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Identifying Key Issues of Education for Sustainable Development

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Abstract: This paper elaborates and presents key issues established for a course on Education for Sustainable Development (ESD). ESD is supported by the United Nations (UN) organization and its agency, the United Nations Educational, Scientific and Cultural Organization (UNESCO). Quality education is also one of the seventeen UN Sustainable Development Goals (SDGs). The evolution of sustainable development and ESD is overviewed first in order to define the most important content of ESD in future teaching. Because of the fast development of humankind in all the SD pillars (economic, social and environmental), the climate crises as well as the new technologies and knowledge emerging, education leaders and teachers are lacking modern and effective content for ESD. Therefore, twelve key issues of ESD are identified and elaborated in the present article. The issues are organized into four groups (approach, contents, teaching, and organization) with three items each. The approach is including ESD scope, policy, and cooperation, the contents part deals with the three ESD pillars — environmental, social and economic; the third group, teaching, regards ESD methodologies, transformative teaching and learning, and capacity building; the organization group presents ESD metrics, documents, and institutions. The twelve issues have been synthesized after reviewing the available literature, enhanced by the participation in several international projects on education. In addition, they were further elaborated from feedback obtained from three international conferences focused on education for sustainable development, social responsibility, and sustainable consumption and production. The key goals suggested by the audience of the international conference in Vienna were holistic education, stakeholders' awareness, participation and cooperation, and building capacity of stakeholders, while the challenge was found to be the timely evolution of human society towards the deep transformation. This paper is an informed perspective proposing content for an Education for Sustainable Development course.

Keywords: education; sustainable development; key issues; deep transformation; principles

1. Introduction

The purpose of this article is to formulate the key issues of a course in Education for Sustainable Development (ESD). Its scope is to define the learning content which is essential for such a course independent of the degree — a teacher is expected to adapt the content to the level of learners. The topics that are important for such a course will be presented. They are expected to help the education leaders and teachers to define the course and look for the details in the literature and on the web. The course is important as mankind is at a very important point of its development — (**a**) climate crisis and lack of resources are slowing down the development, (**b**) social inequalities and huge differences in development stage are causing stresses in societies, and (**c**) neoliberal economy causes increasing problems worldwide and within almost every country. Climate catastrophes with refugees, social protests, unrests, and even wars are increasing, nationalism and autocracies are emerging. The article is intended for national, regional, local and city governments, education leaders and teachers. ESD is

not an instant fix but it is one of the most effective long-term ways to achieve social transformation, increase environmental awareness, and economic de-growth transition.

In order to realize the context, one could consider Sustainable Development (SD) first, and then present the history of ESD and its future which we want to serve. But the two topics are so intertwined that it is the best to deal with them simultaneously.

Sustainable Development (SD) was brought to the public attention by the United Nations (UN) World Commission on Environment and Development (WCED) report Our Common Future, most often called Brundtland Report according to its chairperson Gro Harlem Brundtland, former prime minister of Norway [1]. It was officially introduced at the UN General Assembly in 1987. SD was defined as the development that "meets the needs of the present without compromising the ability of future generations". Today, it is described as the organizing principle of human development that fulfils long term needs of humanity and at the same time sustains the "ability of natural systems to provide natural resources and ecosystem services upon which society and economy depend".

The word "development" and the three pillars concepts were suggested in the UN development aid context where the premise was that economic development would eventually increase human well-being and global equity [2]. Such a policy resulted as 154 member countries are less developed while the 44 developed ones are financing the UN activities. The notion of major environmental issues was added on. Researchers working with environmental challenges have observed that they are still not being taken seriously (economic growth is not sustainable), and researchers working with global social justice have pointed out that economic growth is not reducing global inequity or reducing poverty.

The term and concept of SD are criticized within sustainability studies for a number of reasons: the incorrectness and narrowness of the term, the selectivity of its concept, the controversial character of several methods used, the diversity in understanding its goals, its inefficiency in solving global problems, the incompatibility of national interests to global human interests, the sources of funding the transition, the mechanisms of its implementation, etc. [3]. Nevertheless, UN has succeeded in adding the social pillar to the environmental and economic ones. It has also received political support globally, and inspired several actors (governments at all levels, non-governmental organizations (NGOs), education and research institutions, and general public). Therefore, the critique shall be used to improve it but not to fundamentally change or even abolish it. The 1992 UN Conference on Environment and Development in Rio de Janeiro [4] called for global partnership in SD. In chapter 36 of Agenda 21 they proclaimed that "education has to be reoriented towards SD". This chapter identified four major thrusts to begin the work of Education for Sustainable Development (ESD): (**1**) improve basic education, (**2**) reorient existing education to address SD, (**3**) develop public understanding and awareness, and (**4**) training.

ESD followed the UN International Environmental Education Program (1975–1995) which had presented a vision and mobilized education for environmental awareness. ESD "allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future" [5]. It is "including key SD issues into teaching and learning — e.g., climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption". In 2002 UN General Assembly decided to initiate the 2005–2014 Decade for ESD led by UNESCO [6]. It focused its efforts on four main areas:

1. Looking at education as a critical implementation tool for SD;
2. Reorienting education systems towards commitments of Millennium Development Goals (MDGs) and Education for All (EFA);
3. Networking and interaction among stakeholders in ESD;
4. Developing approaches for the assessment of progress in ESD.

The Global Action Programme (GAP, 2015–2019) on ESD was the follow-up program to the Decade of ESD [7]. The GAP aimed to contribute substantially to the 2030 agenda through two objectives:

- "Reorienting education and learning so that everyone has the opportunity to acquire the knowledge, skills, values, and attitudes that empower him/her to contribute to a sustainable future.

