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How Can Higher Education Institutions Contribute to Achieving the Sustainable Development Goals (SDGs)? Actions, Monitoring and Reporting

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Abstract

The principles of sustainability are becoming increasingly relevant. Against this back-ground, the UN developed the 17 SDGs. HEI teaching plays a key role in achieving the SDGs, as graduates should be equipped with skills that enable them to tackle the large and complex sustainability problems. However, monitoring and reporting in HEI is currently inadequate and needs to be improved accordingly. This article presents three areas of HEI teaching that can be used to promote sustainability skills among students. Subsequently, monitoring and reporting at HEIs is analyzed in order to compare different frameworks for monitoring and reporting for being applied to HEIs.

Keywords: monitoring, reporting, sustainability, higher education institutes (HEIs), teaching, sustainable development goals (SDGs)

1. Introduction

The topic of sustainability is becoming increasingly important worldwide, mainly due to the growing visibility of climate change that is already affecting our lives and is likely to have an even greater impact in the future. This has led to an awareness of the need for sustainable development in both society and economy (Frank et al., 2020). The most common definition today goes back to the Bruntland Report of 1987 and encompasses the dimensions of ecology, economy and society. Today, the 17 Sustainable Development Goals (SDGs) of the United Nations are usually taken as the basis for determining the impact of actions.

2. How Can HEIs Contribute to Achieving the SDG Goals?

Higher education institutions play a crucial role in achieving the Sustainable Development Goals (SDGs) proposed by the UN, as education is considered a systematic tool for transformative social change (Kioupi & Voulvoulis, 2019). The close interaction between teachers and students fosters the development of ethical, ecological, and social values into a comprehensive set of guiding principles (Laurie et al., 2016). By embedding these values and sustainability competencies across disciplines, universities help ensure that graduates bring sustainable thinking and practices into their future careers and local communities, thereby accelerating positive social and environmental change.

However, various steps are required to promote sustainability in education and re-search. Firstly, a common understanding of sustainability and the SDGs should be created. Secondly, the focus of universities must be aligned with the SDGs in order to identify and utilize synergies. Thirdly, universities should promote measures and technologies that advance sustainability and thus contribute to achieving the goals (Msengi et al., 2019).

The concepts of "Education for Sustainable Development" (ESD) and "Education for the SDGs" (ESDG) were developed based on the key role of HEIs described above. Both concepts aim to equip learners with the knowledge, skills, and attitudes needed to drive the necessary transformation of society to achieve the SDGs, regardless of their subject area. It goes without saying that the teaching of specialist content and skills must remain at the forefront, but it should be clearly accompanied by sustainability aspects related to the subject taught.

Integrating and achieving sustainability in HEI teaching can be categorized into three fields of actions: (1) extra-curricular activities, (2) teaching key competences and (3) sustainable and integrative course design (cf. figure 1).

However, the way in which these fields of action can contribute to the SDGs and how an adequate monitoring and reporting should look like has not yet been systematically analyzed.

