Implementing sustainability principles in the development of technical education at the University of Oradea

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Abstract. The paper analyzes and proposes some solutions to implement principles specific to sustainability in the technical education process, a process that can have as result its sustainable development, with possibilities of application at the University of Oradea, prevalently to engineering faculties.

1. Introduction

The significant economic and technological development that humankind has undergone since the middle of the last century has brought with it an important pressure felt on natural systems, any human activity being dependent on natural resources and on the environment. This correlation between economic development and natural resources has been thoroughly studied and has generated global scientific reports, as well as environmental regulations and policies oriented towards environmental protection. In this formal context, the concept of sustainable development also appeared, and subsequently, the term sustainability also acquired an ecological orientation.

Sustainability is the ability of a system to exist constantly, but the current meaning of the term has been refined. Thus, sustainability is defined as the capacity of economic, social, environmental or other systems to exist and develop without exhausting the natural resources for the future. Research related to sustainability has led to deepening the theme, defining and implementing specific ideas, notions, methods and tools, such as: ecological footprint, biocapacity, ecological accounting, green economy, anthropocene, sustainable production, sustainable digitization and others, which demonstrates humanity's broad concerns about sustainability.

2. Global and European strategic context

In 1987, the Bundtland Report promoted the notion of sustainable development as *"meeting today's needs without sacrificing the ability of future generations to meet their own needs."*[1] This was the first moment when the need to impose a form of economic development in harmony with terrestrial nature systems was signaled globally.

In September 2000, the beginning of the millennium marked the adoption by the United Nations, at the Millennium Summit in New York, of the "Millennium Development Goals (MDG)". Through this

[1] The Bundtland Report (also known as "*Our Common Future")* is a document published in March 1987 by the United Nations World Commission on Environment and Development (WCED) headed by *Gro Harlem Brundtland*

UN Declaration[2], the signatory nations committed to a joint partnership defined by eight Sustainable Development Goals, by the target date of 2015.

On 25 September 2015, the United Nations General Assembly[3] adopted, through its resolution entitled "Agenda 2030",[4] a new framework for global sustainable development. This agenda defined 17 Sustainable Development Goals (SDGs) which were complemented by a number of specific targets whose implementation was targeted at two important actors: state (governments and national authorities) and non-state (corporations and civil society). But this was the first moment of legislating in which civil society is also empowered in sustainable development actions.

At EU level, the European Council adopted, on 20 June 2017, the document "A sustainable European future: the European Union's response to the 2030 Agenda for Sustainable Development". It represents the political document assumed by the Member States of the European Union through which the UN 2030 Agenda for Sustainable Development is implemented. The European Commission also presented, on 22 November 2016, its communication: Next *steps for a sustainable European future*. This document presents the European Union's response to the 2030 Agenda and confirms the integration into European policy of the global Sustainable Development Goals endorsed by the UN. At the same time, Eurostat, the statistical body of the European Union, established a set of indicators to monitor the progress of sustainable development that is constantly updated.

The European Union has its own strategic agenda, has defined its priorities and regulated the actions through which it supports its development, integrating the sustainability principles defined by the "Sustainable Development Goals" (SDGs). For the period 2019-2024, the priorities of the European Union were and are: promoting a green Europe, developing the economic base and protecting citizens and their freedoms.

The global and European guidelines are also reflected in Romania's national strategies and policies, in the legislation and programs specific to sustainable development carried out or ongoing, thus demonstrating alignment with international regulations. The main regulatory document is the "National Strategy for Sustainable Development of Romania 2030"[5] which is implemented through the "National Action Plan for the implementation of the National Strategy for Sustainable Development of Romania 2030" (NAP).[6]

Thus, if we refer only to the United Nations Sustainable Development Goal 4 (SDG-4), called "Quality Education", we can assert that its implementation is in full progress and receives newer valences arising from the diversity of the stakeholders. This broad objective is called: "Ensure quality, inclusive and equitable education and promote lifelong learning opportunities for all". At the same time, the priorities defined by the strategic agenda of the European Union have oriented the economic development strategies towards a European model for the future that involves investing in skills and education, supporting European businesses and adopting digital transformations, objectives that directly target education and educational system.