- Strengthening education and learning in all agendas, programs, and activities that promote sustainable development."

The GAP deployed a two-fold approach to multiply and to scale up ESD action: (**1**) integrating sustainable development into education; and (**2**) integrating education into sustainable development. It focused on five priority action areas: (**1**) advancing policy; (**2**) transforming learning and training environments; (**3**) building capacities of educators and trainers; (**4**) empowering and mobilizing youth; and (**5**) accelerating sustainable solutions at the local level. UNESCO published a review on issues and trends in ESD [5], aimed at providing policymakers, educators, and other stakeholders with state-of-the-art analyses of the topic. ESD was placed at the center of the 2030 Sustainable Development Agenda — it was widely recognized as a key enabler of sustainable development and an integral element of quality education. The report contained 10 chapters about understanding and implementing ESD. Learning objectives for several Sustainable Development Goals (SDGs) were presented.

ESD is recognized as a key element of quality education and a crucial enabler for SD. The 2030 Agenda for Sustainable Development, accepted by United Nations in 2015 [8], clearly reflects this vision and the importance of appropriate educational response. Quality education is explicitly formulated as a stand-alone Sustainable Development Goal (SDG No 4), and Target 4.7 on education specifically addresses ESD and related approaches [9]. Education for SDGs is cited in this edition — for each SDG there are three groups of learning objectives: cognitive, socio-emotional, and behavioral ones. ESD is used to implement learning for SDGs, and some case studies are presented. Many education-related targets and indicators are being developed within the SDGs too. Ten out of the 169 SDG targets are attached to Quality Education. They have been analyzed together with the above-mentioned agendas of global organizations and the questionnaire results. Education, training, and learning is linked with all the other SDGs as was shown by the International Council of Scientific Unions and the International Social Science Council Review [10] — now International Council for Science, ICS. The education system is providing professionals, researchers, and teachers for all the human activity areas.

In November 2019, UNESCO adopted the new global framework on ESD (*ESD for 2030*) for the period of 2020–2030 [11]. It focuses on "integrating ESD and the 17 SDGs into policies, learning environments, capacity building of educators, empowerment and mobilization of youth, and local level action". UN General Assembly noted ESD as "an integral element of SDG 4 on Education and a key enabler of all the other SDGs." UNESCO World Conference on ESD will take place on 17–19 May 2021 in Berlin, Germany.

Education is believed to be closely linked to demography and resource consumption; while the former reduces population growth rate, the latter increases consumption [12]. The most developed countries with the highest education levels have the highest per capita consumption rates. Therefore, ESD has to be reoriented towards decreasing consumption, requiring de-growth, and lifestyle revolution in developed countries. Reisch et al. [13] suggested five focus areas on research for sustainable consumption: (**1**) sustainable macroeconomics; (**2**) sustainable consumption, well-being and the "Good Life"; (**3**) sustainability in global supply chains; (**4**) alternative systems of provisioning for sustainable consumption; and (**5**) policies fostering sustainable consumption.

GlobeScan/SustainAbility Survey [14] evaluated the progress made on SDGs, and ranked their relative urgency. The fourth Goal — Quality Education — ranked third in progress made and 10th in urgency. Regarding attention within the organization, this goal is now in fifth place; in Africa and the Middle East it is still the SDG receiving the most attention. In the 2017 Survey, Quality Education was found to be the second most important SDG for society to focus on, only Climate Change was higher in terms of the impact importance. In organizational units, the most attention was paid to Climate Action, and Responsible Consumption and Production while Quality Education was fifth.

The paper is organized in five sections: (**1**) introduction, (**2**) methodology, (**3**) key issues of ESD, (**4**) the course contents, and (**5**) conclusions and outlook.

2. Methods

The key issues have been formulated after studying the available literature, enhanced by the experience from several international conferences and projects. The first draft of the twelve ESD key issues was prepared as a paper for the Copernicus Alliance Conference 2016 in Vienna [15]. During the parallel Interactive Session. The 12 key issues of ESD, the discussion group accepted the draft version as prepared and presented by the author of this article. Each interactive session was expected to find 3 key learnings and one challenge found by discussion. "The recognized key learnings were: holistic education, stakeholders' awareness, participation and cooperation, and building capacity of all the stakeholders." "The challenge was timely evolution of the human society towards a deep transformation" — strong sustainability. The presented paper has been further elaborated using literature sources and practical experiences from several European Higher Education (HE) and Vocational Education and Training (VET) projects [16–18]. In addition, the key issues were tested and improved at two additional international meetings: (**1**) Conference on social responsibility [19], and (**2**) European roundtable of sustainable consumption and production [20]. Remarks and suggestions from participants of these conferences have been taken into account in the final version of the paper.

Scopus search on ESD course content [21] is displaying 477 hits, the first paper on sustainable education in Canada was published back in 1988 [22], followed by one in 1994 and two in 1996; since 1996 the annual number of documents increased slowly to 6 in 2005. Fast linear growth occurred in the later years, reaching more than 40 papers per year in 2017–2019, and a new record number is expected in 2020. The most (156 documents) originated from United States and 30 from United Kingdom. By type, 44.4 % of them were articles, 42.8 % conference papers but only 0.6 % of them were books. By subject area, 26.0 % of them were from social sciences and 24.3 % from engineering, 11.7 % belonged to environmental science, 7.1 % to energy, 6.7 % to computer science, 5.9 % to business, management and accounting, etc. Our first paper was published in 2009 [23]. Early literature reviews about sustainability courses [24], and about SD curricula [25] are worthy of mention.