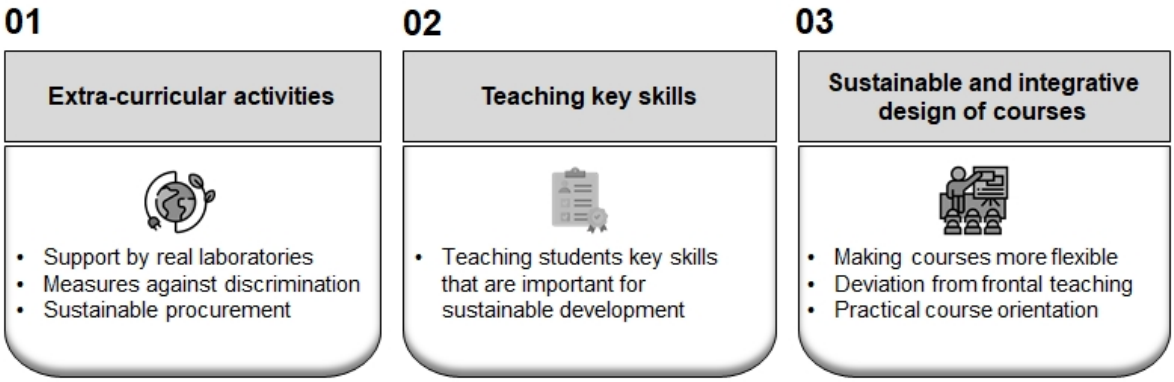

Figure 1. Fields of action for HEI teaching to achieve sustainability

2.1 Extra-Curricular Activities

Extra-curricular activities at HEIs offer a key way to support the SDGs. Examples include partnerships with municipalities and companies to solve real-life problems, the provision of case studies and research projects by cooperation partners, and lectures on current topics by external experts. These activities give students hands-on opportunities to develop sustainability competencies—skills that directly influence how they will act in their future professions and in the community. Research suggests that graduates who have engaged with sustainability teaching are more likely to adopt sustainable practices in their workplaces and wider communities, leading to broader societal changes (Leal Filho et al., 2019). In addition, events can be organized for local decision-makers dealing with sustainable development projects. Another important form of cooperation is the creation of living labs, which provide an experimental environment for mutual learning and promote social innovation. These options strengthen the integration of HEIs into their region and enable local solutions to environmental and social problems in line with the SDGs (Deutscher Bundestag, 2018).

Furthermore, student projects and initiatives on the energy efficiency of buildings, incentives for environmentally friendly transportation, or reforms in HEI procurement—such as using regional and seasonal products in canteens or engaging local SMEs—can improve the sustainability of HEIs in multiple areas. By applying these approaches, students and faculty not only contribute to a more sustainable campus but also develop professional practices that can benefit communities and support continued progress toward the SDGs.

A good example of extra-curricular sustainability initiatives is the "Sustainability Challenge" of four major Viennese universities. Every year, around 80 students from various disciplines work on real-life case studies from partners, supported by experts from the universities and local organizations. These projects promote interdisciplinary skills, enable the development of university – company – public sector networks and offers solutions for partner companies and public organizations. (University of Economics and Business Vienna, 2022)

2.2 Teaching the Necessary Key Skills

In order to ensure long-term success towards sustainability, far-reaching changes such as reforming the labor market are necessary (Wiek et al., 2011). HEIs play a crucial role in this, which is laid-down in SDG 4.7, which aims to ensure that all learners ac-quire the knowledge and skills to promote sustainable development by 2030. Kioupi & Voulvoulis (2019) and Edwards et al. (2020) have compiled key competencies for this (table 1).

Table 1. Key competencies according to Kioupi & Voulvoulis (2019) and Edwards et al. (2020)

No.	Key competences (Kioupi & Voulvoulis, 2019)	Key competences (Edwards et al., 2020)	References
1	Systems thinking	Systems thinking	Rieckmann, 2012; Wiek et al., 2016
2	Anticipatory thinking	Future oriented thinking	de Haan, 2006; Lambrechts et al., 2013; Wiek et al., 2016)
3	Collaboration	Collaboration	Glasser & Hirsh, 2016; Lambrechts et al, 2013
4	Strategic thinking	Strategic thinking	Glasser & Hirsh, 2016; Lambrechts et al, 2013; Steffen et al, 2015
5	Normative competence	Normative competence	de Haan, 2006; Rieckmann, 2012; Steffen et al, 2015; Wiek et al, 2016
6	Critical thinking	Eagerness to act	Glasser & Hirsh, 2016; Komasinski & Ishimura, 2017; Steffen et al, 2015; Wiek et al, 2016
7	Integrated problem solving ability	Problem solving ability	Steffen et al, 2015; Wiek et al, 2016
8	Modeling sustainable behavior		Glasser & Hirsh, 2016
9	Self-reflection		Steffen et al, 2015
10	Emotional intelligence		Lambrechts et al, 2013
11	Media literacy		Rieckmann, 2012
12	Knowledge about the state of the planet		Glasser & Hirsh, 2016

The key competencies highlighted by the two teams of authors cover all the requirements of the Incheon Declaration published by the UN, which states that a high level of cognitive skills as well as interpersonal and social skills are necessary to master future local and global challenges (Tang, 2015).

