its activities in the new semester, plans to organize a series of activities to raise awareness of the whole society, especially students.

Partners

Partnership and engagement is one of the four key aspects of the LiFE model (Figure 9) and recognises that a HEI can only do so much for sustainability on its own and that its own efforts and those of others depend on learning and working together. Most of the operations of a campus rely on procuring goods and services from others. Energy, waste, and transport are but some of the services that universities use or create. In some cases, legislation and regulations will guide activities and help promote sustainability, in others, benchmarks and standards set by professional associations (such as EAUC in the UK or the Green Campus Network in Ireland) will do so. In all such cases it is helpful for a HEI to have clear policies and plans for managing all operational aspects of the institution.

HEIs also partner with professional bodies, who may accredit some of their qualification, with employers who employ the students during or after their studies, and organisations involved in or the beneficiaries or research.

Lastly, there are the local communities in which campuses are situated. Distance education HEIs may not have large numbers of students on their campus, but they can have many staff and be important employers in their locality. How they engage with that community, providing opportunities for them to learn about sustainability or being an example of best practices to local organisations is important. A whole-institution approach that ignores its neighbours is limiting its own role in being a truly green campus.

The University of Jyväskylä and SDG 17: Partnerships for the goals [\[JYU Sustainability Report\]](#)

The University of Jyväskylä's researchers participate actively in scientific panels such as the Finnish Expert Panel for Sustainable Development, the Finnish Nature Panel, and the Finnish Forest Bioeconomy Science Panel. The panels offer independent and interdisciplinary research information to the public and decision makers. In 2022, JYU joined the Nature Positive Universities network as a founding member and gave an operational nature positive commitment to sustainable development together with JAMK, Gradia and city of Jyväskylä.

Timelines: When will we make it a green campus?

There are so many elements to making a campus green it is not surprising that many HEIs might find it difficult to implement. A report by Shakespeare Martineau (2023) found that the key aspects holding institutions back from becoming a green campus were:

- Funding/investment – 77%
- The delivery of renewable energy campus wide – 42%
- Resistance to change within the institution – 31%
- Expertise/knowledge within the institution and its partners – 28%
- Other – 28%
- Lack of collaboration between parties across the institution– 25%

Realistic timelines

These challenges that are holding back action demonstrate the need to be realistic while also being ambitious. As discussed above, setting a clear strategy supported by all parties and creating plans with leaders at all levels and buy in from staff and students is crucial. However, change takes time and being sustainable is not a fixed goal, it is an ongoing process that will need continuous monitoring, review and adaptation of the strategy and plans. Strategic plans are often set over a five-year period. Operational plans are refreshed annually. These are but small steps on a long journey where regularly submitting your institution to internal and external scrutiny and promoting those results to all stakeholders provides the evidence for progress. There will be struggles and setbacks, but this is all part of being a “*laboratory of self-scrutiny, experimentation, and application.*”

Strategic goal “Sustainable development” at UniDistance Suisse [\[UDS Sustainability Report\]](#)

UniDistance Suisse makes an important contribution to society by giving people access to higher education who would not have this opportunity without the flexibility of its distance learning. Lifelong learning in all life situations stands for sustainable development under all social, ecological and economic aspects. The basic understanding of sustainable development is reflected in the values of UniDistance Suisse and is based on jointly developed values that call on you to feel responsible for the whole, to think holistically and in a networked manner, to be viewed as role models, to act transparently, to shape the future together and thus to ensure the long-term success of all those involved. This is being done through 4 areas: Creating commitment; Making university groups aware; Defining responsibilities and taking responsibility; and Promoting engagement.

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Shakespeare Martineau (2023) *Building a Green Campus – what's stopping institutions report*, 38 pp, available at <https://www.shma.co.uk/our-thoughts/green-campus-report/>

The background features a collection of 3D-rendered geometric shapes in various shades of gray. These shapes include circles, squares, and irregular polygons, some of which are cut out or layered to create a sense of depth and shadow. The lighting is soft, highlighting the edges and surfaces of the objects.

Final Remarks

As this report concludes, it becomes evident that the concept of Green Campuses has evolved far beyond traditional, physical spaces. Online and distance education institutions have become crucial players in advancing sustainability, demonstrating that "going green" is not limited to the on-site experience of education but extends seamlessly into online and distance education.

Green Campuses in online and distance education are at the forefront of sustainable innovation, leveraging digital tools and flexible learning platforms to make higher education more environmentally conscious, globally accessible, and impactful. One of the key innovations in online and distance education is its intrinsic ability to minimize environmental impact. By eliminating the need for daily commuting, reducing the demand for physical infrastructure, and shifting to digital resources instead of printed materials, these institutions significantly lower their carbon footprints. These green practices are not mere byproducts of distance learning—they are deliberate strategies to create more sustainable educational ecosystems. The institutions highlighted in this report have taken this a step further by adopting renewable energy for their digital operations, optimizing cloud-based services, and embedding sustainability into their teaching frameworks.

Innovation in online and distance education also extends to the way these institutions integrate sustainability into their curricula. By offering flexible, interdisciplinary courses that focus on planetary well-being, biodiversity conservation, and sustainable development, they are creating a new generation of learners equipped to address global environmental challenges. These courses, delivered entirely online, reach diverse learners from around the world, broadening the scope of sustainability education in ways traditional campuses cannot match. Moreover, through the use of digital platforms, these institutions foster collaborative learning environments where students can engage in real-time discussions on sustainability issues, share best practices, and work on joint projects, all without the need for a physical presence. By pioneering in areas such as zero-waste digital campuses, sustainable IT solutions, and virtual environmental research labs, online and distance learning providers are setting new benchmarks for how education can contribute to the green transition.

In conclusion, this report not only underscores the importance of Green Campus initiatives but also highlights the significant contributions of online and distance education institutions in advancing sustainability. By leveraging digital platforms and innovative educational approaches, these institutions are driving a profound shift toward more sustainable models of higher education—models that have the potential to reach every corner of the globe. It is through continued collaboration, research, and innovation that we can ensure the principles of sustainability are deeply embedded in all future educational frameworks, thus helping to meet the Sustainable Development Goals (SDGs) and contributing to planetary well-being.

Contributing Institutions

EADTU | The Netherlands
University of Jyväskylä | Finland
Anadolu University | Turkey
The Open University | United Kingdom
UniDistance Suisse | Switzerland
Universidade Aberta | Portugal
FernUniversität in Hagen | Germany
Université TÉLUQ | Canada
UMSICHT | Germany

Published by: EADTU, 2024

DOI: 10.5281/zenodo.14008241



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