Stratification and advancement of the sustainability assessment and evaluation in EU countries

Valerija Kozlova, Nellija Titova
RISEBA University of Applied sciences
valerija.kozlova@riseba.lv; nellija.titova@riseba.lv

Abstract

There are multiple assessment and evaluation strategies and tools companies and organizations undergo implementing sustainability policies. However, the companies face the whole range of the approaches and restrictions on the resource side and has to prioritize the choices. Reaching advanced level of sustainability enterprises aim to reach full potential. Therefore, it is crucial for business entity and non-profit organizations to understand the advancement stages, criteria and spread of them among the evaluation techniques internationally. Current research provides support for companies and researchers and systems analyzed not only benefits the individual companies, but it also contributes to the overall success of the sustainability dominance.

The main aim of this article is to provide the systemized and in-depth analysis of the methods and approaches to stratify the evaluation layers, classification of criteria, expanding to throughout classification of the trends and tendencies in seven EU countries. Research was conducted based on bibliographical review and experience of seven partner countries within the project EU strategic partnership project Naturally Sustainable in 2022 - 2023. This study reveals the whole range and scope of the developments in the assessment of good practices working with sustainability issues, setting the up-to-date framework and identifying dominating constituents of the whole meta system of approaches to distinguish, develop and support companies and organizations in sustainability domain. The main agenda of the research within the project is to engage educational institutions but the research has been expanded to the whole spectrum of entities.

Keywords: sustainability, evaluation, assessment, business entities, organizations.

1. Introduction

Sustainability assessment tools and initiatives are currently influencing sustainability strategies and activities both in profit and non-profit organisations and entities. Commercial companies are facing growing demand for the sustainability in action and pressure on the reporting standards and evaluation systems. Nevertheless, the scale of questions combined with limited resource base, knowledge and capacity created the precondition for the analysis and classification of the methods to ease the prioritization and weights of the factors to assess. Education institutions (EIs) in turn are among the most influential elements of implementing concepts of sustainability and sustainable development and their decisions affect the economic, social and environmental dimensions of the communities and regions around them. Society expects them to educate the youth and contribute to the society. Still there is no clear understanding how to integrate sustainability into the systems, no guidelines to action, no checklist that would be equally helpful for all EIs or could be applied across the board by all. Institutions are too different in terms of their legal form (private or public), location (rural or metropolitan) or size (small and specialised or large offering a full range of faculties). In order to structure and estimate the significance and occurrence of Sustainability reporting and evaluation factors, a study has to be undertaken, consisting of an analysis of the literature on the topic by means of a bibliometric analysis and a set of case studies that illustrate the various contexts within which Sustainability reporting and evaluation is being deployed as a method.

2. Bibliometric analysis

The input data for bibliometric analysis was retrieved from Scopus. Among various academic databases, Scopus was selected because of its broad coverage of quality peer-reviewed research related to the topic of this study. To set the boundary for the literature search, we restricted ourselves to papers focused on Sustainability reporting, assessment and evaluation. We used the following broad-based search string that includes different variants of terms related to Sustainability: ((“Sustainability” AND “reporting”) OR (“Sustainability” AND "assessment") OR (“Sustainability” AND “evaluation”)). This search string was informed by previous literature reviews on Sustainability reporting and evaluation. It was developed in an iterative manner. In other words, we started with an initial search string and updated it after checking the returned results from Scopus. That was repeated until adding relevant terms did not result in additional items. The literature search on August 24, 2023 returned 5000 documents. We set no limits on the year of publication. These documents were used for bibliometric analysis.

VOSviewer was used for bibliometric analysis. Among different bibliometric analysis methods, we used the co-occurrence analysis (Fig.1), as we wanted to identify key terms and thematic research areas. The final output is a network of nodes and links, where node size is proportional to the frequency of co-occurrence and link width is proportional to the strength of the connection between nodes. Terms that are strongly linked to each other form thematic clusters and are shown in separate colours.

This section presents and discusses the results obtained and crosschecks them with the literature.