3. Key Issues of Education for Sustainable Development

Higher education institutions (HEIs) have accepted and signed many declarations, charters, and partnerships to improve the effectiveness of ESD. Lozano et al. [26] analyzed 11 declarations for sustainability in higher education and found that the elements:

- Curricula, collaboration and outreach, operations, and research were considered by almost all initiatives;
- Trans-disciplinarity, the collaboration of universities, and 'educate the educators' were considered by about half of the declarations;
- On-campus experience, assessment and reporting, and the institutional framework are cited by a small number of the initiatives, only.

In this paper, the key issues of ESD are organized into four groups (approach, contents, teaching, and organization) with three items each. The approach group contains ESD scope, policy and cooperation. The contents group deals with the Triple Bottom Line of SD (environmental, social and economic dimensions). The third group includes pedagogies (methodology, transformative teaching and capacity building), and the last one overviews ESD measurement and data, and the most important global ESD institutions. The key issues are intended to be used for teaching and learning about ESD at all grades but they have to be shaped to the level used, and updated with further societal development.

When developing a course, the teacher has to define lectures. During writing a textbook, the author has to define chapters from Introduction to Conclusions and Literature. The first version of the key issues was addressed: The twelve principles of ESD [19]. The historical number 12 (dozen) is often used, e.g., the 12 Principles of Green Chemistry [27] and the 12 Principles of Green Engineering [28]. Additionally, the Agile Manifesto is comprised of four foundational values and 12 supporting principles which lead the Agile approach to software development. The twelve principles of ESD have evolved to the twelve key issues of ESD. The proposed key issues of ESD are:

1. **ESD scope**: SD and ESD definitions, education at all the levels (primary-tertiary), life-long, formal, non-formal and informal education, teaching and learning, ESD key milestones, ESD competencies, quality education, and weak and strong sustainability
2. **ESD policy**: vision, mission, peace, justice, and non-violence, democracy, rule of law, strong institutions, public awareness and participation, power and influence distribution, sustainable communities, cities, countries, and regions, and population control (towards zero-growth);
3. **ESD cooperation**: empowering and mobilizing youth and aged people, intergenerational cooperation, cooperation between stakeholders (institutions, companies, communities, etc.), and partnerships;
4. ***Environmental*** *pillar: climate change, adaptation, and mitigation, pollution prevention and zero waste, life cycle approaches, biodiversity, disaster risk reduction, and the six Lisbon principles (responsibility, scale-matching, precaution, adaptive management, full cost allocation, and participation);*
5. ***Social*** *pillar: human rights, hunger and poverty eradication, security, clean water and sanitation, health and well-being, reduced non-equalities (gender, income, living standard ones), decent work, social responsibility, quality education, cultural diversity, sustainable urbanization, and sustainable life styles;*
6. ***Economic*** *pillar: resources (raw materials, energy, water, air, land) and their efficiency, circular economy, affordable and clean energy, sustainable consumption and production, research and development (R&D), innovations and entrepreneurship of all stakeholders, and economic de-growth;*
7. ESD **methodologies**: participatory teaching and learning, student-centered teaching, critical, interdisciplinary, and systems thinking, creativity, and imagining future scenarios (envisioning);
8. **Transformative** teaching, learning, and training: a holistic approach, digital literacy, infrastructure and environments, developing case studies;
9. **Building capacity** for educators and trainers at all levels, media, developing pedagogies, ESD tools, literature, project reports and presentations (PowerPoints, videos, etc.), and financing of projects;
10. ***ESD metrics****: indicators and indices, sustainability accounting, and reporting;*
11. ***ESD documents****: international agreements, declarations from Agenda 21 to 2030 Agenda for SD;*
12. ***ESD institutions****: UN (UNESCO, UNCED, UNEP, UNECE), EEA/EPA, global and regional associations (IAU, CA), national institutions, and NGOs.*

4. Discussion of Key Issues

The twelve key issues of an ESD course will be explained in this section by elaborating their tentative contents.

4.1. ESD Scope

The ESD course shall start with the definitions of SD and ESD. It is intended to be taught at all the levels (from primary to tertiary), including life-long, formal, non-formal and informal education. ESD scope from early events and documents up to modern teaching and learning of SD follows. The key milestones of ESD are: Earth Summits in Rio de Janeiro in 1992 (including Agenda 21, Rio Declaration and Conventions), Rio + 10 conference in Johannesburg (with first USA boycott; Plan of Implementation, PoI), Rio + 20 summit, again in Rio (the document "*The Future We Want*"), The Decade of ESD, the GAP on ESD with the Climate Change Education for SD, SDGs with the Goal No. 4 on quality education and the target 4.7 on knowledge about SD and ESD, sustainable lifestyles, human rights, etc., and finally, Education for Sustainable Development 2020–2030 (*ESD for 2030*).

ESD competences [29] present essential characteristics of ESD (holistic approach, envisioning change, and achieving transformation), and the framework of learning experiences (learning to know — cognitive domain, learning to do — conative domain, learning to live together — social domain, and learning to be — emotional domain). UNESCO [9] is citing eight key competencies for achieving the SDGs: (**1**) system thinking; (**2**) anticipatory, (**3**) normative, and (**4**) strategic approaches; (**5**) collaboration,

(**6**) critical thinking, (**7**) self-awareness and (**8**) integrated problem-solving. Competences to address SDGs in higher education need a reflection on the equilibrium between systemic and personal approaches to achieve transformation action [30].