The definition of relevant key competencies provides HEIs with the necessary objectives to impart the necessary content to students (Kioupi & Voulvoulis, 2019; Wiek et al., 2011). However, the question of how HEI teaching must be designed and which didactic methods are necessary to impart the key competencies remains largely unanswered. For this reason, these two aspects are discussed in detail in this paper.

Furthermore, it must be critically questioned which of the highlighted key competencies can be taught as part of HEI teaching. For example, competencies such as systems thinking or problem-solving skills can be easily integrated into courses, while teaching emotional intelligence, is more difficult to integrate into HEI teaching.

2.3 Sustainable and Inclusive Course Design

Equal opportunities and inclusion - key objectives of the SDGs - require the training of teachers' social and intercultural skills (Kumar & Hamer, 2013) in order to ensure inclusive and high-quality education. In addition to the integration of diversity topics into curricula (Castellanos & Cole, 2015), the SDGs must also be firmly anchored in HEI curricula (Edwards et al., 2020; Schleker & Giesenbauer, 2019; Veidemane, 2022). This requires – beside offering special courses on sustain-ability – the integration of SDG impacts into various subject-specific teaching modules, e.g. in management or engineering, in order to raise students' awareness of sustainability aspects within their subject areas.

To make this possible, an interdisciplinary understanding is necessary to recognize the interrelationships between the SDGs and subject areas (Kioupi & Voulvoulis, 2019). Measures to achieve an improvement on one SDG can have positive or negative impacts on other SDGs. For example, SDG 4 (Quality Education) can reduce poverty (SDG 1) and by that combat (poverty-related) diseases (SDG 3). On the other hand, progress in SDG 9 (Industry, Innovation and Infrastructure) - stimulated by SDG 4 - can have a negative impact on health and well-being (SDG 13) and climate action (SDG 13) due to increased emissions, thus endangering life on land (SDG 15), too.

The SDGs in teaching can therefore only be considered as a holistic system with all its complex chains of effects

and interactions, whereby systems thinking approaches represent a helpful methodology (Müller et al., 2023; Zürn, 2023)

Modern information technology can also make HEI teaching more sustainable and integrative in organizational terms (Schleker & Giesenbauer, 2019). Digital formats complement traditional teaching methods without replacing them and improve access, quality and learning success (Tang, 2015). Models such as the inverted classroom and blended learning combine face-to-face and digital formats (Hochschulforum Digitalisierung, 2016), allowing the benefits of both approaches to be utilized (Draeger & Müller-Eiselt, 2015), such as flexibility, personalization and accessibility (Schleker & Giesenbauer, 2019). Full distance learning reduces CO_2 emissions by cutting down on commuting. However, more practice-oriented face-to-face teaching must compensate for the low level of social interaction, self-motivation and feedback.

Lectures can be improved through various didactic methods. One approach is the introduction of two-semester crosscutting topics that are geared towards current challenges and use modern teaching methods such as concept maps and think-pair-share (Schmidt, 2021). Other approaches include fish bowl discussions, scenario analyses, inverted classroom models and blended learning scenarios (Rieckmann, 2021; Hochschulforum Digitalisierung, 2016), which can also teach key skills. All of these approaches are primarily intended to encourage students to work as groups, think critically, question, and evaluate previously established values and causal chains, which is an important competence, particularly due to the multi-causality and interdependence in the field of sustainability.

It is recommended to integrate practical project work into teaching in order to work on sustainability problems independently, systematically, interdisciplinary and solution-oriented (Dembki et al., 2021; Edwards et al., 2020; Rieckmann, 2021). Real-life projects, in which the teacher merely acts as a supervisor (De Kraker et al., 2017), make the global SDGs more tangible and require intensive engagement with sustainability issues (Schleker & Giesenbauer, 2019). Students develop key skills for sustainability, including analytical skills for finding solutions (Rieckmann, 2021; Sustainable Development Solution Network, 2020). Project work also enables the systematic reflection of acquired knowledge and skills (Dembski et al., 2021). In addition to the SDGs addressed by the project content, this also makes a direct contribution to SDG 17 (partnerships to achieve the goals). In this respect, business games and simulations such as the Sustain2030® business game can be used effectively to understand the complexity of the SDGs and promote systemic thinking by emphasizing interdisciplinary work and the consideration of side effects (Zürn et al., 2022).