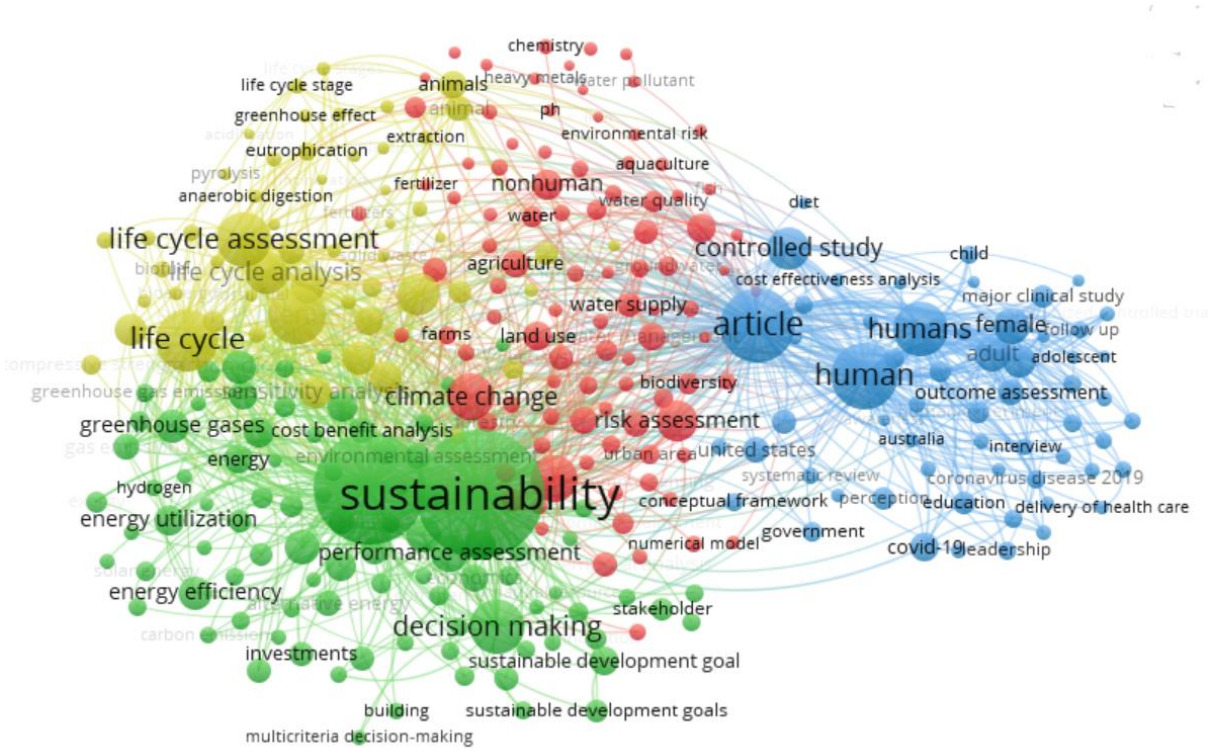


Figure 1 - Results of the co-occurrence analysis (VOSviewer).

The co-occurrence analysis (Fig.1) indicates that Sustainability reporting, assessment and evaluation are closely linked to each other. Four key thematic areas can be distinguished from the bibliometric analysis.

Within clusters, the 15 most weighted keywords that are described in Table 1.

Table 1- The most weighted keywords (VOSviewer)

	Keyword	Total link strength	Occurrences
1	Sustainability	11518	2072
2	Sustainable development	11294	1607
3	Article	9152	738
4	Human	6090	607
5	Life cycle	5404	523
6	Environmental impact	4801	451
7	Life cycle assessment	4482	416
8	Humans	4160	424
9	Decision making	3040	417
10	Environmental sustainability	3019	262
11	Climate change	2661	312
12	Female	2263	193
13	Greenhouse gases	1852	160
14	Risk assessment	1778	248
15	Global warming	1529	153

The Thematic areas are summarised for each cluster, and the keywords in each cluster are listed (as shown in Table 2). Each category is named, with the iconic keywords in each category.

Table 2- Keywords in each cluster (VOSviewer)

Cluster colour	Thematic areas	Keywords
Green	Sustainability/energy	Sustainable development, decision making, environmental assessment, energy utilization, energy efficiency, greenhouse gases.
Blue	Human/health	Article, human, controlled study, outcome assessment, adult, education, public health
Yellow	Life cycle/environmental impact	Life cycle, environmental impact, environmental sustainability, life cycle assessment, recycling bioenergy
Red	Climate change	Climate change, risk assessment, land use, agriculture, water management/treatment, ecosystem, urban development, water supply

The *green cluster* is dominant and is focused on issues such as sustainable development, decision making, environmental assessment, energy utilization, energy efficiency, greenhouse gases. Not surprisingly, decision making has emerged as one of the central terms in this cluster. Environmental assessment plays a vital role, providing decision-makers with an indication of the likely consequences of their actions (Joseph K. 2019). But, despite, the using of different environmental assessment tools are increasingly customized to national political intent and the

legislative frameworks, their effectiveness become a widespread concern (Zhao Y et.al. 2023) among researchers. Energy is another concern within the sustainability assessment tools. From a sustainability perspective, it is crucial to carry out a comprehensive assessment of renewable energy technologies (Haase M. et.al. 2022). The big number of different approaches for energy assessment exists. Although there is growing recognition among scholars of the significance to harmonize and align the methodologies for prospective sustainability assessment of energy technologies, no general approach or standard method exists so far (Haase M, et.al.2022).

The *blue cluster* is also quite dominant and is focused on issues such as article, human, controlled study, outcome assessment, adult, education, public health. Humans are the main term of the cluster. Seeing as sustainability assessment is a widespread mandatory form of impact assessment, it represents an important arena for uncovering potential human health impacts as part of a broader concept of environment (Gulis G, 2022). Another significant term is education. Sustainability assessment requires expert practitioners. Concern about the quality of environmental statements and about the improvement in environmental assessment processes is a recurring topic. Only by the qualitative education this expertise could be achieved. Practitioners' knowledge and skills on environmental assessment can be acquired in various ways, such as education, training and experience (Álvaro Enríquez-de-Salamanca 2019).

The *yellow cluster* is less dominant but still very important and is focused on issues such as life cycle, environmental impact, environmental sustainability, life cycle assessment, recycling bioenergy. The main term "Life cycle" concept was developed to emphasize the significance of overall assessment (R. Lin 2020). It was criticized for considering only environmental impact, that leaded to ignorance of economic benefits and social impacts. So, it was followed by sustainability life cycle assessment, considering environmental, economic, and social aspects.

And finally, the *red cluster* is focused on issues such climate change, risk assessment, land use, agriculture, water management/treatment, ecosystem, urban development, water supply. The great attention is paid to the resources that the land gives to human beings. Climate change, as a main concern worldwide at the level of governments, community, and business (Suzaul-Islam MD, 2016), requires immediate and specific solutions. But the satisfactory reflection of climate change within environmental assessment is therefore seen as a great challenge.