3. Implementing sustainability in universities

Education is an area directly targeted by the global objectives, but also by the European Sustainable Development Goals, and universities have an important role in this regard. Even the legislation in the

[2] The UN Millennium Declaration was adopted in New York on September 8, 2000

[3] 193 signatory countries, members of the UN

[4] Titled "Transforming Our World: The 2030 Agenda for Sustainable Development"; On July 6, 2017, also through the UN resolution, the 17 defined objects are associated with a series of additions that ensure their better applicability, but there are defined 169 targets specific to the objectives and 232 indicators to quantify their evolution.

[5] adopted by Government Decision nr. 877 of 2018

[6] The target in force as of June 21, 2022, being approved by Decision no. 754/2022 for amending and supplementing Government Decision no. 877/2018 on the adoption of the National Strategy for the Sustainable Development of Romania 2030

field[7] defines among the values of higher education: "the sustainable development and green transition, by meeting the needs of the present, without compromising the possibility of future generations to meet their own needs". The law on higher education defines universities as organizations that generate, certify and transfer knowledge through initial and continuous training services of undergraduate and postgraduate type, their role being essential in the professional and personal development of undergraduates, doctoral students and trainees, but also in the insertion of graduates on the labour market and satisfying the socio-economic environment need for competence. Due to their direct role in education for sustainability, their connections with the economic environment and the competence needs of human resources in organizations, the role of the academic community in society and not only, universities have a major contribution in promoting the sustainable development.

In 1990, in France, rectors from 40 countries signed the "Talloires Declaration" which defined and detailed the concept of "sustainable university" and outlined an action plan in order to include sustainability in teaching and research processes in universities. So far, this declaration has been adopted and signed by over 500 universities worldwide, which confirms their adherence to the concept of sustainable university.

Taking into account the fact that the directions and regulations of sustainable development are known, these being imposed by national legislative forms, we consider that a university has a double role in this direction, namely: it is an organization that imposes in its own functioning the principles of sustainable development but, at the same time, is also a promoter of sustainability through information, awareness, knowledge, research and its propagation. Universities promote sustainability by educating and shaping individual and/or group behaviors that they disseminate in society through the academic community (students, teachers, researchers, etc.), with the help of organizations (companies, public institutions, associations, etc.) with which they collaborate, influencing the local community to which they belong, but also the national and even global one. In this way, the university is a multiplier and transmitter of sustainability in society. Figure 1 shows the impact that a university has in raising awareness and education for sustainability, which is a vector of propagation and multiplication.

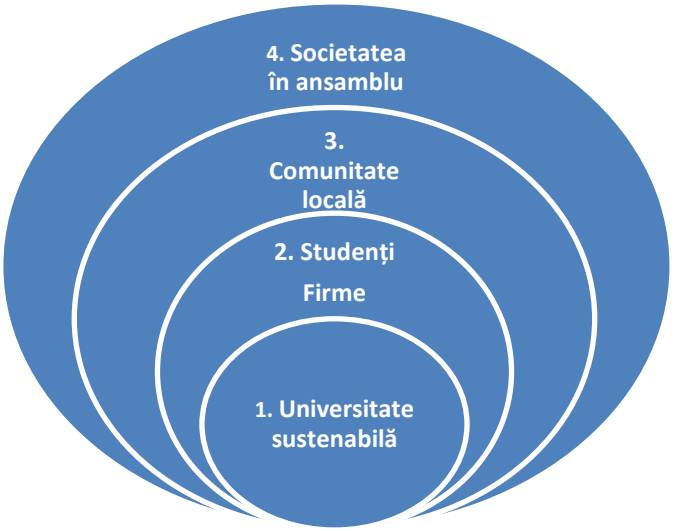

Figure 1. The sustainable university and its influences

Considering the university from an organizational perspective, we believe that in order to have a sustainable development, a university needs a sustainable definition of strategies, vision, mission and objectives. From the perspective of objectives, they can be grouped into the following categories:

[7] Higher Education Law nr. 199/2023, art. 3, (letter m)

Objectives related to the educational process:

- Study programs adapted to the needs of the labor market that have in the structure of curricula not only disciplines related to environmental protection and sustainable development, but also the inclusion in each discipline of elements related to sustainability. Thus, within the disciplines there must also be treated aspects of sustainable development that are specific to the field of study, this aspect being very specific to technical fields, but can also be used in other areas of university training. At the same time, it is essential that all study programs comply with the quality criteria imposed by specific legislation;
- Instructing and developing competent, professionally well-trained teaching staff with a sustainable vision of their own work and personal life;
- Adapting teaching forms so that they are based on sustainability principles so as to allow students to acquire the necessary professional skills through the learning process, but also to ensure a personal education oriented towards sustainability.
- Implementing education for sustainability that is to go beyond environmental issues and its protection and is complemented by economic and social aspects. Thus, the entry on the labor market of specialists with their own sustainable vision will be provided;
- Student orientation of the entire training process, both formal and non-formal.