In this context, teachers must be enabled to convey complex interrelationships of the SDGs systemically and to develop competence-oriented testing methods. This requires continuous further training, supported by sufficient resources and experience to man-age the support required for modern teaching methods (Dembski et al., 2021).

To promote SDG 3 (Health) directly within the teaching situation, organizational changes such as the reduction of academic stress should be considered, which could have strong physical and psychological effects on students (Dixon & Kurpius, 2008). The main causes include heavy workloads, missing lectures, lower grades and the pressure to graduate. Teachers should manage the workload appropriately and offer more flexibility through measures such as lecture recordings to minimize stress.

3. Monitoring & Reporting of Sustainability

Higher education teaching can make an important contribution to the implementation of the SDGs as shown previously. The impact on the SDGs, however, can be direct or indirect, as shown in figure 2.

This situation requires a structured monitoring and reporting that enables the evaluation of measures and the transparent communication of developments. Following the PDCA approach (Deming cycle), which has been successfully used in quality management for decades (see Noguchi, 1995), the authors see monitoring as an opportunity to make evidence-based decisions about adapting existing initiatives or introducing new ones. Existing frameworks and indicators can be used for monitoring and reporting. To ensure a clear execution, a dedicated team within the HEI should take responsibility for monitoring, collecting information, analyzing and making recommendations, involving various stakeholders (Msengi et al., 2019).

Effective monitoring requires clear indicators that allow comparison between courses and universities. However, the focus should be on mutual learning and collaboration to achieve the SDGs rather than competition (Veidemane, 2022). When selecting sustainability indicators for individual events or projects, it is important to ensure that they accurately measure the desired phenomenon, whereby the challenge often lies in precise data collection and processing (HÁK et al., 2016).