Overall, there are different approaches and methodologies how to measure the impact, not only environmental, but economic and social. But all of them suffer insufficiency and are criticized.

3. Sustainability assessment tools

Sustainability is not a single element, but a complex new paradigm affecting all areas and activities (Lee et al., 2013). Therefore, it can be said that sustainability encompasses the classic three dimensions of any organization (social, environmental and economic), also including its main activity: curricular or academic sustainability (Amaral et al., 2015; Fernandez-Sanchez et al, 2014). Morever, cholars concluded that efforts and measures towards sustainability were not fully integrated in EIs' strategies, curricula and initiatives. In order to enable the path towards sustainability, SATs and initiatives have become a crucial element (Lambrechts, 2015). A diverse number of SATs and approaches have emerged in the past decade (Caeiro et al. eds., 2013). They have different purposes: for monitoring, to draw comparisons, and to establish internal strategies towards sustainability (Jenssen, 2012). Many research papers were collected from different sources in order to get an overview of existing techniques for sustainability assessment. These measurement techniques work differently with respect to the area of research.

But there is still lack of summarized information about the tools and initiatives and the methods about SATs teaching.

According to the A. Berzosa et.al, (2017), the most widely spread SATs are AISHE, SAQ, USAT and Sustain Tool. The authors made a deep analysis of the above-mentioned SATs on the particular HEIs case studн. Since indicators are mainly qualitative, a measure was based on the entire compliance of a specific criteria or indicator, so it's effectiveness was measured by the points that each indicator has. The results are represented in a Fig. 2.

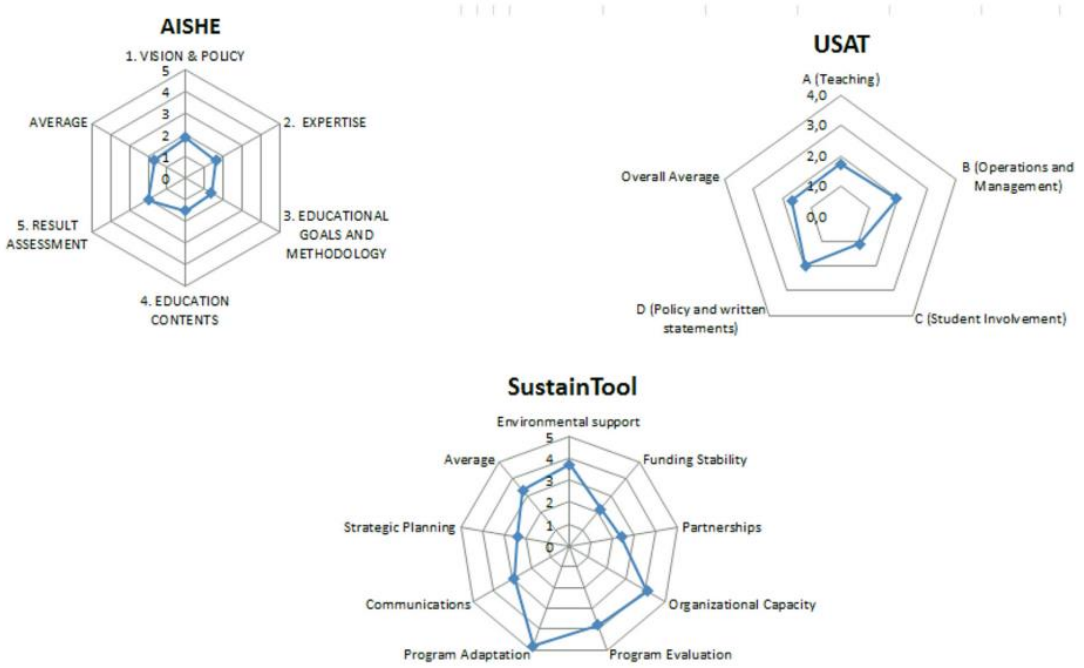


Fig. 2 Results of the UEM applying AISHE, USAT and SustainTool. (Source: A. Berzosa et.al, 2017)

The results obtained for the HEI case study from the SATs are as follows:

AISHE: the areas with the greatest results are vision, policy and assessments. Out of expertise, educational goals and methodology, educational contents are poorly rated (Fig. 1). The AISHE score depends on stages of development of sustainability policies and actions within the organization, and varies from an activity oriented (1) to a society oriented (5) approach. The overall average result does not reach stage 2, which indicates that a process-oriented approach is used for implementing sustainability measures.

USAT: The analysis of the results by area shows that the area of operations and management environment (Part B) and the area of policy and written statements (Part D) are those with the highest average score using the USAT tool. On the contrary, teaching and student commitment (A and C) are the areas with the lowest overall score (Fig. 2).

SAQ: by using this tool 40% of the questions can be satisfactorily answered including the areas of curriculum, research, operations and campus, human resources, dissemination and service to the community, students, and policy, vision and mission. Considering all questions as being equally important, this percentage can be considered as the overall score of the EI, despite the fact, that the tool itself does not have any kind of score. C Sustain Tool: The areas with the highest score are environmental support and organizational capacity as well a program evaluation and adaptation. The maximum value reached is 4/7, a medium performance in sustainability terms. Fig. 1 shows the obtained results.