Objectives related to research, development, innovation:

- Involving teachers, researchers, as well as students in research topics related to the environment and its protection, finding sustainable solutions for products as well as for processes and technologies specific to the field in which they are preparing
- Stimulating the innovative spirit of students through development projects that are related to sustainability and that capitalize on their creative potential, as well as supporting their participation in scientific events, competitions profiled on sustainable development
- Connecting to the national and international interuniversity research environment
- Collaboration with the economic environment for research related to sustainable economic activity and implementation of results obtained within organizations

Organizational objectives

- Building and strengthening an organizational culture oriented towards sustainable development, sustainability being the main element that must be found in all university activities;
- Designing sustainable development strategies that are adapted to the particularities of the university and that overlap with an organizational vision oriented towards sustainability;
- The development of a sustainable material base integrated and digitized both in teaching and research spaces, and in administrative and social ones, endowment that must have optimized consumption so as to correspond to the concept of "green campus";
- Providing integrated facilities systems for the academic community to ensure communication, transport, energy, thermal comfort, water supply, waste management etc. digitally managed, economically efficient, but also environmentally friendly.

4. Sustainable development of technical study programs at the University of Oradea

Technical university studies are the essence of implementing sustainability in the whole society because they create specialists who conceive, design, produce and implement products, technologies, processes etc. with the help of which the economy and society, in general, develop without affecting the resources needed by future generations. The importance and weight of engineering study programs is significant at the University of Oradea, these being found in five out of the 15 faculties that manage a total of 58 bachelor's and master's study programs.

The sustainability of a university derives primarily from the quality of higher education services provided, services that are student-centered, focusing on their needs (being related to the accumulation of transversal, professional and personal skills), on appropriate learning modalities for acquiring skills, on flexibility and adaptation of the study programs to the needs of the labour market etc.

This is why a selective survey was designed, based on a questionnaire, the purpose of the research being to evaluate and determine the orientation of the demands and forms of training that students enrolled in the technical study programs of the University of Oradea consider that they need. This survey can help in adjusting the existing study programs and forms of learning according to the results obtained from its management.

Research objectives refer to students' opinion on:

- the skills they need for integration into the labour market;
- the extent to which the study program they are enrolled in covers these competences;
- the training and/or educational programs they need to develop their skills;
- learning forms/experiences required for competence development.

The research is addressed to students from faculties that have technical study programs, being conducted and administered through "Google Forms". It was distributed in the digital space of the university, on its e-learning platform, to students enrolled in the five faculties that manage study programs in the technical field. The questionnaire was answered by 454 undergraduate and master students, who could select several given answer options which they considered relevant to the issue in discussion.

The summarization of answers and research results are as follows:

- regarding the competences that students consider they need for future integration into the labour market, they were assessed through a semi-open question, the summarization of answers established the hierarchy of competences according to the frequency of options, this being the following:
    - 287 students, i.e. 63.22% out of the total, need entrepreneurial skills;
    - 218 students, i.e. 48.02%, need basic digital skills;
    - 193 students, i.e. 42.51% out of all respondents, consider they need advanced digital skills;
    - 93 students, i.e. 20.48% out of the respondents, consider they need green skills, those that are directly related to sustainability;
    - 42 students, i.e. 9.2% out of the total, mention that they need practical skills;
    - One student, equivalent to 0.20% out of the total, has had options through which they consider they need the following five types of skills: strictly related to what is required at workplace, analysis and synthesis s, linguistic, managerial and physical skills.

The summarization of the distribution of response options is reflected in Figure 2.