Quality education shall be inclusive and equitable, and promote learning opportunities for all (SDG 4). It is including quality from early childhood development to secondary education, skills at technical, vocational and tertiary levels, entrepreneurship, and ESD [11]. The World Economic Forum [31] proposed five key goals: (**1**) to unleash the infinite potential of humanity, (**2**) to learn how to apply oneself as an instrument towards lifelong value, (**3**) to learn how to shape the future, (**4**) to understand and master the conditions for peace and (**5**) to learn how to be healthy and happy. The World Bank proposes six necessary components (referred to as the *6 A's*) to achieve such reforms: (**1**) assessment, (**2**) autonomy, (**3**) accountability, (**4**) attention to teachers, (**5**) early childhood development, and (**6**) culture [32]. Six crucial dimensions of quality education are: (**1**) equity, (**2**) contextualization and relevance, (**3**) child-friendly teaching and learning, (**4**) sustainability, (**5**) balanced approach, and (**6**) learning outcomes" [33]. Ng's research [34] indicates that quality education "includes holistic development, equips students with the knowledge and skills for the future, inculcates students with the right values, and imbues students with a positive learning attitude". It is "delivered by good teachers, enabled by good teaching and learning processes, and facilitated by a conductive learning environment". Ofei-Manu and Didham [35] argue that quality ESD could be improved by "supporting curriculum towards transformative educational and teaching approaches, strengthening teachers' competency for ESD, guiding school administrators to support experiential education, and encouraging education policymakers to consider transformative learning approaches and the integration of ESD into standard educational policy".

The concept of weak sustainability suggests that 'natural capital' can be substituted by 'human capital'; e.g., coal as a natural resource can be converted into electricity and used to improve human life. It was developed within the environmental economics by Robert Solow [36] and John Hartwick [37]. Strong sustainability assumes that both 'capitals' are complementary but not interchangeable — economy is only a subset of society, and society is dependent on the environment (it is often presented in three circles, where economy is embraced by society and society is encircled as being determined by environment). Land, water, air, and biodiversity cannot be substituted. Economy and society are constrained by environmental boundaries — limits to growth [38]. Therefore, strong sustainable consumption is about de-growth [39].

4.2. ESD Policy

ESD vision is a balance between society, economy, and environment while preserving the natural resources of our planet for future generations. UNESCO aims to improve access to quality education on sustainable development at all levels and in all social contexts, to transform society by reorienting education and help people develop knowledge, skills, values, and behaviors needed for sustainable development [40]. An empirical study in the Czech Republic indicated the vision of ESD learners to be self-confident, grounded, open, and engaged [40].

ESD mission is defined in the SDG 4 with its seven targets and three targeted actions. The mission of ESD in higher education is to make the world a better place to live and create graduates who are able to contribute solutions to our urgent societal needs [41]. UNECE [42] strategy for ESD is to empower learners for "leading healthy and productive lifestyles in harmony with nature and with concern for social values, gender equity, and cultural diversity".

Peace is not just the absence of war or violence but is also a pathway to expand human potential without harming others; peace creates conditions for SD [43]. Violence kills more than 1.6 million people every year [44]. In 2015, the cost of violence was estimated to be 13.6 TUSD (trillion US dollars = 10^{12} USD) expressed in purchasing power parity (PPP) terms [45]. This is equivalent to 13.3 % of world GDP (Gross Domestic Product) or 1 876 USD/a (per annum) per person or 5 USD/d (per day) per

person, every day of the year — World Bank estimates that 10.7 % of the worlds' population are living on less than 2 USD/d and yet we spend next to nothing on peace.

ESD started by concentrating on the pedagogical approach and environmental problems. Later, social matters were also addressed including equality, justice, non-violence, democracy, rule of law, strong institutions, public awareness and participation, power and influence distribution, sustainable communities, cities, regions, nations, and countries, population control, etc. The topics were stimulated by the UN documents on MDGs (2000–2015), and SDGs (2016–2030). A typical example of including social responsibility into education is the Sustainable and Socially Responsible University of Maribor [46].

4.3. ESD Cooperation

Universities shall cooperate with other institutions using the United Nations Principles of Responsible Management Education (UN PRME) [47]. As a voluntary initiative with over 650 signatories worldwide, PRME has become the largest organized relationship between the UN and management-related higher education institutions. It engages business and management schools to ensure they provide future leaders with the skills needed to balance economic and sustainability goals, while drawing attention to the SDGs and aligning academic institutions with the work of the UN Global Compact (UN GC). The PRME's six principles are: (**1**) purpose — students as future generators of the inclusive and sustainable global economy, (**2**) values — global social responsibility, (**3**) method — educational framework, materials, processes, and environments that enable effective learning for responsible leadership, (**4**) research to create sustainable social, environmental and economic value, (**5**) partnership with managers of business corporations and (**6**) dialogue among educators, students, businesses, government, consumers, media, civil organizations, etc.

4.4. Environmental Pillar

"The environmental pillar refers to the laws, regulations, and other policy mechanisms concerning air and water pollution, solid waste management, ecosystem management, maintenance of biodiversity, as well as the protection of natural resources, wildlife, and endangered species. Its regional key issues are: climate change, global warming, the environment, and human rights (persecution of activists), modern and renewable energy, ecological development (ending natural resource depletion), reversed air pollution and improved water management, and better control of natural resource extraction. National, regional or local governments' instruments may include economic incentives and market-based instruments such as taxes and tax exemptions, tradable permits, awareness campaigns and educational activities" [48].