The results of the implementation of 3 different SATs to a particular EI show, that different criteria and indicator groups are evolving in different SATs. That's why it is vitally necessary to summarize the most commonly used indicators, to elaborate the most qualitative sustainability teaching course. According to the St Flour, P.O.; Bokhoree, C (2021) SATs could not only vary according to the dimensions and indicators, but according to the scale. The authors divided identified SATs into 4 scale groups: Product, project, sector and country. (Tab. 3)

Tab.3 Sustainability assessment tools (Source: St Flour, P.O et.al. 2021)

	Scale				Dimension		
	Product	Project	Sector	Country	Environmental	Economic	Social
Life Cycle Assessment (LCA) [22]	√				√		
Dow Jones Sustainability Index (DJSI) [23]			√		√	√	√
Environmental Sustainability Index (ESI) [24]				√	√		
Environmental Performance Index (EPI) [25]				√	√		
Ecological Footprint (EF) [26]				√	√		
Sustainable Society Index (SSI) [27]				√	√	√	√
Life Cycle Costing (LCC) [28]	√					√	
Human Development Index (HDI) [29]				√		√	√
Environmental Impact Assessment (EIA) [30]		√			√		
Sustainable National Income (SNI) [31]				√	√	√	
Social Life Cycle Assessment (S-LCA) [32]	√						√
Strategic Environmental Assessment (SEA) [33,34]			√	√	√		
Index of Sustainable Economic Welfare (ISEW) [35]				√		√	
National Sustainable Development Index (NSDI) [36]				√	√	√	√
Composite Sustainable Development Index (I_{CSD}) [37]			√		√	√	√
Full Cost Accounting (FCA) [38]		√				√	

Tab.3 Cont.

	Scale				Dimension		
	Product	Project	Sector	Country	Environmental	Economic	Social
Integrated Value Model for Sustainable Assessment (MIVES) [39,40]		√	√		√	√	√
Cost–Benefit Analysis (CBA) [41]		√			√	√	√
Genuine Progress Indicator (GPI) [42]				√		√	
Life Cycle Sustainability Assessment (LCSA) [43]	√				√	√	√
System Dynamics (SD) [44–47]	√	√	√	√	√	√	√
Multi Criteria Decision Analysis (MCDA) [48,49]			√	√	√	√	√
Sustainability Assessment Model (SAM) [50,51]		√	√		√	√	√
Barometer of Sustainability (BS) [52]				√	√	√	√
Fuzzy Evaluation for Life Cycle Integrated Sustainability Assessment (FELICITA) [53]	√				√	√	√
Sustainability Assessment by Fuzzy Evaluation (SAFE) [54,55]			√	√	√	√	√
Fuzzy Logic Approach for Sustainability Assessment based on the Integrative Sustainability Triangle (FUZZY-IST) [56,57]		√	√		√	√	√
Adaptive Neuro-Fuzzy Inference System (ANFIS) [58,59]			√	√	√	√	√

As well authors suggested the following SATs criteria Tab.4

Tab.4 Sustainability assessment tools and criteria (Source: St Flour, P.O et.al. 2021)

Tools	Dimension	Factor	Number of Assessment Criteria
Sustainable Society Index (SSI) [27]	Human Wellbeing Environmental Wellbeing Economic Wellbeing	– Basic Needs – Personal Development & health – Well-balanced society – Natural resources – Climate & energy – Transition – Economy	21 basic indicators
National Sustainable Development Index (NSDI) [36]	Economic Resource and environmental Social	– Economic growth – Income level – Economic structure – Climate – Air quality – Forest – Arable land – Energy – Education – Health – Drinking water – Sanitation facilities	12 suitable indicators related to each factor
System Dynamics (SD) [47]	Human needs Economic Environment Life services structure	– Demand for Economic support – Supply human needs – Economic capital – Expenditures and depreciation – Economic growth – Economic capital – Demand for economic utilization – Renewable resources – Non Renewable resources – Waste generation – Ecological biodiversity – Ecosystem carrying capacity – Available life services – Supply life services – Population growth	Not composed of fixed indicators. Adapted to changes in the system.
Adaptive Neuro-fuzzy inference system (ANFIS) [59]	Ecological Human	– Air quality – Land integrity – Water quality – Biodiversity – Political aspects – Economic welfare – Health – Education	On SAFE basis (75 optional general indicators)
Multi Criteria Decision Analysis (MCDA) [49]	Human Wellbeing Environmental Wellbeing Economic Wellbeing	– Basic Needs – Personal Development & health – Well-balanced society – Natural resources – Climate & energy – Transition – Economy	On SSI basis (52 optional general indicators depending on available data)
Barometer of Sustainability (BS) [66]	Human Ecosystem	– Health & population – Wealth – Knowledge & culture – Equity – Community – Land – Air – Water – Species & population – Resource use	Not composed of fixed indicators. The methodology is flexible.
Sustainability Assessment by Fuzzy Evaluation (SAFE) [67]	Ecological Human	– Air quality – Land integrity – Water quality – Biodiversity – Political aspects – Economic welfare – Health – Education	69 basic indicators related to each factor

4. Sustainability assessment indicators

In order to perform sustainability performance measurement, the number of indicators used in each model is the most important factor that contributes to decision-making alternatives. They are analysed based on the various factors constructed from a wide range of sustainability indicators in order to address the most important sustainability issues. Indicators are considered to be a crucial point for tracking the quality of a system.