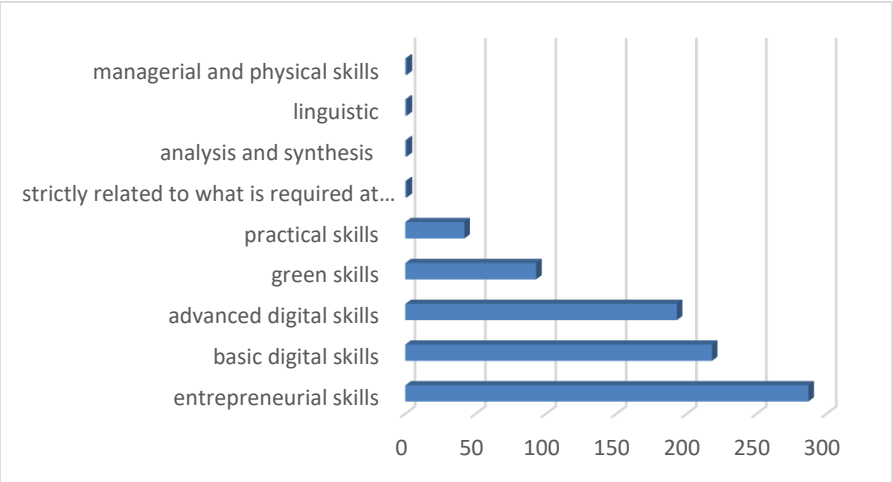

Figure 2. Types of skills considered necessary for future integration into the labour market

- the assessment of the level in which students consider that they accumulate them through the study program in which they are enrolled ensures the development of skills needed on the

labour market, this being illustrated through scores from 1 to 5, 5 representing the maximum level; the processing of the information obtained showed that the average assessment of the extent to which the study programs covered by the surveyed students ensure the development of the competences they consider necessary for integration into the labour market is 3.84. This is a superior level, much higher than the average assessment, but it confirms that students appreciate that there is also a 23% shortage of skills necessary for labour market integration. The breakdown by scores obtained is reflected in Figure 3 in which it is observed that the majority, i.e. 34.80% out of the respondents, scored 4 points.

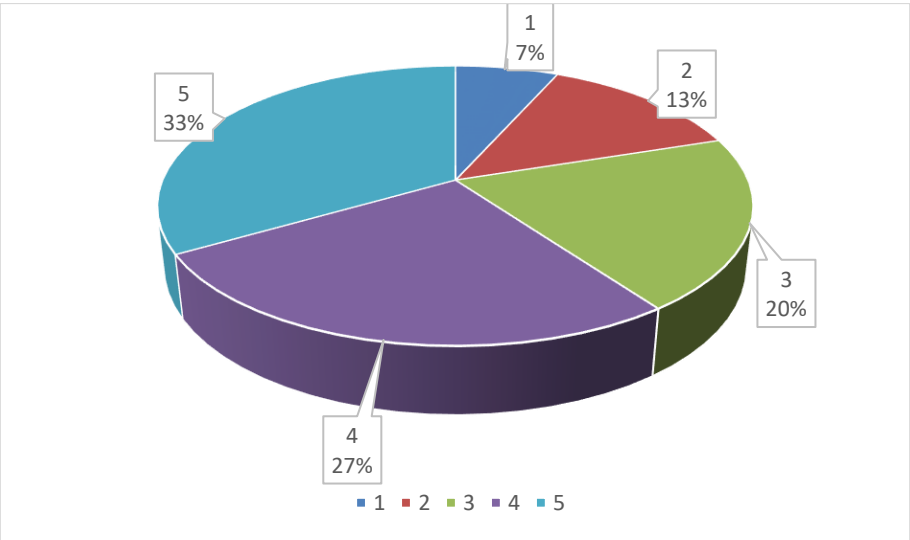

Figure 3. Assessing the extent to which students appreciate that the study program they have chosen develops the competences they consider necessary for integration into the labour market, 5 representing the maximum level

- from the perspective of the education or training programs that students consider necessary for the development of skills that facilitate their integration into the labour market, they have been ranked as follows:
    - 237 students, i.e. 52.20% out of the respondents, appreciated that they needed entrepreneurial skills training programs;
    - 213 students, equivalent to 46.91% of all respondents, consider that they need career guidance workshops;
    - 212 students, i.e. 46.69% out of the respondents, consider that they need basic and advanced digital skills training programs,
    - 181 students, i.e. 39.87% out of the total, consider that they need training programs in green skills, related to the environment, climate, energy, circular economy and bioeconomy;
    - 1 student (equivalent to 0.20% out of the respondents) considers the following (an option for each of them): social-emotional development programs, post-production workshops, technical charts, internships and an option regarding the fact that the current curriculum is sufficient.

The summarization of option distribution is reflected in Figure 4.