There are many warnings that universities are not expending enough effort in sustainable development and especially in preventing the climate change disaster. More should be done in informing and engaging staff and students (e.g., Ecological and Carbon Footprints calculations, Biocapacity, and Ecological Deficit evaluations), and leading by example. Universities could be doing much more than they do, including buildings to the highest environmental standards, cutting waste, reducing institutional footprints and banishing plastics from campuses [49]. Research into climate change and public advocacy role is also very important. Sustainability shall be embedded into learning. Universities in the UK (followed by Finland, Canada, and the USA) are the most environmentally sustainable in the world (SDGs 17, 3, etc.) [49], while those in Canada, Australia, Russia and Ireland are doing the most to tackle climate change (SDG 13); rankings according to other SDGs are also available [49]. The Alliance for Sustainability Leadership in Education (EAUC) is proactive in recycling, plastic alternatives, divesting from fossil fuels, and ethical supply chains.

The learners should be reminded that the SDGs, although very numerous with 17 goals and 169 targets, are ignoring some important environmental problems and possible solutions to them, e.g.,:

- Further GDP growth in most countries is not acceptable as we have not enough resources (raw materials are limited, especially critical raw materials may cause great problems in future; also materials for solar panels, batteries and energy accumulators are scarce and expensive);

- Carbon capture and storage may be difficult and expensive, and underground storage can be dangerous;
- Hydropower plants with dams and reservoirs, windmills causing noise and radiation as well as nuclear power plants with accidents, radioactive nuclear waste, and nuclear weapons are raising many environmental concerns and oppositions;
- Population growth is too high, especially in the least developed big countries in Africa and Asia — education is the best way to reduce population growth;
- Increasing employment and higher wages are increasing resource usage, GHGs emissions, and pollution;
- People are ready to accept efficiencies improvements but they are not favorably disposed to de-growth, GDP reduction, revolutions in mobility, food structure, habits and lifestyles.

These and other problems shall be discussed with learners seeking commonly acceptable solutions for the ever-changing society, economy, and natural environment.

4.5. Social Pillar

"The social pillar refers to social issues: our wellbeing (health- and aged care, free education, housing, employment, etc.). They ensure that individuals do have access to social services, do not suffer through lack of knowledge of their rights, and exercise a responsible influence on the development of social policies and services, both locally and nationally. Key regional issues are: poverty eradication or alleviation, the security of jobs versus contract labor without benefits, income inequality, health and health care, universal access to sexual and reproductive health services, access to education, biases against women, and need for gender equality (both economic opportunities for women and protection from gender-based violence issues)" [48].

UNESCO has shared a draft framework for ESD beyond 2019; its three messages are: (**a**) transformative action of individuals, (**b**) structural change — relationship between economic growth and sustainable development, and (**c**) technological future — critical thinking and green skills. The last years have sharpened social responsibility at different levels: corporate, geographical unit, social group, and individual (ethical, political, managerial, etc.) as well as providing focal points on SDGs, and generating additional tasks for ESD like:

- Decreasing the growing inequalities between 1 % of rich individuals and the 99 % majority;
- Exploitation with the rise of precariat on one hand, and plutocracy and oligarchy on the other one;
- The predominant influence of multinational corporations over policy, jurisdiction, and democracy;
- Avoidance of taxation for common good by using different types of tax havens;
- The harmful influence of neoliberalism on social market economy, social security, and social justice;
- Massive human migrations because of wars and climate changes, and the growth of terrorism;
- Nationalism and populism as an unwanted response to these problems.

ESD has to respond to these new challenges of humankind by modifying and focusing its paradigm.

The current economic and social paradigm is "faster, higher, further". It is built on and stimulates competition between all humans. This causes acceleration, stress, and exclusion. Our economy destroys the natural basis of life. The common values of de-growth society should be care, solidarity and cooperation. By "de-growth", we understand a form of society and economy which aims at the well-being of all and sustains the natural basis of life. To achieve de-growth, we need a fundamental transformation of our lives and an extensive cultural change. Essential for de-growth are [50]:

a. "Striving for the good life for all. This includes deceleration, time welfare, and conviviality.
b. A reduction of production and consumption in the global North, and liberation from the one-sided Western paradigm of development. This could allow for a self-determined path of social organization in the global South.
c. An extension of democratic decision-making to allow for real political participation.

d. Social changes and an orientation towards sufficiency instead of purely technological changes and improvements in efficiency in order to solve ecological problems. It is believed to be historically proven that decoupling economic growth from resource use is not possible.
e. The creation of open, connected, and localized economies."

4.6. Economic Pillar

"The economic pillar includes trade and investment, employment growth, private sector development, domestic and international trends, and assets. Its instruments include tax policy, public-private partnerships, trade and employment policies, national and international finance, etc. Key regional issues are: poverty eradication or alleviation, lack of decent and productive jobs, SME development (toward sustainable growth), role and involvement of the private sector, employment creation, income inequality, and local economic development. The SDGs are called to include: a living wage indicator, the end of tax havens and tax avoidance, reaching a minimum global corporate tax rate, etc." [48].

Various studies have shown that targets under the Paris Climate Agreement can only be met by developing technologies that will provide 'negative emissions' (seen as a questionable strategy [51]), or that efficiency improvements and low-carbon technologies with projected economic growth will overshoot such targets. It implies that slower growth, or de-growth, particularly in the developed countries, is required to stay within planetary limits [52,53]. Moving towards strong sustainable consumption requires two phases of development [54]:

1. Increase in the efficiency of consumption due to technological improvements (eco-design, sustainable production, eco-innovation, etc.), and due to more efficient use of resources (3R — reduce-reuse-recycle, zero waste, etc.) what is called weak sustainable consumption (SC).
2. Changes in consumption patterns (habits, behaviors, and lifestyles) and reduction in consumption levels (de-growth) in developed countries requiring changes in infrastructures what is called strong SC.