Another research of Dizdaroglu (2017) resulted in collections Sustainable development Indicators. They presented examples measure all aspects of sustainability at all scales, from the largest (international) to the smallest (building). However, measuring sustainability is difficult due to the fact that many of the sustainability problems are interlinked and affect each another. There will always be a debate over which is the most appropriate set of indicators to use and in which framework to apply. Moreover, spatial scale is important in the use of indicators as their function is dependent on the context in which they are used. SA frameworks need to include a range of indicators which provide information to function under the national and regional planning systems while being effective for local authorities and communities. Some of the SDIs are presented in the Tab. 5

Tab. 5 Sustainable Development Indicators (Source: Dizdaroglu 2017)

Initiative/Developer(s)	Themes/Headline Indicators	References
The United Nations Commission on Sustainable Development (UNCSD) set of indicators By the United Nations	Poverty Governance Health Education Natural hazards Atmosphere Land Oceans, seas and coasts Freshwater Biodiversity Economic development Global economic partnership Consumption and production patterns	https://sustainabledevelopment.un.org
The Organisation for Economic Co-operation and Development (OECD) Better Life Index	Housing Income Jobs Community Education Environment Civic engagement Health Life Satisfaction Safety Work-Life Balance	http://www.oecdbetterlifeindex.org

Human Development Index (HDI) By the United Nations Development Programme (UNDP)	Health Education Income/Composition of Resources Inequality Gender Poverty Work, employment and vulnerability Human Security Trade and Financial Flows Mobility and Communication Environmental sustainability Demography	http://hdr.undp.org
Millennium Development Goals Indicators (MDGs) By the United Nations	Eradicate extreme poverty and hunger Achieve universal primary education Promote gender equality and empower women Reduce child mortality Improve maternal health Combat HIV/AIDS, malaria and other diseases Ensure environmental sustainability Develop a global partnership for development	http://mdgs.un.org
OECD Green Growth Indicators	The socio-economic context and characteristics of growth The environmental and resource productivity of the economy The natural asset base Environmental quality of life Economic opportunities and policy responses	http://www.oecd.org/greengrowth
EEA core set of indicators By European Environment Agency	Air pollution Biodiversity Climate change Energy Transport Water Other thematic indicators: Fisheries, land, soil, waste, household consumption and green economy	http: //www.eea.europa.eu
WHO Environmental Health indicators	Socio-demographic context Air pollution Sanitation Shelter Access to safe drinking water Vector-borne disease Solid waste management Hazardous/ toxic substances Food safety Radiation Non-occupational health risks Occupational health risks	http://www.who.int/ceh/en
EUROSTAT (The statistical office of the European Union) Indicators for sustainable development	Socio-economic development Sustainable consumption and production Social inclusion Demographic changes Public health Climate change and energy Sustainable transport Natural resources Global partnership Good governance	http://ec.europa.eu/eurostat

These indicators are used to monitor the long-term sustainability trends from a retrospective point of view. The information they provide helps in making short-term projections and relevant decisions for the future. The studies in the literature show that there is a lack of consistent data sources within and between countries and communities. Therefore, the development of SDIs requires further investigation and more micro-level indicators are needed to be developed to work with more detailed data in Sustainability Assessment.

5. Weighted prioritisation approach: Project "Naturally Sustainable" methodology

One of the goals of the project "Naturally Sustainable" is to conduct international research about existing sustainability assessment and measurement tools worldwide, as well as initiatives, in order to identify the most commonly used sustainability assessment dimensions and indicators.

This information will be later integrated into on-line project platform, that will help sustainability teachers and lecturers to deliver the better qualified courses and stress more attention to the most important sustainability measurement indicators.

Totally 42 assessment tools and initiatives were collected by the project “Naturally Sustainable” 8 partners from 7 countries. (Annex 1).

Analysing collected SATs and initiatives the most commonly used dimension was identified among SATs and among initiatives separately. For both SATs and initiatives, the environmental dimension attracts more attention from the EIs.

Fig. 3 Sustainability assessment dimensions (Source: Authors)

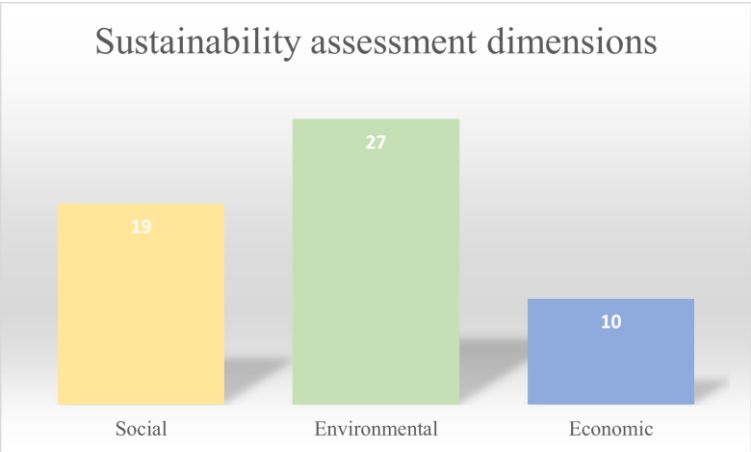
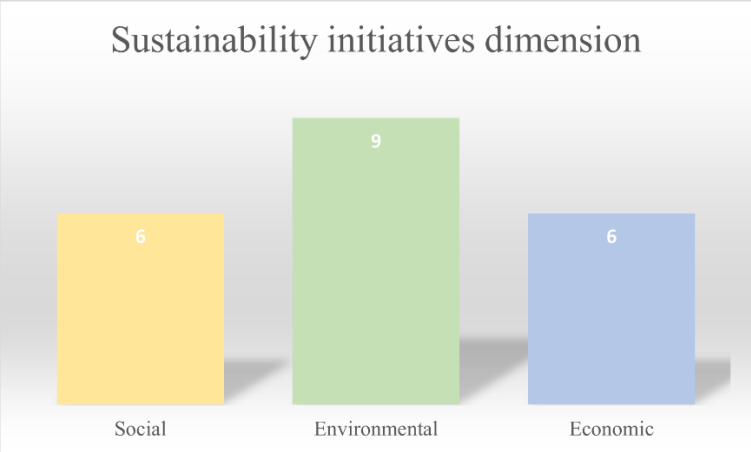