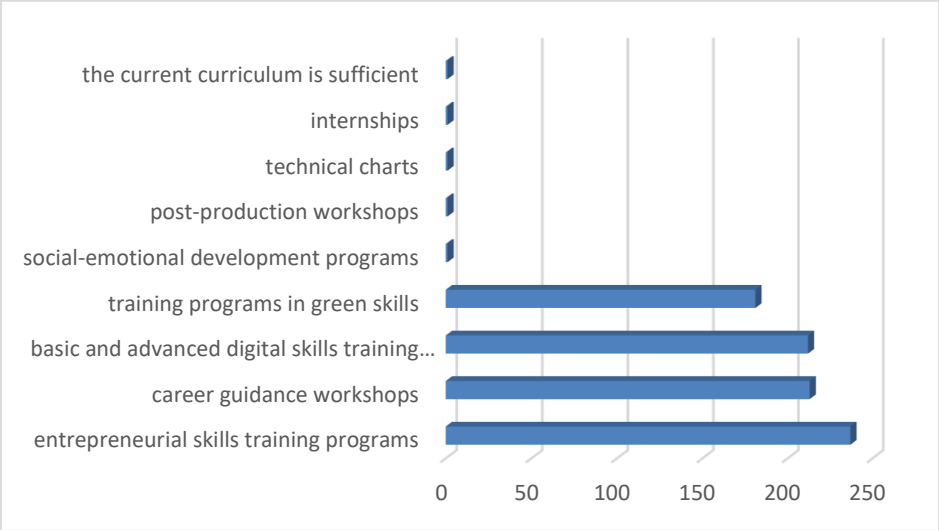

Figure 4. Training/education program requirements resulting from the questionnaire application

- regarding the forms of learning/contexts/experiences through which students consider that they can develop the competences they need on the labor market, the summary of the responses generated the following results:
    - 357 students, i.e. 78.63% out of the total, consider that they need specialized practice stagies;
    - 259 students, i.e. 57.05% out of the respondents, appreciate that they need learning programs in their future jobs;
    - 143 students, equivalent to 31.49% out of the respondents, consider they need career coaching programs.

The summarization of option distribution is reflected in Figure 5.

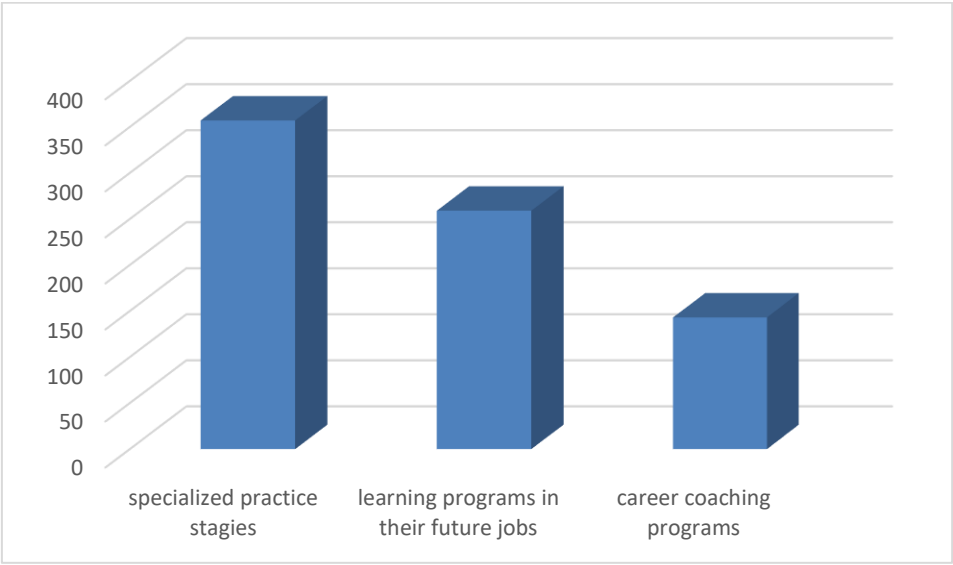

Figure 5. The need for skills development experiences needed for labour market integration

Thus, analyzing the results of the survey, it can be estimated that the skills needed by the surveyed students (from technical education) consider that what they need is made up of entrepreneurial, digital and green skills that can be covered by completing the curricula with subjects from these categories but adapted to the particularities of their field of study. In the university, important steps have been made regarding the current orientation of the labor market, new subjects of study, such as: Entrepreneurship, Life Skills, Career Coaching, Digitization of Products and Processes etc. being included in the curricula.