Weak SC may be e.g., using a car with a reduced gasoline usage of 3 cl/km (3 liters per 100 km) while strong SC means using public transportation instead of the car. People (individuals, businesses, and governments) are ready to apply the first phase but they are hesitant to use the second one.

The main causes of overconsumption are mobility (car and air transport including holiday trips), food (meat, dairy, obesity), energy use (heating, cooling, energy-using appliances), and housing (building and demolition) which are causing 70–80 % of the life-cycle environmental impact categories [55]. OECD countries have 19 % of the human population but consume 80 % of the global resources. Historically, improvements in efficiency have not succeeded to outpace increases in the quantities of goods and services provided [56]. Therefore, phase 1) will not be enough.

4.7. ESD Methodologies

"Pedagogy describes the practice or method of teaching [57]. Different to the teaching content, it does not describe what students learn, but how they learn". "The two most commonly discussed principles are active learning and student-centered learning. Progress has also taken place at the teaching method level — the development of collaborative learning, experiential learning, and problem-based learning" were introduced [58]. An interactive, experiential, learner-centered, and action-oriented pedagogy is the third element of ESD. Students should work collaboratively on group assignments, solve real-life problems for an external client, go on excursions, or discuss problems in small group seminars. The teacher is rather a facilitator than a knowledge provider. The student is rather active and responsible than being a passive recipient of knowledge.

Teaching methods are "adapted to the audience, to learning objectives, and to content". Participatory teaching is using student-centered learning which can include "flipped classrooms, case studies, problem-solving, mini-projects, short-term tasks, formal presentations, debates, panel discussions, tutorials, practical work sessions, workshops, role-play, multimedia sessions, simulations,

gaming, study visits, blended learning, etc. The more interactive and participatory the method, the greater the audience's concentration and the easier skills are acquired" [59]. Case studies can be found at the Leading Practice Publication [60]. Many massive open online courses (MOOCs) are available.

4.8. Transformative Teaching, Learning, and Training

"Transformative or transformational teaching changes people by altering fundamentally the way learners understand themselves and others, the way they engage in and contribute to their larger world" [61]. "Transformational teaching is about employing strategies that promote positive changes in students' lives. The goal is not simply to impart certain information to students, but rather to change something about how students learn and live. It is about making lifelong changes."

Slavich and Zimbardo [58] presented six core methods of transformational teaching reflecting this notion:

1. Establishing a shared vision for a course.
2. Providing modelling and mastery experiences.
3. Intellectually challenging and encouraging students.
4. Personalizing attention and feedback.
5. Creating experiential lessons.
6. Promoting pre-flection and reflection.

As a guide, Slavich and Zimbardo proposed the following parameters for measuring transformational teaching [58]:

1. "The teacher is conceptualized as an instructor of the relevant material and also as a change agent who guides students through the transformational process.
2. In his or her role as the change agent, the teacher works to decrease students' perceived barriers to success while increasing their self-efficacy for change.
3. Teaching shall center on the use of self-change projects but requires previous mastery of the course concepts via other teaching methods.
4. Students are viewed as being capable of mastering the course content and achieving the targeted changes."

"Inquiry-based learning, service-learning, and project-based learning are all forms of transformational education" [62]. Teachers who use these methods have a high burden of preparation and flexibility, but the short-term time investment has a long-term payoff, particularly when a classroom of learners becomes an engaged community capable of reflecting on their needs and interests. Key aspects of transformational teaching are active learning, collaboration, and persistence. Active classrooms sometimes require collaborative or team-based work. When students leave the classroom, they will be engaged in a work world that frequently requires group work or someone to act as a team leader. Another key aspect of transformational teaching is the concept of struggle. Recent educational research looks to long-term student success and has identified one of the key traits among those with the highest educational success as persistence. Struggle and failure is part of the learning process.

Teaching creativity is very important too. It is "hands-on, participative and experiential, and requires a model that encourages the students to be entrepreneurial and become producers rather than consumers of information. It is also about learning how to communicate in the digital space, having the ability to understand information systems, evaluate data and identify fake news" [63].

4.9. Building Capacity

Building capacity (also capacity building or capacity development) is "the process by which individuals and organizations obtain, improve, and retain the skills, knowledge, tools, equipment and other resources needed to do their jobs competently. It also allows individuals and organizations perform at a greater capacity (larger scale, larger audience, larger impact, etc.)" [64].

Erasmus+ project University Educators for Sustainable Development, UE4SD [17] has tried to re-orient the HE curriculum towards SD by improving support for university educators to develop

professional competences in ESD. It is suitable for all levels of education and also for other jobs in HEIs and in SD. Professional development recognizes that change is a constant feature of life. It addresses the need for continual learning and conscious reflection to respond effectively to change in professional practice. This can be supported through informal or formal activities, such as training, mentoring, workshops, action-learning sets, workplace projects, and accreditation schemes. Developing academic leadership and the ability to influence and change the way the curriculum is shaped is very important nowadays. The state-of-the-art report found that many European countries lack formal ESD professional development opportunities. An Academy was initiated and its pilot program prepared to fill in the gap. It brings a range of professional challenges to the university educator, such as [17]:

- Understanding how new pedagogies could be applied in their subject;
- Linking ESD pedagogies with the special literacies (science, reading, and mathematics) they teach;
- Reframing what quality learning outcomes might look like with ESD;
- Engaging with students in different ways regarding the learning relationship;
- Digesting new sustainability thinking and practice in their industry/profession;
- Learning more about how to achieve education change in their workplace.