Fig. 4 Sustainability initiative dimensions (Source: Authors)



In previous literature review, comparative studies related with SATs and initiatives were based on desk research and most of them were related only HEIs. In this research, the main goal is to analyse the sustainability integration extent not only of universities but the other EIs. To do so, some the most commonly met sustainability dimension is identified.

The next step of the research is to identify the most important and most often met indicators of the assessments.

Tab. 7 Sustainability assessment indicator groups (Source: Authors)

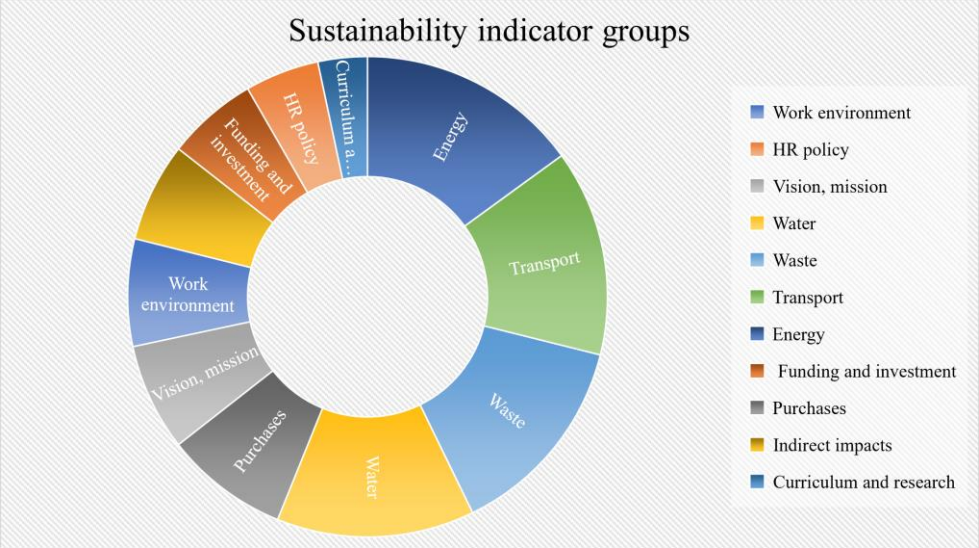
		Sustainability indicator groups										
		Social			**Environment**				**Economical**			Other
	Sustainability assessment tools	Work environment	HR policy	Vision, mission	Water	Waste	Transport	Energy	Funding and investment	Purchases	Indirect impacts	Curriculum and research
1	Sustainability index	X	X	X	X	X	X	X	X	X	X	
2	Eco School				X	X	X	X				
3	UI GreenMetric				X	X	X	X				
4	SAQ	X		X								X
5	AISHE			X	X	X	X	X		X		X
6	GASU	X	X	X	X	X	X	X	X	X	X	X
7	UBSAT	X		X	X	X	X	X		X	X	X
8	LCA				X	X	X	X				
9	DJSI	X	X	X	X	X	X	X	X	X	X	
10	ESI				X	X	X	X				
11	Sustainable Brand Index™				X	X	X	X		X		
12	DSFM	X	X	X	X	X	X	X	X	X	X	
13	PSAT	X		X	X	X	X	X	X	X	X	
14	BSAT	X	X	X	X	X	X	X	X	X	X	
16	Sustainability development goals in Regione Lombardia	X	X	X	X	X	X	X	X	X	X	
17	The Europe Sustainable Development Report 2021	X	X	X	X	X	X	X	X	X	X	
18	National Sustainable Development Monitoring Network	X	X	X	X	X	X	X	X	X	X	
19	OKKA	X			X	X	X	X		X		
20	SYKLI Environmental				X	X	X	X				X
21	EcoCompass				X	X	X	X				
23	the National Sports Council, Ministry of Education and Culture				X	X	X	X				X
24	The Swan, official Nordic Ecolabel					X	X	X	X	X	X	
25	LUT University							X				
26	Finnish Association for Nature Conservation							X				
27	EPA (Environmental protection Agency)				X	X	X	X				
28	University College Dublin, AIRO, EPA, GeoHive, Ordnance Survey, OPR				X	X	X	X				
29	Governement of Ireland				X	X	X	X				
30	Irish Green Building Council	X	X	X	X	X	X	X	X	X	X	
		13	9	13	24	25	25	27	11	15	12	6

Findings and conclusions

Totally 30 sustainability assessment tools and 11 indicator groups were analysed.

According to the analysis of Sustainability assessment indicator groups, the most met and important were identified in each dimension.