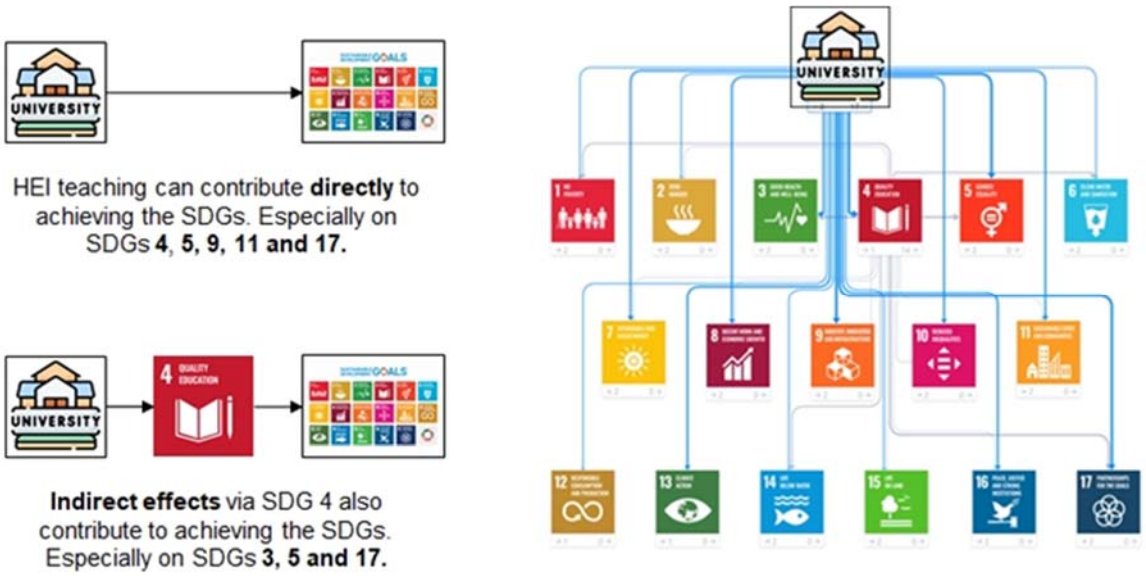

Figure 2. Direct and indirect impacts of HEI teaching on SDGs

3.1 Monitoring of Key Competences

Various studies agree that the right key competencies are crucial to drive sustainability and thus to meet the SDG targets (Edwards et al., 2020; KioupiI & Voulvoulis, 2019; Wiek et al., 2011). They are therefore a central learning objective in HEI teaching. A suitable methodology must be developed and used to measure the teaching of key competences and thus also the success with regard to SDG 4.7. However, the UN does not specify any quantitatively measurable metrics for SDG 4.7, which means that HEIs are requested for developing suitable indicators themselves.

In view of the complexity of the SDGs and their interdependencies, traditional examinations are unsuitable for this. It is therefore recommended that authentic assessment methods be used that provide a more valid indication of whether students have acquired the desired skills. These require students to tackle complex, real-world challenges, using their competences effectively while applying judgment, innovation and action in different contexts and receiving appropriate feedback. This approach also includes giving students time to self-reflect on their performance, reducing the relevance of "high-stakes" examinations and by that allowing students' strengths and weaknesses to be evaluated, which contributes positively to the reduction of stress among students already mentioned in 2.3 and thus fosters SDG 3. Although authentic assessment methods have been known for a long time (see Wiggins, 1998) and enable a more valid assessment of key competences, their use is still only sporadically established, especially in the European education area.

3.2 Reporting on Sustainability

Clear and transparent reporting is an important aspect following monitoring, as it enables HEIs to communicate their measures and progress transparently both internally and to the public. This helps to build trust, especially in view of the different objectives of HEI stakeholders (Joseph et al., 2013; Lukman et al., 2010; Rahdari et al., 2016). However, in practice, sustainability reporting is often delayed and inconsistent, and best practice approaches are underutilized, which affects the quality of reporting (Sepasi et al., 2019). Here, the application of the Global Reporting Initiative (GRI) can provide the necessary guidelines with clear requirements and recommendations for transparency as well as principles for quality assurance and also encourages internal or external review of reports with the involvement of stakeholders or expert bodies. Together with the fields of actions and the integration of SDGs, an appropriate setup for monitoring and reporting of HEI sustainability could be formed (see figure 3).