A current Erasmus+ project on Education for Zero Waste and Circular Economy is developing online courses for two interdisciplinary jobs: manager or teacher, and technician or worker [65]. It is including also the Knowledge Hub, interactive Platform, Diagnosis tool, and Dissemination as intellectual outputs. A further Erasmus+ and former Lifelong Learning program projects overview is available [66].

4.10. ESD Metrics

Quality of education is normally measured in the following three dimensions: (**1**) reading and language proficiency, (**2**) mathematics and numeracy proficiency, and (**3**) scientific knowledge and understanding. The Program for International Student Assessment (PISA — science, reading and mathematics literacies), Progress in International Reading Literacy Study (PIRLS), Trends in International Mathematics and Science Study (TIMSS), and Program for the International Assessment of Adult Competencies (PIAAC) are the most often used evaluations. In tertiary education (TE) the share of the population with TE, enrolment in TE, school life expectancy to TE, international mobility of students, etc. are measured and published.

Schools from primary to tertiary levels and campuses can measure and mutually compare their environmental impact by four popular metrics: carbon emissions, water use, recycling rate, and energy use as well as health status and financial input per capita. More seldom is to measure and compare other social and economic indicators: poverty and hunger, wellbeing, equalities, peace, justice, etc. Many indices are available for universities but they are mainly concerned with R&D activities. GreenMetric [67] is comparing universities regarding their environmental achievements: (**1**) campus setting and infrastructure, (**2**) energy and climate change, (**3**) waste, (**4**) water, and (**5**) transportation.

Times Higher Education (THE) University Impact Rankings [49] measure global universities' success in delivering the UN SDGs across three broad areas: research, outreach, and stewardship. Eleven out of 17 SDGs are included. Universities can submit data on as many of these SDGs as they are able. Each SDG has a series of metrics that are used to evaluate the performance of the university in that SDG. Any university that provides data on SDG 17 (Partnerships for the Goals) and at least three other SDGs is included in the overall ranking. Besides the overall ranking, the results of each individual SDG are also published in 11 separate tables. A university's final score in the overall table is calculated by combining its score in SDG 17 with its top three scores out of the remaining SDGs. SDG 17 accounts for 22 % of the overall score, while the other SDGs carry a weighting of 26 % each. There are three categories of metrics within each SDG: research (metrics are derived from data supplied by Elsevier), continuous metric (contributions to the impact — they vary continually across a range, e.g., the number of graduates with a health-related degree) and evidence to support the claims.

Universities have a significant influence on a large proportion of the world's future leaders. Reporting, managing, engaging, and developing strategy on SD issues, therefore, have a considerable impact [68]. The way the students are educated can be a force for change. Yet, despite the 22 years of developments in sustainability reporting and the 7 years of integrated reporting, this potential is not exploited enough.

4.11. ESD Documents

The most important ESD documents that help the reader find additional information are as follows:

- Education for Sustainable Development Toolkit [12];
- Teachers' Guide for Education for Sustainable Development in the Caribbean [69];
- The Competences in ESD (Learning for the Future Competences) [29];
- Sustainable development in higher education [70];
- ESD and Quality Management and Enhancement Framework [71];
- Shaping the Future We Want, UN Decade of ESD, Final Report [6];
- Transformative Teaching: Changing Today's Classrooms [72];
- Building Capacity in Higher Education Topic Guide [73];
- Education and the SDGs, Educate a Child [74];
- Transformative Teachers; Teacher Leadership and Learning in a Connected World [75];
- Education for Sustainable Development. Learning Objectives [9];
- Consultation on Further and Higher Education and the SDGs [76];
- Issues and trends in Education for Sustainable Development [5].

Further documents can be found at the UE4SD Platform [17] containing useful publications, with three resource packages: (**1**) international ESD initiatives, (**2**) European ESD policy and guidance, and (**3**) ESD and professional development.

4.12. ESD Institutions

United Nations (UN) maintains many organizations dealing with the ESD. The most known ones, worth monitoring for historical and actual documents, are as follows:

- *UNESCO*, United Nations Educational, Scientific and Cultural Organization; its platform has links to ESD definition, the work going on, resources (including key publications, Overview of the International Frameworks on ESD, and Higher Education Sustainability Initiative, HESI), and the future of ESD.
- *UNEP*, United Nations Environment Program platform is including: Education for Sustainable Consumption, Sustainability communications: A Toolkit for Marketing and Advertising Courses, Shaping the Future We Want — UN Decade of Education for Sustainable Development (DESD, Final report), The International Training Program on *ESD* in Higher Education (ITP ESD-HE), Environmental Education for SDGs, etc.
- *UNECE*, The United Nations Economic Commission for Europe has published the evaluation report on the implementation of the UNECE Strategy for ESD 2005–2015, Empowering Educators, Competences for ESD and other contributions.

The European Environment Agency (EEA) is helping the Community and its member states to make informed decisions about improving the environment, integrating environmental considerations into economic policies, and moving towards sustainability. It is publishing a 5-year evaluation of the state and outlook of the European environment (SOER) as well as global megatrends and cross-country comparisons. The European Network of the Heads of Environment Protection Agencies (EPA Network) deals with the implementation of environmental policy and communication of environmental issues. The European environment information and observation network (Eionet) is a partnership network of the EEA, and its 33 member- and 6 cooperating countries.