Fig. 5 Sustainability indicator groups (Source: Authors)



Work environment and vision and mission of the organisation are considered as the most important indicator groups of a social dimension of sustainability. Both indicator groups got 13 points.

Among the Environmental dimension, the most important and commonly met indicator group is energy, though other indicator groups such as waste, water and transport are considered quite often as well.

For the third economical dimension, the most important indicator group is purchases. The final most often used indicator, especially related to EIs is curriculum and research.

Conclusions

Despite the efforts made by international researchers to measure sustainability, it still remains an important challenge to provide efficient tools. Sustainability assessment has had significant impact on the decisions.

Although there are various sustainability performance measurement techniques and tools, only few of them integrate the environmental, economic, and social dimensions.

The research conducted within the project “Naturally Sustainable” contributes to a better understanding of the existing SATs and initiatives on different levels. As well as it helps to understand what SATs dimensions and indicators play the most significant role in the sustainability assessments and initiatives.

Funded: ERASMUS+ project 2021-1-LV01-KA220-VET 000025436

References

1. Álvaro Enríquez-de-Salamanca (2019) Environmental assessment: a third division subject at the university, Impact Assessment and Project Appraisal, 37:5, 452-454, https://doi.org/10.1080/14615517.2019.1589773
2. Amaral, L.P., Martins, N., Gouveia, J.B., 2015. Quest for a sustainable university: a review. Int. J. Sustain. High. Educ. 16 (2), 155e172.
3. Berzosa, A.,2017. Sustainability assessment tools for higher education: An empirical comparative analysis, Journal of Cleaner Production, Volume 161,pages 812-820, ISSN 0959-6526, https://doi.org/10.1016/j.jclepro.2017.05.194.
4. Caeiro, S., Leal Filho, W., Jabbour, C., Azeiteiro, U.M., 2013. Sustainability Assessment Tools in Higher Education Institutions, Mapping Trends and Good Practices Around the World. Springer.
5. Dizdaroglu, D. 2017. Developing Micro-Level Urban Ecosystem Indicators for Sustainability Assessment.Environ. Impact Assess Rev., 54, 119–124.
6. Fernandez-S anchez, G., Bernaldo, M.O., Castillejo, A., Manzanero, A.M., Esteban, J., 2014. Proposal of theoretical competence-based model in a civil engineering degree. J. Prof. Issues Eng. Educ. Pract. 141 (2). C4014001.
7. Gulis G, Krishnankutty N, Boess ER, Lyhne I and Kørnøv L (2022)Environmental Impact Assessment, Human Health and the Sustainable Development Goals. Int J Public Health 67:1604420. https://doi.org/10.3389/ijph.2022.1604420
8. Jenssen, S., 2012. Sustainability at Universities: an Explorative Research on Assessment Methods and Tools for Sustainability Implementation at Universities. Master-Thesis. International Centre for Integrated Assessment and Sustainable Development (ICIS), University of Maastricht.
9. Joseph, K., Eslamian, S., Ostad-Ali-Askari, K., Nekooei, M., Talebmorad, H., Hasantabar-Amiri, A. (2019). Environmental Impact Assessment as a Tool for Sustainable Development. In: Leal Filho, W. (eds) Encyclopedia of Sustainability in Higher Education. Springer, Cham. https://doi.org/10.1007/978-3-030-11352-0_170
10. Lambrechts, W., 2015. The contribution of sustainability assessment to policy development in higher education. Assess. Eval. High. Educ. 40 (6), 801e816.
11. Lee, K., Barker, M., Mouasher, A., 2013. Is it even espoused? An exploratory study of commitment to sustainability as evidenced in vision, mission and graduate attribute statements in Australian universities. J. Clean. Prod. 48, 20e28. http:// dx.doi.org/10.1016/j.jclepro. 2013.01.007.
12. St Flour, P.O et.al, 2021. Structured Fuzzy Based Methodological Approach towards Sustainability Performance Assessment. Int. J. Environ. Sci. Develop.,5, 223–227
13. Haase, M., Wulf, C., Baumann, M. et al. Prospective assessment of energy technologies: a comprehensive approach for sustainability assessment. Energ Sustain Soc 12, 20 (2022). https://doi.org/10.1186/s13705-022-00344-6
14. Ruojue Lin, Yi Man, Jingzheng Ren, Chapter 8 - Framework of life cycle sustainability assessment, Editor(s): Jingzheng Ren, Sara Toniolo, Life Cycle Sustainability Assessment for Decision-Making, Elsevier, 2020, Pages 155-173, ISBN 9780128183557, https://doi.org/10.1016/B978-0-12-818355-7.00008-7.
15. Suzaul-Islam MD, Yanrong Z (2016) Strategic Environmental Assessment and Sustainable Development: Climate Change Perspective. J Earth Sci Clim Change 7:379. https://doi.org/10.4172/2157-7617.1000379
16. Yuting Zhao, Xiaomin Li, Hua Mo, Liwen Zhan, Yihan Yao, Yafei Li, Haisheng Li. How does the environmental impact assessment (EIA) process affect environmental performance? Unveiling EIA effectiveness in China: A practical application within the thermal power industry, Environmental Impact Assessment Review, Volume 101, 2023, 107120, ISSN 0195-9255, https://doi.org/10.1016/j.eiar.2023.107120.

-tools, -initiatives

Annex 1

Sustainability assessment tools and initiatives.