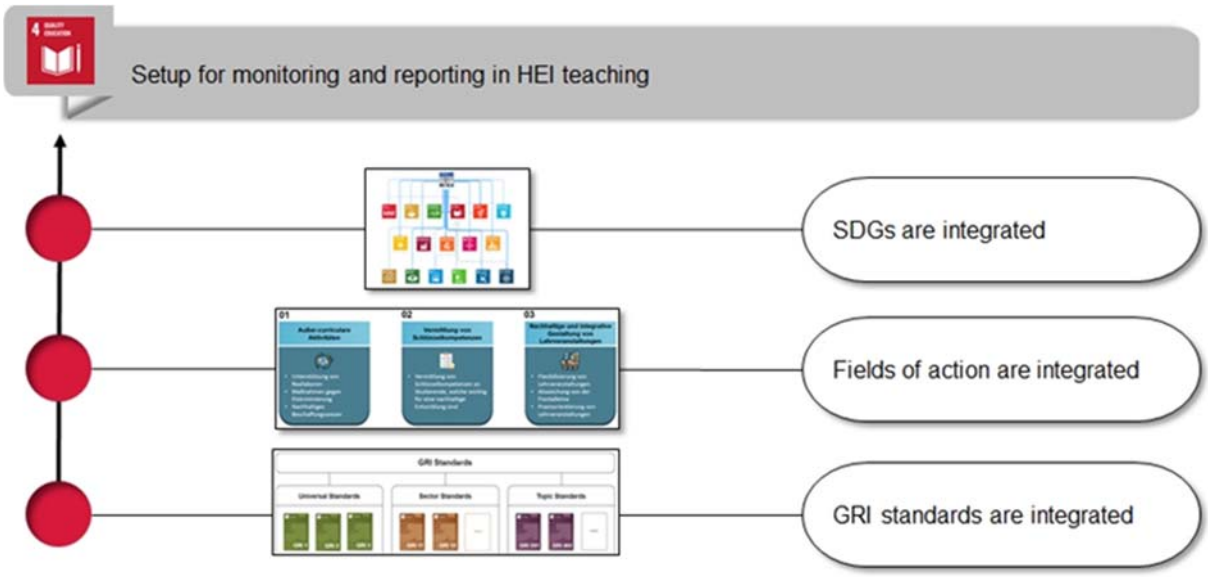

Figure 3. Setup for monitoring and reporting of HEI sustainability

3.3 Challenges Regarding Monitoring and Reporting in HEI

HEIs face the challenge of finding suitable data sources for monitoring and reporting on sustainability and ensuring data quality (Kioupi & Voulvoulis, 2019; Ketter et al., 2020). In addition, there is often a lack of established processes for generating sustainable values from SDG-relevant data (Kiehle et al., 2023). A global study found that less than half of HEIs collect data for ESD indicators, but more than half plan to start doing so in the next few years (Veidemane, 2022).

Surveys are often integrated into monitoring systems to assess the sustainability of a HEI. However, survey results only provide a snapshot, while long-term developments of SDG-relevant factors are crucial to check the impact of teaching on students' values and skills and to assess their future role as sustainability ambassadors (Brody & Ryu, 2006).

3.4 Comparison of Different Monitoring & Reporting Frameworks

In recent years, various frameworks for measuring and reporting sustainability in higher education institutions (HEIs) have been developed. They differ in assessment methodology, focus, and implementation. Some frameworks concentrate on a specific aspect of sustainability, while others offer a comprehensive view. The degree to which they address the SDGs also varies, influencing how sustainability is evaluated.

Because every HEI has unique strategies, goals, and stakeholders, it is important to choose a framework that aligns best with the institution's context and objectives. The four most commonly used frameworks are STARS, Times Higher Education Impact Rating, PRME Sharing Information on Progress Reports (SIP), and the Sustainability Literacy Test (Sulitest).

- STARS (Sustainability Tracking, Assessment & Rating System): "A transparent, self-reporting framework for colleges and universities to measure their sustainability performance." (STARS, n.d.) It enables institutions to benchmark their sustainability efforts and compare results with peers.
- Times Higher Education Impact Rating: "Assesses universities' contributions to the UN SDGs across research, outreach, and stewardship." (Times Higher Education, n.d.). It focuses on how universities' policies and practices align with and advance the SDGs.
- PRME Sharing Information on Progress Reports (SIP): "A reporting tool under the Principles for Responsible Management Education to communicate progress in implementing sustainability-related principles." (PRME, n.d.-a, n.d.-b). It primarily aimed at business and management schools but can guide broader institutional commitments to responsible education.
- Sustainability Literacy Test (Sulitest): "An online education and assessment tool that raises awareness of the SDGs by measuring knowledge of sustainability and global challenges." (Sulitest, n.d.). It focuses on individual SDG literacy rather than institutional reporting.

Each framework emphasizes different aspects of sustainability. STARS and the Times Higher Education Impact

Rating concentrate on broader sustainability in HEI departments, whereas SIP focuses on adherence to PRME principles, and Sulitest specifically addresses SDG literacy. With the exception of Sulitest (which does not offer a reporting option), these frameworks allow for institution-wide assessments and comparisons that can highlight best practices. Depending on an institution's needs, the "fields of action" from Chapter 2 may be fully or only partially covered by each framework (see table 3).