International Association of Universities (IAU), created under the auspices of UNESCO in 1950, provides a framework for universities to develop inter-institutional collaboration in pursuit of SD. IAU [77] developed a *dedicated portal on Higher Education and Research for Sustainable Development* including all the SDGs. IAU has published an overview of climate action (SDG 13), and actions listed under the SDG 4. The *COPERNICUS Alliance* (CA) is a European network of universities and colleges committed to transformational learning and change for SD. CA is organizing face to face and online annual conferences on HESD, it participates in R&D projects and awards micro funds. The Association for the Advancement of Sustainability in Higher Education (AASHE) has over 900 members across 48 U.S. states, 9 Canadian provinces, and 20 countries. It is publishing news, the Bulletin, annual reports, and its Hub contains over 1000 publications.

Non-governmental organizations (NGOs) and national institutions are important too. The UN Economic and Social Council [78] is listing over 4900 NGOs with consultative status. It is the principal body for the coordination, policy review, policy dialogue, and recommendations on issues of economic and social development including the SDGs. Many NGOs are dealing with SD, some of them also with ESD. For example, Gaia Education [79] is an international NGO providing students of all ages and cultural backgrounds in 54 countries with knowledge and skills to design a thriving society. A list of face to face and e-learning programs is available. Links between HE organizations and NGOs promote ESD [80]. Similarly, the purpose of the NGO Committee on Sustainable Development-NY [81] is to monitor and influence the implementation of the commitments and agreements adopted by the United Nations that pertain to sustainable development, from 1992 Rio Earth Summit to UN SDGs (SDG Education Alliance).

5. Conclusions and Outlook

The ESD course topics list presents the intended course content and the reasons for the choice of the content; it will undoubtedly be modified in future evolutions of science and policy, climate change crisis, pedagogy, and assessment methods. Some of these ideas have been tested in an existing Master's course on Sustainable Engineering; the students' response was good especially after calculation of their carbon and ecological footprints, and a seminar work. Human development is bringing new solutions and also new problems which shall and will be included in ESD curricula and courses. In addition, the key issues may be organized in a different way. The list and literature cited can help teachers, school leaders and policy makers to introduce a new course on ESD or at least include some of its elements in an existing course. Experienced teachers and university lecturers can contribute and extend the ideas presented in this paper.

What are the future expectations in the SD evolution and, therefore, the ESD development? The latest data on SD is below the expected ones — climate change is turning into the climate crisis. Climate disasters are increasing both in frequency and severity. Let us mention some of them: heatwaves with droughts, wildfires, reduced food production, ice and permafrost melting with methane release, and water scarcity. July 2019 was the hottest month ever including the heatwave in Western Europe; vast areas of the Arctic (Russia, Greenland, Canada, and Alaska) and the Amazon rainforest were in flames. On the other side thunderstorms, hurricanes, tornados, cyclones, floods and avalanches are destroying fertile land, settlements, and people's lives. In 2018 alone, 17.2 million new displacements associated with disasters in 148 countries and territories were recorded; the World Bank estimated that as many as 143 million people in sub-Saharan Africa, South Asia, and Latin America could become climate migrants by 2050. The World Health Organization (WHO) estimated that climate crisis could lead to about 25 000 additional deaths each year. Global biodiversity loss is estimated to be 100–1000 times higher than the (naturally occurring) background extinction rate and it is expected to still grow in the upcoming years. We already know that the Paris Agreement to keep a global temperature rise this century well below 2 °C above pre-industrial levels will not be enough (even without the USA and Brazil withdrawals from the Agreement). The hysteresis effect is further worsening the future development of humanity.

The social pillar development is not much better. Although the share of people living in poverty and hunger has decreased in recent decades, the non-equalities between the richest 1 % and 99 % poor are increasing rapidly. The World population and per capita consumption are increasing. The wars are persisting and spreading out to new regions. Present and future climate migrants are causing severe problems in developed countries strengthening nationalists' political parties and leading potentially to a third World war. The neoliberal economic system is causing these changes by requiring constant GDP growth and free-market domination with the diminishing role of the social state. The raw materials scarcity, renewable energy production, and the limited planet cannot cope with such extensive growth. However, people, businesses, and governments in developed countries are hesitating to change their lifestyles, management, and social models.

To decrease consumption, de-growth and lifestyle changes are needed in developed countries. Profound changes in the human mind are required to achieve de-growth. Education can and must play the most important role in this development change. Universities are not doing enough efforts in sustainable development and in the climate change disaster prevention. The Happy Planet Index [82] peaks at 5 kUSD (thousand USD) per capita while developed nations achieve 30–40 kUSD, South European and wealthy East Asian countries about 25 kUSD, and new EU member states around 15 kUSD.

The above described key issues of ESD course contents are just the beginning of the new age — they need constant updating and revolutionary changes; youths from numerous countries have required them by declarations and protests. ESD needs to be holistic, embracing all areas of the human experience: intellectual, emotional, social, physical, etc. using balanced relationships between people themselves and their environment. It emphasizes democratic learning, emotional health, and relationship growth, to a far greater degree than the traditional learning environment [83]. Stakeholders' awareness is an important barrier observed in the practical application of the key issues on ESD; in spite of the scientific consensus on climate change and global warming, and in contradiction with the EU parliament declaration on climate crisis there are many influential politicians and financially strong corporations selling non-renewables who are denying the irreversible changes. However, younger generations are more susceptible to evidence as they are going to live at the end of the 21st century. Participation, cooperation, and building capacity of all the stakeholders are the factors needed for a successful ESD [14]. The challenge is timely evolution of the human society towards a deep transformation — the strong sustainability including de-growth transformation as an important and just transition is needed before it will be too late.

The ESD curricula and courses have to follow the needs of human society during the SD evolution. The acceptance of the key issues of an ESD course at three international conferences enables us to present it to professional associations and networks as well as to policy makers, asking them for support. A European research project about this topic would be welcome too.

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