An important aspect to mention is the students' preference oriented towards skills training programs that have a practical characteristic, this option also being complemented by the desire to participate in career guidance workshops. They would be advisable to be facilitated or even organized and financed by the university (through projects with external, national or other funding) for first-year students, which would better orient students on career directions in the field of study, thus ensuring the student retention and the sustainability of study programs.

The students of the technical faculties have certain peculiarities specific to their training, materialized in didactic activities with an applicative characteristic within the laboratory and project hours, in certain technical disciplines, also necessary for them being the need to have a good practical training in the field and specialty, which allows them to successfully cope with the engineer profession. At this moment we can also discuss about a peculiarity arising from the employers needs of work force in the area, which generates additional pressure on the education system which refers to a higher demand than the supply of specialists with technical training. This leads to the employment of students starting from the period of their university studies, before they complete their professional training. Employers rely on on-the-job training of specialists, adapted to their organizational system, but this negatively influences the education system that faces a high school dropout rate resulting from the labor needs in the economic environment.

The integration of the options resulting from the application of the survey has already begun to be implemented by the university, through the faculties and departments coordinating study programs, by adapting / completing the current forms of training, orienting the students' training towards variants with a consistent component of field, specialty and practice for the elaboration of the graduation paper, obtaining funding through which students have access to training programs in entrepreneurship, digital skills and sustainability etc. This flexibility in professional training provides sustainability in the delivery of educational services to students in technical fields.

Also, in order to strengthen learning through internships and workshops, faculties have established direct relationships with companies in the economic environment by concluding partnership contracts that provide collaboration in terms of accepting students into practice and internship. Another way to make technical study programs more sustainable could be completed by expanding collaboration with specialized companies through generating study and research topics that are to represent the basis of the elaboration of diploma, dissertation or doctoral papers under the guidance of both teaching staff and production specialists and also carrying out mentoring activities addressed to students, master or doctoral students.

These directions of action lead to an increase in the quality of technical education and consequently provide its sustainable development. An important role in this process is also played by continuing the sustainable digitization of the university through the acquisition of specialized software solutions through which operations and processes are reconfigured, thus transforming the university into a digital organization. The University of Oradea started the digitization process with the introduction of the Internet in all educational spaces, the implementation of the e-learning platform and the functionalization of the "SMART" building on campus I. The continuation of sustainable digitization will be achieved through the following: transforming other administrative and educational spaces into "SMART" spaces; solutions related to the introduction of artificial intelligence systems in internal communication can be implemented in the protection and security of buildings, in the management of volumes, journals and other scientific materials in libraries etc. Digitization, as a process, offers added

value, saves time and other types of resources leading to an increased degree of sustainability of the university.

From the perspective of research activities, research oriented towards digitization and sustainability is carried out in the university and this orientation must be maintained and developed in its largeness. This is perfectly achievable through research centers, technology transfer centers and specialized research teams.

5. Conclusions

The confirmation of openness to sustainable development and the application of sustainability principles in the University of Oradea is also illustrated by the 515th place (out of 1050 universities) in the UI GreenMetric World University Rankings obtained in 2022, being positioned on the 145th place in Europe. Also, another confirmation is the involvement of the university as a founding member of The European University Alliance for Sustainability: responsible GRowth, inclusive Education and ENvironment (EU GREEN), an alliance that aligns with the UN Sustainable Development Goals.

The orientation towards the principles of sustainability of any university is the path that provides sustainable development, focusing on the quality of the educational process, integrating aspects that allow responsible management of resources and adequate environmental protection**.**

References

[1] The Bundtland Report (also known as "*Our Common Future")* published in March 1987 by the United Nations World Commission on Environment and Development (WCED) headed by Gro *Harlem* Brundtland;

[2] The UN Millennium Declaration, adopted in New York, September 8, 2000;

[3] Transforming Our World: The 2030 Agenda for Sustainable Development; July 6, 2017;

[4] National Strategy for Sustainable Development of Romania 2030, adopted by Government Decision nr. 877/2018;

[5] National Action Plan for the implementation of the National Strategy for Sustainable Development of Romania 2030, Government Decision no. 754/2022;

[6] Higher Education Law nr. 199/2023, art. 3, (letter m);