Table 3. Comparison of four common monitoring & reporting frameworks

Framework	Focus	Reference to chapter 2	Advantages	To be considered
Sustainability Tracking Assessment and Rating System (STARS)	(1) Sustainability science (2) Business activities (3) Engagement (4) Planning & Administration (5) Innovation and	Extra-curricular activities and the integrative and sustainable design of courses are addressed.	• Very extensive • Templates are made available • Learning between universities is made possible • Case studies are made available	• High assessment effort • Extensive monitoring necessary • Little focus on the teaching of key competences
Times Higher Education Impact Rating	(1) Research (2) Use of resources (3) Collaborations (4) Teaching Additionally: SDG 17	Extra-curricular activities and the integrative and sustainable design of teaching events are considered.	• Extensive • Orientation towards the SDGs • Learning between universities is made possible • Indicators	• Participation in the ranking is subject to conditions • Key competencies are not addressed
PRME Sharing Information on Progress Reports (SIP)	(1) Meaning (2) Values (3) Methodology (4) research (5) Partnerships (6) Dialogue	The principles can be used to cover all fields of action from chapter 2.	• Qualitative reporting of qualitative data • Learning between universities is made possible • Report on past and future goals	• Less comparable due to free design
Sustainability Literacy Test (Sulitest)	Multiple-choice questions to test knowledge on all SDGs; procedural, strategic and organizational areas not considered	Attention to integrative and sustainable design of teaching events.	• Students' knowledge is easily recorded • Weak points can be identified • Progress measurement	• Little individualization possible • No comprehensive framework • Reporting is not included in the framework

4. Conclusion and Outlook

The 17 SDGs holistically promote sustainability in the dimensions of economy, ecology, and society. Higher Education Institutes (HEIs) are crucial for the training of future managers who are expected to solve complex social problems in the interests of sustainable development. In addition to imparting specialist knowledge, HEIs have three starting points for promoting sustainability: (1) extra-curricular activities, (2) teaching important key skills, and (3) sustainable and integrative teaching design. Cooperation with society and campus activities enables exchange and adaptation to social needs, while real-world laboratories promote experimental learning. The acquisition of key skills such as systems thinking and anticipatory thinking are central topics in the education of students. Integrative teaching requires embedding the SDGs in curricula and using practice-oriented teaching methods. This is the only way to convey a comprehensive understanding of sustainability and reduce stress among students, which con-tributes directly to the SDG 3 target (Bulo & Sanchez, 2014).

Despite these opportunities, there are notable institutional barriers to adopting SDG-aligned teaching. Limited resources, competing institutional priorities, and insufficient faculty training often hinder the successful integration of interdisciplinary SDG con-tent into existing programs. Rigid administrative structures can also slow the introduction of innovative teaching methods and the creation of sustainability-focused collaborations. Overcoming

these obstacles requires strong leadership support, cross-departmental collaboration, and strategic investment in faculty development (Lozano et al., 2019; Leal Filho et al., 2021).

However, the major challenge remains to measure the effective teaching of key competencies (Kioupi & Voulvoulis, 2019; Edwards et al., 2020). In order to create a functioning monitoring system, new processes often have to be implemented within the HEIs (Ketter et al., 2020), which are adapted to the respective structure of the organization. Based on this monitoring, reporting serves to disseminate information to internal and external stakeholders. The GRI can provide helpful guidelines in this context.

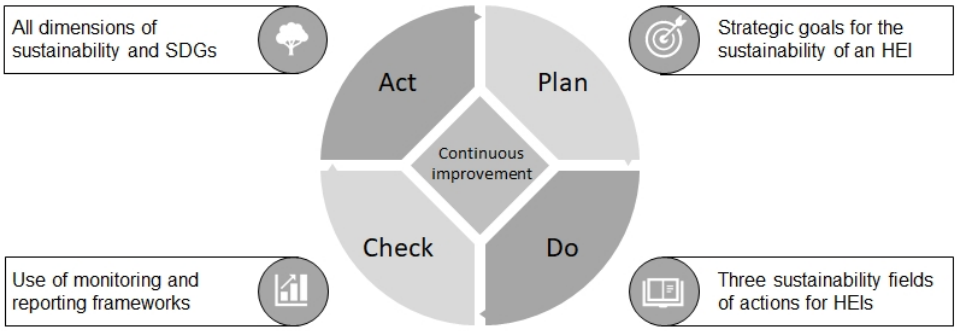

Figure 4. PDCA cycle in the context of sustainability in HEI teaching

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