	Sustainability assessment tool or initiative	Webpage address
1	Sustainability index	https://www.incsr.eu/novertejumi/ilgtspejas-indekss/
2	Eco School	https://www.ecoschools.global/how-does-it-work
3	UI GreenMetric	https://greenmetric.ui.ac.id/
4	Sustainability Assessment Questionnaire	https://ulsf.org/sustainability-assessment-questionnaire/
5	"Assessment Instrument for Sustainability in Higher Education" (AISHE)	https://www.sustainabilityexchange.ac.uk/audit-instrument-for-sustainability-in-higher-educ
6	The Graphical Assessment of Sustainability in Universities (GASU)	http://org-sustainability.com/eng/gasu
7	UNIT-BASE SUSTAINABILITY ASSESSMENT TOOL	https://www.eauc.org.uk/theplatform/usat_unit-based_sustainability_assessment_tool
8	Life Cycle Assessment (LCA)	https://ecochain.com/knowledge/life-cycle-assessment-lca-guide/
9	Dow Jones Sustainability Index (DJSI)	https://www.spglobal.com/esg/performance/indices/djsi-index-family
10	Environmental Sustainability Index (ESI)	https://sedac.ciesin.columbia.edu/data/collection/esi#:~:text=The%20Environmental%20Sustainability%20Index%20(ESI,indicators%20derived%20from%20underlying%20datasets.
11	Sustainable Brand Index™	https://www.sb-index.com/methodology
12	Organizing eco-friendly events	https://www.environnement.gouv.qc.ca/developpement/outils/index.htm#prise_en_compte_principes
13	Education for sustainable development	https://fr.unesco.org/themes/education-au-developpement-durable/outils
14	Analising sustainability	https://www.ifdd.francophonie.org/actions/outils-de-
15	Calculate your carbon footprint	Calculateur carbone Particulier - Fondation GoodPlanet
16	Evaluate sustainability	ESG System - Sustainability Metrics Simplified
17	Evaluate the sustainability capacity of a program	https://www.sustaintool.org/psat/assess/#:~:text=The%20Program%20Sustainability%20Assessment%20Tool%20%28PSAT%29%20is%20a,can%20be%20used%20to%20help%20with%20sustainability%20planning.
18	Express an organization's sustainability performance in three ways	https://sustainabilityadvantage.com/assessments/bsat/
19	Sustainability development goals in Italy	https://www.istat.it/it/benessere-e-sostenibilit%C3%A0/obiettivi-di-sviluppo-sostenibile
20	Sustainability development goals in Regione Lombardia	https://www.svilupposostenibile.regione.lombardia.it/it/strategia-regionale/il-percorso
21	Sustainability development goals in Brescia - A2A (utility, gas, electricity)	https://www.a2a.eu/it/sostenibilita/territori/brescia/sdg
22		https://www.comune.brescia.it/servizi/ambienteeverde/Ambiente/Pagine/Iniziative-del-Settore-Sostenibilit%C3%A0-Ambientale.aspx
23		https://sostenibile.unibs.it/category/sdg/
24	The Europe Sustainable Development Report 2021	https://urly.fi/2wFK
25	National Sustainable Development Monitoring Network	https://kestavakehitys.fi/en/frontpage
26	OKKA Sustainable development certification of educational establishments	https://koulujaymparisto.fi/in-english/sustainable-development-programme/
27	SYKLI Environmental School of Finland	www.sykli.fi
28	EcoCompass	https://ekokompassi.fi/briefly-in-english/
29	Sykli	https://www.kadenjalki.fi/oppilaitokselle/materiaalit/
30	Sitra	https://www.sitra.fi/en/articles/circular-economy-teaching-materials-for-primary-school-upper-secondary-school-and-vocational-school/
31	Syke	https://www.syke.fi/fi-FI/Tutkimus__kehittaminen/Kulutus_ja_tuotanto/Laskurit
33	the National Sports Council, Ministry of Education and Culture	https://www.liikuntaneuvosto.fi/wp-content/uploads/2022/01/Kestava-kehitys-valtion-liikuntaa-ja-urheilua-edistavissa-toimenpiteissa-loppuraportti.pdf
34	The Swan, official Nordic Ecolabel, Ympäristömerkintä	www.joutsenmerkki.fi
35	LUT University	https://www.lut.fi/web/en/news/-/asset_publisher/lGh4SAywhcPu/content/7-questions-and-answers-on-lut-university's-carbon-negativity-target
36	Finnish Association for Nature Conservation	https://www.ekoenergy.org/ecolabel/
37	Cority	https://www.cority.com/environmental-cloud/sustainability-software/
38	EY	https://www.ey.com/en_ie/sustainability/sustainability-assessment
39	EPA (Environmental protection Agency)	https://greenbusiness.ie/sme-efficiency-and-cost-reduction-questionnaire/
40	University College Dublin, AIRO, EPA, GeoHive, Ordnance Survey, OPR	https://enviromap.ie
41	Governement of Ireland	https://www.gov.ie/en/publication/7e1aa-strategic-environmental-assessment-guidelines-for-regional-assemblies-and-planning-authorities/
42	SGS	https://www.sgs.com/en/our-services/sustainability-solutions?utm_source=sgs-website&utm_medium=super-promo&utm_campaign=https://www.sgs.ie/en-gb/sustainability
43	Irish Green Building Council	https://www.igbc.ie/wp-content/uploads/2014/11/IGBC-Guide-NEW-03-10-13-2.pdf